Strategy for Promoting Education for Natural Disaster Reduction in Indonesia and ASEAN Region

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Abstract. Because of the dynamic geological conditions of Indonesia and South East Asia Region, many countries in such region are vulnerable for geological disasters, such as earthquake, tsunami, volcanic eruption, landslide and floods. This paper describes strategy to develop appropriate education program for geological disaster risk reduction in this region. Formal education program, especially at the universities and schools, should be enhanced to provide qualified human resources which capable to improve the resilience of the society in response to any potential geological disaster. Program for public education should also be developed in such effective mechanism by in formal approach. The real challenge of this education strategy is to build up the culture for disaster awareness and prevention, by empowering the society to adapt with the dynamic geological conditions.

Keywords. Geological disaster, education strategy, society resilience, culture for disaster awareness and prevention, adaptive approach.

1. Background of the problems

Because of the active tectonic setting of the region, the risks of geological disasters inevitably increase in Indonesian Archipelagoes and other ASEAN countries. Hundred thousands of people died as the victim of tsunami on the 26th December 2004. Several more thousands of people were also died due to the earthquakes in Yogyakarta, Indonesian (2006) and in China (2008). Indeed, numbers of people buried by landslides and debris flow continuously increases every year. Total socio-economical loss as the results of all those geological disasters has reached billion of US dollars.

Impacts of natural disasters can be prevented or minimized if it can be properly mitigated and managed (Abbot, 2004). It was highlighted in the Hyugo Framework declared in 2005 that development of the nation and society resilience in response to the disaster is MUST. Thus, the right of human being to live safely in their environment should be guaranteed, despite all of the complexity of geological phenomena at the region.

However, it is also impossible to change the nature of geological phenomena in Indonesia and ASEAN, which actively and continuously result in geological disasters. Therefore, there should be some efforts with appropriate strategy to increase the community resilience in the vulnerable areas. Empowering the community living in the vulnerable area **to adapt** with the nature of geology will be rather more feasible, instead of challenging the geological nature. Indeed, **adaptive approach** will be the main consideration, and thus public education on geohazard will be urgently required to empower human resources living in geological disaster vulnerable area (Karnawati and Pramumijoyo, 2005a).

2. Goal of geological education.

Regarding the stated problems above, it becomes an urgent need to develop appropriate geological education with the goal for improving the society resilience in geological disaster prone area, through formal and in formal programs. By conducting such education programs it is expected that the social and economical risks due to geological disaster can be significantly reduced.

3. Design of education program.

Formal Education

At university

Knowledge to anticipate geological disasters, which is required to be delivered in a special subject so called as Geohazard Management, has been introduced for undergraduate program in some universities in ASEAN countries, such as in Indonesia, Malaysia, the Philippine, and Thailand. However, such knowledge has not yet provided in a special subject (Karnawati and Pramumijoyo, 2004). It is only integrated as the topics to be discussed in the subjects of Environmental Geology (under the topic of geohazard management), Soil Mechanic and Geotechnics, (under the topic of slope stability related to landslide prediction and control), Hydrology and/ or Geohydrology (under the topic of groundwater problems), Volcanology (under the topic of mitigation for volcanic eruption) and or Seismology (under the topic of earthquake mitigation). Those topics mainly discuss several issues on factors controlling the hazard occurrence (hazard = potential occurrence of geological disaster), the mechanisms and processes leading to the hazard occurrence, how to predict, mitigate and control such hazard. Unfortunately, quite limited practical exercises and field works can be provided for the students due to the limited concerns on the importance of geohazard education. Similar to the undergraduate education, in the postgraduate program (master program) quite few universities in Indonesia and in some other ASEAN countries provided special courses on Geohazard Management. Moreover, most of the existing geohazard education more emphasizes on the knowledge enhancement, but less effort to provide effective learning method which include appropriate field and laboratory works.

Despite some limitations in conducting geohazard education at the university level, students at the university are considered as the strategic target for human resource empowerment and community resilience in geological disaster prone area. Indeed, the students will become the potential future researcher to develop appropriate technology for disaster prevention and control, as well as the as potential analysts and policy makers to anticipate and to manage geological disaster in their regions. Thus, they should be considered as the seeds for future agents to further develop the national culture for disaster awareness and prevention. Clearly, mechanism and method of geohazard education in

the universities need to be further enhanced through several stages as follows:

- Enhancement the syllabus (content) and learning method on geohazard subject, which provide more opportunity for the student to study the real field and society problems related to geological disasters.
- Provide more research opportunities to stimulate the development of appropriate technology for disaster prevention.
- Establish the national and regional education network on geohazard education.

