

# SOCIO-ECONOMIC IMPACTS OF NATURAL DISASTERS ON THE EDUCATION SECTOR: A CASE STUDY OF INDONESIA

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## **Abstract**

*Indonesia merupakan negara yang berada di area rawan bencana alam. Berbagai bencana alam berdampak negatif terhadap kondisi sosial dan perekonomian masyarakat, baik secara langsung maupun tidak langsung. Bagi sektor pendidikan, bencana memiliki dampak ganda. Seringkali sektor pendidikan bukan menjadi prioritas dalam penanganan awal bencana. Di sisi lain, fasilitas pendukung sektor pendidikan seringkali justru dimanfaatkan sebagai pendukung penanganan bencana, misalnya penggunaan sekolah sebagai tempat berlindung bagi para pengungsi. Upaya preventif mengurangi dampak bencana lebih lanjut sudah selayaknya menjadi prioritas untuk mengurangi dampak negatif sosial dan ekonomi yang lebih tinggi. Dalam sektor pendidikan, upaya preventif tersebut meliputi pengetahuan tentang risiko bencana, penyediaan area aman bagi anak, dukungan psikologis bagi guru, penyediaan area alternatif untuk tempat berlindung di luar area sekolah, dan penyediaan fasilitas pendukung pendidikan.*

**Keywords :** *Dampak bencana, sosial ekonomi, pendidikan, preventif.*

## **1. CONTEXTUAL ANALYSIS**

"We cannot eliminate disasters,  
but we can mitigate risk.  
We can reduce damage and  
we can save more lives."

The United Nations Secretary-General, Ban Ki Moon, states the abovementioned quote during the launch of the 2011 Global Assessment Report on Disaster Risk Reduction. Ensuring better preparedness plan undeniably reduces the costs and minimizes the unfavorable effects of natural disasters. The United Nations Development Program states that every single dollar spent on preventing and mitigating disasters saves an average of seven dollars in humanitarian disaster response (UNDP, 2012).

This paper will examine the impacts of natural disasters on education sector, both its infrastructure and its system. Furthermore, the

paper will generate recommendations in order to reduce socio-economic impacts of natural disasters on education sector. A few case studies on the impact of natural disasters on education sector in Indonesia will be taken into account as example. Considering limited data availability, this paper uses some proximate indication on the trends and quantities in pre-disaster and post-disaster spending. This paper is also based on literature study of journals, working papers, and news related to the topic. Indonesia as an archipelago country comprises approximately 17,508 islands. The country's geographic location within the boundaries of the Pacific, Eurasian, and Australian tectonic plates makes Indonesia as a site with frequent volcano eruptions and earthquakes. In addition, tsunamis, landslides, floods, and various natural disasters make Indonesia as a natural-disaster prone country. A major earthquake resulting tsunami hit Nanggroe

Aceh Darussalam province on December 2004. It caused over 230,000 dead or missing to date and over 500,000 displaced. Other major natural disasters in Indonesia include Yogyakarta earthquake in 2006, Pangandaran earthquake and tsunami in 2006, West Sumatra and Jambi earthquake in 2009, and Merapi volcano eruptions in 2010.

Indonesia's disaster prone areas cover 11.5 percent of the country with 67.4 percent of population could be potentially affected and in terms of socio-economic, disasters affect 62.3 percent of Indonesia's Gross Domestic Product (GDP) at risk (de la Fuente, 2010). Taking the Aceh tsunami case as an example, total estimation of destruction and losses reached USD 4.45 billion or in equivalent of Rp 41.4 trillion (Masyrafah & McKeon, 2008).

Education sector is inevitably affected by disasters. Many school infrastructures have been either deteriorated or have been destroyed by natural calamities. Furthermore, transportation systems, accessibility to schools, educational supplies, and learning processes are also hindered due to natural hazards. In the case of the 2004 Aceh tsunami, over 44,000 students as well as 2,500 teachers and education personnel were killed while 2,135 schools were damaged, including kindergartens, primary, junior and senior high schools as well as universities, and 150,000 students lost their access to proper education facilities (Brooks, 2005).

