

Conceptual Tool and Procedure for Community-Based Participation in School Maintenance Program

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Abstract

The Aceh Tsunami in 2004 has made Indonesia more aware of the urgency of safe building from possible disasters. Indonesia, which is centred on the convergence of three tectonic plates, and ringed by volcanoes, seriously exposed to natural disasters. The Government of Indonesia has begun a program to standardize building that is safe against disasters. School buildings and public facilities are primary target within this government programmed National Disaster Management Plan of 2010-2014. One of the programs is to rehabilitate schools in order to meet safety regulations. The rehabilitated schools need to be maintained regularly in order to remain safe. The maintain process include periodically monitoring and evaluation initiated by the school committee and run by the local community to meet the effectiveness within the implementation. This paper proposes a development of simple tool as guidance for school building maintenance. The developed guidance is applied to indicate if there is a discrepancy in the standard school buildings that have been rehabilitated. The monitoring and evaluation for maintenance using this tool is conducted periodically includes forwarding the information regarding damage in school building to local government by school committee. Tool and procedure in this paper will contain points of action need to be fulfilled by the school and the community in creating safe schools from disaster.

Keywords: community-based participation, school building, maintenance, tool and procedure.

1. Introduction

Indonesia that formed from a convergence of three tectonic plates, namely as Indo-Australia plate, Euro-Asia Plate and Pacific Plate, became an area that seriously exposed to natural disasters. Indonesia is not only prone to earthquake, but also floods, landslides, and forest fires. Data from BNPB (National Agency for Disaster Management) in www.bnpb.go.id stated that Indonesia has a high seismic level, ten times higher than in the US. Problems arise when earthquake is often followed by tsunamis and other secondary disasters. BNPB also stated that almost whole areas in Indonesia are potentially exposed to earthquake, with various risk level as figured in map below.

Realizing disasters may cause problems as slowing down the national development, loss of resources, material and non-material loss, Government of Indonesia (GoI) has prioritized a

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safe from disasters principles in designing every infrastructure, in order to achieve Disaster Risk Reduction paradigm. The main target of GoI as stated in National Disaster Management Plan of 2010-2014 is public facilities, including school building. One of Government's programs is the rehabilitation of the school in order to meet safety regulation required.

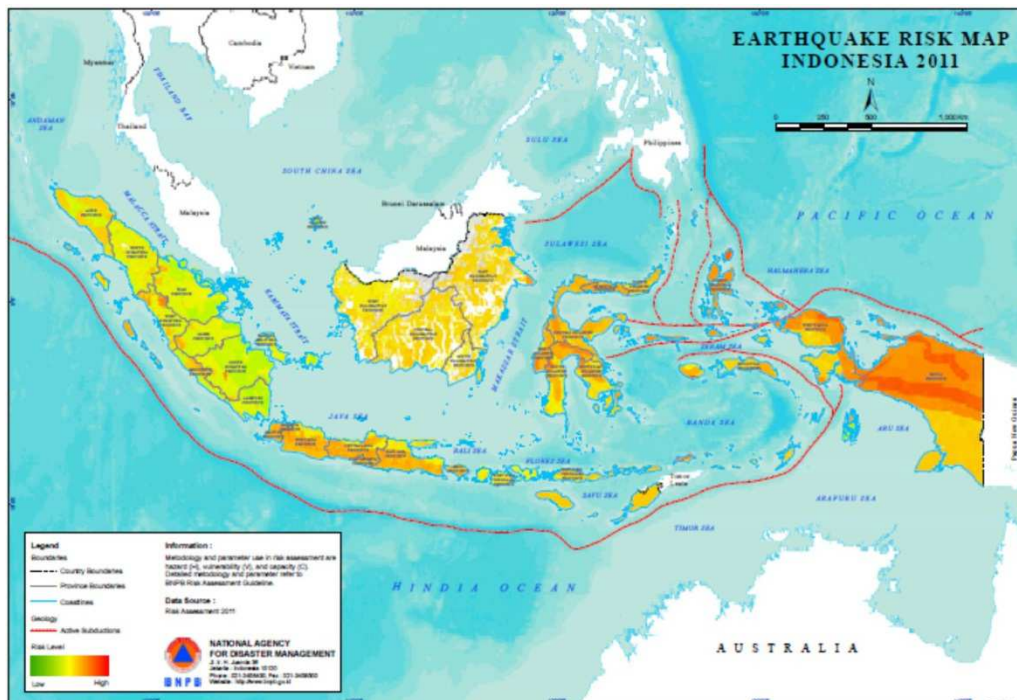


Figure 1: Earthquake Risk Map (BNPB, 2011)