Indeed, the interactive learning method through student working groups by providing case studies needs to be done in order to improve not only the student's knowledge and practical skill but also to develop their attitude and spirit for disaster awareness. Indeed, introduction of real case problem and field work, working group discussion and seminars can be an excellent media for the students to learn to apply their knowledge as well as to creatively improve their analytical skills, and to provide sound decisions to solve complex problems related to geological disaster

Supports from government agency and some other relevant research institutes are also required as the internship program to provide facilities and opportunities for students to explore more knowledge and experiences from the real problems in the field and communities. Interdisciplinary approach also needs to be elaborated by inviting relevant experts from other disciplines as the external resource person, due to the complexity of geohazard management problems.

Obviously, establishment of networks for geohazard educations at national and ASEAN levels are crucial to facilitate the effective learning and research program on geohazard education. Since the year of 2003, ASEAN University Network/ the South East ASEAN Engineering Education Network (AUN/SEED-Net) has also established the Field of Geological Engineering Networks consisting several universities from Member Institution Countries such as from Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippine, Singapore, Thailand and Vietnam as well as from Japan. In this network, education and research on geohazard has been carried out. Due to the leading experience to deal with geohazard problems, Gadjah Mada Universities in Indonesia has been assigned as the Host Institution for the network where students from other countries in the network are now conducting the learning and research on geohazard to obtain Master and Ph.D. Degrees (Karnawati et all, 2005b). Academic and research support from Kyushu Unversity, Kyoto University, Tokyo Institute of Technology and Hokkaido University are available to warrantee the quality and effectiveness of such research and education programs.

Eventhough, since the year 2008, Integrated Fields of Disaster Mitigation has been established by this ASEAN University Network to accommodate the needs to improve research based education for disaster risk reduction.

As a part of this program ***school on the move*** and ***long distance learning program*** now are proposed to further develop the existing research and education programs, especially for postgraduate programs through the ASEAN network. Through this program, students can have opportunity to move from one research institutes to the others, either conducting in their own-country or outside of their countries for having research training in geohazard education. More opportunities for the students to be exposed to the real geohazard problem within the ASEAN regions can also be provided. The student will have quite various experiences on geohazard management before completing their Master degree. Their communication skill and capability to adapt with the new environment also can be improved by having school on the move program.

Nevertheless, financial consideration remains to be the obstacle of this program. Therefore, the cost sharing within the ASEAN countries are required.

At school

Basic and simple knowledge on geology to understand some Geohazards such as flood, landslide, and soil erosion have been introduced as a part of Geography Subject at schools since the primary school in Indonesia (Karnawati and Pramumijoyo, 2004), Vietnam, Cambodia, Laos, Malaysia and Thailand. Meanwhile the knowledge about volcanoes and earthquakes also introduced at schools in Indonesia and Philippine. However, it is apparent that such education has not yet successfully improving student's skill and attitude for geohazard awareness and preparedness. This existing education program mainly emphasize for the development of knowledge aspects related to the definition and the cause of flood, landslides, soil erosion, earthquake and volcanic eruption. The contents and syllabus as well as the method of delivery and learning process of geohazard at schools need to be further evaluated and enhanced.

Fruthermore, Karnawati and Pramumijoyo (2004) suggested that practical knowledge about geohazard mitigation and preparedness should be provided in a simple but attractive method of teaching and learning. The most important aspects need to be learned by the pupils at school include several important points as below:

- Mechanism of occurrence of any geological process that result in geohazard,
- Symptoms of such geohazards,
- Practical knowledge on hazard mitigation, preparedness and emergency responses.

It was also suggested in the National Workshop on Geohazard Education held in Indonesia last August 2005 that the new curricula is not necessary to be developed to provide special subject on geohazard awareness and preparedness at school (Gadjah Mada University, 2005). It was suggested that the knowledge of geohazard can be integrated in the syllabus of the existing subjects such as in the subjects of Geography, Natural Sciences, Language or Religion. Practical exercise for emergency responses is also important to be included in the existing subject of Physical Exercise. Visit to the field and institutions dealing with geohazard management will also be useful to provide students with more visual examples on the real problems of geohazard. In fact, some schools in Indonesia also highlight their needs for obtaining special module on Geohazard Awareness and Preparedness which will be delivered in the extra-curricula activities.

Moreover, some revisions on the content of Geography books are suggested as well by Karnawati and Pramumijoyo (2004), because some un-appropriate explanations of some geological terms and processes related to geohazard. It was found some misleading information about lava and lahar. Correction on the definition of lava and lahar is crucial regarding that some volcanoes in Indonesia are actively

produced lava and lahar with different potential impacts. In response to this situation, training for teachers on Geography and Geosciences has been conducted regularly every year during the last five years to improve the teachers' knowledge and skills, as well as to provide the field experience.