On the other hand, education sector is generally not recognized as a priority in the emergency setting. No other sector consistently ranks as the least-funded sector or has a smaller share of humanitarian appeals funded (The Global Partnership for Education, 2012). In addition, the international community spends only one percent of aid on disaster preparedness, despite it is an essential investment against natural hazard impacts (UNDP, 2012).

However, based on the Section 31, Article (4) of the 1945 Constitution, the Indonesian government obliges the government to allocate at least 20 percent of the state budget to the education sector. Through the Minister of

Finance Decree number 238/PMK.05/2010, the government also has accommodated the concept of school rehabilitation and reconstruction due to natural disaster funded by the Education Reserve Fund (Dana Cadangan Pendidikan). The fund is a part of the 20 percent education budget, which its utilization is dedicated to provide scholarships and endowment fund for natural disaster impacts on education. Therefore, there is opportunity to tie the education in emergencies into a comprehensive policy in order to reduce the socio-economic impact of natural disasters on education sector.

## 2. STAKEHOLDER ANALYSIS

The government of Indonesia has issued the Law number 24 year 2007 concerning Natural Disaster Management which emphasizes the importance of disaster risk management. Under the coordination of Badan Nasional Penanggulangan Bencana (BNPB) or National Disaster Management Agency, the government also issued the National Disaster Management Plan 2010-2014 which includes policies, strategies, program priorities, and focuses of disaster management and disaster risk reduction within a five year time frame.

Referring to the methodology designed by the UN Economic Commission for Latin America and the Caribbean (ECLAC) standards, there are three main aspects in assessment of a natural disaster impacts (BNPB, 2009):

- Damage (direct impact) refer to the impact on assets, stock which includes final goods, goods in production, raw materials and spare parts, and property which is valued at agreed replacement unit prices. The assessment considers the level of damage whether an asset can be rehabilitated or repaired, or has been completely destroyed.
- Losses (indirect impact) refer to flows that will be affected, such as production decline, reduced incomes, increased expenditures, etc., over the time period until the economy and assets are recovered. All those losses are quantified at present value as the

definition of the time period is critical. If a recovery process takes longer than it is expected, then losses might increase significantly.

- Economic and social effects include macroeconomic and fiscal impacts; livelihood, employment and incomes; and social impacts. The analysis aims to measure the impact of the disaster on economic growth, unemployment, and poverty at national and sub-national levels.

These three assessments are eventually used for the analysis on this paper.

These assessments are also linked to the coordination among the stakeholders in terms of education in emergencies and risk reduction plans. Stakeholders involved in the emergency disaster include: BNPB, Parliament, The Ministry of National Planning, The Ministry of Education, The Ministry of Religion Affairs (which responsible for the Quranic schools), The Ministry of Finance, Non-Government Organizations (NGOs), Palang Merah Indonesia (PMI), and External Donors. All of these stakeholders are interconnected and interact within the system to implement disaster management and to provide solutions to disaster problems.

### **3. SOCIO - ECONOMIC IMPACTS OF DISASTERS: CASE STUDIES**

Visible impacts of natural hazards are loss of lives, massive displacement, destruction of houses and public facility buildings, contaminated water and sanitation, food supply shortage, and disrupted road access. The indirect effects of the disasters are increased disease patterns and stress symptoms, loss of income sources, increased unemployment, and increased poverty rate. Table I depicts the matrix of socio-economic impacts of natural disaster within various sectors.

In terms of education sector, the direct impacts of natural disasters are damaged class rooms and damaged school facilities. Furthermore, the indirect impacts of the

disaster to education sectors are loss of school information or records, closed or delayed schools, absenteeism of students and teachers, disruptions of the curricula, compromised quality of education, low enrolment rates, increased drop-outs, and even the usage of schools as shelters.

School infrastructures such as classrooms, libraries, and laboratories are severely affected due to the natural disasters. In the 2006 Yogyakarta earthquake, 2,155 educational facilities were damaged or destroyed, and specifically in Bantul district, which was the most severely affected district, 949 buildings, or over 90 percent of educational infrastructures, were damaged or destroyed (BAPPENAS, 2006). This condition forced the students to delay their study.

