Appendix A7

Compiled Information and Data on Lessons Learned from Extreme Natural Disasters

Appendix A7 Lessons Learned from Extreme Natural Disasters

A7.1. Related Information concerning past extreme natural disasters and their influences on economic activities

A7.1.1. Related information concerning 2013 Jakarta Flood, Indonesia

(1) News Source describing the damage situation -- 1

According to the Reuters, the damage situation of 2013 Jakarta Flood is as follows;

At least 20,000 people were forced from their homes in the capital and weather officials warned the rain could get worse over the next few days. "Rain will continue to fall in the greater Jakarta area ... the potential for flooding remains," a spokesman for the Meteorology Climatology Meteorology and Geophysics Agency told Reuters. He said rain was expected to remain heavy in mountains above Jakarta, often the source of floodwater. Four people were reported to have been killed, according to the National Disaster Prevention Agency, which urged residents to stay at home to reduce traffic congestion on blocked roads. Torrential rain was reported across much of the country, including the main island of Java and heavily agricultural area of southern Sumatra. However, officials said there had been no reports of any serious damage to key crops such as rice, sugar and palm oil. An estimated more than 175 mm (7 inches) of rain fell in one part of west Jakarta between 7 a.m. and midday. "In 30 years of my life here it has never flooded, ever. This is the very first time," said Ninuk, 30, a resident of central Jakarta. Floods even forced the country's anti-corruption agency to move some of its most prominent prison inmates, including a former deputy head of the central bank, to a notorious women's prison, Pondok Bambu, in east Jakarta, a spokesman said The flooding will put pressure on the capital's popular new governor, Joko Widodo, who came to office last October with promises to work to fix a huge array of basic infrastructure problems that bedevil the city of about 10 million people. "The government has to do something to prevent floods ... If it needs to build stronger dykes, then build them," said Syaiful Bakhri, a taxi driver whose car was stuck in the flood. In the centre of Jakarta, where streets are jammed at the best of times, long lines of idled cars waited for waist-deep water to recede. An inflatable dinghy provided by emergency services ferried people to safety across water dividing the heart of the city. The city's main airport was open but many roads leading to it were reportedly blocked. Most commuter trains and buses were suspended. The Jakarta Stock Exchange did open but trading was light. Flooding was even reported at the presidential palace, forcing the postponement of a meeting between President Susilo Bambang Yudhoyono and his visiting Argentine counterpart, Cristina Fernandez.

Source: Reuters. Floods paralyze Indonesian capital, heavy rains continue. Jan 17, 2013, Jakarta.

http://www.reuters.com/article/2013/01/17/us-indonesia-floods-idUSBRE90G05Q20130117

(2) News Source describing the damage situation -- 2

Another news source describes the damage situation the Flood as follows;

Recent widespread flooding in the Indonesian capital, Jakarta, highlights the need for more effective flood management. The government's efforts to reduce perennial flooding in Jakarta have been focused on building more floodways, but this does not address fundamental problems like environmental degradation, says Marco Kusumawijaya, an urban planning expert at the Jakarta-based Rujak Center for Urban Studies.

"Infrastructure drains, but if you don't reduce the amount of water [in] surface run-off, the capacity of the drains will always be overwhelmed," he told IRIN. "Because when you build drains you only solve the effects of water, but not the cause of the flooding. You have to reforest the upstream area in the south and create open space in the downstream area to absorb more water," he added. Kusumawijaya said, historically, every time a new floodway has been built, flooding occurred in the following years. "When you build more infrastructure, you build more buildings because you [mistakenly] think it's OK because there are new drains," he said. Days of flooding in Jakarta peaked on January 17, bringing the megacity of more than 10 million people to a near standstill and killing 20 people. More than 40,000 people were displaced, according to the National Disaster Management Agency. More than 100,000 people's homes were under water. The national weather service has predicted continued rains until early February. Heavy flooding in 2007 killed 57 people and displaced more than 420,000 in Jakarta. The authorities put the total damage that year at nearly $695 million. Jakarta is surrounded by mountains the slopes of which form the upstream catchment areas of 13 major rivers that flow through the city to the Java Sea. An estimated 40 percent of the city lies below sea level - made worse by land subsidence resulting from groundwater extraction, say experts.

Government action

Mohammad Hasan, director-general of water resources at the Public Works Ministry, said the completion in 2011 of a new spillway in East Jakarta reduced flooding in some parts of the city, but that it will still take years before flooding can be more effectively controlled city-wide.

"In Jakarta there were about 78 flood-prone pockets, but they have been reduced thanks to the repairs of the West Flood Canal and the construction of the East Flood Canal. We will start work on normalizing several rivers and repairing sluices and dikes," he said.

" The government's flood management does not only involve building infrastructure, but also campaigning on proper waste disposal and the use of infiltration wells [wells to drain rainwater into the ground] as well as [increasing] the role of communities [in flood control]," he told local TV on 22 January. President Susilo Bambang Yudhoyono has urged Jakarta Governor Joko Widodo to relocate residents living in shanty towns along the banks of the Ciliwung River who are often blamed for clogging waterways with household waste. The government has pledged to construct a 1.5km underground water canal connecting the Ciliwung River with the East Flood Canal at the cost of $73 million.

World Bank project

Work on a $189 million World Bank-funded project to dredge and rehabilitate floodways, canals and retention basins is expected to start in March, its team leader, Fook Chuan Eng, told the Jakarta Globe.

The first two years' work involves dredging 67.5km of key channel systems and four retention basins, as well as repairing 42km of embankments, the report said. Eng said around 57 residential areas in Jakarta - inhabited by 1.8 million people living near project sites - will experience less flooding after the project's completion. Kusumawijaya of the Center for Urban Studies said Indonesia can be an example for other low-lying megacities if it can better manage its water. "This is not a unique Jakarta problem, but a problem in developing countries that are prioritizing growth," he said.

Source: JakartaGlobe. Jakarta Flooding Highlights Prevention Gaps. January 24, 2013, Jakarta.

http://www.thejakartaglobe.com/home/jakarta-flooding-highlights-prevention-gaps/567449

A7.2. Related information concerning 2011 Thailand Floods, Thailand

2011 Thailand Flood Executive Summary

In 2011, Thailand witnessed its worst flooding in half a century, leaving severe impairments to the country's economy, industrial sector, and society. Factors that contributed to flood crisis range from natural to manmade. Consequently, floodwaters inundated 90 billion square kilometers of land, more than two-thirds of the country, ranking the natural disaster as the world's fourth costliest disaster as of 2011. (Geo-Informatics and Space Technology Development Agency)

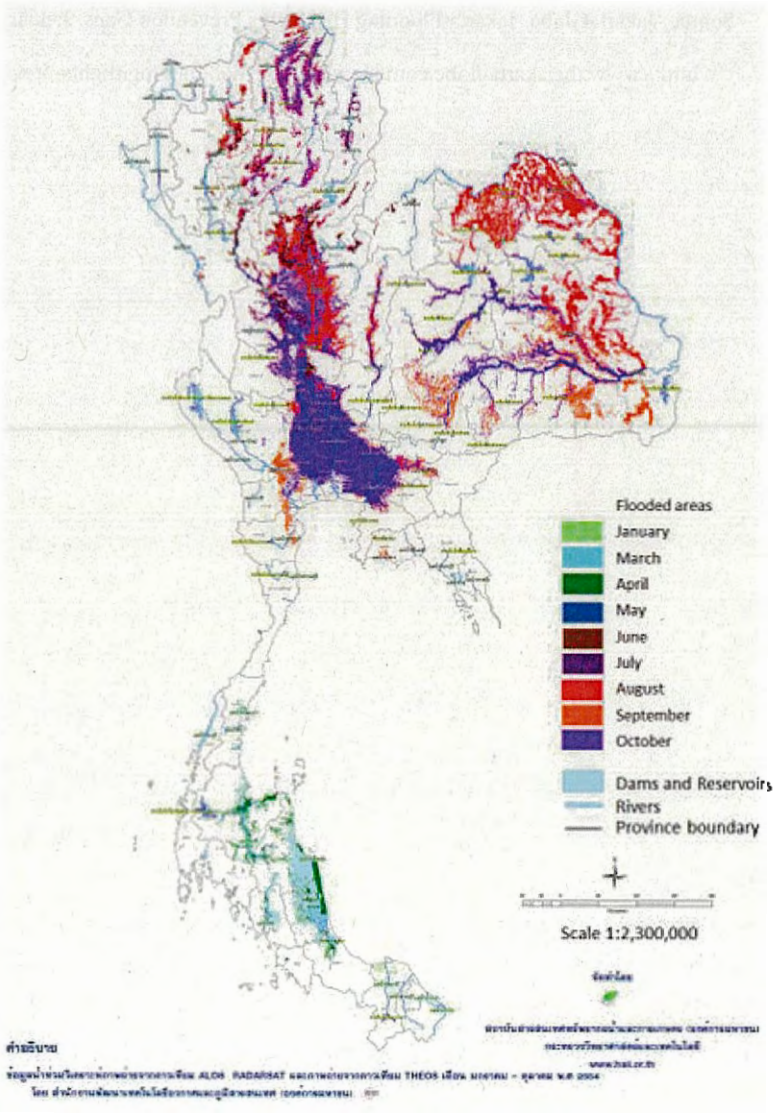


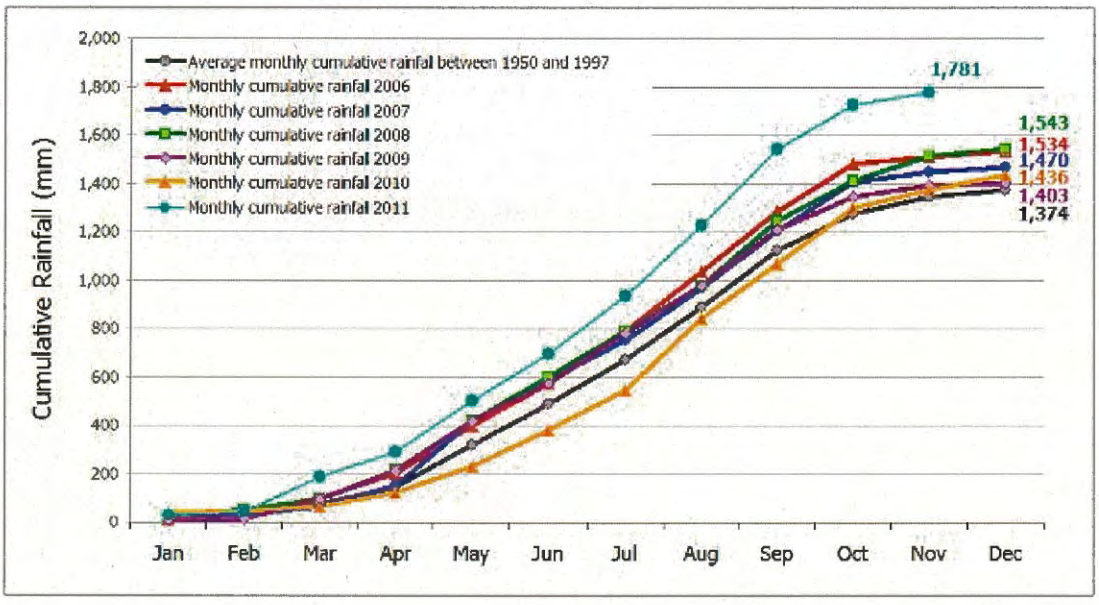
Diagram of Flooded Areas

Table of 2011 Monthly Flooded Areas

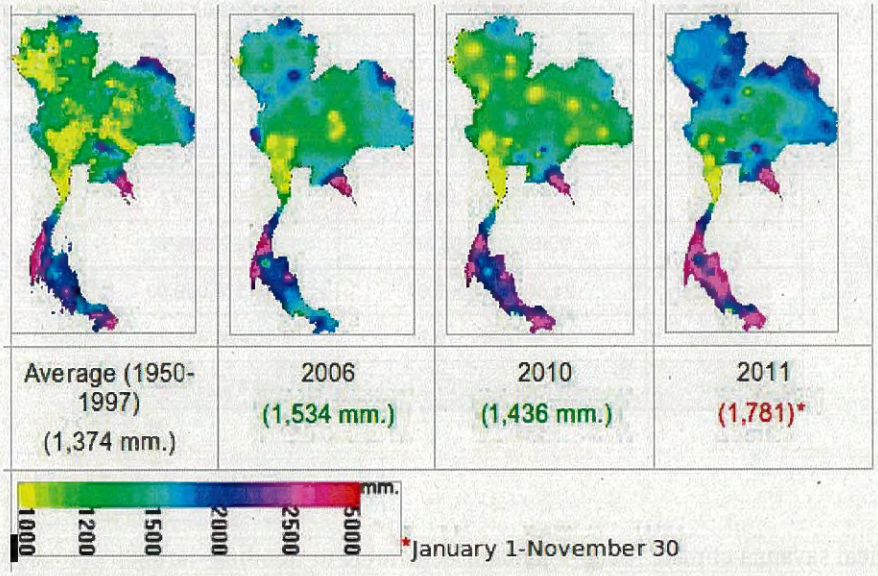
Month	Area (Square kilometer)	Area (Rai)
January	189,607,196.54	118,504.50
February	-	-
March	1,963,221,266.48	1,227,013.29
April	22,925,700,697.00	14,328,562.94
May	122,616,438.84	76,635.27
June	739,073,358.93	461,920.85
July	1,415,716,433.11	884,822.77
August	9,100,495,393.35	5,687,809.62
September	24,604,894,396.54	15,378,059.00
October	29,591,106,876.98	18,494,441.77
Total	**90,652,432,057.77**	**56,657,770.01**

I. CAUSE

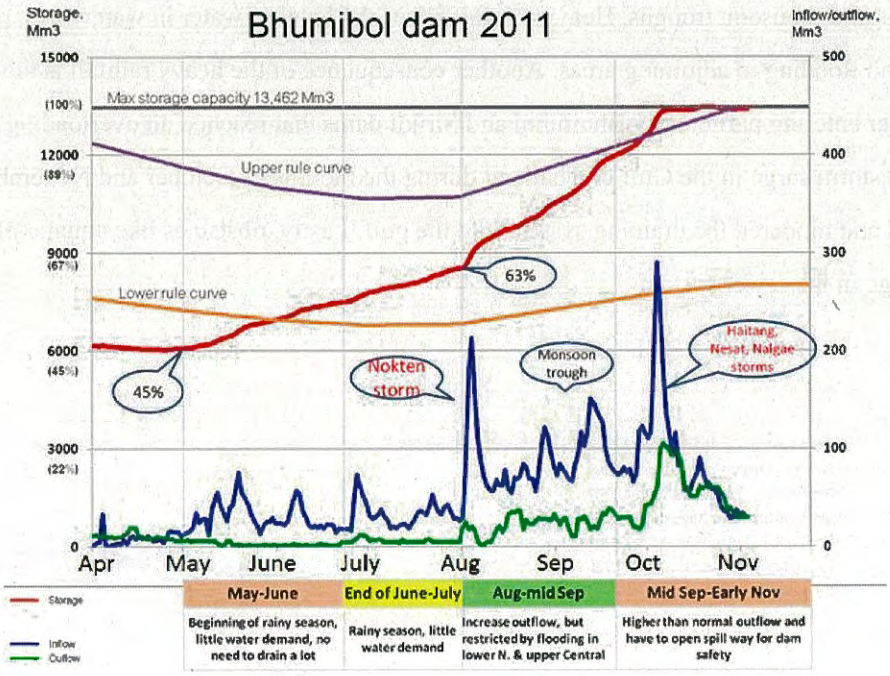
Thailand's tropical savanna climate leaves Thailand vulnerable to flooding during its monsoon season—this year in particular. The accumulated precipitation from January to October 2011 was 35% higher than average in consequence of La Niña—a phenomenon that, as a result of lower surface ocean temperatures, usually brings increased and, in this case, earlier than expected precipitation—, five key tropical storms, and monsoon troughs. Heavy rainfall raises the level of water in waterways, producing overflowing and flooding to adjoining areas. Another consequence of the heavy rainfall is the exceeding amount of water entering particularly Bhumibol and Sirikit dams that reached an overloading capacity. High tides and storm surge in the Gulf of Thailand during the months of October and November also raised tbe water level and hindered the draining system into the gulf. Lastly, obstacles like aquatic plants create a natural blockage in the sewer system.



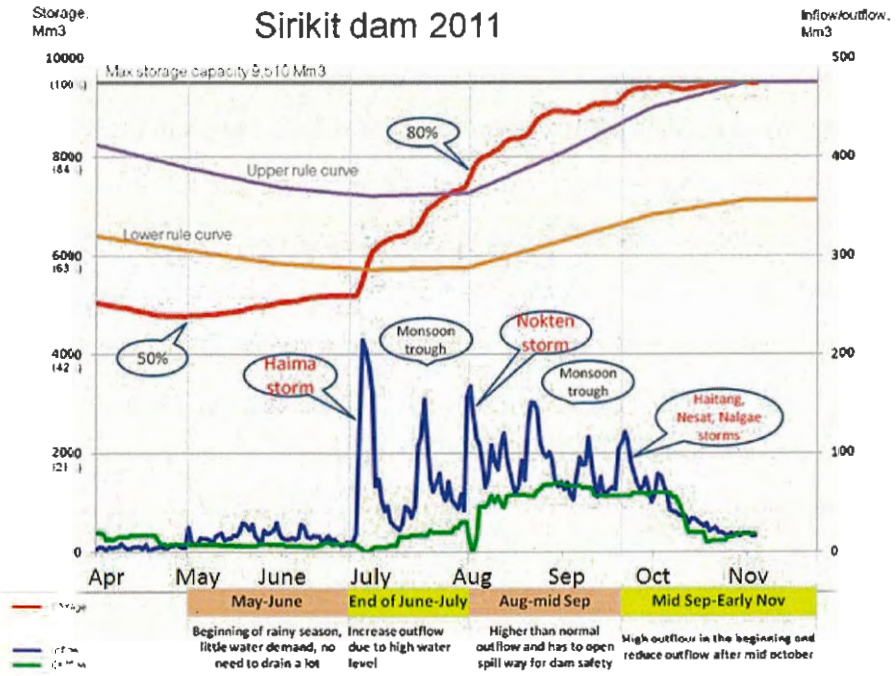
Cumulative rainfall in 2011



Average Annual Cumulative Rainfall Comparison (mL per year)



Bhumibol Dam Graph



Sirikit Dam Graph

Human factors that factored in the flooding crisis stem largely from deforestation. Deforestation erodes soil, which settles at the bottom of waterways, rising the level of water and consequently causing flood. Forests also acts as a natural regulartor of discharge; forest can alleviate flooding by controling downstream flow by natural flow resistance like dead woods, twigs, and tree trunks.

Deforestation

Year	Forest Land area in square kilometers	Deforestation area in square kilometers	%
1961	273629		
1973	221707	4327	0.84
1976	198417	7763	1.51
1978	175224	11597	2.26
1982	156600	4656	0.91
1985	150866	1911	0.37
1988	143803	2354	0.46
1989	143417	386	0.08
1991	136698	3359	0.65
1993	133554	1477	0.31
1995	131485	1018	0.2
1998	129722	588	0.11
2000	170111	-16	-3.94
2004	167591	630	0.12
2005	161001	6590	1.28
2006	158653	2349	0.46

II. IMPACT

The flood crisis impacted a total of 4,039,459 households and 13,425,869 people; 2,329 houses were completely destroyed, while 96,833 houses were partially damaged; death toll reached to 657 people and 3 were reported missing. As of December 2011, Word Bank estimated damages to have reached THB 1,440 billion. Because of the major affects on the industrial sector, unemployment has stemmed due to the closure of multiple factories. The economy continues to be in a delicate position as the flood impact has reduced investors' and insurance companies' confidence, which will ultimately lead to an increase in unemployment and poor economy. Tourism, another substantial revenue in the economy, suffered a loss of THB 3.71 billion and a fall of 3.2 million tourists according to the Tourism Ministry. Although domestic tourism will recover prompter than international tourism, international tourism revenue contributes twice that of domestic tourism. Urgent measures have been instigated, but the journey in recovery and enhancement is years ahead.

Damage report from the Department of Disaster Prevention and Mitigation. Ministry of Interior

Month	Provinces		Casualties	Rainfall (mm)	Average rainfall 2005-2010
June	4 Chiang Rai, Nan, Phayao, Tak	4 provinces in the North	2	North - 217.81 mm	North - 170.12 mm
July	10 Phrae, Nan, Chiang Rai, Mae Hong Son, Uttaradit, Phichit, Nakhon Phanom, Udon Thani, Nong Khai and Bungkan	6 provinces in the North and 4 provinces in Northeast	-	North - 252.85 mm, Northeast - 278.29 mm	North - 181.04 mm, Northeast - 196.70 mm
August	36 Chiang Mai, Nan, Phrae, Lampang, Lamphun, Mae Hong Son, Uttaradit, Tak, Kumpangpetch, Phetchabun, Loei, Nong Khai, Nakhon Phanom, Mukdahan, Udon Thani, Bungkan, Sakon Nakhon, Roiet, Kalasin, Prachuap Khiri Khan, Nakhon Nayok, Prachinburi, Sukhothai, Phichit, Phitsanulok, Nakhon Sawan, Ang Thong, Phra Nakhon Si Ayutthaya, Chai Nat, Ubon Ratchathani, Chiang Rai, Rayong, Phangnga, Phuket, Ranong, and Surat Thani	14 provinces in the North, 10 provinces in the Northeast, 4 provinces in the Central, 3 provinces in the East, 3 provinces in the Southwest and 2 provinces in the Southeast.	55	North - 292.99 mm, Northeast - 333.38 mm, Central - 194.42 mm, East - 326.53 mm, Southwest - 366.69 mm, Southeast - 221.56 mm	North - 228.29 mm, Northeast - 252.08 mm, Central - 164.29 mm, East - 224.98 mm, Southwest - 243.60 mm, Southeast - 162.75 mm

Month	Provinces		Casualties	Rainfall (mm)	Average rainfall 2005-2010
September	23 Sukhothai, Phichit, Phitsanulok, Nakhon Sawan, Uthai Thani, Chai Nat, Sing Buri, Ang Thong, Phra Nakhon Si Ayutthaya, Lopburi, Sara Buri, Suphan Buri, Nakhon Pathom, Pathumthani, Nonthaburi, Ubon Ratchathani, Khon Kaen, Srisaket, Surin,Chacheongsao, Nakhon Nayok, Prachinburi and Chiangmai	4 provinces in the North, 4 provinces in the Northeast, 12 provinces in the Central, and 3 provinces in the East.	205	North - 325.30 mm, Northeast - 351.60 mm, Central - 237.07 mm, East - 442.64 mm	North - 245.40 mm, Northeast - 253.42 mm, Central - 242.95 mm, East - 327 mm
October	26 Phichit, Phitsanulok, Nakhon Sawan, Uthai Thani, Chai Nat, Sing Buri, Ang Thong, Phra Nakhon Si Ayutthaya, Lopburi, Sara Buri, Suphan Buri, Nakhon Pathom, Pathumthani, Nonthaburi, Samutsakhon, Bangkok, Ubon Ratchathani, Khon Kaen, Srisaket, Surin, Roiet, Mahasarakam, Kalasin, Chacheongsao, Nakhon Nayok, and Prachinburi.	2 provinces in the North, 7 provinces in the Northeast, 14 provinces in the Central, and 3 provinces in the East.	427	North - 137.37 mm, Northeast - 178.82 mm, Central - 200.76 mm, East - 250.88 mm	North - 156 mm, Northeast - 145.46 mm, Central - 198.93 mm, East - 216.74 mm

III. SOLUTION

The following proposed strategic actions implemented tactically in urban settings, rural areas, industrial estate, and agricultural land will relieve future inundation and prevent a reoccurrence of the flood crisis:

1)A well-organized city planning system, or the control of the use of land and design of urban environment, must be implemented with emphasis on the development of the drainage system in order to control flood levels; the government must issue clear regulation for usage of land, especially in flooding areas.

2) The use of Light Detection and Ranging technology to interpret the ground level and other useful data will supplement this procedure. Reinforcing the riverbanks will reduce the risk or water overflowing into the adjacent regions. The information technology system must be renovated in order to obtain significant data in a real-time manner or, at least, updated frequently (recommended monthly). The IT system should monitor water levels in order to determine and maintain an equilibrated water level. The data garnered from the IT system should be educated and shared to the public community to raise awareness of the water situation.

3) Additional waterway canals and existing waterways must be further developed. Utilizing the "monkey cheek" design—large water-holding areas—in key provincial locations, the concept of dredging to deepen water ways), and enhancement of water gates, floodways, and dams will improve control of the inflow and outflow of water and balance the water-resource management. The residents who reside in the areas near the "monkey cheek" will be compensated.

4) Pollution and deforestation laws must continue to be reinforced in order to upkeep the functionality of the drainage and sewer systems, especially in industrial estates, and control the downstream of water flow, respectively.

5) The government must centralize authority to help coordinate with various government agencies to improve communication and cooperation among the water management private sectors to draw optimal synergy from all relevant parties.

There is no doubt over the need for enduring water management, in which safety, nature, and economic prosperity are taken into account.

Source: Thailand Integrated Water Resource Management. 2011 Thailand Flood Executive Summary. http://www.thaiwater.net/web/index.php/ourworks2554/379-2011flood-summary.html

A7.3. Related information concerning 2004 Indian Ocean earthquake and tsunami

Effects of the 2004 Sumatra-Andaman Earthquake and Indian Ocean Tsunami in Aceh Province

On December 26, 2004, at 07:58:50 local time, a powerful earthquake, moment magnitude (MW) 9.2, occurred in the Indian Ocean. The Sumatra-Andaman earthquake was one of the three largest earthquakes ever recorded. The fault rupture propagated 1,300 to 1,600 kilometers northwest for about 10 minutes along the boundary between the Indo-Australian plate and the Eurasian plate, from northwestern Sumatra to the Nicobar Islands and to the Andaman Islands. The hypocenter, the point where the fault rupture origin-ated, was 10 kilometers deep. The faulting spread updip and downdip from 18 to 25 meters on a low-angle thrust fault plane dipping about 10 degrees northeast. The Indo-Australian plate moved northeast relative to the Eurasian plate. Several excellent papers have been written on the tectonics of the earthquake (e.g., Lay et al., 2005), and the seismological, geologic, and geodetic aspects have been comprehensively described by Kanamori (2006) and Hudnut (2006).

The resulting tsunami affected 12 nations around the Indian Ocean, with Indonesia suffering the greatest damage. In Aceh, the northern province of Sumatra, the United Nations (UN) Field Office reported approximately 131,000 people confirmed dead and 37,000 missing. With more than 80,000 houses sustaining major damage or collapse, the UN estimated that more than 500,000 people were displaced from their homes in Sumatra alone. In addition to the massive damage to housing, utilities, roads, and bridges, the disaster significantly disrupted the social fabric and government of the affected communities.

Shaking Damage

The epicenter of the earthquake was about 250 kilometers off the west coast of Aceh Province. Strong to violent shaking in Aceh Province reportedly lasted five to six minutes. Banda Aceh was the only major city that experienced earthquake-shaking damage. One- to two-story, traditional, concrete-frame and wood-frame buildings survived well and were largely undamaged by the strong ground shaking. However, because the earthquake occurred a significant distance offshore, the resulting long-period ground motions caused serious damage to, or the collapse of, buildings more than three stories high.

Fault Deformation

A compounding problem was tectonic subsidence resulting in 20 to 100 centimeters of down-warping of the Earth's crust beneath the Aceh region. The subsidence extends for at least 280 kilometers along the entire northwestern Aceh coast. This submergence thwarted rescue efforts and has hindered the restoration of roads, bridges, and utility distribution systems.

Tsunami Damage

The fault rupture uplifted the ocean floor, releasing the most destructive series of tsunami waves in recorded history. The waves spread throughout the Indian Ocean, causing damage in the coastal

communities of 12 countries. By far, the most damaging effects were sustained by Aceh Province, where three devastating waves struck the western shore within about 30 minutes. The tsunami waves ranged from 4 to 39 meters high and destroyed more than 250 coastal communities.

In the low-lying areas of western coastal Sumatra, including the city of Banda Aceh, the tsunami waves extended inland as far as 5 kilometers, affecting a large portion of the population of 300,000. The western part of the city has nearly flat topography traversed by rivers and drainage channels. In these areas, the maximum wave-flow height was 4 to 8 meters. In hilly areas south of Banda Aceh, the wave-flow height was significantly greater, due to the topography.

Residential neighborhoods and fishing villages in coastal areas were entirely devastated, and houses were swept inland or out to sea. The traditional construction that had resisted shaking damage could not resist the tsunami forces and most were obliterated. Most well designed and well constructed buildings and industrial facilities that had withstood the earthquake shaking also withstood the tsunami waves and suffered only minor damage. For example, the La Farge Cement Plant, a well designed and well constructed steel-frame series of industrial structures about 20 kilometers southwest of Banda Aceh, did not experience structural damage from the strong shaking and was not damaged by the tsunami waves, which, as documented by stadia-rod, reached a wave-flow beight of 38.9 meters nearby. Several one- and two-story administrative buildings and machine shops were smashed by waves carrying nearly empty large oil-storage tanks. The impact of the waves caused non-structural damage to some of the buildings. For example, metal siding was stripped from the steel-frame buildings up to the height of the waves.

Inspection revealed that the quality of construction and of the concrete in most mosques was excellent. Most have steel-reinforced concrete frames as load-resisting systems, along with domes and open arches that allowed tsunami waves to traverse the space without causing serious damage.

The low-lying topography of Banda Aceh and surrounding areas and the height of the water resulted in debris being swept in and out by the three successive destructive tsunami waves. This caused large, heavy projectiles, such as cars, trucks, and fishing boats, to be swept in and out, each time impacting previ-ously undamaged facilities. Many small buildings were structurally damaged by tsunami waves carrying floating debris.

A large number of fishing boats were docked at the coastal and river locations that traverse the city. Fishing boats were torn from their moorings and cast inland during the tsunami. One boat that was permanently docked on the second story of a house saved 52 people, who were able to climb through the roof-hatch and take shelter there; inside, they found a stranded security person in the captain's quarters.

Electric Power

Most well designed and well constructed electric power plants in Aceh Province did not experience structural damage from the earthquake or tsunami. The electric generating facilities experienced light damage to the generating capacity and no damage to the transmission network. However, there was

substantial damage to the distribution network in the affected area. Most above-ground distribution systems were seriously damaged or destroyed by the tsunami. Damage to the power supply was concentrated in western Aceh Province, along low-lying areas in Banda Aceh and toward the south along the west coast to just beyond Meulaboh. The main damage was to the power distribution networks (small substations and hollow-core distribution poles). About 170,000 customers were affected by loss of power in Banda Aceh and along the low-lying coastal plain to Meulaboh.

Indonesia's public electric supply is provided by PT PLN, the state-owned electric company. Banda Aceh's electric power comes from the Aceh regional electric grid and, in central Banda Aceh, the Luengbata diesel-generation plant (50-megawatt, 11 units), which reported damage only to some generation transformers. An 11-megawatt diesel-generating station, mounted on a barge offshore, was swept inland more than 3 kilo-meters from the harbor in Banda Aceh by tsunami wave action. Although the power plant was undamaged, it left a path of destruction of houses and commercial buildings as it charged inland. PT PLN plant operators informed us that neither the intense shaking nor the 3 kilometer transport of the barge-station was the reason the plant was not operating; the main problem was lack of demand. PT PLN reported that electric power was restored to most emergency-response customers in Banda Aceh within three days and to the remaining customers within about two weeks.

PT PLN reported that the electric system generally was not affected by earthquake shaking, except for the newly built headquarters building, which was more than three stories high and had to be abandoned. The tsunami did not affect the 150-kV substation or the inland diesel-generating power stations. A small (1 megawatt) diesel-powered plant was destroyed at Calang, directly on the coast about halfway between Banda Aceh and Meulaboh. The Meulaboh Lamno diesel plant did not experience significant damage. The 150-kV transmission line and associated substations transmitting power from power plants to the east functioned normally during and after the earthquake and tsunami. In fact, the electric power in western Aceh Province did not shut down. Some PT PLN emergency-response workers were electrocuted when they attempted to restore electricity to emergency facilities because they had assumed the tsunami had tripped the power supply.

Gas and Liquid Fuel Facilities

The state-owned Pertamina petroleum company suffered substantial damage to fuel depots, where storage facilities were damaged and some fuel was lost, mostly on the west coast of Aceh Province, particularly in Banda Aceh and south to Meulaboh. The deep-water port at Kreung Raya, the petroleum storage and distribution facility, lost half of its above-ground piping and 3 of 12 liquid fuel (diesel, high-octane gas, oil, and kerosene) storage tanks. None of the tanks was anchored to its foundations, and the three that were swept away by tsunami waves were only partially full. The nine full storage tanks were not affected. As with the electric system, most above-ground distribution systems were seriously damaged or destroyed by the tsunami.

Roads and Bridges

Roads and bridges were devastated by the force of the tsunami waves. Many bridges were swept off their supports, and connecting earth embankments were significantly scoured, disabling the transportation network for hundreds of kilometers along the west coast of Aceh Province. Hundreds of bridges were picked up and swept inland by the tsunami waves, some more than a kilometer. The extensive damage to bridges severely constrained rescue and relief efforts, as the bridges had been vital links to population centers in the region. Many of the bridges on the coastal road to Meulaboh were destroyed and washed away, and sections of the road disappeared, which isolated many small communities. Survivors could be reached only by boat or helicopter. In addition, the destruction of tbe bridges resulted in the disruption of the electric distribution system at bridge crossings.

Liquefaction

Although earlier reconnaisances reported no evidence of liquefaction, earthquakes of this magnitude and duration commonly cause liquefaction in coastal areas. During a reconnaissance by helicopter, we observed extensive liquefaction in near-shore beach deposits for at least 150 kilometers along the Aceh coast, from south of Meulaboh to north of Calang.

Conclusions

Although routinely constructed houses and buildings may have been able to survive the eartbquake shaking, tsunami waves devastated almost all of them. Most well designed and well constructed utility and industrial facilities had sufficient capacity to withstand both the earthquake and the tsunami. Partially full storage tanks, bridges, and other light structures that were not anchored to their foundations were not able to resist tsunami forces. Tectonic subsidence and liquefaction were significant contributors to the devastation.

Source: Lloyd S. Cluff. (2007).

Effects of the 2004 Sumatra-Andaman Earthquake and Indian Ocean Tsunami in Aceh Province.

http://www.nae.edu/Publications/Bridge/EngineeringfortheThreatofNaturalDisasters/Effectsofthe2004Sumatra-AndamanEarthquakeandIndianOceanTsunamiinAcehProvince.aspx

A7.4. Related information concerning 1991 Eruption of Mount Pinatubo, Philippines

(1) Overview of the Eruptions

After 2 weeks of locally felt earthquakes, steam explosions announced volcanic unrest at Mount Pinatubo on April 2, 1991. The unrest culminated 10 weeks later in the world's largest eruption in more than half a century. Volcanologists of the Philippine Institute of Volcanology and Seismology were joined in late April by colleagues from the U.S. Geological Survey. Together they successfully forecast the eruptive events and their effects, enabling Philippine civil leaders to organize massive evacuations that saved thousands of lives. The forecasts also led to the evacuation of Clark Air Base (U.S. Air Force), which is located just east of the volcano. Nevertheless, the climactic eruption, coincident with a typhoon on June 15, caused 200 to 300 deaths and extensive property damage, owing to an extraordinarily broad distribution of heavy, wet tephra-fall deposits.

The volcanic unrest and eruptions, which involved intrusion of basaltic magma into a reservoir of crystal-rich, vapor-saturated dacitic magma, evolved in stages: mid-March through May--felt earthquakes in March, phreatic explosions on April 2, and persistence of numerous volcano-tectonic earthquakes; June 1-7--localization of shallow earthquakes in a narrow pipelike zone near the volcano's summit; June 7-12--lava-dome growth, accompanied by increasing ash emission and seismic-energy release, including significant episodes of volcanic tremor; June 12-14--a series of four brief vertical eruptions accompanied by a profound buildup of long-period earthquakes; June 14-15--thirteen brief surge-producing eruptions that became progressively more closely spaced; June 15--the climactic eruption, which lasted approximately 9 hours and included collapse of the volcano's summit to produce a 2.5-kilometer-diameter caldera; June 15-middle or late July--decline and termination of continuous emission of a tephra plume from vents within the caldera and steady decline of volcano-tectonic earthquakes that began during the climactic eruption (intermittent small ash eruptions continued until early September); and July-October 1992--extrusion of a lava dome within the caldera.

Runoff from monsoon and typhoon rains is eroding and redistributing the voluminous pyroclastic deposits emplaced during the eruption. Sedimentation from the resulting lahars continues to bury communities and valuable agricultural land over large areas in the lowlands surrounding the volcano.

Source: Edward W. Wolfe1 and Richard P. Hoblitt1. Overview of the Eruptions. U.S. Geological Survey. http://pubs.usgs.gov/pinatubo/wolfe/index.html

(2) Socioeconomic Impacts of the Mount Pinatubo Eruption

ABSRACT

The Mount Pinatubo eruptions and their aftereffects, particularly lahars during rainy seasons, not only have taken the lives of many but also have wrought havoc to the infrastructure and to economic activities of Central Luzon. Damage to crops, infrastructure, and personal property totaled at least 10.1 billion pesos ($US 374 million) in 1991, and an additional 1.9 billion pesos ($US 69 million) in 1992. In addition, an

estimated 454 million pesos ($US 17 million) of business was foregone in 1991, as was an additional 37 million pesos ($US 1.4 million) of business in 1992. Lahars continue to threaten lives and property in many towns in the provinces of Tarlac, Pampanga, and Zambales.

The actual destruction, coupled with the continuing threat of lahars and ash fall, has disrupted the otherwise flourishing economy of Central Luzon, slowing the region's growth momentum and altering key development activities and priorities. Major resources have been diverted to relief, recovery, and prevention of further damage.

The costs of caring for evacuees (including construction of evacuation camps and relocation centers) was at least 2.5 billion pesos ($US 93 million) in 1991-92, and an additional 4.2 billion pesos ($US 154 million) was spent during the same period on dikes and dams to control lahars.

The longevity and impact of the calamity is so great that the public and private response must go beyond traditional relief and recovery. Return to preeruption conditions is impossible. Instead, responses must create an attractive climate for new investments, provide new livelihood and employment alternatives, promote growth in areas that are safe from future lahars and flooding, and provide an infrastructure that is tough enough to survive future natural disasters.

INTRODUCTION

The eruptions of Mount Pinatubo and their continuing aftereffects have disrupted the flourishing socioeconomic environment in Central Luzon. Economic growth, which had been spreading to the region from Manila and which was slated for an extra boost from conversion of former U.S. military bases, has been weakened by the eruption. The auspicious development picture for the region has been replaced by uncertainty and delays. For the short and medium term, rehabilitation and reconstruction dominate socioeconomic planning; for the long term, planning needs to take advantage of new opportunities that are presented by massive rebuilding of the socioeconomic infrastructure.

This paper presents actual and projected damage arising from the Mount Pinatubo eruptions, their implications for Central Luzon's development, and broad directions that could be taken to respond to the calamity. This report is neither comprehensive nor complete, as the calamity is still ongoing.

NATURE OF THE DISASTER

During the June 15, 1991, eruption, heavy damage was caused by ash fall, which buried large tracts of land and collapsed roofs of buildings near the volcano. Although ash fell in varying amounts across the whole of Luzon, the most heavily affected provinces were those adjacent to Mount Pinatubo--Pampanga, Tarlac, and Zambales.

Continuing effects are now brought by lahars--rain-induced torrents of loose volcanic debris that flow down the major river systems around the volcano and out into densely populated, adjoining lowlands. Lahars destroy and bury everything along their path: people and animals, farm and forest lands, public

infrastructure, natural waterways, houses, and other facilities. Infilling of stream channels has caused overbank flows, drowning of areas behind natural impoundments, and other forms of flooding in low-lying areas.

Secondary explosions also continue--explosions that occur when heavy rain and runoff come in contact with still-hot pyroclastic deposits on the volcano's slopes. These explosions produce fine, powdery ash fall that continues to impact, among other things, the former Clark Air Base.

REPORT ON DAMAGE

In the 2-year period since June 1991, the damage from eruptions and their aftereffects has been staggering and debilitating. Worse, it is expected to continue for at least several years more, until lahars no longer occur.

Damage is reported in different ways for different sectors. That for public infrastructure, natural resources, and military facilities is the estimated cost to repair or replace damaged assets. Estimates of damage to trade and industry include the cost to repair or replace facilities and projected income from foregone sales and service. Estimated damage in agriculture is the expected value of yield multiplied by the area damaged. Except for the basic data on monthly foregone income per industry type (see table 8), which was provided by the National Statistics Office (NSO), all reports on damage provided below came from government agencies and departments involved in rescue, relief, reconstruction, and rehabilitation and were consolidated through the National Disaster Coordinating Council (NDCC). The NDCC used this information to recommend to the President of the Philippines which areas should be declared to be under a state of calamity.

The other legal body that facilitated information gathering on damage was the Presidential Task Force on the Rehabilitation of Areas Affected by the Eruption of Mt. Pinatubo and its Effects, popularly known as Task Force Mt. Pinatubo. Created by President Corazon C. Aquino on June 26, 1991, by Memorandum Order No. 369, Task Force Mt. Pinatubo was mandated to guide all rehabilitation efforts of the government and to coordinate these with the private sector and, whenever necessary, with the international community. In December 1992, the work of Task Force Mt. Pinatubo was taken over by the Mount Pinatubo Assistance, Resettlement and Development Commission (MPC) created under Republic Act No. 7637.

AREAS AND POPULATION AFFECTED

From June 1991 to November 1992, means of livelihood, houses, or both were partially or wholly lost in 364 barangays (villages) (table 1). About 329,000 families (2.1 million people), about one-third of the region's population, lived in these 364 barangays at the time of the 1990 census. In 1991, 4,979 houses were totally destroyed and 70,257 houses were partially damaged. The number decreased in 1992, when 3,281 houses were wholly destroyed and 3,137 units were partially damaged (table 2).

Of the 329,000 families (2.1 million persons) affected, 7,840 families (35,120 persons) were of the Aeta cultural minority (Office for Northern Cultural Communities, unpub. data, August 14, 1991). Although constituting less than 2 percent of the total affected population, these cultural minorities have received significant attention.

Table 1. Total number of barangays affected as of November 17, 1992 (National Disaster Coordinating Council, 1992).["Affected" refers to a situation where means of livelihood, houses, or both are lost or partially or completely destroyed]

Province	Affected barangays	Number of families
Zambales	96	30,115
Pampanga	173	239,131
Tarlac	88	44,367
Angeles City	5	14,197
Nueva Ecija	2	1,331
Total	364	329,141

Table 2. Total number of houses damaged (National Disaster Coordinating Council, 1992; Presidential Task Force on Mount Pinatubo, 1992; Department of Social Welfare and Development, unpub. data, 1992). [Partial damage refers to any degree of physical destruction attributed to the disaster. Total destruction is the condition when the house is no longer livable]

Extent of damage	1991	1992	Total
Totally destroyed	4,979	3,281	8,260
Partially damaged	70,257	3,137	73,394
Total	75,236	6,418	81,654

Table 3. Total cost of damage to infrastructure as of August 23, 1991 (National Disaster Coordinating Council, 1992; Presidential Task Force on Mount Pinatubo, 1992; Department of Public Works and Highways, Region III, unpub. data, 1991). [The prevailing foreign exchange rate during this period was $1 = 27.07 pesos]

Infrastructure subsector/Facility	Damage Cost (in thousand pesos)
Transportation	1,149,908
Communication	13,215
Power and electrification	54,918
Water resources	1,568,642
Social infrastructure	1,045,708
Total	3,832,391

Table 4. Damage to Contract Reforestation and Integrated Social Forestry projects, 1991 (National Disaster Coordinating Council, 1992; Presidential Task Force on Mount Pinatubo, 1992; Department of

Environment and Natural Resources, Region III, unpub. data, 1991).[This damage was caused by ash fall and ash flow. Contract Reforestation--Regular DENR project involving a 3-year plantation and maintenance of forest trees through family-based, community-based, and corporate-based modes of contracting. Integrated Social Forestry (ISF)--community-based/family-based planting of 20% forest trees and 80% agricultural-based crops. Contractors are given a 25-year security of tenure through the certificate of stewardship contract (CSC)]

Province	Contract Reforestation		Integrated Social Foresty	
	Area (hectares)	Value/Amount lost (pesos)	Area (hectares)	Value/Amount lost (pesos)
Zambales	2,108.0	33,576,690.8	799.7	6,136,419.5
Pampanga	2,116.1	19,137,420.8	1,789.8	1,749,500.0
Tarlac	4,842.0	54,440,562.8	1,719.1	760,563.8
Bataan	529.0	8,133,902.2	236.5	1,507,500.0
Total	9,595.1	115,288,576.6	4,545.1	10,153,983.3

Table 5. Major river systems affected (National Disaster Coordinating Council, 1992; Presidential Task Force on Mount Pinatubo, 1992; PHIVOLCS/NEDA, 1992).[Total lahar hazard areas include those prone to lahar deposition, siltation and flooding, and bank erosion]

River system	Areas actually affected as of August 1992 (hectares)	Total lahar hazard area (hectares)
Abacan	2,930	4,060
Bucao-Balin Baquero	5,380	8,600
Maloma	1,820	1,700
O'Donnell-Bangut	3,350	11,540
Pasig-Potrero	4,370	10,000
Porac-Gumain	3,140	3,370
Sacobia-Bamban	10,310	25,090
Santo Tomas	4,640	12,590
Total	35,940	76,950

Table 6. Actual damage to agricultural area by commodity as of July 1991 (Department of Agriculture, Region III, unpub. data, 1991; National Disaster Coordinating Council, 1992; Presidential Task Force on Mount Pinatubo, 1992).

Commodity	Area or number damaged	Value (Philippine pesos)
Rice (hectares)	81,895	350,855,594
Vegetables (hectares)	2,486	163,548,456
Rootcrops (hectares)	2,070	182,791,365
Assorted fruit trees (number)	2,646	290,061,075
Fisheries (hectares)	7,129	284,098,228
Livestock and poultry (heads)	778,714	203,191,200

Total	1,474,545,918

DAMAGE BY SECTOR

PUBLIC INFRASTRUCTURE

In its damage assessment report as of August 23, 1991, the Department of Public Works and Highways (DPWH) Regional Office III estimated damage to public infrastructure amounting to 3.8 billion pesos (table 3). The gravest destruction was on irrigation and flood control systems, roads and bridges, and school buildings. Additional damage of at least 1 billion pesos was done to roads and bridges by lahars of 1992 (National Disaster Coordinating Council, 1992).

NATURAL RESOURCES

The Mount Pinatubo eruptions buried some 18,000 ha of forest lands in ash fall of about 25 cm (Paladio-Melosantos and others, this volume). The heaviest concentration of ash fall was in the mountains of Botolan and San Marcelino in Zambales, in Porac and Floridablanca in Pampanga, and in Bamban and Capas, Tarlac.

Reforestation activities have been seriously set back. Approximately 14,140 ha of newly established plantations were destroyed and some 125 million pesos worth of seedlings were lost (table 4). About 43,800 ha of natural forest cover and old plantations were damaged.

Heavy rains that came after the eruptions caused ash deposits from the mountain slopes to wash down to low-lying areas in the form of lahars. At least eight major river systems have been clogged by lahars (table 5; see also Arboleda and Martinez, this volume; Martinez and others, this volume; Pierson and others, this volume; Rodolfo and others, this volume; K.M. Scott and others, this volume; Umbal and Rodolfo, this volume).

AGRICULTURE

About 96,200 ha of agricultural land was seriously affected by ash fall. Damage to crops, livestock, and fisheries was about 1.4 billion pesos (table 6).

Damage from lahars, flooding, and siltation, as of November 17, 1992, was reported to be 778 million pesos (table 7). Of this, crops suffered the biggest damage (547 million pesos), followed by fisheries (165 million pesos), sugarcane (57 million pesos), and livestock (10 million pesos). The estimate of 778 million was later raised to 1,422 million (see table 10).

TRADE AND INDUSTRY

The manufacturing subsector, and consequently the exporting subsector, was heavily damaged. Lost assets for 559 firms totaled 851 million pesos. Foregone production losses for 1991 were reported to be about 45 percent of the potential sales for the year 1991, or 454 million pesos, and 424 million pesos of capital

investment was destroyed at 306 surveyed firms. The furniture industry was hardest hit, with damage of 156.5 million in 108 firms. The processed food sector suffered 97 million pesos of loss in 18 firms, and the gifts, toys, and housewares sector lost 60 million pesos in 92 firms.

In 1992, foregone income in the manufacturing subsector was 1.5 million pesos per month, followed by the wholesale and retail subsector with foregone income of 846,000 pesos per month. Foregone income for the financial, real estate, and business services subsector was about 635,000 pesos per month, and that of the transportation, storage, and communication subsector was estimated to be 65 million pesos per month. Total foregone income during 1992, in all sectors, was 3.1 million pesos. By province, industries in Pampanga and Tarlac had the greatest share of foregone sales, of 1.7 million and 0.6 million pesos per month, respectively (table 8).

SOCIAL SERVICES SECTOR

Health.--An increase in morbidity and mortality rates occurred mainly in evacuation centers. The leading diseases were acute respiratory infections (ARI), diarrhea, and measles (Department of Health, unpub. data, 1991). The death rate (Aetas and lowlanders combined) was 7 per 10,000 per week during 1991; that for Aetas in 1991 reached as high as 26 per 10,000 per week, and averaged 16 per 10,000 per week (Department of Health, 1992), and was especially high among Aeta children.

Social welfare.--The continuing threat of lahars has required that relief--food, clothing, shelter, and other help--be provided far beyond the period that is normal for typhoons and other calamities. As of October 28, 1993, approximately 1,309,000 people were being served outside evacuation centers. As of the same date, 159 evacuation centers were being maintained by the Department of Social Welfare and Development (DSWD) throughout Region III, housing some 11,455 families or 54,880 persons and providing them with food-for-work or cash-for-work assistance.

Education.--Destruction of about 700 school buildings with 4,700 classrooms displaced an estimated 236,700 pupils and 7,009 teachers. Damage to school buildings was estimated to be 747 million pesos as of August 1991 (table 9), an amount that is growing with continuing lahar activity. (Note: This value is also included within the category of social infrastructure in table 3.) Disruption of schooling is compounded by use of undamaged school buildings as evacuation centers, which forces delays in the opening of classes and causes other disruptions of the school calendar. Initial damage to instructional materials, furniture, equipment, and other school supplies was estimated at 93 million pesos (Department of Education, Culture, and Sports, unpub. data, 1991).

MILITARY FACILITIES

Damage to military facilities was considerable, but estimates of that damage are difficult to obtain or make. For the purposes of this report, we use an estimate of 3.8 billion pesos of damage in 1991 and no additional damage in 1992 (table 10). This estimate does not include heavy damage to former U.S. military facilities.

ALL SECTORS

In sum, damage and production losses resulting from the eruption and subsequent lahars were about 10.5 billion pesos in 1991 and 1.9 billion pesos in 1992 (table 10). These values include only damage and losses that are readily quantifiable. Additional losses, not included in these estimates, include human life, social fabric of communities, children's schooling, and a host of other, mostly social, items that are discussed in C.B. Bautista (this volume).

Table 7. Existing damage to agricultural commodities (in million pesos; Department of Agriculture, Region III, unpub. data, 1991; National Disaster Coordinating Council, 1992). [Damage cost = total area damaged x expected yield per hectare. Expected yield is computed by referring to precalamity yield. Postcalamity yield is derived by referring to precalamity yield and subjecting the damaged crops to recovery chances/percentages. The value of the crops with negative chances/percentages is derived by multiplying them by the prevailing market prices of the crops. This value then becomes the damage cost.]

Commodity	1991	1992	Total
Crops (hectares)	987.2	546.8	1,534.0
Livestock (heads)	203.2	9.8	213.0
Fisheries (hectares)	284.1	164.9	449.0
Sugarcane (hectares)	·	56.9	56.9
Total	1,474.5	778.4	2,252.9

Table 8. Monthly foregone gross income per industry type per affected province for 1992 (National Statistics Office, Region III, unpub. data, 1992) [The estimated loss to industry was based on the proportion of the affected households and their average expenditure on each type of industry. Does not include construction (52,689 pesos). No provincial breakdown available]

Province	Manufacturing	Wholesale/ Retail	Transport/ Storage/ Communication	Financing institution/ Real estate/ Business services	Total for province
Bataan	45,000	23,000	25,000	180,000	273,000
Bulacan[1]	23,000	5,100	590	620	29,310
Nueva Ecija	23,000	12,000	2,100	1,700	38,800
Pampanga[2]	1,100,000	540,000	22,000	83,000	1,745,000
Tarlac	230,000	190,000	8,900	190,000	618,900
Zambales	103,000	76,000	6,100	180,000	365,100
Total	1,524,000	846,100	64,690	635,320	3,070,110

[1]Municipality of Calumpit only. [2]Includes Angeles City.

Table 9. Estimated cost of damage to school buildings by province or city as of August 12, 1991 (National Disaster Coordinating Council, 1992; Presidential Task Force on Mount Pinatubo, 1992; Department of Education, Culture, and Sports, Region III, unpub. data, 1991). [Ash fall is the major cause for this type of damage]

Province/City	Cost (in thousand pesos)
Zambales	410,000
Bataan	34,000
Olongapo City	140,000
Pampanga	130,000
Tarlac	13,000
Angeles City	12,000
Bulacan	5,050
Nueva Ecija	3,200
Total	747,250

Table 10. Existing sectoral damage and production losses, 1991–92 (in millions of pesos) (National Disaster Coordinating Council, 1992; Presidential Task Force on Mount Pinatubo, 1992; National Economic Development Authority, unpub. data, 1991, 1992).

Sector	1991	1992	Total 1991–92
Public infrastructure	3,830	454	4,284
Agriculture	1,474	1,422	2896
Military facilities	3,842	0	3,842
Trade and industry	851	0	851
Natural resources	125	0	125
Foregone income (trade and industry).	454	37	491
Total	10,576	1,913	12,489

Table 11. Gross Regional Domestic Product by industrial origin from 1987 to 1992 at constant prices, Region III, Central Luzon (in thousand pesos; Economic and Social Statistics Office, National Statistical Coordination Board, unpub. data, July 1993).

Industrial origin	1987	1988	1989	1990	1991	1992
Gross Regional Domestic Product	57,456,387	61,712,579	64,419,389	68,814,787	67,184,484	72,227,785
Agriculture and forestry	12,943,820	13,241,781	14,462,739	15,849,415	16,043,616	16,038,629
Agriculture	12,928,545	13,230,282	14,450,556	15,833,694	16,033,651	16,032,689
Forestry	15,275	11,499	12,183	15,721	9,965	5,940
Industry	23,567,988	26,618,118	26,751,658	29,187,703	27,745,807	32,505,094
Mining and quarrying	1,324,296	1,435,041	1,519,655	1,297,769	1,165,203	1,170,126
Manufacturing	17,237,722	19,960,049	19,802,819	22,691,941	21,018,947	21,731,866
Construction	3,264,967	3,296,771	3,368,449	3,248,637	3,890,864	7,631,570

Electricity, gas, and water	1,741,003	1,926,257	2,060,835	1,949,356	1,670,793	1,971,532
Services	20,944,579	21,862,680	23,204,992	23,777,669	23,395,061	23,684,062
Transportation	3,444,086	3,600,625	3,766,868	3,781,629	3,727,350	3,769,834
Trade	8,766,074	9,034,766	9,592,306	9,772,620	9,644,546	9,768,813
Finance and housing	769,154	826,842	911,405	978,366	964,006	970,116
Real estate	3,389,119	3,586,285	3,848,135	3,962,822	3,912,763	3,931,460
Private services	3,188,222	3,326,732	3,534,305	3,643,687	3,471,446	3,562,519
Government services	1,387,924	1,477,430	1,551,973	1,638,545	1,674,950	1,693,320

COSTS OF EVACUATIONS AND OTHER RISK MITIGATION

It is beyond the scope of this paper to discuss evacuations and other risk mitigation measures in detail. However, for comparison to estimates of damage, at least 2.5 billion pesos was spent in construction and operation of evacuation sites (Department of Budget and Management, Region III, unpub. data). About 4.2 billion pesos was spent in 1991-92 for dredging of river channels and for construction of dikes and dams to control lahars (Department of Public Works and Highways, 1992).

IMPACT ON THE REGIONAL ECONOMY

The 1991 Gross Regional Domestic Product (GRDP) of Region III accounted for about 9.4 percent of the Gross Domestic Product (GDP) (Economic and Social Statistics Office, National Statistical Coordination Board, ESSO-NSCB, unpub. data, July 1993). (The GDP is Gross National Product (GNP) less net factor income from the rest of the world.) The average growth of the region's GRDP from 1987 to 1991 was 5 percent per year (NEDA, Agricultural Staff, 1993). The largest contributor from 1987 to 1991 was industry (42 percent), followed by services (35 percent) and agriculture (23 percent) (table 11).

Because of the eruption, the GRDP in 1991 amounted to only 67.2 billion pesos, compared to the 1990 GRDP of 68.8 billion pesos (table 11). This represents a 1.6 billion pesos (2.3 percent) reduction in output. All sectors of the economy were affected by the eruption. Hardest hit were manufacturing, mining and quarrying, agriculture, and private services.

In 1992, GRDP amounted to 72.2 billion pesos, a 7 percent increase from 1991. Industry and services exhibited positive growth rates (Economic and Social Statistics Office, National Statistical Coordination Board, ESSO-NSCB, unpub. data, July 1993). However, agricultural productivity was still below the 1991 level because lahars took additional agricultural lands out of production in 1992.

RECOMMENDATIONS

The overall impact of the Mount Pinatubo eruptions is the slowing down of the region's growth momentum and alteration of key development activities and priorities. The calamity can, however, be taken as an opportunity, in which rehabilitation and reconstruction can aid in regional development. Specifically, rehabilitation and reconstruction should:

1. Mitigate further destruction, mainly from lahars and flash floods.
2. Normalize and accelerate economic recovery including the creation of an attractive investment climate.
3. Provide adequate livelihood and employment alternatives, especially for displaced farmers and workers (including those from Clark Air Base and the former Subic Bay Naval Station).
4. Promote growth and development in resettlement and new settlement areas that can serve as alternatives to heavily devastated or high risk areas.
5. Ensure the continuous flow of goods and services, especially during relief operations following future calamities.
6. Strengthen public awareness and institutional mechanisms for disaster preparedness.
7. Reduce the infrastructure's susceptibility to damage from lahars and other natural disasters.
8. Prevent future degradation of the environment and rehabilitate damaged ecosystems.