School rehabilitation and its maintenance is the responsibility of local Government and school communities itself, yet considering the high number of school needs to be reviewed periodically after rehabilitation, the effective way to handle the monitoring and evaluation for maintenance is creating community based disaster risk reduction. They were the first one in dealing with disaster when it happen in their area making the awareness and concern to the school buildings around them is a necessity. Some tools have been proposed for maintaining building including school building but the tools fail when they are experimented to the community. The tools are too complex and too detailed to be understood by student or local community.

The needs of 'tool' to support active public/community participation in monitoring and evaluation to meet accountability in implementing school building maintenance become a necessity. The new approach developed in this paper is a guideline for maintenance in monitoring and evaluation doing periodically by the community. The participation is expected to reduce risk cause by the failure of the building. The tool and procedure given in a simple way, loaded with information, consists of concrete steps in forming safe school, and presenting the visualization checklist in order to make better understanding to the community.

The simple tool is anticipated to be understood and can be carried out by community that does not have any engineering knowledge regarding construction. According to BPS (Central Bureau of Statistics) data on Indonesian population based on education, as shown in the Figure 2, around 65.5% of Indonesia's population over 19 years old have the highest education level of high school. This group of people will participate in the program. Therefore, the need of a simple tool is necessary. The findings in the monitoring and evaluation for maintenance that comes from the community then can be reported to the local government for future actions.

The objective of this paper is reducing the risk of disasters by helping communities to periodically monitoring and evaluating the schools that have been rehabilitated in order to remain safe from disaster and ultimately create a culture of safety in the communities. This paper focuses on tool of monitoring and evaluation process for accessible structural element of the school building that can be applied by common people.