Natural disasters also affect education supplies and supporting facilities damages. During the 2009 West Sumatra earthquake, UNICEF had to provide 348 school tents that benefitted 27,840 children and provide 62 boxes of 'School in a Box' consisting of learning materials for 2,480 children and teaching materials for 124 teachers to support the Back-to-School Campaign. A total of 39 Early Childhood Development Kits were distributed benefitting 1,560 children in affected areas as well as 328 boxes of recreation materials that benefitted 13,120 children (UNICEF, 2010).

Delays in restoring normal operations on the education sector in a post-disaster situation can have significant effects on affected students and the educational curricula. During an earthquake, on average 1.5 week of classes are suspended, while during or after a hurricane, it could reach on average 4 weeks of suspended classes (Topinka, 2005). Even though, it depends on the level of the disaster and the place where a disaster hit, but in general thousands of students and teachers can be affected with many weeks of suspended classes. Taking an example within Indonesia context, during the 2010 Merapi volcano eruption, schools were reported closed for almost two weeks (Widhiarto, 2010).

It is also a common situation for public spaces and buildings to be used as emergency

Table 1. Matrix of Socio-economic Impacts of Natural Hazards

Impacts	Monetary		Nonmonetary	
	Direct	Indirect	Direct	Indirect
<b>Social</b>				
Households			Number of death. Number of injured.	Increase of diseases. Stress symptoms.
<b>Economic</b>				
Private sector : Household	Housing damaged.	Loss of income sources. Decreasing purchasing power.		Increasing poverty rate.
Private sector : Business, Industry, Agriculture	Infrastructures damaged: offices, factories, machinery, crops, etc.	Loss of production.	Increasing unemployment.	Increasing poverty rate.
Public service : Government service, Education, Health, Transportation, Water and Sanitation, Energy and Electricity.	Infrastructures damaged: class rooms, hospitals, buildings, roads, machinery, etc.	Loss of public services.	Increasing absenteeism in schools, increasing infectious diseases.	Increasing poverty rate.

Source: various, edited

shelters for local community until the situation safe enough to return home. Schools are often deliberately chosen to serve as shelter because they provide safe and spacious area and have water and sanitation facilities. While hosting displaced people in existing schools may appear to be an adequate solution for evacuation needs, it can have negative short-term and long-term impacts on education systems and educational continuity. Thus, school buildings play an important role in responding to and recovering from natural disasters.

Relate to the economic sector, a natural disaster influences the economy in a multi-dimension way. A natural disaster damages infrastructures: buildings, factories, and machinery. It halts the economic cycle and generates loss of production. A disaster may also lead to changes in the sector's

employment rate by rendering personnel who work in the affected institutions unemployed for relatively long time periods. Eventually, it will also affect poverty rate within the impacted region. Unemployment and poverty hikes would affect the education as some parents might put education less priority when their income decreases.

Inflation is also affected by the natural disaster. Limited access of supply and high demand would push the prices higher in the disaster area. For instance, due to an increase in raw materials and transport costs, the unit price of housing rises significantly from Rp 30 million to Rp 60 million at the end of the first year of reconstruction in Aceh (Masyrafah & McKeon, 2008). The government had to double its budget per new house. NGOs then faced the difficult choice of either increasing their

committed funds, or decreasing the number of units that they could produce. In the subsequent years, many NGOs failed to deliver on their promised units.

In general context, natural disasters halt socio-economic developments. The EM-DAT of the International Disaster Database shows that various natural disasters in Indonesia within the last decade cost almost USD12.0 billion (See Table II). In 2004, 2006, and 2009, the Aceh earthquake and tsunami, Yogyakarta earthquake, and the West Sumatra earthquake consecutively generated tremendous economic loss. The Aceh tsunami losses reached USD 4.5 billion in the region. The number is equivalent to about 80 percent of Aceh's regional gross domestic product (Masyrafah and McKeon 2008).