The complexity of these challenges and the expectation of more lahars to come demand no less than a well-coordinated, integrated response from the government sector, non-governmental organizations, and the victims themselves. With unity, selflessness, and honesty of those who serve and are being served, economic growth in the disaster-stricken areas of Central Luzon will become a reality.

Source: Remigio A. Mercado, Jay Bertram T. Lacsamana, and Greg L. Pineda. Socioeconomic Impacts of the Mount Pinatubo Eruption National Economic and Development Authority. http://pubs.usgs.gov/pinatubo/mercado/index.html

Appendix A9

Compiled Information and Data on Records of Natural Hazards

A9.1 Flood

A9.1 Flood

No.	Country	Cause	Disaster Start			Disaster End			Damage				Affected Region	Reference	Location		Flood Magnitude
			Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount/ GDP-PPP (%)			Latitude	Logitude	
1	Brunei	General	2012	12	3								Whole	GLIDE:			
2	Brunei	General	2010	12	14								Whole	GLIDE:			
3	Brunei	General	2010	9	9								Whole	GLIDE			
4	Brunei	General	2010	1	14								Whole	GLIDE			
5	Brunei	General	2009	1		2009	2				0.009	0	Whole	GLIDE			
6	Brunei	General	2009	1		2009	2				0.051	0	Whole	GLIDE			
7	Brunei	General	2009	1	21						0.051	0	Whole	GLIDE			
8	Brunei	General	2008	2	9								Whole	GLIDE			
9	Brunei	General	2007	12	23								Whole	GLIDE			
1	Cambodia	General	2011	8	10	2011	11	1	247	1,640,023	521.000	1.541	Whole	EM-DAT			
2	Cambodia	General	2010	10	20	2010	11	9	8		70.000	0.226	Whole	EM-DAT			
3	Cambodia	Flash	2010	10	15	2010	10	15					Whole	GLIDE			
4	Cambodia	Flash	2010	10	11	2010	10	17	6	31,505	70.000	0.226	Whole	GLIDE			
5	Cambodia	Flash	2009	9	4	2009	9	10	13	28,645			Whole	GLIDE			
6	Cambodia	Flash	2008	9	15	2008	9	23					Whole	GLIDE			
7	Cambodia	General	2007	8	10	2007	8	24	2	19,000	1.000	0.004	Whole	EM-DAT	105.882	13.28	6.1
8	Cambodia	Flash	2007	5		2007	8		5	80,540			Whole	GLIDE			
9	Cambodia	General	2006	8	10	2006	11	1	5	33,000			Whole	EM-DAT	104.675	11.062	7.1
10	Cambodia	General	2006	7	6	2006	7	7		5,000			Whole	EM-DAT			
11	Cambodia	General	2005	9	8	2005	9	29	16				Whole	EM-DAT			
12	Cambodia	General	2004	8	24	2004	10	21					Whole	EM-DAT	105.824	10.318	6.4
13	Cambodia	General	2002	8	18	2002	11	26	29	1,470,000	0.100	0.001	Whole	EM-DAT	103.527	16.772	7.9
14	Cambodia	General	2001	8	15	2001	11	19	56	1,669,182	15.000	0.118	Whole	EM-DAT	105.382	11.768	7.2
15	Cambodia	Monsoonal	2000	8	28	2000	9	1	1139	6,574,000	782.000	6.794	Whole	PRCC	106.195	11.544	6.3
16	Cambodia	General	2000	7	11	2000	8	10	347	3,448,053	160.000	1.39	Whole	EM-DAT			
17	Cambodia	Dam Break	2000	3	3	2000	3	4	3				Whole	PRCC	106.939	13.719	4.4
18	Cambodia	General	1999	10	25	1999	11	9		124,475			Whole	EM-DAT			
19	Cambodia	General	1999	8	2	1999	8	8	7	535,904	0.500	0.005	Whole	EM-DAT	106.09	13.433	6.1
20	Cambodia	General	1996	9	30	1996	11	3	59	1,300,000	1.500	0.019	Whole	EM-DAT	105.076	13.986	6.3
21	Cambodia	Monsoonal	1995	9	18	1995	10	2		1,348			Whole	PRCC	105.709	16.542	6
22	Cambodia	General	1994	7	31	1994	7	31	506	29,000			Whole	EM-DAT			
23	Cambodia	General	1991	8	22	1991	8	30	100	900,000	150.000	2.821	Whole	EM-DAT	105.268	11.537	5.7
1	Indonesia	Flash	2012	11	7	2012	11	9	18				Sulawesi	EM-DAT			
2	Indonesia	Flash	2012	9	12	2012	9	12		1,150			West Sumatera	EM-DAT			
3	Indonesia	Flash	2012	8	25	2012	8	25	4	1,045			Sulawesi	EM-DAT			
4	Indonesia	General	2012	7	31	2012	8	1	11	599			Seram	EM-DAT			
5	Indonesia	Torrential	2012	7	20	2012	7	23		586			Sulawesi	PRCC	122.436	0.782	4.5
6	Indonesia	Torrential	2012	3	4	2012	3	7	5				Kalimantan	PRCC	116.093	-3.184	4.3
7	Indonesia	Torrential	2012	2	20	2012	2	27		1,200			W. Sumatera, C. Java	PRCC	103.416	-2.586	6.2
8	Indonesia	Torrential	2012	2	12	2012	2	14		6,800			West Java	PRCC	106.658	-6.319	4.6
9	Indonesia	Torrential	2012	1	27	2012	1	29	6	3,000			East Java	PRCC	112.51	-7.483	4.5
10	Indonesia	General	2011	12	18	2011	12	22	10	54			Central Java	EM-DAT	110.236	-7.38	4.6
11	Indonesia	Torrential	2011	12	12	2011	12	17		42			Sulawesi	PRCC	120.008	-0.914	3.9
12	Indonesia	Heavy rain	2011	11	27	2011	11	30		500			West Sumatera	PRCC	100.378	1.699	4.7
13	Indonesia	Torrential	2011	4	23	2011	4	25		1,800			Timor	PRCC	124.355	-9.709	4.5
14	Indonesia	General	2011	4	1	2011	4	10	18	3,000			Papua	EM-DAT	137.834	-4.391	5.4
15	Indonesia	Heavy rain	2011	3	31	2011	4	1		400			North Sumatera	PRCC	98.973	3.33	4.7
16	Indonesia	General	2011	3	17	2011	3	31	13	3,000			Papua	EM-DAT			
17	Indonesia	General	2011	3	10	2011	3	11	21	750			North Sumatera	EM-DAT	97.099	4.211	5.1
18	Indonesia	Torrential	2011	2	24	2011	2	26		4,000			East Java	PRCC	115.087	-8.414	4.3
19	Indonesia	Flash	2011	2	6	2011	2	7		1,060			Central Java	EM-DAT			
20	Indonesia	General	2011	1	16	2011	1	20		12,000			West Java	EM-DAT	108.26	-6.844	4.5
21	Indonesia	Flash	2010	11	2	2010	11	5	16	200			Timor	EM-DAT	121.614	-8.672	5
22	Indonesia	Flash	2010	10	2	2010	10	6	291	13,248	76.000	0.007	Sulawasi	EM-DAT	132.811	-1.224	5.4
23	Indonesia	General	2010	9	11	2010	9	11	24				Kalimantan	EM-DAT			
24	Indonesia	General	2010	7	23	2010	7	25	21	15,007			Buru	EM-DAT	114.972	-2.141	5.5
25	Indonesia	Heavy rain	2010	5	8	2010	5	10					Sulawesi	PRCC	121.994	-3.876	4.9
26	Indonesia	Heavy rain	2010	4	16	2010	5	2					South Kalimantan	PRCC	113.972	-2.682	6.2
27	Indonesia	Torrential	2010	3	24	2010	3	28		25,000			West Java, Sumatera	PRCC	104.787	-4.447	5.7
28	Indonesia	General	2010	2	23	2010	3	1	44	100			West Java	EM-DAT			
29	Indonesia	General	2010	1	22	2010	1	22	10	355			Sulawesi	EM-DAT			
30	Indonesia	General	2010	1	11	2010	1	11	5	28,500			East Java	EM-DAT			
31	Indonesia	Flash	2009	12	8	2009	12	8	6	704			North Sulawesi	EM-DAT			
32	Indonesia	Flash	2009	10	8	2009	10	8		2,500			Central Sulawesi	EM-DAT			
33	Indonesia	Flash	2009	9	15	2009	9	18	38	10,000			North Sumatera, Sulawesi	EM-DAT	98.593	2.891	5.3
34	Indonesia	Heavy rain	2009	4	17	2009	4	27		20,000			East Kalimantan	PRCC			
35	Indonesia	Torrential	2009	3	30	2009	3	31		1,000			West Sumatera	PRCC	106.364	-6.5542	4.6
36	Indonesia	General	2009	3	26	2009	3	27	64	1,600			West Java	EM-DAT			
37	Indonesia	Heavy rain	2009	2	23	2009	3	9	1	20,000			East Java	PRCC			
38	Indonesia	Flash	2009	1	27	2009	2	2	18	12,000			East Java, Sulawesi	EM-DAT	113.773	3.345	5.5
39	Indonesia	General	2008	12	26	2009	1	12	24	15,000			West Lombok	EM-DAT			
40	Indonesia	General	2008	11	15	2008	11	16	33	84,420			West Java	EM-DAT			
41	Indonesia	General	2008	10		2008	10		5	11,000			Central Java, Sulawesi	EM-DAT			
42	Indonesia	General	2008	9	6	2008	9	8	16	118,000	1.080	0	Sulawesi, North Sumatra	EM-DAT	122.521	0.682	4.6
43	Indonesia	Flash	2008	7	11	2008	7	11	1	2,800			Kalimantan	GLIDE			
44	Indonesia		2008	7	9	2008	7	10	1				C. Sulawesi, E. Kalimantan	PRCC	116.237	-1.675	5.3
45	Indonesia	Flash	2008	4	23	2008	4	27		34,514			North Sumatera	EM-DAT	95.773	4.649	4.3
46	Indonesia	General	2008	3	10	2008	4	3		60,000			West Sumatera	EM-DAT	101.782	0.538	6.3
47	Indonesia	General	2008	3	1	2008	3	14	3	12,000			East Java	EM-DAT	112.368	-7.127	5.8
48	Indonesia	Heavy rain	2008	2	14	2008	3	14		10,000			W to E Java (Jakarta)	PRCC	107.286	-6.261	5.5
49	Indonesia	General	2008	2	11	2008	2	27	11	3,500			Central Java,	EM-DAT	119.511	-9.653	5.3
50	Indonesia	Flash	2008	2	8	2008	2	12	14	7,000			East Java	EM-DAT	113.998	-7.739	3.3
51	Indonesia	General	2008	2	1	2008	2	6	3	89,761			West, East, Central Java	EM-DAT	106.845	-6.189	3.4
52	Indonesia	General	2008	1	30	2008	1	31	3	40,000	0.653	0	East Java	EM-DAT	112.908	-7.708	3.8
53	Indonesia	General	2008	1	2	2008	1	6		1,000			West Java	EM-DAT	106.828	-6.225	4
54	Indonesia	Heavy rain	2007	12	25	2008	1	3	153	50,000			East to Central Java	PRCC	111.333	-7.542	5.9
55	Indonesia	General	2007	12	25	2007	12	29	127	269,515			Central Java	EM-DAT	100.616	-0.686	4.6
56	Indonesia	Heavy rain	2007	12	17	2007	12	24		4,500			Sulawesi	PRCC	123.06	0.611	4
57	Indonesia	Heavy rain	2007	10	18	2007	10	31		3,300			North Kalimantan	PRCC	97.222	3.518	5.8
58	Indonesia	Heavy rain	2007	9	2	2007	9	4	4	1,000			Kalimantan	EM-DAT	116.716	-1.076	4.2
59	Indonesia		2007	7	28	2007	8	10		3,000			Maluka to Timor	PRCC	128.141	-0.641	4.3
60	Indonesia	General	2007	7	25	2007	8	2	15	2,000			Timor	EM-DAT	120.198	-3.28	4.3
61	Indonesia	General	2007	7	22	2007	8	7	88	3,389			Sulawesi	EM-DAT	97.514	2.961	4.5
62	Indonesia	General	2007	7	17	2007	7	30	58	5,000			Sulawesi	EM-DAT	121.488	-1.74	4.8
63	Indonesia	Heavy rain	2007	6	16	2007	6	20	1	212			Sulawesi	PRCC	123.096	0.618	3.8
64	Indonesia	General	2007	5	15	2007	6	5	4	60,000			East Kalimantan	EM-DAT	116.92	-0.188	5.9
65	Indonesia	Heavy rain	2007	5	6	2007	5	12	2	14,400			Sulawesi	PRCC	119.954	-1.075	4.4
66	Indonesia	Heavy rain	2007	5	1	2007	5	25		3,000			Kalimantan	PRCC	114.779	-0.86	6
67	Indonesia	Heavy rain	2007	4	17	2007	4	20					North Sumatera	PRCC	95.737	4.725	3.5
68	Indonesia	Heavy rain	2007	4	16	2007	5	3					Sulawesi	PRCC	121.217	-1.925	4.8
69	Indonesia	Heavy rain	2007	4	14	2007	4	18					Timor	PRCC	117.444	-8.578	3.6
70	Indonesia	Heavy rain	2007	3	17	2007	3	22		3,000			Timor	PRCC	124.71	-9.537	4
71	Indonesia	Flash	2007	3	1	2007	3	10	74	11,556			Timor	EM-DAT	120.757	-8.567	4.5
72	Indonesia	General	2007	1	31	2007	2	23	68	217,087	971.000	0.116	West Java (Jakarta)	EM-DAT	1086.828	-6.225	5.2
73	Indonesia	Monsoonal	2007	1	12	2007	1	14	26	3,990			North Sulawesi	PRCC	125.54	3.557	3.1
74	Indonesia	Flash	2006	12	23	2006	12	24	236	618,486			North Sulawesi	EM-DAT	97.505	4.475	5.4
75	Indonesia	Flash	2006	6	25	2006	6	29	52	18,250			Kalimantan	EM-DAT	115.49	-3.286	5.1
76	Indonesia	Heavy rain	2006	6	24	2006	6	26	41	3,000			South Kalimantan	EM-DAT			
77	Indonesia	General	2006	6	23	2006	6	27		5,000			North Sulawesi	EM-DAT	123.009	0.545	3.6

A9.1 Flood

No.	Country	Cause	Disaster Start			Disaster End			Damage				Affected Region	Reference	Location		Flood Magnitude
			Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount/ GDP-PPP (%)			Latitude	Logitude	
78	Indonesia	Flash	2006	6	19	2006	6	23	236	29,231	55.200	0.007	South Sulawesi	EM-DAT	120.107	-5.167	4.2
79	Indonesia	Flash	2006	4	19	2006	4	23	22	50,000			East Java	EM-DAT	111.863	-7.838	5
80	Indonesia	Flash	2006	2	13	2006	2	23	39	17,539	25.000	0.003	North Sulawesi	EM-DAT	124.664	1.073	5.6
81	Indonesia	Heavy rain	2006	2	7	2006	2	13		300			Sumatera	PRCC	102.23	-1.815	5.3
82	Indonesia	General	2006	1	26	2006	2	14	19	10,000	27.100	0.004	Central Java	EM-DAT	108.593	-6.853	6.2
83	Indonesia	Monsoonal	2006	1	22	2006	1	27	11	3,000			Timor to East Java	PRCC	117.291	-8.441	5.5
84	Indonesia	Heavy rain	2006	1	6	2006	1	12		6,000			West Java	PRCC	108.215	-6.381	3.7
85	Indonesia	Flash	2005	12	31	2006	1	3	79	7,811			East Java	EM-DAT	113.342	-8.023	4
86	Indonesia	Flash	2005	10	18	2005	10	19	28	12,211			North Sulawesi	EM-DAT	97.754	3.505	3.7
87	Indonesia	Flash	2005	4	26	2005	4	27	47	768			North Sumatera	EM-DAT	97.662	3.695	3.5
88	Indonesia	Heavy rain	2005	2	19	2005	2	25		50,000			West Java	PRCC	107.603	-6.959	3.8
89	Indonesia	Heavy rain	2005	1	11	2005	2	10			14.200	0.002	South Sumatera	PRCC	104.432	-3.904	6.4
90	Indonesia	Heavy rain	2004	12	2	2004	12	6	15	20,000			East Java	PRCC	112.175	-8.044	4.6
91	Indonesia	Heavy rain	2004	11	3	2004	11	4	1	150			Sumatera	PRCC	101.398	-2.043	2.7
92	Indonesia	Heavy rain	2004	9	26	2004	10	3		3,000			North Sumatera	PRCC	95.962	4.363	4.6
93	Indonesia	Heavy rain	2004	5	7	2004	5	11		10,000			Sulawesi, E and C Kalimanta	PRCC	116.828	-0.528	4.9
94	Indonesia	Heavy rain	2004	3	16	2004	3	17	1	8,000			West Java	PRCC	107.494	-6.93	3.5
95	Indonesia	Heavy rain	2004	2	22	2004	2	25	1	3,000			North Sumatera	PRCC	99.125	3.282	3.6
96	Indonesia	General	2004	2	18	2004	2	23	5	13,000	60.000	0.009	West Java (Jalarta)	EM-DAT	106.838	-6.194	3.2
97	Indonesia	Heavy rain	2004	2	17	2004	2	25		4,000			West Java	PRCC	108.144	-6.41	4.5
98	Indonesia	Heavy rain	2004	2	3	2004	2	5	4	2,400			E. and C. Java	PRCC	112.566	-7.632	4.9
99	Indonesia	General	2003	12	10	2004	1	5	148	150,000			Central Sumatera	EM-DAT	102.902	-1.042	6.9
100	Indonesia	Heavy rain	2003	12	5	2003	12	10		1,000			North Sumatera	PRCC	98.729	3.597	3.5
101	Indonesia	General	2003	11	30	2003	12	6	8	25,000			Central Sumatera	EM-DAT	101.494	0.267	4.4
102	Indonesia	Heavy rain	2003	11	22	2003	11	24	3	12,000			East Java	PRCC	112.522	-8.107	3.3
103	Indonesia	Flash	2003	11	2	2003	11	3	241	1,498			North Sumatera	EM-DAT	98.063	3.429	3.1
104	Indonesia	Heavy rain	2003	9	22	2003	9	24		5,000			North Sumatera	PRCC	98.729	3.613	3.3
105	Indonesia	Heavy rain	2003	5	3	2003	5	6		2,000			Sumatera	PRCC	103.544	-1.504	4.7
106	Indonesia	Heavy rain	2003	3	31	2003	4	1	39				Flores	PRCC	121.709	-8.784	2.8
107	Indonesia	Heavy rain	2003	3	20	2003	3	25	12				South Sulawesi	PRCC	119.784	-3.094	3.8
108	Indonesia	Heavy rain	2003	2	16	2003	2	17		4,300			West Java	PRCC	107.604	-6.973	2.9
109	Indonesia	General	2003	2	13	2003	2	14	3	33,000			West Java (Jakarta)	EM-DAT	106.847	-6.208	3
110	Indonesia	Torrential	2003	2	4	2003	2	6	7	260			Sumatera	PRCC	102.64	-3.461	3.7
111	Indonesia	Heavy rain	2003	1	30	2003	2	9					West Java (Jakarta)	PRCC	107.641	-7.047	4.7
112	Indonesia	Flash	2003	1	28	2003	1	28	1	15,000			Central Java	EM-DAT			
113	Indonesia	Heavy rain	2003	1	25	2003	2	6	3	20,000			North Sumatera	PRCC	102.452	-0.113	5.6
114	Indonesia	Heavy rain	2003	1	20	2003	2	10	1	1,500			North Sumatera	PRCC	102.894	2.468	4.8
115	Indonesia	Heavy rain	2003	1	14	2003	2	6		30,000			West Kalimantan	PRCC	113.005	-2.429	5.7
116	Indonesia		2003	1	10	2003	1	10	10	1,700			West Sumatera	EM-DAT			
117	Indonesia		2003	1	8	2003	1	8		230			West Lombok	EM-DAT			
118	Indonesia	General	2003	1		2003	1		3	10,000			Java, Sulawesi	EM-DAT			
119	Indonesia	Heavy rain	2002	12	26	2002	12	30	24	10,000			South Sumatera	PRCC	104.218	-4.66	4.9
120	Indonesia	Heavy rain	2002	12	15	2002	12	20		60,000			North Sumatera	PRCC	100.517	0.978	5.1
121	Indonesia	Heavy rain	2002	12	11	2002	12	15	28				East Java	PRCC	112.39	-7.44	3.5
122	Indonesia	General	2002	11	19	2002	12	3	13	87,000	1.600	0	North Sumatera	EM-DAT	97.436	3.113	5.7
123	Indonesia	Heavy rain	2002	10	18	2002	10	20		3,000			West Sumatera	PRCC	100.611	-1.344	2.6
124	Indonesia	General	2002	5		2002	5			1,000			Sulawesi	EM-DAT			
125	Indonesia	Heavy rain	2002	4	17	2002	4	20	19				Timor	EM-DAT	120.632	-9.704	4.3
126	Indonesia	Heavy rain	2002	4	17	2002	4	20	4				Timor	PRCC	108.216	-7.286	3.4
127	Indonesia	General	2002	3	27	2002	3	30	14	780			West sumatera	EM-DAT	97.745	0.96	3.6
128	Indonesia	Heavy rain	2002	2	17	2002	2	25	4	30,000			Central Java	PRCC	109.784	-6.954	4.1
129	Indonesia	Heavy rain	2002	2	13	2002	2	23		15,000			West Java (Jakarta)	PRCC	106.855	-6.213	3.9
130	Indonesia	Flash	2002	2	5	2002	2	7					East Java	GLIDE			
131	Indonesia	General	2002	1	27	2002	2	12	150	500,750	250.000	0.044	East Java	PRCC	112.792	-7.317	6.1
132	Indonesia	Dam Releas	2002	1	15	2002	1	26		3,000			West Java (Jakarta)	PRCC	106.855	-6.213	4
133	Indonesia	General	2002	1	13	2002	1	18	13	2,000			North Sumatera	EM-DAT	98.621	3.591	4.4
134	Indonesia	General	2002	1	8	2002	1	12	21	40			South Sumatera	EM-DAT	103.346	-3.997	3.9
135	Indonesia	Heavy rain	2002	1	5	2000	1	7	4	240			North Sumatera	PRCC	125.462	3.672	2.8
136	Indonesia	Heavy rain	2002	1	1	2002	1	4	5	300			South Sulawesi	PRCC	119.618	-5.233	4.3
137	Indonesia	General	2001	12	28	2002	1	1	15	2,000			Sumatera, Sulawesi	EM-DAT	98.813	3.399	4.7
138	Indonesia		2001	12	17	2001	12	17					Papua	EM-DAT			
139	Indonesia	Heavy rain	2001	10	17	2001	10	27	20	18,000			C. and E. of Java	PRCC	109.763	-7.595	4.4
140	Indonesia	Heavy rain	2001	10	8	2001	10	9		4,000			Central Java	PRCC	109.305	-7.524	3.7
141	Indonesia	Heavy rain	2001	7	31	2001	8	1	1	3,000			Cental Sulawesi	PRCC	122.413	-1.315	3.7
142	Indonesia	General	2001	7	31	2001	8	1	257	3,694			North Sumatera	EM-DAT	97.754	0.816	3.7
143	Indonesia	Flash	2001	2	4	2001	2	18	130	80,000	10.000	0.002	East Java	EM-DAT	112.07	2.3929	5.8
144	Indonesia	Torrential	2000	12	3	2000	12	6	38	39,852			North Sulawesi	EM-DAT	116.887	-8.737	3.7
145	Indonesia	General	2000	11	28	2000	12	4	100	386,021	34.000	0.007	North sumatera	EM-DAT	124.7	1.168	4.4
146	Indonesia		2000	11	21	2000	12	1	243	68,682	94.500	0.019	N. and W. Sumatera	PRCC	99.803	1.581	6.6
147	Indonesia	Torrential	2000	11	5	2000	11	7	3	21			Central Java	PRCC	109.443	-7.637	4.4
148	Indonesia	Heavy rain	2000	10	29	2000	10	31	40	10,000			W. and C. Java	PRCC	108.884	-7.323	4.6
149	Indonesia	Flash	2000	5	16	2000	5	24	126	50,000	79.000	0.016	West sumatera	EM-DAT			
150	Indonesia	Monsoona	1999	2	9	1999	2	14	2	2,000			Sulawesi, Sumatera	PRCC	102.854	-0.358	5.9
151	Indonesia		1999	1	5	1999	1	5	12	16,000			Sulawesi, Java	EM-DAT			
152	Indonesia		1998	12	27	1998	12	31		9,600			West Java	PRCC	107.063	-6.84	5.4
153	Indonesia		1998	8	2	1998	8	2	4	100,000			East Kalimantan	EM-DAT			
154	Indonesia	Torrential	1998	7	23	1998	7	26	26				Java, Irian Jaya	PRCC	112.885	-7.167	5.4
155	Indonesia	Heavy rain	1998	6	10	1998	6	11		180			Java	PRCC	111.879	-7.75	4.7
156	Indonesia	Heavy rain	1998	5	11	1998	5	13					West Java (Jakarta)	PRCC	107.054	-6.651	4.9
157	Indonesia	Heavy rain	1998	4	15	1998	4	16	13	400			South Sumatera	PRCC	103.962	-3.611	5.4
158	Indonesia	Heavy rain	1998	3	24	1998	3	25		400			Java	PRCC	110.866	-7.85	4.7
159	Indonesia	Heavy rain	1998	2	25	1998	2	27					Central Java	PRCC	109.837	-7.524	5.1
160	Indonesia	Heavy rain	1997	12	24	1997	12	27	5				East Java	PRCC	113.312	-7.858	4.4
161	Indonesia	Heavy rain	1997	11	1	1997	11	6	3				North Sumatera	PRCC	99.07	2.808	5.5
162	Indonesia		1996	12	13	1996	12	13	14	10,000			Central Java	EM-DAT			
163	Indonesia	Flash	1996	10	20	1996	10	22	13	5,007	3.000	0.001	Central Java	EM-DAT	110.139	-7.335	4.6
164	Indonesia	Heavy rain	1996	7	5	1996	7	10		18,000			North Sumatera	PRCC	95.71	5.159	4.8
165	Indonesia	Heavy rain	1996	5	16	1996	5	20	4				West Java	PRCC	106.781	-6.604	4.1
166	Indonesia	General	1996	3	27	1996	3	31	34	527	0.430	0	South Sumatera	EM-DAT	104.478	-4.339	5.5
167	Indonesia	Heavy rain	1996	3	1	1996	3	3		18,584			Java	PRCC	109.6	-7.254	4.7
168	Indonesia	General	1996	2	9	1996	2	13	20	556,000	434.800	0.088	West Java (Jakarta)	EM-DAT	106.829	-6.229	4.1
169	Indonesia	General	1996	1	6	1996	1	9	6	252,965	126.900	0.026	West Java (Jakarta)	EM-DAT	106.847	-6.258	3.7
170	Indonesia	General	1995	12	28	1996	1	2	18	201,472	50.000	0.011	North Sumatera	EM-DAT			
171	Indonesia	Flash	1995	5	7	1995	5	7	27	2,200			North Sumatera	EM-DAT			
172	Indonesia	General	1995	5	1	1995	5	1	45	17,500	600.000	0.134	North Sumatera	EM-DAT	99.286	2.559	5.8
173	Indonesia	General	1995	2	3	1995	2	17	47	36,000	0.400	0	Java, Sumatera	EM-DAT	101.896	-0.53	6.6
174	Indonesia	General	1995	1	9	1995	1	11	3	3,000			West Sumatera	EM-DAT	101.984	0.633	5.4
175	Indonesia		1994	12	2	1994	12	7	6	640	1.500	0	East Java	EM-DAT	100.547	-0.776	5.4
176	Indonesia	Heavy rain	1994	11	1	1994	11	4	31				Timor	PRCC	119.16	-8.597	4.9
177	Indonesia		1994	10	12	1994	10	12	3	60,000			North Sumatera	EM-DAT			
178	Indonesia	General	1994	7	12	1994	7	12	5	50,000	1.700	0	Timor	EM-DAT			
179	Indonesia		1994	4	23	1994	4	23	8	1,000			North Sumatera	EM-DAT			
180	Indonesia	General	1994	3	23	1994	3	26	33	187,131	18.145	0.045	East Java	EM-DAT	111.684	-7.502	5.2
181	Indonesia	Heavy rain	1994	3	12	1994	3	16	5	50,000	1.700	0	Timor	PRCC	118.798	-8.484	4
182	Indonesia	Heavy rain	1994	2	11	1994	2	14	5				North Sumatera	PRCC	99.033	3.126	4.9
183	Indonesia	Heavy rain	1994	1	28	1994	1	31	2				Central Java	PRCC	110.662	-7.376	5.4
184	Indonesia	General	1994	1	12	1994	1	22	4	30,000	1.900	0	West Java	EM-DAT	107.657	-6.84	5.1
185	Indonesia	Flash	1993	12	26	1993	12	27	72	8,000			West Java	EM-DAT	106.357	-6.242	3.9
186	Indonesia	Heavy rain	1993	11	3	1993	11	16	5	3,000			North Sumatera	PRCC	101.308	1.124	5.8
187	Indonesia	General	1993	2	2	1993	2	5	59	259,553	19.301	0.005	Bintang (North Sumatera)	EM-DAT	111.256	-6.808	5
188	Indonesia	Heavy rain	1992	9	2	1992	10	15	70	15,000			Java	PRCC	111.708	-7.585	6.6

No.	Country	Cause	Disaster Start			Disaster End			Damage				Affected Region	Reference	Location		Flood Magnitude
			Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount/ GDP-PPP (%)			Latitude	Logitude	
189	Indonesia		1992	8		1992	8		57	265,553			East Java	EM-DAT			
190	Indonesia	General	1991	12	16	1991	12	19	15	240,000	14.800	0.005	Central Sumatera	EM-DAT	101.949	0.61	5.8
191	Indonesia	Heavy rain	1991	11	30	1991	12	2					North Sumatera	PRCC	96.903	3.964	5.2
192	Indonesia	General	1991	6	8	1991	6	11	97				Kalimantan	EM-DAT	114.253	-1.687	5.4
193	Indonesia	Heavy rain	1991	4	1	1991	4	2	1	100,000			West Sumatera	PRCC	100.463	-0.929	4.9
194	Indonesia	Heavy rain	1990	12	12	1991	1	3	5		0.167	0	East Sumatera	PRCC	103.373	-1.58	5.8
195	Indonesia	Heavy rain	1990	10	26	1990	10	29		300			Sulawesi	PRCC	120.486	0.618	4.4
196	Indonesia		1990	4	4	1990	4	5	22				West Jawa (Jakarta)	EM-DAT	106.815	-6.557	3.7
197	Indonesia	General	1990	1	26	1990	2	1	169	21,000	4.800	0.002	Central Java	EM-DAT	110.479	-7.131	5.2
198	Indonesia	Heavy rain	1989	8	9	1989	8	13					N. and W. Sumatera	PRCC	101.905	0.655	5.7
199	Indonesia	Heavy rain	1989	7	31	1989	8	2	8				West Java (Jakarta)	PRCC	106.969	-6.184	4
200	Indonesia		1989	6	20	1989	6	20	18	32,500			Malucca	EM-DAT			
201	Indonesia		1989	6	3	1989	6	3		29,000			East Java	EM-DAT			
202	Indonesia	Heavy rain	1989	2	21	1989	2	27	3	1,500			Central Java	PRCC	109.606	-7.271	5.1
203	Indonesia	General	1988	12	20	1988	12	20	158	100,000	4.600	0.002	C and W Java, Sumatera	EM-DAT	109.96	-6.931	4.3
204	Indonesia	Heavy rain	1988	12	18	1988	12	19	28				Central Java	PRCC	98.039	3.537	4.6
205	Indonesia	General	1988	11	6	1988	11	6	21				Flores	EM-DAT	121.641	-8.806	3.4
206	Indonesia	Torrential	1988	2	5	1988	2	6	7	3,000			Central Java	PRCC	110.814	-7.768	4.2
207	Indonesia		1987	12	25	1987	12	25	119		60.000	0.029	South Sulawesi	EM-DAT			
208	Indonesia		1987	12	14	1987	12	14	38	884			West Sumatera	EM-DAT			
209	Indonesia		1987	11		1987	11		4	2,000			North Sumatera	EM-DAT			
210	Indonesia		1987	5		1987	5		37		4.000	0.002	South Sumatera	EM-DAT			
211	Indonesia	General	1987	2	21	1987	2	23	3	26,000	1,700	0.001	East Java	EM-DAT	111.925	-7.33531	5.1
212	Indonesia	General	1986	10	24	1986	10	24	96	20,000	12.800	0.007	South Sumatera	EM-DAT	106.005	-3.707	6.1
213	Indonesia		1986	4	15	1986	4	15	2	38,000			West Java	EM-DAT			
214	Indonesia		1986	3	6	1986	3	6		50,000			East Java	EM-DAT			
215	Indonesia		1986	1	16	1986	1	16	77	19,000			Timor, Java	EM-DAT			
216	Indonesia	Storm	1985	6	30	1985	6	30	11	2,000			West Sumatera	EM-DAT			
217	Indonesia	General	1985	2	19	1985	2	23	10	2,000			Central and East Java	EM-DAT	108.14	-7.04	5.6
218	Indonesia	Flash	1985	2	4	1985	2	18	21	300			North Sulawesi	EM-DAT	124.606	1.015	5.4
219	Indonesia		1984	12	3	1984	12	3		37,500			West Java	EM-DAT			
220	Indonesia		1984	4	27	1984	4	27		2,700	1.500	0.001	West Java	EM-DAT			
221	Indonesia		1984	2	3	1984	2	3	26	320,000			Central, East, West Java	EM-DAT			
222	Indonesia		1983	12		1983	12		7	410,497	7.007	0.005	Central Java	EM-DAT			
223	Indonesia		1983	10		1983	10		2	5,000			North Sumatera	EM-DAT			
224	Indonesia		1983	7		1983	7		11	2,000			North Sulawesi	EM-DAT			
1	Lao PDR	Flash	2012	7	31	2012	8	1		8,114			Central	GLIDE			
2	Lao PDR	Flash	2011	8	1	2011	10	13	34	430,000			Central	EM-DAT			
3	Lao PDR	General	2011	6	23	2011	6	29	14	37,000			North	EM-DAT	101.556	19.38	5.6
4	Lao PDR	Flash	2009	8	13	2009	8	13		803			North	GLIDE			
5	Lao PDR	General	2009	8	10	2009	8	11	10				Central	EM-DAT	104.792	17.827	4.7
6	Lao PDR	General	2008	8	12	2008	8	18	6	204,190			North	EM-DAT			
7	Lao PDR	General	2002	8		2002	8		2	150,000			Central	EM-DAT			
8	Lao PDR		2001	8		2001	8			453,000			Central	EM-DAT			
9	Lao PDR		2000	9		2000	9		15	450,000	1.000	0.016	North	EM-DAT			
10	Lao PDR	General	1996	8	15	1996	8	15	30	420,000			North	EM-DAT			
11	Lao PDR	General	1995	9	18	1995	9	25		391,400			Central	EM-DAT	100.367	5.348	4
12	Lao PDR		1995	7		1995	7			200,000				EM-DAT			
13	Lao PDR		1994	8		1994	8			190,000			Central	EM-DAT			
14	Lao PDR	General	1992	8		1992	8		10	150	21.828	0.642	Whole	EM-DAT			
15	Lao PDR	General	1991	9		1991	9			332,000			Central	EM-DAT			
16	Lao PDR	Heavy rain	1991	7	15	1991	7	22	16	800			North	PRCC	102.592	21.047	5.7
17	Lao PDR		1984	9		1984	9		14	2,000				EM-DAT			
1	Malaysia	Torrential	2012	12	1	2012	12	4		150			South Malay	PRCC	103.073	2.62	5.1
2	Malaysia	Heavy rain	2012	11	4	2012	11	8		4,000			South Malay	PRCC	102.61	2.871	5.4
3	Malaysia	Torrential	2011	12	17	2011	12	22		3,265			South Malay	PRCC	103.007	2.557	5.1
4	Malaysia	Heavy rain	2011	3	31	2011	4	1		4,230			North-West Malay	PRCC	100.482	6.08	4.8
5	Malaysia	Torrential	2011	3	24	2011	3	25		406			North-West Malay	PRCC	101.212	4.857	4.3
6	Malaysia	Heavy rain	2011	2	1	2011	2	16		24,000			South Malay	PRCC	102.77	2.653	5.8
7	Malaysia	General	2011	1	28	2011	1	31	2	20,000			South Malay	EM-DAT	104.669	-4.052	5.6
8	Malaysia	Heavy rain	2010	11	1	2010	11	5		40,000			North Malay	PRCC	101.922	5.616	5.4
9	Malaysia	General	2009	11	23	2009	11	26		1,793			North Malay	EM-DAT			
10	Malaysia	General	2009	11	20	2009	11	27		9,082			North Malay	EM-DAT	102.358	4.992	5.4
11	Malaysia	Heavy rain	2009	11	10	2009	11	16		1,793			North Malay	PRCC	100.96	5.743	5
12	Malaysia	Heavy rain	2009	3	17	2009	3	19	1	330			North Kalimantan	PRCC			5.1
13	Malaysia	Heavy rain	2009	2	2	2009	2	12		2,000			Kalimantan	PRCC			5
14	Malaysia	Flash	2008	12	28	2009	1	19		6,000			South Malay	EM-DAT			5.9
15	Malaysia	General	2008	12	1	2008	12	4		2,000			South Malay	EM-DAT			4.6
16	Malaysia	Torrential	2008	9	5	2008	9	7		125,000			North West Malay	PRCC	102.124	4.078	5.8
17	Malaysia	Heavy rain	2008	3	5	2008	3	14		2,400			Kalimantan	PRCC	114.961	4.575	5.6
18	Malaysia	General	2007	12	7	2007	12	21	29	29,000	363.000	0.097	South Malay	EM-DAT	102.928	3.894	6.3
19	Malaysia	General	2007	1	11	2007	2	1	17	137,533	605.000	0.162	South Malay	EM-DAT	103.368	2.192	5.9
20	Malaysia	Monsoonal	2007	1	4	2007	1	22	1	3,532			Kalimantan	PRCC	115.907	4.968	6.1
21	Malaysia	Flash	2006	12	19	2006	12	20	6	100,000	22.000	0.006	South Malay	EM-DAT	103.223	1.874	5.9
22	Malaysia	Heavy rain	2006	10	20	2006	11	1	1	1,500			North West Malay	PRCC	100.514	5.772	5.3
23	Malaysia	General	2006	4	20	2006	4	21		500			Central Malay	EM-DAT	102.15	5.273	4
24	Malaysia	Torrential	2006	2	26	2006	2	26		9,000			Central Malay	PRCC	101.653	3.116	3.1
25	Malaysia	General	2006	2	10	2006	2	18		4,908			Whole Malay	EM-DAT	102.536	4.326	5.9
26	Malaysia	General	2006	1	9	2006	1	9		1,112			South Malay	EM-DAT			
27	Malaysia	Flash	2005	11	23	2006	1	12	9	30,000			North Malay	EM-DAT	100.124	7.205	6.9
28	Malaysia	Flash	2005	7	17	2005	7	19	4	600			North Kalimantan	EM-DAT	116.224	6.055	3.9
29	Malaysia	General	2004	12	10	2004	12	18	13	15,000	10.000	0.004	North Malay	EM-DAT	101.592	6.272	5.9
30	Malaysia	General	2004	3	8	2004	3	11		9,138			South Malay	EM-DAT			
31	Malaysia	General	2004	1	24	2004	2	3	3	6,900			West Kalimantan	EM-DAT	103.742	1.627	5.6
32	Malaysia	General	2003	12	17	2004	1	5		2,000			North Malay	EM-DAT	117.982	5.415	5.7
33	Malaysia	Flash	2003	11	29	2003	12	2	5	3,000			North Malay	EM-DAT	103.22	4.817	5.6
34	Malaysia	General	2003	10	3	2003	10	25	3	13,800			North Malay	EM-DAT	100.097	6.647	6
35	Malaysia	Heavy rain	2003	2	4	2003	2	7		11,000			Kalimantan	PRCC	110.416	1.311	4.4
36	Malaysia	Heavy rain	2003	1	20	2003	2	10	1	1,500			South Malay	PRCC	102.894	2.4676	4.8
37	Malaysia	Heavy rain	2003	1	12	2003	1	15		500			Kalimantan	PRCC	111.881	2.252	4.8
38	Malaysia	Heavy rain	2002	12	27	2002	12	29					Central Malay	PRCC	101.909	2.592	3.4
39	Malaysia	Heavy rain	2002	11	19	2002	11	26		400			South Malay	PRCC	102.695	2.409	4
40	Malaysia	General	2001	12	22	2002	1	3	11	18,000			East Malay	EM-DAT	103.134	4.658	5.5
41	Malaysia	Heavy rain	2001	12	16	2001	12	19		1,000			East Malay	PRCC	102.631	5.386	4.8
42	Malaysia	Heavy rain	2001	12	4	2001	12	7		6,000			North kalimantan	PRCC	115.875	5.424	3.5
43	Malaysia	Heavy rain	2001	11	5	2001	11	12	1				East Malay	PRCC	102.92	4.111	4.8
44	Malaysia		2001	10	30	2001	10	30		200			Central Malay	EM-DAT			
45	Malaysia		2001	10		2001	10			500			North Klimantan	EM-DAT			
46	Malaysia	Flash	2001	8	19	2001	8	19		10,000			North Malay	EM-DAT			
47	Malaysia	Torrential	2001	4	26	2001	4	26	2				Central Malay	PRCC	101.717	3.147	2.9
48	Malaysia	Heavy rain	2001	3	8	2001	3	8		12,000			Central Malay	PRCC	101.591	3.466	2.9
49	Malaysia	Monsoonal	2001	1	16	2001	1	21	2	5,000			South Malay	PRCC	102.631	5.386	5
50	Malaysia	Flash	2000	11	21	2000	12	1	12	8,000	1.000	0	North Malay	EM-DAT			
51	Malaysia	Heavy rain	1999	9	3	1999	9	7		2,000			North Malay	PRCC	99.68	7.615	5.2
52	Malaysia	General	1999	1	1	1999	1	1	1	2,000			West Malay	EM-DAT			
53	Malaysia	Monsoonal	1998	12	20	1998	12	21					North Malay	PRCC	103.263	4.285	5.2
54	Malaysia		1998	11	19	1998	11	19		2,500			North malay	EM-DAT			
55	Malaysia	Heavy rain	1997	8	23	1997	8	27	6	2,115			North West Malay	PRCC	100.618	5.88	4.7
56	Malaysia	Heavy rain	1996	12	26	1996	12	28	200	52			Kalimantan	PRCC	117.312	5.514	5.3

A9.1 Flood

No.	Country	Cause	Disaster Start			Disaster End			Damage				Affected Region	Reference	Location		Flood Magnitude
			Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount/ GDP-PPP (%)			Latitude	Logitude	
57	Malaysia	General	1996	2	11	1996	2	11		418		*	North Kalimantan	EM-DAT			
58	Malaysia		1995	9	17	1995	9	22		5,120			North Malay	PRCC			5.5
59	Malaysia	General	1993	12	22	1993	12	27	30	25,000			North Malay	EM-DAT	102.442	3.792	5.8
60	Malaysia	Heavy rain	1991	12	24	1991	12	30	11				East malay	PRCC	112.949	2.983	5.7
61	Malaysia	General	1988	11	12	1988	11	12	27	60,000			North Malay	EM-DAT			
62	Malaysia		1987	12		1987	12		3	2,576			East Malay	EM-DAT			
63	Malaysia		1986	11	28	1986	11	28	11	25,000	11.500	0.021	East Malay	EM-DAT			
64	Malaysia		1983	12		1983	12		10	15,000			East Malay	EM-DAT			
1	Myanmar	General	2012	7	15	2012	8	29	2	85,000			Central	EM-DAT	97.854	16.592	7
2	Myanmar	Flash	2011	10	19	2011	10	21	151	35,734	1.700	0.002	North	EM-DAT			
3	Myanmar	Torrential	2010	8	1	2010	9	1		20,000			West	PRCC	95.49	20.88	5.1
4	Myanmar	Monsoonal	2010	6	15	2010	6	26	60	5,000			West	PRCC	94.011	22.28	6.1
5	Myanmar	Heavy rain	2009	7	12	2009	7	17		300			Central	PRCC			5.9
6	Myanmar	Monsoonal	2007	8	14	2007	10	4	2	40,000			Central	PRCC	95.173	16.962	7.1
7	Myanmar	General	2007	7	6	2007	7	11		101,920			Central	EM-DAT			
8	Myanmar	Monsoonal	2007	7	6	2007	8	1		3,000			Central	PRCC	95.317	18.524	6.5
9	Myanmar	General	2007	6	11	2007	6	11					West	EM-DAT			
10	Myanmar	General	2007	5	3	2007	5	9	5	3,000			Central	EM-DAT	96.131	16.909	5
11	Myanmar	General	2006	9	15	2006	10	19	25	10,000			North	EM-DAT	95.448	19.812	6.8
12	Myanmar	Monsoonal	2006	7	3	2006	7	12	1				Central	PRCC	95.048	18.227	6.2
13	Myanmar	Monsoonal	2003	7	2	2003	9	1					West	PRCC	95.504	20.575	7.2
14	Myanmar	Monsoonal	2002	8	17	2002	9	4		5,000			North	PRCC	96.753	22.419	6.7
15	Myanmar	General	2002	8	17	2002	8	20	21	50,000			South	EM-DAT	98.361	17.159	6.3
16	Myanmar	General	2001	6	2	2001	6	2	51	3,750			Central	EM-DAT			
17	Myanmar	Flash	1999	8		1999	8		22	50,000			East	EM-DAT			
18	Myanmar	Monsoonal	1997	8	10	1997	8	20	100	3,000			Central	PRCC	96.477	17.938	5.9
19	Myanmar	Heavy rain	1995	9	26	1995	10	10	50	20,000			North	PRCC	97.375	22.462	6.7
20	Myanmar		1995	9	12	1995	9	12	51	31,945			Central	EM-DAT			
21	Myanmar	Heavy rain	1992	8	10	1992	8	20					Central	PRCC	96.189	18.067	5.6
22	Myanmar		1992	5		1992	5		5	4,625	55.115	NA	South	EM-DAT			
23	Myanmar	Heavy rain	1991	8	18	1991	8	19		29,674			Central	PRCC	97.657	17.364	4.8
24	Myanmar	Heavy rain	1991	8	7	1991	8	9	1	210,250		NA	Central	PRCC	95.559	16.981	5.5
25	Myanmar	General	1991	7	10	1991	7	13	23	359,976	79.840		North	EM-DAT	95.019	23.941	6.3
26	Myanmar	Heavy rain	1990	7	4	1990	7	5		300			North	PRCC	95.287	24.01	4.8
1	Philippines	General	2012	8	6	2012	8	8	116	4,451,725	72.330	0.017	Central (Manila)	EM-DAT			
2	Philippines	Monsoonal	2012	7	21	2012	7	23	8				Central (Manila)	PRCC	121.195	15.204	4.6
3	Philippines	Flash	2012	6	11	2012	6	11		12,300			Mindanao	EM-DAT			
4	Philippines	Flash	2012	6	9	2012	6	12	1	700			Mindanao	EM-DAT	124.785	6.874	5.1
5	Philippines	Torrential	2012	3	26	2012	3	30	4				South East Luzon	PRCC	123.278	13.629	4.4
6	Philippines	Torrential	2012	2	20	2012	2	27		25,000			Mindanao	PRCC	125.265	8.224	5.5
7	Philippines	General	2012	2	14	2012	2	16		569			Mindanao	EM-DAT	122.12	7.157	3.6
8	Philippines	General	2012	1	17	2012	1	17	4	88,570			Mindanao	EM-DAT			
9	Philippines	General	2011	12	25	2011	12	28	12	171,809			South Luzon	EM-DAT			
10	Philippines	General	2011	12	21	2011	12	21	10	39,520			Central Luzon (Manila)	EM-DAT			
11	Philippines	General	2011	11	14	2011	11	17	5	16,191	0.183	0	Mindanao	EM-DAT			
12	Philippines	Flash	2011	11	9	2011	11	14		8,610	178.881	0.046	Bohol	EM-DAT			
13	Philippines	Flash	2011	10	7	2011	10	7		185			Central Island Group	EM-DAT			
14	Philippines	Flash	2011	9	19	2011	9	19		274	0.115	0	Mindanao	EM-DAT			
15	Philippines	General	2011	8	5	2011	8	5		2,060			Visayas	EM-DAT			
16	Philippines	Flash	2011	7	20	2011	7	20		469			Mindanao	EM-DAT			
17	Philippines	Flash	2011	6	28	2011	6	29	31	121,005	0.251	0	Mindanao	EM-DAT	126.05	7.398	4.3
18	Philippines	Heavy rain	2011	6	5	2011	6	21	15	15,000			Mindanao	PRCC	125.208	8.306	6.3
19	Philippines	General	2011	5	31	2011	6	19	12	944,781	10.666	0.003	Mindanao	EM-DAT			
20	Philippines	Flash	2011	5	5	2011	5	5		30,858			Negros	EM-DAT			
21	Philippines	Flash	2011	3	31	2011	3	31	2	871			Mindanao	EM-DAT			
22	Philippines	General	2011	3	14	2011	3	18	16	241,777	0.280	0	Visayas	EM-DAT	125.091	8.104	5.3
23	Philippines	General	2011	2	1	2011	2	4	11	2,000			Mindanao	EM-DAT	124.865	7.095	5.4
24	Philippines	General	2011	1	25	2011	2	7	23	638,418	12.411	0.003	Leyte	EM-DAT	125.779	9.47	4.6
25	Philippines	Heavy rain	2011	1	1	2011	1	18	53	10,000			Mindanao	PRCC	125.566	8.133	5.6
26	Philippines	Flash	2010	12	24	2011	1	25	110	1,972,446	47.411	0.013	Palawan	EM-DAT			
27	Philippines	General	2010	11	1	2010	11	10	16	450,673			Mindanao	EM-DAT	121.76	17.715	5
28	Philippines	Flash	2010	9	10	2010	9	17	6	46,713	3.156	0.001	Mindanao	EM-DAT			
29	Philippines	Flash	2010	8	15	2010	8	15		505			Mindanao	EM-DAT			
30	Philippines	General	2010	7	13	2010	7	31		80,920			Mindanao	EM-DAT			
31	Philippines	General	2010	6	1	2010	6	1		200,000			Mindanao	EM-DAT			
32	Philippines	General	2010	5	28	2010	6	1	27	40,000			Mindanao	EM-DAT	125.3	6.778	5
33	Philippines	General	2010	1	17	2010	1	17	1	15,480			Mindanao	EM-DAT			
34	Philippines	Flash	2010	1	14	2010	1	17	2	40,198	0.220	0	Mindanao	EM-DAT			
35	Philippines	Flash	2009	9	21	2009	9	21						GLIDE			
36	Philippines	Storm	2009	9	1	2009	9	10	9				North Luzon	PRCC	121.371	17.23	5.9
37	Philippines		2009	8	10	2009	8	10						GLIDE			
38	Philippines	General	2009	8	5	2009	8	5		1,578			Central Luzon	EM-DAT			
39	Philippines	Torrential	2009	7	25	2009	8	4	10	200,000			Mindanao	PRCC	125.367	7.652	5.8
40	Philippines	Flash	2009	7	17	2009	7	17		920			Mindanao	EM-DAT			
41	Philippines	Flash	2009	7	4	2009	8	10	22	5,025,102	22.960	0.007	Mindanao	EM-DAT			
42	Philippines	General	2009	5	18	2009	5	18		715			Mindanao	EM-DAT			
43	Philippines	Flash	2009	5	18	2009	5	18		34,325			Mindanao	EM-DAT			
44	Philippines	Storm	2009	5	3	2009	5	8	47	65,000			Luzon	PRCC			5.2
45	Philippines	Flash	2009	4	21	2009	4	22		110			Luzon	GLIDE			
46	Philippines	Heavy rain	2009	2	7	2009	2	9	5				Negros	PRCC			6.1
47	Philippines	Heavy rain	2009	1	26	2009	1	27	5	200			Mindanao	PRCC			5.9
48	Philippines	General	2009	1	9	2009	1	9		1,300			Cebu	EM-DAT			
49	Philippines	Flash	2009	1	8	2009	1	8		1,345			Mindanao	EM-DAT			
50	Philippines	General	2009	1	2	2009	1	15	33	537,991	6.354	0.002	Central Luzon	EM-DAT			6.9
51	Philippines	General	2008	12	1	2008	12	4	29	50,000			South Luzon	EM-DAT	100.112	7.555	5.5
52	Philippines	Flash	2008	11	21	2008	11	24	10	239,763	4.088	0.001	Central Luzon	EM-DAT			
53	Philippines	General	2008	9	4	2008	9	13	6	365,678	4.137	0.001	Mindanao	EM-DAT			
54	Philippines	General	2008	8	8	2008	8	8		39,530			Central Luzon	EM-DAT			
55	Philippines	General	2008	6	17	2008	6	17	7	2,391	0.173	0	Mindanao	EM-DAT			
56	Philippines	Flash	2008	6	6	2008	6	6	1	1,000			Mindanao	EM-DAT			
57	Philippines	Flash	2008	5	15	2008	5	16		6,000			Central Luzon	GLIDE			
58	Philippines	General	2008	2	12	2008	3	12	63	975,343	30.733	0.009	Mindoro	EM-DAT	125.935	8.536	6.1
59	Philippines	General	2008	1	18	2008	1	18		29,184	0.446	0	Mindanao	EM-DAT			
60	Philippines	General	2007	12	1	2007	12	4		12,205			Mindoro	EM-DAT			
61	Philippines	Storm	2007	11	28	2007	11	28		33,571			Mindanao	EM-DAT			
62	Philippines	Storm	2007	11	18	2007	11	21	11	16,463	2.520	0.001	Visayas	EM-DAT			
63	Philippines	General	2007	10	27	2007	11	1	20				South Luzon	EM-DAT	123.361	13.358	4.5
64	Philippines	General	2007	1	10	2007	1	24	9	24,508	4.080	0.001	Mindanao	EM-DAT	125.217	7.712	5.8
65	Philippines	Heavy rain	2006	12	29	2007	1	15	12	50,000			Samar	PRCC	124.771	12.445	4.5
66	Philippines	General	2006	12	27	2006	12	29		415,618	3.395	0.001	Samar	EM-DAT			
67	Philippines	Heavy rain	2006	11	30	2006	12	8	526	82,915	12.250	0.004	South East Luzon	PRCC	106.736	10.33	5.6
68	Philippines	Heavy rain	2006	10	30	2006	11	1	19	300,000			Norht Luzon	PRCC	121.805	17.262	4.9
69	Philippines	General	2006	10	21	2006	10	27	2	40,000	0.763	0	Mindanao	EM-DAT	125.834	7.615	4.4
70	Philippines	General	2006	10	4	2006	10	8	3	4,250	0.399	0	Mindanao	EM-DAT			
71	Philippines	Heavy rain	2006	9	27	2006	10	6	260	250,000	668.000	0.236	Luzon	PRCC	107.206	16.679	5.8
72	Philippines		2006	8		2006	8		26	15,000			Mindanao	EM-DAT			
73	Philippines	Flash	2006	3	4	2006	3	6	1	1,000			Bohol	EM-DAT	125.565	7.172	3.3
74	Philippines	Monsoonal	2006	2	10	2006	2	18	20	30,000	6.700	0.002	Mindanao	PRCC	125.115	8.157	5.9
75	Philippines	Flash	2006	1	26	2006	2	5	4	256,641	9.800	0.003	Central Luzon	EM-DAT	121.817	17.017	5.8

