Assessing school disaster preparedness by applying a comprehensive school safety framework: A case of elementary schools in Banda Aceh City

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Abstract. The study assessed the depth of school disaster safety at public elementary schools in Banda Aceh City, Indonesia in terms of comprehensive school safety, especially school location, disaster management and disaster education. The findings indicate that 56% of public elementary schools in Banda Aceh City are exposed to high tsunami risk, and most externally driven school disaster preparedness activities were not continued by the schools due to lack of ownership and funding. To realize comprehensive school safety, disaster preparedness programs should neither be brought in by external donors, nor be in a patchwork. Rather, it should be conducted jointly and sustainably by the local school and the community and supported by multi-sectoral support in the city. Comprehensive school safety of public elementary schools in Banda Aceh City could be realized by reviewing, updating and localizing school disaster preparedness programs by all the education partners in the city with strong political will and commitment.

1. Introduction

“Disaster education is the foundation of all the efforts for disaster risk reduction. The capacity of a society to accommodate itself to and recover from the effects of a natural disaster depends on how much each individual was able to learn from the past experiences and knowledge passed down from our ancestors, and how much they were able to prepare for a disaster in daily life through partnerships among households, schools, and the community” [1]. This is a preamble of the Sendai Declaration adopted at the International Forum for Promoting Education on Disaster Resilience, which was a
public forum at the 3rd World Conference on Disaster Risk Reduction in Sendai, Japan. This sentence represents Japan’s 20 years of experience in enhancing school disaster safety. It clearly states that disaster education involves efforts to increase the capacity of individuals and the society as a whole based on learning from previous disaster experiences, and that disaster education is a continuous community effort. In addition, the Sendai Framework for Disaster Risk Reduction 2015-2030 supports the idea of a comprehensive school safety [2] that includes an understanding of school disaster safety, particularly safe school locations and buildings, effective school disaster management and education to reduce disaster risk, disaster loss and disruption of educational services at the time of a disaster. In Banda Aceh City, several forms of external assistance have been promoting school disaster safety since the 2004 Indian Ocean Tsunami (IOT). A decade since the disaster occurred, there remains questions of how much these forms of assistance could contribute to enhancing school safety against disaster, as well as how much these external supports have been institutionalized at the school level.

2. Purpose
The purpose of the study is to assess the depth of school disaster preparedness at public elementary schools in Banda Aceh City, and to examine ways for a sustainable approach for the schools to continue by themselves. The study aims at finding out the situation as to what extent the experience of the 2004 IOT is being integrated into school safety against tsunami disaster at all public schools.

3. Methods
The study was conducted over two years from March 2014 through December 2015 and included two field visits by the authors. There were three steps involved in the assessment of the depth of school disaster preparedness. The first step was to conduct a city-wide elementary school mapping with the 2004 tsunami inundation data in order to identify school locations and to determine which schools are still located in tsunami risk areas. In the second step, we conducted interviews and focus groups with school headmasters and teachers of 47 schools located at the inundated area. Structured interviews were arranged with headmasters of the selected schools. In addition, a focus group discussion was conducted with elementary school teachers. The third step involved collecting survey data from 113 students from four schools in grades 4-6.

During the second step, we retrieved the following data: 1) detailed personal information from the participants (i.e., headmasters and teachers), including their assignment history and teaching experience; 2) participants’ experience with the 2004 IOT and participation in disaster trainings and other capacity building activities; and 3) the condition of the schools before and after the 2004 IOT, including status of the school’s disaster preparedness program (SSB status), risk exposure of the school, disaster prevention, mitigation and preparedness activities conducted by the school, as well as nature of school-community collaboration. During each school visit, we also conducted an observation to assess the building type, primary structure, existence and condition of tsunami evacuation locations, as well as the existence and condition of tsunami evacuation maps, tsunami evacuation route and signage.