The assessment of the pre-disaster prevention spending and post-disaster recovery expenses shows that prevention investment is beneficial. Pre-disaster spending

includes expenditures on identifying risks (risk mapping and hazard assessments), risk reduction (physical/structural works to withstand damage), risk transfer (insurance), and disaster preparedness (early warning systems and public training and awareness about risks and prevention). Post-disaster spending includes expenditures on emergency response (search and rescue operations, relief), rehabilitation, and reconstruction (repairing and reconstructing houses, commercial establishments, and public buildings). Alejandro de la Fuente (2010) found two main tendencies of disaster-related expenditures: First, total post-disaster expenditures on average exceed pre-disaster expenditures. Secondly, pre-disaster investments remain constant over time or display an increasing trend whereas post disaster investments are highly responsive to the occurrence of major disasters every year and thus volatile. Figure I suggests that the disaster management in Indonesia was still reactive

Table 2. Economic Impacts of Natural Disasters in Indonesia, 2004–2014

(in million USD)

Disaster Type	2004	2005	2006	2007	2008	2009
Earthquake	4,519.6	-	3,155.0	700.0	-	2,381.0
Flood	60.0	-	107.3	971.0	1.7	-
Mass movement wet	3.5	5.0	37.9	-	-	-
Storm	-	-	-	-	-	-
Volcano	-	-	-	-	-	-
Wildfire	-	-	14.0	-	-	-
<b>Total</b>	<b>4,583.1</b>	<b>5.0</b>	<b>3,314.2</b>	<b>1,671.0</b>	<b>1.7</b>	<b>2,381.0</b>

Disaster Type	2004	2005	2006	2007	2008	2009
Earthquake	-	5.9	-	130.0	-	10,755.6
Flood	78.0	-	-	3,000.0	399.0	1,140.0
Mass movement wet	-	-	-	-	-	46.4
Storm	-	-	1.0	-	-	-
Volcano	-	-	116.0	-	14.0	-
Wildfire	-	-	-	-	-	14.0
<b>Total</b>	<b>78.0</b>	<b>5.9</b>	<b>117.0</b>	<b>3,130.0</b>	<b>413.0</b>	<b>11,956.1</b>

Source: EM-DAT : The OFDA/CRED International Data Base

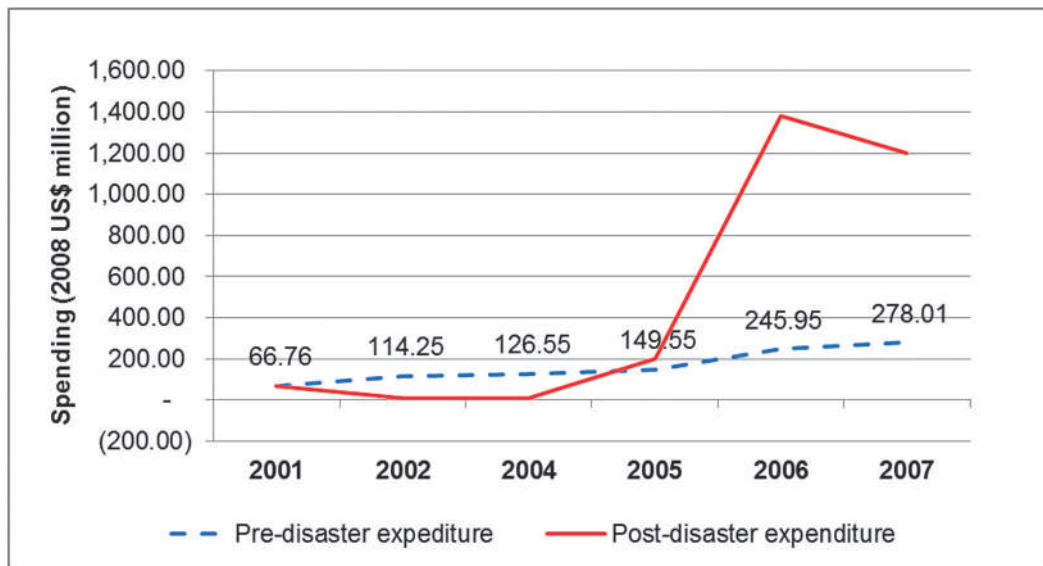


Figure 1. Indonesia Pre-and Post-disaster Government Spending  
Source: de La Fuente, 2010

than preventive. This conclusion is drawn to the fact that post-disaster expenditures in 2006 and 2007, as the aftermath of Aceh Tsunami and Yogyakarta earthquake, were higher than the pre-disaster investment.