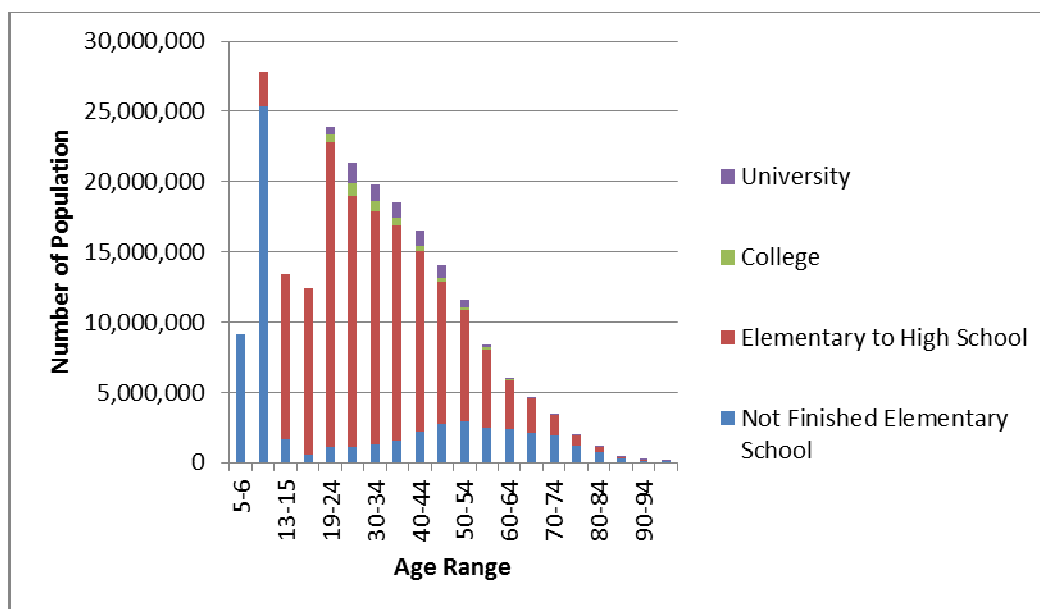


Figure 2: Indonesian Population Data Based on Education

2. Literature Review

Climate change is becoming a problem for mankind. Therefore, it is crucial to increase resilience and reduce vulnerability related to climate change with an appropriate approach. Climate change can lead to a devastating disaster in many aspects of life, especially for vulnerable groups such as children, the elderly and women. The risk of adverse impacts of disasters can be reduced by monitoring and evaluation, including by avoiding danger and increase readiness to respond to the events. Therefore, it is necessary that some measures are taken, such as building understanding and awareness as well as disaster risk reduction (DRR Spurrz Care Zambia, 2010). Steps taken to build understanding and awareness is to use knowledge, innovation and education to build a culture of safety and resilience at all levels, while reducing the risk to do with reducing the underlying risk factors.

Reducing the risk of disasters related to building is taken by conducting building maintenance. Maintenance is a complicated and costly process. But if this is done properly can extend the life of the building and save cost (Akasah, et.al, 2009). Building maintenance activities in Indonesia is regulated under Law number 28 year 2002 which the execution of the law is described in the Government Regulations number 36 year 2005. The law defines that maintenance is an activity to maintain the reliability of the building and its infrastructure in order to keep their function. Another definition of maintenance is the totality of all actions that keep the building functioning effectively (Wood, 2009). In relation to school buildings, Akasah et.al (2009) adds that the maintenance of school buildings is needed to ensure the health and safety of staff and students and to support educational performance. There are two types of maintenance processes commonly performed which are preventive maintenance and corrective maintenance. Cruzan (2009) defines preventive maintenance as a scheduled program of regular inspections, adjustments, lubrication, or replacement of worn or failing parts in order to maintain an asset's function and efficiency. Meanwhile, corrective maintenance work orders emergency maintenance activities carried out after the damage occurred.

Maintenance process in school building is a necessary conduct to ensure safety for students and teachers and to minimize the impact of disasters. In Indonesia, this process cannot be undertaken thoroughly due to occurrences of obstacles in the field. Firstly, Indonesia has almost 200 thousand schools from elementary to high school which are located in 34 provinces and scattered on area of 1,922,570 km². This condition becomes problematic for school building inspection conducted by government due to the difficulty in reaching the school, especially for school in remote area. Secondly, GoI has established some regulation and manual for school building maintenance. The Manual for School Building Maintenance issued by Directorate General of Primary and Secondary Education, Regulation of The Head of National Agency for Disaster Management number 4 year 2012 regarding Guidelines for the Implementation of School/Madrasah Safe from Disasters and Technical Guidelines for School Infrastructure Maintenance with Community are among guidelines that are established for school building maintenance process. While the guidelines are prepared to ensure safe school, those guidelines are difficult to understand by common people who do not have a technical knowledge regarding construction and building safety.

Despite the obstacles, the need of community participation in maintaining the feasibility of school building becomes necessary. Hawe in Nugroho and Yon (2011) defines a community as a collection of people with three grouping reasons: geographic, demographic, and the social institution (entity). Furthermore, community-based activities can be interpreted as an attempt to make changes in the community with external facilitation and managed by the community itself. According to World Bank (Swift-Morgan, 2006), participation is defined as a process through which the stakeholders influence and share control over development initiatives and the decisions and resources which affect them. By that definition, community-based participation programs do not always take the locus of community, but rather the level of community control over the program.

Community-based participation program is considered as an effective approach to conduct the school building maintenance especially in the remote area. To accommodate the level of

knowledge of the community, the developed tool needs to be simple. Most of the school building in Indonesia is classified as simple building. According to Government Regulations number 36 year 2005, simple building is defined as a building with simple character, complexity and technology. The basic parts of a building are sub structure and super structure (Punmia, 1993). The focus of the inspection is on the super structure which is accessible by common people. The components of building inspected are masonry units (walls), flooring, roof and ceiling, doors, window and other openings and building finishes.

3. Development Approaches

With most areas are vulnerable to disasters, a community-based approach in preserving a safe school becomes necessary. Community around the school will be the first to keep the maintenance of school buildings and ensure school safety from disasters. Through community-based participation in school building maintenance, two purposes are achieved which are forming a safety culture and increasing building safe school from disaster.