A9.1 Flood

No.	Country	Cause	Disaster Start			Disaster End			Damage				Affected Region	Reference	Location		Flood Magnitude
			Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount/ GDP-PPP (%)			Latitude	Logitude	
76	Philippines	General	2005	12	5	2005	12	29	4	192,946	0.515	0	Mindoro	EM-DAT	119.171	10.092	5.1
77	Philippines	Monsoonal	2005	9	15	2005	9	27	16	8,000			Central Luzon (Manila)	PRCC	120.963	15.301	5.2
78	Philippines	Monsoonal	2005	7	27	2005	7	30	3	32,782			Negros	PRCC	122.905	10.41	3.6
79	Philippines		2005	5	12	2005	5	12	1	100			Mindanao	EM-DAT			
80	Philippines	Heavy rain	2004	11	29	2004	12	22	939	432,000	75.000	0.031	East and North Luzon	PRCC	121.243	15.179	6
81	Philippines	Heavy rain	2004	7	31	2004	8	13		80,000			Mindanao	PRCC	124.577	7.021	4.5
82	Philippines	Flash	2004	6	28	2004	6	30	15	1,500			Mindanao	EM-DAT	124.576	7.377	3.8
83	Philippines	General	2004	2	11	2004	2	26	7	20,000			Mindanao	EM-DAT	125.744	8.23	5.5
84	Philippines	General	2004	1	23	2004	1	23	27	194			North Luzon	EM-DAT			
85	Philippines	Heavy rain	2003	12	19	2004	1	7	200	97,500	3.000	0.001	Leyte	PRCC	125.766	8.882	5.4
86	Philippines	Torrential	2003	9	21	2003	9	22	9				Negros	PRCC	122.896	9.35	2.4
87	Philippines	Heavy rain	2003	8	11	2003	8	18		145,000			Central Luzon	PRCC			3.4
88	Philippines	Heavy rain	2003	6	25	2003	6	26	2	10,000			Mindanao	PRCC	124.377	7.044	3.4
89	Philippines	Heavy rain	2003	5	26	2003	5	30	41	8,357	1.000	0	North Luzon	PRCC	120.74	15.596	5.2
90	Philippines	Flash	2003	5	16	2003	5	16		3,500			Cebu	EM-DAT			
91	Philippines	Heavy rain	2003	3	20	2003	3	21	8				Mindanao	PRCC	125.58	6.345	2.9
92	Philippines	Storm	2002	8	13	2002	8	17	26	3,559			Negros	EM-DAT			
93	Philippines	Storm	2002	7	20	2002	7	28	18	7,000			Central Luzon (Manila)	EM-DAT			
94	Philippines	Heavy rain	2002	6	26	2002	6	27	6				Mindanao	PRCC	122.939	7.684	5.3
95	Philippines	General	2002	3	21	2002	3	26	35	50,000	1.450	0.001	Mindanao	EM-DAT	126.216	8.849	4.5
96	Philippines	General	2002	1	4	2002	1	7	11	95,008	0.392	0	Mindanao	EM-DAT	125.828	8.251	4.7
97	Philippines	Heavy rain	2001	12	5	2001	12	7	2	10,000			Cebu	PRCC	124.939	10.981	3.9
98	Philippines	Heavy rain	2001	11	19	2001	11	21		29,000			Negros	PRCC	122.957	10.212	4.3
99	Philippines	Flash	2001	10	10	2001	10	10	4	300			Mindanao	EM-DAT	122.076	6.961	2.3
100	Philippines	Heavy rain	2001	9	24	2001	9	25	1				North Luzon	PRCC	121.539	18.154	4.1
101	Philippines	Flash	2001	8	12	2001	8	14	37	79,000	8.000	0.004	Mindanao	EM-DAT	122.872	7.799	5
102	Philippines	Heavy rain	2001	7	1	2001	7	19	178	800,000	2980.000	1.51	Luzon (Manila)	PRCC	110.999	22.909	6.9
103	Philippines	General	2001	1	15	2001	1	15	2	12,000			Negros	EM-DAT			
104	Philippines	Heavy rain	2000	11	30	2000	12	3	12	70,000			Mindanao	PRCC	125.231	8.936	4.8
105	Philippines	Storm	2000	9	4	2000	9	5	5	6,508			Central Luzon (Manila)	EM-DAT	120.916	14.776	3.5
106	Philippines	Torrential	2000	7	4	2000	7	10	45	800,000	2.200	0.001	North Luzon	PRCC	120.823	14.929	4.9
107	Philippines	Flash	2000	1	28	2000	2	1	50	153,885	4.080	0.002	Mindanao	EM-DAT	126.1	7.199	4.9
108	Philippines	Storm	2000	1	22	2000	1	22		5,250			Basilan (Mindanao)	EM-DAT			
109	Philippines	Heavy rain	1999	12	25	1999	12	28	8	2,000			Mindanao	PRCC	126.238	8.995	5.1
110	Philippines	Torrential	1999	9	10	1999	9	14	1	4,500			Central Luzon (Manila)	PRCC	121.73	15.89	5.1
111	Philippines	Flash	1999	7	30	1999	8	8	130	2,099,763	18.000	0.01	Central Luzon	EM-DAT			
112	Philippines	Heavy rain	1999	4	15	1999	4	21	11	200			Mindanao	PRCC	126.304	8.227	5.3
113	Philippines		1999	3	2	1999	3	2		1,300			Mindanao	EM-DAT			
114	Philippines	Flash	1999	3		1999	3			250			Mindanao	EM-DAT			
115	Philippines	Flash	1999	2	20	1999	2	22	34	3,703	6.000	0.003	Mindanao	EM-DAT	125.997	7.916	5.2
116	Philippines	Torrential	1999	2	4	1999	2	8	24	500,000	3.200	0.002	Mindanao	PRCC	126.134	6.192	5.3
117	Philippines	Heavy rain	1998	9	17	1998	9	19	27	70,512			Central Luzon	PRCC	120.781	15.025	4
118	Philippines	General	1997	3	9	1997	3	13	18	105,000	0.760	0	Mindanao	EM-DAT	125.768	8.881	5
119	Philippines		1996	6	30	1996	6	30		96,000			Mindanao	EM-DAT			
120	Philippines	Heavy rain	1996	6	22	1996	8	3	89	40,000	53.700	0.034	Central Luzon	PRCC	120.781	15.278	5.5
121	Philippines	Heavy rain	1996	1	6	1996	1	12		2,000			Mindanao	PRCC	126.103	8.701	4.5
122	Philippines	General	1995	12	22	1995	12	27	13	47,700	0.500	0	Mindanao	EM-DAT	124.471	6.769	4.6
123	Philippines		1995	12	11	1995	12	11	17	17,500	0.142	0	South Luzon	EM-DAT			
124	Philippines		1995	12	10	1995	12	16	12	4,500			Mindanao	EM-DAT	56.154	25.178	4.3
125	Philippines		1995	11	28	1995	11	28	18	10,000			Negros	EM-DAT			
126	Philippines	Flash	1995	9	4	1995	9	15	416	24,485	700.300	0.484	Mindanao	EM-DAT	120.745	22.809	5.3
127	Philippines	Monsoonal	1995	8	29	1995	9	6	3	45,000	0.550	0	Central Luzon (Manila)	PRCC	120.687	15.463	5.3
128	Philippines		1995	7	29	1995	7	29		25,000			Central Luzon	EM-DAT	120.77	15.134	4.4
129	Philippines	Monsoonal	1994	9	19	1994	9	24	16	10,000	0.380	0	Central Luzon	PRCC	122.982	10.017	5.5
130	Philippines	General	1994	7	22	1994	8	2	2	18,000	1.600	0.001	Central Luzon, Negros	EM-DAT			
131	Philippines		1994	6	22	1994	6	22	50	774,000	1.650	0.001	Central Luzon	EM-DAT			
132	Philippines	Storm	1994	5	24	1994	5	24	1	2,762	0.037	0	Mindanao	EM-DAT	125.689	8.382	5.7
133	Philippines	General	1994	3	18	1994	3	31	9	16,821	0.855	0.001	Mindanao	EM-DAT	124.962	10.741	3
134	Philippines	General	1993	11	29	1993	12	1	25	4			Leyte	EM-DAT	120.592	15.63	5.8
135	Philippines	Heavy rain	1993	10	4	1993	10	12	57	300,000	6.790	0.005		PRCC			
136	Philippines		1993	8	26	1993	8	26	5	258,080	2.600	0.002	Central Luzon (Manila)	EM-DAT			
137	Philippines	Heavy rain	1993	8	19	1993	8	22	5	10,000	2.600	0.002	Central Luzon (Manila)	PRCC	120.432	15.182	4.5
138	Philippines	Monsoonal	1993	6	26	1993	6	28	5	22,700			Central Luzon (Manila)	PRCC	120.46	15.6	4.8
139	Philippines	General	1993	2	1	1993	2	5	23	90,000	37.000	0.03	Mindanao	EM-DAT	125.706	8.794	5.1
140	Philippines		1992	12	22	1992	12	27	19	58,255			Mindanao	EM-DAT	125.923	7.785	5
141	Philippines		1992	10		1992	10			52,800				EM-DAT			
142	Philippines		1992	7		1992	8		60	942,777	74.200	0.061	North Luzon	EM-DAT			
143	Philippines	Storm	1991	11	11	1991	11	11	10				Leyte	EM-DAT			
144	Philippines	Monsoonal	1991	9	7	1991	9	8		10,000			Central Luzon	PRCC	120.147	14.99	2.9
145	Philippines	Storm	1991	8	2	1991	8	24	50				Whole Luzon	EM-DAT			
146	Philippines		1991	3		1991	3		10	823	1.300	0.001	Mindanao	EM-DAT			
147	Philippines		1990	9		1990	9		50	662,500				EM-DAT			
148	Philippines	Storm	1990	8	25	1990	9	1	28	50,000			Central Luzon (Manila)	EM-DAT			
149	Philippines	Flash	1990	6	17	1990	6	19	98	236	0.043	0	Mindanao	EM-DAT	123.116	8.336	4
150	Philippines	Heavy rain	1989	9	23	1989	9	25	2				Central Luzon (Manila)	PRCC	121.057	14.648	3.6
151	Philippines	General	1989	8	9	1989	8	14		47,500			Central Luzon (Manila)	EM-DAT	125.207	11.81	5.1
152	Philippines	Heavy rain	1989	6	1	1989	6	8	11	4,000			Mindanao	PRCC	126.068	8.899	4.5
153	Philippines		1989	2	9	1989	2	9	44	260,011	6.000	0.006	South Luzon	EM-DAT			
154	Philippines	Monsoonal	1989	1	25	1989	2	8	72	551,051	4.340	0.004	Central Luzon (Manila)	PRCC	125.355	11.23	5.7
155	Philippines	Heavy rain	1986	10	6	1986	10	7	18	60,000			Central Luzon (Manila)	PRCC	120.882	14.655	4.7
156	Philippines		1986	6	28	1986	6	28	3	615	0.056	0	Mindanao	EM-DAT			
157	Philippines		1985	10		1985	10		25	5,000			South Luzon	EM-DAT			
158	Philippines	General	1985	1	26	1985	1	26	54	444			Negros	EM-DAT	122.974	10.021	4.4
159	Philippines		1983	9	23	1983	9	23	11	1,835	0.003	0	Mindanao	EM-DAT			
1	Singapore	Torrential	2009	11	19	2009	11	20					Whole	PRCC	103.833	1.431	3.5
2	Singapore	Heavy rain	2006	12	19	2007	1	10					Whole	PRCC	103.223	1.874	5.9
1	Thailand	General	2012	9	12	2012	9	26		235,545			North	EM-DAT	99.641	17.091	5.8
2	Thailand	Torrential	2012	1	1	2012	1	9		1,000			South	PRCC	99.424	8.772	5
3	Thailand	General	2011	8	5	2012	1	4	813	9,500,000	40000.000	6.642	North, Central (Bangkok)	EM-DAT	102.822	17.038	7.5
4	Thailand	Flash	2011	3	23	2011	4	5	64	716,110	317.000	0.053	South	EM-DAT	99.277	8.666	6.1
5	Thailand	Flash	2010	10	10	2010	12	10	258	8,970,653	332.000	0.056	Central	EM-DAT	102.195	15.03	5.5
6	Thailand	Torrential	2010	9	20	2010	9	30	2				Central	PRCC	100.35	14.445	5.4
7	Thailand	General	2009	11	7	2009	11	8	15	200,000			South	EM-DAT	99.917	7.472	5.1
8	Thailand	Flash	2009	5	27	2009	5	27		5,000			North	GLIDE			
9	Thailand	Flash	2008	12	29	2009	1	19		32,584	0.344	0	South	EM-DAT			
10	Thailand	Flash	2008	11	20	2008	12	20	21	700,000	11.500	0.002	South	EM-DAT	101.823	4.937	6.4
11	Thailand	General	2008	9	13	2008	10	7	18	839,573	16.000	0.003	North	EM-DAT	103.177	17.821	6.8
12	Thailand	Flash	2008	9	8	2008	9	8		114,345			North	GLIDE			
13	Thailand	General	2007	12	7	2007	12	21	3	65,000			South	EM-DAT			
14	Thailand	General	2007	10	22	2007	10	29	2	100,000	1.500	0	South	EM-DAT	99.002	9.722	5.1
15	Thailand	General	2007	9	5	2007	11	10	10	17,000			North	EM-DAT	102.48	16.82	7.3
16	Thailand	Heavy rain	2007	8	20	2007	8	24		3,000			South	PRCC	98.982	8.936	5.1
17	Thailand	General	2007	5	11	2007	5	21		1,000			Central	EM-DAT	100.339	17.212	5.6
18	Thailand	Heavy rain	2007	5	1	2007	5	7	1	1,000			Central	PRCC	99.614	11.653	4.6
19	Thailand	Flash	2007	4	14	2007	4	15	38				South	EM-DAT	99.646	7.444	2.8
20	Thailand	Monsoonal	2006	10	10	2006	11	4					North East	PRCC	103.609	16.138	6.7
21	Thailand	General	2006	8	20	2006	12	13	164	2,212,413	9.940	0.002	North	EM-DAT	100.017	18.765	7.7
22	Thailand	Monsoonal	2006	5	31	2006	5	31					Central	PRCC	100.914	15.127	4.1
23	Thailand	Flash	2006	5	22	2006	6	11	116	342,895	25.000	0.005	North	EM-DAT	100.149	18.181	6.5

A9.1 Flood

No.	Country	Cause	Disaster Start			Disaster End			Damage				Affected Region	Reference	Location		Flood Magnitude
			Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount/ GDP-PPP (%)			Latitude	Logitude	
24	Thailand	General	2006	2	10	2006	2	18		2,000			South	EM-DAT	102.536	4.326	5.9
25	Thailand	Flash	2005	11	23	2006	1	12	55	700,000	97.000	0.022	South	EM-DAT	100.124	7.205	6.9
26	Thailand	Flash	2005	8	13	2005	8	31	21	119,310	121.000	0.027	North	EM-DAT	99.369	19.069	7.1
27	Thailand	General	2004	12	10	2004	12	18	2	5,000	175.000	0.042	South	EM-DAT			
28	Thailand	Flash	2004	9	15	2004	9	15	2	2,000			North	EM-DAT			
29	Thailand	General	2004	8	6	2004	8	30	9	500,000			Central	EM-DAT	103.073	15.397	7.6
30	Thailand	Heavy rain	2004	7	27	2004	8	2	3				North East	PRCC	103.937	15.848	5.1
31	Thailand	Monsoonal	2004	6	4	2004	6	21	1	4,000			North	PRCC	100.168	17.107	6.1
32	Thailand	Torrential	2004	5	20	2004	5	23	8				North West	PRCC	98.601	17.027	3.3
33	Thailand	Flash	2003	12	11	2003	12	11	6	104,700	1.400	0	South	EM-DAT	99.665	8.655	5.2
34	Thailand	General	2003	10	15	2003	10	15	3	3,000	25.000	0.007	Central	EM-DAT	98.79	12.559	5.6
35	Thailand	General	2003	10	3	2003	10	25					South	EM-DAT	100.097	6.647	6
36	Thailand	Monsoonal	3003	9	12	2003	10	12	7	10,000	3.690	0.001	North and North-East	PRCC	101.593	17.373	7
37	Thailand	Heavy rain	2003	8	5	2003	8	7	2				Central	PRCC	102.261	12.629	4.3
38	Thailand	Flash	2002	10		2002	10		154	3,289,420	35.827	0.01	North	EM-DAT			
39	Thailand	Flash	2002	9	29	2002	9	29		1,500			North-East	EM-DAT			
40	Thailand	Monsoonal	2002	9	17	2002	12	2	1	3,000			Central	PRCC	100.951	14.974	7
41	Thailand	Monsoonal	2002	8	18	2002	11	26	65	400,000	32.000	0.009	North	PRCC	103.527	16.772	7.9
42	Thailand	Heavy rain	2002	8	17	2002	9	20	2	150,000			West	PRCC	98.361	17.159	6.3
43	Thailand	Monsoonal	2001	12	24	2001	12	24		25,000	0.297	0	South	PRCC	100.193	8.041	3.9
44	Thailand		2001	8	31	2001	8	31		4,000			North-East	EM-DAT			
45	Thailand	Flash	2001	8	8	2001	9	6	104	450,109	24.500	0.008	North	EM-DAT	105.953	18.361	4.8
46	Thailand	Flash	2001	6	27	2001	6	27		1,000			South	EM-DAT			
47	Thailand	Flash	2001	5	4	2001	5	4	33	5,140			North	EM-DAT			
48	Thailand	Flash	2001	5	4	2001	5	5	83	4,130	4.000	0.001	North	EM-DAT	99.075	17.965	4.6
49	Thailand		2001	3	11	2001	3	11	2	6,000			South	EM-DAT			
50	Thailand	General	2000	11	21	2000	11	21	51	808,801	57.500	0.019	South	EM-DAT			
51	Thailand	General	2000	9		2000	9		9	12,500	0.506	0	Central	EM-DAT			
52	Thailand	Monsoonal	2000	7	11	2000	8	10	47	2,500,000	51.050	0.016	North	EM-DAT	105.064	11.243	6.6
53	Thailand		2000	6	21	2000	6	21		2,500			North	EM-DAT			
54	Thailand	Storm	1999	12	23	1999	12	23		200	0.267	0	South	EM-DAT			
55	Thailand	General	1999	12	4	1999	12	7	2	2,000			South	EM-DAT	104.168	14.822	5.8
56	Thailand	Storm	1999	10	25	1999	11	9	10	170,000			Central	EM-DAT			
57	Thailand	Flash	1999	8		1999	8			862			North	EM-DAT			
58	Thailand	Flash	1999	7	24	1999	8	5	7	90,700	13.000	0.004	Central	EM-DAT	107.245	14.795	6.6
59	Thailand	Flash	1999	2	9	1999	2	13	3	20,000			North-East	EM-DAT	102.126	15.546	5.8
60	Thailand	General	1997	9	18	1997	9	18	14				North-East	EM-DAT			
61	Thailand	Monsoonal	1997	8	19	1997	9	1	46	300,000			North-East	PRCC	103.765	17.038	5.8
62	Thailand	Monsoonal	1997	8	19	1997	9	1	46	200,000			South	PRCC	98.967	9.321	5.7
63	Thailand	Monsoonal	1996	10	3	1996	10	28	60				Central	PRCC	100.456	14.041	6.5
64	Thailand	General	1996	6	30	1996	10	22	91	5,000,000	0.500	0	North and Central	EM-DAT			
65	Thailand	General	1995	8	1	1995	11	9	231	4,280,984	140.500	0.05	North	EM-DAT	101.558	14.964	8.1
66	Thailand		1994	10	21	1994	10	21	11	112,257	30.000	0.012		EM-DAT			
67	Thailand	Storm	1994	9	25	1994	9	25	31				Central	EM-DAT			
68	Thailand	Heavy rain	1994	9	3	1994	12	18	407	200,000	208.000	0.083	South	PRCC	104.452	16.19	7.1
69	Thailand		1994	7		1994	7		60	59,000	238.000	0.095		EM-DAT			
70	Thailand		1993	12	16	1993	12	29	14	192,674	400.100	0.178	South	EM-DAT	100.419	7.283	5.8
71	Thailand	Flash	1993	11	27	1993	12	2	23	393,809	1261.000	0.562	South	EM-DAT	99.898	8.158	5.5
72	Thailand		1993	10	31	1993	10	31	4	302,862	319.850	0.142	South	EM-DAT			
73	Thailand		1991	10	26	1991	10	26	1	14,574	1.478	0.001	South	EM-DAT			
74	Thailand	Heavy rain	1991	9	5	1991	9	8	16	2,000	6.400	0.003	North	PRCC	99.937	19.73	4.7
75	Thailand	General	1991	8		1991	8		16	2,000			Samai (South)	EM-DAT			
76	Thailand	Torrential	1991	7	25	1991	7	27	1				South	PRCC	99.942	6.78	4.2
77	Thailand	General	1988	11	19	1988	11	27	664	1,114,819	169.146	0.139	South	EM-DAT	99.82	8.297	6.4
78	Thailand	Torrential	1988	9	18	1988	10	5	19	16,000			Central	PRCC	101.507	16.079	6.6
79	Thailand		1987	11	30	1987	11	30	24		7.200	0.007	South	EM-DAT			
80	Thailand	General	1986	5	8	1986	5	8	42	27,801	2.000	0.002	Central (Bangkok)	EM-DAT	100.638	15.065	5.8
81	Thailand		1985	10	12	1985	10	12	18	7,640	3.600	0.004	Central	EM-DAT	99.642	12.943	4.9
82	Thailand		1984	12		1984	12		17	34,571	3.000	0.004	South, East	EM-DAT			
83	Thailand		1984	1	19	1984	1	19		751,600	400.000	0.506	Central (Bangkok)	EM-DAT			
84	Thailand		1983	8		1983	8		50	1,000,000			Central (Bangkok)	EM-DAT			
1	Viet Nam	General	2012	9	2	2012	9	7	16	17,798			North	EM-DAT	105.458	19.063	5
2	Viet Nam	General	2011	10	21	2011	10	21	13	461,584			Central	EM-DAT			
3	Viet Nam	General	2011	9	14	2011	9	14	24	300,000	44.000	0.015	North	EM-DAT			
4	Viet Nam	General	2011	9		2011	9		85	600,000	175.002	0.058	South	EM-DAT			
5	Viet Nam	General	2010	11	12	2010	11	17	50	10,000	256.000	0.092	Central	EM-DAT			
6	Viet Nam	Torrential	2010	11	2	2010	11	27	143	1,000,000			Central	PRCC	108.003	15.182	6.4
7	Viet Nam	General	2010	10	29	2010	11	10	31	39,008	107.700	0.039	South	EM-DAT	108.92	12.518	5.4
8	Viet Nam	Torrential	2010	10	15	2010	10	21	112	3,000			Central	PRCC	105.524	16.705	6.1
9	Viet Nam	General	2010	10	14	2010	10	18	21	761,000	154.000	0.056	North	EM-DAT			
10	Viet Nam	Torrential	2010	10	2	2010	10	12	149	150,000			Central	PRCC	105.3	16.83	5.3
11	Viet Nam	Flash	2010	10	1	2010	10	6	84	679,825	142.500	0.051	North	EM-DAT			
12	Viet Nam	Storm	2010	7	23	2010	7	25	8	12,400			North	PRCC	105.951	22.107	5.3
13	Viet Nam	Storm	2009	10	23	2009	10	26	1				Central	PRCC	107.39	15.565	5.1
14	Viet Nam	General	2009	9	25	2009	9	28	17	40,000			Central	EM-DAT	108.022	15.189	5.5
15	Viet Nam	General	2009	7	3	2009	7	6	20	700,000			North	EM-DAT			5.3
16	Viet Nam	General	2008	12	25	2009	1	5	9	20,000			Central	EM-DAT			4.9
17	Viet Nam	Flash	2008	10	27	2008	11	4	99	600,000	479.000	0.199	North	EM-DAT			
18	Viet Nam	Flash	2008	10	19	2008	10	20	29	12,004	4.000	0.002	North	EM-DAT	107.456	14.898	5.1
19	Viet Nam	General	2008	8	26	2008	8	28	16				North	EM-DAT			
20	Viet Nam	Flash	2008	8	8	2008	8	9	100				North	GLIDE			
21	Viet Nam	Flash	2008	5	11	2008	5	12	4	500			South	EM-DAT	107.828	12.139	4
22	Viet Nam	Storm	2007	11	10	2007	11	21	55	150,000	350.000	0.158	Central	EM-DAT			
23	Viet Nam	Heavy rain	2007	10	27	2007	11	3	92	3,000			South	PRCC	106.323	20.74	6.1
24	Viet Nam	Dam break	2007	10	27	2007	10	31					South	PRCC	106.69	10.767	3.2
25	Viet Nam	Flash	2007	10	28	2007	11	9	83	94,042	300.000	0.135	Central	EM-DAT	107.36	16.321	5.7
26	Viet Nam		2007	10	20	2007	11	2	3	280,000			South	EM-DAT	105.514	11.011	6.1
27	Viet Nam	General	2007	10	14	2007	10	24	15	22,000	10.000	0.005	Central	EM-DAT	107.78	15.868	5.4
28	Viet Nam	Storm	2007	8	5	2007	8	7	74	416,130	130.000	0.059	Central	EM-DAT	108.198	12.343	6.3
29	Viet Nam	Heavy rain	2007	6	30	2007	7	2	3				North	PRCC	107.174	21.24	4.2
30	Viet Nam	Heavy rain	2006	11	30	2006	12	8	526	82,915	12.250	0.006	South	PRCC	106.736	10.33	5.6
31	Viet Nam	General	2006	10	12	2006	10	17	60					EM-DAT			
32	Viet Nam	Heavy rain	2006	9	17	2006	9	21	4	16,000			South	PRCC	108.108	11.865	5.2
33	Viet Nam	General	2006	8	12	2006	8	30	42	50,020	8.000	0.008	South	EM-DAT	106.149	17.764	6.4
34	Viet Nam	General	2006	8	10	2006	11	1	60	33,000			South	EM-DAT	104.675	11.062	7.1
35	Viet Nam	Flash	2006	7	18	2006	7	18	12	2,000			North	EM-DAT			
36	Viet Nam	Flash	2006	7	9	2006	7	11	4	100	1.000	0.001	North	EM-DAT	105.326	22.713	3.3
37	Viet Nam	Heavy rain	2006	2	14	2006	2	21		500			Central	PRCC	106.928	17.043	5.4
38	Viet Nam	Flash	2005	12	4	2005	12	24	69	18,000	27.000	0.015	Central	EM-DAT	108.583	13.607	6.1
39	Viet Nam	Heavy rain	2005	11	18	2005	11	21	5	3,000			Central	PRCC	108.104	15.525	4.8
40	Viet Nam	Flash	2005	10	20	2005	10	28	67	33,800	12.000	0.007	Central	EM-DAT	109.071	12.753	5.4
41	Viet Nam	General	2005	10	7	2005	10	10	17	10,000	15.000	0.008	Central	EM-DAT	106.82	17.126	4.6
42	Viet Nam	General	2005	9	8	2005	9	29	39	30,000			South	EM-DAT	105.735	10.707	6.9
43	Viet Nam	Heavy rain	2005	8	13	2005	8	18	13				North	PRCC	104.857	19.17	4.8
44	Viet Nam	General	2005	5	26	2005	5	26		593			South	EM-DAT			
45	Viet Nam	General	2004	8	24	2004	10	21	34	30,000			South	EM-DAT	105.824	10.318	6.4
46	Viet Nam	Flash	2004	7	18	2004	7	28	53	18	8.000	0.005	North	EM-DAT	105.869	22.5641	5.1
47	Viet Nam	General	2004	4	16	2004	4	17	9	5,000			North	EM-DAT	103.941	21.279	3.8
48	Viet Nam	Heavy rain	2003	11	24	2004	11	26	3				Central	PRCC	108.35	15.612	4.1
49	Viet Nam	General	2003	11	11	2003	11	14	61	194,049	35.000	0.024	Central	EM-DAT	108.979	12.905	5.4

No.	Country	Cause	Disaster Start			Disaster End			Damage				Affected Region	Reference	Location		Flood Magnitude
			Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount/ GDP-PPP (%)			Latitude	Logitude	
50	Viet Nam	Storm	2003	10	15	2003	10	22	52	221,774	32.000	0.022	Central	EM-DAT	108.846	14.768	4.9
51	Viet Nam	General	2003	9	10	2003	9	14	15	1,000	38.000	0.026	North	EM-DAT	105.73	19.401	5.2
52	Viet Nam	Heavy rain	2003	8	4	2003	8	8					South	PRCC	106.447	10.542	4.9
53	Viet Nam	Torrential	2003	8	2	2003	8	5	12				South	PRCC	107.896	12.982	4.2
54	Viet Nam		2003	7	25	2003	8	1	5				North	PRCC	103.048	21.871	5
55	Viet Nam	Heavy rain	2002	11	3	2002	11	7	2		0.200	0	Central	PRCC	109.23	12.529	4.6
56	Viet Nam	Heavy rain	2002	10	26	2002	10	29	2				South	PRCC	108.878	14.206	4.5
57	Viet Nam	General	2002	9	20	2002	9	30	55	291,616	58.000	0.044	North	EM-DAT	105.175	18.578	5.6
58	Viet Nam	General	2002	9		2002	9		82	1,138,200	23.900	0.019	North	EM-DAT			
59	Viet Nam	Monsoonal	2002	8	19	2002	8	24	4	6,000	3.000	0.002	Central	PRCC	108.131	12.646	4.9
60	Viet Nam	Heavy rain	2002	8	14	2002	8	22	29	80,000	2.000	0.002	North	PRCC	104.679	22.564	6
61	Viet Nam	General	2002	7	31	2002	8	6	10	2,000	2.200	0.002	North	EM-DAT	103.689	22.108	5.3
62	Viet Nam	Monsoonal	2002	7	15	2002	12	2	155	200,000	25.400	0.019	South	PRCC	105.254	10.502	6.8
63	Viet Nam	Heavy rain	2002	6	20	2002	6	23	4		0.724	0.001	South	PRCC	107.069	11.789	3.9
64	Viet Nam	Heavy rain	2002	6	9	2002	6	11					North	PRCC	105.025	22.78	3.8
65	Viet Nam	Heavy rain	2002	5	12	2002	5	15	6		2.000	0.002	North	PRCC	104.442	22.052	5.6
66	Viet Nam	Storm	2001	11	4	2001	11	4		3,000			South	EM-DAT			
67	Viet Nam	Flash	2001	10	20	2001	10	24	28	35,006	4.700	0.004	Central	EM-DAT			
68	Viet Nam	Heavy rain	2001	8	20	2001	8	22	11	640	0.400	0.001	South	PRCC	108.296	12.091	4.8
69	Viet Nam	General	2001	8	15	2001	11	19	310	1,570,270	84.000	0.07	North	EM-DAT			
70	Viet Nam	Torrential	2001	7	3	2001	7	6	32	13,000			North	PRCC	105.583	21.664	5
71	Viet Nam		2001	6	30	2001	6	30	9	175			North	EM-DAT			
72	Viet Nam	Heavy rain	2001	5	15	2001	5	17	2		0.965	0.001	Central	PRCC	107.55	16.307	4.2
73	Viet Nam	General	2000	11	18	2000	11	26	36	25,003	15.000	0.014	Central	EM-DAT	108.567	14.79	5.6
74	Viet Nam	Monsoonal	2000	10	10	2000	10	19	23	200,000			Central	PRCC	107.684	12.292	5.9
75	Viet Nam	Monsoonal	2000	8	26	2000	9	1					South	PRCC	106.195	11.544	6.3
76	Viet Nam	General	2000	7	11	2000	8	10	460	5,000,004	250.000	0.226	North	EM-DAT	105.064	11.243	6.6
77	Viet Nam	Torrential	2000	5	31	2000	6	2	3				Central	PRCC	108.358	12.124	4.1
78	Viet Nam	General	1999	12	2	1999	12	10	127	2,163,694	53.000	0.052	Central	EM-DAT	107.876	16.181	6.1
79	Viet Nam	Storm	1999	10	25	1999	11	9	622	3,504,412	237.000	0.234	Central	EM-DAT			
80	Viet Nam	Flash	1999	7	24	1999	8	5	40	115,175	19.500	0.019	South and Central	EM-DAT	107.245	14.795	6.6
81	Viet Nam	Heavy rain	1998	11	13	1998	11	16	17		17.000	0.018	Central	PRCC	107.783	15.94	5
82	Viet Nam	General	1998	10	16	1998	10	23	45	32,505	13.700	0.014	Central	EM-DAT	109.082	13.329	5.3
83	Viet Nam	Heavy rain	1998	6	28	1998	7	11	4	12,000			North	PRCC	105.344	21.565	5.6
84	Viet Nam	Heavy rain	1998	6	9	1998	6	10					North	PRCC	105.136	21.327	3.8
85	Viet Nam	Heavy rain	1997	8	1	1997	8	7	12	800			North	PRCC	104.011	21.883	5.3
86	Viet Nam	Heavy rain	1996	10	1	1996	11	13	162	200,000	50.000	0.062	South	PRCC	105.275	10.201	6
87	Viet Nam	General	1996	10	1	1996	11	13	162	375,000	138.000	0.17	South	EM-DAT			
88	Viet Nam		1996	9	14	1996	9	19	60		13.400	0.017	Central	EM-DAT			
89	Viet Nam	Monsoonal	1996	8	18	1996	8	25	55	90,000			North	PRCC	104.581	21.757	6.1
90	Viet Nam	General	1995	9	21	1995	10	19	253	400,000	86.000	0.118	Central	EM-DAT			6.3
91	Viet Nam	General	1994	9	4	1994	12	18	310	382,000	206.000	0.317	South	EM-DAT			
92	Viet Nam	Heavy rain	1994	7	15	1994	7	31	21	172	2.300	0.004	North	PRCC	102.98	21.818	5.8
93	Viet Nam	Flash	1993	10	2	1993	10	12	64	15,000	10.000	0.017	South	EM-DAT	106.625	17.429	5.8
94	Viet Nam	Storm	1992	10	28	1992	10	31	1	58,000			Central	EM-DAT			
95	Viet Nam	General	1992	10	5	1992	10	9	55	51,698	47.700	0.09	North	EM-DAT	106.367	17.532	5.4
96	Viet Nam	Heavy rain	1992	7	28	1992	7	31		38,000			North	PRCC	105.195	22.073	4.4
97	Viet Nam	General	1991	9	19	1991	9	25	136	21,000	38.500	0.081	South	EM-DAT	105.635	10.208	5.2
98	Viet Nam	General	1991	8		1991	8		21	270,600	5.000	0.011	South	EM-DAT			
99	Viet Nam	General	1991	7	28	1991	7	31	38	4,014	3.200	0.007	North	EM-DAT	103.614	21.721	5.1
100	Viet Nam	General	1990	6	20	1990	7	8	82	10,200	0.725	0.002	North	EM-DAT	108.266	12.548	5.19
101	Viet Nam	Heavy rain	1990	6	20	1990	7	8	13	4,000	0.725	0.002	North	PRCC	104.096	21.334	5.4
102	Viet Nam	Heavy rain	1990	6	12	190	6	20	20				Central	PRCC	108.266	12.548	5.2
103	Viet Nam	Torrential	1987	12	5	1987	12	10	86	40,000			Central	PRCC	108.372	13.99	5.4
104	Viet Nam	General	1986	12	3	1986	12	5	165				Central	EM-DAT	106.708	13.915	5.2
105	Viet Nam	Heavy rain	1986	7	25	1986	8	4					North	PRCC	105.593	21.574	5.9
106	Viet Nam	General	1985	9	7	1985	9	7	93	2,800,000			North (Hanoi)	EM-DAT	106.251	20.845	5.3
107	Viet Nam		1984	10		1984	10		33	38,000			Central	EM-DAT			

A9.2 Earthquake

A9.2 Earthquake

No.	Country	Name/ Region	Date			Damage				Origin		Magnitude	max. MMI
			Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	North	East		
1	Indonesia	BANDA SEA	1629	8	1					-4.600	129.900		
2	Indonesia	BANDA SEA	1630							-4.600	129.900		
3	Indonesia	BANDA SEA	1657	12						-3.000	128.000		
4	Indonesia	BANDA SEA	1659	11	9					-6.920	129.125		
5	Indonesia	N. MOLUCCAS ISLANDS	1673	5	20					1.375	127.520		
6	Indonesia	BANDA SEA	1673	7	12					-3.000	128.000		
7	Indonesia	N. MOLUCCAS ISLANDS	1673	8	12					1.375	127.520		
8	Indonesia	AMBON ISLAND, SERAM ISLAND	1674	2	17	86				-3.750	127.750	6.8	
9	Indonesia	BANDA SEA	1674	5	6					-3.700	128.200		
10	Indonesia	SUMATRA: MENTAWAI ISLANDS	1681	12	11								
11	Indonesia	BANDA SEA	1708	11	28					-3.690	128.150		
12	Indonesia	BANDANEIRA	1710	3	6					-4.530	129.900		
13	Indonesia	BANDA SEA	1711	9	5					-4.000	129.000	7	
14	Indonesia	JAVA: DJAKARTA (JAKARTA)	1722	10						-6.174	106.829		
15	Indonesia	AMBON ISLAND	1754	8	18	4				-3.500	128.500	6.5	
16	Indonesia	BANDA SEA	1754	9	7					-3.500	128.500		
17	Indonesia	JAKARTA	1757	8	24					-6.000	107.000	7.5	
18	Indonesia	BANDANEIRA	1763	9	12					-6.000	130.000		
19	Indonesia	SUMATRA:	1770							-5.000	102.000	7	
20	Indonesia	BANDA SEA	1775	4	18					-3.700	128.200		
21	Indonesia	SW. SUMATRA	1797	2	10					0.001	99.000	8	
22	Indonesia	BANDA SEA	1802	8						-3.700	128.200		
23	Indonesia	TIMOR ISLAND, KUPANG, KISSAR ISLAND	1814							-10.217	123.633		
24	Indonesia	AMBON ISLAND	1815	4	11					-3.700	128.400		
25	Indonesia	BALI	1815	11	22	10,253				-8.000	115.000	7	
26	Indonesia	INDONESIA: MALAYSIA: PENANG ISLAND	1816	5	1					5.000	96.500		
27	Indonesia	INDOENSIA: SUMATRA: BENGKULU	1818	3	18					-4.000	101.500	7	
28	Indonesia	SUMBAWA ISLAND: BIMA	1818	11	8					-7.000	117.000	8.5	
29	Indonesia	SULAWESI: MAKASAR	1820	12	29					-7.000	119.000	7.5	
30	Indonesia	JAVA	1823	9	9					-6.500	108.500	6.8	
31	Indonesia	SULAWESI	1828	12	29					-7.000	119.000		9
32	Indonesia	SUMATRA: BENGKULU	1833	11	24					-2.500	100.500	8.3	9
33	Indonesia	JAVA: BOGOR, CINAJUR	1834	10	10					-6.700	107.000		9
34	Indonesia	MALUKU: AMBON	1835	11	1					-3.700	128.200		9
35	Indonesia	BANDA ATJEH	1837	9	29					5.500	96.000	7.3	
36	Indonesia	SUMBAWA ISLAND: BIMA	1837	11	28					-8.500	118.500		9
37	Indonesia	JAVA: PURWOREJO	1840	1	4					-8.000	110.500	7	9
38	Indonesia	TERNATE ISLAND	1840	2	14					0.800	127.325		
39	Indonesia	N. MOLUCCAS ISLANDS	1841	11	26					-5.000	130.000		
40	Indonesia	BANDA SEA	1841	12	16					-4.000	127.500	6	8
41	Indonesia	SW. SUMATRA	1843	1	5					1.500	98.000	7.3	
42	Indonesia	JAVA: GENTENG ISLAND	1843	2	7					-7.200	114.000	6	
43	Indonesia	N SULAWESI: MENADO, TIKALA, TOMOHON	1845	2	8	118				1.480	124.850	7	9
44	Indonesia	N. MOLUCCAS ISLANDS	1846	1	25					2.000	126.500	7.3	
45	Indonesia	JAVA: CHERIBON	1847	11	16					-6.670	108.550		
46	Indonesia	JAVA: DJAKARTA; SUMATRA: TELUKBETUNG	1852	1	9					-6.500	105.500	6.5	8
47	Indonesia	SUMATRA: SIBOLGA	1852	11	11					1.500	98.000	6.8	
48	Indonesia	AMBON ISLAND	1852	11	19					-3.700	128.200		
49	Indonesia	MALUKU: BANDANAIRA	1852	11	25					-5.250	129.750	8.3	9
50	Indonesia	BANDANEIRA	1852	12	24					-5.000	130.500	7	
51	Indonesia	BANDA SEA	1854	1	4					-3.500	128.600	6	
52	Indonesia	TERNATE ISLAND	1854	9	27					0.800	127.400		
53	Indonesia	MALUKU: TERNATE	1855	7	14	34				0.800	127.300		9
54	Indonesia	SANGIHE PULAU (VOLCANIC)	1856	3	2					3.670	125.500		
55	Indonesia	LOMBOK ISLAND	1856	7	25					-8.500	116.000		
56	Indonesia	TIMOR ISLAND:: DILHI, GERA	1857	5	13	36				-8.000	115.500	7	
57	Indonesia	SULAWESI ISLAND: KEMA	1857	11	17					1.350	125.200		
58	Indonesia	SULAWESI ISLAND: KEMA	1857	11	18					1.350	125.200		
59	Indonesia	N. MOLUCCAS ISLANDS	1858	12	13					1.000	126.000	7.3	
60	Indonesia	N. MOLUCCAS ISLANDS	1859	6	28					1.000	126.500	7	
61	Indonesia	LONTHOR ISLAND	1859	7	20					-4.600	129.900		
62	Indonesia	SULAWESI	1859	7	29					0.009	125.500	7.3	
63	Indonesia	NEIRA I, LONTHOR I	1859	9	25					-5.500	130.500	6.8	
64	Indonesia	S. JAVA SEA	1859	10	20					-9.000	111.000		
65	Indonesia	SULAWESI: MANADO, BELANG	1859	12	17					0.900	124.900		
66	Indonesia	SULAWESI: MINAHASSA	1860	8						1.300	121.000		
67	Indonesia	HALMAHERA ISLAND	1860	10	6					-1.250	128.500		
68	Indonesia	LAGUNDI, SIMUK, TELLO I	1861	2	16					-1.000	97.500	8.5	9
69	Indonesia	SW. SUMATRA	1861	3	9					0.009	98.000	7	
70	Indonesia	SW. SUMATRA	1861	4	26					1.000	97.500	7	
71	Indonesia	SW. SUMATRA	1861	6	17					1.000	97.500	6.8	
72	Indonesia	SW. SUMATRA	1861	9	25					-1.500	100.000	6.5	
73	Indonesia	JAVA	1863	3	16					-6.100	106.700		
74	Indonesia	JAVA: BANYUMAS	1863	7	31					-7.500	109.300		
75	Indonesia	IRIAN JAYA: MANOKWARI	1864	5	23					-1.000	135.000	7.8	7
76	Indonesia	JAVA: AMBARAWA	1865	7	16					-7.200	110.300		
77	Indonesia	JAVA: JOGYAKARTA, SURAKARTA	1867	6	10	5				-7.800	110.400		9
78	Indonesia	GORONTALO	1871	8	25					0.500	123.000		
79	Indonesia	W JAVA: KUNINGAN	1875	10	25	7				-6.900	108.300		8
80	Indonesia	BURU ISLAND, CERAM SEA	1876	5	28					-3.000	127.250	6.8	7
81	Indonesia	BANDANEIRA	1882	10	10					-4.500	129.900	7.5	
82	Indonesia	BURU I, AMBON I, HARUKU I	1885	4	30					-2.500	127.500	7.3	
83	Indonesia	SUMATRA: AJERBANGIS	1885	7	29						99.500	6.8	
84	Indonesia	BANDA ATJEH	1885	12	14					5.550	95.300		
85	Indonesia	KOETA RADJA (ATJEH)	1886	1	31					5.600	95.300		
86	Indonesia	SUMATERA: SIGLI	1887	5	19					5.400	96.000		
87	Indonesia	SUMATERA: BREUEH ISLAND	1888	3	21					5.800	95.000		
88	Indonesia	N. MOLUCCAS ISLANDS	1889	9	6					1.000	126.250	8	
89	Indonesia	MADURA ISLAND, JAVA	1889	11	23					-7.000	113.500	6	
90	Indonesia	BANDANEIRA	1890	11	23					-4.500	129.900		7
91	Indonesia	JAVA: PATI	1890	12	12					-6.760	111.040		8
92	Indonesia	SUMATERA: SIGLI	1891	5	19					5.400	96.000		

A9.2 Earthquake

No.	Country	Name/ Region	Date			Damage				Origin		Magnitude	max. MMI
			Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	North	East		
93	Indonesia	SUMATRA: PADANGSIDIMPUAN, LAKE TOBA	1892	5	17					2.500	99.500		6
94	Indonesia	SERAM ISLAND	1892	11	18					-3.000	127.750	7	
95	Indonesia	TIMOR: ALOR ISLAND	1896	4	18	250				-8.250	124.750		8
96	Indonesia	SW. SUMATRA, JAVA	1896	10	10					-3.500	102.500	6.8	
97	Indonesia	KAJUADI ISLAND	1897	3	15					-6.800	120.800	5.5	
98	Indonesia	BANDA SEA	1899	9	29	2,460				-3.000	128.500	7.8	
99	Indonesia	GALELA (HALMAHERA ISLAND)	1900	1	10					-0.030	127.250		
100	Indonesia	JAVA: SUKABUMI	1900	1	14					-6.840	106.960		7
101	Indonesia	NW. IRIAN JAYA	1900	10	7					-4.000	140.000	7.8	
102	Indonesia	S OF JAVA	1903	2	27					-8.000	106.000	8.1	
103	Indonesia	TIFU, MASARETE, KAJELI	1903	3	30					-3.000	127.500	6.5	
104	Indonesia	S. JAVA	1904	9	7					-7.700	109.000		
105	Indonesia	MINAHASSA PENINSULA	1905	1	22					1.000	123.000	8.4	
106	Indonesia	NW SUMATRA: GUNUNGSITOLI, BARUS	1907	1	4					2.000	94.500	7.8	
107	Indonesia	TALAUD ISLANDS: KARAKELONG ISLAND	1907	3	29					3.000	122.000	7.3	
108	Indonesia	DJAILOLO GILOLO	1907	6	25					1.000	127.000	7.9	
109	Indonesia	SULAWESI: LEMO, COLO, ANJA, OLU CONGKO	1907	7	30					-2.000	121.000		8
110	Indonesia	SW. SUMATRA	1908	2	6					-2.000	100.000	7.5	
111	Indonesia	TIMOR	1908	3	23					-10.000	129.000	6.6	
112	Indonesia	CELEBES SEA	1908	5	5					3.000	123.000	7.5	
113	Indonesia	SW SUMATRA: KERINTJI, REDJANGLEBONG	1909	6	3					-2.000	101.000	7.6	
114	Indonesia	TALAUD ISLANDS	1910	12	16					4.500	126.000	7.5	
115	Indonesia	SULAWESI-N. MOLUCCAS ISLANDS	1910	12	18					4.000	127.000	6.7	8
116	Indonesia	SANGIHE ISLAND	1913	3	14	138				4.500	126.500	7.9	9
117	Indonesia	NEW GUINEA: IRIAN JAYA: JAPEN	1914	5	26	11				-2.000	137.000	7.9	9
118	Indonesia	SUMATRA: LAIS	1914	6	26	20	20			-3.5	102	-	-
119	Indonesia	SUMATRA: LAIS	1914	7	26					-3.500	102.000		
120	Indonesia	KAIMANA	1915	5	23					-3.644	133.695		
121	Indonesia	NW. IRIAN JAYA	1915	11	6					-1.000	136.000	6	
122	Indonesia	NEW GUINEA: IRIAN JAYA	1916	1	13					-3.000	136.000	8.1	
123	Indonesia	NEW GUINEA: IRIAN JAYA	1916	1	13					-3.000	135.500	8.1	
124	Indonesia	INDONESIA	1916	9	11					-9.000	113.000	7.3	
125	Indonesia	BALI	1917	1	21	15,000				-7	116	6.6	9
126	Indonesia	BANDA SEA	1917	8	30					-7.500	128.000	7.8	
127	Indonesia	BANDA SEA	1918	11	18					-7.000	129.000	8.1	
128	Indonesia	IRIAN JAYA REGION	1919	11	21								8
129	Indonesia	N. MOLUCCAS ISLANDS	1920	1	29					0.870	122.920		
130	Indonesia	SANGKULIRANG,RENDING,KARIORANG,SEKURAN	1921	5	14					0.700	117.900	6.2	8
131	Indonesia	S OF JAVA	1921	9	11					-11.000	111.000	7.5	
132	Indonesia	NEW GUINEA: IRIAN JAYA: SENTANI	1921	10	10					-2.300	138.800		7
133	Indonesia	BANDA	1922	2	22					-3.300	128.900		
134	Indonesia	SW. SUMATRA	1922	4	10					-1.000	100.350		
135	Indonesia	JAVA: MAOS	1923	5	15					-7.700	109.200		9
136	Indonesia	DJAILOLO GILOLO	1923	10	7					-1.750	128.750	7.5	
137	Indonesia	JAVA	1924	11	12	60				-7.300	109.800		
138	Indonesia	JAVA: WONOSOBO	1924	12	2	727	11,250			-7.3	109.9	-	9
139	Indonesia	BANDA SEA	1925	1	8					-8.000	115.000		3
140	Indonesia	SUMATERA	1926	6	28					-0.700	100.600	5.8	9
141	Indonesia	SUMATRA	1926	7	5					-0.300	100.400		
142	Indonesia	NEW GUINEA: IRIAN JAYA	1926	10	26					-3.500	138.500	7.9	
143	Indonesia	JAVA: PRUPUK,MARGARSARI,DUBUKTENGAH	1926	12	13					-7.100	109.000		9
144	Indonesia	SULAWESI: DONGGALA	1927	12	1	50	50			-0.7	119.7	6.3	7
145	Indonesia	JAVA-S. JAVA SEA	1930	6	19					-5.600	105.300	6	
146	Indonesia	S. JAVA SEA	1930	7	19					-9.300	114.300	6.5	
147	Indonesia	AMURANG ISLAND	1930	9	11					1.200	124.570		4
148	Indonesia	SW. SUMATRA	1931	9	25					-5.000	102.750	7.4	8
149	Indonesia	SULAWESI: KAKAS,LANGOWAN,POSO,TONDANO	1932	5	14	6	3,075			0.5	126	7.4	7
150	Indonesia	AMBON ISLAND, CERAM ISLAND	1932	9	9					-3.570	128.350		7
151	Indonesia	S SUMATERA	1933	6	24					-5.500	104.800	7.5	9
152	Indonesia	CELEBES SEA	1935	11	25					5.500	94.000	6.5	
153	Indonesia	N SUMATERA: BATU I,PADANG,SIBOLGA	1935	12	28						98.250	7.9	8
154	Indonesia	TALAUD ISLANDS	1936	4	1					4.500	126.500	7.7	9
155	Indonesia	BANDA ACEH,LHOK SUKON,LHOKSEMAWE	1936	8	23	9	20			6.1	94.7	7.3	8
156	Indonesia	N SUMATERA: TAPANULI, KARO	1936	9	9	17				3.5	97.5	-	8
157	Indonesia	JAVA: JOGYAKARTA: KLUMPIT,PRAMBANAN	1937	9	27	1				-9.400	110.200	7.2	9
158	Indonesia	NEW GUINEA: FAKFAK	1937	11	6					-3.000	132.300		
159	Indonesia	NEW GUINEA	1938	2	1					-5.250	130.500	8.5	
160	Indonesia	NEW GUINEA: FAKFAK	1938	2	13					-3.000	132.300		
161	Indonesia	SULAWESI ISLAND	1938	5	20	17	4,710			-1	120	7.6	9
162	Indonesia	CENTRTAL SULAWESI: KALO,LUWUK,SULA I	1939	12	21						123.000	8	
163	Indonesia	MINAHASSA PENINSULA	1942	5	28						124.000	7.5	
164	Indonesia	S SUMATERA	1943	6	9					-1.000	101.000	7.6	
165	Indonesia	JAVA: JOGYAKARTA	1943	7	23	213	16,096			-9.5	110	8.1	8
166	Indonesia	NEW GUINEA: IRIAN JAYA: ARU ISLANDS	1943	11	6					-6.000	134.500	7.6	
167	Indonesia	FLORES	1944	3	22					-8.500	123.500	7.5	
168	Indonesia	SERAM	1948	3	1					-3.000	127.500	7.9	
169	Indonesia	OFF NORTHWEST COAST	1948	6	2					6.000	95.000	6.2	
170	Indonesia	BANDA ACEH	1949	5	9					5.000	95.000	6.7	
171	Indonesia	JAVA: GRESIK	1950	6	19	16				-6.000	113.000	6.5	7
172	Indonesia	SERAM	1950	10	8					-3.800	128.300	7.6	
173	Indonesia	BANDA SEA	1950	11	2					-6.500	129.500	8.1	
174	Indonesia	SUMABAWA: BIMA,RABA	1954	11	2					-8.000	119.000	6.8	8
175	Indonesia	BANDA SEA	1956	7	18					-5.500	130.000	7.5	
176	Indonesia	JAVA SEA	1957	4	16					-4.600	107.100	7.5	
177	Indonesia	NEW GUINEA: IRIAN JAYA	1957	6	22					-1.500	137.000	7.3	
178	Indonesia	S. JAVA SEA	1957	9	26					-8.200	107.300		
179	Indonesia	KALIMANTAN ISLAND	1957	10	26					-2.000	116.000	6	
180	Indonesia	INDOENSIA: SUMATRA: BENGKULU	1958	4	21					-4.500	104.000	6.7	
181	Indonesia	JAVA: MALANG	1958	10	20	8				-9.5	112.5	6.7	8
182	Indonesia	CENTRAL SULAWESI: UNA-UNA ISLAND	1960	4	29					-0.500	121.500		8
183	Indonesia	FLORES: ENDEH	1961	3	16	2				-8.200	122.000	6.5	8
184	Indonesia	BALI	1963	5	18					-8.200	115.600	6	

A9.2 Earthquake

No.	Country	Name/ Region	Date			Damage				Origin		Magnitude	max. MMI
			Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	North	East		
185	Indonesia	BANDA SEA	1963	11	4					-6.860	129.580	8.3	
186	Indonesia	JAVA: LABUHAN, MENES, PONOROGO	1963	12	16					-6.400	105.400	6.6	
187	Indonesia	SULAWESI: PINRANG	1964	1	8	8				-3.700	119.400	5.2	
188	Indonesia	BANDA ACEH	1964	4	2					5.900	95.700	7	7
189	Indonesia	SANANA ISLAND	1965	1	24	40				-2.4	126.1	7.6	-
190	Indonesia	-	1965	2	0	71				-	-	-	-
191	Indonesia	JAVA: DAMPIT,GONDANG,TRENGGALEK	1967	2	19	54	8,411			-9.2	113.1	6.8	9
192	Indonesia	MAKASSAR STRAIT	1967	4	11	71	100			-3.7	119.3	5.5	-
193	Indonesia	INDONESIA-MALAYSIA: N SUMATERA,MALAY PENINS	1967	4	12	14				5.500	97.300	6.1	
194	Indonesia	NEW GUINEA: IRIAN JAYA	1968	5	28					-2.900	139.300	7.7	
195	Indonesia	MOLUCCA ISLANDS: MANADO, CELEBES	1968	8	10					1.400	126.200	7.6	
196	Indonesia	SULAWESI: TAMBU,COAST OF MAPAGA	1968	8	14					0.200	119.800	7.4	8
197	Indonesia	TALAUD ISLANDS, MINDANAO, VISAYAN	1969	1	30					4.800	127.400	7.5	
198	Indonesia	SULAWESI: PARASANGA, PALETOANG	1969	2	23	64				-3.100	118.900	7.4	
199	Indonesia	OFF NW COAST SUMATERA	1969	11	21					2.100	94.600	7.7	
200	Indonesia	NEW GUINEA: IRIAN JAYA:DJAJAPURA,SENTANI	1971	1	10					-3.100	139.700	8.1	9
201	Indonesia	NATAL, SIBOLGA, TARUTUNG, PASAMAN	1971	2	4					0.600	98.800	7.1	6
202	Indonesia	JAVA: BUARAN,BANTAR KAWSUN,JIPANG	1971	6	16	1				-7.200	109.100	5.2	
203	Indonesia	CELEBES SEA	1972	6	11					3.900	124.300	7.8	
204	Indonesia	MALUKU: BANDANAIRA	1975	1	15					-5.000	130.000	5.9	7
205	Indonesia	JAVA	1975	2	9	1				-6.700	106.700	5.6	8
206	Indonesia	NEW GUINEA: IRIAN JAYA	1976	6	26	420	15,000			-4.603	140.091	7.1	-
207	Indonesia	BALI	1976	7	14	573	454,755	195	0.18122	-8.17	114.888	6.5	-
208	Indonesia	NEW GUINEA: IRIAN JAYA: JAYAWIJAYA	1976	10	29	133	7,000			-4.517	139.918	7.1	8
209	Indonesia	BALI: KAYUBIHI,BANJAR ANTUGAN JEHEM	1977	1	26					-8.220	115.190	5.2	6
210	Indonesia	SUMATERA,SINURAT,TALU	1977	3	8					0.450	100.020	6	8
211	Indonesia	SUNDA ISLANDS	1977	8	19	185	3,975	1	0.00112	-11.085	118.464	8	-
212	Indonesia	-	1977	8	27	2	25			-	-	-	-
213	Indonesia	BALI	1979	5	21					-8.299	115.934	5.4	
214	Indonesia	SUMBAWA ISLAND	1979	5	30	34	36,048	4	0.00386	-8.207	115.949	5.8	-
215	Indonesia	NEW GUINEA: IRIAN JAYA	1979	9	12	2	5,005			-1.679	136.04	7.9	-
216	Indonesia	SUMBAWA ISLAND	1979	10	20	2				-8.254	115.847	6.2	
217	Indonesia	JAVA	1979	11	2	26	43,200	16	0.01487	-7.656	108.252	6.1	-
218	Indonesia	S SUMATERA	1979	12	15	5	1,500			-3.299	102.712	6.6	-
219	Indonesia	SUMBAWA ISLAND: BALI, LOMBOK	1979	12	18	32	619			-8.39	115.889	6.3	-
220	Indonesia	JAVA: TASIKMALAJA	1980	4	16					-8.082	108.793	5.8	-
221	Indonesia	-	1980	9	5		20,000			-	-	-	-
222	Indonesia	NEW GUINEA: IRIAN JAYA: JAYAWIJAYA MTS	1981	1	22	306	2,682			-4.576	139.232	6.7	-
223	Indonesia	JAVA, SUKABUMI	1982	2	10			4	0.00255	-6.863	106.936	5.5	
224	Indonesia	NORTHERN SUMATERA	1982	2	24		15,000	4	0.00255	4.374	97.755	5.4	0
225	Indonesia	SUMBAWA ISLAND REGION	1982	3	11					-9.265	118.479	6.4	
226	Indonesia	FLORES ISLANDS: RUTENG	1982	8	6					-8.375	120.577	5.6	
227	Indonesia	FLORES ISLAND: EASTERN	1982	12	25	13	8,817	1	0.00106	-8.405	123.08	5.9	0
228	Indonesia	BANDA SEA	1983	3	12					-4.056	127.924	6.5	
229	Indonesia	SUMATERA: BANDA ACEH	1983	4	3		100	1	0.00067	5.723	94.722	6.6	7
230	Indonesia	CELEBES: MINAHASSA: TOLITOLI	1983	10	16					1.084	121.052	6	
231	Indonesia	CENTRAL SULAWESI	1983	10	25	2				1.131	120.858	6.1	7
232	Indonesia	SULAWESI: W	1984	1	10	2	89			-2.823	118.806	6.6	-
233	Indonesia	N SUMATERA: TARUTUNG	1984	8	27		1,858	1	0.00061	1.761	99.075	5.2	0
234	Indonesia	DENPASAR, BALI	1985	4	13					-9.245	114.185	6.2	
235	Indonesia	NEW GUINEA: IRIAN JAYA: ENAROTALI	1985	9	15	10	7			-4.13	136.049	6.3	0
236	Indonesia	NEW GUINEA: IRIAN JAYA: MANOKWARI	1985	11	17					-1.639	134.911	7.1	8
237	Indonesia	SUMATERA: S, HAHAT, MUARAENIM	1986	1	29					-3.904	103.461	5	
238	Indonesia	SUMATERA: N, TARUTUNG-LAKE TOBA,	1987	4	26	2	15,001			2.244	98.866	6.6	-
239	Indonesia	TIMOR: PANTAR, MOUNT SIRUNG	1987	11	26	125	17,100	5	0.00245	-8.247	124.155	6.5	0
240	Indonesia	MOLUCCA PASSAGE: MOROTAI, TANAWANGU	1989	3	8		5,500			1.031	126.189	5.6	0
241	Indonesia	TIMOR: ALOR	1989	7	14		197			-8.081	125.129	6.2	0
242	Indonesia	KURIMA DISTRICT, BALIEM RIVER	1989	8	1	120	17,196			-4.511	139.022	5.8	0
243	Indonesia	TEMBAGAPURA	1989	9	4					-4.219	136.667	6	
244	Indonesia	MINAHASSA PENINSULA: BOLAANG-GORONTALO	1990	4	18	5	7,036			1.186	122.857	7.6	0
245	Indonesia	JAVA: W, KUNINGAN, MAJALENGA	1990	7	6		103			-6.904	108.12	4.8	0
246	Indonesia	N SUMATERA, BLANGKEJEREN, KUTACANE	1990	11	15	1	2,172	2	0.00076	3.908	97.457	6.8	0
247	Indonesia	MINAHASSA: GORONTALO, MAMADO	1991	6	20		1,000			1.196	122.787	7.5	6
248	Indonesia	TIMOR: KALABAHI, DILI	1991	7	4	28	16,191	18	0.00587	-8.099	124.681	6.5	0
249	Indonesia	JAWA, BREBES	1992	2	4		7,501			-7.138	109.067	4.4	0
250	Indonesia	FLORES REGION, MAUMERE, BABI	1992	12	12	2,500	92,103	100	0.02993	-8.48	121.896	7.8	0
251	Indonesia	KAU	1994	1	21	7	200,040			1.015	127.733	7	0
252	Indonesia	SOUTHERN SUMATERA, LIWA, LAMPUNG	1994	2	16	207	49,399	170	0.04209	-4.967	104.302	6.9	-
253	Indonesia	JAVA	1994	6	2	239	8,720	2	0.00054	-10.477	112.835	7.8	0
254	Indonesia	JAVA	1994	6	2					-10.477	112.835	7.8	
255	Indonesia	JAVA	1994	6	3					-10.362	112.892	6.6	
256	Indonesia	JAVA	1994	6	4					-10.777	113.366	6.5	
257	Indonesia	HALMAHERA	1994	10	9	1	2,437			-1.258	127.98	6.8	-
258	Indonesia	-	1994	11	20		67			-	-	-	-
259	Indonesia	IRIAN JAYA REGION	1995	3	19					-4.183	135.109	6.9	
260	Indonesia	TIMOR, DILI, MALIANA, MAUBARA	1995	5	14	15	176			-8.378	125.127	6.9	7
261	Indonesia	-	1995	5	19		1,538			-	-	-	-
262	Indonesia	SUMATERA, JAMBI PROVINCE	1995	10	7	84	90,218			-2.045	101.436	6.8	-
263	Indonesia	SULAWESI: MINAHASSA PENINSULA, TOLITOLI	1996	1	1	9	13,000	1	0.00024	0.729	119.931	7.9	6
264	Indonesia	NEW GUINEA: IRIAN JAYA: BIAK, SUPIORI	1996	2	17	166	25,638	4	0.00085	-0.891	136.952	8.2	0
265	Indonesia	N. SUMATERA, ACEH, BANDA ACEH, MEDAN	1997	8	20					4.358	96.494	6	
266	Indonesia	SULAWESI, PAREPARE	1997	9	28	20	3,105	1	0.00021	-3.776	119.727	5.9	0
267	Indonesia	SULAWESI: MINAHASSA PENINSULA,GORONTALO	1997	11	25					1.241	122.536	7	
268	Indonesia	JAWA, MALANG, BLITAR, BANTUR	1998	9	28	1	500			-8.194	112.413	6.6	0
269	Indonesia	MANGOLE, MANADO, TALIABU	1998	11	29	33	6,448	200	0.04346	-2.071	124.891	7.7	7
270	Indonesia	PANDEGLANG, W JAWA, SE SUMATERA	1999	12	21	5	16,920	4	0.00083	-6.845	105.555	6.5	0
271	Indonesia	SULAWESI: LUWUK, BANGGAI, PELENG,	2000	5	4	45	52,770	30	0.00599	-1.105	123.573	7.6	0
272	Indonesia	SUMATRA: BENGKULU, ENGGANO	2000	6	4	103	204,714	41	0.00818	-4.721	102.087	7.9	6
273	Indonesia	SOUTHERN SUMATERA: LAHAT	2000	6	7	1	3,000			-4.612	101.905	6.7	0
274	Indonesia	JAWA:BANDUNG,CIBADAK,CIMANDIRI,KADUDAMPIT	2000	7	12		4,124	2	0.0004	-6.675	106.845	5.4	0
275	Indonesia	-	2000	10	25		5,500			-	-	-	-
276	Indonesia	-	2001	2	14					-	-	-	-