Major natural disasters also potentially terminate economic growth. While the annual economic impact of natural disasters is estimated at 0.3 percent of GDP over the last decade, rigorous statistics exercises show that a major earthquake which occur once every 250 years could cause losses in excess of US\$30 billion, that is, 3 percent of GDP of Indonesia (Mahul & Gunawan, 2011). Therefore, these finding suggest a shift in disaster management from response and recovery towards prevention.

#### 4. EMERGENCY PREPAREDNESS: RECOMMENDATION

It is critical to consider the emergency prevention as a national strategy dealing with natural disasters, than stay reactive once the hazards affect the economy. Echoing the United Nations Development Program, every one dollar of preventing and mitigating disasters

saves an average of seven dollars in disaster response (UNDP, 2012). Therefore, it is very important to put a priority in disaster prevention. Measuring prevention of socio-economic impact of natural disasters on education sector in Indonesia requires a lot of effort and considerable judgment to identify spending categories across sectors and levels of government. The more advance method of the measurement and the analysis need to be implemented. In the future, the measurements of the natural disasters impacts which are critical to be taken into account include:

- Assessment of the conditions before the disaster occurred;
- Identification of potential effects of disaster;
- Quantification of direct damage;
- Valuation of direct damage;
- Identification of indirect losses;
- Estimation of indirect losses;
- Valuation of indirect losses;
- Assessment of macro-economic effects (inflation, unemployment, poverty, and economic growth).

The cost-benefit analysis in this area is a comprehensive and ideal approach to monetize the socio-economic impacts.



Specifically in the education sector, the Minimum Standards for Education of the Inter-Agency Network for Education in Emergencies (INEE) provides a guideline on subjects to be covered, tools, and trainings in order to contextualize and operationalize the Standards in the field. For example, in the aftermath of the 2004 tsunami in Aceh, the International Rescue Committee and the Consortium for Assistance and Recovery towards Development in Indonesia used the INEE Minimum Standards to conduct a rapid and holistic needs assessment for emergency education and to plan a response to fill identified gaps (Anderson, Martone, Robinson, Rognerud, & Sullivan-Owomoyela, 2006).

In the practical level, a budget system should consider more strategic budget allocation on education in emergencies, specifically in the prevention perspective. According to the Indonesia's Rencana Penanggulangan Bencana Nasional (National Disaster Management Plan) 2010-2014, the government allocate Rp 368.5 billion (or in equivalent of roughly USD 33.0 million) for the research, education, and training program. The budget is only 0.6 percent of the total budget allocation of Rp 64,475.1 billion (or in equivalent of roughly USD 6.0 billion). These funds are dedicated to fund 3000 researches at 33 universities in Indonesia, implementation of technology for 14 different disasters (including the development of early warning systems), public education to increase public awareness in 33 provinces and 275 districts/cities, training of 4000 teachers, establishment of disaster preparedness for schools in 275 districts/cities, and five annual workshops on community-based disaster risk reduction (BNPB, 2010).

The Education Reserve Fund exist on the educational budget should also be allocated into a prevention effort to reduce post-natural disasters impacts. For instance, the budget could be allocated into renovation of the existing school buildings which have not yet earthquake resistance. According to the Minister of Finance Decree number 238/PMK.05/2010 verse 7 point (4), it is stated that the use of reserve fund needs approval of the committee/council/

national education team. It would definitely take time if the government needs such an approval and would not be able to act immediately after the disasters. Other practical programs that could be prepared to prevent education from negative effects of disasters are:

1. Risk Awareness

Teaching school communities the skills and competencies of natural disaster risks would equip the teachers and the students with the knowledge of risk reduction and response preparedness of the hazards. Education of disaster management will contribute to an individual's ability to engage in society as well as contribute to the stability of the society in which the individual lives during or post-disaster.