4. Results and Discussion
4.1 Safety of school location
The distribution of public elementary schools in Banda Aceh City in the 2004 IOT tsunami inundation area was found by school location mapping based on the inundation data estimated by the Japan International Cooperation Agency’s (JICA) [3]. The results showed that 55 of the 98 public elementary schools in Banda Aceh City are located in the 2004 tsunami inundation areas.
4.2 Experiences of school disaster preparedness programs in the past
Among the 55 elementary schools located in the 2004 IOT tsunami inundation area, 47 public and Islamic elementary schools were surveyed. 29 of those schools had received at least one school preparedness program between 2009 and 2014 and were labeled as SSB schools, while 18 of the schools had not received any programs at all. Supporters use various program names to represent a “school disaster preparedness program”. However, for analytical purposes, we labelled all of the schools that received school disaster preparedness programs as SSB (Sekolah Siaga Bencana). In total, 34 elementary schools in Banda Aceh City have received SSB programs in the past, and 61 have not received any programs [4]. This means that so far, the SSB program has been prioritizing the schools located in the previous inundation area. The sample in this study is representative of the schools in Banda Aceh City, as 29 of 34 schools that received SSB programs were included in the analysis. Among those schools, six of them have received the program more than once, with one school receiving the program four times from different agencies.

Each agency provides different types of disaster preparedness activities. For example, the school disaster preparedness program by the Tsunami and Disaster Mitigation Research Center (TDMRC) of Syiah Kuala University provides a school watching workshop, first aid training, an art workshop on disaster mitigation, provision of disaster related equipment, and disaster risk reduction (DRR) festivals. On the other hand, the SSB program of TDMRC and Bank of Indonesia assisted schools in preparing their tsunami evacuation maps, evacuation drills, school disaster preparedness task forces and school disaster management standard operating procedures. This was confirmed in survey to SDN 6 (SDN stands for Sekolah Dasar Negeri or public elementary school) 6, SDN 17, SDN 41 and SDN 65. Schools that received the SSB program from the Indonesian Red Cross (PMI) were equipped with tsunami evacuation signs and “safe location” signs.

| Name of the SSB Program | Types of activities included in the SSB Program |
|-------------------------|-----------------------------------------------|
|                         | Teaching content (in subject / curriculum) | Extra-curricular activities | Evacuation map | Evacuation Drill | Provision of disaster equipment (e.g., signage) |
| DRR-A Program           | x                                             | x                             | x             | x              | x                                             |
| TDMRC, LIPI & UNESCO SSB Program | x                                             | x                             | x             | x              | x                                             |
| TDMRC & LIPI SSB Program | x                                             | x                             | x             | x              | x                                             |
| TDMRC, ACT, PMI SSB Program | x                                             | x                             | x             | x              | x                                             |
| TDMRC & Bank Indonesia SSB Program | x                                             | x                             | x             | x              | x                                             |
| TDMRC & ACT SSB Program | x                                             | x                             | x             | x              | x                                             |
| Education Agency Aceh province SSB Program | x                                             | x                             | x             | x              | x                                             |

Source: Compiled by authors, from various sources
Remarks: DRR-A (Making Aceh Safer through Disaster Risk reduction in Development, UNDP & Government of Indonesia, 2009-2012), TDMRC (Tsunami and Disaster Management Research Center, Syiah Kuala University), LIPI (Indonesian Science Institute), ACT (Aksi Cepat Tunggup, a local NGO), PMI (Indonesian Red Cross).

4.3 Disaster Management
Some of the schools with SSB recognition are more aware of their designated tsunami evacuation site, are equipped with an evacuation route map and sign and have conducted at least one disaster drill during the
program. However, based on the statistics, the number of schools demonstrating more awareness was not significant. For example, only 12 of 29 SSB schools are equipped with evacuation route maps. In addition, there were only two non-SSB schools that were equipped with evacuation route maps. Only 9 of 29 SSB schools were aware of their designated evacuation sites, and only five teachers actually had the experience of visiting and assessing the site. Some schools were equipped with an illustrative image indicating the location of the schools, access roads, and names and locations of the designated evacuation sites. Other schools used an aerial photo to indicate the access road for the evacuation place. However, all of the disaster evacuation maps, regardless of the type, lacked scaling information to indicate the distance or time required to access the designated evacuation place. This is a fundamental feature of a map and the evacuation maps need to be updated so that they are in compliance with the 2014 National Disaster Management Agency (BNPB) Planning Guidelines on Tsunami Evacuation Routes and Signage [5].