Informal education

Approach and mechanism

Lack of information about the phenomena and symptoms of geohazard are one of most critical problem, which leads to low community awareness and finally results in the high numbers of geohazard victims. Despite there have been quite many research outcomes related to geohazard predictions and mitigation, most of the research outcomes and information have not yet reached to the community living in the geohazard prone area. Thus, communication and dissemination of the outcomes of geohazard research should be effectively carried out as a part of the informal education program. As illustrated in Figure 1, effective link between source and receiver of information are crucial to support the effective mechanism of geohazard education program. Research institutes, government agency as well as the universities are the prominent source of information related to geohazard. Meanwhile, the Universities, NGO and some identified key person are very potential to be a media for transferring and disseminating the information of geohazard to the schools, communities, and families. Indeed, the universities also have an important role to enhance the understanding on geohazard phenomena to support public awareness and preparedness.

However, the key persons from the religion, ethnic and community groups who have the traditional knowledge or wisdom are also important to raise the sensitivity of the community to recognize symptoms of geohazards. Thus, integration of knowledge based on modern science delivered from the university and the traditional wisdom exist in the local community is required.

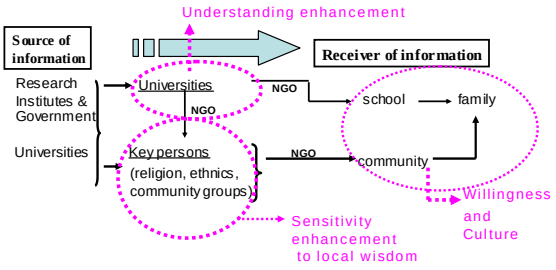

Fig. 1 Mechanism on geohazard public education with the emphasize on the effectiveness of communication (Karnawati, et al. 2005a).

Transfer of information by the Government, research institutes and universities to the planner and policy maker should also be effective to support the development of appropriate regional master plan and regulation in geohazard prone areas. Such master plan and regulation should become the guideline to drive the efforts to build up the attitude and culture of the communities, families and individuals to adapt with their nature which is prone to geohazard (Figure 2). It is expected that the improvement of community understanding on geohazard as well as the development of appropriate master plan and regulation will effectively drive the changing behavior and the development of adaptive culture in geohazard prone countries.

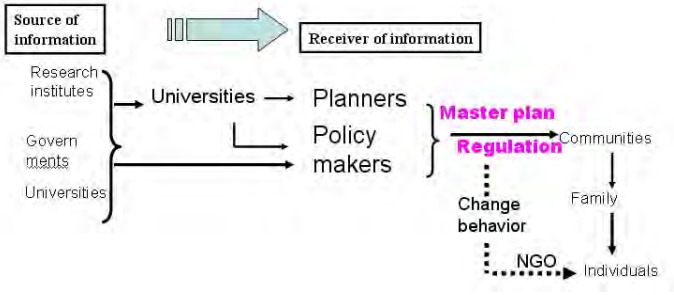

Fig. 2 Mechanism of geohazard education by improving communication effectivity (Karnawati, et al. 2005a)

Method of knowledge dissemination

More active involvement of Geologist in disseminating their research outcomes, especially those related to geohazard management is also crucial to raise public awareness. The disseminated materials should include information about mechanism of the geological process leading to geohazard, the symptoms of geohazards, and also practical knowledge on hazard preparedness and emergency responses.

This dissemination should reach the children and the youth at schools, through various mass media, such as leaflets, booklets, popular books (comics, poems, etc), TV, radio, internet (website),or through the several activities such as Boy and Girl Scout and via direct communication with children at schools. Regarding that the cycle of geohazard occurrence can be quite short time (only within few years) and also can be long term cycle (for hundred years), development of museum or exhibition of any geohazard that has been occurred or potentially occur will also be important to transfer and sustain the message of geohazard awareness.

Recently, Indonesian Ministry of National Education has established the Earth Science Olympiad for High Schools as the national agenda that should be conducted annually, with respect to the International Earth Science Olympiade for the high school students established since the year of 2007. Obviously, this Earth Science Olympiad is considered as one strategic mechanism to initiate the improvement of geohazard education program at schools, which finally can also stimulate the school and student awareness for disaster risk reduction.

Conclusions

Appropriate public education for Geohazard awareness and preparedness is the urgent need to empower the community living in geohazard vulnerable areas, and to reduce the numbers of victims and loss. Adaptive approach, instead of challenging approach, is considered to be most appropriate strategy for such education. University has important roles as the resources or provider and also as the media for transferring geohazard information to communities. This education program should be designed to reform the communities' behavior and to build up the culture for geohazard awareness and preparedness.

Acknowledgments

The efforts to elaborate the development of strategy for geohazard education can be undertaken due to the supports from ASEAN University Network/ South East Asean Engineering Education Development Program (AUN/SEED NET) during the period of 2003 - 2012, as well as from the Indonesian National Ministry of Education and Gadjah Mada University.

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