A9.2 Earthquake

No.	Country	Name/ Region	Date			Damage				Origin		Magnitude	max. MMI
			Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	North	East		
277	Indonesia	-	2001	6	28		12,512			-	-	-	-
278	Indonesia	BANDA SEA	2001	10	19					-4.102	123.907	7.5	
279	Indonesia	SULAWESI: TOJO	2002	8	15		2,548			-1.196	121.333	6.2	0
280	Indonesia	NEW GUINEA: IRIAN JAYA: RANSIKI	2002	9	20		155			-1.68	134.234	6.4	0
281	Indonesia	NEW GUINEA: MANOKWARI, ORANSBARI, RANSIKI	2002	10	10	8	9,082			-1.757	134.297	7.6	0
282	Indonesia	SUMATERA: SIMEULUE	2002	11	2	3	60			2.824	96.085	7.3	0
283	Indonesia	SUMBAWA ISLAND: DOMPU	2003	1	23		2,502			-8.807	118.524	5.5	6
284	Indonesia	JAVA: CARACAS, CILIMUS, SAMPORA	2003	3	21					-6.983	108.468	4.6	
285	Indonesia	FLORES: REO	2003	3	25	4				-8.294	120.743	6.5	
286	Indonesia	MOROTAI, BEREBERE, DARUBA	2003	5	27	1	247			2.354	128.855	7	-
287	Indonesia	HALMAHERA: WASILE	2003	8	11		500			1.142	128.152	6	0
288	Indonesia	FLORES, RUTENG	2003	12	5					-8.137	120.524	4.9	
289	Indonesia	BALI, LOMBOK	2004	1	1	1	30,040	12	0.00185	-8.31	115.788	5.8	6
290	Indonesia	SERAM	2004	1	28					-3.120	127.400	6.7	
291	Indonesia	NABIRE	2004	2	6	37	14,072	1	0.00015	-3.615	135.538	7	-
292	Indonesia	NABIRE	2004	2	7					-4.003	135.023	7.3	
293	Indonesia	SUMATRA: PADANGPANJANG	2004	2	16	5	507			-0.466	100.655	5.1	0
294	Indonesia	SUMATRA: PESISIR SELATAN	2004	2	22					-1.559	100.488	6	
295	Indonesia	SUMATRA: PADANG	2004	4	9					-1.549	100.540	5.4	
296	Indonesia	BALI	2004	4	16					-8.669	114.650	5.5	
297	Indonesia	TIMOR: KUPANG	2004	4	23					-9.362	122.839	6.7	
298	Indonesia	KEPULAUAN ALOR	2004	11	12	33	83,381			-8.152	124.868	7.5	-
299	Indonesia	NABIRE	2004	11	26	32	12,833	55	0.00846	-3.609	135.404	7.1	8
300	Indonesia	SUMATRA: OFF WEST COAST	2004	12	26	1,001		10,000	1.53799	3.295	95.982	9.1	
301	Indonesia	SULAWESI: PALU	2005	1	24	1	684			-1.198	119.933	6.3	-
302	Indonesia	JAVA: GARUT	2005	2	2	1				-7.037	107.819	4.8	
303	Indonesia	SUMATERA: SW	2005	3	28	915	105,313			2.085	97.108	8.7	0
304	Indonesia	PADANG	2005	4	10					-1.644	99.607	6.7	5
305	Indonesia	SUMATRA: NIAS ISLAND: GUNUNGSITOLI	2005	7	5					1.819	97.082	6.7	
306	Indonesia	SULAWESI: DONGGALA	2005	7	9					-1.174	119.963	5.9	
307	Indonesia	TIMOR: TIMOR TENGAH UTARA	2005	7	18					-9.948	124.480	5.3	
308	Indonesia	BANDA SEA	2006	1	27					-5.473	128.131	7.6	
309	Indonesia	SERAM	2006	3	14	3	1,202			-3.595	127.214	6.7	0
310	Indonesia	N. SUMATRA: TAPAKTUAN	2006	3	28					3.462	97.224	5	
311	Indonesia	SUMATRA: KALIANDAK	2006	5	12					-5.575	105.395	5.5	
312	Indonesia	JAVA: BANTUL, YOGYAKARTA	2006	5	27	5,778	3,177,923	3,100	0.40365	-7.961	110.446	6.3	-
313	Indonesia	JAVA	2006	7	17					-9.254	107.411	7.7	
314	Indonesia	SULAWESI: PINRANG	2006	11	24					-3.728	119.233	5.2	
315	Indonesia	HALMAHERA: MOROTAI	2006	11	29					2.520	128.283	6.2	
316	Indonesia	SUMABAWA: BIMA	2006	12	1	1	114			-8.251	118.777	6.3	0
317	Indonesia	SUMATERA: NORTHERN, MUARASIPONGI	2006	12	18	8	1,200			0.626	99.859	5.8	-
318	Indonesia	MOLUCCA ISLANDS: N	2007	1	21	4				1.065	126.282	7.5	
319	Indonesia	SUMATRA: SOUTHERN	2007	3	6	67	137,660	200	0.04346	-0.493	100.498	6.4	8
320	Indonesia	LABUHA	2007	5	29					-1.065	127.343	6.1	
321	Indonesia	MALUKU: N	2007	7	26					2.872	127.464	6.9	
322	Indonesia	JAVA	2007	8	8					-5.968	107.655	7.5	
323	Indonesia	SITUBONDO	2007	9	9		469			-7.783	114.338	4.8	0
324	Indonesia	SUMATRA	2007	9	12	25	459,567	500	0.05949	-4.438	101.367	8.4	0
325	Indonesia	SUMATRA	2007	9	12					-2.625	100.841	7.9	
326	Indonesia	SUMBAWA ISLAND	2007	11	25	3				-8.277	118.339	6.5	
327	Indonesia	SUMBAWA ISLAND	2007	11	26	3	21,800			-8.277	118.339	6.5	-
328	Indonesia	NEW GUINEA: MANOKWARI,	2008	1	7					-0.795	134.012	5.9	
329	Indonesia	SUMATRA: NIAS ISLAND: GUNUNGSITOLI	2008	1	22	1				1.011	97.442	6.1	
330	Indonesia	SUMATERA: ACEH PROVINCE	2008	2	20	3	25			2.768	95.964	7.4	0
331	Indonesia	SUMATRA: PADANG	2008	2	25					-2.486	99.972	6.5	
332	Indonesia	SUMATRA: SOUTHERN	2008	9	9	2	625			-3.935	103.058	5.4	0
333	Indonesia	MINAHASSA PENINSULA	2008	11	17	6	10,077			1.271	122.091	7.3	-
334	Indonesia	PAPUA NEW GUINEA: NEAR NORTH COAST	2009	1	4	5	4,250	10	0.00104	-0.414	132.885	7.6	-
335	Indonesia	KEPULAUAN TALAUD	2009	2	11		3,049	9	0.00094	3.884	126.397	7.2	0
336	Indonesia	SUMATRA: PADANG	2009	8	16					-1.479	99.490	6.7	
337	Indonesia	JAVA	2009	9	2	128	339,792	160	0.01665	-7.782	107.297	7	0
338	Indonesia	BALI: DENPASAR	2009	9	18					-9.138	115.593	5.7	
339	Indonesia	SUMATRA: PADANG	2009	9	30	1,195	2,501,798	2,200	0.22889	-0.72	99.867	7.5	0
340	Indonesia	SUMATRA: SOUTHERN: KERINCI	2009	10	1	3		10	0.00104	-2.515	101.501	6.6	
341	Indonesia	SUMABAWA: BIMA	2009	11	9	2	1,475	2	0.00021	-8.207	118.631	6.6	-
342	Indonesia	JAVA: GARUT	2010	1	10	1				-7.907	107.879	5.1	
343	Indonesia	SUMATRA	2010	4	6					2.383	97.048	7.8	
344	Indonesia	N. SUMATRA: SIMEULUE ISLAND	2010	5	9					3.748	96.018	7.2	
345	Indonesia	NEW GUINEA: IRIAN JAYA: JAPEN	2010	6	16	17	4,600			-2.174	136.543	7	6
346	Indonesia	SUMATRA	2010	10	25					-3.487	100.082	7.8	
347	Indonesia	SULAWESI: KENDARI	2011	4	24					-4.586	122.771	6.1	
348	Indonesia	SUMATRA	2011	9	5	10		6	0.00052	2.965	97.893	6.7	0
349	Indonesia	N SUMATRA: OFF WEST COAST	2012	4	11	10				2.327	93.063	8.6	
350	Indonesia	N SUMATRA: OFF WEST COAST	2012	4	11					0.802	92.463	8.2	
351	Indonesia	JAVA	2012	6	4					-7.692	106.371	5.8	
352	Indonesia	BANDA ACEH	2012	7	25	1				2.707	96.045	6.5	
353	Indonesia	SULAWESI: SIGI, PARIGI MOUNTONG	2012	8	18	6				-1.315	120.096	6.3	
354	Indonesia	SUMATERA: GEUMPANG	2013	1	21	1				4.961	96.083	5.9	
1	Lao PDR	BOKEO; THAILAND: CHIANG RAI, CHIAN SAEN	2007	5	16					20.504	100.746	6.3	
1	Malaysia	SABAH: LAHAD,DATU,KANAK	1976	7	26					4.960	118.310	6.2	7
2	Malaysia	KALIMANTAN: RANAU	1991	5	26	1				5.865	116.746	4.5	
1	Myanmar	MYNAMAR (BURMA): AVA (INNWA)	1714	8	4					21.850	95.967		
2	Myanmar	MYANMAR (BURMA) COAST	1750							18.500	93.400		
3	Myanmar	AVA (INNWA)	1838							21.800	96.000		
4	Myanmar	AVA, AMARAPURA	1839	3	23	400				21.900	96.000		11
5	Myanmar	THAYETMYO, PROME	1858	8	24					19.000	95.000		
6	Myanmar	RANGOON	1895							16.800	96.200		
7	Myanmar	KACHIN	1908	12	12					26.500	97.000	7.5	
8	Myanmar	MANDALAY, MOGOK, MAYMYO	1912	5	23					21.000	97.000	8.0	9

No.	Country	Name/ Region	Date			Damage				Origin		Magnitude	max. MMI
			Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	North	East		
9	Myanmar	HTAWGAW	1929	1	19					25.500	98.000	5.5	9
10	Myanmar	MYITKYINA	1929	6	4					25.200	97.200		
11	Myanmar	PEGU, RANGOON	1930	5	5	500				17.300	96.500	7.3	9
12	Myanmar	THARRAWADDY	1930	7	18	50				17.400	95.500		
13	Myanmar	PYU	1930	12	4	36				18.200	96.400	7.3	–
14	Myanmar	KACHIN	1931	1	27					25.600	96.800	7.6	
15	Myanmar	KAMAING	1931	1	28					25.400	96.800		9
16	Myanmar	MYANMAR; INDIA: ASSAM	1932	8	14					26.000	95.500	7.0	
17	Myanmar	CHINA: YUNNAN PROVINCE	1941	12	26	15				22.700	99.900	7.0	8
18	Myanmar	MYANMAR (BURMA)	1943	10	23					21.500	93.500	7.2	
19	Myanmar	MYANMAR (BURMA)	1946	9	12					23.900	96.200	7.5	
20	Myanmar	MYANMAR (BURMA)	1946	9	12					23.900	96.200	7.8	
21	Myanmar	MYANMAR; INDIA: CALCUTTA, CUTTACK, BHAGALPU	1954	3	21					24.500	95.300	7.4	
22	Myanmar	MYANMAR (BURMA)	1956	7	16	38				22.200	95.700	7.0	
23	Myanmar	PAGAN	1975	7	8	1		1	0.00569	21.490	94.700	6.5	
24	Myanmar	MYANMAR (BURMA); INDIA: GAUHATI, SIBSAGAR, IMP	1988	8	6	38		1	0.00569	25.149	95.127	7.2	6
25	Myanmar	THABEIKKYIN, MANDALAY	1991	1	5		160			23.613	95.901	7.1	–
26	Myanmar	CHINA: YUNNAN PROVINCE: LANCANG, MENGLIAN; T	1995	7	12					21.966	99.196	6.8	–
27	Myanmar	TAUNGDWINGYI; THAILAND: BANGKOK	2003	9	21					19.917	95.672	6.6	
28	Myanmar	MYANMAR (BURMA)	2008	12	25					23.970	97.569	4.7	
29	Myanmar	MYANMAR (BURMA); INDIA: SIBSAGAR	2009	8	30					25.280	95.101	5.2	
30	Myanmar	MONYWA	2011	2	4	1				24.618	94.680	6.3	
31	Myanmar	MYANMAR: TACHILEK	2011	3	24	74	21,277	4	0.00435	20.687	99.822	6.8	–
32	Myanmar	SHWEBO	2012	11	11	26				23.005	95.884	6.8	
1	Philippines	MANILA	1599	6	21					14.600	121.000		8
2	Philippines	MANILA	1600	11						14.600	121.000		6
3	Philippines	MANILA	1601	1	16					14.600	121.000		8
4	Philippines	LUZON: E	1610	11						17.000	122.000		9
5	Philippines	N LUZON: ILOCOS PROV,ZAGAIAN PROV	1619	11	30					18.200	121.600		10
6	Philippines	PANAY,ILOILO,CAPIZ	1620							10.800	122.500		9
7	Philippines	W. LUZON ISLAND: CAGAYAN: BANGUI	1627	9	14					18.400	121.600	8	10
8	Philippines	LUZON: CAMALIG, ALBAY	1628							13.200	123.700		9
9	Philippines	MINDANAO: ILLANA BAY	1636	12	21					7.600	123.700		9
10	Philippines	LUZON: APARRI	1641	1	4					18.200	121.700		10
11	Philippines	LUZON: S BATANGAS TO N CAGAYAN	1645	11	30	600				14.400	121.000	8	10
12	Philippines	LUZON: S BATANGAS TO N CAGAYAN	1645	12	5					14.400	121.000		7
13	Philippines	LUZON: S	1648							15.000	121.000		8
14	Philippines	MINDORO ISLAND	1653	7						13.100	121.600		
15	Philippines	S LUZON: MANILA, SANTA CRUZ	1658	8	20					14.400	120.600		9
16	Philippines	MANILA	1665	6	19	19				14.600	121.000		8
17	Philippines	MINDORO ISLAND, LUZON ISLAND	1675	3						13.000	121.000		8
18	Philippines	LUZON: CENTRAL,S	1677	12	7	2				14.500	120.500		
19	Philippines	MANILA	1699							14.400	120.600		
20	Philippines	TAAL, MANILA, RIZAL, LAGUNA, CAVITE	1716	9	24					14.002	120.993		7
21	Philippines	NE LUZON: CAGAYAN VALLEY	1721	1	14					18.000	121.500		
22	Philippines	S LUZON: MANILA	1728	11	28					14.400	121.000		9
23	Philippines	TAYABAS,LAGUNA	1730							14.100	121.400		9
24	Philippines	E. LUZON ISLAND, PHILIPPINES	1735	12	27					15.800	121.700		
25	Philippines	LUZON: TAYABAS,LAGUNA	1743	1	12	5				14.000	121.600		10
26	Philippines	LEYTE	1743	9						11.200	124.300		
27	Philippines	W. LUZON ISLAND, PHILIPPINES	1744							17.000	121.000		
28	Philippines	SE LUZON IS: NAGA	1747							13.600	123.200		7
29	Philippines	TAAL VOLCANO	1749	8	12					14.002	120.993		9
30	Philippines	TAAL VOLCANO	1754	5	15	12				14.002	120.993		10
31	Philippines	MANILA	1767	11	13					14.200	121.000		7
32	Philippines	MANILA	1770	12						14.600	120.980		8
33	Philippines	MANILA	1771	2	1					14.200	121.000		8
34	Philippines	PANAY,CAPIZ,ILOILO	1787	5						10.800	122.500		10
35	Philippines	PANAY: ILOILO,ANTIQUE,BUENAVISTA	1787	7	12					10.700	122.500		10
36	Philippines	LUZON: PANGASINAN, BAGUIO, ZAMBALES	1796	11	5					16.000	119.500		9
37	Philippines	CAMARINES	1811	10	5					13.100	123.900		9
38	Philippines	SE LUZON: ALBAY	1814	2	2					13.100	123.900		7
39	Philippines	SE LUZON: TAYABAS,RIZAL,LAGUNA	1824	9	29					13.700	121.700		
40	Philippines	MANILA,SAN FRANCISCO	1824	10	26					14.250	121.250		
41	Philippines	MANILA	1828	11	9					14.550	120.900		8
42	Philippines	MANILA	1830	1	18					14.550	120.900		9
43	Philippines	MANILA	1830	9	16					14.550	120.900		
44	Philippines	SORSOGON,MASBATE IS,CASIGURAN,ALBAY	1840	3	22	17				12.900	123.900	6.5	9
45	Philippines	LUZON: BATAAN, RIZAL, PAMPANGA,MANILA	1852	9	16	3				14.000	120.500	7.5	9
46	Philippines	BATANGAS, N MINDANAO	1852	12	24					13.800	121.100		9
47	Philippines	CAMARINES, DAET	1853							14.000	123.000		8
48	Philippines	S LUZON	1855	3	22					16.000	121.000		
49	Philippines	S LUZON ISLAND, MINDORO ISLAND	1862	3	4					14.500	121.000	6.5	
50	Philippines	MANILA, RIZAL, BULACAN	1863	6	3	400				14.500	121.000	6.5	10
51	Philippines	MANILA	1863	6	9					14.500	121.000		7
52	Philippines	SE LUZON: TIWI,LUBAN,RINCONADA	1865	10	19					13.250	123.500	6	
53	Philippines	N LUZON: LAOAG	1866	12	28					18.200	120.600		8
54	Philippines	MASBATE ISLAND	1869	8	16					12.500	123.500	7	9
55	Philippines	S LUZON: MANILA; N MINDORO	1869	10	1					13.500	121.000		8
56	Philippines	MINDANAO: DAVAO,BLANCO	1870	11	4	4				7.000	125.400		
57	Philippines	CAMIGUÍN ISLAND: MAMBAJAO,CATARMAN	1871	2	20					9.203	124.673		9
58	Philippines	W MINDANAO: COTABATO,POLLOC HARBOR	1871	12	8					7.400	124.200		9
59	Philippines	AGNO	1872	1	26					16.000	119.000	6	7
60	Philippines	S LUZON: RIZAL, CAVITE; N MINDORO	1872	12	29					13.800	121.000		8
61	Philippines	LEPANTO-BONTOC	1874	8	3					17.000	120.600		
62	Philippines	MINDANAO,ZAMBOANGA,ISABELA (BASILAN)	1874	8	24					6.800	122.000		8
63	Philippines	SE LUZON: NUEVA,CACERES	1875	5	19					13.600	123.200		8
64	Philippines	BENGUET: LA TRINIDAD	1875	10	15					16.300	120.300		
65	Philippines	NEAR MOUNT APO	1878	9	16					6.900	125.100		7
66	Philippines	NW MINDANAO: SURIGAO	1879	6	30					9.800	125.500		10
67	Philippines	LUZON: E	1880	7	14					15.000	121.500		8

No.	Country	Name/ Region	Date			Damage				Origin		Magnitude	max. MMI
			Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	North	East		
68	Philippines	S COAST LUZON: PASIG RIVER,PAMPANGA	1880	7	18	20				16.000	121.850	7.5	9
69	Philippines	SW OF LAKE BAY, MANILA	1880	7	20					15.000	121.500		8
70	Philippines	NUEVA VIZCAYA,BAYOMBONG	1881	9	1					16.500	121.100		9
71	Philippines	NUEVA VIZCAYA	1881	9	30					16.200	121.200		
72	Philippines	E MINDANAO: SURIGAO	1885	2	22					9.800	125.500		8
73	Philippines	NE MINDANAO: DAPITAN	1885	7	23					8.300	123.600		9
74	Philippines	PANAY, ILOILO	1887	2	2					10.700	122.600		9
75	Philippines	SE LUZON: CAMARINES, NUEVA CACERES	1887	3	24					13.700	123.300		8
76	Philippines	MINDANAO,MINDORO	1889	5	25					13.500	121.000	6.8	8
77	Philippines	SAMAR,LEYTE: CATBALOGAN,BARUGO	1890	2	7					11.200	124.400		
78	Philippines	BATAN ISLAND,SAN DOMINGO	1892	3	8					21.000	122.000		8
79	Philippines	LUZON: ABRA,PANGASINAN,UNION	1892	3	16	2				17.300	120.600		10
80	Philippines	E MINDANAO: AGUSAN RIVER	1893	6	21					6.900	125.800		10
81	Philippines	SE MINDANAO: DAVAO GULF	1894	2	9					6.000	126.000		8
82	Philippines	E MINDANAO: AGUSAN RIVER VALLEY	1894	6	28					8.200	126.100		8
83	Philippines	N MINDORO: CALAPAN	1895	5	13					13.400	121.700		7
84	Philippines	MASBATE ISLAND	1897	5	13					12.000	124.000	7.9	8
85	Philippines	LUZON: ILOCOS SUR	1897	8	15					18.000	120.000	7.9	8
86	Philippines	NW MINDANAO: DAPITAN	1897	9	20					6.000	122.000	8.6	7
87	Philippines	MINDANAO, ZAMBOANGA, SULU, ISABELA	1897	9	21					6.000	122.000	8.7	9
88	Philippines	NORTHERN SAMAR	1897	10	18					12.000	126.000	8.1	9
89	Philippines	NORTHERN SAMAR	1897	10	19					12.000	126.000		8
90	Philippines	NORTHERN SAMAR	1897	10	20					12.000	126.000	7.9	
91	Philippines	LUZON: E TAYABAS,CALAUAG BAY	1901	9	10					14.000	121.600		7
92	Philippines	LUZON	1901	12	14					14.000	122.000	7.8	7
93	Philippines	MINDANAO: LANAO, COTABATO	1902	8	21					7.500	123.500	7.3	10
94	Philippines	ILOILO,PANAY	1902	8	26					10.800	122.600		9
95	Philippines	DAVAO GULF	1903	12	28					7.000	126.000	7.8	8
96	Philippines	W. LUZON ISLAND: TUBURAN	1905	12	8					11.000	123.500	6.5	
97	Philippines	SE LUZON: CAMARINES	1907	4	18	2				14.000	123.000	7.6	9
98	Philippines	SE LUZON: CAMARINES	1907	4	18					13.500	123.000	7.4	7
99	Philippines	N LUZON: TUGUEGARAO,LAOAG,N ILOCOS	1907	5	25					18.000	120.000		8
100	Philippines	SE LUZON: CAMARINES	1907	11	24					14.000	123.000		9
101	Philippines	MINDANAO	1908	3	5					9.000	126.000	7.5	
102	Philippines	MINDANAO: E	1909	3	18					8.000	127.000		8
103	Philippines	SULU SEA	1910	12	30					9.000	125.500	6.2	7
104	Philippines	LUZON: TAAL VOLCANO	1911	1	27					14.002	120.993		9
105	Philippines	MINDANAO: TALACOGON,DAVAO,BUTUAN	1911	7	12					9.000	126.000	7.8	10
106	Philippines	SORSOGON	1912	11	8					12.600	124.000		9
107	Philippines	PHILIPPINES	1913	4	25					9.500	127.800	7.7	
108	Philippines	SABTAN,BATAN	1915	5	16					11.300	122.300		8
109	Philippines	W. LUZON ISLAND	1915	11	18					18.000	119.500	6.4	8
110	Philippines	PANAY: PANAY,MAASIN	1916	1	4					11.100	122.300		8
111	Philippines	S MINDANAO: GLAN,GLAN PADIDU,TUYAN	1917	1	31	7				6.000	125.000	6.4	9
112	Philippines	MINDANAO	1918	2	7					6.500	126.500	7.5	7
113	Philippines	MINDANAO: COTABATO	1918	8	15	100				5.500	123.000	8.3	10
114	Philippines	BATANES: IVANA,SABTAN,SAN VICENTE	1918	9	13					20.400	121.950		9
115	Philippines	MINDANAO ISLAND	1919	1	1					8.000	126.000	7.4	7
116	Philippines	NW PANAY, SW TABLAS, CARABAO I	1919	4	27					12.000	122.000		8
117	Philippines	E MINDANAO: MANAY	1921	11	7					7.000	126.000		8
118	Philippines	MINDANAO: E	1921	11	11					8.000	127.000	7.5	7
119	Philippines	CEBU I: CEBU; MACTAN I	1922	1	27					10.200	123.500		8
120	Philippines	CEBU ISLAND, MACTAN ISLAND	1922	2	27	5				10.200	124.100	6.3	5
121	Philippines	SIATON,ZAMBOANGUITA	1922	3	1					9.000	123.250	6	8
122	Philippines	MINDANAO ISLAND	1923	3	2					6.500	124.000	7.2	7
123	Philippines	BUTUAN, CAMIGUIN ISLAND	1923	7	18					9.300	125.000	5.5	5
124	Philippines	E MINDANAO: MATI,SURIGA	1924	4	14					6.500	126.500	8.3	9
125	Philippines	AGNO	1924	5	6					16.000	118.000	6.5	
126	Philippines	MINDANAO: SURIGAO,BUTUAN	1924	8	30					8.500	126.500	7.3	9
127	Philippines	W. LUZON ISLAND, PHILIPPINES	1925	5	5	17				9.300	122.700	6.8	9
128	Philippines	LUZON: W	1925	5	25					12.200	122.100	6.3	7
129	Philippines	SAMAR I, LAOANG I, BATAG I	1925	11	13					13.000	125.000	7.3	9
130	Philippines	SW MINDORO	1928	6	15					12.400	120.900	7	8
131	Philippines	COTABATO,N COAST OF ILLANA BAY	1928	12	19	93				7.000	124.000	7.3	7
132	Philippines	MINDANAO: HINATUAN,EBRO	1929	6	13					8.500	127.000	7.2	10
133	Philippines	LUZON: LAOAG,BACARRA,VIGAN,BATAC	1931	3	19					18.300	120.200	6.9	9
134	Philippines	LUZON: BAGUIO,BAUANG,LA UNION	1932	8	24					16.500	120.500		7
135	Philippines	LUZON	1934	2	14					17.500	119.000	7.9	
136	Philippines	LUZON	1937	8	20	1				14.500	121.500	7.5	8
137	Philippines	LUZON ISLAND, MINDOR ISLAND	1939	5	6					13.500	121.250	6.5	5
138	Philippines	MINDORO	1942	4	8					13.500	121.000	7.8	
139	Philippines	E OF	1943	5	25					7.500	128.000	8.1	
140	Philippines	PANAY, ILOILO CITY, ANTIQUE	1948	1	25	27				10.500	122.000	8.3	9
141	Philippines	N LUZON	1949	9	5					17.000	121.500	6.4	
142	Philippines	LUZON: E	1949	12	29	15				18.000	121.000	7.2	8
143	Philippines	PHILIPPINES	1951	3	19					9.500	127.300	7.8	
144	Philippines	BUTUAN	1952	3	19					9.500	127.250	7.8	7
145	Philippines	LUZON: SORSOGON, BACON, LEGASPI	1954	7	2	13	101			13.000	123.900	6.8	9
146	Philippines	MINDANAO: LANAO,OZAMIZ,COTABATO	1955	4	1	400	2,000			8.100	123.200	7.6	8
147	Philippines	PHILIPPINES	1957	9	24					5.500	127.500	7.6	
148	Philippines	PANAY	1960	10	7	3				11.100	122.300		
149	Philippines	—	1967	8	0	200				—	—	—	—
150	Philippines	LUZON: MANILA	1968	8	2	271	261	5		16.500	122.200	7.3	—
151	Philippines	MINDANAO	1970	1	10					6.800	126.700	7.6	6
152	Philippines	LUZON, ROMBLON I; TABLAS I; ODIONGAN	1970	2	5	3				12.600	122.100	7.1	
153	Philippines	LUZON	1970	4	7	14	200			15.780	121.710	7.3	6
154	Philippines	BATAN ISLANDS: BASCO, SABTANG	1970	9	30					20.600	122.000	5.3	7
155	Philippines	MINDORO, LUZON, MANILA	1972	4	25					13.400	120.300	7.2	6
156	Philippines	MINDANAO, DAVAO	1972	12	2					6.500	126.600	7.4	6
157	Philippines	QUEZON CITY: CALAUG,LOPEZ,GUIAYANGAN	1973	3	17	14	64	0		13.400	122.800	7.5	9
158	Philippines	PHILIPPINES	1975	10	31					12.540	125.993	7.6	6
159	Philippines	MINDANAO: S	1976	8	16	6,000	181,348	134	0.20794	6.262	124.023	8.1	6

A9.2 Earthquake

No.	Country	Name/ Region	Date			Damage				Origin		Magnitude	max. MMI
			Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	North	East		
160	Philippines	MINDANAO	1976	8	17					7.249	122.939	6.8	
161	Philippines	LUZON: MANILA	1977	3	19	1	60,030	0	0.00016	16.770	122.330	7.3	7
162	Philippines	VIRAC, CATANDUANES	1982	1	11					13.752	124.358	7.1	7
163	Philippines	LUZON	1983	8	18	19	1,901	2	0.00262	18.231	120.860	6.5	8
164	Philippines	PAGADIAN, ZAMBOANGA	1985	3	18	2	175			7.758	123.544	6.5	5
165	Philippines	LUZON: BENGUET PROVINCE, BAGUIO	1985	4	24	6				16.498	120.815	6.1	7
166	Philippines	MANILA, CUBI POINT	1987	4	25					16.066	120.301	6.3	5
167	Philippines	MINDANAO: TALAKAG-MALAYBALAY	1987	5	23	1				8.047	125.410	5.2	2
168	Philippines	MINDORO: SAN JOSE, CALAPAN	1988	6	19	2				12.376	121.067	6.2	7
169	Philippines	LUZON: LAOAG	1988	6	24					18.606	121.013	5.4	
170	Philippines	SAMAR: CATARMAN, CATBALOGAN	1988	11	17					12.399	124.537	6.6	6
171	Philippines	MINDANAO: COTABATO, DAVAO	1989	12	15	2		1	0.00093	8.337	126.729	7.5	6
172	Philippines	BOHOL, CEBU, CAGAYAN DE ORO, CAMIGUIN	1990	2	8	1	34,504	1	0.00078	9.755	124.694	6.6	7
173	Philippines	SANTIAGO	1990	3	26	1				9.253	125.606	5.5	4
174	Philippines	CULASI, PANAY	1990	6	14	4	15			11.760	121.899	7.1	6
175	Philippines	BAGUIO, CABANATUAN, DAGUPAN	1990	7	16	2,412	1,597,553	370	0.32094	15.679	121.172	7.8	9
176	Philippines	LUZON: MANILA, PINATUBO ERUPTION	1991	6	15					15.119	120.355	5.5	
177	Philippines	MINDANAO, TANDAG, BISLIG	1992	5	17					7.191	126.762	7.5	
178	Philippines	–	1994	5	13		218			–	–	–	–
179	Philippines	MINDORO	1994	11	15	81	270,866	4	0.00273	13.525	121.067	7.1	–
180	Philippines	SAMAR	1995	4	21					12.059	125.580	7.2	0
181	Philippines	SAMAR	1995	4	21					12.047	125.920	6.8	
182	Philippines	S LUZON: MANILA, SANTA CRUZ	1999	12	12	6	190	2	0.00102	15.766	119.740	7.3	7
183	Philippines	BASCO, MOUNT IRADA, BATAN ISLANDS	2000	7	16					20.253	122.043	6.4	
184	Philippines	MINDANAO	2001	1	1					6.898	126.579	7.5	
185	Philippines	MINDANAO	2002	3	6	15	73,451	2	0.00082	6.033	124.249	7.5	–
186	Philippines	LUZON: DIMASALANG	2003	2	15					12.171	123.921	5.8	6
187	Philippines	MASBATE, DIMASALANG	2003	2	15					12.168	124.079	6.3	6
188	Philippines	SAMAR: CAN-AVID	2003	11	18	1				12.025	125.416	6.5	7
189	Philippines	BOHOL ISLAND: TUBIGON	2004	5	19					9.926	124.038	4.1	6
190	Philippines	MINDANAO	2007	2	16					6.614	126.240	4.9	
191	Philippines	BOHOL ISLAND: MABINI	2007	11	7	1				9.721	124.647	5.1	
192	Philippines	LUZON: LEGASPI	2008	8	15					12.897	124.319	6	
193	Philippines	COTABATO, SULTAN KUDARAT	2009	9	18		392	0	0.00003	6.513	124.715	5.7	0
194	Philippines	CELEBES SEA: MORO GULF	2010	7	23					6.486	123.467	7.6	4
195	Philippines	MINDANAO	2011	3	3					9.457	125.935	5.5	
196	Philippines	MINDANAO: BUKIDNON PROVINCE	2011	11	7		28			7.904	125.185	5	0
197	Philippines	NEGROS ORIENTAL PROVINCE	2012	2	6	51		15	0.0036	9.999	123.206	6.7	
198	Philippines	MASBATE ISLAND	2012	3	5					12.354	123.700	5.6	
199	Philippines	SURIGAO	2012	3	16					10.037	125.633	5.8	
200	Philippines	CAGAYAN DE ORO, TACLOBAN	2012	8	31	1		0	0.00007	10.838	126.704	7.6	
1	Thailand	YONOK-NAGABANDHU	460	7	22					20.300	100.000		12
2	Thailand	BANGKOK	1983	4	22					14.926	99.023	5.9	
3	Thailand	**CHINA:** YUNNAN PROVINCE: LANCANG, MENGLIAN; T	1995	7	12					21.966	99.196	6.8	–
4	Thailand	MAE RIM	2006	12	12					18.901	98.916	4.6	
5	Thailand	**MYANMAR:** TACHILEK	2011	3	24	1	16			20.687	99.822	6.8	–
1	Vietnam	VIETNAM: HO CHI MINH CITY	2005	8	5					9.985	108.383	4.5	–

A9.3 Tsunami

A9.3 Tsunami

No.	Country	Name/ Region	Date			Damage				Origin		Magnitude	max. water height
			Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	North	East		
1	Indonesia	JAVA-S. JAVA	416							-6.102	105.423	-	-
2	Indonesia	GAMALAMA, TERNATE ISLAND	1608	7	1					0.800	127.325	-	-
3	Indonesia	BANDA SEA	1629	8	1					-4.600	129.900	*	16
4	Indonesia	BANDA SEA	1630							-4.600	129.900	*	-
5	Indonesia	BANDA SEA	1648	2	29					-	-	-	-
6	Indonesia	BANDA SEA	1657	12						-3.000	128.000	*	-
7	Indonesia	BANDA SEA	1659	11	11					-6.920	129.125	*	1.5
8	Indonesia	N. MOLUCCAS ISLANDS	1673	5	20					1.375	127.520	*	-
9	Indonesia	BANDA SEA	1673	7	12					-3.000	128.000	*	-
10	Indonesia	N. MOLUCCAS ISLANDS	1673	8	12					1.375	127.520	*	-
11	Indonesia	BANDA SEA	1674	2	17	2,244				-3.750	127.750	6.8	100
12	Indonesia	BANDA SEA	1674	5	6					-3.700	128.200	6.0	-
13	Indonesia	SUMATRA	1681	12	11					-	-	*	-
14	Indonesia	BANDA SEA	1690							-	-	-	-
15	Indonesia	BANDA SEA	1708	11	28					-3.690	128.150	*	-
16	Indonesia	BANDA SEA	1710	3	6					-4.530	129.900	*	-
17	Indonesia	BANDA SEA	1711	9	5	2				-4.000	129.000	7.0	1.2
18	Indonesia	DJAKARTA (JAKARTA), JAVA	1722	10						-6.174	106.829	*	-
19	Indonesia	BANDA SEA	1754	8	18					-3.500	128.500	6.5	-
20	Indonesia	BANDA SEA	1754	9	7					-3.500	128.500	*	-
21	Indonesia	JAKARTA	1757	8	24					-6.000	107.000	7.5	0.5
22	Indonesia	BANDA SEA	1763	9	12	7				-6.000	130.000	*	9
23	Indonesia	SW. SUMATRA	1770							-5.000	102.000	7.0	-
24	Indonesia	N. MOLUCCAS ISLANDS	1771	11	9	1				0.800	127.325		-
25	Indonesia	KALIMANTAN ISLAND	1773							-	-	-	-
26	Indonesia	AMBON ISLAND	1775	4	18					-3.700	128.200	*	-
27	Indonesia	SW. SUMATRA	1797	2	10	300				0.001	99.000	8.0	-
28	Indonesia	SE. SUMATRA	1799							-	-	-	15
29	Indonesia	BANDA SEA	1802	8						-3.700	128.200	*	-
30	Indonesia	TIMOR ISLAND	1814							-10.217	123.633	*	-
31	Indonesia	TAMBORA	1815	4	10					-8.200	118.000	-	3.5
32	Indonesia	AMBON ISLAND	1815	4	11					-3.700	128.400	*	-
33	Indonesia	BALI SEA	1815	11	22	1,200				-8.000	115.000	7.0	-
34	Indonesia	MALACCA STRAIT	1816	5	1					5.000	96.500	*	-
35	Indonesia	BENGKULU, SUMATRA	1818	3	18					-4.000	101.500	7.0	-
36	Indonesia	BALI SEA	1818	11	8					-7.000	117.000	8.5	3.5
37	Indonesia	FLORES SEA	1820	12	29	500				-7.000	119.000	7.5	25
38	Indonesia	FLORES SEA: BIMA	1821							-8.456	118.723	-	
39	Indonesia	JAVA	1823	9	9					-6.500	108.500	6.8	0.3
40	Indonesia	FLORES SEA	1828	12	29					-	-	*	-
41	Indonesia	SW. SUMATRA	1833	11	24					-2.500	100.500	8.3	-
42	Indonesia	FLORES SEA	1836	3	5					-8.300	118.700	*	-
43	Indonesia	FLORES SEA	1836	11	28					-8.300	118.700	7.5	-
44	Indonesia	BANDA ACEH	1837	9	29					5.500	96.000	7.3	-
45	Indonesia	S. JAVA SEA	1840	1	4					-8.000	110.500	7.0	-
46	Indonesia	N. MOLUCCAS ISLANDS	1840	2	14					0.800	127.325	*	-
47	Indonesia	MOLUCCAS ISLANDS	1841	11	26					-5.000	130.000	*	3
48	Indonesia	BANDA SEA	1841	12	16					-4.000	127.500	6.0	1.5
49	Indonesia	SW. SUMATRA	1843	1	5					1.500	98.000	7.3	-
50	Indonesia	JAVA	1843	2	7					-7.200	114.000	6.0	-
51	Indonesia	CELEBES SEA	1845	2	8					1.500	124.850	7.0	-
52	Indonesia	TERNATE ISLAND, N. MOLUCCAS ISLANDS	1846	1	25					2.000	126.500	7.3	1.2
53	Indonesia	LAMPUNG BAY	1851	5	4					-5.000	105.000		1.5
54	Indonesia	JAVA	1852	1	9					-6.500	105.500	6.5	-
55	Indonesia	BANDA SEA	1852	11	10					-	-	-	-
56	Indonesia	SIBOLGA, SUMATRA	1852	11	11					1.500	98.000	6.8	
57	Indonesia	BANDA SEA	1852	11	16					-	-	-	-
58	Indonesia	AMBON ISLAND, BANDA SEA	1852	11	19					-3.700	128.200	*	-
59	Indonesia	BANDA SEA	1852	11	23					-	-	-	-
60	Indonesia	BANDA SEA	1852	11	25	60				-5.250	129.750	8.3	8
61	Indonesia	BANDANEIRA	1852	12	24					-5.000	130.500	7.0	-
62	Indonesia	BANDA SEA	1854	1	4					-3.500	128.600	6.0	-
63	Indonesia	N. MOLUCCAS ISLANDS	1854	9	27					0.800	127.400	*	-
64	Indonesia	FLORES ISLAND	1855	4	14					-9.000	121.000	-	-
65	Indonesia	SANGIHE ISLAND	1856	3	2					3.670	125.500	*	-
66	Indonesia	JAVA-FLORES SEA	1856	7	25					-8.500	116.000	*	-
67	Indonesia	BALI SEA	1857	5	13					-8.000	115.500	7.0	3.4
68	Indonesia	KEMA, SULAWESI I, N. MOLUCCAS IS	1857	11	17					1.350	125.200	*	-
69	Indonesia	KEMA, SULAWESI I, N. MOLUCCAS IS	1857	11	18					1.350	125.200	*	-
70	Indonesia	N. MOLUCCAS ISLANDS	1858	12	13					1.000	126.000	7.3	-
71	Indonesia	N. MOLUCCAS ISLANDS	1859	6	28					1.000	126.500	7.0	10
72	Indonesia	LONTOR ISLAND, BANDA SEA	1859	7	20					-4.600	129.900	*	-
73	Indonesia	N. MOLUCCAS ISLANDS	1859	7	29					0.009	125.500	7.3	1
74	Indonesia	BANDA SEA	1859	9	25					-5.500	130.500	6.8	-
75	Indonesia	S. JAVA SEA	1859	10	20	2				-9.000	111.000	*	-
76	Indonesia	N. MOLUCCAS ISLANDS	1859	10	26					-	-	-	-
77	Indonesia	N. MOLUCCAS ISLANDS	1859	12	17					0.900	124.900	*	-
78	Indonesia	N. MOLUCCAS ISLANDS	1859	12	25					1.370	125.100	-	-
79	Indonesia	SULAWESI-N. MOLUCCAS ISLANDS	1860	8						1.300	121.000	*	-
80	Indonesia	CERAM SEA	1860	10	6					-1.250	128.500	*	-
81	Indonesia	SW. SUMATRA	1861	2	16	1,105				-1.000	97.500	8.5	7
82	Indonesia	SW. SUMATRA	1861	2	21					-	-	-	-
83	Indonesia	SW. SUMATRA	1861	3	9	950				0.009	98.000	7.0	-

A9.3 Tsunami

No.	Country	Name/ Region	Date			Damage				Origin		Magnitude	max. water height
			Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	North	East		
84	Indonesia	BANDA SEA	1861	3						-3.700	128.200	-	1.8
85	Indonesia	SW. SUMATRA	1861	4	26					1.000	97.500	7.0	-
86	Indonesia	JAVA	1861	6	5					-6.300	107.300	-	-
87	Indonesia	SW. SUMATRA	1861	6	17					1.000	97.500	6.8	-
88	Indonesia	SW. SUMATRA	1861	9	25					-1.500	100.000	6.5	-
89	Indonesia	CHERIBON DISTRICT, JAVA	1862	4	8					-6.700	108.570		2.1
90	Indonesia	JAVA	1863	3	16					-6.100	106.700	*	-
91	Indonesia	SW. SUMATRA	1864	2	16					-	-	-	-
92	Indonesia	NW. IRIAN JAYA	1864	5	23	250				-1.000	135.000	7.8	3
93	Indonesia	RUANG	1871	3	3	400				2.280	125.425	-	25
94	Indonesia	N. MOLUCCAS ISLANDS	1871	8	25					0.500	123.000	*	-
95	Indonesia	N. MOLUCCAS ISLANDS	1874	5						-	-	-	-
96	Indonesia	CERAM SEA	1876	5	28					-3.000	127.250	6.8	0.3
97	Indonesia	TAGRILAND ISLAND	1878	8						-	-	-	-
98	Indonesia	BANDA SEA	1882	10	10					-4.500	129.900	7.5	-
99	Indonesia	BANKA ISLAND	1883	5	31					-2.250	106.000	-	-
100	Indonesia	KRAKATAU	1883	8	27	36,000				-6.102	105.423	-	35
101	Indonesia	JAVA-S. JAVA	1883	10	10					-6.102	105.423	-	-
102	Indonesia	KRAKATAU	1884	2						-6.102	105.423	-	-
103	Indonesia	MOLUCCAS ISLANDS	1885	4	30					-2.500	127.500	7.3	1.2
104	Indonesia	AJERBANGIS, SUMATRA	1885	7	29					-	99.500	6.8	-
105	Indonesia	SULAWESI ISLAND	1885	8	3					1.100	124.300	-	-
106	Indonesia	BANDA ACEH	1885	12	14					5.550	95.300	*	-
107	Indonesia	BANDA ACEH	1886	1	31					5.600	95.300	*	-
108	Indonesia	SIGLI, ACEH, SUMATRA	1887	5	19					5.400	96.000	*	-
109	Indonesia	BREUEH ISLAND	1888	3	21					5.800	95.000	*	-
110	Indonesia	JAVA-S. JAVA	1889	8	16					-6.050	105.920	-	-
111	Indonesia	N. MOLUCCAS ISLANDS	1889	9	6					1.000	126.250	8.0	4
112	Indonesia	JAVA	1889	11	23					-7.000	113.500	6.0	-
113	Indonesia	SIGLI, ACEH, SUMATRA	1891	5	19					5.400	96.000	*	-
114	Indonesia	N. MOLUCCAS ISLANDS	1891	6	10					-0.500	127.500	-	-
115	Indonesia	BANDA SEA	1891	6	20					-4.000	129.000	-	-
116	Indonesia	TIMOR SEA	1891	10	5					-9.000	124.000	7.0	-
117	Indonesia	AURI, HALMAHERA	1892	1	7					-	-	-	-
118	Indonesia	NORTHEAST SUMATRA	1892	5	17					2.500	99.500	*	-
119	Indonesia	AWU VOLCANO, SANGIHE ISLAND	1892	6	7					3.670	125.500	-	0.75
120	Indonesia	SERAM ISLAND	1892	11	18					-3.000	127.750	7.0	-
121	Indonesia	SW. SUMATRA	1896	10	10					-3.500	102.500	6.8	-
122	Indonesia	FLORES SEA	1897	3	15					-6.800	120.800	5.5	-
123	Indonesia	BANDA SEA	1899	9	29	2,460				-3.000	128.500	7.8	12
124	Indonesia	GALELA, HALMAHERA ISLAND	1900	1	10					1.820	127.850	*	-
125	Indonesia	BISMARCK SEA	1900	10	7	5				-4.000	140.000	7.8	-
126	Indonesia	BANDA SEA	1903	3	30					-3.000	127.500	6.5	1
127	Indonesia	BANDA SEA	1904	7	5					-3.600	128.700	-	-
128	Indonesia	S. JAVA	1904	9	7					-7.700	109.000	*	-
129	Indonesia	INDONESIA NW. SUMATRA	1907	1	4	400				2.000	94.500	7.6	-
130	Indonesia	KARAKELONG, TALAUD ISLANDS	1907	3	29					3.000	122.000	7.3	4
131	Indonesia	SW. SUMATRA	1908	2	6					-2.000	100.000	7.5	1.4
132	Indonesia	TIMOR SEA	1908	3	23					-10.000	129.000	6.6	-
133	Indonesia	SUMATRA	1909	6	3					-2.000	101.000	7.6	-
134	Indonesia	SULAWESI	1910	12	18					4.000	127.000	6.7	-
135	Indonesia	SANGIHE ISLAND	1913	3	14					4.500	126.500	7.9	-
136	Indonesia	INDONESIA	1914	3	14					-	-	-	-
137	Indonesia	NW. IRIAN JAYA	1914	5	26					-2.000	137.000	7.9	0.1
138	Indonesia	INDONESIA	1914	6	25					-4.500	102.500	7.6	-
139	Indonesia	LAIS, SUMATRA	1914	7	26					-3.500	102.000	*	-
140	Indonesia	AMBON ISLAND	1914	12	3					-3.700	128.200	-	-
141	Indonesia	KAIMANA	1915	5	23					-3.644	133.695	*	0.5
142	Indonesia	NW. IRIAN JAYA	1915	11	6					-1.000	136.000	6.0	-
143	Indonesia	CELEBES SEA	1917	1	9					1.570	122.720	-	-
144	Indonesia	BALI SEA	1917	1	20					-7.000	116.000	6.6	2
145	Indonesia	LINGA ARCHIPELAGO	1917	1						-0.250	104.500	-	-
146	Indonesia	JAVA	1917	3	16					-3.700	116.600	-	1.5
147	Indonesia	BANDA SEA	1917	8	23					-3.600	128.700	-	-
148	Indonesia	SULAWESI	1918	7	18					3.138	125.491	-	0.08
149	Indonesia	TIMOR SEA	1919	2	13					-9.000	124.850	-	-
150	Indonesia	SULAWESI	1919	4	3					3.138	125.491		5
151	Indonesia	NW. IRIAN JAYA	1919	11	21					-	-	*	-
152	Indonesia	N. MOLUCCAS ISLANDS	1920	1	29					0.870	122.920	*	2
153	Indonesia	MAKASSAR STRAIT	1921	5	14					0.700	117.900	6.2	1
154	Indonesia	S. JAVA SEA	1921	9	11					-11.000	111.000	7.5	0.1
155	Indonesia	BANDA SEA	1922	2	22					-3.300	128.900	*	-
156	Indonesia	SW. SUMATRA	1922	4	10					-1.000	100.350	*	-
157	Indonesia	LHOKNGA, ACEH	1922	7	8					5.500	95.200	*	-
158	Indonesia	BANDA SEA	1925	1	8					-8.000	115.000	*	1
159	Indonesia	SW. SUMATRA	1926	6	28					-0.700	100.600	5.8	
160	Indonesia	SULAWESI	1927	12	1	50				-0.700	119.700	6.3	15
161	Indonesia	KRAKATAU	1928	3	26					-6.102	105.423	-	-
162	Indonesia	INDONESIA FLORES SEA	1928	8	4	128				-8.320	121.708	-	10
163	Indonesia	TJALANG, N.W. SUMATRA	1929	11	9	6				4.633	95.567	-	-
164	Indonesia	KRAKATAU	1930	3	17					-6.102	105.423		500
165	Indonesia	JAVA-S. JAVA SEA	1930	6	19					-5.600	105.300	6.0	1.5
166	Indonesia	S. JAVA SEA	1930	7	19					-9.300	114.300	6.5	0.1

A9.3 Tsunami

No.	Country	Name/ Region	Date			Damage				Origin		Magnitude	max. water height
			Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	North	East		
167	Indonesia	CELEBES SEA	1930	9	11					1.200	124.570	*	–
168	Indonesia	SW. SUMATRA	1931	9	25					-5.000	102.750	7.4	1
169	Indonesia	JAVA TRENCH	1932	9	9					-3.570	128.350	6.2	–
170	Indonesia	CELEBES SEA	1935	11	25					5.500	94.000	6.5	–
171	Indonesia	SW. SUMATRA	1935	12	28					0.001	98.250	7.9	–
172	Indonesia	SULAWESI	1936	4	1					4.500	126.500	7.7	3
173	Indonesia	OFF NORTHWEST COAST	1936	8	23					6.100	94.700	7.3	–
174	Indonesia	BANDA SEA	1937	11	6					-3.000	132.300	6.0	0.5
175	Indonesia	BANDA SEA	1938	2	1					-5.250	130.500	8.5	1
176	Indonesia	BANDA SEA	1938	2	13					-3.000	132.300	6.0	0.5
177	Indonesia	MAKASSAR STRAIT	1938	5	19	17				-1.000	120.000	7.6	3
178	Indonesia	N. MOLUCCAS ISLANDS	1939	12	21					–	123.000	8.0	–
179	Indonesia	OFF NORTHWEST COAST	1948	6	1					6.000	95.000	6.3	–
180	Indonesia	BANDA ACEH	1949	5	9					5.000	95.000	6.7	–
181	Indonesia	JAVA TRENCH	1950	10	8					-3.800	128.300	7.6	–
182	Indonesia	NW. IRIAN JAYA	1957	6	22					-1.500	137.000	7.3	1.8
183	Indonesia	S. JAVA SEA	1957	9	26					-8.200	107.300	5.5	0.7
184	Indonesia	MAKASSAR STRAIT	1957	10	26					-2.000	116.000	6.0	–
185	Indonesia	BENGKULU, SUMATRA	1958	4	21					-4.500	104.000	6.5	–
186	Indonesia	LESSER SUNDA: BALI: AGUNG VOLCANO	1963	3	30					8.342	115.508	–	–
187	Indonesia	JAVA	1963	12	16					-6.400	105.400	6.6	–
188	Indonesia	OFF NORTHWEST COAST OF INDONESIA	1964	4	2					5.800	95.400	7.0	–
189	Indonesia	SANANA ISLAND	1965	1	24	71				-2.400	126.100	7.6	–
190	Indonesia	MAKASSAR STRAIT	1967	4	11	13				-3.700	119.300	5.5	–
191	Indonesia	NORTHEAST SUMATRA	1967	4	12					5.500	97.300	6.1	–
192	Indonesia	N. MOLUCCAS ISLANDS	1968	8	10					1.400	126.200	7.6	0.4
193	Indonesia	INDONESIA BANDA SEA	1968	8	15	200				0.200	119.800	7.8	10
194	Indonesia	INDONESIA MAKASSAR STRAIT	1969	2	23	64	97			-3.100	118.900	6.9	4
195	Indonesia	BANDA SEA	1975	1	15					-5.000	130.000	5.9	–
196	Indonesia	SUNDA ISLANDS	1977	8	19	189				-11.085	118.464	8.0	15
197	Indonesia	INDONESIA LOMBLEN ISLAND [LEMBATA]	1979	7	18	539	23			-8.600	123.500	–	9
198	Indonesia	LOMBLEN ISLAND [LEMBATA]	1979	8	9					-8.500	123.500	–	–
199	Indonesia	IRIAN JAYA	1979	9	12	100				-1.679	136.040	7.9	2
200	Indonesia	JAVA TRENCH	1982	2	24					4.374	97.755	5.4	0.1
201	Indonesia	SUMBAWA ISLAND	1982	3	11					-9.265	118.479	6.6	0.1
202	Indonesia	FLORES SEA	1982	12	25					-8.405	123.080	6.0	–
203	Indonesia	BANDA SEA	1983	3	12					-4.056	127.924	6.9	3
204	Indonesia	LESSER SUNDA ISLANDS	1983	8	17					-8.540	123.590	–	–
205	Indonesia	SULAWESI	1984	1	8					-2.823	118.806	6.8	0.1
206	Indonesia	BALI ISLAND	1985	4	13					-9.245	114.185	6.2	2
207	Indonesia	TIMOR SEA	1987	11	26					-8.247	124.155	6.6	0.1
208	Indonesia	FLORES SEA	1992	12	12	1,169				-8.480	121.896	7.8	26.2
209	Indonesia	HALMAHERA	1994	1	21					1.015	127.733	7.0	2
210	Indonesia	SOUTHERN SUMATRA	1994	2	15					-4.967	104.302	–	–
211	Indonesia	JAVA	1994	6	2	250				-10.477	112.835	7.8	13.9
212	Indonesia	JAVA	1994	6	3					-10.362	112.892	6.6	3.7
213	Indonesia	TIMOR SEA	1994	6	4					-10.777	113.366	6.5	3
214	Indonesia	HALMAHERA	1994	10	8	1				-1.258	127.980	6.8	3
215	Indonesia	TIMOR SEA	1995	5	14	11				-8.378	125.127	6.9	4
216	Indonesia	SULAWESI	1996	1	1	9				0.729	119.931	7.9	3.43
217	Indonesia	IRIAN JAYA	1996	2	17	110				-0.891	136.952	8.2	7.68
218	Indonesia	TALIABU ISLAND,	1998	11	29					-2.071	124.891	7.7	2.75
219	Indonesia	SULAWESI	2000	5	4					-1.105	123.573	7.6	6
220	Indonesia	IRIAN JAYA	2002	10	10					-1.757	134.297	7.6	5
221	Indonesia	SERAM ISLAND	2004	1	28					-3.120	127.400	6.7	–
222	Indonesia	KEPULAUAN ALOR	2004	11	11					-8.152	124.868	7.5	–
223	Indonesia	INDONESIA OFF W. COAST OF SUMATRA	2004	12	26	165,708	532,898	4451.6	0.68465	3.295	95.982	9.1	50.9
224	Indonesia	INDONESIA	2005	3	28	10				2.085	97.108	8.7	3
225	Indonesia	KEPULAUAN MENTAWAI	2005	4	10					-1.644	99.607	6.7	0.4
226	Indonesia	SERAM ISLAND	2006	3	14	4				-3.595	127.214	6.7	3.5
227	Indonesia	INDONESIA JAVA	2006	7	17	802	35,543	55	0.00716	-9.254	107.411	7.7	20.9
228	Indonesia	SUMATRA	2007	9	12					-4.438	101.367	8.4	5
229	Indonesia	SUMATRA	2008	2	25					-2.486	99.972	6.5	0.12
230	Indonesia	SULAWESI	2008	11	16					1.271	122.091	7.3	0.13
231	Indonesia	NEAR NORTH COAST	2009	1	3					-0.414	132.885	7.6	0.39
232	Indonesia	NEAR NORTH COAST	2009	1	3					-0.691	133.305	7.3	–
233	Indonesia	CELEBES SEA	2009	2	11					3.884	126.397	7.2	0.13
234	Indonesia	SUMATRA	2009	8	16					-1.479	99.490	6.7	0.18
235	Indonesia	SUMATRA	2009	9	30					-0.720	99.867	7.5	0.27
236	Indonesia	SUMATRA	2010	4	6					2.383	97.048	7.8	0.44
237	Indonesia	INDONESIA SUMATRA	2010	10	24	530	11,864			-3.487	100.082	7.8	7
238	Indonesia	JAPAN HONSHU ISLAND (?)	2011	3	11	1	95			38.297	142.373	9.0	–
239	Indonesia	OFF W. COAST OF N SUMATRA	2012	4	11					2.327	93.063	8.6	–
240	Indonesia	OFF W. COAST OF N SUMATRA	2012	4	11					0.802	92.463	8.2	–
1	Malaysia	INDONESIA OFF W. COAST OF SUMATRA	2004	12	26	80	5,063	500	0.18	3.295	95.982	9.1	–
1	Myanmar	AVA (INNWA)	1714	8	4					21.850	95.967	*	–
2	Myanmar	MYANMAR (BURMA) COAST	1750							18.800	93.633	*	–
3	Myanmar	MYANMAR COAST	1930	5	5	500				17.300	96.500	7.3	–
4	Myanmar	INDONESIA OFF W. COAST OF SUMATRA	2004	12	26	71	15,700	500	1.245	3.295	95.982	9.1	–
1	Philippines	W. LUZON ISLAND	1627	9	14					18.400	121.600	8.0	–