It is also critical to notice that the “safe location” sign installed at several SSB schools and assembly point for evacuation were not hazard specific (i.e., fire, earthquake or tsunami). Thus, they could give a confusing message to the school community regarding the safety of the assembly point or safe location. Moreover, in the case of a tsunami, the Indonesian tsunami evacuation guidelines does not recognize the term “safe location” (or “tempat aman” in Indonesian). Instead, it introduces the concept of a “temporary evacuation place” (TES: Tempat Evakuasi Sementara) and “final evacuation place” (TEA: Tempat Evakuasi Akhir) [ibid]. Accordingly, the school community must be trained to recognize their designated evacuation place, either TES or TEA, and evacuate to those places rather than waiting or stopping at the “safe location”. BNPB’s 2014 standards on the signage for TES and TEA also includes specific dimensions and colors, as well as guidelines on its placement.

There is also little correlation between preparation of an evacuation route map and having a designated evacuation place actually used during a disaster simulation or drill. Only 6 of 29 SSB schools actually used the evacuation route map for the simulation. Another issue is that schools generally do not update their evacuation route maps or make efforts to assess the situation along the route. Only one SSB school reported having updated its evacuation route map. Nevertheless, in terms of relevance of the disaster type, almost all surveyed schools with evacuation maps stated that the information is relevant for an evacuation in the event of an earthquake and tsunami, and some added that it is also intended for an evacuation in the event of a fire and landslide. We also found that generally, the schools do not designate additional resources for maintenance of the tsunami-related signage. Thus, in some schools, their tsunami evacuation maps become completely unreadable.

![Figure 1](image_url). Various Types and Conditions of Tsunami “safe location” (left and center columns, survey, October 2015), in comparison with BNPB Guideline (right column)
We also observed problems with the availability and placement of evacuation route signs and “safe location” signs. Only 11 SSB schools had evacuation route signage available at the time of the survey in 2015. In those schools, the tsunami evacuation route direction and “safe location” were placed without consideration for the appropriateness of the location, whether it was visible or being blocked by other objects, or whether it gave the same message when being looked upon from both sides. Most of the tsunami evacuation route signs also needed to be updated so that they would be in compliance with the 2014 BNPB’s Planning Guidelines on Tsunami Evacuation Routes and Signage, particularly the signage standards addressing the name and distance to the designated evacuation place. The most recent standards also regulate color (green background with the text and information written in white), dimensions and layout so that the signage is readable from any direction. Figure 3 showcases various types and conditions of tsunami evacuation routes available in several elementary schools in Banda Aceh City, in comparison with the national standard.
In general, SSB schools have more experience in conducting evacuation drills or simulations. However, this does not mean that non-SSB schools do not receive or conduct disaster drills. Among the 25 SSB schools and 7 non-SSB schools that reported conducting evacuation drills or simulations, there was only one school that consistently organized disaster drills from 2005-2014 period, with at least one and sometimes three drills per year. After the SSB program ended, the other SSB schools did not assume the responsibilities of conducting school evacuation drills or regularly visiting and assessing the designated evacuation locations. This implies an issue of sustainability. Since school principals and teachers are regularly transferred to other schools, routine implementation of evacuation drills at schools are critical for transferring knowledge and skills to newly assigned teachers and ensure the safety of the students in the case of tsunami, especially since they are located in the tsunami inundated areas. The headmaster or teachers who received the SSB training may have a basic idea of disaster preparedness and evacuation, since non-SSB schools have very limited understanding of this. For example, one of the non-SSB school teachers interviewed stated, “(We will evacuate to) the school ground (if there is) an earthquake and (to) school hall on the third floor in the case of tsunami...” (a teacher, female, interviewed in September 2015). This indicated that they were unaware that there is no guarantee of safety in the school hall. The results also show that four SSB schools reported that they have never conducted evacuation drills. This implies that even though the school experienced the drill, none of the current teachers had ever participated in a drill.