As stated above, that Indonesian communities mostly had limited knowledge regarding the actions to maintain the safety of school buildings. Thus the development of the tool for school building maintenance is conducted as follows:

1. Analysing the existing tools

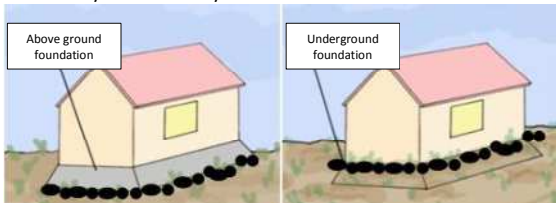
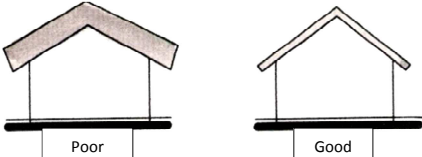
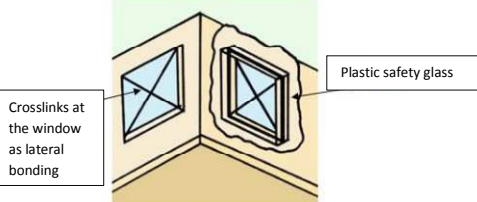
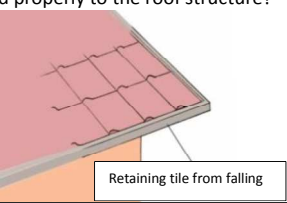
Analysing the existing tools for rehabilitation, monitoring and evaluation for maintenance process of safe school building is the first step taken. The Technical Guideline for School Infrastructure Maintenance with Community issued by the Coordinating Minister for People's Welfare, Ministry of Education and Culture, Ministry of Religious Affairs of the Republic of Indonesia, together with Decentralized Basic Education and USAID is evaluated. The guideline reflects the importance of managing education infrastructure and facilities by school communities itself to achieve the effectiveness of maintenance. The aim is to facilitate the school communities that may not be able to implement, execute, and familiarize with maintenance activities that should regularly conducted. Yet, the guideline only manage the organizational issues, cleanliness, tidiness, and efficiency in energy consuming without specifically mention the maintenance of structural components of the building which are important to identify the disaster risks in a building. Figure 3 shows some aspects of maintenance that required in the guideline.

No	Maintenance	Executor	Activities Undertaken	Additional Note
1	Toilets and Sewer Cleaning		Cleaning the closet, tub drain, scrubbing floor, flushing the closet	
2	Checking electricity usage		Turning the lights off after being used	
3	Never leave the door and window unlocked		Lock the door and window when out of the room	

Source: Technical Guideline for School Maintenance with Community, 2010 (as translated into English)



Figure 3: Sample Inspection Form for School Infrastructure and Facilities Maintenance

Another tool released in dealing with the increasing threat of disaster in relation to protect education facilities and infrastructure is the Guideline for the Implementation for School/Madrasah Safe from Disasters by BNPB (National Agency for Disaster Management) in Regulation of the Head of National Agency for Disaster Management number 4 year 2012. The guideline aims to help the building inspection process conducted by the school. Although the guideline provides list of infrastructure component and facilities that must be inspected with illustration, it is still difficult to understand by common people, related with many unexplained engineering terms that stated. Figure 4 below shows some examples taken from the guideline as translated in English. Directorate General of Primary and Secondary Education released other manual, The Manual of School Building Maintenance. The manual actually covers both of infrastructure and facilities of the building that should be inspected and the figure as well as the explanation, which is good to optimize the maintenance process. Yet, the weakness of this tool is too much explanation on each item without proper illustration, thus potentially causing confusion to the users. The example form for maintenance inspection is shown in Figure 5.

No	Structural Component	Yes	No	Additional Note
311	Is there any foundation system under the construction? 			
321	Is the construction has tie beams?			
322	Is the construction has ring beams?			
351	Is the roof made from lightweight material? 			
352	Is the roof connected properly to the truss?			
421	Is the ceiling is fastened securely to the roof system?			
432	Is window glass has been given crosslinks between the angle as lateral bonding on the structure or the glass coated with plastic safety glass so that when an earthquake happens, the glass is not harmful 			
447	Is roof tile attached properly to the roof structure? 			