A9.3 Tsunami

No.	Country	Name/ Region	Date			Damage				Origin		Magnitude	max. water height
			Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	North	East		
2	Philippines	W. LUZON ISLAND	1638							–	–	–	–
3	Philippines	W. LUZON ISLAND	1645	11	30					14.400	121.000	8.0	–
4	Philippines	SIBUYAN SEA	1653	7						13.100	121.600	*	–
5	Philippines	SULU SEA	1675	3						13.000	121.000	*	–
6	Philippines	W. LUZON ISLAND	1677	12	7					14.500	120.500	*	–
7	Philippines	TAAL, LUZON ISLAND	1716	9	24					14.002	120.993	*	–
8	Philippines	E. LUZON ISLAND	1735	12	27					15.800	121.700	*	–
9	Philippines	N. LUZON ISLAND	1744							17.000	121.000	*	–
10	Philippines	SOUTHEASTERN LUZON ISLAND	1747							13.600	123.200	*	–
11	Philippines	TAAL, LUZON ISLAND	1749	8	12					14.002	120.993	*	–
12	Philippines	TAAL, LUZON ISLAND	1754	11	15	12				14.002	120.993	–	–
13	Philippines	W. LUZON ISLAND	1770	12						14.600	120.980	*	–
14	Philippines	LUZON ISLAND	1796	11	5					16.000	119.500	*	–
15	Philippines	W. LUZON ISLAND	1824	10	26					14.250	121.250	*	–
16	Philippines	W. LUZON ISLAND	1828	11	9					14.550	120.900	7.5	–
17	Philippines	W. LUZON ISLAND	1830	1	18					14.550	120.900	*	1
18	Philippines	W. LUZON ISLAND	1830	9	16					14.550	120.900	*	–
19	Philippines	PHILIPPINE SEA	1840	3	22	35				12.900	123.900	6.5	–
20	Philippines	PHILIPPINE SEA	1850							20.600	134.800	–	–
21	Philippines	W. LUZON ISLAND	1852	9	16					14.000	120.500	7.5	–
22	Philippines	PHILIPPINE SEA	1854	1	15					20.900	134.800	–	–
23	Philippines	W. LUZON ISLAND	1862	3	4					14.500	121.000	6.0	–
24	Philippines	W. LUZON ISLAND	1863	6	3					14.500	121.000	6.5	–
25	Philippines	SULU SEA	1865	10	13					–	–	–	–
26	Philippines	PHILIPPINES	1865	10	19					13.250	123.500	6.0	–
27	Philippines	SULU SEA	1869	8	16					12.500	123.500	7.0	–
28	Philippines	SULU SEA	1871	4	30					9.203	124.673	*	–
29	Philippines	PHILIPPINES	1872	1	26					16.000	119.000	6.0	–
30	Philippines	E. LUZON ISLAND	1880	7	18					16.000	121.850	7.5	–
31	Philippines	PANAY ISLAND	1887	2	2					10.700	122.600	*	–
32	Philippines	MINDORO ISLAND	1889	5	25					13.500	121.000	6.8	0.1
33	Philippines	AGUSAN RIVER	1893	6	21					6.900	125.800	*	–
34	Philippines	SULU SEA	1897	9	20					6.000	122.000	8.6	2
35	Philippines	SULU SEA	1897	9	21	13				6.000	122.000	8.7	7
36	Philippines	SAMAR ISLAND	1897	10	18					12.000	126.000	8.1	–
37	Philippines	E. LUZON ISLAND	1901	9	10					14.000	121.600	7.0	–
38	Philippines	ILLANA BAY, CELEBES SEA	1902	8	21					7.500	123.500	7.3	–
39	Philippines	W. LUZON ISLAND	1905	12	8					11.000	123.500	6.5	–
40	Philippines	SULU SEA	1910	12	30					9.000	125.500	6.2	–
41	Philippines	TAAL, LUZON ISLAND	1911	1	30	54				14.002	120.993	*	3
42	Philippines	PHILIPPINE TRENCH	1911	7	12					9.000	126.000	7.8	–
43	Philippines	W. LUZON ISLAND	1915	11	18					18.000	119.500	6.4	–
44	Philippines	CELEBES SEA	1917	1	31					6.000	125.000	6.4	1.5
45	Philippines	CELEBES SEA	1918	8	15	6				5.500	123.000	8.3	7.2
46	Philippines	MINDANAO ISLAND, PHILIPPINES	1919	1	2					8.000	126.000	7.4	0.44
47	Philippines	PHILIPPINE TRENCH	1921	11	11					8.000	127.000	7.5	–
48	Philippines	CEBU ISLAND	1922	2	27					10.200	124.100	6.3	0.7
49	Philippines	SULU SEA	1922	3	1					9.000	123.250	6.0	–
50	Philippines	MINDANAO ISLAND, PHILIPPINES	1923	3	2					6.500	124.000	7.2	–
51	Philippines	BUTUAN, SULU SEA	1923	7	18					9.300	125.000	5.5	–
52	Philippines	E. MINDANAO ISLAND	1924	4	14					6.500	126.500	8.3	–
53	Philippines	PHILIPPINES	1924	5	6					16.000	118.000	6.5	–
54	Philippines	W. LUZON ISLAND	1924	6	2					–	–	–	–
55	Philippines	E. MINDANAO ISLAND	1924	8	30					8.500	126.500	7.3	–
56	Philippines	W. LUZON ISLAND	1925	5	5					9.300	122.700	6.8	–
57	Philippines	W. LUZON ISLAND	1925	5	25					12.200	122.100	6.3	–
58	Philippines	PHILIPPINE SEA	1925	11	13					13.000	125.000	7.3	–
59	Philippines	SULU SEA	1925	11	25					–	–	–	–
60	Philippines	SULU SEA	1928	6	15					12.400	120.900	7.0	–
61	Philippines	CELEBES SEA	1928	12	19	4				7.000	124.000	7.3	–
62	Philippines	E. MINDANAO ISLAND	1929	6	13					8.500	127.000	7.2	–
63	Philippines	E. SAMAR ISLAND	1933	12	25	9				12.770	124.050	–	–
64	Philippines	SOUTH CHINA SEA	1934	2	14					17.500	119.000	7.9	–
65	Philippines	W. LUZON ISLAND	1937	8	20					14.500	121.500	7.5	–
66	Philippines	TAYABAS BAY, SULU SEA	1939	5	6					13.500	121.250	6.5	–
67	Philippines	SULU SEA	1948	1	24	2				10.500	122.000	8.3	–
68	Philippines	NORTHERN LUZON ISLAND	1949	9	5					17.000	121.500	6.4	0.1
69	Philippines	E. LUZON ISLAND	1949	12	29	1				18.000	121.000	7.2	–
70	Philippines	E. OF MINDANO, PHILIPPINES	1952	3	19					9.500	127.250	7.8	0.33
71	Philippines	**CHILE** CENTRAL CHILE	1960	5	22	32				-39.5	-74.5	9.5	–
72	Philippines	TAAL, LUZON ISLAND	1965	9	28	355				14.002	120.993	–	4.7
73	Philippines	E. LUZON ISLAND	1968	8	1	1				16.500	122.200	7.3	0.16
74	Philippines	LUZON ISLAND	1969	3	21	3				19.077	122.202	–	–
75	Philippines	PHILIPPINE TRENCH	1970	1	10					6.800	126.700	7.6	0.06
76	Philippines	PHILIPPINE SEA	1970	4	7					15.780	121.710	7.3	–
77	Philippines	PHILIPPINE TRENCH	1970	9	30					20.600	122.000	5.3	–
78	Philippines	MINDANAO ISLAND, PHILIPPINES	1972	12	2					6.500	126.600	7.4	0.5
79	Philippines	QUEZON	1973	3	17					13.400	122.800	7.5	1.3
80	Philippines	PHILIPPINE TRENCH	1975	10	31	1				12.540	125.993	7.6	4
81	Philippines	MORO GULF	1976	8	16	4,376				6.262	124.023	8.1	8.5
82	Philippines	MINDANAO ISLAND, PHILIPPINES	1978	6	14					8.249	122.403	6.9	0.03
83	Philippines	PHILIPPINES	1982	1	11					13.752	124.358	7.1	0.1
84	Philippines	LUZON ISLAND	1983	8	17					18.231	120.860	6.6	0.1

A9.3 Tsunami

No.	Country	Name/ Region	Date			Damage				Origin		Magnitude	max. water height
			Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	North	East		
85	Philippines	NORTH OF LUZON ISLAND	1988	6	24					18.606	121.013	5.4	1.03
86	Philippines	PHILIPPINES	1990	2	8					9.755	124.694	6.6	2.1
87	Philippines	CANIGUIN IS.,PHILIPPINES	1990	5						7.000	126.000	–	5
88	Philippines	PHILIPPINES	1992	5	17					7.191	126.762	7.3	6
89	Philippines	PHILIPPINE ISLANDS	1994	11	14	81				13.525	121.067	7.1	7.3
90	Philippines	SAMAR ISLAND	1995	4	21					12.059	125.580	7.2	0.2
91	Philippines	SAMAR ISLAND	1995	4	21					12.047	125.920	6.8	0.2
92	Philippines	TAWI-TAWI, PHILIPPINES	2000	1	26					5.100	120.150	–	20
93	Philippines	MINDANAO ISLAND, PHILIPPINES	2002	3	5					6.033	124.249	7.5	3
94	Philippines	PHILIPPINE ISLANDS	2012	8	31					10.838	126.704	7.6	0.15
1	Thailand	**INDONESIA** OFF W. COAST OF SUMATRA	2004	12	26	8,345	67,007	1000	0.242	3.295	95.982	9.1	–
2	Thailand	**INDIA** LITTLE NICOBAR ISLAND (?)	1955	6	0	500				6.5	94	7.3	

A9.4 Volcano

A9.4 Volcano

No.	Country	Name/ Region	Date			Damage				Location		Volcanic Explosivity Index (VEI)	Hazard Situation (Agent)
			Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	North	East		
1	Indonesia	Krakatau	416							-6.102	105.423	-	W
2	Indonesia	Kelut	1311							-7.930	112.308	3	-
3	Indonesia	Kelut	1334							-7.930	112.308	3	-
4	Indonesia	Kelut	1376							-7.930	112.308	3	-
5	Indonesia	Kelut	1385							-7.930	112.308	3	-
6	Indonesia	Dukono	1550	11						1.680	127.880	3	-
7	Indonesia	Gamkonora	1564	12	31					1.375	127.520	3	-
8	Indonesia	Kelut	1586			10,000				-7.930	112.308	5	-
9	Indonesia	Merapi	1587							-7.542	110.442	4	-
10	Indonesia	Raung	1593							-8.125	114.042	5	-
11	Indonesia	Raung	1597							-8.125	114.042	3	T
12	Pacific Ocean	Banda Api	1598							-4.525	129.871	3	-
13	Indonesia	Gamalama	1608	7	18					0.800	127.325	3	-
14	Pacific Ocean	Banda Api	1615	3						-4.525	129.871	3	-
15	Indonesia	Raung	1638			1,000				-8.125	114.042	3	M
16	Indonesia	Makian	1646	7	19					0.320	127.400	4	-
17	Pacific Ocean	Teon	1659	11	11					-6.920	129.125	4	-
18	Pacific Ocean	Teon	1660	2		3				-6.920	129.125	4	G,T
19	Indonesia	Merapi	1672	8	4	3,000				-7.542	110.442	3	P
20	Indonesia	Gamkonora	1673	5	20					1.375	127.520	5	W
21	Indonesia	Guntur	1690							-7.130	107.830	3	-
22	Pacific Ocean	Serua	1692	6	4					-6.300	130.000	4	L
23	Pacific Ocean	Banda Api	1694	11	20					-4.525	129.871	3	-
24	Indonesia	Cereme	1698							-6.892	108.400	3	-
25	Indonesia	Awu	1711	12	10	3,000				3.670	125.500	3	P
26	Indonesia	Kelut	1716	7	20					-7.930	112.308	2	M
27	Indonesia	Raung	1730							-8.125	114.042	3	M,T
28	Indonesia	Makian	1760	9	22	2,000				0.320	127.400	4	M
29	Indonesia	Gamalama	1771	8	28	35				0.800	127.325	3	T
30	Indonesia	Papandayan	1772	8	12	2,957				-7.320	107.730	3	A
31	Indonesia	Gamalama	1773	2	2					0.800	127.325	2	I
32	Indonesia	Gamalama	1775	8	20	1,300				0.800	127.325	3	P,I
33	Indonesia	Lokon-Empung	1775							1.358	124.792	3	-
34	Indonesia	Dieng Volc Complex	1786			38				-7.200	109.920	2	A
35	Indonesia	Guntur	1800	10	8					-7.130	107.830	-	M
36	Indonesia	Awu	1812	8	6	953				3.670	125.500	3	P,M
37	Indonesia	Tambora	1815	4	5	10,000				-8.250	118.000	7	P,W
38	Indonesia	Ijen	1817	1	24					-8.058	114.242	2	M
39	Indonesia	Raung	1817							-8.125	114.042	4	-
40	Pacific Ocean	Banda Api	1820	6	11					-4.525	129.871	2	-
41	Indonesia	Galunggung	1822	10	8	4,011				-7.250	108.050	5	P,M
42	Indonesia	Merapi	1822	12	27	100				-7.542	110.442	3	-
43	Indonesia	Kelut	1826	10	11					-7.930	112.308	3	M
44	Indonesia	Dieng Volc Complex	1826	10	11					-7.200	109.920	2	-
45	Indonesia	Guntur	1829							-7.130	107.830	2	-
46	Indonesia	Merapi	1832	12	25	32				-7.542	110.442	3	-
47	Indonesia	Kaba	1833	11	24	126				-3.520	102.620	2	M
48	Pacific Ocean	Banda Api	1835	11	1					-4.525	129.871	-	-
49	Indonesia	Peuet Sague	1837	9						4.914	96.329	-	-
50	Indonesia	Gamalama	1838	2	26	4				0.800	127.325	2	T
51	Indonesia	Gamalama	1840	2	2					0.800	127.325	2	-
52	Indonesia	Lamongan	1843	8		4				-8.000	113.342	2	-
53	Indonesia	Soputan	1845	2	8					1.108	124.725	2	-
54	Indonesia	Tangkubanparahu	1846	5	27					-6.770	107.600	2	-
55	Indonesia	Dieng Volc Complex	1847	12	4					-7.200	109.920	2	-
56	Indonesia	Kelut	1848	5	16	21				-7.930	112.308	2	M
57	Indonesia	Awu	1856	3	2	2,806				3.670	125.500	3	P
58	Indonesia	Semeru	1860	4						-8.108	112.920	2	-
59	Indonesia	Makian	1861	12	29	326				0.320	127.400	4	P,I
60	Indonesia	Kelut	1864	1	3	54				-7.930	112.308	2	M
61	Indonesia	Lewotobi	1869	7	7	2				-8.530	122.775	2	-
62	Indonesia	Lamongan	1869	8		8				-8.000	113.342	2	T,A
63	Indonesia	Ruang	1870	8						2.280	125.425	2	-
64	Indonesia	Iliwerung	1870							-8.540	123.590	3	-
65	Indonesia	Ruang	1871	3	3					2.280	125.425	2	W
66	Indonesia	Gamalama	1871	8	7	1				0.800	127.325	2	T
67	Indonesia	Merapi	1872	11	3	200				-7.542	110.442	4	P,T
68	Indonesia	Kelut	1875	1	29					-7.930	112.308	0	m
69	Indonesia	Krakatau	1883	8	27	2,000				-6.102	105.423	6	W,P,I
70	Indonesia	Krakatau	1883	10	10					-6.102	105.423	-	-
71	Indonesia	Krakatau	1884	2						-6.102	105.423	-	-
72	Indonesia	Semeru	1884	12	10	74				-8.108	112.920	2	A
73	Indonesia	Banua Wuhu	1889	9	6					3.138	125.491	2	-
74	Indonesia	Makian	1890	6	29					0.320	127.400	2	-
75	Indonesia	Sorikmarapi	1892	5	21	180				0.686	99.539	2	M
76	Indonesia	Awu	1892	6	7	1,532				3.670	125.500	3	P,M
77	Indonesia	Semeru	1895	5	22					-8.108	112.920	2	-
78	Indonesia	Kelut	1901	5	22					-7.930	112.308	3	-
79	Indonesia	Merapi	1902	12		16				-7.542	110.442	2	P
80	Indonesia	Lewotobi	1907	9	28	1				-8.530	122.775	2	-
81	Indonesia	Kelud	1909	0	0	5,500				-8.108	112.920	2	m
82	Indonesia	Semeru	1911	11	8					-8.108	112.920	3	-

A9.4 Volcano

No.	Country	Name/ Region	Date			Damage				Location		Volcanic Explosivity Index (VEI)	Hazard Situation (Agent)
			Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	North	East		
83	Indonesia	Semeru	1913	6	23					-8.108	112.920	2	-
84	Indonesia	Banua Wuhu	1918	7	18					3.138	125.491	3	-
85	Indonesia	Banua Wuhu	1919	4	3					3.138	125.491	-	-
86	Indonesia	Kelud	1919	5	0	5,000				-7.930	112.308	4	M
87	Indonesia	Merapi	1920	7	25	33				-7.542	110.442	3	P
88	Indonesia	Papandayan	1923	3	11	1				-7.320	107.730	1	G
89	Indonesia	Paluweh	1927	8	7					-8.320	121.708	-	-
90	Indonesia	Krakatau	1928	3	28					-6.102	105.423	-	-
91	Indonesia	Dieng Volc Complex	1928	5	13	40				-7.200	109.920	2	T
92	Indonesia	Paluweh	1928	8	4	98				-8.320	121.708	3	W,T
93	Indonesia	Krakatau	1930	3	17					-6.102	105.423	2	-
94	Indonesia	Merapi	1930	11	25	1,369				-7.542	110.442	3	P
95	Indonesia	Merapi	1931	12	13	1,300				-	-	-	-
96	Indonesia	Dieng Volc Complex	1939	10	13	10				-7.200	109.920	1	T
97	Indonesia	Karangetang [Api Siau]	1940	6	20	1				2.780	125.480	2	-
98	Indonesia	Semeru	1941	9	21					-8.108	112.920	2	-
99	Indonesia	Dieng Volc Complex	1944	12	4	117				-7.200	109.920	2	T
100	Indonesia	Semeru	1946	2		6				-8.108	112.920	2	F
101	Indonesia	Semeru	1946	10	29					-8.108	112.920	2	-
102	Indonesia	Iliwerung	1948	4	7					-8.540	123.590	2	-
103	Indonesia	Semeru	1950	8	28	6				-8.108	112.920	1	P
104	Indonesia	Merapi	1951	8	31	1,300				-7.930	112.308	3	0
105	Indonesia	Merapi	1953	3	23	64				-7.542	110.442	3	P
106	Indonesia	Sirung	1953	6		5				-8.510	124.148	0	-
107	Indonesia		1954	1	0	37				-	-	-	-
108	Indonesia	Merapi	1957	6	25	6				-7.542	110.442	2	P
109	Indonesia	Mahawu	1958	7	12	1				1.358	124.858	2	M
110	Indonesia	Gamalama	1962	12	31	5				0.800	127.325	2	-
111	Indonesia	Agung	1963	1	3	1,584	78,000			-8.342	115.508	4	P,T,M,A
112	Indonesia	Semeru	1963	5	5	106				-8.108	112.920	2	T
113	Indonesia	Batur	1963	9	5	2				-8.242	115.375	2	-
114	Indonesia	Paluweh	1964	1	1	1				-8.320	121.708	2	-
115	Indonesia	Dieng Volc Complex	1964	12	13	114				-7.200	109.920	1	-
116	Indonesia	Kelud	1966	4	25	1,000	5,060			-7.930	112.308	4	M,m,P
117	Indonesia	Awu	1966	8	12	88	42,000			3.670	125.500	4	P,M,I
118	Indonesia	Merapi	1967	1	12	3				-7.542	110.442	3	P
119	Indonesia	Semeru	1967	8	31	3				-8.108	112.920	3	M
120	Indonesia	Semeru	1968	1		372				-8.108	112.920	2	m
121	Indonesia	Iya	1969	1	28		250,000	0.2		-8.880	121.630	3	T,m
122	Indonesia	Semeru	1973	1		12				-8.108	112.920	2	M
123	Indonesia	Paluweh	1973	1						-8.320	121.708	3	-
124	Indonesia	Iliwerung	1973	12	5	2				-8.540	123.590	2	W
125	Indonesia	Karangetang [Api Siau]	1974	2	11	4				2.780	125.480	3	A
126	Indonesia	Marapi	1975	1		80				-0.381	100.473	2	M
127	Indonesia	Semeru	1976	8	31	40				-8.108	112.920	2	M
128	Indonesia	Karangetang [Api Siau]	1976	9	15	1				2.780	125.480	2	P
129	Indonesia	Sinila	1979	2	20	175	28,000			-7.200	109.920	1	G
130	Indonesia	Merapi	1979	5	0	82				-	-	-	-
131	Indonesia	Gamalama	1980	9	4		52,235			-	-	-	-
132	Indonesia	Semeru	1981	3	2	192	5,000			-	-	-	-
133	Indonesia	Paluweh	1981	9	5					-8.320	121.708	2	P
134	Indonesia	Galunggung	1982	4	5	30	300,000	160	0.11646	-7.250	108.050	4	I,T
135	Indonesia	Soputan	1982	8	26		30,000			-	-	-	-
136	Indonesia	Gamkunoro Volcano	1983	6	28		2,500			-	-	-	-
137	Indonesia	Colo	1983	7	14		7,101	25.5	0.01714	-0.170	121.608	4	0
138	Indonesia	Iliwerung	1983	8	17					-8.540	123.590	1	W
139	Indonesia	Gamalama	1983	9	9		6,334	149.69	0.10059	-	-	-	-
140	Indonesia	Soputan	1984	5	25		6,000			-	-	-	-
141	Indonesia	Merapi	1984	6	15		5,000			-	-	-	-
142	Indonesia	Karangetan	1984	9	5		17,000			-	-	-	-
143	Indonesia	Sangeang	1985	7	30		1,078			-	-	-	-
144	Indonesia	Merapi	1986	10	15	1				-7.542	110.442	2	M
145	Indonesia	Sirung	1987	12	1					-8.510	124.148	-	-
146	Indonesia	Mandosawu	1987	12	28		13,000			-	-	-	-
147	Indonesia	Banda Api	1988	5	9	7	10,000			-4.525	129.871	3	T,L
148	Indonesia	Kiebessy	1988	7	17		1,570			-	-	-	-
149	Indonesia	Soputan	1989	4	23		3,000			-	-	-	-
150	Indonesia	Kelud	1990	2	10	33	10,265	8	0.00289	-7.930	112.308	4	T,P
151	Indonesia	Lokon	1991	10	24		7,679	1	0.00033	1.358	124.792	1	T,P
152	Indonesia	Karangetang [Api Siau]	1992	5	11	6				2.780	125.480	1	P
153	Indonesia	Damar	1993	1	21	1	3,012			-	-	-	-
154	Indonesia	Karangetang	1993	1	25	2	452			-	-	-	-
155	Indonesia	Krakatau	1993	6	13	1				-6.102	105.423	1	T
156	Indonesia	Semeru	1994	2	3	7	2,000			-	-	-	-
157	Indonesia	Marapi	1994	7	16	1				-0.381	100.473	2	T
158	Indonesia	Barujari	1994	11	3	31				-	-	-	-
159	Indonesia	Merapi	1994	11	22	58	2,722			-7.542	110.442	3	0
160	Indonesia	Semeru	1996	5	5	1				-8.108	112.920	2	P
161	Indonesia	Merapi	1997	1	17	1	3,000			-	-	-	-
162	Indonesia	Karangetang [Api Siau]	1997	4	17	3				2.780	125.480	1	P
163	Indonesia	Merapi	1998	7	11		6,000			-	-	-	-
164	Indonesia	Karangetang [Api Siau]	2002	1	3					2.780	125.480	3	M

A9.4 Volcano

No.	Country	Name/ Region	Date			Damage				Location		Volcanic Explosivity Index (VEI)	Hazard Situation (Agent)
			Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	North	East		
165	Indonesia	Papandayan	2002	11	11		5,000			–	–	–	–
166	Indonesia	Egon	2004	1	29		4,000			–	–	–	–
167	Indonesia	Awu	2004	6	1		16,828			–	–	–	–
168	Indonesia	Bromo	2004	6	8	2	20,005			-7.942	112.950	2	T
169	Indonesia	Egon	2004	9	4		2,100			–	–	–	–
170	Indonesia	Talang	2005	4	12		26,000			–	–	–	–
171	Indonesia	Merapi	2006	4	18		11,000			–	–	–	–
172	Indonesia	Merapi	2006	6	14	2				-7.542	110.442	1	
173	Indonesia	Gamkonora	2007	7	9		9,758			–	–	–	–
174	Indonesia	Kelud	2007	10	16		22,154			–	–	–	–
175	Indonesia	Egon	2008	4	15		600			–	–	–	–
176	Indonesia	Karangetang [Api Siau]	2010	8	6	4				2.780	125.480	3	
177	Indonesia	Sinabung	2010	8	29	1	15,060			3.170	98.392	0	0
178	Indonesia	Merapi	2010	10	24	322	137,140			-7.542	110.442	0	0
179	Indonesia	Tengger Caldera	2010	12	28					-7.942	112.950	–	–
180	Indonesia	Merapi	2011	1	3	1				-7.542	110.442	–	M
181	Indonesia	Karangetang [Api Siau]	2011	3	18					2.780	125.480	–	–
182	Indonesia	Lokon-Empung	2011	7	11		6,000			1.358	124.792	0	0
183	Indonesia	Gamalama	2011	12	4	3	2,373			0.800	127.325	3	m
184	Indonesia	Merapi	2013	2	12	1				-7.542	110.442	–	M
185	Indonesia	Paluweh	2013	2						-8.320	121.708	–	
1	Philippines	Taal	-3580							14.002	120.993	6	
2	Philippines	Pinatubo	-3550							15.130	120.350	6	
3	Philippines	Pinatubo	-1050							15.130	120.350	6	
4	Philippines	Taal	1716	9	24					14.002	120.993	4	
5	Philippines	Taal	1749	8	11					14.002	120.993	3	
6	Philippines	Taal	1754	5	13	12				14.002	120.993	4	W,T
7	Philippines	Mayon	1766	7	20	49				13.257	123.685	3	m
8	Philippines	Mayon	1800	10	30					13.257	123.685	2	
9	Philippines	Mayon	1814	2	1	1,200				13.257	123.685	4	P,M,E
10	Philippines	Mayon	1853	7	13	34				13.257	123.685	3	P
11	Philippines	Mayon	1858	1						13.257	123.685	2	P
12	Philippines	Hibok-Hibok	1871	4	30					9.203	124.673	2	
13	Philippines	Mayon	1871	12	8	3				13.257	123.685	3	P
14	Philippines	Ragang	1873	1	16					7.670	124.500	2	
15	Philippines	Taal	1874	7	19					14.002	120.993	2	
16	Philippines	Mayon	1887	3	9	15				13.257	123.685	3	T
17	Philippines	Mayon	1897	5	23	350				13.257	123.685	3	P,T,M
18	Philippines	Taal	1911	1	31	1,335	199			14.002	120.993	4	P,W
19	Philippines	Mayon	1928	1						13.257	123.685	3	P
20	Philippines	Bulusan	1933	12	25					12.770	124.050	2	
21	Philippines	Mayon	1938	6	5					13.257	123.685	2	
22	Philippines	Mayon	1947	1	7					13.257	123.685	2	
23	Philippines	Hibok-Hibok	1948	9	1	68				9.203	124.673	3	P
24	Philippines		1950	9	0	84							
25	Philippines	Hibok-Hibok	1951	12	4	500				9.203	124.673		
26	Philippines	Ambalatungan Group	1952			12				17.320	121.100	1	
27	Philippines	Hibok-Hibok	1954			2				9.203	124.673		m
28	Philippines	Taal	1965	9	28	355	58,785	10		14.002	120.993	4	P,W
29	Philippines	Mayon	1968	4	20	3	51,000	5		13.257	123.685	3	M,P
30	Philippines	Didicas	1969	3	21					19.077	122.202	2	W
31	Philippines	Kanlaon	1969	10	5		1,700						
32	Philippines	Taal	1976	9	3		11,510	0.679	0.0011	14.002	120.993		
33	Philippines	Mayon	1978	5	0		25,000			13.257	123.685		
34	Philippines	Bulusan	1978	7	29		1,000			12.770	124.050	2	
35	Philippines	Mayon	1981	6	30	200				13.257	123.685		m
36	Philippines	Mayon	1984	9	10		70,000			13.257	123.685	3	M
37	Philippines	Taal	1991	4	0		3,800			14.002	120.993		
38	Philippines	Poon Bato	1991	4	5		2,000			14.002	120.993		
39	Philippines	Pinatubo	1991	6	9	640	1,036,065	211	0.178	15.130	120.350	6	P,m,I
40	Philippines	Taal	1992	2	14		1,578			14.002	120.993		
41	Philippines	Pinatubo	1992	7	12	6				15.130	120.350	1	m
42	Philippines	Mayon	1993	2	6	79	165,009	0.488	0.0004	13.257	123.685	2	P
43	Philippines	Pinatubo	1995	7	29		2,500			15.130	120.350		
44	Philippines	Mayon	2000	2	24		68,426	2.214	0.0012	13.257	123.685		
45	Philippines	Mayon	2001	5	24		25,576	0.792	0.0004	13.257	123.685		
46	Philippines	Mayon	2001	7	25		57,645	1.788	0.0009	13.257	123.685		
47	Philippines	Bulusan	2006	6	7	1				12.770	124.050	2	
48	Philippines	Mayon	2006	7	13	1,266				13.257	123.685	2	m
49	Philippines	Mayon	2006	8	13		43,849			13.257	123.685		
50	Philippines	Bulusan	2007	7	31		14,036			12.770	124.050		
51	Philippines	Mayon	2009	12	14		47,137			13.257	123.685		
52	Philippines	Bulusan	2010	11	9		14,161			12.770	124.050		
53	Philippines	Bulusan	2011	2	21		32,616			12.770	124.050	2	
54	Philippines	Taal	2011	3	17		1,315			14.002	120.993		

A9.5 Cyclone (Typhoon) and Meteorological Hazard

A9.5 Cyclone

No.	Country	Disaster Type	Cause/ Sub Type (name)	Disaster Start			Disaster End			Damage				Affected Area		Hazard Situation	Affected Arra (km2)	Affected Region
				Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	Latitude	Logitude			
1	Cambodia	Cyclone		2009	11	2	2009	11	3	2								
2	Cambodia	Cyclone		2009	9	29	2009	9	30	17	178091	0	0.00000%	107.98	14.90	5.59	49030	Central Coastal Vietnam, Kambong Thom province, Cambodia
3	Cambodia	Cyclone		1997	11	1	1997	11	4	25		0.01	0.00012%					
4	Cambodia	TC		1994	7	30	1994	8	8			0	0.00000%			5.60	40130	Provinces: Kampang Speu, Kandal, Western Pursat, Northwestern Battambang
1	Indonesia	TC		2004	3	30	2004	3	30		1315							Cijeruk, Cipelang, Warung ...
2	Indonesia	LS		2004	2	3	2004	2	5	4	2400							East Java, West Nusa Teng ...
3	Indonesia	TC		1998	11	17	1998	11	22							5.53	56180	East and West Nusa Tenggara
4	Indonesia	TC		1989	1	17	1989	1	27							5.88	68880	Sumatra – Bengkulu, Riau
5	Indonesia	Storm		1985	2	0	1985	2	0		10000							Bandung region
6	Indonesia	TC		1982	1	0	1982	1	0	2	123							Slemen (Central Java)
7	Indonesia	TC		1980	2	15	1980	2	15		800							West Java
8	Indonesia	TC		1977	7	30	1977	7	30	1	3060							Central Java
9	Indonesia	Storm		1976	12	0	1976	12	0	25								
10	Indonesia	Storm		1974	1	0	1974	1	0	10	2000							Situbondo (West Java)
11	Indonesia	TC		1973	6	0	1973	6	0	1650								Flores
12	Indonesia	TC		1956	12	0	1956	12	0	300								
1	Lao PDR	Cyclone		2009	10	1	2009	10	1	16	128887	100	0.69425%					
2	Lao PDR	Cyclone		1995	8	1	1995	8	1	26	1000000							
3	Lao PDR			1993	7		1993	7		8	120	302.151	8.21063%					
4	Lao PDR	Cyclone		1992	7	10	1992	7	10	22	268877	3.65	0.10732%					
5	Lao PDR			1991			1991				38315	0.15	0.00483%					
1	Malaysia	Storm		2004	11	6	2004	11	6	1	40000							
2	Malaysia	Storm		2004	7	16	2004	7	16		1000							
3	Malaysia	Storm		2002	3	30	2002	3	30	2	153							
4	Malaysia	Storm		2000	9	27	2000	9	27		500							
5	Malaysia	Cyclone		1997	8	23	1997	8	27	2	2115							
6	Malaysia	Cyclone		1997	8	21	1997	8	21	68	137418							
7	Malaysia	Cyclone		1996	12	26	1996	12	28	270	4176	52	0.02980%					
8	Malaysia	Storm		1968	1	7	1968	1	7	21	10000							
1	Myanmar	Cyclone		2010	10	22	2010	10	22	45	260049	57	0.07426%					
2	Myanmar	Cyclone		2008	5	2	2008	5	3	1E+05	2420000	4000	5.89997%					
3	Myanmar	Cyclone		2006	4	29	2006	5	5	34	60106							
4	Myanmar	Cyclone		2004	5	19	2004	5	19	236	25000	0.688	0.00171%					
5	Myanmar	Cyclone		1994	5	2	1994	5	2	17	64970	10	0.05688%					
6	Myanmar	Cyclone		1982	5	4	1982	5	4	11	36000							
7	Myanmar	Cyclone		1978	5	17	1978	5	17		132000							
8	Myanmar	Cyclone		1975	5		1975	5		200								
9	Myanmar	TC		1902	5	4	1902	5	4	600								
10	Myanmar	TC		1926	5	19	1926	5	19	2700	40000							
11	Myanmar	TC		1923	5	7	1923	5	7	6								
12	Myanmar	TC		1936	4	21	1936	4	21	1000	150000							
13	Myanmar	TC		1968	5	10	1968	5	10	1070	90000	2.5						
14	Myanmar	TC		1967	10	23	1967	10	23	178	27319	3.2						
15	Myanmar	TC		1967	5	16	1967	5	16	100	130200	5						
16	Myanmar	TC		1965	10	23	1965	10	23	100	500000	1						
17	Myanmar	TC		1963	5	25	1963	5	25		200							
1	Philippines	Cyclone		2012	10	25	2012	10	25	36	15000							
2	Philippines	Cyclone		2012	10	3	2012	10	3		322							
3	Philippines	Cyclone		2012	9	21	2012	9	24	4	7921							
4	Philippines	Cyclone		2012	9	13	2012	9	14	1	1234							
5	Philippines	Cyclone		2012	8	20	2012	8	21	11	5607	0.099	0.00002%					
6	Philippines	Cyclone		2012	8	17	2012	8	17	4								
7	Philippines	Cyclone		2012	7	31	2012	8	7	58	949086	9.821	0.00236%					
8	Philippines	Cyclone		2011	12	15	2011	12	18	1439	1150300	38.082	0.00974%					
9	Philippines	Cyclone		2011	10	13	2011	10	13	11	75638							
10	Philippines	Cyclone		2011	10	1	2011	10	1	25	1116775	2.655	0.00068%					
11	Philippines	Cyclone		2011	9	24	2011	9	24	103	3030846	344.173	0.08800%					
12	Philippines	Cyclone		2011	8	27	2011	8	29	43	403230	34.452	0.00881%					
13	Philippines	Cyclone		2011	8	2	2011	8	2	11	8423	0.059	0.00002%					
14	Philippines	Cyclone		2011	7	26	2011	7	27	84	1108224	63.258	0.01617%					
15	Philippines	Cyclone		2011	6	21	2011	6	25	20	1700089	12.869	0.00329%					
16	Philippines	Cyclone		2011	6	19	2011	6	24									
17	Philippines	Cyclone		2011	6	9	2011	6	10	9	1152							
18	Philippines	Cyclone		2011	5	20	2011	5	29		446907	0.431	0.00011%					
19	Philippines	Cyclone		2011	5	8	2011	5	11	37	430092	31.259	0.00799%					
20	Philippines	Cyclone		2010	10	18	2010	10	18	35	2009026	275.745	0.07482%					
21	Philippines	Cyclone		2010	8	9	2010	8	9	31	1045		0.00000%					
22	Philippines	TS	Basyang (Conson)	2010	7	12	2010	7	15	146	585474	8.675	0.00235%	121.47	17.10	5.32	34780	Luzon, Laguna Province, 27 out of 30 towns flooded
23	Philippines	Cyclone		2009	11	25	2009	11	25	4	48142	0.012	0.00000%					
24	Philippines	TS	Mirinae	2009	10	30	2009	11	4			0		107.66	14.91	6.05	124900	Bicol, Southern Tagalog and Metro Manila
25	Philippines	Cyclone		2009	10	28	2009	10	28	39	802175	15.194	0.00450%					
26	Philippines	Typhoon	Parma	2009	10	2	2009	10	17			0		121.42	17.57	6.04	34500	Northern Luzon
27	Philippines	Cyclone		2009	9	29	2009	10	10	512	4478491	583.379	0.17265%					
28	Philippines	Cyclone		2009	9	24	2009	9	27	501	4901763	237.489	0.07028%	120.75	14.87	5.55	25300	Mindanao, Manilla and surrounding provinces
29	Philippines	Cyclone		2009	9	12	2009	9	13	3	48333							
30	Philippines	Cyclone		2009	9	8	2009	9	9	15	388373	6.303	0.00187%					
31	Philippines	Cyclone		2009	9	2	2009	9	8	1	95700			121.37	17.23	5.86	36440	
32	Philippines	Cyclone		2009	8	4	2009	8	8	26	94229	25	0.00740%	121.44	17.87	4.87	24550	Luzon
33	Philippines	Cyclone		2009	8	1	2009	8	3	14	221422	2888	0.85469%					
34	Philippines	Cyclone		2009	7	23	2009	7	26	16	110405	4.281	0.00127%					
35	Philippines	TC		2009	7	18	2009	7	18	5	248058			121.35	17.12	5.15	47240	Northerrn Philippines, northern Ilocos Norte province,Manila
36	Philippines	Cyclone		2009	5	15	2009	5	15		100	0.005	0.00000%					
37	Philippines	TC		2009	5	7	2009	5	10	77	401007	30.342	0.00898%	121.36	18.03	5.28	21370	Luzon
38	Philippines	TS	Heavy Rain	2009	1	3	2009	1	13			0		125.04	8.45	5.60	36190	Mindanao, Gingoog City, Iligan, Cagayan de Oro.
39	Philippines	Cyclone		2008	11	6	2008	11	11	19	474							
40	Philippines	Cyclone		2008	9	29	2008	9	29	1	27683							
41	Philippines	Cyclone		2008	9	22	2008	9	22	37	46132	7.42	0.00224%					
42	Philippines	Cyclone		2008	8	22	2008	8	22	38	429463	33.87	0.01023%					
43	Philippines	Cyclone		2008	8	4	2008	8	4	2	4498							
44	Philippines	TS	Fung-wong	2008	7	28	2008	7	29	10	22081	0.04	0.00001%	120.97	23.35	5.39	61670	Northern Luzon, Taiwan, western Japan
45	Philippines	Cyclone		2008	7	18	2008	7	18	2	31130	0.147	0.00004%					
46	Philippines	Typhoon	Fenshen	2008	6	21	2008	6	23	644	4785460	284.694	0.08596%	122.27	11.63	5.90	178300	Central portion of the archipelago
47	Philippines	TC		2008	5	18	2008	5	18	64	1496668	99.174	0.02995%	120.56	17.12	4.87	14850	Northwestern Luzon – Pangasinan, Zambales, Benguet, La Union and the Ilocos provinces. Dagupan, Bugallon, San Fabian, Sta. Cruz, Catacdang Bonuan, Subic, Buguias. Lingayen, Calasiao, Infanta, Mangaldan, San Carlos, Urdaneta, Baguio City

A9.5 Cyclone

No.	Country	Disaster Type	Cause/ Sub Type (name)	Disaster Start			Disaster End			Damage				Affected Area		Hazard Situation	Affected Arra (km2)	Affected Region
				Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	Latitude	Logitude			
48	Philippines	TC		2008	5	13	2008	5	13	1	8390	0.28	0.00008%	122.88	9.88	5.35	24920	Negros Occidental – Ilog, Purok Embarkadero, Kabankalan City, San Enrique, Cauayan, Hinobaan. Antique Western Visayas – Barbaza Central Visayas – Bayawan, Bais City Panay – Iloilo: Pavia, Lambunao and Dumangas. Arevalo, La Paz, Jaro Mindanao – Sultan Kudarat: Lambayong, Esperanza. Sarangani: Maitum, Kiamba, Zamboanga
49	Philippines	Cyclone		2008	4	13	2008	4	13	1		16	0.00483%					
50	Philippines	TC		2007	11	25	2007	12	2	29	443115	5	0.00161%	122.01	17.08	5.43	33590	Luzon – Apayao, Isabela, Cagayan, Pangasinan and Aurora. Camarines Sur, Camarines Norte, Ilocos Norte. Towns – Palanan, Ilagan, Tumauini, Pagudpud, Conner, Piat, Tuao and Rizal. Bacarra and Sarrat.
51	Philippines	TC		2007	11	18	2007	11	23	20	35333	1	0.00032%	124.83	124.83	4.83	11140	Central Visayans and Northern Mindanao regions. Iligan city. City of Surigao and the province of Surigao del Norte, Tagana-an, Placer. Cebu city. Lanao Del Norte. Misamis Oriental – Lugait. South Cotabato – Polomolok
52	Philippines	TC		2007	11	4	2007	11	6	8	33884	2.971	0.00096%	121.76	17.57	4.89	25810	Luzon – Isabela (San Mateo), Cagayan (Ilagan), Kalinga, Ifugao
53	Philippines	Cyclone		2007	9	29	2007	9	30	11	12515	0.26	0.00008%					
54	Philippines	Cyclone		2007	9	29	2007	10	12	8	2000							
55	Philippines	Cyclone		2007	9	18	2007	9	18	1	64000							
56	Philippines	Cyclone		2007	9	17	2007	9	25	2	30000							
57	Philippines	TC		2007	8	17	2007	8	24	3	380000	0.492	0.00016%	119.91	27.00	6.74	460400	Philippines – Central Luzon, the Cagayan Valley, southern Luzon provinces and the Bicol region – Metro Manila area, Pasay, Paranaque, Makati, Taguig, Manila, Malabon, Valenzuela and Quezon. Pampanga. Rizal, Batangas, Laguna and Cavite ---Taiwan – Yunlin, Changhua, Kaohsiung and Pingtung counties. Hualien, Taitung, Haocha in Pingtung County ---China – Fujian (Yongfeng county, Hui'an county, Fuzhou, Jiaocheng). Zhejiang (Wenzhou). Hunan (Yongxing, Chenzhou, Zhuzhou) Jiangxi.
58	Philippines	TC		2007	8	8	2007	8	13	7	921462	0.492	0.00016%	121.09	14.67	4.39	4110	Southern and central Luzon – metro Manila area, Malabon, Pateros. Quezon City. Bulacan. Antipolo City, Zambales, Baguio City
59	Philippines	Cyclone		2006	12	11	2006	12	11	42	327542							
60	Philippines	TC		2006	11	30	2006	12	8	1399	2562517	66.4	0.02342%	106.74	10.33	5.61	45660	Philippines – Bicol Region – Albay province – Padang, Legazpi city. Daraga, Guinobatan Catanduanes Island – Mindoro Island – ---Vietnam – provinces: Ba Ria Vung Tau, Ben Tre, Phu Yen, Binh Thuan, Binh Dinh, Vinh Long, Tien Giang. Phu Quy island
61	Philippines	Cyclone		2006	11	13	2006	11	13	6	21260							
62	Philippines	Cyclone		2006	10	30	2006	11	1	34	283021	9.077	0.00320%	121.82	17.02	4.86	23980	Luzon Island: Isabela (Ilagan, Dinapigue, Jones, Cauayan City). Neuva Vizcaya (Kasibu). Benguet (Bugias). Kalinga. Aurora. La Union. Cagayan (Tuao). Baguio city
63	Philippines	TC		2006	9	27	2006	10	6	228	3842406	113	0.03985%	107.21	16.68	5.84	69820	Philippines – Luzon Island – provinces: Laguna (Santa Rosa), Cavite (General Trias, Kawit, San Francisco), Quezon, Albay, Rizal. Bicol region. Manila area. Calauan. Sorsogon. Panay Island – Antique province. Barbaza, Tibiao, Iloilo, Maasin, Pavia Leyte – Kananga, Ormoc City Samar – Calbayog area Negros Occidental – Ilog, Kabankalan ---Vietnam – Quang Nam, Quang Binh, Quang Tri, Thua Thien Hue, Nghe An, Ha Tinh. Danang area. Hoi An. Linh Cam, Son Diem
64	Philippines	TC		2006	8	2	2006	8	6	6	15000	135	0.04761%	110.11	21.11	5.91	162800	Philippines – northern Luzon Quirino region China – Provinces – Guangdong (counties: Yangxi, Dianbai, Taishan, Enping, Yangchun) Guangxi. Hainan.
65	Philippines	TC		2006	7	30	2006	8	2			0.64466	0.00023%	120.74	15.86	4.04	2751	Provinces – Tarlac, Zambales and Nueva Ecija. Isabela, Quirino and Pampanga
66	Philippines	TC		2006	7	24	2006	7	28	4	200355	0.471	0.00017%	117.28	26.39	6.24	350900	Philippines – Central Luzon Provinces – Bulacan (San Jose del Monte, Malolos, Bocaue, Obando, Marilao, Balagtas, Meycauayan). Manila (Quezon, Valenzuela, Marikina). Zambales (San Narciso, San Felipe, San Marcelino, San Antonio). Pampanga (San Fernando). Tarlac (Camiling). La Union. Bataan (Dinalupihan, Hermosa). Other islands: Mimaropa (Mindoro, Marinduque, Romblon and Palawan). Southeastern China – Provinces: Fujian (Zhao'an). Jiangxi (Shangyou, Ganzhou, Fuzhou). Guangdong (Wuhua). Hainan. Hunan. Zhejiang. Southern Taiwan – Pingdong County
67	Philippines	TC		2006	7	11	2006	7	19			3328	1.17373%	112.11	24.00	6.92	613200	Philippines – Northern Luzon. Manila, Malabon City, Baguio City, Olongapo City. Ilocos Sur ---China – Hunan Province – Hengyang, Chenzhou, Zixing area, Pingshi. Guangdong – Shaoguan, Lechang, Meizhou, Chaozhou. Dongguan's Changan township. other provinces: Zhejiang, Fujian, Jiangxi, Guangdong and Guangxi ---Vietnam – Bac Can Province: (Ba Be, Pak Nam, Cho Don). other provinces: Lang Son, Vinh Phuc, Cao Bang, Thai Nguyen, Ha Giang.
68	Philippines	Cyclone		2006	7	1	2006	7	17	37	51680	3	0.00106%					
69	Philippines	Cyclone		2006	6	30	2006	8	2	8	476027	0.645	0.00023%					
70	Philippines	TC		2006	5	11	2006	5	12	41	42000	3.328	0.00117%	124.86	11.24	3.82	1660	Leyte – Sogod, Macrohon Luzon: Bicol Region – Albay Province
71	Philippines	Cyclone		2005	9	15	2005	9	22	16	20000	2	0.00077%					
72	Philippines	Cyclone		2005	3	15	2005	3	17	18	11							
73	Philippines	TC		2004	11	30	2004	12	3	8	70488	34	0.01401%			5.98	39970	Eastern Luzon – Quezon Province – Towns: Real, Infanta and General Nakar. Other provinces: Aurora (Dingalan, Baler), Rizal, Nueva Ecija (Gabaldon), Camarines Norte, Bulacan, Cagayan, Isabela, La Union, Quirino.
74	Philippines	TC		2004	11	29	2004	11	30	1619	881023	78.2	0.03222%					
75	Philippines	TC		2004	11	23	2004	11	28	29	2014	0				5.11	21570	Luzon – Aurora province: Dingalan, San Luis, Ma. Aurora. Cagayan province: Tuguegarao, Enrile, Solana, Iguig and Sanchez Mira Nueva Ecija province: Gapan City and San Leonardo
76	Philippines	TC		2004	11	14	2004	11	21	104	838674	6	0.00247%			5.21	14670	Southern Tagalog and Bicol regions. Provinces: Albay, Catanduanes, Camarines Sur, Sorsogon, Masbate, Oriental Mindoro, Bicol.