2. Provision of Safe Spaces

The ideal educational system provides students affected by natural disasters with psychosocial support and recreational activities. One ideal example of the system is the Child Safety Spaces (CFS) program by Plan Haiti during the 2010 Haiti earthquake. Plan Haiti anticipated that children attending the CFS could benefit from non-formal education activities. Two types of non-formal education activities implemented were Early Childhood Care and Development program which provided age-appropriate pre-school and recreational activities for children three to five, and After School Program that served children grade one to six (Rivera, 2010). According to the INEE Minimum Standards, in acute crises, CFS or safe spaces are often first response while formal education is being reestablished or reactivated.

3. Teacher and Psychological Support

Teachers who are often victims and are traumatized also need support. Preparing the teachers with psychological knowledge of disaster and stress management not only would help the teachers themselves but also would leverage their capability to provide psychological support to their students.

4. Provision of Alternative Spaces when School Buildings Used as Shelters

Students affected by the natural hazards need safe spaces to study and play. Avoid

using a school as temporary shelters through national disaster management policy and comprehensive school safety in advance of a disaster. If a school is used as temporary shelter, ensure educational continuity in a safe environment through the dual use of the school facility for shelter and education or the use of a temporary learning space.

#### 5. Provision of Supporting Facilities

Supporting facilities are needed by the students affected by the natural disasters. General food distribution for communities and nutritious meals for students and teachers in school would help the students concentrate with their study. Water trucking for immediate response would provide hygiene latrines. Temporary school bus for transportation accessibility would help the students to reach the schools if there is no public transportation or no fuel sold in the gas station.

In the future, the challenge of the natural disasters is increasing as it is further complicated by climate change. With expected temperatures rise and possible precipitation rate changes, floods and drought are likely to increase in intensity. It is predicted that some rice-growing areas will experience a month-long delay in the onset of monsoon rains by 2050, and that late summer rainfall could drop by 25 percent on average (France-Press, 2012). Therefore, prevention is critical to be taken into account in the socio-economic measurement of natural disaster. Budgeting for disasters preparedness has the potential to reduce the exposure to risk and promoting mitigation prior to a loss. In terms of education, the prevention budgeting is the investment for the future.

## REFERENCES

Anderson, A., Martone, G., Robinson, J. P., Rognerud, E., & Sullivan-Owomoyela, J. (2006). *Standards Put to the Test: Implementing the INEE Minimum Standards for Education in Emergencies, Chronic Crisis and Early Reconstruction*.

Retrieved from [http://www.ineesite.org/uploads/files/resources/doc\\_1\\_83\\_networkpaper005.pdf](http://www.ineesite.org/uploads/files/resources/doc_1_83_networkpaper005.pdf)

BAPPENAS. (2006). *Preliminary Damage and Loss Assessment: Yogyakarta and Central Java Natural Disaster*. Retrieved from [http://siteresources.worldbank.org/INTINDONESIA/Resources/226271-1150196584718/PackageJune13\\_HIRES\\_FINAL.pdf](http://siteresources.worldbank.org/INTINDONESIA/Resources/226271-1150196584718/PackageJune13_HIRES_FINAL.pdf)

BNPB. (2009, October). *West Sumatra and Jambi Natural Disasters: Damage, Loss and Preliminary Needs Assessment*. Retrieved from [http://www.gfdrr.org/sites/gfdrr.org/files/documents/GFDRR\\_Indonesia\\_DLNA.2009.EN\\_.pdf](http://www.gfdrr.org/sites/gfdrr.org/files/documents/GFDRR_Indonesia_DLNA.2009.EN_.pdf)