In addition, there is little correlation between having a SSB-status and having the means for the school to access the disaster early warning information and evacuation order. A total of 34 schools, 18 SSB and 16 non-SSB, admitted that they had no means to receive official evacuation decisions from either the Education Agency or BPBD. Only nine schools reporting having heard a tsunami siren during an
earthquake in April 2012. One of the SSB programs did provide an earthquake alarm for the schools. However, all of the beneficiaries said that the alarm was no longer working. The other schools said that they created their own early warning instrument using bamboo or listened to announcements from local mosques. During the interviews, one of the headmasters described the school’s situation as follows: “(There is) no official information received. I had to decide by myself for evacuation basically. But, when in 2014 there was a risk of big flood, I participated in a briefing organized by Education Agency for (elementary schools) headmasters, on how to manage the flood. Also, we had received earthquake alarms from Indonesian Red Cross, but (they are) broken now. Also, when in 2014 we have an earthquake during school day, the students just escaped and left behind all their bags and shoes” (a headmaster, female, interviewed in September 2015).

4.4 Disaster Education

Disaster Risk Reduction Project for Aceh (DRR-A) developed guidelines, entitled ‘Sababat Siaga’, on how schools can prepare for disasters, and integrate disaster content into the elementary school curricula for grades 1-3 and grades 4-6. Outputs of the initiative were also endorsed by the Governor of Aceh Instruction 2/2012 on integrating disaster content into the curriculum [4]. However, from the trained schools (SDN 1, SDN 2, SDN 31, SDN 36 and SDN 39) in DRR-A among the 47 surveyed schools, only one school clearly still referred to the curriculum guideline. In addition, since a new national curriculum was introduced in Indonesia, these guidelines should be also updated accordingly. There is little correlation between having received the SSB program and including disaster education content during the teaching process. Both SSB and non-SSB schools reported that they provided disaster content during teaching hours through multiple methods and time allocations. Most schools from the SSB and non-SSB groups stated that they teach students disaster education. The pattern in both groups is similar in that the disaster education teaching material was owned by the schools, the same grades received disaster education, and the same types of hazards were being taught.

Both SSB and non-SSB schools stated that they have additional reading material for teaching disaster content, supplementing the use of an ordinary teaching book. However, some SSB-schools had more material or utilized various means for teaching disaster content. For example, 2 schools used the DRR-A materials, student projects or assignments, printed materials (e.g., maps, posters, disaster photos) and a mock, model or video of disaster. Other similarities include the student grade level selected for receiving disaster content and the type of hazards being taught, which included earthquake and tsunami. Common types of hazards taught include flood, landslide, and volcanic eruption. Both SSB and non-SSB schools preferred to target grades 4, 5 and 6, as can be seen from the Figure 4.