No.	Country	Disaster Type	Cause/ Sub Type (name)	Disaster Start			Disaster End			Damage				Affected Area		Hazard Situation	Affected Arra (km2)	Affected Region
				Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	Latitude	Logitude			
77	Philippines	TC		2004	8	25	2004	8	26	35	1058849					6.07	38800	Philippines – Luzon – Provinces: Pampanga, Tarlac, Bataan, Bulacan, Pangasinan, Benguet, Rizal, La Union, Nueva Vizcaya, Nueva Ecija, Ifugao. Cities: Metro Manila area. San Mateo. Quezon City, Hermosa, Dinalupihan, Olongapo City, San Fernando, Paniqui, Urdaneta City, Candaba, Arayat, Santo Tomas, Calumpit. Camanava area. ---Central and northern Taiwan – Counties: Hsinchu, Nantou, Taipei, Miaoli, Taichung. Cities: Sanchung, Hsinchuang, Keelung. Chunan and Toufen areas. Jen-ai and Hsinyi area
78	Philippines	TC		2004	6	29	2004	7	13							6.28	84820	Philippines: Luzon – northern areas – Cagayan, Laoag, La Union, Ilocos, Cordillera. Central Mindanao. ---Taiwan: counties: Nantou, Taichung, Chiayi. Taichung City, Pingtung ---North Korea: Kangwon and South Hwanghae provinces
79	Philippines	Cyclone		2004	6	25	2004	7	2	28	385012	19.667	0.00810%					
80	Philippines	Cyclone		2004	6	10	2004	6	10	7	4504							
81	Philippines	Cyclone		2004	5	13	2004	5	19	31	714	1	0.00041%					
82	Philippines	Cyclone		2003	8	30	2003	9	2	1	34289							
83	Philippines	Cyclone		2003	8	20	2003	8	24	1	1156	0.073	0.00003%					
84	Philippines	Cyclone		2003	8	4	2003	8	5		155147	0.661	0.00030%					
85	Philippines	Cyclone		2003	7	30	2003	7	31		3748	0.146	0.00007%					
86	Philippines	TC		2003	7	19	2003	7	23	21	14280	26.468	0.01188%			5.50	63740	Northern Luzon – Provinces: Cagayan, Isabela, Nueva Ecija, Tarlac, Quezon, La Union, Ilocos Norte. Towns and cities: Malabon, Tarlac, Cabanatuan, Guimba, Sto. Domingo, San Manuel, San Clemente, Camiling, La Paz ---Mindanao – Provinces: Maguindanao, North Cotabato, Sultan Kudarat, Libungan
87	Philippines	Cyclone		2003	7	15	2003	7	19	8	116602	1.499	0.00067%					
88	Philippines	TC		2003	6	15	2003	6	18	13	127130	2.455	0.00110%			4.96	22830	Samar Island – Catbalogan Biliran Island – Barangay Aslum, Naval, Biliran city. Leyte – Sorsogon, Albay, Catanduanes and Camarines
89	Philippines	TC		2003	5	26	2003	5	30	51	13909	4	0.00180%			5.12	17430	Northern provinces on Luzon: Pangasinan, Bulacan, Benguet. Cities: Dagupan, Urdaneta, Calasiao, Manila, Quezon, Caloocan, Makati, Pasay, Meycauayan, Pandayan, Calasiao, Sta. Barbara, Taytay, Valenzuela, Malabon, Pasig City.
90	Philippines	TC		2002	8	11	2002	8	14	57	194472	3.34	0.00161%			4.77	11680	Luzon Island – Manila and Rizal Province. Negros Island – Negros Occidental
91	Philippines	TC		2002	7	15	2002	7	23	14	19050	0.238	0.00011%			5.06	12840	Luzon – Provinces: Bulacan, Laguna, Pampanga, Pangasinan. Manila area. Mindanao – Maguindanao Province Negros Island. Visayas.
92	Philippines	TC		2002	7	13	2002	7	13	62	11000	5.664	0.00273%			5.46	20600	Luzon Island – Provinces: Pampanga, Nueva Ecija, Bulacana, Tarlac, Bataan, La Union, Batangas, Pangasinan. Towns: Baguio, Manila area, Quezon City, Navotas and Marikina.
93	Philippines	Cyclone		2002	7	7	2002	7	9	33	700041	1	0.00048%					
94	Philippines	Cyclone		2002	6	28	2002	7	3	7	3000							
95	Philippines	Cyclone		2002	3	20	2002	3	20	42	54631	3.292	0.00158%					
96	Philippines	TC		2001	12	5	2001	12	7	6	54840	0.096	0.00005%			3.92	2800	Visayas region – Cebu: Metro Cebu, Cebu city, Mandaue city, Naga town, Sitio Sapa-Sapa. Leyte: Tacloban City, Abuyog, MacArthur, Palo, Burauen and Dagami. Capiz: Panit-an and Mambusao towns. Negros Occidental.0
97	Philippines	TC		2001	11	8	2001	11	8	290	1060147	22.7	0.01151%			3.56	610	Philippines: Camiguin Island – Mahinog, Catarman, Sagay, Mambajao. Cebu Island – Toledo and Cebu cities Negros Island – Negros Occidental province. Panay Island – Capiz province Cagayan de Oro city on Mindanao Island. Central Vietnam: Phu Yen, Binh dinh, and Quang Ngai Provinces
98	Philippines	TC		2001	9	22	2001	9	27	4	37357	1.407	0.00071%			4.08	6000	Luzon Island – Cagayan province. Towns: Carasi, Solsona, Pasuquin, Laoag City.
99	Philippines	Cyclone		2001	8	17	2001	8	17		295355	0.293	0.00015%					
100	Philippines	TC		2001	7		2001	7		232	1902654	68.565	0.03475%			6.89	205200	Philippines – Luzon Island – Provinces: Pangasinan, La Union, Benguet, Mountain. Cordillera and Ilocos regions. Baguio city. Metro Manilla ---China ---Guangdong Province – Counties: Suixi, Lianjiang, Leizhou and Potou. Cities: Shanwei, Shantou, Jieyang, Huizhou, Meizhou, Zhanjiang. ---Guangxi Province – Guigang, Pingnan, Teng and Wuzhou. Nanning. ---Yunnan Province – Wenshan Zhuang and Miao Autonomous Prefecture. Counties: Wenshan, Jinping. ---Hong Kong – New Territories
101	Philippines	TC		2001	2	17	2001	2	17	55	100084	6	0.00304%			4.38	5960	Mindanao Island – Provinces: Davao del Norte, Surigao del Sur and Agusan del Sur. Bit-os and Hinayhayan
102	Philippines	TC		2000	12	8	2000	12	11			0				3.94	2200	Northern Panay Island – Capiz province
103	Philippines	TC		2000	11	30	2000	12	3	48	164093	1	0.00053%			4.76	14310	Wide areas of Mindanao and the central Philippines – Visayasislands.
104	Philippines	TC		2000	11	3	2000	11	5	94	1747872	31	0.01653%			4.26	6000	Luzon Island – Provinces: Rizal, Laguna, Cagayan and Nueva Vizcaya. Manila area, suburban Taguig
105	Philippines	TC		2000	10	28	2000	10	31	154	2436256	17	0.00907%			4.45	7000	Philippines – Southeastern Luzon: Provinces: Cavite, Sorsogon, Catanduanes, Samar, Albay. Manila and nearby areas
106	Philippines	Cyclone		2000	7	7	2000	7	7	75	1483321	25.763	0.01374%			5.02	11600	Philippines – Luzon Island. western regions of Luzon and central Visayas. Provinces: Pampanga, Bulacan and Bataan. Towns: Manila, Subic Bay Freeport Zone, Baguio, Malolos. Tullahan River. — ---Japan: coastal areas near Tokyo. Izu island chain, Honshu Island. — —Taiwan: eastern coast
107	Philippines	Cyclone		2000	7	5	2000	7	5	11	120000	7.5	0.00400%					
108	Philippines	Cyclone		2000	5	18	2000	5	18	12	235889	1.201	0.00064%			4.97	11740	Island of Luzon – Manila and north. Towns: Valenzuela, 21 towns in the provinces of Bataan, Bulacan, Nueva Ecija and Pampanga north of Manila; Rivers: Tullahan, Marikina
109	Philippines	Cyclone		1999	10	5	1999	10	5	7	41933	1.8	0.00102%					
110	Philippines	Cyclone		1998	12	11	1998	12	11	69	326520	27.399	0.01630%					
111	Philippines	Cyclone		1998	10	21	1998	10	21	332	71							
112	Philippines	Cyclone		1998	10	13	1998	10	18	75	1344619	50	0.02975%					
113	Philippines	Cyclone		1998	9	18	1998	9	18	118	1749436	87.038	0.05179%					
114	Philippines	Cyclone		1997	10	20	1997	10	20	1	4000							
115	Philippines	Cyclone		1997	8	18	1997	8	19	18	53659	5	0.00299%			5.24	19170	Luzon Provinces – Pampanga, Bataan, Zambales, Bulacan, Tarlac, Nueva Ecija
116	Philippines	Cyclone		1997	5	24	1997	5	26	30	309111	2.3	0.00138%			4.51	10760	Luzon – Manilla, Zambales, Rizal, Bulcan, Pampanga, Bataan
117	Philippines	Cyclone		1996	11	6	1996	11	6	12	800	4.15	0.00266%					
118	Philippines	Cyclone		1996	7	15	1996	7	15	26	36828	38	0.02434%					
119	Philippines	Cyclone		1995	12	25	1995	12	25	11	229193							
120	Philippines	Cyclone		1995	11	3	1995	11	3	882	1599588	244	0.16855%					

A9.5 Cyclone

No.	Country	Disaster Type	Cause/ Sub Type (name)	Disaster Start			Disaster End			Damage				Affected Area		Hazard Situation	Affected Arra (km2)	Affected Region
				Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	Latitude	Logitude			
121	Philippines	Cyclone		1995	10	28	1995	11	1	146	348053	30	0.02072%			6.28	209700	Luzon (Quezon), Negros, Panay, Cebu
122	Philippines	Cyclone		1995	10	9	1995	10	26	184	864437	38.1	0.02632%			5.12	7280	Pampanga Province
123	Philippines	TC		1995	9	30	1995	10	3			33	0.02280%			5.88	189600	Luzon: Pampanga, Palayan City, Manila, Batangas Panay: Iloilo Leyte Samar Negros: Bukidnon
124	Philippines	Cyclone		1995	9	4	1995	9	4	20	19655	0.394	0.00027%					
125	Philippines	Cyclone		1995	8	28	1995	8	28	6	195886							
126	Philippines	TC		1995	7	29	1995	7	31		20000	5	0.00345%			4.44	9190	Luzon Provinces: Pampanga, Zambales, Tarlac
127	Philippines	TC		1994	12	19	1994	12	23	49	867923	26.813	0.01979%			5.41	51070	Leyte, Negros (Bacolod), Samar, Cebu, Panay
128	Philippines	Cyclone		1994	10	18	1994	10	22	32	258751	67.4	0.04975%			4.83	13650	Leyte: Tacloban City, Maasin Mindanao: Surigao del Sur – Tandag, Tago
129	Philippines	Cyclone		1994	9	10	1994	9	10	7	54674	3.9	0.00288%					
130	Philippines	TC		1994	8	6	1994	8	10			0				4.96	18140	Batanes Islands Northern Luzon Provinces – Cagayan, Isabela, Aurora
131	Philippines	Cyclone		1994	8	2	1994	8	2	11	14000							
132	Philippines	TC		1994	7	23	1994	8	3							5.42	22000	Northern Luzon Provinces, Mt. Pinatubo, Manila
133	Philippines	Cyclone		1994	7	19	1994	7	19	11	420728	37.6	0.02775%					
134	Philippines	Cyclone		1994	7	15	1994	7	15	39		1.7	0.00125%					
135	Philippines	TC		1994	7	15	1994	7	20			0				4.87	12360	Luzon Provinces: Pampanga, Bataan, Zambales, Bulacan,
136	Philippines	Cyclone		1994	7	7	1994	7	7	3	5300							
137	Philippines	TC		1994	7	1	1994	7	16	17	166585	1	0.00074%			5.41	37090	Northern Luzon Provinces: Cagayan, La Union, Pangasinan, Dagupan City
138	Philippines	Cyclone		1994	6	23	1994	6	23	2	23952							
139	Philippines	Cyclone		1994	4	9	1994	4	9	15	105746							
140	Philippines	TC		1994	1	6	1994	1	6	62	73558	2.4	0.00177%			5.34	44230	Southern Luzon: Sorsogon Province – Manito Visayas Northern Mindanao
141	Philippines	TC		1993	12	27	1993	12	28			7.4	0.00582%			3.40	1260	Mindanao Island – Surigao del Norte province and Butuan City
142	Philippines	Cyclone		1993	12	26	1993	12	26	52	366224	17	0.01338%					
143	Philippines	Cyclone		1993	12	6	1993	12	6	311	1159802	50	0.03934%			5.63	46900	Philippines (Lola followed by Manny) — Southeastern Luzon Island – Camarines Sur province, Naga city, Naga River, Catanduanes Island, Marinduque Island, Mindoro Island, Samar Island. — Southern Vietnam (Lola) – Khanh Hoa and Ninh Thuan provinces. — Southern Thailand (Manny) – Phatthalung Province; Nakhon Si Thammarat
144	Philippines	Cyclone		1993	11	20	1993	11	23	1		2	0.00157%					
145	Philippines	Cyclone		1993	10	4	1993	10	4	124	1941566	188	0.14791%					
146	Philippines	Cyclone		1993	6	26	1993	6	26	2	43735	0.442	0.00035%					
147	Philippines	Cyclone		1993	2		1993	2		28	70000	40	0.03147%					
148	Philippines	TC		1992	10	28	1992	10	30			0				5.23	56290	Philippines: Luzon – Mount Pinatubo, Manila, Quezon city
149	Philippines	Cyclone		1992	8	31	1992	8	31	11	176569							
150	Philippines	Cyclone		1992	8	16	1992	8	16	26	733096	56	0.04599%			6.70	70410	Luzon – Pangasina, Cagayan, Isabela, Nueva Vizcaya, Benguet, La Union
151	Philippines	TC		1992	7	21	1992	7	29			3.6	0.00296%			4.68	5260	Luzon – Nueva Ecija Province
152	Philippines	Cyclone		1992	7	20	1992	7	20	42	134494							
153	Philippines	Cyclone		1992	7	11	1992	7	12	22	5135							
154	Philippines	Cyclone		1991	11	5	1991	11	8	5956	647254	100	0.08435%			5.09	20700	Leyte
155	Philippines	TC		1991	10	28	1991	10	29							5.04	54780	Luzon Provinces – Ilocos Norte, Ilocos Sur, La Union, Pangasinan, Cagayan, Isabela, Quirino, Benguet, Abra, Kalinga-Apayao
156	Philippines	Cyclone		1991	10	27	1991	10	27	65	316038	90	0.07591%					
157	Philippines	Cyclone		1991	7	26	1991	7	26	9	90296							
158	Philippines	Cyclone		1991	7	22	1991	7	22	2	10000	0				4.86	12140	Central Luzon Provinces – Tarlac, Zambales, Pampanga, Bataan, Manila
159	Philippines	Cyclone		1991	7	18	1991	7	18	4	2500							
160	Philippines	Cyclone		1991	7	10	1991	7	10	47	505777	83	0.07001%			4.36	5760	Central Luzon
161	Philippines	Cyclone		1990	11	12	1990	11	16	503	6159569	388.5	0.33735%			5.44	55710	Leyte, Panay, Negros, Cebu, Palawan Islands
162	Philippines	Cyclone		1990	9	8	1990	9	8			0				5.59	96170	North/Central Luzon
163	Philippines	Cyclone		1990	8	30	1990	8	30	85								
164	Philippines	Cyclone		1990	8	28	1990	8	28	85		0				5.75	69900	Luzon – Manila, Benguet, Nueva Viscaya, Nueva Ecija, Bulaca, Pampanga
165	Philippines	Cyclone		1990	6	22	1990	6	22	64	160014	3.6	0.00313%			5.63	71150	Philippines: Luzon – La Union Province Southern Taiwan
166	Philippines	Cyclone		1989	11	22	1989	11	22	11	13050	0.325	0.00030%					
167	Philippines	TC		1989	11	3	1989	11	8			0				4.85	11860	Southern Philippines
168	Philippines	Cyclone		1989	10	14	1989	10	14	30	458679	35.4	0.03289%					
169	Philippines	Cyclone		1989	10	9	1989	10	9	58	736605	59.2	0.05501%			4.42	5320	Northern Luzon Coast – Gonzaga, Santa Ana
170	Philippines	Cyclone		1989	10	2	1989	10	2	147	289191	8	0.00743%					
171	Philippines	TC		1989	9	10	1989	9	12			1.42	0.00132%			5.04	36940	Northern Luzon – Cagayan, Ilocos Sur, Ilocos Norte, Abra, Pangasinan, Cordilleras, Benguet, Kalinga-Apayao, La Union, Zambales
172	Philippines	Cyclone		1989	9	7	1989	9	7	22	140021	4.3	0.00400%					
173	Philippines	TC		1989	7	16	1989	7	20							5.37	46660	Luzon – Ilocos Sur, Ilocos Norte, Cagayan, Isabela, Nueva Vizcaya, La Union, Abra, Mountain Province,
174	Philippines	Cyclone		1989	7	15	1989	7	15	97	486382	61	0.05668%					
175	Philippines	Cyclone		1989	5	15	1989	5	15	13	12937	2.86	0.00266%					
176	Philippines	TC		1988	11	5	1988	11	5	289	1045029	149.06	0.15266%			4.72	10600	Luzon Island – Bicol Peninsula, Camarines Sur province, Pasacao, Pasig in Metro Manilla area. Panay Island – Capiz and Aklan provinces — Palawan Island – Rizal. — Flooding also reported on Cebu, Leyte, Visayas and Romblon islands
177	Philippines	Cyclone		1988	11	1	1988	11	1	41	28913	0.94	0.00096%					
178	Philippines	Cyclone		1988	10	21	1988	10	21	416	3250208	240.5	0.24631%					
179	Philippines	LS		1988	10	21	1988	10	21		20000							
180	Philippines	Cyclone		1988	7	16	1988	7	16	6	117355	11.516	0.01179%					
181	Philippines	TC		1988	6	1	1988	6	6			0				4.30	3300	Luzon Island – Rizal Province, Metro Manila area.
182	Philippines	Cyclone		1988	5	3	1988	5	30	36	56000	1	0.00102%					
183	Philippines	Cyclone		1987	12	14	1987	12	14	22	56380	8.5	0.00961%					
184	Philippines	Cyclone		1987	11	23	1987	11	23	882	1819112	56	0.06333%					
185	Philippines	Cyclone		1987	10	21	1987	10	21	100	78979	25	0.02827%					
186	Philippines	Cyclone		1987	8	13	1987	8	13	5	13336	5.6	0.00633%					
187	Philippines	Cyclone		1987	8	8	1987	8	8	85	1269825	98.6	0.11150%					
188	Philippines	Cyclone		1986	12	20	1986	12	20	16	26722	4	0.00486%					
189	Philippines	Cyclone		1986	10	17	1986	10	17	2	308	36	0.04370%					
190	Philippines	Cyclone		1986	10	10	1986	10	10	4	3134	1.4	0.00170%					
191	Philippines	Cyclone		1986	10	6	1986	10	6	22	82555	1.2	0.00146%					
192	Philippines	Cyclone		1986	9	2	1986	9	2	23	482704	13.15	0.01596%					
193	Philippines	Cyclone		1986	7	9	1986	7	9	109	647313	30.71	0.03728%			5.37	46630	Philippines – Luzon Isla. Provinces: Nueva Ecija, La Union, Cagayan, Tarlac, Pangasinan. low-lying areas in Manila, Baguio. China – Guangdong Province, Jiexi a Puning counties. Lufeng town
194	Philippines	TC		1985	10	19	1985	10	20			0				5.25	89520	Isla of Luzon
195	Philippines	Cyclone		1985	10	15	1985	10	15	81	1183626	62.373	0.08003%					
196	Philippines	Cyclone		1985	9	1	1985	9	1	5	148	0.66	0.00085%					
197	Philippines	Cyclone		1985	6	20	1985	6	20	100	420200	30	0.03849%					
198	Philippines	Cyclone		1984	11	3	1984	11	3	1079	2261900	96.6	0.11837%					
199	Philippines	Cyclone		1984	10	23	1984	10	23	63	2694	0.19	0.00023%					
200	Philippines	Cyclone		1984	9	1	1984	9	1	1399	1786865	216.7	0.26553%					
201	Philippines	Cyclone		1984	8	27	1984	8	27	138	483747	23	0.02818%					

No.	Country	Disaster Type	Cause/ Sub Type (name)	Disaster Start			Disaster End			Damage				Affected Area		Hazard Situation	Affected Arra (km2)	Affected Region
				Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	Latitude	Logitude			
202	Philippines	Cyclone		1983	11	17	1983	11	17	8	18854	2.25	0.00265%					
203	Philippines	LS		1983	9	16	1983	9	16	2	100							
204	Philippines	Cyclone		1983	9	3	1983	9	3	3	1684	0.43	0.00051%					
205	Philippines	Cyclone		1983	7	14	1983	7	14	115	149892	1.64	0.00193%					
206	Philippines	Cyclone		1982	12	2	1982	12	2		85	0.005	0.00001%					
207	Philippines	Cyclone		1982	10	12	1982	10	12	96	64179	32	0.03993%					
208	Philippines	Cyclone		1982	9	5	1982	9	5	65	50008							
209	Philippines	Cyclone		1982	8	25	1982	8	25	70	25967	6.5	0.00811%					
210	Philippines	Cyclone		1982	8	20	1982	8	20	29	36927	4.2	0.00524%					
211	Philippines	Cyclone		1982	7	12	1982	7	12	10	12319	4.5	0.00562%					
212	Philippines	Cyclone		1982	3	23	1982	3	23	151	789031	69	0.08610%					
213	Philippines	Cyclone		1982	3	22	1982	3	22	117	16000							
214	Philippines	Cyclone		1982	3	18	1982	3	18	25	25099	2.4	0.00299%					
215	Philippines	Cyclone		1981	12	25	1981	12	25	250	180000	26	0.03567%					
216	Philippines	Cyclone		1981	11	25	1981	11	25	261	840173	35	0.04801%					
217	Philippines	Cyclone		1981	11	17	1981	11	17	4	5736	0.167	0.00023%					
218	Philippines	Cyclone		1981	9	20	1981	9	20	55	21905	6.7	0.00919%					
219	Philippines	Cyclone		1981	8	16	1981	8	16	5	9721	12.908	0.01771%					
220	Philippines	Cyclone		1981	7	4	1981	7	4		28500							
221	Philippines	LS		1981	7		1981	7		214	32	2	0.00274%					
222	Philippines	Cyclone		1981	6	28	1981	6	28	210	15478	7.609	0.01044%					
223	Philippines	Cyclone		1980	11	6	1980	11	6	101	1004000	102.3	0.15875%					
224	Philippines	Cyclone		1980	7	25	1980	7	25	40	190000							
225	Philippines	Cyclone		1980	7	21	1980	7	21	31	600000	15.4	0.02390%					
226	Philippines	Cyclone		1980	7	19	1980	7	19	36	69237							
227	Philippines	Cyclone		1980	5	7	1980	5	7		3063	0.289	0.00045%					
228	Philippines	Cyclone		1980	3	20	1980	3	20	4	665	0.402	0.00062%					

1	Thailand	TC	Juaning (Nock-ten)	2011	8	4	2011	8	6	18	1000000							Phrae, Chian Mai, Sukhoth ...
2	Thailand	TC	Kammuri (Julian)	2008	8	11	2008	8	20			6.65	0.00121%	103.66	17.31	6.64	219500	Also Burma. Widespread flooding along Mekong floodplain. Vietiane
3	Thailand	TC	Nargis	2008	5	2	2008	5	3		1000							Tak province
4	Thailand	TC	Damrey	2005	9	26	2005	9	30	10	2000	20	0.00449%					Lampang, Chiang Mai, Chia ...
5	Thailand	Storm		2005	5	21	2005	5	21		1500	0.246	0.00006%					Lampang, Nan provinces
6	Thailand	TC	Chanthu (Gener/08W)	2004	6	4	2004	6	21	1	4000							Prae, Nakhon Sawan, Sukho ...
7	Thailand	Storm		2004	5	20	2004	5	23	13	5050							Mae Ramat (Tat province)
8	Thailand	LS		2003	4	11	2003	4	11		5000							Muang, Wiang Chai, Phan, ...
9	Thailand	LS		2002	4	23	2002	4	23		2500							Sam Ngao, Phop Phra distr ...
10	Thailand	LS		2002	1	12	2002	1	12	1	27704	2	0.00058%					Muang, Chiang Saen, Mae C ...
11	Thailand	TC		2001	8	10	2001	8	25			26.4	0.00816%			4.82	4160	Thailand - Lom Sak District of Phetchabun Province, Nam Kor village. Eastern Udon, Chiang Mai, Chiang Ra, Lam Phun, Nong Khai, Phrae and Nan Provinces. --Vietnam North central coast - Provinces: Ha Tinh, Quang Binh, Nghe An.
12	Thailand	Storm		2001	6	27	2001	6	27		150							Muang, La-ngu, Tha Phae, ...
13	Thailand	TC	Kaemi	2000	8	21	2000	8	21	2	41219							Tha Tum, Chom Phra, Samro ...
14	Thailand	TC	Linda	1997	10	1	1997	10	4	152		5	0.00166%					
15	Thailand	TC	Zita	1997	8	19	1997	9	1	46	50394	39.5	0.01309%					Surat Thani Province
16	Thailand	TC	Gloria and Frankie	1996	7	18	1996	8	21	9	343386	150	0.04988%			7.04	314300	Chumphon, Chiang Rai, Nan ...
17	Thailand	TC		1995	8	9	1995	8	9	27								Bangkok
18	Thailand	TC	Harry	1994	8	30	1994	9	7	10		12	0.00480%			6.16	160000	Chiang Rai, Chiang Mai, P ...
19	Thailand	TC	Amy	1994	7	28	1994	8	4	9	10000	8	0.00320%			5.87	124800	Lampang, Nan, Kanchanabur ...
20	Thailand	TC		1994	5	8	1994	5	8		5000							Bangkok
21	Thailand	Storm	Winona	1993	9	29	1993	9	29		25468	25.07	0.01116%					Udon Thani, Khon Kaen, Na ...
22	Thailand	Storm	Lewis	1993	7	11	1993	7	11	4	188448	106.9	0.04761%					Nakhon Phanom, Sakon Nakh ...
23	Thailand	TC		1992	11	29	1992	11	29			0				4.40	25180	6 Southern provinces
24	Thailand	Storm	Forrest	1992	11	12	1992	11	12	3	119787							Surat Thani, Krabi, Phang ...
25	Thailand	TC	Colleen	1992	10	17	1992	10	17		160550							Sisaket province (North)
26	Thailand	TC	Angela	1992	10	16	1992	10	16	3	106109							Ko Samui (Surat Thani pro ...
27	Thailand	Storm		1992	5	19	1992	5	19									
28	Thailand	TC		1991	8	18	1991	8	21			0				5.29	48320	Provinces - Skahon Nakhon, Nakhon Panom, Mukdahan, Nong Khai, Udon Thani
29	Thailand	TC		1991	8	17	1991	8	17	38	1894238	8.323	0.00454%					North and Northeast
30	Thailand	TC	Ira	1990	10	8	1990	10	26	36		50	0.03051%			5.87	124800	Central and northeastern ...
31	Thailand	TC	Gay	1989	11	3	1989	11	5	458	199000	452	0.31980%			5.55	44230	Chumphon, Nakkhon Si Tham ...
32	Thailand	Storm		1981	12	0	1981	12	0	55		13	0.02214%					South
33	Thailand	TC	Kelly	1981	7	6	1981	7	6		43000							Nan province
34	Thailand	Storm		1978	5	0	1978	5	0	50								
35	Thailand	TC	Harriet	1962	10	27	1962	10	27	769		19						

1	Viet Nam	Typhoon	Son Tinh (Ofel)	2012	10	28	2012	10	28	11	90							Nghe An, Thanh Hoa, Ninh ...
2	Viet Nam	Typhoon	Kai-Tak	2012	8	17	2012	8	17	17	60479							Yen Bai, Vinh Phuc, Quang ...
3	Viet Nam	Typhoon	Vicente	2012	7	0	2012	7	0	10	3							
4	Viet Nam	LS		2011	6	22	2011	6	26	16	63							North
5	Viet Nam	TC	Haima (Egay)	2011	6	19	2011	6	24									
6	Viet Nam	Typhoon	Mindulle	2010	8	24	2010	8	25	14	20700	44	0.01586%					Nghe An, Than Hoa, Ha Tin ...
7	Viet Nam	Typhoon	Chanthu	2010	7	23	2010	7	25	10	12400	0		105.95	22.11	5.31	68320	Northern Viet Nam, Ha Giang province, Lao Cai province
8	Viet Nam	Typhoon	Conson (Basyang)	2010	7	17	2010	7	17	11	1500	0.5	0.00018%					Thanh Hoa, Quang Ngai, Qu ...
9	Viet Nam	TC	Mirinae (Santi)	2009	11	2	2009	11	2	124	500145	280	0.10923%					Binh Dinh, Phu Yen, Khabh ...
10	Viet Nam	TS		2009	10	23	2009	10	26					107.39	15.57	5.05	28280	Central Viet Nam
11	Viet Nam	Typhoon	Pepeng (Parma)	2009	10	14	2009	10	14			0.2	0.00008%					
12	Viet Nam	TC	Ondoy (Ketsana)	2009	9	28	2009	9	29	182	2477315	785	0.30623%	107.98	14.90	5.59	49030	Binh Dinh, Da Nang, Dak L ...
13	Viet Nam	TC	Noul	2008	11	17	2008	11	20	17	8828	1	0.00041%	107.71	15.70	5.16	36160	Phu Yen, Khanh Hoa, Binh ...
14	Viet Nam	TC	Maysak (Quinta-Sony)	2008	11	5	2008	11	5	11								Ho Chi Minh city
15	Viet Nam	Typhoon	Mekkhala	2008	9	30	2008	9	30	18	31680	6.5	0.00269%					Quang Binh, Ha Tinh
16	Viet Nam	Typhoon	Hagupit (Nina)	2008	9	25	2008	9	28	46	58511	63	0.02611%	104.59	21.90	5.77	58980	Lang Son, Son La, Bac Gia ...
17	Viet Nam	TC	Kammuri (Julian)	2008	8	8	2008	8	11	162	57630	120	0.04973%	105.21	22.05	5.48	50404	Lao Cai, Yen Bai, Phu To, ...
18	Viet Nam	TC		2007	11	10	2007	11	21			350	0.15763%	108.44	15.30	5.65	36820	Khanh Hoa, Quang Ngai (Son Tay), Binh Dinh (Tuy Phuoc), Quang Nam (Dien Ban, Duy Xuyen, Hoi An, Dai Loc, Phuoc Son, Tay Giang, Dong Giang), Thua Thien-Hue (Nam Dong, Quang Dien, Phu Vang, Huong Thuy), Ninh Thuan, Quang Tri (Hai Lang, Trieu Phong), Da Nang
19	Viet Nam	TC	Lekima	2007	9	29	2007	10	12	96	685430	191	0.08602%	106.90	17.07	5.87	35430	Quang Binh, Ha Tinh, Quan ...
20	Viet Nam	TC		2007	8	3	2007	8	17			57	0.02567%	108.20	12.34	6.34	98230	provinces: Dak Lak (Cu M'ga and Krong Nang), Lam Dong, Ha Tinh (Huong Khe, Vu Quang), Nghe An, Gia Lai, Phu Yen, Dak Nong and Quang Binh (Chau Hoa, Van
21	Viet Nam	Storm	Durian (Reming)	2006	11	30	2006	12	8	95	1226360	456	0.22920%					Ba Ria-Vung Tau , Ben Tre ...
22	Viet Nam	LS		2006	11	20	2006	11	20	13		10	0.00503%					Quan Ninh province
23	Viet Nam	Storm	Xangsane (Milenyo)	2006	9	27	2006	10	6	71	1467925	624	0.31364%					Ha Tinh, Thua Thien-Hue, ...

A9.5 Cyclone

No.	Country	Disaster Type	Cause/ Sub Type (name)	Disaster Start			Disaster End			Damage				Affected Area		Hazard Situation	Affected Area (km2)	Affected Region
				Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount (Million US$)	Amount /GDP PPP (%)	Latitude	Logitude			
24	Viet Nam	Storm	Bilis	2006	7	11	2006	7	19	17	2000							Bac Can, Lang Son, Vinh P ...
25	Viet Nam	Storm	Chanchu (Caloy)	2006	5	17	2006	5	17	204	600000							
26	Viet Nam	Storm		2006	4	7	2006	4	7	1	1005							Yen Chau district (Son La ...
27	Viet Nam	TC	Kai Tak	2005	11	2	2005	11	4	20	15000	11	0.00618%			4.70	16660	Quang Nam, Quang Ngai (So ...
28	Viet Nam	TC	Damrey	2005	9	27	2005	9	30	75	337660	219.25	0.12312%			6.91	492000	Yen Bai, Tram Tau, Nghia ...
29	Viet Nam	TC	Vicente	2005	9	18	2005	9	19	8	8500	20	0.01123%			4.88	10780	Thanh Hoa, Nghe An, Ha Ti ...
30	Viet Nam	Storm		2005	8	13	2005	8	16	13	6500							Nghe An province
31	Viet Nam	TC	Muifa (Unding/29W)	2004	11	26	2004	11	26	56	500000	23	0.01438%					Hue, Quang Ngai, Quang Na ...
32	Viet Nam	TC	Chanthu (Gener/08W)	2004	6	7	2004	6	11	14	905	7	0.00438%					Bin Dinh, Danang, Quang N ...
33	Viet Nam	TC	Koni	2003	7	23	2003	7	23		5018		0.00000%					North
34	Viet Nam	LS		2002	10	0	2002	10	0		1800	0.1	0.00008%					Long An province
35	Viet Nam	TC	Lingling (Nanang)	2001	11	12	2001	11	12	20	73183	55	0.04551%					Phu Yen, Binh Dinh, Quang ...
36	Viet Nam	TC	Usagi	2001	8	11	2001	8	11	3	10003	3.2	0.00265%					Ha Tinh, Nghe An, Quang B ...
37	Viet Nam	TC	Durian	2001	7	4	2001	7	4	30	117453	25	0.02069%			4.89	12940	Thai Nguyen, Tuyen Quang, ...
38	Viet Nam	TC	Wukong	2000	9	10	2000	9	10	5	6029	21	0.01900%					Thach Ha, Cam Xuyen, Ky A ...
39	Viet Nam	Storm	LS	2000	8	24	2000	8	24		134							Khanh Binh Tay commune (T ...
40	Viet Nam	Storm		2000	8	24	2000	8	24		503	0.035	0.00003%					Rach Gia (Kien Giang prov ...
41	Viet Nam	Storm		2000	8	24	2000	8	24		5730							My tho, Go Gong (Tien Gan ...
42	Viet Nam	TC	Kaemi	2000	8	20	2000	8	20	15	4	5	0.00452%					Quang Binh, Quang tri, Th ...
43	Viet Nam	Storm		2000	7	10	2000	7	10		2005							Can Tho province
44	Viet Nam	Storm		2000	6	12	2000	6	12	3	129							Binh Hoa, Giao Ha commune ...
45	Viet Nam	TC		1999	10	25	1999	11	9			265	0.26152%			6.87	232600	Vietnam: central coastal areas: Thua Thien Hue, Quang Binh, Quang Tri, Quang Ngai, Da Nang, Qaung Nam, Sing Dinh provinces Thailand: Provinces – Prachuap Khiri Khan, Phetchaburi, Ratchaburi, Kanchanaburi, Lop Buri, Phichit, Nakhon Sawan, Satun, Phuket Southern Cambodia: Provinces – Takeo, Kandal, Kampong Speu, Phnom Penh Municipality, Pursat; Phnom Penh district of Dang Kor Malaysia: Kedah, Pulau Pinang, Perak
46	Viet Nam	LS		1999	6	6	1999	6	6	10								Baie d'Halong – Quang Nin ...
47	Viet Nam	TC	Faith & Gil	1998	12	16	1998	12	16	43	84645	15	0.01574%					Khanh Hoa, Phu Yen, Quang ...
48	Viet Nam	TC		1998	11	19	1998	11	24			22	0.02308%			4.81	10720	Quang Nam-Da Nang Province
49	Viet Nam	TC	Chip, Elvis , Dawn	1998	11	13	1998	11	29	283	2440092	93.2	0.09779%			3.98	9570	Quang Binh, Khanh Hoa, Qu ...
50	Viet Nam	LS		1998	5	8	1998	5	8	42	500							Thanh Hoa province
51	Viet Nam	TC	Linda	1997	11	2	1997	11	4	3682	1081127	470	0.52744%			5.75	34010	Ca Mau, Soc Trang, Ben Tr ...
52	Viet Nam	TC	Fritz	1997	9	20	1997	9	29	10	50	5	0.00561%			5.20	15920	Danang, Quang Ngai, Quang ...
53	Viet Nam	TC	Zita	1997	8	22	1997	8	27			5	0.00561%					
54	Viet Nam	TC	Willie	1996	9	21	1996	9	22	9	280000	11	0.01359%					Nghe An, Ha Tinh province ...
55	Viet Nam	TC	Sally	1996	9	9	1996	9	10	1		0.02	0.00002%					
56	Viet Nam	TC		1996	8	14	1996	8	26	194		227	0.28037%					Thanh Hoa, Golfe du Tonki ...
57	Viet Nam	TC	Frankie	1996	7	24	1996	7	24	585	387091	362	0.44712%					Thai Binh, Nam Ha, Ninh B ...
58	Viet Nam	TC		1995	10	8	1995	11	15			90	0.12386%			6.02	26970	Provinces: Quang Ngai, Binh Dinh, Quang Nam-Danang, Quang Tri, Quang Binh ...
59	Viet Nam	TC	Zack	1995	11	1	1995	11	1	16	23051	21.2	0.02918%					Quang Ngai, Binh Dinh, Qu ...
60	Viet Nam	TC	Luke	1994	9	17	1994	9	17	30	11000	45	0.06925%					Thanh Hoa, Ninh Binh, Nam ...
61	Viet Nam	TC	Lola	1993	12	8	1993	12	8	73	25235	50	0.08551%					Ninh Hai, Cam Ranh distri ...
62	Viet Nam	TC	Kyle	1993	11	23	1993	11	23	130	11506	15	0.02565%					Phu Yen, Khanh Hoa, Binh ...
63	Viet Nam	LS		1993	3	16	1993	3	16	3	2016							Tuyen Quang province
64	Viet Nam	TC		1992	10	28	1992	10	31			0				5.44	69560	Vietnam: Quang Binh, Quang Tri; 8 coastal provinces Thailand: Provinces – Surat Thani, Chumphon, Nakhon Si Thammarat
65	Viet Nam	TC	Angela	1992	10	23	1992	10	23	17	32172	18	0.03400%					Between Thua Thien Hue an ...
66	Viet Nam	TC	Chuck	1992	6	29	1992	6	29	14	47186	0.4	0.00076%					Haiphong, Quang Ninh prov ...
67	Viet Nam	TC		1992	6	20	1992	6	24			0				4.73	10790	Provinces – Haiphong, Quang Ninh, Thai Binh, Nam Ha
68	Viet Nam	Storm		1991	12	28	1991	12	28	251	10200	1	0.00210%					Quang Ngai, Quang Nam-Da, ...
69	Viet Nam	TC	Fred	1991	8	17	1991	8	17	17	455921	9.5	0.01997%			5.32	42120	Quang Bin, Ha Tinh, Than ...
70	Viet Nam	TC	Zeke	1991	7	13	1991	7	13	21	776							Quang Ninh Hai Phong
71	Viet Nam	Storm		1991	3	15	1991	3	15	8	10708							Khanh Hoa
72	Viet Nam	TC		1990	11	15	1990	11	15	68								Nghe Tinh
73	Viet Nam	TC		1990	10	23	1990	10	23	15	2000					6.15	82530	Central Eastern Coast
74	Viet Nam	Typhoon		1990	9	22	1990	9	26			0				5.01	20590	Provinces – Quang Nam-Danang, Quang Tri
75	Viet Nam	TC	Becky	1990	8	0	1990	8	0	19	500108							Ky Anh, Quang Trach, Quan ...
76	Viet Nam	TC	Brian, Angela, Dan	1989	10	0	1989	10	0	104	4635762							Nghe Tinh, Binh Tri Thien ...
77	Viet Nam	Typhoon		1989	7	25	1989	7	31							4.88	10730	Vietnam – Thanh Hoa
78	Viet Nam	TC	Irving	1989	7	24	1989	7	24	104	1445491							Thanh Hoa province
79	Viet Nam	TC	Cecil	1989	5	25	1989	5	25	751	336106	21	0.05277%			5.40	18570	Da Nang city (Quang Nam D ...
80	Viet Nam	TC		1988	11	6	1988	11	6	20	720000							Dong Nai, Phu Khanh, Thua ...
81	Viet Nam	TC		1988	10	10	1988	10	10	137	600000							Nghe Tinh
82	Viet Nam	Storm		1987	12	0	1987	12	0	22								
83	Viet Nam	TC	Maury	1987	11	18	1987	11	18	101	937011							Nghia Binh, Phu Khahu Pro ...
84	Viet Nam	TC	Wayne	1986	9	6	1986	9	6	435	2502502							Ha Nam Ninh, Thai Binh, H ...
85	Viet Nam	TC	Cecil	1985	10	23	1985	10	23	798	450257							Binh Tri Thien, Nghe Tinh ...
86	Viet Nam	TC	Agnes	1984	11	0	1984	11	0	134	650705							, Nghe Tinh, Nghia Binh, ...
87	Viet Nam	TC		1984	4	15	1984	4	15	21	1094							100 km East from Hanoi
88	Viet Nam	TC	Georgia	1983	10	5	1983	10	5	80	336544							Ha Nam Ninh, Ha Son Binh, ...
89	Viet Nam	TC	Herbert, Kim, Lex	1983	9	0	1983	9	0	578	845324							
90	Viet Nam	LS		1983	5	0	1983	5	0	76								Central
91	Viet Nam	TC	Nancy	1982	10	18	1982	10	18	70	1300290							Nghe Tinh, Thanh Hoa Prov ...
92	Viet Nam	TC	Ruth	1980	9	15	1980	9	15	176	9027174							Thanh Hoa, Nghe Tinh, Ha ...
93	Viet Nam	TC	Joe	1980	7	23	1980	7	23	132	6624710							Ha Bac, Hai Phong, Hai Hu ...
94	Viet Nam	TC	Sarah	1977	7	22	1977	7	22		1000							Haiphong
95	Viet Nam	TC		1973	11	10	1973	11	10	100	150000							Binh Dinh
96	Viet Nam	TC		1971	10	23	1971	10	23	89								North
97	Viet Nam	TC	Wanda	1971	5	1	1971	5	1	23	50000							Quang Ngai province
98	Viet Nam	TC	Iris	1964	9	0	1964	11	0	7000	700000	50						China sea coast
99	Viet Nam	TC		1956	11	0	1956	11	0	56								
100	Viet Nam	TC		1953	9	26	1953	9	26	1000								Southern coast

A9.6 Landslide

A9.6 Landslide

No	Country	Disaster Sub Type	Cause	Disaster Start			Disaster End			Damage				Affected Region	Reference	Location	
				Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount(Million US$)	Amount/GDP PPP%			North	East
1	Brunei	landslide	Rain	2008	1	3	2008	1	3						PRCC	4.6401	114.4396
2	Brunei	landslide	Rain	2007	1	8	2007	1	8						PRCC	4.9833	114.9170
3	Brunei	landslide	Rain -	2007	2	11	2007	2	11						PRCC	4.4999	114.6667
1	Indonesia	Landslide		1987	5	4	1987	5	4	131	701	1	0.00049%	Padang Panjang (West Suma	EM-DAT	-0.4500	100.4162
2	Indonesia	Landslide	heavy rain	2011	11	30	2011	11	30	34				Majo Kampung Barije distr ...	EM-DAT		
3	Indonesia	Landslide		2011	5	6	2011	5	6	19	4			Garut district (Java Isla ...	EM-DAT	7.2500	107.9095
4	Indonesia	Landslide		2010	10	12	2010	10	12	13	18			Sulawesi Isl.	EM-DAT	-0.0005	120.5318
5	Indonesia	Landslide		2009	11	8	2009	11	8	14				Sulawesi (Celebes)	EM-DAT	-0.1513	120.5277
6	Indonesia	Landslide		2009	1	18	2009	1	18	15	5			Buwung Mas Sakotong villa ...	EM-DAT	-7.3347	115.2426
7	Indonesia	Landslide		2008	5	5	2008	5	5	21				Papua	EM-DAT	-3.4684	139.3263
8	Indonesia	Landslide		2007	1	12	2007	1	14	32	3990			Tahuna (Sangihe Isl., Nor ...	EM-DAT	3.6155	125.4717
9	Indonesia	Landslide		2007	1	9	2007	1	9	11				Jorong Sungai Sariak (Pad ...	EM-DAT		
10	Indonesia	Landslide		2006	12	15	2006	12	15	17				Air Dingin village, Lemba ...	EM-DAT	-2.0176	103.4713
11	Indonesia	Landslide		2006	1	22	2006	1	27	11	3000	10.94	0.00142%	Bali, Lombok	EM-DAT	-7.5557	115.1891
12	Indonesia	Landslide		2006	1	1	2006	1	4	156	8313	27	0.00352%	Sijeruk (Banjarnegara dis ...	EM-DAT	-6.6806	109.7107
13	Indonesia	Landslide		2005	9	2	2005	9	2	25	10			Bukit Gaung (Padang, West ...	EM-DAT		
14	Indonesia	Landslide		2005	2	21	2005	2	21	143		5	0.00071%	Bandung	EM-DAT	-5.0821	107.6095
15	Indonesia	Landslide		2004	4	23	2004	4	23	44	11			Pasaman region (Sumatra I ...	EM-DAT		
16	Indonesia	Landslide		2004	4	22	2004	4	22	13	7			Kidang Pananjung, near Ba ...	EM-DAT		
17	Indonesia	Landslide		2004	3	27	2004	3	27	33	5000			Manimbahoi sub-district, ...	EM-DAT		
18	Indonesia	Landslide		2004	1	23	2004	1	30	29		3.5	0.00054%	Central Java province	EM-DAT	-6.8459	110.1404
19	Indonesia	Landslide		2003	3	31	2003	4	2	76	229548	3.961	0.00066%	Ende, Sikka, East Flores ...	EM-DAT	-5.5123	106.8811
20	Indonesia	Landslide		2003	3	18	2003	3	18	12				Makale, Sa'dan Balusu are ...	EM-DAT	-2.8933	119.8512
21	Indonesia	Landslide		2003	1	31	2003	1	31	10	20			Cantilan village, Kuninga ...	EM-DAT		
22	Indonesia	Landslide		2003	1	29	2003	1	29	21	1760			Garut, Nenggeng, Budi Ate ...	EM-DAT	-6.7500	107.9095
23	Indonesia	Landslide		2002	12	11	2002	12	11	32	5			Pacet (Java Isl.)	EM-DAT		
24	Indonesia	Landslide		2001	10	23	2001	10	23		600			Ayah district	EM-DAT		
25	Indonesia	Landslide		2001	10	30	2001	10	30		310			Seling village (Sadang di ...	EM-DAT	-6.3957	109.6679
26	Indonesia	Landslide		2001	1	22	2001	1	22	63				North Sulawesi province	EM-DAT	0.4960	123.9421
27	Indonesia	Landslide		2001	2	8	2001	2	12	122	23000	10	0.00188%	Cipinas, Lebak district (...	EM-DAT	-5.4317	106.4267
28	Indonesia	Landslide		2000	11	5	2000	11	7	52	19			Purworejo, Purbalingga, K ...	EM-DAT	-6.5268	109.4289
29	Indonesia	Landslide		2000	10	29	2000	11	1	40	56210	43	0.00858%	Cilacap, Banyumas (Centra ...	EM-DAT		
30	Indonesia	Landslide		2000	6	24	2000	6	24		520			Banngai	EM-DAT	-0.3529	123.5491
31	Indonesia	Landslide		2000	2	22	2000	2	24	34		11.6	0.00232%	Brebes District (Java Isl ...	EM-DAT	-5.1231	109.0422
32	Indonesia	Landslide		1999	12	9	1999	12	9	56				Dberang Pallinggam (Sumat ...	EM-DAT		
33	Indonesia	Landslide		1999	1	7	1999	1	7	33	2			Bali Isl.	EM-DAT	-7.5557	115.1891
34	Indonesia	Landslide		1996	10	3	1996	10	3	23	4			Batam Isl.	EM-DAT	1.0796	104.0306
35	Indonesia	Landslide		1992	10	8	1992	10	8	75	37000	5.4	0.00162%	Tasikmalaya, Ciamis, Garu ...	EM-DAT	-6.6628	108.2004
36	Indonesia	Landslide		1991	1	16	1991	1	16	33				Java	EM-DAT		
37	Indonesia	Landslide		1989	1	16	1989	1	16	6	11601	0.341	0.00014%	Solok, Sawahlunto Sijunju ...	EM-DAT	-0.6626	100.7827
38	Indonesia	Landslide		1988	2	6	1988	2	6	43				Java	EM-DAT		
39	Indonesia	Landslide		1983	0	0	1983	0	0	21					EM-DAT		
40	Indonesia	Landslide		1982	6	0	1982	6	0	225	3000			South Sumatra	EM-DAT	-2.6010	103.9083
41	Indonesia	Landslide		1982	1	10	1982	1	10	50				North Sumatra	EM-DAT	1.9922	99.5277
42	Indonesia	Landslide		1981	11	6	1981	11	6		6000			Jogjakarta	EM-DAT	-6.1996	110.3686
43	Indonesia	Landslide		1980	12	0	1980	12	0	100	3010			Talaga	EM-DAT	-5.0114	108.3101
44	Indonesia	Landslide		1979	5	29	1979	5	29	23	6			Ciherang	EM-DAT	-5.2450	107.0973
45	Indonesia	Landslide		1955	4	0	1955	4	0	405					EM-DAT		
46	Indonesia	landslide		2013	2	6	2013	2	6					Slamet Mountain	ADRC	-6.7580	109.2145
47	Indonesia	landslide	torrential rain	2013	1	27	2013	1	27	16				West Sumatra and Jambi Province, western Indonesia	ADRC	-0.7188	100.7986
48	Indonesia	landslide	heavy rain	2012	4	2	2012	4	2		3000			Cianjur district, West Java province	ADRC	-6.9085	107.6688
49	Indonesia	landslide	heavy rain	2011	11	30	2011	11	30	4	30			Nias	ADRC	1.0959	97.5224
50	Indonesia	landslide and Flash	heavy rain	2010	10	5	2010	5	26	26					ADRC		
51	Indonesia	landslide	rain	2010	7	25	2010	7	25	18				eastern Indonesian province	ADRC		
52	Indonesia	landslide		2010	2	23	2010	2	23	4	40			West Java	ADRC	-0.7188	100.7986
53	Indonesia	landslide	torrential rain	2008	11	14	2008	11	14	15				West Java	ADRC	-0.7188	100.7986
54	Indonesia	landslide and Flood	heavy rainfall	2008	2	7	2008	2	7	2				Java	ADRC	-6.1962	110.6630
55	Indonesia	landslide		2008	1	15	2008	1	15	10				Papua	ADRC	-3.6456	139.3644
56	Indonesia	landslide	torrential rains	2007	12	25	2007	12	25	23				Central Java province	ADRC	-6.8459	110.1404
57	Indonesia	Flood, Land Slide		2007	7	23	2007	7	23	7	16000			Sulawesi	ADRC	-0.0005	120.5318
58	Indonesia	landslide		2007	3	3	2007	3	3	40				Flores	ADRC	-7.3427	121.0794
59	Indonesia	landslide	torrential rain	2007	2	19	2007	2	19	8					ADRC		
60	Indonesia	landslide		2007	1	12	2007	1	12	11				Sangihe	ADRC	3.6155	125.4717
61	Indonesia	landslide		2006	12	15	2006	12	15	17				Sumatra	ADRC	-2.0176	103.4713
62	Indonesia	floods and landslide		2006	6	20	2006	6	20	94					ADRC		
63	Indonesia	floods and landslide	heavy rain	2006	4	20	2006	4	20	23				Java	ADRC	-6.1962	110.6630
64	Indonesia	flood and landslide	torrential rain	2006	2	21	2006	2	21	24				North Sulawesi.	ADRC	0.4960	123.9421
65	Indonesia	landslide		2006	1	4	2006	1	4		100			Sijeruk village	ADRC	-6.8866	109.7137
66	Indonesia	Land Slide, Flash Flood	Tsunami-devastated	2005	10	18	2005	10	18	16				Aceh province	ADRC	4.5746	96.7266
67	Indonesia	landslide		2005	9	3	2005	9	3	14				Sumatra	ADRC		
68	Indonesia	landslide		2005	2	21	2005	2	21	13	100			Jakarta	ADRC	-5.0821	107.6095
69	Indonesia	landslide		2004	4	24	2004	4	24	44				Bandung	ADRC		
70	Indonesia	landslide	flash floods	2003	4	1	2003	4	1	27				eastern Indonesia	ADRC		
71	Indonesia	landslide	heavy rain	2003	1	11	2003	1	11	10				Borneo island	ADRC	-0.8939	114.1439
72	Indonesia	Flood, Land Slide	torrential rain	2002	2	17	2002	2	17	7				central Java	ADRC	-6.8459	110.1404
73	Indonesia	landslide		2002	1	29	2002	1	29	4				Jakarta	ADRC	-5.7835	106.8441
74	Indonesia	landslide		2002	1	5	2002	1	5	4				Sulawesi.	ADRC	-0.0005	120.5318
75	Indonesia	Landslide	Rain	2009	1	19	2009	1	19	4	11 missing				PRCC	-8.507	116.662

A9.6 Landslide

No	Country	Disaster Sub Type	Cause	Disaster Start			Disaster End			Damage				Affected Region	Reference	Location	
				Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount(Million US$)	Amount/ GDP PPP%			North	East
76	Indonesia	Landslide	Not known could be previous rainfall	2009	7	10	2009	7	10	5				Cijeruk	PRCC	-6.703	106.773
77	Indonesia	Landslide	Heavy rain	2009	9	15	2009	9	15		Damaged 16 houses				PRCC	-7.368	112.715
78	Indonesia	Landslide	Heavy rains	2009	10	4	2009	10	4	1	Blocked road				PRCC	-5.472	104.484
79	Indonesia	Landslide	Rain recent eq	2009	10	17	2009	10	17	2					PRCC	-0.452	100.428
80	Indonesia	Landslide	Heavy rain	2009	10	26	2009	10	26	5				Pati	PRCC	-6.754	111.039
81	Indonesia	Landslide	Heavy rain	2009	11	8	2009	11	8	14	20 houses buried			Palopo	PRCC	-3.001	120.196
82	Indonesia	Landslide	Heavy rain	2009	11	20	2009	11	20	1	28 houses were buried. several bridges were also cut hindering the mobility of the villagers				PRCC	-7.466	107.662
83	Indonesia	Landslide	Heavy rain	2009	11	21	2009	11	21	2				Geger	PRCC	-7.743	111.544
84	Indonesia	Landslide	Heavy rain	2009	11	21	2009	11	21		9 house damaged badly while 37 slightly damaged				PRCC	-7.571	109.919
85	Indonesia	Landslide	Heavy rain	2009	11	22	2009	11	22	2	3 houses destroyed damaged infrastructure like roads and bridges- cutting off land transportation between several villages			Toba-meerDanau Toba	PRCC	2.583	98.833
86	Indonesia	Landslide	Heavy rain	2009	11	22	2009	11	22						PRCC	-7.733	109.000
87	Indonesia	Landslide	Heavy rain	2009	11	22	2009	11	22	3	Number of houses were buried				PRCC		
88	Indonesia	Landslide	Heavy rains	2009	11	27	2009	11	27	0	falling trees have temporarily cut road				PRCC	1.245	125.007
89	Indonesia	Landslide	Rain	2009	12	14	2009	12	14	1	4 injured				PRCC	-4.333	137.000
90	Indonesia	Landslide	Rain	2008	1	6	2008	1	6						PRCC	-8.196	111.104
91	Indonesia	Landslide	Rain	2008	1	6	2008	1	6						PRCC	-7.972	112.628
92	Indonesia	Landslide	Rain	2008	1	15	2008	1	15	10	1 missing				PRCC	-2.534	140.706
93	Indonesia	Landslide	Rain	2008	2	1	2008	2	1	2					PRCC	1.017	122.200
94	Indonesia	Landslide	Rain	2008	2	1	2008	2	1	8					PRCC	2.308	97.830
95	Indonesia	Landslide	Rain	2008	2	6	2008	2	6	4					PRCC	-6.864	109.034
96	Indonesia	Landslide	Rain	2008	2	15	2008	2	15	5					PRCC	-6.733	110.867
97	Indonesia	Landslide	Rain	2008	2	16	2008	2	16		1 injured				PRCC	-8.151	111.722
98	Indonesia	Landslide	Rain	2008	2	27	2008	2	27	1					PRCC	-8.033	111.400
99	Indonesia	Landslide	Rain	2008	3	13	2008	3	13	5					PRCC	-2.233	101.417
100	Indonesia	Landslide	Rain	2008	3	23	2008	3	23		Blocked roads				PRCC	-0.448	100.937
101	Indonesia	Landslide	Rain	2008	4	1	2008	4	1						PRCC	0.112	113.917
102	Indonesia	Landslide	Rain	2008	4	16	2008	4	16	2					PRCC	-0.967	100.432
103	Indonesia	Landslide	Rain and mining	2008	5	5	2008	5	5	19					PRCC	-4.403	136.044
104	Indonesia	Landslide	Rain	2008	5	19	2008	5	19	1					PRCC	-7.068	112.583
105	Indonesia	Landslide	Rains	2008	8	11	2008	8	11	5					PRCC	-3.300	128.400
106	Indonesia	Landslide	Rain - mining	2008	10	16	2008	10	16	2					PRCC	-5.330	120.349
107	Indonesia	Landslide	Rain	2008	10	18	2008	10	18	3					PRCC		
108	Indonesia	Landslide	Heavy rain-	2008	10	30	2008	10	30	5	20 missing				PRCC	-4.500	121.729
109	Indonesia	Landslide	Heavy rain	2008	11	7	2008	11	7	6	hundreds homeless- blocked roads				PRCC		
110	Indonesia	Landslide	Rain-mining	2008	11	12	2008	11	12	10					PRCC	-1.016	123.292
111	Indonesia	Landslide	Heavy rain	2008	11	13	2008	11	13	5	10 injured				PRCC	-7.022	106.951
112	Indonesia	Landslide	Heavy rain	2008	11	17	2008	11	17	1	5 injured				PRCC	-8.558	115.424
113	Indonesia	Landslide	Heavy rain	2008	11	22	2008	11	22		Destroyed 1 house				PRCC	1.493	124.841
114	Indonesia	Landslide	Heavy rains	2008	12	17	2008	12	17		Blocked roads- damaged 2				PRCC	-7.831	111.841
115	Indonesia	Landslide	Heavy rain	2008	12	21	2008	12	21		16 houses damaged- road blocked				PRCC	0.128	117.484
116	Indonesia	Landslide	Heavy rain	2008	12	22	2008	12	22		34 houses damaged				PRCC	1.354	116.382
117	Indonesia	Landslide	Rain	2007	1	15	2007	1	15	3					PRCC	3.542	125.540
118	Indonesia	Landslide	Rain	2007	1	31	2007	1	31	6					PRCC	-0.681	119.762
119	Indonesia	Landslide	Rain	2007	2	6	2007	2	6	7					PRCC	-6.250	106.100
120	Indonesia	Landslide	Rain	2007	2	19	2007	2	19	21					PRCC	-7.280	110.141
121	Indonesia	Landslide	Rain	2007	3	1	2007	3	1	12					PRCC	-8.699	125.672
122	Indonesia	Landslide	Heavy rain	2007	3	3	2007	3	3	3					PRCC	-8.567	120.800
123	Indonesia	Landslide	Rain	2007	4	21	2007	4	21	5					PRCC	-6.967	110.417
124	Indonesia	Landslide	Rain	2007	5	1	2007	5	1	30					PRCC	-2.679	118.893
125	Indonesia	Landslide	Heavy rain	2007	7	28	2007	7	28	4					PRCC	0.777	120.413
126	Indonesia	Landslide	Rains -	2007	12	5	2007	12	5	78					PRCC	-6.788	107.444
127	Indonesia	Landslide	Rain	2007	12	26	2007	12	26						PRCC	-7.651	111.184
128	Indonesia	Landslide	Rains	2007	12	26	2007	12	26	37					PRCC	-7.621	109.547
129	Indonesia	Landslide	Rain	2007	12	31	2007	12	31						PRCC	-7.667	111.117
130	Indonesia	landslide	rain	2007	1	15	2007	1	15	3	* landslide occurred on 1/12/07; 24 killed, 10 missing, 4,000 displaced			Sangihe island, Northeast of Jakarta	PRCC	3.5424	125.5401
131	Indonesia	landslide	rain	2007	1	31	2007	1	31	6	*3 killed, 6 houses buried			Dongala, Central Sulawesi	PRCC	-0.6811	119.7620
132	Indonesia	landslide	rain	2007	2	6	2007	2	6	7	*6 killed and 2 missing			Pandeglang regency, Banten province, Cadasari district	PRCC	-6.2500	106.1000