BNPB. (2010, January). *Rencana Penanggulangan Bencana Nasional (National Disaster Management Plan) 2010-2014*. Retrieved from <http://www.bnbp.go.id/uploads/pubs/468.pdf>

Brooks, D. (2005). *Case Study on the Utilization of the INEE Minimum Standards: Participatory assessment and teacher training in the aftermath of the Tsunami*. Retrieved from Inter-Agency Network for Education in Emergencies: [http://www.ineesite.org/uploads/files/resources/doc\\_1\\_INEECaseStudyTsunamiAssessmt.pdf](http://www.ineesite.org/uploads/files/resources/doc_1_INEECaseStudyTsunamiAssessmt.pdf)

de la Fuente, A. (2010). *Government Expenditures in Pre and Post-Disaster Risk Management*. Retrieved from <https://www.gfdrr.org/sites/gfdrr.org/files/New%20Folder/Country%20Disaster%20Expenditures%20Note.pdf>

France-Press, A. (2012, May 01). *Climate Change Threatens Indonesian Rice Farmers*. Retrieved March 22, 2013, from [http://www.terraily.com/reports/Climate\\_Change\\_Threatens\\_Indonesian\\_Rice\\_Farmers\\_999.html](http://www.terraily.com/reports/Climate_Change_Threatens_Indonesian_Rice_Farmers_999.html)

Mahul, O., & Gunawan, I. (2011). *Advancing a National Disaster Risk Financing Strategy – Options for Consideration*. Retrieved from [https://www.gfdrr.org/sites/gfdrr.org/files/publication/Indonesia\\_DRFI\\_Report\\_FINALOct11.pdf](https://www.gfdrr.org/sites/gfdrr.org/files/publication/Indonesia_DRFI_Report_FINALOct11.pdf)



- Masyrafah, H., & McKeon, J. M. (2008). *Post-Tsunami Aid Effectiveness in Aceh: Proliferation and Coordination in Reconstruction*. Retrieved from [http://www.brookings.edu/~media/research/files/papers/2008/11/aceh%20aid%20masyrafah/11\\_aceh\\_aid\\_masyrafah](http://www.brookings.edu/~media/research/files/papers/2008/11/aceh%20aid%20masyrafah/11_aceh_aid_masyrafah)
- Rivera, C. (2010). *INEE Minimum Standards Case Study: Non-formal Education in Haiti*. Retrieved from [http://www.ineesite.org/uploads/files/resources/Case\\_study\\_haiti\\_PlanInt.pdf](http://www.ineesite.org/uploads/files/resources/Case_study_haiti_PlanInt.pdf)
- The Global Partnership for Education. (2012, September 24). *Education Cannot Wait: Protecting Children and Youth's Right to a Quality Education in Humanitarian Emergencies and Conflict Situations*. Retrieved from The Global Partnership for Education: <http://www.globalpartnership.org/news/364/762/Education-Cannot-Wait-Protecting-Children-and-Youth-s-Right-to-a-Quality-Education-in-Humanitarian-Emergencies-and-Conflict-Situations/>
- Topinka, H. (2005, July). *The impact of natural disasters on education sectors of LAC region between years 1976-2005*.
- UNDP. (2012, July 02). *Act Now, Save Later: new UN social media campaign launched*. Retrieved March 15, 2013, from <http://www.undp.org/content/undp/en/home/presscenter/articles/2012/07/02/act-now-save-later-new-un-social-media-campaign-launched/>
- UNICEF. (2010). *West Sumatra Earthquake One Year on Fact Sheet*. Retrieved from [http://www.unicef.org/indonesia/id/West\\_Sumatra\\_earthquake\\_one\\_year\\_on\\_Fact\\_Sheet.pdf](http://www.unicef.org/indonesia/id/West_Sumatra_earthquake_one_year_on_Fact_Sheet.pdf)
- Widhiarto, H. (2010, November 06). *Merapi eruption halts social, economic activities in Kebumen*. Retrieved March 21, 2013, from <http://www.thejakartapost.com/news/2010/11/06/merapi-eruption-halts-social-economic-activities-kebumen.html>