There were variations in terms of the teaching subject or activity used to deliver disaster content. At the non-SSB schools, the content was being taught in either natural science, social science, citizenship or physical education. However, SSB schools taught the content a wider range of subjects, including natural science and social science, mathematics, Indonesian language, and extracurricular activities (e.g., Boy Scouts/Girl Scouts). In terms of teaching hours, the pattern is also similar for both SSB and non-SSB schools with the same portion of schools that taught disaster content irregularly: 1-5 teaching hours/semester or 6-10 teaching hours/semester. However, some SSB schools allocated more than 15 hours/semester to teach disaster content. To this point, SSB schools still have the upper hand for teaching disaster content and have tried various means. As the vice headmaster at a SSB school stated, “… (we teach) in the subject of natural science and social science. Each at around 2 class hours per in a week, especially with the new thematic teaching style. In total, it might have accounted for 12 hours per month. We indeed tried to connect with local content as well” (a vice headmaster, female, interviewed in September 2015).
Generally, schools also did not keep records or documentation of the physical conditions before and after the 2004 tsunami. Thus most of the schools used resources from after the IOT and general information, as opposed to resources specific to the school’s locale, as a means to teach students about the tsunami itself. There were only 6 schools (4 SSB schools and 2 non-SSB schools) that kept memories of the 2004 IOT, which were mostly photos and videos, and usually belonged to the personal collections of the teachers themselves. Similarly, only four schools (1 SSB and 3 non-SSB) kept records and documentation of the school situation before the 2004 IOT. However, almost all of the schools’ headmasters and teachers knew the general oral history of physical damage, people’s loss of life in the school due to the 2004 IOT and year...
of schools’ reconstruction as well as the name of organization/donors that built their school. Only 2 non-SSB schools and 1 SSB school were found to have a complete absence of records of the history of the school due to the 2004 IOT. Nevertheless, there was no evidence that the documentation of the schools’ records and documentation of the 2004 IOT were being used for teaching about the disaster or DRR education. However, having tsunami poles at the school site helped them to have a point of discussion for disaster education or to commemorate the 2004 tsunami, as 11 of 19 schools with tsunami poles used them for this purpose. In contrast, 24 schools reported organizing a visit to Aceh Tsunami Museum as part of education about the 2004 IOT. Other means for education include newspaper articles, photos and videos about the 2004 IOT, although these materials were not necessarily about the school’s experience. In cases in which the school was located in proximity to a preserved memorial facility of the 2004 IOT or tsunami-related infrastructure (e.g., spot of the “floating boat” or tsunami evacuation building), we found that there was a tendency for the school to organize a trip to visit those locations.

![Figure 5](image_url). Example of a record of the school’s status before and shortly after the IOT 2004

![Figure 6](image_url). Example of tsunami poles built at schools (left, SDN 31; right, SDN 27)

5. Conclusion

The study found that although most of the schools were totally damaged by the 2004 Indian Ocean Tsunami, 56% of public elementary and Islamic schools are still located in the 2004 tsunami inundated area. According to the Banda Aceh City Education Office, as of 2014, the lives of 21,301 students are exposed to a great potential tsunami disaster risk. Through post-disaster recovery assistance, massive externally-driven disaster risk reduction activities have been implemented to enhance the school disaster safety in the Banda Aceh City, including reconstructing concrete and two-story school buildings, making evacuation route maps and signs, conducting evacuation drills, preparing for teaching and developing learning materials. However, the study results indicated that these activities were mainly donor-driven and were implemented without full involvement from the local education
agency. After the external supports ended, these activities were not assumed by local education agencies and schools. Tsunami evacuation information and disaster education curricula have not been updated. Since most of these disaster preparedness projects at the schools were supported by external donors during the past decade, a “sense of dependency” on external actors was observed among teachers at many schools. Schools and headmasters were not aware that they were responsible for ensuring the continuation of disaster education.

To realize comprehensive school safety, disaster preparedness programs should neither be brought in by external donors, or be a patchwork. Rather, it should be conducted jointly and sustainably by the local school and the community and supported by multi-sectoral support in the city. Comprehensive school safety of public elementary schools in Banda Aceh City could be realized by reviewing, updating and localizing existing school disaster preparedness programs among all the education stakeholders in the City with strong political will and commitment.

In the Sendai Framework on Disaster Risk Reduction 2015-2030, “increasing public education and awareness of disaster risk” in the post-disaster recovery, rehabilitation and reconstruction phase is newly emphasized. Since school disaster preparedness in Banda Aceh has been a precedent case in a post-disaster recovery process, continuous follow-up efforts should be made to make schools a center for creating a culture of safety against the next potential disaster. It is recommended to promote collaboration with other tsunami affected areas, such as that of the 2011 Great East Japan Earthquake and Tsunami to exchange experience, which could help avoiding the erosion of memories and experiences of the tsunami disaster.

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