Source: Regulation of the Head of BNPB, 2012 (as translated into English)

Figure 4: Sample Inspection Form for the School

	<ul style="list-style-type: none"> • Check if there are missing tiles, deflection, or else. Replace the missing tiles and the deflected tile • If using roofing sheet (asbestos or metal), check the bolts and nails that bind the sheet. Fasten or replace the loose and missing nails and bolts. Check also the cover of sheets joint, replace if badly rusted. Paint or replace the joint sheets that is missing or damaged
	<ul style="list-style-type: none"> • Check the outer wall (bricks composition/block, plastering, etc.) from the crack, flaking, or any other damage, and then repair the damage appropriately. Note that large cracks that occurs to the wall mostly vertical cracking, splitting straight from top to bottom, probably caused by the movement (declining or shifting) from foundation. Immediately do the checking and repairing if needed (foundation treatment or else). Hair cracks on the wall need further observation if getting bigger, because that indicates the problems in foundation system. Consult a construction consultant to handle it as soon as possible • Check the electrical installation (panels) outside the building • For building with steel frame roof, check the frame and the joints from rust, flake, or else. Repair any damage. If repainting is the choice, make sure that the rusty part already repaired

Source: The Manual of School Building Maintenance (as translated into English)

Figure 5: Sample Task List for Regular School Maintenance Activities

2. Reviewing literature and collecting information from the field

The next step is reviewing available literature and collecting information related to monitoring and evaluation of safe school building as well as community-based participation. The actions are emphasized in the requirement of the simplicity of conceptual tool. The conceptual procedure is developed from the regulation and technical guideline that have been the basis for current activity in monitoring and evaluation of safe school building.

3. Developing the conceptual procedure and tools for monitoring and evaluation of safe school building that can be utilized by ordinary people.

4. Proposed Procedure

This paper provides the procedure of monitoring and evaluation for maintenance process to preserve efficacy in implementing the program. The proposed procedure describes the process since the school rehabilitated until the school experienced periodically audit as shown in Figure 6.

The process is beginning when the rehabilitated building audited periodically by the community. The audit/monitoring and evaluation process is using the tool that also developed on this paper. From the result of the audit process that also prepared by the community, known that the damage indicators are found or not. If there is no finding in damage indicator, then the building consider as safe. If there are findings in the damage indicator, then the community itself should reported the findings to the school committee.

School committee will forward the information to the local government who will be then forward the information to the central government. Receiving the information from local government, the central government then conduct the follow-up action to rehabilitate the school building.