A9.6 Landslide

No	Country	Disaster Sub Type	Cause	Disaster Start			Disaster End			Damage				Affected Region	Reference	Location	
				Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount(Million US$)	Amount/GDP PPP%			North	East
133	Indonesia	landslide	rain	2007	2	19	2007	2	19	21	*Homes slid down on top of other houses burying them			Semarang district, Central Java	PRCC	-7.2800	110.1410
134	Indonesia	landslide	rain	2007	3	1	2007	3	1	12	* 21 killed, 48 still missing; transportation to disaster areas has been cut off by landslides			Jakarta, East Nusantara Province	PRCC	-8.6993	125.6723
135	Indonesia	landslide	heavy rain	2007	3	3	2007	3	3	3	*other reports of 43 deaths			Manggarai	PRCC	-8.5667	120.8000
136	Indonesia	landslide	rain	2007	4	21	2007	4	21	5	3 killed when landslide buried house, late in evening; also derailed train in nearby			Jakarta,West Java province, Semarang village	PRCC	-6.9667	110.4167
137	Indonesia	landslide	rain	2007	5	1	2007	5	1	30	* 5 killed and many more missing			Mamuju regency of West Sulawesi Province	PRCC	-2.6786	118.8933
138	Indonesia		rain	2007	7	23	2007	7	23	3	*closest to predicted location of Kolonedale (48.04 km)			Bungko Utara, Morowali	PRCC	-1.8240	121.5179
139	Indonesia	landslide	heavy rain	2007	7	28	2007	7	28	4	*4 sub districts affected; many roads covered by mud and soil, bridges damaged and houses affected by			four subdistricts in Minahasa and South East Minahasa District	PRCC	0.7770	120.4130
140	Indonesia	landslides	rains	2007	9	1	2007	9	1		* covered dozens of houses			Balikpapan, East Kalimantan	PRCC	-1.2654	116.8310
141	Indonesia	landslide	rains - ?	2007	12	5	2007	12	5	78	* Occurred in evening, blocked traffic			Bandung to Jakarta Road at Baros	PRCC	-6.7883	107.4435
142	Indonesia	landslide	rain	2007	12	26	2007	12	26		*landslides affected almost entire island of Java, *fear of more landslides in the same			Tawangmangu, central Java	PRCC	-7.6511	111.1835
143	Indonesia	landslide	rains	2007	12	26	2007	12	26	37	*triggered by torrential rains; *12 hours of non-			Karanganyar, village of Ledoksari	PRCC	-7.6213	109.5470
144	Indonesia	landslide	rain	2007	12	31	2007	12	31		*none killed, 30 homes destroyed, 177 people displaced			Tengklik village in Tawangmangu, central Java	PRCC	-7.6667	111.1167
1	Laos PDR	landslide	Heavy rain	2010	9	23					7 people are missing						
1	Malaysia	Landslide		1993	12	11	1993	12	11	72				Kuala Lumpur	EM-DAT	3.1390	101.6869
2	Malaysia	Landslide		2011	5	21	2011	5	21	16	6			Hulu Langat	EM-DAT	3.1116	101.8132
3	Malaysia	Landslide		2002	1	31	2002	5	21	10				Simunjan district (Borneo ...	EM-DAT		
4	Malaysia	Landslide		1996	8	30	1996	8	30	50	262			Pos Dipang (Perak State)	EM-DAT		
5	Malaysia	Landslide		1995	6	30	1995	6	30	20	23			Genting Highlands (Near K ...	EM-DAT		
6	Malaysia	Landslide		2011	8	7	2011	8	7	7				Canerib Highland, Pahang	ADRC	4.51202	101.47935
7	Malaysia	Landslide		2011	5	21	2011	5	21	16				Hulu Langat	ADRC	3.11164	43.60667
8	Malaysia	Landslide		2002	11	21	2002	11	21	8					ADRC		
9	Malaysia	Landslide	heavy rain	2002	1	28	2002	1	28	10				eastern Malaysia	ADRC		
10	Malaysia	Landslide	Bad weather-rain	2009	1	16	2009	1	16	0	Blocked road				PRCC	1.531	110.344
11	Malaysia	Landslide	Heavy rains	2009	3	1	2009	3	1	0	Blocked road				PRCC	2.733	102.099
12	Malaysia	landslide	Heavy rain	2009	9	19	2009	9	19		Minimal				PRCC	3.186	101.767
13	Malaysia	landslide	Heavy rain	2009	9	19	2009	9	19		Buried car				PRCC	3.187	101.769
14	Malaysia	landslide	Heavy rain	2009	11	3	2009	11	3	0	Blocked road				PRCC	3.291	101.635
15	Malaysia	Landslide	Heavy rain	2009	11	3	2009	11	3	0	Blocked road				PRCC	3.297	101.631
16	Malaysia	Landslide	Heavy rain-quarrying	2009	11	19	2009	11	19	1					PRCC	4.233	100.633
17	Malaysia	Landslide	Heavy rain	2009	12	2	2009	12	2	0	Road blocked				PRCC	6.022	116.492
18	Malaysia	landslide	Rain	2008	1	16	2008	1	16	2					PRCC	4.461	101.394
19	Malaysia	landslide	Flash flood/rain along a	2008	10	7	2008	10	7	1					PRCC	3.190	101.699
20	Malaysia	landslide	Heavy rain	2008	11	23	2008	11	23		Cut off 1-100 residents-blocked road				PRCC	6.367	116.433
21	Malaysia	landslide	- possible drainage issue	2008	12	4	2008	12	4		Broke retaining wall-blocked road				PRCC	3.152	101.678
22	Malaysia	landslide	Heavy rain	2008	12	6	2008	12	6	5	12 houses destroyed-1000 people evacuated				PRCC	3.187	101.773
23	Malaysia	landslide	Heavy rain	2007	3	22	2007	3	22						PRCC	2.943	101.698
24	Malaysia	landslide	Rains	2007	10	3	2007	10	3		Blocked road				PRCC	5.998	116.596
25	Malaysia	landslide	Rains	2007	10	19	2007	10	19	2					PRCC	6.043	116.445
26	Malaysia	landslide	heavy rain	2007	3	22	2007	3	22		* 2,000			Putrajaya	PRCC	2.9430	101.6980
27	Malaysia	landslides	rain	2007	8	25	2007	8	25		* blocked roads to hill resort preventing people from coming back down			Bukit Larut, Taiping	PRCC	4.8525	100.7943
28	Malaysia	mud-landslide	rains	2007	9	26	2007	9	26		* broke a retaining wall and destroyed houses			Taman Melawati	PRCC	3.1028	101.6899

No	Country	Disaster Sub Type	Cause	Disaster Start			Disaster End			Damage				Affected Region	Reference	Location	
				Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount(Million US$)	Amount/GDP PPP%			North	East
29	Malaysia	landslide	rains	2007	10	3	2007	10	3		* covered 60-100 m of road at kilometer 84 at 3am			Kundasang-Tamparuli road, Kundasang, near the Mount Kinabalu national park area	PRCC	5.9976	116.5956
30	Malaysia	landslide	rains	2007	10	19	2007	10	19	2	* blocked road, occurred at 7:30 pm			Ranau-Tamparuli Road	PRCC	6.0430	116.4453
31	Malaysia		rains	2007	12	26	2007	12	26	40	*heavy rain lasted for two hours			Kapit	PRCC	2.0110	112.9430
32	Malaysia	Landslide		1973	10					42		64.8		Kampuung Kacang Putih, Ipoh,Perak	National Slope Master Plan 2009-2023		
33	Malaysia	Landslide		1993	12					48		184.9	0.149%	Highand Tower Collapse, Ampang, Selangor	National Slope Master Plan 2009-2023		
34	Malaysia	Landslide		1995	6					20		N		Km 39 Lebuhraya KL-Karak, Genting Highkand, Pahang	National Slope Master Plan 2009-2023		
35	Malaysia	Landslide		1996	1					1		16.7	0.00957%	Km 303.8 North South Expressway, Gunung Tempurung, Perak	National Slope Master Plan 2009-2023		
36	Malaysia	Landslide		1996	9					44		69	0.03954%	Pos Dipang,Peak	National Slope Master Plan 2009-2023		
37	Malaysia	Landslide		1996	12					302		458.9	0.26298%	Keningau, Sabah	National Slope Master Plan 2009-2023		
38	Malaysia	Landslide		1999	2					17		29.5	0.01534%	Kg. Gelam, Sandakan, Sabah	National Slope Master Plan 2009-2023		
39	Malaysia	Landslide		2002	1					16		28	0.01191%	Simunajan, Sarawak	National Slope Master Plan 2009-2023		
40	Malaysia	Landslide		2002	11					8		17.4	0.00740%	Taman Hillview, Hulu Kelang, Kuala Lumpur	National Slope Master Plan 2009-2023		
41	Malaysia	Landslide		2003	11							836	0.32928%	Km 21.8 NKVE Bukit Lanjan, Selangor	National Slope Master Plan 2009-2023		
42	Malaysia	Landslide		2005	4							47	0.01499%	Kg Melayu Bt 11, Puchong, Selangor	National Slope Master Plan 2009-2023		
43	Malaysia	Landslide		2006	4							354.6	0.10378%	Km 44 JLn Simpang Pulai Cameland, Highland, Pahang(Gunung Pass)	National Slope Master Plan 2009-2023		
44	Malaysia	Landslide		2006	5					4		20.7	0.00606%	Kampung Pasir(Taman Bukit Zooview), Hulu Kelang,	National Slope Master Plan 2009-2023		
1	Myanmar	Landslide		2010	6	17	2010	6	17	68	145000			Maungdaw, Buthidaung; Rak ...	EM-DAT	20.8700	92.5275
2	Myanmar	Landslide		2009	7	4	2009	7	4	24	1351			Hpakant city (Kachin stat ...	EM-DAT	25.6389	96.3866
3	Myanmar	Landslide		2005	9	14	2005	9	15	17	16			Palow, Kyun Su, Myeik (Th ...	EM-DAT		
4	Myanmar	Landslide		2005	9	14	2005	9	14	30				Southeastern Myanmar	ADRC		
5	Myanmar	Landslide	Heavy rain and storm	2009	6	3	2009	6	3	4	3 injured				PRCC	9.9988	98.5465
6	Myanmar	Landslide	Heavy rains	2009	10	3	2009	10	3	3	2 injured				PRCC	9.9988	98.5465
1	Philippines	Landslide		2000	11	8	2000	11	8	11				Cabugao-Apayao (Kaling-Ap ...	EM-DAT	17.7919	120.4551
2	Philippines	Landslide		1985	10	21	1985	10	21	300				South Mindanao	EM-DAT	8.4855	123.3024
3	Philippines	Rockfall		1980	11	11	1980	11	11	50				Santa Fe (Vizcaya Provinc ...	EM-DAT	16.1619	120.9389
4	Philippines	Landslide		2011	8	5	2011	8	5		310			Subic (Zambales); Mindoro ...	EM-DAT	14.8920	120.2355
5	Philippines	Landslide		2011	7	4	2011	7	4	5	5			Bukkidnon (Mindanao Isl.) ...	EM-DAT	7.9765	125.0398
6	Philippines	Landslide		2011	4	22	2011	4	22	24	574			Panganason-B., Kingking, ...	EM-DAT		
7	Philippines	Landslide		2010	1	1	2010	1	1	2	927	0.078	0.00002%	Valencia, Cagdianao provi ...	EM-DAT	10.1541	125.6550
8	Philippines	Landslide		2009	5	18	2009	5	18	10	16			Magapispis, Sitio Boringo ...	EM-DAT		
9	Philippines	Landslide		2008	9	6	2008	9	6	24	5028			Maco town (Compostelle Va ...	EM-DAT	7.4098	126.0009
10	Philippines	Avalanche		2006	8	13	2006	8	13	6	1200			Between Kapatogan and Pag	EM-DAT	7.8931	123.7757
11	Philippines	Landslide		2006	2	17	2006	2	17	1126	5926	2.203	0.00078%	Baranguay Guinsaugon (St ...	EM-DAT	10.2893	125.1229
12	Philippines	Landslide		2006	2	14	2006	2	14	11	7525			Agos Agos (Sogod Southern ...	EM-DAT		
13	Philippines	Landslide		2004	12	13	2004	12	13	8	6			Hubo (nearTinambac)	EM-DAT	13.8167	123.3333
14	Philippines	Landslide		2003	12	19	2004	1	7	255	217988	7	0.00288%	Liloan, San Francisco, Ma ...	EM-DAT	10.0571	125.1617
15	Philippines	Subsidence		2000	7	10	2000	7	10	287	2838			Manilla	EM-DAT	14.5995	120.9842
16	Philippines	Landslide		1999	8	4	1999	8	4	58				Manilla	EM-DAT	14.5995	120.9842
17	Philippines	Landslide		1999	9	13	1999	9	13	13				Nord du pays	EM-DAT		
18	Philippines	Landslide		1999	5	10	1999	5	10	10	45			Compostela Valley (Mindan ...	EM-DAT	7.4978	126.1749
19	Philippines	Landslide		1999	4	0	1999	4	0	19				South of Philippines	EM-DAT		
20	Philippines	Landslide		1996	11	28	1996	11	28	33	8			Catanduanes (Mindanao)	EM-DAT	13.6970	124.2418
21	Philippines	Landslide		1996	9	17	1996	9	17	12				South	EM-DAT		
22	Philippines	Landslide		1994	9	19	1994	9	24	23	68740	24	0.018%	Mont Pinatubo area (Luzon ...	EM-DAT		
23	Philippines	Landslide		1994	2	5	1994	2	5	4	5103			Davao Del Norte Province	EM-DAT	7.5618	125.6533
24	Philippines	Landslide		1993	9	7	1993	9	7	21				Kimatu	EM-DAT		
25	Philippines	Landslide		1989	0	0	1989	0	0	72					EM-DAT		
26	Philippines	Landslide		1989	9	16	1989	9	16	14	77			Muntinlupa	EM-DAT	14.4081	121.0415
27	Philippines	Landslide		1989	5	0	1989	5	0	13	1200			Mindanao/Monkayo	EM-DAT	7.8167	126.0500
28	Philippines	Landslide		1988	5	22	1988	5	22	30				Davao del Sur	EM-DAT	6.4242	125.4782
29	Philippines	Landslide		1988	4	4	1988	4	4	24				Davao Oriental	EM-DAT	7.0806	126.1763
30	Philippines	Landslide		1981	10	0	1981	10	0	200					EM-DAT		
31	Philippines	Landslide		1978	8	13	1978	8	13	22	7			Subic	EM-DAT	14.8920	120.2355
32	Philippines	Landslide		1960	1	0	1960	1	0	40					EM-DAT		
33	Philippines	Flashflood, Landslide	Tropical storm	2012	6	28	2012	6	28					northern Luzon	ADRC		
34	Philippines	Landslide		2012	1	5	2012	1	5	25				Southern Philippines	ADRC		
35	Philippines	Landslide		2011	4	22	2011	4	22	3				Southern Philippines	ADRC		
36	Philippines	Landslide		2008	5	18	2008	5	18	26				Southern Philippines	ADRC		
37	Philippines	Flooding, Landslide		2008	2	12	2008	2	12	35	27			Philippines	ADRC		
38	Philippines	Flood, Landslide	Storm	2007	11	19	2007	11	20	13				center and soutrhern Philippine	ADRC		
39	Philippines	Flood, Landslide		2007	8	9	2007	8	9	17	13			northern philippines	ADRC		
40	Philippines	Landslide		2006	9	22	2006	9	22	8	14			northern philippines	ADRC		
41	Philippines	Landslide	six days of heavy rains	2003	12	20	2003	12	20	200				central Philippines	ADRC		
42	Philippines	Flood, Landslide	monsoon rains	2002	7	7	2002	7	7	27	24000			Philippines	ADRC		
43	Philippines	Landslide	Heavy rain	2009	1	2	2009	1	2	0	Blocked road				PRCC	12.5655	124.0419
44	Philippines	Landslide	Heavy rain	2009	1	11	2009	1	11	4					PRCC	8.2101	126.2848
45	Philippines	Landslide	Torrential rain	2009	2	7	2009	2	7	2					PRCC	9.2900	123.2260
46	Philippines	Landslide	Heavy rain	2009	2	9	2009	2	9	2					PRCC	14.5450	121.5600
47	Philippines	landslide	Tropical storm "dante" (international name: kujira)	2009	5	5	2009	5	5	21					PRCC	12.7894	123.8635
48	Philippines	landslide	Typhoon nangka(locally known as feria)	2009	6	23	2009	6	23	2	House damaged				PRCC	8.4539	124.6193
49	Philippines	Landslide	Heavy rain	2009	7	31	2009	7	31	2	1 injured-damaged				PRCC	14.6759	121.2397

No	Country	Disaster Sub Type	Cause	Disaster Start			Disaster End			Damage				Affected Region	Reference	Location	
				Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount(Million US$)	Amount/GDP PPP%			North	East
50	Philippines	landslide	Typhon morakot (local	2009	8	6	2009	8	6	3	1 injured- blocked road				PRCC	16.3920	120.5996
51	Philippines	Landslide	Typhon morakot (local	2009	8	8	2009	8	8	15					PRCC	16.4020	120.5970
52	Philippines	landslide	Heavy rain- tropical storm labuyo and sw monsoon	2009	9	8	2009	9	8	2					PRCC	14.1939	121.1481
53	Philippines	landslide	Heavy rain (td maring)/mining	2009	9	9	2009	9	9	3					PRCC	15.2662	120.2051
54	Philippines	Landslide	Heavy rain	2009	9	9	2009	9	9	2					PRCC	14.1940	121.1481
55	Philippines	landslide	Heavy rain	2009	9	13	2009	9	13	2	3 injured				PRCC	14.2138	121.0105
56	Philippines	landslide	Tropical storm "Ondoy" (ketsana)	2009	9	26	2009	9	26	1					PRCC	16.7432	120.8269
57	Philippines	landslide	Tropical storm "Ondoy" (ketsana)	2009	9	26	2009	9	26	1					PRCC	16.5702	120.5204
58	Philippines	landslide	Typhoon "pepeng"	2009	10	1	2009	10	1		Blocked roads				PRCC	13.8193	124.1754
59	Philippines	landslide.	Typhoon "parma"	2009	10	3	2009	10	3	12					PRCC	16.5364	120.8512
60	Philippines	landslide	Heavy rain/ tropical depression	2009	10	5	2009	10	5	8	Blocked highway				PRCC	16.4020	120.5970
61	Philippines	landslide	Heavy rain/ tropical depression	2009	10	8	2009	10	8	0	Blocked highway				PRCC	17.5632	121.2180
62	Philippines	landslide	Heavy rain/ tropical depression	2009	10	8	2009	10	8	2					PRCC	16.7449	120.8252
63	Philippines	landslide	Heavy rain/ tropical depression	2009	10	8	2009	10	8	3	2 injured				PRCC	16.9645	120.8147
64	Philippines	landslide	Heavy rain/ tropical depression	2009	10	8	2009	10	8	7	40 missing				PRCC	16.4597	120.5809
65	Philippines	landslide	Heavy rain/ tropical depression	2009	10	8	2009	10	8	0	Blocked highway				PRCC	17.6424	121.3254
66	Philippines	landslide	Heavy rain/ tropical depression	2009	10	8	2009	10	8	3					PRCC	16.4072	120.5829
67	Philippines	landslide	Heavy rain/ tropical depression	2009	10	8	2009	10	8	0	Blocked highway				PRCC	17.4541	121.2284
68	Philippines	landslide	Heavy rain/ tropical depression	2009	10	8	2009	10	8	2	Blocked road				PRCC	16.5713	120.7325
69	Philippines	landslide	Heavy rain/ tropical depression	2009	10	8	2009	10	8	0	Blocked highway				PRCC	18.5005	120.8417
70	Philippines	landslide	Heavy rain/ tropical depression	2009	10	8	2009	10	8	0	Blocked highway				PRCC	18.4293	121.0796
71	Philippines	landslide	Heavy rain/ tropical depression	2009	10	8	2009	10	8	26	28 injured- (21 missing)				PRCC	16.8828	120.7802
72	Philippines	landslide	Heavy rain/ tropical depression	2009	10	8	2009	10	8	0	Blocked highway				PRCC	17.1246	121.3148
73	Philippines	landslide	Heavy rain/ tropical depression	2009	10	8	2009	10	8	50	10 missing- 3 injured				PRCC	16.9643	120.8163
74	Philippines	landslide	Heavy rain/ tropical depression	2009	10	8	2009	10	8	7	6 injured- 1 missing				PRCC	16.5127	120.6336
75	Philippines	landslide	Heavy rain	2009	10	15	2009	10	15	0	Blocked highway				PRCC	16.4946	120.6524
76	Philippines	Landslide	Heavy rains due to tropical depression	2009	11	24	2009	11	24	3					PRCC	8.6542	124.7556
77	Philippines	Landslide	Heavy rains due to tropical depression	2009	11	24	2009	11	24	0					PRCC	8.7031	124.7439
78	Philippines	Landslide	Heavy rains due to tropical depression	2009	11	24	2009	11	24	0					PRCC	8.7122	124.7653
79	Philippines	Landslide	Heavy rains due to tropical depression	2009	11	24	2009	11	24	0					PRCC	8.8152	124.8293
80	Philippines	Landslide	Heavy rains due to tropical depression	2009	11	24	2009	11	24	0					PRCC	10.3456	123.8969
81	Philippines	Landslide	Heavy rains due to tropical depression	2009	11	24	2009	11	24	0					PRCC	8.8604	124.7893
82	Philippines	Landslide	Heavy rains due to tropical depression	2009	11	24	2009	11	24	0					PRCC	6.7916	125.1489
83	Philippines	Landslide	Heavy rains due to tropical depression	2009	11	24	2009	11	24	0					PRCC	8.9196	124.7837
84	Philippines	Landslide	Heavy rains due to tropical depression	2009	11	24	2009	11	24	0					PRCC	8.9626	124.8514
85	Philippines	Landslide	Heavy rains due to tropical depression	2009	11	24	2009	11	24	0					PRCC	8.5419	124.7630
86	Philippines	Landslide	Heavy rains due to tropical depression	2009	11	24	2009	11	24	0					PRCC	8.4359	124.5196
87	Philippines	Landslide	Heavy rains due to tropical depression	2009	11	24	2009	11	24	0					PRCC	8.5770	124.7850
88	Philippines	Landslide	Heavy rains due to tropical depression	2009	11	24	2009	11	24	0					PRCC	8.5008	124.4309

A9.6 Landslide

No	Country	Disaster Sub Type	Cause	Disaster Start			Disaster End			Damage				Affected Region	Reference	Location	
				Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount(Million US$)	Amount/GDP PPP%			North	East
89	Philippines	Landslide	Heavy rains due to tropical depression	2009	11	24	2009	11	24	0	10 injured				PRCC	9.8260	125.6095
90	Philippines	Landslide	Heavy rains due to tropical depression urduja	2009	11	25	2009	11	25	0	Road to sudlon and other barrangay is blocked				PRCC	9.8964	123.4200
91	Philippines	landslide	Rain	2008	1	3	2008	1	3						PRCC	10.0374	125.2172
92	Philippines	landslide	Rain	2008	1	3	2008	1	3		Blocked road				PRCC	10.1831	125.1251
93	Philippines	landslide	Rain	2008	1	3	2008	1	3						PRCC	10.3904	124.9851
94	Philippines	landslide	Rain	2008	1	14	2008	1	14						PRCC	7.0932	125.5583
95	Philippines	landslide	Rain	2008	1	16	2008	1	16						PRCC	7.8253	126.0367
96	Philippines	landslide	Rain	2008	1	31	2008	1	31						PRCC	7.8339	125.5986
97	Philippines	landslide	Rain	2008	2	15	2008	2	15						PRCC	11.7548	125.4606
98	Philippines	landslide	Rain	2008	2	17	2008	2	17	11					PRCC	12.0478	125.4357
99	Philippines	landslide	Rain	2008	2	19	2008	2	19						PRCC	13.8701	124.3101
100	Philippines	landslide	Rain	2008	2	21	2008	2	21	6					PRCC	7.8953	123.8436
101	Philippines	landslide	Rain	2008	2	21	2008	2	21	1					PRCC	13.6944	123.7851
102	Philippines	landslide	Rain	2008	2	23	2008	2	23	1					PRCC	7.1633	125.8992
103	Philippines	landslide	Rain	2008	2	25	2008	2	25	2					PRCC	14.6394	121.0922
104	Philippines	landslide	Rain	2008	3	7	2008	3	7		Blocked roads				PRCC	10.7349	122.9747
105	Philippines	landslide	Rain	2008	3	20	2008	3	20	4					PRCC	5.4274	125.3739
106	Philippines	landslide	Rain	2008	5	13	2008	5	13		Road blocked				PRCC	9.2903	123.2600
107	Philippines	landslide	Heavy rain	2008	5	29	2008	5	29		Several injured				PRCC	14.7231	121.2541
108	Philippines	landslide	Typhoon fengshen	2008	6	21	2008	6	21	1					PRCC	6.2189	124.6815
109	Philippines	landslide	Heavy rains	2008	6	24	2008	6	24	2					PRCC		
110	Philippines	landslide	Heavy rains	2008	6	29	2008	6	29	4					PRCC	9.5300	123.3100
111	Philippines	landslide	Heavy rains	2008	7	2	2008	7	2	2					PRCC	14.4700	121.0500
112	Philippines	landslide	Typhoon julian	2008	8	4	2008	8	4		Blocked roads				PRCC	17.4458	121.4196
113	Philippines	landslide	Rain	2008	8	17	2008	8	17		Blocked road				PRCC	16.9500	121.0450
114	Philippines	landslide	Typhoon karen	2008	8	20	2008	8	20	5					PRCC	16.3160	120.7414
115	Philippines	landslide	Typhoon karen	2008	8	20	2008	8	20	1					PRCC	16.4260	120.5823
116	Philippines	landslide	Typhoon karen	2008	8	20	2008	8	20	1					PRCC	16.9000	120.4525
117	Philippines	landslide	Typhoon nina	2008	9	22	2008	9	22		Blocked road				PRCC	16.3790	120.6000
118	Philippines	landslide	Typhoon nina	2008	9	22	2008	9	22	2					PRCC	16.4270	120.5870
119	Philippines	landslide	Typhoon nina	2008	9	23	2008	9	23		2 injured				PRCC	16.3900	120.6600
120	Philippines	landslide	Heavy rain	2008	9	24	2008	9	24	2	2 injured				PRCC	14.6750	121.1500
121	Philippines	landslide	Heavy rain	2008	11	20	2008	11	20		9 injured				PRCC	8.4400	126.3400
122	Philippines	landslide	Heavy rain-	2008	12	10	2008	12	10	3					PRCC	7.6758	126.1139
123	Philippines	landslide	Rain	2006	12	28	2006	12	28						PRCC	12.3000	124.8330
124	Philippines	landslide	Rain - mining	2007	1	11	2007	1	11	6					PRCC	7.5314	126.0130
125	Philippines	landslide	Rain	2007	1	17	2007	1	17						PRCC	8.6184	125.6732
126	Philippines	landslide	Rain	2007	1	18	2007	1	18	5					PRCC	17.1167	120.9170
127	Philippines	landslide	Rains	2007	9	11	2007	9	11	1					PRCC	11.0333	122.2000
128	Philippines	landslide	Rains	2007	9	17	2007	9	17						PRCC	9.9242	123.1706
129	Philippines	landslide	Rains -	2007	9	29	2007	9	29						PRCC	16.8333	121.1167
130	Philippines	landslide	Rains	2007	9	18	2007	9	18						PRCC	10.6000	122.6167
131	Philippines	landslide	Rains over	2007	10	19	2007	10	19	5					PRCC	16.3183	120.5519
132	Philippines	landslide	Rains	2007	11	13	2007	11	13		Blocked road				PRCC	11.1719	125.5245
133	Philippines	landslide	Rains	2007	11	23	2007	11	23		Blocked road				PRCC	14.4882	121.3088
134	Philippines	landslide	Rains - ts mina/mitag	2007	11	24	2007	11	24	2					PRCC	13.7856	124.1604
135	Philippines	landslide	Rains	2007	11	25	2007	11	25		Blocked road				PRCC	17.7500	121.2500
136	Philippines	landslide	Rains	2007	11	26	2007	11	26	1					PRCC	18.5038	120.9096
137	Philippines	landslide	rain - mining	2007	1	11	2007	1	11	6				Inupuan in Barangay Mainit, Nabunturan, Compostela Valley Province	PRCC	7.5314	126.0130
138	Philippines	landslide	rain	2007	1	17	2007	1	17					Surigao Sur, Agusan del Sur	PRCC	8.6184	125.6732
139	Philippines	landslide	rain	2007	1	18	2007	1	18	5				Barangay Dalican in Bontoc, Mt. Province	PRCC	17.1167	120.9170
140	Philippines		rain	2007	7	10	2007	7	10					Mt. Diwalwal	PRCC	7.8098	125.4498
141	Philippines		rain	2007	7	11	2007	7	11	26				Sipalay City	PRCC	9.7500	122.5000
142	Philippines		rain	2007	7	12	2007	7	12	3				Baiura	PRCC		
143	Philippines		rain	2007	7	12	2007	7	12					Baglung	PRCC		
144	Philippines		rain/logging	2007	7	13	2007	7	13					Agusan del Norte	PRCC	8.9697	125.5593
145	Philippines		rain	2007	8	2	2007	8	2					Cebu City	PRCC	10.3658	123.8897
146	Philippines		rain	2007	8	4	2007	8	4	10				Itogon	PRCC	16.3922	120.6794
147	Philippines	* occurred at 12:15	rain/unsure	2007	8	6	2007	8	6	1				Compostela Valley	PRCC	7.3908	125.9049
148	Philippines		rain	2007	8	8	2007	8	8	1				Baguio City	PRCC	16.4357	120.5763
149	Philippines	landslide/debris	?? - digging quarry	2007	8	14	2007	8	14	1				Carcar City	PRCC	10.1500	123.6190
150	Philippines	landslide	rains	2007	9	11	2007	9	11	1				Valderama, Antique	PRCC	11.0333	122.2000
151	Philippines	landslide	rains	2007	9	17	2007	9	17					Barangay Pinalubngan, Tayasan town, in northern	PRCC	9.9242	123.1706
152	Philippines	mud, landslide	rains	2007	9	20	2007	9	20	9				Mining village in Maco, Compostela Valley	PRCC	7.3908	125.9049
153	Philippines	landslide	rains - ?	2007	9	29	2007	9	29					Sitio Upper Pitawan in Barangay O-ong in Hingyon town, Ifugao province	PRCC	16.8333	121.1167
154	Philippines	landslide	rains	2007	9	18/25?	2007	9	18/25?					Poblacion village in Jordan town, Guimaras province	PRCC	10.6000	122.6167
155	Philippines	landslides	rains - Typhoon Ineng	2007	10	2	2007	10	2					Angat River in Barangay Lumang Bayan in Plaridel town	PRCC	14.8890	120.8640
156	Philippines	volcanic	rains	2007	10	14	2007	10	14					Barangay Sag-ang, La	PRCC	10.3333	123.0333
157	Philippines	mudslides, lahars	rains	2007	10	17	2007	10	17					Irosin town in Sorsogon province, Bulusan Volcano	PRCC	12.7500	124.0330
158	Philippines	landslide	rains over week	2007	10	19	2007	10	19	5				Kennon Road in Camp 6, Tuba	PRCC	16.3183	120.5519
159	Philippines	landslides	rains	2007	10	28	2007	10	28					Baras Town Virac, Catanduanes Province	PRCC	13.7000	124.3500
160	Philippines	landslides	rains	2007	10	29	2007	10	29					Bicol Region	PRCC	13.4000	123.3667
161	Philippines	landslides/mudslides	rains - storm Kabayan	2007	11	4	2007	11	4					Halsema Highway leading to Mountain Province	PRCC	16.3748	120.6101
162	Philippines	landslides	rains	2007	11	4	2007	11	4					Catanduanes, Virac-San Miguel-Viga-Panganiban-Bagamanoc-Caramoan-San Andres-Virac Section Road, Agban Section along Baras-Cimaster-Virac Road	PRCC	13.7143	124.3807
163	Philippines	landslide	rains	2007	11	13	2007	11	13					Guinapondan-Buenavista junction of the road stretching from Marabut-Lawaan-Balangiga-Giporlos Quinapondan Road	PRCC	11.1719	125.5245

A9.6 Landslide

No	Country	Disaster Sub Type	Cause	Disaster Start			Disaster End			Damage				Affected Region	Reference	Location	
				Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount(Million US$)	Amount/GDP PPP%			North	East
164	Philippines	landslides	rains - TS Lando	2007	11	19	2007	11	19					Tagana-an town, and Visayas and Mindanao regions	PRCC	9.9667	125.5794
165	Philippines	landslides	rains - TS Cebu	2007	11	19	2007	11	19	3				Barangay Mataas in Cagraray Island, Bacacay, Albay	PRCC	13.2989	123.8000
166	Philippines	landslides	rains - TS Cebu	2007	11	19	2007	11	19					Catanduanes, Barangay Balongbong in Bato town and between Barangays Banog Banog and Asqad in San Andres town	PRCC	13.6068	124.2856
167	Philippines	landslide-boulders	rains - TS Cebu	2007	11	19	2007	11	19					Surigao del Norte province's mining town of Placer	PRCC	9.6527	125.6008
168	Philippines	landslides	rains - TS Cebu	2007	11	19	2007	11	19	5				Surigao City	PRCC	9.7824	125.4873
169	Philippines	landslides	rains - TS Lando	2007	11	19	2007	11	19	2				National Highway at Barangay Libas, Lavezares, Northern	PRCC	12.5054	125.0039
170	Philippines	landslides	rains - TS Lando	2007	11	20	2007	11	20					highway linking Cebu City to Balamban town	PRCC	10.3789	123.8514
171	Philippines	landslides	rains - TS Mina/Mitag	2007	11	23	2007	11	23					Virac (and other towns), Catanduanes province	PRCC	13.9490	124.2100
172	Philippines	landslide	rains	2007	11	23	2007	11	23					Pililla town, Rizal Province	PRCC	14.4882	121.3088
173	Philippines	landslide	rains - TS Mina/Mitag	2007	11	24	2007	11	24	2				San Andres-Caramoran road up to Barangay Puting Baybay	PRCC	13.7856	124.1604
174	Philippines	landslide	rains	2007	11	25	2007	11	25					Kalinga province	PRCC	17.7500	121.2500
175	Philippines	landslide	rains	2007	11	26	2007	11	26	1				boundary of Ilocos Norte and Cagayan province	PRCC	18.5038	120.9096
176	Philippines	landslide	rain	2006	12	28	2006	12	28					Silvino Lobos, Northern Samar	PRCC	12.3000	124.8330
1	Singapore	Landslide	heavy rain	2007	1	11								Jalan Anak Bukit			
1	Thailand	Landslide		2004	10	18	2004	10	18	3	110			Baan Huay Nam Khiew (Krab ...	EM-DAT		
2	Thailand	Landslide		2002	9	3	2002	9	3	35	33000			Ban Tha Sala (Mae Hong So ...	EM-DAT	8.6759	99.8275
3	Thailand	Landslide		1994	8	2	1994	8	2	9	10000			North and Central provinc ...	EM-DAT		
4	Thailand	Flash Flood, Mud	Heavy monsoon rains	2006	5	23	2006	5	23	10	47			northern Thailand	ADRC	18.5028	99.6059
5	Thailand	Mudslide	Heavy monsoon rains	2005	12	18	2005	12	18	12				southern Thailand	ADRC		
6	Thailand	Mudslide		2002	9	18	2002	9	18		800			northern Thailand	ADRC	18.5028	99.6059
7	Thailand	landslide	Heavy rain	2008	7	15	2008	7	15	3					PRCC	7.8900	98.3000
8	Thailand	landslide	Heavy rains	2008	7	18	2008	7	18						PRCC	19.0833	101.0833
9	Thailand		rain	2007	8	9	2007	8	9		*closest to predicted location of Nakhon Phanom (762.56 km)			Kanchanaburi	PRCC	14.7333	98.6333
10	Thailand	mud/landslides	rain	2007	8	20	2007	8	20	1	*LS on road cuts, blocking passage			Pheng-Nga and Surat Thani, Takuapha Municipality	PRCC	8.8427	98.3834
11	Thailand	mudslide	rain	2007	8	23	2007	8	23		* only small amount of information, villager killed in rainfall-triggered mudslide			Nakhon Thai district	PRCC	17.1167	100.8333
12	Thailand	mudslide	rains	2007	9	15	2007	9	15		* affected tourist spot along road			Lamru National Park, Khao Lak in Phangnga province	PRCC	8.5695	98.2558
13	Thailand	debris, rock slide	rains	2007	9	20	2007	9	20		* Along road, residents helped to move boulders, traffic suspended			Phrae-Mae Lua road, Phrae	PRCC	18.1578	100.1589
14	Thailand	slump	rains	2007	10	26	2007	10	26		* occurred at 1am			Patong	PRCC	7.8882	98.3071
1	Viet Nam	Landslide		2009	11	6	2009	11	6	13	1			Quang Nam province	EM-DAT	15.5602	107.8552
2	Viet Nam	Landslide		2004	9	13	2004	9	13	23				Bat Xat district (Lao Cai ...	EM-DAT	22.5539	103.6826
3	Viet Nam	Landslide		2000	10	3	2000	10	3	40	17			Sin Ho district (Lai Chau ...	EM-DAT	22.2936	103.3152
4	Viet Nam	Landslide		2000	7	22	2000	7	22	33	22			Ban Sai (Sapa region, Lao ...	EM-DAT		
5	Viet Nam	Landslide		1994	7	15	1994	7	31	21	1034	2.3	0.004%	Lai Chau province	EM-DAT	22.3129	103.2652
6	Viet Nam	Avalanche		1992	7	25	1992	7	25	200	38000			Ha Tuyen (Cao Bang provin ...	EM-DAT	22.6366	106.2533
7	Viet Nam	Flooks and landslides	torrential rain	2006	8	20	2006	8	20	15	1				ADRC		
8	Viet Nam	Landslide		2004	3	17	2004	3	17	3				Northern Vietnamese	ADRC		
9	Vietnam	landslide	Typhoon ・ス ondoy・ス (ketsana)	2009	9	29	2009	9	29	7					PRCC	15.5980	107.8584
10	Vietnam	Landslide	Heavy rain	2009	10	23	2009	10	23	0	1 missing-blocked				PRCC	16.3395	107.7424
11	Vietnam	landslide	Typhoon mirinae	2009	11	5	2009	11	5	13	1 injured				PRCC	15.5721	108.4671
12	Vietnam	landslide	Rain-quarrying	2008	1	4	2008	1	4	3					PRCC	20.5667	105.9000
13	Vietnam	landslide	Rain	2008	2	20	2008	2	20						PRCC	14.9924	108.7010
14	Vietnam	landslide	Rain	2008	6	7	2008	6	7		Damaged houses				PRCC	10.7069	106.7361
15	Vietnam	landslide	Heavy rains	2008	7	22	2008	7	22	4					PRCC	22.7800	104.9500
16	Vietnam	landslide	Heavy rains	2008	7	26	2008	7	26	1					PRCC	22.7500	104.4800
17	Vietnam	landslide	Heavy monsoons	2008	8	16	2008	8	16	1	2 injured				PRCC	10.5780	105.5740

A9.6 Landslide

No	Country	Disaster Sub Type	Cause	Disaster Start			Disaster End			Damage				Affected Region	Reference	Location	
				Year	Month	Day	Year	Month	Day	Killed	Affected People	Amount(Million US$)	Amount/GDP PPP%			North	East
18	Vietnam	landslide	Heavy rains	2008	8	27	2008	8	27	3	2 injured				PRCC	22.7500	104.6667
19	Vietnam	landslide	Heavy rain-mining	2008	10	12	2008	10	12	6					PRCC	15.8000	107.8800
20	Vietnam	landslide	Rain	2008	10	16	2008	10	16		Destroyed petrol depot				PRCC	16.2000	108.1330
21	Vietnam	landslide	Heavy rain	2008	10	17	2008	10	17		Affected many people				PRCC	16.5489	107.2327
22	Vietnam	landslide	Rain	2008	11	12	2008	11	12		21 houses destroyed-138 residents homeless				PRCC	8.8313	105.2523
23	Vietnam	landslide	Heavy rain	2008	11	20	2008	11	20	1	2 injured				PRCC	15.1238	108.8117
24	Vietnam	landslide	Rains - tropical depression	2007	10	30	2007	10	30	3					PRCC	15.5946	107.9660
25	Vietnam	mudslide	rain	2007	5	7	2007	5	7	3	* 3 killed, 13 injured - Nghe An is 300km south of Hanoi			Central Vietnam, Nghe An Province	PRCC	19.2675	104.8433
26	Vietnam		rain	2007	7	1	2007	7	1	3	* 140-257mm of rain; also landslides in Ha Long City's Hong Gai and Bai Chay			Cam Pha Town, Quang Ninh Province	PRCC	21.0233	107.2930
27	Vietnam	mud-landslides	rains - typhoon Lekima	2007	10	5	2007	10	5		* flooding and landslides affected entire province, 67 died in total in two provinces			Thanh Hoa	PRCC	20.0400	105.3500
28	Vietnam	landslides	rains - typhoon Lekima	2007	10	5	2007	10	5		* multiple areas in North and Central Vietnam hit by Typhoon, extensive flooding and landslides, especially along road			Nghe An's Que Phong, Son La	PRCC	21.3167	103.9000
29	Vietnam	landslides	rains	2007	10	15	2007	10	15		* 27 landslides in 6 mountainous districts, affecting the road			Quang Nam Province	PRCC	15.6045	107.9408
30	Vietnam	landslide	rains - tropical depression	2007	10	30	2007	10	30	3	* blocked roads in mountainous areas			Quang Nam	PRCC	15.5946	107.9660
31	Vietnam	landslides	rains	2007	11	5	2007	11	5					National Highway 24 and Quang Ngai Province	PRCC	15.2340	108.4852
32	Vietnam	landslides	rains	2007	11	9	2007	11	9	12	* major flooding and landslides throughout provinces,			Nam Tra My District, Quang Nam Province	PRCC	15.3333	108.2167

Appendix A10

Compiled Information and Data on Measures Taken for Natural Disasters

Measures Taken for Natural Disasters

A10.1 Flood, Cyclone (Typhoon) and Meteorological Hazard, and Landslide

A10. Compiled Information and Data on Measures Taken for Natural Disasters
A10.1.10 Flood – Vietnam
1. Organizatiotion and Institution

Chapter	Item	Document/Information Title	Contents	Target Areas	Map URL	Executing Agencies	Source	URL	Year
1	Responsible organization	Future outlook: Area 2 The development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards.	The standing office of CCFSC is under MARD with DDMFSC as the focal point. DRR policies, legislation, projects, programmes and activities are designed and implemented.	na	na	CCFSC, MARD, DDMFSC	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
1	Responsible organization	Central Committee for Flood and Storm Control (CCFSC)	website of CCFSC, in Vietnamese only	na	na	CCFSC	CCFSC website (Vietnamese only)	http://ccfsc.org.vn/	accessed on 2013/2/26
1	Responsible organization	Department for Dyke Management, Flood and Storm Control (DDMFSC), MARD	Major functions of duties and authorities of Department of Dike Management and Flood, storm Control (DDMFSC) under Ministry of Agriculture and Rural Development (MARD) concern planning, action plan for dyke construction and management, flood diverge, flood and storm control, and disaster mitigation to be submitted to authorized level for approval, and arrange implementation after approval; as well as legal documents Disaster Management Center (DMC) shall function under the administrative control of DDMFC-MARD.	na	na	DDMFSC	ASEM Water website	http://www.asemwater.org/Partnerships/Partners/2011-05-19/183.html	accessed on 2013/2/26
1	Responsible organization	Disaster Management Center (DMC)	The Disaster Management Center (DMC) under the Directorate of Water Resources was established in 2010. The main responsibilities of DMC are to co-operate with the Department of Dyke Management, Flood and Storm Control (DDMFSC) ensuring the operation of the Standing Office for the Central Committee for Flood and Storm Control (CCFSC), consults CCFSC in implementing all activities indicated at the Decision No.14/2010/ND-CP dated 27/2/2010 of the Prime Minister.	na	na	DMC	DMC website	http://www.dmc.gov.vn/Home/tabid/38/language/en-US/Default.aspx	accessed on 2012/2/26
1	Responsible organization	Disaster Management Center (DMC)	The Disaster Management Centre (DMC), operates under the auspices of the PIM Directorate of Water Resources of the Ministry of Agriculture and Rural Development (MARD) and provides consultancy and technical support services to the Ministry on all DMC aspects of disaster risk reduction (DRR). The DMC also undertakes policy development and provides strategic planning advice and support. In addition, the Centre shares information on DRR, undertakes specific research, organises institutional development, capacity building and training and is involved with international cooperation and technology transfer.	na	na	DMC	International Conference Brochure	http://www.dmc.gov.vn/Home/tabid/38/language/en-US/Default.aspxhttp://pubs.iied.org/pdfs/G03176.pdf	accessed on 2013/2/26
1	Responsible organization	Disaster Management Center (DMC)	The DMC will be the Government executive body for communication of disaster warnings, advise and provide consultation of flood and storm management, prevention and control, disaster mitigation for the whole of Viet Nam in order to ensure safety of production activities and socio-economic development of the country.	na	na	DMC	ASEM Water website	http://www.asemwater.org/Partnerships/Partners/2011-05-19/183.html	accessed on 2013/2/26
1	Responsible organization	Ministry of Agriculture and Rural Development (MARD)	MARD is a governmental agency performing state management functions in the fields of agriculture, forestry, salt production, irrigation / water services and rural development nationwide, including state management functions with regard to delivery of public service and management of the State' s ownership of rural state owned enterprises in accordance with legal documents.	na	na	MARD	MARD website (Vietnamese and English)	http://www.agroviet.gov.vn/en/Pages/default.aspx	accessed on 2013/2/26
1	Budget for DRR program	Viet Nam: Statement made at the Global Platform for Disaster Risk Reduction (2011)	In 2009, the Government approved a US $53.5 million community-based disaster risk management programme to improve capacity at national, provincial and local levels in 6,000 communes and villages (roughly 2/3 of the country) frequently affected by disasters.	6,000 communes and villages prone to disasters	na	communes	PreventionWeb	http://www.preventionweb.net/english/policies/v.php?id=21857&cid=190	2011
1	DRR planning	Priority for action 1: Core indicator 2 Dedicated and adequate resources are available to implement disaster risk reduction plans and activities at all administrative levels	All 63 provinces have developed their action plans to implement the National Strategy. Most ministries participating in the CCFSC (e.g. MARD, MoNRE, MoLISA, MoC, MoD, MoIC, MoET, etc.) have developed action plans for the mainstreaming of DRR in their sectors. In the past two years, some DRM action plan activities have already been implemented in the provinces or by sectors (e.g dyke construction, relocation, embankments, training, awareness raising, risk mapping, etc.).	na	na	ministries and province governments	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	na	2012
1	DRR planning	Priority for action 1: Core indicator 4 A national multi sectoral platform for disaster risk reduction is functioning.	The focal agencies in charge of flood and storm control of Viet Nam are CCFSC/MARD.	na	na	CCFSC, MARD	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
1	Responsible organization (DRR planning)	Priority for action 1: Core indicator 3 Community Participation and decentralisation is ensured through the delegation of authority and resources to local levels	The current flood and storm control structure also decentralizes management functions to the provincial and sectoral levels. These include the annual disaster planning, contingency planning, budgeting, capacity building and awareness raising.	na	na	MARD	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
1	DRR planning	Priority for action 6: Core indicator 2 Disaster preparedness plans and contingency plans are in place at all administrative levels, and regular training drills and rehearsals are held to test and develop disaster response programmes.	Annually, 100% of communes, districts, and provinces conduct the disaster preparedness and response planning to review the lessons-learned and prepare for the upcoming disaster season including updates on the disaster situations, strengthening the organizational structure, etc.	na	na	communes, districts, and provinces	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
1	DRR planning	Priority for action 6: Core indicator 2 Disaster preparedness plans and contingency plans are in place at all administrative levels, and regular training drills and rehearsals are held to test and develop disaster response programmes.	At the national level, the CCFSC also conducts review meeting and develops a plan for the whole country and relevant ministries also develop a plan for each sector. However, the focus is still laid with the focal agency – MARD and its branches.	na	na	CCFSC	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
1	Plan	Priority for action 1: Core indicator 3 Community Participation and decentralisation is ensured through the delegation of authority and resources to local levels	Prominently, the Decision 1002/2009/QD-TTG on Community Based Disaster Risk management (CBDRM) emphasises the involvement of people and communities in DRR and DRM; the Decision stipulates that subsequent action planning at provincial levels for rolling out CBDRM in 6,000 disaster-prone communes (out of total 9,121communes in the whole country as of 31 December 2009-GSO) will be carried out.	na	na	na	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
1	Capacity building	Geo-Information Technology for Hazard Risk Assessment (Approved)	Enhance the Government's capability by improving knowledge base of natural disasters, inventory of at-risk facilities, and hazard maps in selected areas and ability to use a computer-based GIS to assess hazard risks Activities were (i) training and (ii) a pilot project for a selected province	country-wide with a pilot in Yen Bai	na	Government	ADM Website	http://www.adb.org/projects/40282-012/main	2009-
1	Capacity building	Area 2 The development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards.	The national DRM strategy set the target of ensuring that 100% of local staff who directly work in the field of disaster prevention, response and mitigation would be trained by 2020. Some provinces have now developed their action plans for implementing Decision 1002 and a few have begun to roll out capacity building activities. The overall vision is to train 6,000 communes (roughly two- thirds of the country) by 2020.	na	na	ministries and provinces	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
1	DRM project	Managing Natural Hazards Project (Loan approved)	1. Establishment of provincial disaster management centers in project provinces. Improving harmonization and sharing of DRM databases including: (i) integrating existing DRM databases and information systems; (ii) development of an inventory of existing medium and small scale reservoirs in project provinces, their safety standards, safety guidelines, and operational procedures; (iii) development of software for the management of reservoirs for national and provincial levels. 2. Integrating weather forecasting and early warning systems nationwide. 3. community-based disaster risk management including support for: (i) improving commune-level flood and storm risks management procedures; (ii) the development of inter-communal support platforms; (iii) enhancement of private sector commune partnerships. 4. Priority disaster risk mitigation investments within the four selected river basins	na	ni	MARD	WB Website	http://www.worldbank.org/projects/P118789/vietnam-managing-natural-hazards-project?lang=en	2013-
1	Strategies and plans	Priority for action 4: Core indicator 1 Disaster risk reduction is an integral objective of environment related policies and plans, including for land use natural resource management and adaptation to climate change.	Water sector strategies and plans place a heavy emphasis on the construction of dykes, reservoirs, irrigation systems etc, partly as a means to improving water resource management but also to prevent/mitigate/reduce soil erosion and flooding.	na	na	Water sector	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010

2. Flood Risk Assessment

Chapter	Item	Document/Information Title	Contents	Target Areas	Map URL	Executing Agencies	Source	URL	Year
2	DMIS	8.10.1 (1) DMIS and Disaster Loss Database	At the national level, disaster monitoring systems installed in Disaster Management Centers (DMC) are placed to monitor, archive and disseminate data on key hazards and damages caused by disasters.	na	na	DMC	Data Collection Survey on ASEAN Regional Collboration in Disaster Management	http://www.dmc.gov.vn/Home/tabid/38/language/en-US/Default.aspx	accessed on 2012/2/26
2	Hazard map	Priority for action 2: Core indicator 1 National and local risk assessments based on hazard data and vulnerability information are available and include risk assessments for key sectors.	Some maps at 1:25,000-scale have been developed by national agencies. However at present, there are no multi-hazard maps or risk assessment data available at national level.	na	na	DDMFSC	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
2	Hazard map	7.1.10 (2) Risk Assessment	Flood hazard maps for the Mekong River basin has been developed by the MRC based on the actual inundation areas during the floods in 1995, 1996, and 2000. Also, flood hazard maps for four provinces including Thua Thien Hue Province were prepared through the Natural Disaster Risk Management Project in 2010.	Mekong River basin	na	MRC	Data Collection Survey on ASEAN Regional Collboration in Disaster Management	na	2010
2	Hazard map	Priority for action 2: Core indicator 1 National and local risk assessments based on hazard data and vulnerability information are available and include risk assessments for key sectors.	In An Giang province, the DoNRE and DARD have developed some risk maps for key hazards including flood and landslide at the scale of 1:25,000. These maps serve as a tool for land-use planning, residential relocation, infrastructure building. However, the more detailed maps at district or commune level are not yet developed.	An Giang province	na	DoNRE, DARD	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
2	Hazard map	Drivers of Progress a) Multi-hazard integrated approach to disaster risk reduction and development	The NDRMP has successfully piloted Integrated Disaster Risk Management approach for 3 provinces (Quang Nam, Quang Tri and Thanh Hoa in the North Central Coast region) with advanced digitized integrated GIS hazard maps	Quang Nam, Quang Tri and Thanh Hoa	ni	ni	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
2	Hazard map	Priority for action 2: Core indicator 1 National and local risk assessments based on hazard data and vulnerability information are available and include risk assessments for key sectors.	Recently the NDRMP developed high quality flood modelling maps for 3 provinces (Quang Tri, Thanh Hoa and Quang Nam); JICA supported Thua Thien Hue for similar maps but only with substantial technical and financial support.	Quang Tri, Thanh Hoa and Quang Nam	ni	DARD	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
2	Risk assessment	Priority for action 2: Core indicator 1 National and local risk assessments based on hazard data and vulnerability information are available and include risk assessments for key sectors.	Currently, the risk assessment has been conducted by the two main sectors (agriculture and environment); while other sectors have not conducted a thorough risk assessment yet (health, education, construction, etc.).	Nationwide	na	Sectors	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010

2	Risk assessment	Priority for action 2: Core indicator 1 National and local risk assessments based on hazard data and vulnerability information are available and include risk assessments for key sectors.	For specific hazards some risk assessments have been carried out at national level such as: floods and drought (MoNRE, MARD), earthquakes and tsunamis (Geophysical Institute), flash floods (MARD, MONRE), and typhoon (Hydro-Met).	na	na	MoNRE, MARD, Geophysical Institute, Hydro-Met	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
2	Vulnerability assessment	Priority for action 2: Core indicator 1 National and local risk assessments based on hazard data and vulnerability information are available and include risk assessments for key sectors.	Vulnerability and Capability Assessment (VCA) methodologies have been developed under various ODA-financed projects, but usually these approaches are only pilots at commune levels and are not usually continued.	na	na	ni	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010

3. Early Warning

Chapter	Item	Document/Information Title	Contents	Target Areas	Map URL	Executing Agencies	Source	URL	Year
3	Responsible organization	The Utilization of satellite data at National Hydro-Meteorological Services (NHMS)	In 1976 Hydro-Meteorological Services (NHMS) was established and was transferred under Ministry of Natural Resources and Environment (MONRE) in 2002.	na	na	NHMS	World Meteorological Homepage	ftp://ftp.wmo.int/Documents/PublicWeb/dra/rap/regionII/workshops/japan2011jan/5.2(6)-Vietnam.pdf	accessed on 2013/2/26
3	Responsible organization	8.10.1 (2) Early Warning System (EWS)	Weather forecast and early warning is under the responsibility of the National Hydro-Meteorological Service (NHMS). The NHMS consists of nine regional hydro-metrological centers and 54 provincial hydro-metrological forecasting centers and has observation station networks nationwide. The NHMS collects and archives hydro-meteorological data observed in a considerable number of stations:	na	na	NHMS	Data Collection Survey on ASEAN Regional Collboration in Disaster Management	na	2012
3	Forecasting	Priority for action 2: Core indicator 3 Early warning systems are in place for all major hazards, with outreach to communities.	PM Decision 986/QD-TTg June 2010 – Plan for modernizing forecasting technology and network of hydro-met system for the period 2010-2012. Provide timely, concise information for forecasting using digital technology for rainfall and flood.	na	na	national government	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
3	EWS	Area 2 The development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards.	Early Warning Systems Development project finannced for Ministry of Natural Resources and Environment (MoNRE) to strengthen capacity for forecasting and EWS since June 2010	na	na	MoNRE	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
3	EWS	7.1.10 (3) Monitoring / Early Warning System	Hydro-meteorological monitoring and flood forecasting are conducted by the National Hydro- Meteorological Service (NHMS). There are 70 hydrological monitoring stations all over the country. Five-day advance flood forecasting is made every six hours.	na	na	NHMS	Data Collection Survey on ASEAN Regional Collboration in Disaster Management	na	2012
3	EWS	Priority for action 2: Core indicator 3 Early warning systems are in place for all major hazards, with outreach to communities.	Vietnam launched Vinasat 1 in April 2008 to increase its capacity for a more reliable and accurate EWS	na	na	ni	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
3	EWS	The Utilization of satellite data at National Hydro-Meteorological Services (NHMS)	NHMS analyzes data from satellites and weather charts, results from NWP to make daily weather forecast, medium and long range forecast and tropical cyclone warning.	na	na	NHMS	World Meteorological Homepage	ftp://ftp.wmo.int/Documents/PublicWeb/dra/rap/regionII/workshops/japan2011jan/5.2(6)-Vietnam.pdf	accessed on 2013/2/26
3	EWS transmission tools	Priority for action 3: Core indicator 4 Countrywide public awareness strategy exists to stimulate a culture of disaster resilience, with outreach to urban and rural communities.	Ministry of Information and Communication (MIC) commits to providing the infrastructures for DRR. MIC has a Free Public Communication Fund to be utilized for supporting the provision of equipment to receive radio/cell phone. It also provides SMS system for EWS text.	na	na	MIC	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
3	Forecasting	National Hydro-Meteorological Service National Center for Hydro-Meteorological Forecasting	The National Center for Hydro-meteorological Forecasting (NCHMF) is an operational unit under the National Hydro-meteorological Service (NHMS), Ministry of Natural Resources and Environment (MONRE). Its function is to carry out the hydro-meteorological forecasting and related services, implement the specialized hydro-meteorological telecommunication networks for the whole country and related areas	na	na	NCHMF	NCHMF Website	http://www.nchmf.gov.vn/web/en-US/43/Default.aspx	accessed on 2013/2/26
3	Forecasting	Priority for action 3: Core indicator 1 Relevant information on disasters is available and accessible at all levels, to all stakeholders (through networks, development of information sharing systems etc)	The National Centre for Hydro-Met provide timely and accessible information on forecasting and early warning of main hazards (typhoon, floods, rain) on its website	na	na	NCHMF	NCHMF website Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://www.nchmf.gov.vn/web/en-US/105/92/Default.aspx	Accessed on 2013/2/26
3	Forecasting	Area 2 The development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards.	Flood forecasting capacity has improved in recent years due to the installation of a greater number of hydrological monitoring stations. There has however only been moderate progress on drought forecasting.	na	na	ni	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
3	Forecasting at sea	Area 3 The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes in the reconstruction of affected communities.	the Coastal Communications Company (CCC) has built 32 stations along the coast of Viet Nam.	Coast	na	CCC	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2009-2015
3	Forecasting at sea	Area 3 The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes in the reconstruction of affected communities.	The MoIC project links up with the CCC to provide affordable and effective warning systems for fishermen. For example of 2,500 fishing boats in Ninh Thuan 10% have I-COM up to 500km. The rest fish near shore and communications can be effectively carried out using mobile phones, short wave radio etc. The province has built 3 coastal stations to communicate with 90% of boats.	Coast	na	MoIC and CCC	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
3	EWS	Priority for action 2: Core indicator 3 Early warning systems are in place for all major hazards, with outreach to communities.	An Giang province constructed real-time online monitoring stations (water current flow, sediment of Mekong River), 2 more to be constructed – national project to be funded by MoNRE. EWS for flooding in Mekong Delta.	An Giang	na	MoNRE	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
3	EWS	Priority for action 2: Core indicator 3 Early warning systems are in place for all major hazards, with outreach to communities.	In Lao Cai province designed flash flood warning system based on precipitation levels	Lao Cai	na	Provincial government	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
3	Forecasting and monitoring	Mekong River Commission	MRC has 24 stations and update the flood forecasting and river monitoring web site daily during flood season from June to October and weekly on Monday during dry season from November to May.	Mekong River	na	MRC	Mekong River Commission Website	http://ffw.mrcmekong.org/floodrisk.htm	accessed on 2013/2/21