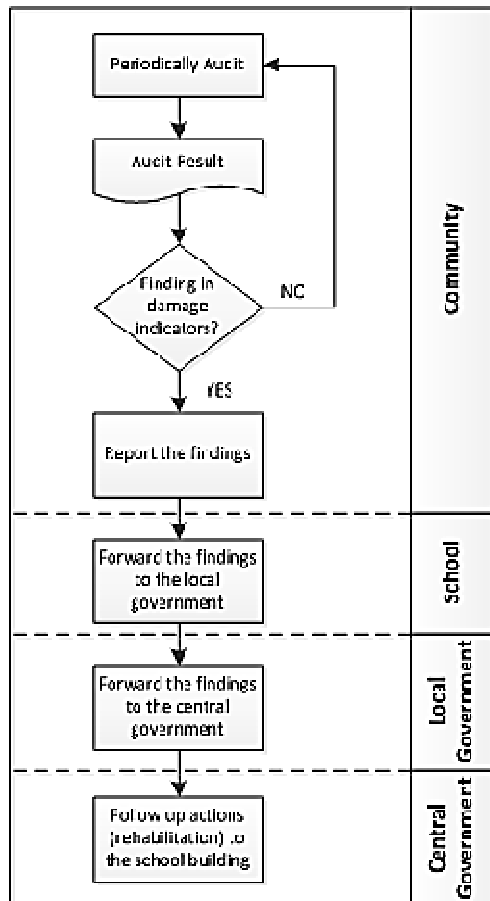


Figure 6: Activity Diagram

5. Proposed Tool

Considering the user's limited knowledge in structural element of the building, the proposed tool should address these conditions: easy to understood, applicable, but still loaded with useful information to guarantee the accountability of the monitoring and evaluation for maintenance process. Combining the three conditions, the tool is presented with both illustration and table. The tool defining the accessible structural element in six types: floor, door, window, wall, ceiling and roof. Each structural element is divided by their material and damage, as well as the importance level to rehabilitate. Identification on material type, its condition, the existence and the quantity is the task for the evaluator, while the importance level of rehabilitation already stated by considering the regulation. The detail of each element will described as follows:

1. Floor: The common materials for floor used in Indonesia's school building are ceramics and cement/concrete, yet in several school buildings, they do not even have floor to cover the ground. Damage that may arise on the ceramics floor is divided into: cracked

and heavily damaged. While on the cement/concrete floor, the damage that may arise is cracked, and crumbled. The next task for the evaluator is to identify the existence of any damage type that occurs and then to measure the amount of the damage and express it in unit area or unit number.

2. Door: This paper assumes the material for door is wood, the most popular material used for door in buildings. Rotten door is the main problem of building that lack of maintenance action. In Indonesia's school building, the addition problem beside rotten door is the absence of door. The evaluator assigned to identify the damage occurred, and measure the amount in unit number.
3. Window: Damage occurred in window classified in: rotten frame, broken glass, and no window. The damage on window is seriously needed to be fixed immediately, because the window with improper condition will directly harm the students when the disaster strikes. The measurement for window's damage is expressed in unit area or unit number depending on the damage.
4. Wall: Wall material divided into concrete/brick wall and plywood wall. Though plywood is less good to be used as wall material, a lot of schools are using it. The damage type of concrete wall divided into: non-structural cracking (had no effect on structural resilience), structural cracking (direct effect to structural strength), old wall which is feared to collapse, and no wall. While the damage type for the plywood wall include: rotten and old wall. Measurement for the amount of damage is expressed in unit area.
5. Ceiling: The critical element that should not be missed is the ceiling. Improper or especially broken ceiling should be fixed immediately since it is very dangerous for everyone in the room. The damage on ceiling consists of water seepage, bending, and no ceiling. The quantity measurement for ceiling is expressed in unit area.
6. Roof: As the topmost element of the building, roof has an important role as the primary protection, so the condition should be kept well. Commonly used type of roof is tile, asbestos and zinc/metal. Damage to the roof caused by wind, vibration, falling loads, or extreme change of weather. Therefore, the damage type is classifying by the roof material. For roof tile, the type of damage are cracked, misplaced, or missing tiles, commonly caused by vibration, or falling loads. The damage types of roof that using asbestos as material divided by cracked roof, crumbling and missing sheet. While for the zinc/metal roof, the damage types are: rusty, broken on surface (torn or holed) and loose roof. The quantity measurement for roof tile is in unit number, while the asbestos and zinc/metal roof measured in unit area.

The tool with complete illustration and table is attached.

6. Conclusion

The total area of Indonesia and Indonesia's vulnerability to natural disasters makes the importance of community-based participation in implementing programs for the National

Disaster Management Plan of 2010-2014. Spread of schools from cities to remote areas makes the community become the frontline in ensuring school safety against natural hazards. On the other hand, the ability and knowledge of the community building in general is limited. This requires a tool and a simple procedure that can be understood by all levels of society so that the program of the Government of Indonesia in disaster management can be carried out more extensively. Conceptual tools and procedures developed from the literature review and the field study is expected to meet program objectives of the Government of Indonesia.

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<http://www.bps.go.id/>

Appendix: Sample of Checklist for Building School Maintenance

Element	Condition	Illustration	Existence		Quantity		Importance Level
			Yes	No	Pieces	cm ² /m ²	
Floor	Heavily damaged						Major
Door	Rotten						Major
Window	Rotten						Major
Wall	Structural cracking						Major
	No wall						Major
Ceiling	Seepage at the ceiling						Major
Roof	Cracked						Major
	Missing						Major