4. Disaster Management Information

Chapter	Item	Document/Information Title	Contents	Target Areas	Map URL	Executing Agencies	Source	URL	Year
4	Responsible organization (EW dissemination)	National Center for Hydro-Meteorological Forecasting	The NCHMF is responsible for providing various hydro-meteorological and marine forecasts. The hydro-meteorological forecasts and warnings are broadcasted on the mass media. The hazardous weather warnings are transmitted to Governmental Authorities, which are responsible for organizing and guiding the disaster prevention and preparedness for the people.	na	na	NCHMF	NCHMF website	http://www.nchmf.gov.vn/web/en-US/105/92/Default.aspx	Accessed on 2013/2/26
4	EWS dissemination	8.10.1 (2) Early Warning System (EWS)	Flood and storm early warning is in DMC' s charge. DMC monitors, archives and disseminates data of river monitoring data. DMC performs weather forecast and early warning based on those data. Flood forecast and early warning is provided to relevant national agencies and local governments (province/district/commune).	na	na	DMC	Data Collection Survey on ASEAN Regional Collboration in Disaster Management	na	2012
4	EWS dissemination	8.10.1 (3) Means of Dissemination of Early Warning	In case of weather forecast and early warning, NHMS disseminates to communities through mass media (e.g. television, radio), the NHMS website and local governments.	na	na	NHMS	Data Collection Survey on ASEAN Regional Collboration in Disaster Management	na	2012
4	EWS dissemination	Priority for action 2: Core indicator 3 Early warning systems are in place for all major hazards, with outreach to communities.	The traditionally EWS in Vietnam include 2 channels: 1. TV/Radio including VTV and VOV are very active and recently increased its frequency of news and coverage. These are effective channel to disseminate forecasting and early warning to the public audience 2. CCFSC organization system exists from central to commune level which brings timely warning messages to the authorities and communities 3. Loudspeaker systems exists in most communes and in some cases messengers still can be mobilized to timely warn the people at the lowest level.	na	na	CCFSC, TV/Radio	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
4	Information source for DRR	Priority for action 3: Core indicator 1 Relevant information on disasters is available and accessible at all levels, to all stakeholders (through networks, development of information sharing systems etc)	CCFSC website is the only portal for information on water-related natural disasters at the national level. CCFSC requires its system from commune to provincial and sectors to report and share information on disaster damages and disaster preparedness plans with relevant agencies. This system is sufficient for DRR actors to plan for response and recovery but not for contingency planning and rehabilitation and reconstruction.	na	na	CCFSC	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
4	Information sharing	Priority for action 6: Core indicator 4 Procedures are in place to exchange relevant information during hazard events and disasters, and to undertake post-event reviews	CCFSC utilizes formal communication channels for information sharing and mobilizing response during hazard events. The communication infrastructure of MIC and mass media (VTV, VOV) is considered as effective for sharing information with the public.	na	na	CCFSC, media	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010
4	Information source for DRR	Priority for action 3: Core indicator 1 Relevant information on disasters is available and accessible at all levels, to all stakeholders (through networks, development of information sharing systems etc)	Some provinces have developed their own DRR websites for sharing the disaster information such as Thua Thien Hue, HCMC, Long An and Bac Lieu.	Thua Thien Hue, HCMC, Long An and Bac Lieu. etc	na	Province	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) – interim	http://preventionweb.net/go/15492	2010

5. Disaster Management at Community Level and Disaster Education

Chapter	Item	Document/Information Title	Contents	Target Areas	Map URL	Executing Agencies	Source	URL	Year
5	Capacity building	Project for Building Disaster Resilient Societies in Central Region	Project Activities 1.1 To consolidate DMDs within DARD 1.2 To produce hazard maps on sediment disasters, floods, and bank erosion 1.3 To formulate intergrated flood management plans 1.4 To improve early warning and evacuation systems 2.1 To formulate plans of Community-centered disaster management (CCDM) activities in pilot sites and conduct them with local universities and NGOs 2.2 To produce plans and a manual for promoting CCDM 3.1 To implement suitable low-cost small-scale works for two pilot construction sites 3.2 To produce Guidline for Riverbank Erosion Management 4.1 To plan and conduct disaster management training programs for MARD officials and produce training materials	Thua Thien Hue 州など4州/ Thua Tien Hue, Quang Nam, Quang Ngai	http://www.jica.go.jp/project/english/vietnam/007/outline/index.html	MARD, DARD of Hue Province, Quang Nam Province, and Quang Ngay Province	JICA Website	http://www.jica.go.jp/project/english/vietnam/007/outline/index.html	2009/3-2012/2

5	Capacity building	Area 2 The development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards.	The World Bank funded Natural Disaster Risk Management Project (NDRMP) which has successfully trained staff of Committees for Flood and Storm Control (CFSC) in 12 provinces on Community Based Disaster Risk Management (CBDRM).	12 provinces	na	CFSC	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
5	Capacity building	Area 2 The development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards.	Currently a major focus of the international development assistance community is on supporting the GoV plan for Community Based Disaster Risk Management (CBDRM) to synthesize lessons learned, standardize approaches, methodologies and tools, develop training materials and programmes including the Training of Trainers for the implementation of this plan (e.g. the UNDP Strengthening Capacity for Disaster Management (SCDM) Project).	ni	na	na	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
5	Public awareness	Priority for action 3: Core indicator 4 Countrywide public awareness strategy exists to stimulate a culture of disaster resilience, with outreach to urban and rural communities.	The CBDRM sets out a target to disseminate knowledge about flood and storm prevention and control and natural disaster mitigation to 70% of population in communes in natural disaster–frequented areas by 2020.	disaster–frequent areas	na	ni	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
5	Public awareness	Priority for action 3: Core indicator 4 Countrywide public awareness strategy exists to stimulate a culture of disaster resilience, with outreach to urban and rural communities.	Annually, there are some public education campaigns to be organized on the Vietnam Disaster Day, International Disaster Day, annual rehearsal organized by flood and storm control sector, search and rescue, Red Cross, and others project–based activities to raise the public awareness on DRR.	na	na	Flood and storm control sector, search and rescue, Red Cross	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
5	Public awareness	Priority for action 3: Core indicator 4 Countrywide public awareness strategy exists to stimulate a culture of disaster resilience, with outreach to urban and rural communities.	Ministry of Information and Communication (MIC) and DIC at provincial levels highly commit and possess sufficient mass media with modern technology (TV, Radio, Cable TV, print newspapers, internet, phone) to launch public education programs.	na	na	MIC, DIC	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
5	Public awareness	Priority for action 3: Core indicator 4 Countrywide public awareness strategy exists to stimulate a culture of disaster resilience, with outreach to urban and rural communities.	Recently, Vietnam Digital Company launched a dedicated channel TV14 for broadcasting documentaries and news about DRR. VTV is also planning to launch a channel on the same topic.	na	na	Vietnam Digital Company, VTV	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
5	Public awareness	7.1.10 (5) Emergency Response	In some communes such as Binh Duong Commune in Quang Ngai Province, flood damages were quite limited since their disaster response plan had been formulated in advance and had been well known to residents in workshops and meetings on a regular basis.	Binh Duong etc.	ni	Communes	Data Collection Survey on ASEAN Regional Collboration in Disaster Management	na	2012
5	Public awareness	Priority for action 6: Core indicator 2 Disaster preparedness plans and contingency plans are in place at all administrative levels, and regular training drills and rehearsals are held to test and develop disaster response programmes.	Before the disaster season, the Prime Minister issues an instruction to all stakeholders involved about flood and storm control activities.	na	na	Prime Minister	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
5	Public awareness	Priority for action 6: Core indicator 2 Disaster preparedness plans and contingency plans are in place at all administrative levels, and regular training drills and rehearsals are held to test and develop disaster response programmes.	Every year on the National Disaster Day (22nd May), the President sends an official letter to CCFSC and people asking everyone to participate in disaster prevention, response, and recovery.	na	na	Prime Minister	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
5	Mock training and drills	Priority for action 5: Core indicator 1 Strong policy, technical and institutional capacities and mechanisms for disaster risk management, with a disaster risk reduction perspective are in place.	In terms of mock training and drills, at local level, annually, CFSC and local authorities conduct rehearsals with participation of army soldiers, security police, Red Cross and youth volunteers, and community representatives. However, due to the lack of funding, the drills are mostly conducted at few communes and not frequently. Rarely, the drill is conducted at provincial or national level. Currently, there is no training and mock drills in school and hospitals for emergency preparedness; except in some areas where INGOs supported local CFSC and authorities to conduct drill in the most disaster–prone communes.	na	na	CFSC	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
5	NGO activities	Drivers of Progress d) Human security and social equity approaches integrated into disaster risk reduction and recovery activities	Government and mass organizational structures extend down to the commune level. The mass organizations such as the Fatherland Front, Youth Union and Women' s Union' s in particular play a strong role at grassroots levels in ensuring that the most vulnerable groups are prioritized.	na	na	Mass organizations	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
5	NGO activities	Priority for action 1: Core indicator 4 A national multi sectoral platform for disaster risk reduction is functioning.	There exists an informal DRM network namely DMWG with voluntary participation of various INGOs, UN agencies, as well as some local organizations and mass organizations for sharing information, joint advocacy, joint disaster damage and needs assessments etc.	ni	na	various INGOs, UN agencies, local organizations	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
5	NGO activities	Drivers of Progress d) Human security and social equity approaches integrated into disaster risk reduction and recovery activities	Vulnerable populations are prioritized in DRM planning and response, for example, the relocation of highly vulnerable populations in areas prone to flooding and erosion, swimming lessons for children in the Mekong delta, day care centres for children in the Mekong Delta during flood season, and the housing for the poor programme (Programme 167).	Nationwide	na	Mass organizations	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
5	NGO activities	Drivers of Progress e) Engagement and partnerships with non–governmental actors; civil society, private sector, amongst others, have been fostered at all levels	There is a significant INGO community active in the field of DRR in Viet Nam and they are organized under a Disaster Management Working Group (DMWG) and some are also members of a Joint Advocacy Network Initiative (JANI) both of which create a forum for sharing DRM lessons from the field and a more structured approach towards advocacy and lobbying.	Nationwide	na	INGO community	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
5	NGO activities	Disaster Management Working Group (DMWG)	The NGO Resource Disaster Management Working Group (DMWG) was established in 1999 to support information sharing and coordination of relief activities. It provides forums for Vietnamese non–governmental organizations, international NGOs, UN agencies, the Red Cross Movement and Government counterparts to participate actively in disaster risk management. This working group meets on a monthly basis. Assessment report on Preparedness & Relief in regions are available from the website.	Nationwide	na	DMWG	The Sixth International Conference The Sixth International Conference on Community–Based Adaptation Brochure and DMWG webstie	http://www.ngocentre.org.vn/dmwg	accessed on 2013/2/26
5	School education	Priority for action 3, Core indicator 2 School curricula , education material and relevant trainings include disaster risk reduction and recovery concepts and practices.	There have been numerous projects led by Viet Nam Red Cross (VNRC) and International Non–Governmental Organizations (INGOs) which have attempted to develop a curriculum for inclusion of DRR into the primary and secondary school curricula and piloted training on disaster preparedness for school children. One specific example is the successful program to provide swimming lessons for children in the flood prone areas (Mekong Delta and other central provinces).	Elementary and secondary schools	na	ni	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
5	School education	Priority for action 3, Core indicator 2 School curricula , education material and relevant trainings include disaster risk reduction and recovery concepts and practices.	STC and UNICEF are currently taking the lead in synthesizing existing curricula, lessons and experiences, piloting in 2 provinces for 8–15 years old, conducting ToT with intention for scale up.	Elementary and secondary schools	na	ni	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
5	Capacity building for rescue	Drivers of Progress: c) Capacities for risk reduction and recovery identified and strengthened	The Viet Nam Red Cross (VNRC) provides first aid /responder training to its staff and search and rescue teams throughout the country and regularly re–trains and updates the training.	Nationwide	na	VNRC	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
5	Capacity building for rescue	Area 3 The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes in the reconstruction of affected communities.	There is a need for further roll out of first responder training for search and rescue staff although the Viet Nam Red Cross (VNRC) has made a significant contribution, providing training and refresher training throughout the country.	Nationwide	na	Red Cross	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
5	Communication tool	Priority for action 2: Core indicator 3 Early warning systems are in place for all major hazards, with outreach to communities.	Leaders in Ninh Thuan province is equipped with some satellite phones for using in case of an disruptive disaster	Ninh Thuan	na	Provincial government	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010

6. Research on Disaster Management

Chapter	Item	Document/Information Title	Contents	Target Areas	Map URL	Executing Agencies	Source	URL	Year
6	Academic Education	Drivers of Progress c) Capacities for risk reduction and recovery identified and strengthened	One or two degree courses are now available in Viet Nam for higher level professional qualifications in disaster related subject areas, including the Bachelors in Disaster Risk Management offered by the Ha Noi School of Public Health.	Ha noi	na	Ha Noi School of Public Health.	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
6	Research	Priority for action 3: Core indicator 3 Research methods and tools for multi–risk assessments and cost benefit analysis are developed and strenghtened.	In recent years there have been some research projects carried out on DRR e.g. Child drowning in Mekong Delta (STC/GSO), CC and SLR in Mekong Delta (ADB), Hydro–Met research (together with Oxford, Kyoto Universities), DRR financing by NDRMP.	ni	na	universities etc	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
6	Research	Priority for action 3: Core indicator 3 Research methods and tools for multi–risk assessments and cost benefit analysis are developed and strenghtened.	The existing research institutes within university setting or government ministries mainly focus on hydro–met risks and modelling.	ni	na	Research institute	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009–2011) – interim	http://preventionweb.net/go/15492	2010
6	Research	The Utilization of satellite data at National Hydro–Meteorological Services (NHMS)	NHMS's functions include 1) Carrying out researches and applications of new technologies on hydro–meteorological forecasting, 2) Accomplishing international cooperation projects and programs on hydro–meteorological forecasting, data transmission and other related issues.	na	na	NHMS	World Meteorological Homepage	ftp://ftp.wmo.int/Documents/PublicWeb/dra/rap/regionII/workshops/japan2011jan/5.2(6)–Vietnam.pdf	accessed on 2013/2/26

7. Structural and Non–structural Measures

Chapter	Item	Document/Information Title	Contents	Target Areas	Map URL	Executing Agencies	Source	URL	Year
7	River dikes	7.1.10 (4) Preparedness / Prevention and Mitigation	River dikes designed for 100–year floods have been constructed along the Red River in Hanoi. They are maintained by the Department of Dyke Management, Flood and Storm Control (DDMFSC) by using a systematic database.	Hanoi	na	ni	Data Collection Survey on ASEAN Regional Collboration in Disaster Management	na	2012
7	Drainage project	7.1.10 (4) Preparedness / Prevention and Mitigation	Phase 2 of the drainage project in Hanoi is being started.	Hanoi	na	ni	Data Collection Survey on ASEAN Regional Collboration in Disaster Management	na	2012
7	Flood protection infrustructure	Second Red River Basin Sector Project	The rehabilitation of flood protection infrastructure (Red River Delta including Ha Tay, Ha Nam, Nam Dinh, Thai Binh, Hai Phong, Hai Duong, Thai Nguyen, Bac Ninh, Bac Giang, Vinh Phuc, Phu Tho, Yen Bai and Ninh Binh provinces)	the Red River basin	ni	MARD	ADB Website	http://www.adb.org/projects/30292–013/main	2002–2011
7	Dams	7.1.10 (4) Preparedness / Prevention and Mitigation	A committee chaired by the DDMFSC controls the release of discharge during flood season in four out of the seven large dams in the country, namely Hoa Binh, Tuyen Quang, Son La, and Thac Ba. Floods that were assumed to be caused by incorrect reservoir operation were reported in the past, and DDMFSC recognizes the possibility of similar accidents in the future.	na	na	ni	Data Collection Survey on ASEAN Regional Collboration in Disaster Management	na	2012
7	Dams	7.1.10 (6) Issues and Needs	There are two existing and one ongoing large dams under the management of the Hue Office of the Department of Agriculture and Rural Development (DARD). At present, each dam has its own operation rules, and it was supposed to have difficulty in coordination of operations among the dams during floods	Hue	na	Hue Office of the DARD	Data Collection Survey on ASEAN Regional Collboration in Disaster Management	na	2012

7	Rehabilitation	Emergency Rehabilitation of Calamity Damage Project	Reinstate essential rural infrastructure damanged by typhoons and storms in 2005. 1. flood protection reinstated 2. Equivalent or enhanced storm and flood protection provided to vulnerable areas	Ha Giang, Ha Tinh, Nam Dinh, Nghe An, Phu Tho, Phu Yen, Quang Binh, Quang Tri, Thanh Hoa, Yen Bai provinces.	ni	Ministry of Agriculture & Rural Development (MARD)	ADB Website	http://www.adb.org/projects/40282-013/main	2006-2012
7	Water Supply Development and Expansion	Central Region Small and Medium Towns Development (Loan approved)	(i) Construction and rehabilitation of existing headworks, (ii) Construction of water treatment plants and pumping stations,(iii) Construction, rehabilitation, and improvement of water distribution networks, and (iv) Installation of new piped connections and rehabilitation of existing connections	Binh Thuan, Dak Nong, Khanh Hoa, Ninh Thuan, and Phu Ye	ni	ni	ADB Website	http://www.adb.org/projects/30286-013/main	2006-
7	Flood control measures	Greater Mekong Subregion Corridor Towns Development Project (Loan Approved)	Increase climate resilience through flood control measures	Dong Ha City, Lao Bao, and Moc Bai	ni	Provincial People's Committee of Quang TriProvince	ADB Website	http://www.adb.org/projects/43319-043/main	2012-
7	Reservoirs	The Project for Rehabilitation of Small-Scale Reservoirs in Quang Ngai Province	Seven severely deteriorated reservoirs with and their related facilities will be repaired and improved, in an effort to reduce the risk of breaches and ensure the safety of residents.	Quang Ngai	http://www.mofa.go.jp/mofai/gaiko/oda/data/gaiyou/odaproject/asia/vietnam/pdfs/100811_101.pdf	ni	JICA sebsite	http://www.jica.go.jp/english/news/press/2010/101013.html	2010
7	Bridges	The Project for Reconstruction of Bridges in the Central District (Phase II)	The project consists of 4 bridges construction work in Ninh Thuan Province, Dak Lak Province and Khanh Hoa Province	Ninh Thuan, Dak Lak and Khanh Hoa Provinces	http://www.mofa.go.jp/mofai/gaiko/oda/data/gaiyou/odaproject/asia/vietnam/pdfs/120508_101.pdf	ni	JICA Website	http://www.jica.go.jp/chotatsu/musho/pdf/20120904_vietnam.pdf	2012-
7	Roads, bridges, water facilities	Natural Disaster Risk Management Project- Additional Finance (On going)	Post-disaster reconstruction for 165 subprojects in 8 provinces which were heavily hit by Storm Xangsane (October 2006) and Storm Lekima (October 2007). The subprojects covered the reconstruction of small-scale infrastructure such as rural roads, small bridges, rural water supply and sewerage facilities, rural irrigation canals, pumping stations, water retaining walls, small-scale damn rehabilitation etc.	8 provinces hit in 2006 and 2007	ni	Vietnam Sustainable Development (EASVS)	WB Website	http://documents.worldbank.org/curated/en/2010/03/12028201/vietnam-additional-finance-natural-disaster-risk-management-project	2010-
7	Construction	Area 3 The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes in the reconstruction of affected communities.	The ongoing World Bank loan project NDRMP includes substantial investment (65 M USD) for subprojects including Ba Tri sea dyke and upgrading of embankments, safe harbours, reservoirs etc.	ni	ni	ni	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
7	Sea dyke	Area 3 The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes in the reconstruction of affected communities. Priority for action 4: Core indicator 3	The country is currently implementing a plan to build a sea dyke from Quang Ninh to Quang Nam (Phase 1 2009-2015) and Phase 2 (2015-2020) Quang Ngai to Kien Giang (i.e. covering the entire coast of Viet Nam).	entire coast of Viet Nam	ni	Government of Vietnam	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2009-2020
7	Typhoon resistant builindg	Priority fr action 4: Core indicator 3 Economic and productive sectorial policies and plans have been implemented to reduce the vulnerability of economic activities	A number of DRR preparedness and mitigation measures are included in sectoral plans at national and provincial levels including strengthening foundations, building schools with 2 floors, roves/doors/windows specially designed for typhoon resistant (especially in Mekong Delta). Such public buildings also double as evacuation centres during emergencies. In An Giang Education sector 95% of high schools have been strengthened against flooding, 85% of secondary schools, 70% primary schools the remainder should be completed by 2015.	Thphoon area	ni	ni	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2009-2020
7	Budget for disaster prevention and response	Viet Nam: Statement made at the Global Platform for Disaster Risk Reduction (2011)	National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020. This framework, focuses mainly on water-related disasters, has a budget of US$13 billion, of which around US$11billion is for structural measures such as reservoirs, dams and dykes and safe harbors, and more than US$2billion for non-structural measures.	na	na	National government	PreventionWeb	http://www.preventionweb.net/english/policies/v.php?id=21857&cid=190	2011
	Non-structural measurement								
7	Building codes and standards	Area 1 The more effective integration of disaster risk considerations into sustainable development policies, planning and programming at all levels, with a special emphasis on disaster prevention, mitigation, preparedness and vulnerability reduction.	More than 1,000 building codes and standards have been issued since 1996 including 10 standards for DRM to ensure the safety of the people and the structures themselves.	na	na	Ministry of Construction	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
7	Structure designs and models	Area 1 The more effective integration of disaster risk considerations into sustainable development policies, planning and programming at all levels, with a special emphasis on disaster prevention, mitigation, preparedness and vulnerability reduction.	The Ministry of Construction (MoC) continues to issue data about hydro-meteorological and natural disaster conditions and the relevant structure designs to be applied. The MoC also issued some models for typhoon and flood resistant housing models which have been disseminated to provinces.	na	na	Ministry of Construction	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
7	Zoning and technical requirements	Area 1 The more effective integration of disaster risk considerations into sustainable development policies, planning and programming at all levels, with a special emphasis on disaster prevention, mitigation, preparedness and vulnerability reduction.	A national level zoning of earthquake vulnerable areas has been completed by MoC. Technical requirements for the construction of earthquake-proof buildings have also been issued by MoC but further studies need to be conducted to examine their suitability to the Vietnamese context.	na	na	Ministry of Construction	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
7	Guildeline for construction	Priority for action 5: Core indicator 1 Strong policy, technical and institutional capacities and mechanisms for disaster risk management, with a disaster risk reduction perspective are in place.	In the Mekong delta, the education and health sector have plan to upgrade all facilities to be flood-proof which taken into account the history flood in 2000 for designing the new building or renovating the old one. The foundation must be elevated higher than the flood level 2002 and must be at least two stories building.	Mekong River basin	ni	Education and health sector	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
7	Guildeline for construction	Priority for action 4: Core indicator 4 Planning and management of human settlements incorporate disaster risk reduction elements, including enforcement of building codes.	In 2008 MoC issued instructions for the application of construction technologies/techniques in the various hazard zones in order that developments and infrastructures are resistant to the differing and multiple hazards throughout the country.	na	na	Ministry of Construction	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
7	Relocation	Priority for action 4: Core indicator 4 Planning and management of human settlements incorporate disaster risk reduction elements, including enforcement of building codes.	The Ministry of Construction (MoC) has a Master Plan for Urban Planning until 2020 including the continuation of relocating people from flood-prone areas of the Mekong Delta; resettlement of populations vulnerable to coastal erosion e.g. Ninh Thuan, Quang Tri, Thai Binh; and relocation of those populations affected by riverbank erosion e.g. An Giang and flash flood prone areas of Kon Tum, Lao Cai, and Quang Tri.	Flood prone areas	ni	Ministry of Construction	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
7	Relocation	Area 1 The more effective integration of disaster risk considerations into sustainable development policies, planning and programming at all levels, with a special emphasis on disaster prevention, mitigation, preparedness and vulnerability reduction.	A number of provincial, sub-national or regional GoV projects focusing on relocating disaster-prone communities have been implemented including for the Mekong Delta Region, Central Region and numerous hazard prone provinces. Some recent examples include the relocation of people living outside the sea dyke area in Thai Binh province; in An Giang 200 residential areas for the deeply flooded areas have been resettled and continuing to build a further 40 residential areas for people living in landslide areas; in Lao Cai people have been relocated out of flash flood prone areas; in Ninh Thuan 200 households have been moved from coastal areas prone to erosion.	Mekong Delta Region, Central Region	na	Government of Vietnam	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010

8. Preparedness for Effective Response

Chapter	Item	Document/Information Title	Contents	Target Areas	Map URL	Executing Agencies	Source	URL	Year
8	Capacity building	Project for Building Disaster Resilient Societies in Central Region	Project Activities 1.1 To consolidate DMDs within DARD 1.2 To produce hazard maps on sediment disasters, floods, and bank erosion 1.3 To formulate intergrated flood management plans 1.4 To improve early warning and evacuation systems 2.1 To formulate plans of Community-centered disaster management (CCDM) activities in pilot sites and conduct them with local universities and NGOs 2.2 To produce plans and a manual for promoting CCDM 3.1 To implement suitable low-cost small-scale works for two pilot construction sites 3.2 To produce Guidline for Riverbank Erosion Management 4.1 To plan and conduct disaster management training programs for MARD officials and produce training materials	Thua Thien Hue 州など4州/ Thua Tien Hue, Quang Nam, Quang Ngai	http://www.jica.go.jp/project/english/vietnam/007/outline/index.html	MARD, DARD of Hue Province, Quang Nam Province, and Quang Ngay Province	JICA Website	http://www.jica.go.jp/project/english/vietnam/007/outline/index.html	2009/3-2012/2
8	Capacity building	Area 2 The development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards.	The World Bank funded Natural Disaster Risk Management Project (NDRMP) which has successfully trained staff of Committees for Flood and Storm Control (CFSC) in 12 provinces on Community Based Disaster Risk Management (CBDRM).	12 provinces	na	CFSC	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
8	Capacity building	Area 2 The development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards.	Currently a major focus of the international development assistance community is on supporting the GoV plan for Community Based Disaster Risk Management (CBDRM) to synthesize lessons learned, standardize approaches, methodologies and tools, develop training materials and programmes including the Training of Trainers for the implementation of this plan (e.g. the UNDP Strengthening Capacity for Disaster Management (SCDM) Project).	ni	na	na	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
8	Public awareness	Priority for action 3: Core indicator 4 Countrywide public awareness strategy exists to stimulate a culture of disaster resilience, with outreach to urban and rural communities.	The CBDRM sets out a target to disseminate knowledge about flood and storm prevention and control and natural disaster mitigation to 70% of population in communes in natural disaster-frequented areas by 2020.	disaster-frequent areas	na	ni	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
8	Public awareness	Priority for action 3: Core indicator 4 Countrywide public awareness strategy exists to stimulate a culture of disaster resilience, with outreach to urban and rural communities.	Annually, there are some public education campaigns to be organized on the Vietnam Disaster Day, International Disaster Day, annual rehearsal organized by flood and storm control sector, search and rescue, Red Cross, and others project-based activities to raise the public awareness on DRR.	na	na	Flood and storm control sector, search and rescue, Red Cross	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
8	Public awareness	Priority for action 3: Core indicator 4 Countrywide public awareness strategy exists to stimulate a culture of disaster resilience, with outreach to urban and rural communities.	Ministry of Information and Communication (MIC) and DIC at provincial levels highly commit and possess sufficient mass media with modern technology (TV, Radio, Cable TV, print newspapers, internet, phone) to launch public education programs.	na	na	MIC, DIC	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010

8	Public awareness	Priority for action 3: Core indicator 4 Countrywide public awareness strategy exists to stimulate a culture of disaster resilience, with outreach to urban and rural communities.	Recently, Vietnam Digital Company launched a dedicated channel TV14 for broadcasting documentaries and news about DRR. VTV is also planning to launch a channel on the same topic.	na	na	Vietnam Digital Company, VTV	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
8	Public awareness	7.1.10 (5) Emergency Response	In some communes such as Binh Duong Commune in Quang Ngai Province, flood damages were quite limited since their disaster response plan had been formulated in advance and had been well known to residents in workshops and meetings on a regular basis.	Binh Duong etc.	ni	Communes	Data Collection Survey on ASEAN Regional Collboration in Disaster Management	na	2012
8	Public awareness	Priority for action 6: Core indicator 2 Disaster preparedness plans and contingency plans are in place at all administrative levels, and regular training drills and rehearsals are held to test and develop disaster response programmes.	Before the disaster season, the Prime Minister issues an instruction to all stakeholders involved about flood and storm control activities.	na	na	Prime Minister	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
8	Public awareness	Priority for action 6: Core indicator 2 Disaster preparedness plans and contingency plans are in place at all administrative levels, and regular training drills and rehearsals are held to test and develop disaster response programmes.	Every year on the National Disaster Day (22nd May), the President sends an official letter to CCFSC and people asking everyone to participate in disaster prevention, response, and recovery.	na	na	Prime Minister	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
8	Mock training and drills	Priority for action 5: Core indicator 1 Strong policy, technical and institutional capacities and mechanisms for disaster risk management, with a disaster risk reduction perspective are in place.	In terms of mock training and drills, at local level, annually, CFSC and local authorities conduct rehearsals with participation of army soldiers, security police, Red Cross and youth volunteers, and community representatives. However, due to the lack of funding, the drills are mostly conducted at few communes and not frequently. Rarely, the drill is conducted at provincial or national level. Currently, there is no training and mock drills in school and hospitals for emergency preparedness; except in some areas where INGOs supported local CFSC and authorities to conduct drill in the most disaster-prone communes.	na	na	CFSC	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
8	NGO activities	Drivers of Progress d) Human security and social equity approaches integrated into disaster risk reduction and recovery activities	Government and mass organizational structures extend down to the commune level. The mass organizations such as the Fatherland Front, Youth Union and Women's Union's in particular play a strong role at grassroots levels in ensuring that the most vulnerable groups are prioritized.	na	na	Mass organizations	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
8	NGO activities	Priority for action 1: Core indicator 4 A national multi sectoral platform for disaster risk reduction is functioning.	There exists an informal DRM network namely DMWG with voluntary participation of various INGOs, UN agencies, as well as some local organizations and mass organizations for sharing information, joint advocacy, joint disaster damage and needs assessments etc.	ni	na	various INGOs, UN agencies, local organizations	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
8	NGO activities	Drivers of Progress d) Human security and social equity approaches integrated into disaster risk reduction and recovery activities	Vulnerable populations are prioritized in DRM planning and response, for example, the relocation of highly vulnerable populations in areas prone to flooding and erosion, swimming lessons for children in the Mekong delta, day care centres for children in the Mekong Delta during flood season, and the housing for the poor programme (Programme 167).	Nationwide	na	Mass organizations	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
8	NGO activities	Drivers of Progress e) Engagement and partnerships with non-governmental actors; civil society, private sector, amongst others, have been fostered at all levels	There is a significant INGO community active in the field of DRR in Viet Nam and they are organized under a Disaster Management Working Group (DMWG) and some are also members of a Joint Advocacy Network Initiative (JANI) both of which create a forum for sharing DRM lessons from the field and a more structured approach towards advocacy and lobbying.	Nationwide	na	INGO community	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
8	NGO activities	Disaster Management Working Group (DMWG)	The NGO Resource Disaster Management Working Group (DMWG) was established in 1999 to support information sharing and coordination of relief activities. It provides forums for Vietnamese non-governmental organizations, international NGOs, UN agencies, the Red Cross Movement and Government counterparts to participate actively in disaster risk management. This working group meets on a monthly basis. Assessment report on Preparedness & Relief in regions are available from the website.	Nationwide	na	DMWG	The Sixth International Conference The Sixth International Conference on Community-Based Adaptation Brochure and DMWG webstie	http://www.ngocentre.org.vn/dmwg	accessed on 2013/2/26
8	School education	Priority for action 3, Core indicator 2 School curricula , education material and relevant trainings include disaster risk reduction and recovery concepts and practices.	There have been numerous projects led by Viet Nam Red Cross (VNRC) and International Non-Governmental Organizations (INGOs) which have attempted to develop a curriculum for inclusion of DRR into the primary and secondary school curricula and piloted training on disaster preparedness for school children. One specific example is the successful program to provide swimming lessons for children in the flood prone areas (Mekong Delta and other central provinces).	Elementary and secondary schools	na	ni	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
8	School education	Priority for action 3, Core indicator 2 School curricula , education material and relevant trainings include disaster risk reduction and recovery concepts and practices.	STC and UNICEF are currently taking the lead in synthesizing existing curricula, lessons and experiences, piloting in 2 provinces for 8-15 years old, conducting ToT with intention for scale up.	Elementary and secondary schools	na	ni	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
8	Capacity building for rescue	Drivers of Progress: c) Capacities for risk reduction and recovery identified and strengthened	The Viet Nam Red Cross (VNRC) provides first aid /responder training to its staff and search and rescue teams throughout the country and regularly re-trains and updates the training.	Nationwide	na	VNRC	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
8	Capacity buildng for rescue	Area 3 The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes in the reconstruction of affected communities.	There is a need for further roll out of first responder training for search and rescue staff although the Viet Nam Red Cross (VNRC) has made a significant contribution, providing training and refresher training throughout the country.	Nationwide	na	Red Cross	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
8	Communication tool	Priority for action 2: Core indicator 3 Early warning systems are in place for all major hazards, with outreach to communities.	Leaders in Ninh Thuan province is equipped with some satellite phones for using in case of an disruptive disaster	Ninh Thuan	na	Provincial government	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010

9. Emergency Response and Recovery

Chapter	Item	Document/Information Title	Contents	Target Areas	Map URL	Executing Agencies	Source	URL	Year
9	Response and recovery	Priority for action 1: Core indicator 2 Dedicated and adequate resources are available to implement disaster risk reduction plans and activities at all administrative levels	Most of the response and early recovery tasks are reliant upon volunteers and the armed force/police.	na	na	volunteers and the armed force/police	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
9	Budget for disaster response	Priority for action 1: Core indicator 2 Dedicated and adequate resources are available to implement disaster risk reduction plans and activities at all administrative levels	The MoF and DoFs set aside annual contingency funding from 2-5% of national and provincial budgets for disaster response and recovery.	na	na	MoF、DoF	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
9	Budget for disaster response	Priority for action 4: Core indicator 5 Disaster risk reduction measures are integrated into post disaster recovery and rehabilitation processes	At present Viet Nam tends to utilize overall contingency funds (between 2-5% of national and provincial budgets) and where necessary in extreme cases, the National Reserve for post-disaster response, recovery and reconstruction.	na	na	MoF	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
9	Supply materials	Priority for action 6: Core indicator 3 Financial reserves and contingency mechanisms are in place to support effective response and recovery when required.	The Ordinance requires that every government agencies and individual must stockpile sufficient material reserves such as rock, sand bag, stone, bamboo for rescuing infrastructure failure; life vest, lifebuoy, boat for rescuing people; foods, fuel, medicines for surviving at the disaster-prone areas for some days. It also stipulates that the flood and storm control agencies is authorized to mobilize available resources from all sectors to cope with disasters.	na	na	Government agencies	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
9	Supply materials	Priority for action 6: Core indicator 3 Financial reserves and contingency mechanisms are in place to support effective response and recovery when required.	CCFSC instructs provinces and relevant ministries to stockpile and reserve funds, basic equipment and resources for disaster responses such as: DoH (medicines), DARD (seeds), DoET (school supplies), DoT (rock, cement, machinery), etc.	na	na	Government agencies	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
9	Su	Priority for action 6: Core indicator 2 Disaster preparedness plans and contingency plans are in place at all administrative levels, and regular training drills and rehearsals are held to test and develop disaster response programmes.	There are a number of warehouses and distribution points throughout the country in key/strategic locations with stockpiles for emergency response.	Nationwide	na	warehouses and distribution points	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
9	Food supply	Priority for action 6: Core indicator 3 Financial reserves and contingency mechanisms are in place to support effective response and recovery when required.	A National Reserve Ordinance allows the mobilization of thousands of tons of rice for emergencies. The storages are located in strategic areas that allow timely relief support to disaster affected people.	na	na	ni	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
9	DMIS	8.10.1 (1) DMIS and Disaster Loss Database	When flood disaster occurs, the DDMFSC is supposed to receive disaster reports including damage information and needs (e.g. food, drinking water, seeds) from PCFSC&SR.	na	na	DMC	Data Collection Survey on ASEAN Regional Collboration in Disaster Management	na	2012
9	Emergency response	Drivers of Progress d) Human security and social equity approaches integrated into disaster risk reduction and recovery activities	The country operates by a generally effective '4 on the Spot' motto (command, manpower, logistics and materials) in disaster response circumstances with the military quickly mobilized to assist and enabling emergency response operations to reach remote areas relatively quickly.	na	na	military	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
9	Emergency response	Drivers of Progress d) Human security and social equity approaches integrated into disaster risk reduction and recovery activities	One of the other advantages of a predominantly rural society is that at the local level a strong culture of community social governance and safety nets still pervades and this in turn means that particularly vulnerable groups such as female-headed households, old people, disabled, and families with young children are prioritized in local level decision-making by communal consensus and prioritized in emergency response. cooperation	na	na	Community	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
9	Emergency response	Priority for action 6: Core indicator 4 Procedures are in place to exchange relevant information during hazard events and disasters, and to undertake post-event reviews	For example during Ketsana in 2009 they met every 6 hours to update the situation in the disaster area and mobilize resources appropriately. Frontline Committee established in Da Nang city by Deputy Prime Minister.	Da Nang	na	Frontline Committee	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
9	Rescue	Priority for action 6: Core indicator 2 Disaster preparedness plans and contingency plans are in place at all administrative levels, and regular training drills and rehearsals are held to test and develop disaster response programmes.	The Search and Rescue system is well established and recently equipped with modern technology and facilities to be ready for conducting search and rescue missions both onshore and offshore.	na	na	ni	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
9	Medical care	Priority for action 5, Core indicator 2 Social development policies and plans are being implemented to reduce the vulnerability of populations most at risk.	Vietnam has a good coverage of hospitals and health centres down to commune level for basic first aid and medicines	na	na	hospitals and health centers	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
9	Shelters	Priority for action 6: Core indicator 2 Disaster preparedness plans and contingency plans are in place at all administrative levels, and regular training drills and rehearsals are held to test and develop disaster response programmes.	Shelters for mass evacuation during the short period of time are the public building with limited water and sanitation facilities as well as gender sensitivities. In case on longer evacuation, tents (provided by army and Red Cross) are used to accommodate the people.	na	na	public buildings	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
9	Recovery	Priority for action 6: Core indicator 4 Procedures are in place to exchange relevant information during hazard events and disasters, and to undertake post-event reviews	Based on these damage inventories (detailing deaths, houses damaged, public infrastructure (road, electricity, phone lines, schools, hospitals, irrigation/dyke/dam etc) damage, ha of agricultural land destroyed, livestock losses), support is allocated accordingly following CCFSC meetings.	na	na	ni	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
9	Rescue measures at sea	Area 3 The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes in the reconstruction of affected communities.	A Ministry of Information and Communications (MoIC) Project 2009-2015 is studying, piloting and implementing mobile stations for sea/coastal search and rescue nationwide. The MoIC have also developed a map for search and rescue at sea for whole country.	Coast	na	MoIC	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2009-2015

9	Funding	The systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes in the reconstruction of affected communities.	The post-disaster reconstruction component of the Natural Disaster Risk Management Project (NDRMP) is to plug some of the funding gaps in the short term whilst the country develops more solid risk-financing options.	na	na	ni	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
9	Damage survey	Priority for action 2: Core indicator 2 Systems are in place to monitor, archive and disseminate data on key hazards and vulnerabilities	Information on damage is systematically collected through the CCFSC organizational system from the commune to the provincial levels and from relevant sectors; the collected data is mostly utilized for planning emergency response (relief) and some recovery activities.	na	na	CCFSC	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010
9	Reconstuction	Priority for action 4: Core indicator 5 Disaster risk reduction measures are integrated into post disaster recovery and rehabilitation processes	There have been some efforts by NGOs such as DWF and IFRC Participating National Societies to persuade local governments to build back better in Thua Thien Hue, Ninh Thuan, Kon Tum and Gia Lai	Thua Thien Hue, Ninh Thuan, Kon Tum and Gia Lai	ni	NGOs	Vietnam: National progress report on the implementation of the Hyogo Framework for Action (2009-2011) - interim	http://preventionweb.net/go/15492	2010

Measures Taken for Natural Disasters

A10.2 Earthquake

Appendix A10.2

Appendix A10.2.1 Measures Taken for Natural Disasters: Earthquake / Brunei

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	Disaster Management Order (DMO) was enacted in 2006. It is the legal basis and guideline of disaster management. DMO prescribes the responsibilities and authority of the "National Disaster Council (NDC)" and "National Disaster Management Center (NDMC)". A disaster management component is included in each sector by sector law. Therefore, it is considered that a comprehensive disaster management law is not required. Outlines of Strategy and Policy for Development (OSPD), 2007-2017 shows policy as "developing further appropriate systems and organizations, for responding quickly and effectively to threats from natural disasters, infectious diseases, acts of terrorism, and other emergencies."
	Plan for Disaster Management	Article 18 in the DMO requests NDC to prepare a national disaster management plan. The NDMC explains that the plan is composed of the national "standard operating procedures (SOP)" and the Strategic National Action Plan for Disaster Risk Reduction 2012-2025.
	Organization for Disaster Management	The NDC is the highest authority for disaster management. Under NDC, the NDMC is established as the implementation agency. NDMC has put up the Disaster Command Center in place. In a disaster, an Incident Command Post (ICP) is established. Brunei's local administration is composed of four districts. In all districts, a District Disaster Management Center and District Emergency Operation Center are established.
Risk assessment		No historical earthquake disaster is recorded and investigation and study focusing and limited to this country area are not found.
Early warning		Monitoring and early warning system are not implemented.
Disaster management information		Any DMIS and/or disaster loss database has not been established. However, disaster losses are systematically reported, monitored and analyzed. These reports are then used in planning.
Disaster management at community level and disaster education		Each district prepares a "response plan" following the DMC guideline (SOP), which is provided as a community-based disaster risk management program. Hazard map is prepared by every community as one of the program components. The Ministry of Education is in charge of educating the public regarding disaster prevention and mitigation. Disaster risk reduction (DRR) has yet to be incorporated in school curricula. However, outreach programs have been taken up seriously through other means such as the ASEAN Regional Drawing Competition for students. These programs are held to promote awareness on disaster resilience among students, teachers and parents. The Ministry of Education is going to implement a new education program (SPN-21) to the public that includes a systematic curriculum for disaster prevention and mitigation. Drills for the public are held once a year based on the program of NDMC and other relevant agencies.
Preparedness for effective response		No information for this issue is found.
Emergency response and recovery		No information for this issue is found.

Appendix A10.2.2 Measures Taken for Natural Disasters: Earthquake / Cambodia

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	The Law on Disaster Management is in the progress. The National Committee for Disaster Management (NCDM) issued its policy document for disaster management in 1997; nevertheless, no actions have been taken except for responsive activities. A national contingency plan to tackle flooding and drought has been formulated since 2011, which requires a decree of the improvement and update by sector respectively.
	Plan for Disaster Management	The Strategic National Action Plan for Disaster Risk Reduction (2008-2013) was officially launched in 2009, and it has gradually implemented by the relevant stakeholders through cross sectors in Cambodia.
	Organization for Disaster Management	NCDM has been established in 1995 as a core institution and assistance to the Royal Government of Cambodia to lead, manage, and coordinate the disaster management tasks. The secretariat-general of NCDM shall consist of an "Emergency Coordination Center" under its management structure. NCDM shall consist of the sub-national committee for disaster management that composted of city-provincial committee for disaster management, town-district committee for disaster management and commune committee for disaster management.
Risk assessment		No historical earthquake disaster is recorded and investigation and study focusing and limited to this country area are not found.
Early warning		No information for earthquake is found.
Disaster management information		The NCDM is developing an information system for emergency management and early warning supported by the World Bank. The system will be installed to the Emergency Coordination Center, which is under construction. The system will be used to share disaster information among national and provincial agencies. NCDM will collect disaster-related information from various administrative and other agencies at all levels under their jurisdiction. Such agencies include the NCDM, PCDM, DCDM, CCDM and other organizations related to agriculture, health, rural development, the Cambodia Red Cross, etc. The system will be used in normal situations for monitoring meteorological and hydrological information at provincial levels. During emergency situations when disasters occur in a province, the provincial staff shall use the system to report to NCDM the actual situation (damages, activities and/or so on) as well as requests for emergency relief. NCDM plans to install this system in eight out of 24 provincial offices as a pilot project. The system will include a disaster loss database.
Disaster management at community level and disaster education		The commune level has disaster management committee structure. As instructed by NCDM, the commune-sangkat chiefs is supposed to issue an order to establish the Village Disaster Management Team (VDMT) comprising people in order to strengthen the community-based disaster risk management.
Preparedness for effective response		NCDM has drafted the National Emergency Management Policy since 1997, while the Cambodia Red Cross prepares its own response policy. NCDM, on the other hand, is expanding its emergency response function by establishing an Emergency Coordination Center. NCDM has prepared a National Contingency Plan, which is still subject for approval by issuing a decree, since 2011. It is expected that this national plan will be used as a guideline for provinces for the preparation and implementation of the provincial contingency plan.
Emergency response and recovery		No information for this issue is found.

Appendix A10.2.3 Measures Taken for Natural Disasters: Earthquake / Indonesia

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	The Disaster Management Law (No. 24) was enacted in 2007. Ancillary regulations for this law in below are enacted in 2008. 1) Regulation No. 22 on Disaster Aid Financing and Management 2) Regulation No.23 on Participation of International Institutions and Foreign Non-Governmental Organizations in Disaster Management 3) Regulation No.8 on National Agency Disaster Management.
	Plan for Disaster Management	National Level: The National Action Plan for Disaster Reduction 2006-2009 (2006) The National Action Plan for Disaster Risk Reduction 2010-2012 (2010) The National Disaster Management Plan 2010-2014 Local Level: All 33 provinces have prepared provisional versions of their respective plans (at March 2012)
	Organization for Disaster Management	National Level: BNPB (National Agency for Disaster Management) was established as a agency equal to ministry in 2008. BNPB is a self-contained agency comprising "steering committee" and "management executing body". Local Level: BPBD (Local Disaster Management Agency) is planned to be established at every province, district, and city. BPBDs have already established for all 33 provinces, while 395 for 405 regencies and 97 cities.
Risk assessment		Several seismic hazard maps have been developed. BNPB is disclosing thematic maps of earthquake hazard
Early warning		BMKG prepares shake maps by using USGS software and discloses them after earthquakes (http://inatews.bmkg.go.id). BMKG shares information with BNPB.
Disaster management information		Two database systems, GEOSPASIAL1 and DIBI2, are run by BNPB, GEOSPASIAL is a Web-GIS database system that shows; (1) disaster/damage information caused by disasters occurring within 30 days, (2) various types of hazard maps, and (3) administrative boundaries on maps. DIBI is a database that stores information on historical disaster events in Indonesia. After a disaster has emerged, BNPB collects the disaster information from the national government,
Disaster management at community level and disaster education		Clauses 26 and 27 of the Disaster Management Law No.24 prescribe the rights and obligations of the community in disaster management. Several activities have been conducted by government agencies and donors. However, tit is considered that he current mechanism needs to be improved in terms of the participatory process
Preparedness for effective response		No information for this issue is found.
Emergency response and recovery		No information for this issue is found.

Appendix A10.2.4 Measures Taken for Natural Disasters: Earthquake / Lao PDR

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	It is expected that the Prime Minister's Decree to order the preparation of a Disaster Management Law will be issued by around October 2012. If the decree is issued as assumed, the law will be started to be prepared targeting to be enacted within 2013.
	Plan for Disaster Management	National Level: "Strategic Plan on Disaster Risk Management in Lao PDR 2020, 2010 and Action Plan (2003-2005)" was issued in the form of Decree No.158 by the Ministry of Labour and Social Welfare (MLSW) in 2003. The plan lists long-term aims up to 2020 and goals for the medium-term until 2005 and 2010. The new plan called the National Disaster Management Plan 2012-2015 has been drafted and reviewed. A decree from the Prime Minister is necessary for the above new plan to be implemented even after it is finalized. Local Level: Five out of 17 provinces1 and some of their districts have prepared provincial/district disaster management plans.
	Organization for Disaster Management	National Level: Prime Minister Decree No. 158 was issued in 1999 in order to establish the National Disaster Management Committee (NDMC) and to position the NDMO within MLSW. Local Level: NDMC, which consists of the ministries, is chaired by the Deputy Prime Minister. Committees are also established in all the provinces (PDMC) and districts (DDMC). The Village Disaster Protection Unit (VDPU) is also set up at the village level.
Risk assessment		Almost no historical earthquake disaster is recorded and investigation and study focusing and limited to this country area are not found.
Early warning		With assistance from the China Earthquake Administration (CEA), the DMH installed a broadband seismograph and a strong motion accelerograph at Luang Prabang and Laksao in 2008. However, it is required more seismographs and the engineers' capacity for operations and maintenance of instruments and analysis of data.
Disaster management information		The NDMO has been implementing two projects under the thematic area of risk assessment and disaster information management. These are: a) Establishment of Disaster Information Management System (EDIS) Project of LANGOCA Program b) Development of National Risk Profile Project under cooperation with UNDP. The EDIS project is being implemented under the Laos Australia NGO Cooperation Agreement (LANGOCA) by NDMO, ADPC and Save the Children Australia.
Disaster management at community level and disaster education		Community-based disaster management programs are implemented by various donors targeting not only village people but local governments. Programs of education for disaster prevention and mitigation are under the responsibility of the Ministry of Education. There is a curriculum for elementary school students in 3rd, 4th and 5th grade regarding the matter. Textbooks that deal with fire, floods, droughts, landslides, a contagious disease have already been published. However earthquake is not included.
Preparedness for effective response		Preparedness and contingency plans have been prepared for certain disasters. However it is mainly for flood. The current contingency plan is being reviewed to be revised. Some resources for emergency are allocated to the national as well as provincial levels. The Ministry of Labor and Social Welfare, of which NDMO is part as a division, has allocated stocks such as shelter materials and food for emergency assistance at various administrative levels.
Emergency response and recovery		The emergency response is supposed to be headed by local level disaster management organizations for mobilizing assistance resources from the government, the army and local communities. In case of a disaster, the Ministry of Foreign Affairs will ask for international/local NGOs to mobilize assistance. The establishment of a Disaster Response Coordination Center is proposed. NDMO is in need of an Emergency Operation Center as its internal function.

Appendix A10.2.5 Measures Taken for Natural Disasters: Earthquake / Malaysia

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	Malaysia has no specific disaster management law. However, it has a disaster management policy and mechanism known as the National Security Council (NSC) Directive No. 20 approved by the Prime Minister in 1997. NSC Directive No.20 is in the course of revision to shift its paradigm from emergency response to disaster prevention and mitigation as agreed among ASEAN countries. NSC is considering to prepare a disaster management law once the new NSC No.20 is approved.
	Plan for Disaster Management	There is no specific disaster management plan but preparation of one is intended once the new NSC No.20 is approved. A budget for mitigation measures for flood and its monitoring activities is allocated to the implementing agency, i.e., the Department of Irrigation and Drainage. Local disaster management plans have not been considered necessary.
	Organization for Disaster Management	National Level: The Central Disaster Management and Relief Committee (CDMRC) were established at the federal state level. The NSC is the implementing agency for disaster management and establishes a Disaster Management Division (DMD). The NSC local departments play the secretariat roles for respective state and district levels of the committee. Local Level: The state (SDMRC) and district (DDMRC) committees are also established. It depends on the scale of the affected area what level of committee is responsible for principal response. Monsoon-related flood is seasonal and tends to have nationwide effect, which is mainly handled by CDMRC.
Risk assessment		Earthquake disaster is not common in Malaysia and study focusing and limited to this country area are not found.
Early warning		A seismograph network and tsunami monitoring and early warning system has already been established (MNTEWS). Seventeen broadband seismographs, 191 GPS, 3 buoys, 23 sirens and others have already installed.
Disaster management information		The National Disaster Data and Information Management System (NADDI) are coordinated by NSC and MACRES. NADDI emphasizes on the utilization of remote sensing, geographical information system (GIS) and global positioning system (GPS) technologies to provide an up-to-date and reliable data to support the three components of disaster management, which are: - Early warning, - Detection and monitoring, and - Mitigation and relief for pre, during and post disaster management activities coordinated by NSC and implemented by relevant authorities.
Disaster management at community level and disaster education		Malaysia has disseminated disaster information to communities and implemented community-based disaster management programs, which helps in improving people's awareness of disaster management. Disaster drills are also conducted regularly. In 2011, a "Disaster Awareness Day" campaign was organized with selected role-model cities, which is aimed in particular to encourage other cities to be active in disaster awareness in respective local context. However, the education sector do not have primary and secondary school curriculum for disaster risk reduction yet.
Preparedness for effective response		Malaysia has prepared SOPs in seven different disasters, namely, i) flood, ii) forest fire/open burning and haze, iii) industrial disasters, iv) bencana industry petroleum, gas dan petrochemicals, v) earthquake, vi) tsunami, and, vii) drought. The Safety Guidelines for Facing Crisis and Disasters have also been prepared.
Emergency response and recovery		In case of a disaster, an On Scene Command Post (OSCP) is established as a command structure and control base. The OSCP coordinates with the Disaster Operations Control Center (DOCC) at each management level. DOCCs are set up according to the 3 levels of disaster.

Appendix A10.2.6 Measures Taken for Natural Disasters: Earthquake / Myanmar

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	The Disaster Management Bill has been drafted and submitted to the Union Attorney-General for scrutiny. It would then be submitted to the Parliament for approval. Disaster management policies and guidelines have been prepared by the Central Committee on National Disaster Prevention (currently renamed as the Myanmar Disaster Preparedness Agency, MDPA) established in 2005.
	Plan for Disaster Management	National Level: The Myanmar Action Plan on Disaster Risk Reduction (MAPDRR) 2009-2015 has been prepared but it requires endorsement of the national government to be a formal document. Nevertheless, some of the project components indicated in MAPDRR have been implemented on stand-alone basis, most likely with donor support. Local Level: Apart from regional/ state flood protection plans, comprehensive disaster management plans and/or action plans does not seem to have been prepared at the local level.
	Organization for Disaster Management	National Level: The Minister of Social Welfare, Relief and Resettlement Department chairs MDPA. The Minister of Defense and the Minister of Home Affairs are co-vice-chairmen for MDPA. The Deputy Minister of MSWRR is the secretary, and RRD's Director General is the joint secretary for MDPA. Ministerial level of the committees is also organized. Local Level: At the state/regional level, the Chief Minister chairs the committee following the new administrative structure under the new Constitution. Similar structure and chairmanship are applied to districts, township and towns/wards/village-tract levels, respectively.
Risk assessment		A small-scale nationwide seismic zone map and a tectonic map of Myanmar were developed by the Myanmar Earthquake Committee (MEC) in 2004 and by the Myanmar Geosciences Society (MGS) in 2012, respectively. A seismic zonation map of community level has not been prepared yet, but some projects have already started for some area.
Early warning		Seismic observation is practically conducted with 5 seismographs, two digital broadband seismographs of DMH and three analog seismographs installed by JICA. The number of seismographs is not sufficient at all now. DMH also strongly desires to strengthen the capacity of seismic observation staff.
Disaster management information		There is no comprehensive DMIS and disaster loss database in Myanmar, but hazard profiles are conducted (Title of report is "Hazard Profile of Myanmar"). The report includes historical data of natural disaster and results of the analysis of each natural hazard in Myanmar.
Disaster management at community level and disaster education		International organizations, Red Cross and NGOs have provided grassroots level assistance to the communities affected by Cyclone Nargis in 2008, which has made them to institutionalize disaster preparedness setup. However, the same setup has not developed for other areas. MAPDRR includes community-based disaster preparedness and risk reduction programs. Search and rescue drills are provided at township levels by the fire services department.
Preparedness for effective response Earthquake		Seismic observation and risk assessment in Myanmar are at a beginning stage. It is required that an earthquake disaster management plan will be prepared for main cities including Yangon and Naypyidaw based on hazard identification, risk assessment and impact analysis. The Standing Order has been the principal document for preparedness in Myanmar. The document served as a contingency plan since it was prepared in 2009.
Emergency response and recovery Earthquake		RRD under MSWRR plays a central role for the provision of relief items and reception of foreign aid. Emergency medical services are provided by the health department and military medical team. Corpse management is handled by the National Search and Rescue Committee established by the Presidential Decree in 2011. At present, the emergency response for an earthquake has not been prepared even in main cities, because earthquakes and tsunamis occur not as frequently as floods.

Appendix A10.2.7 Measures Taken for Natural Disasters: Earthquake / Philippines

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	The Disaster Risk Reduction and Management Act (Republic Act 101211) were issued in 2010 aiming at strengthening disaster management system with the management framework. The act also institutionalizes the management plan and appropriation fund. The act contains the paradigm shift from emergency response to disaster prevention and mitigation. Republic Act 101211 complements with the Climate Change Act (Republic Act 9729) in terms of implementing rules and regulations. The Philippines has formulated the roadmap known as the Strategic National Action Plan 2009-2019 to sustain disaster risk reduction initiatives stated some decades ago in Presidential Decree 1566. The action plan enforces institutionalization of disaster risk reduction to be integrated into government policy.
	Plan for Disaster Management	National Level: In February 2012, the National Disaster Risk Reduction and Management Plan (NDRRMP) 2011-2028 were approved. NDRRMP covers four thematic areas, namely, i) disaster prevention and mitigation, ii) disaster preparedness, iii) disaster response, and iv) disaster rehabilitation and recovery. Local Level: Although local level disaster risk reduction management plans are to be prepared, the guideline for planning is still in preparation.
	Organization for Disaster Management	The National Disaster Coordination Council was renamed as the National Disaster Risk Reduction Management Council (NDRRMC)" by Republic Act 101211. More authority is granted to NDRRMC than NDCC. The Administrator of the Office of Civil Defense (OCD) of the Department of National Defense (DND) is the Executive Director for NDRRMC.
Risk assessment		The hazard maps of 22 provinces have been developed in the READY Project with assistance from the UNDP and A USAID. CBDRMs including development of evacuation plans were supported in the READY Project based on the hazard maps. The microzoning hazard maps of Metro Manila with scale of 1:5,000 were developed in the JICA development study "Earthquake Impact Reduction Study for Metropolitan Manila, Republic of the Philippines" conducted in 2004. PHIVOLCS initiated the upgrading of the microzoning hazard map by itself for completion in 2013.
Early warning		PHIVOLCS has a total of 66 seismological observatories. PHIVOLCS has a plan to add at least 85 seismological observatories by 2016. The SATREPS project "Enhancement of Earthquake and Volcano Monitoring and Effective Utilization of Disaster Mitigation Information Project" by JICA and JST plans to provide 100 broadband seismographs and ten strong motion accelerographs. Those plans are expected to improve the accuracy of hypocenter and magnitude determination. The software EQ-Plotter and REDAS developed by PHIVOLCS and PCIEERD can determine hypocenters and magnitudes, and anticipate damage automatically in case of an earthquake. PHIVOLCS disseminates earthquake information within 15 minutes after an earthquake.
Disaster management information		The National Disaster Risk Reduction Management Council (NDRRMC) has established an operations center. During emergencies, the NDRRMC Operations Center is activated into an NDRRMC Emergency Operations Center (EOC) and conducts; 1) Alert and monitoring, 2) Multi-agency operational coordination, 3) Response resource mobilization, 4) Information management.
Disaster management at community level and disaster education		The NDRRMP indicates that for Issue 2: Disaster preparedness, the target of capacity development of community including improvement of disaster risk awareness should be set. Metro Manila, in the National Capital Region, has implemented community support through local government units within the region.
Preparedness for effective response		A law regarding quake resistance standards was enacted in 1992 and amended in 2004. Seismic resistant design is compliant with AASHTO / US. In a JICA development project regarding improvement of bridges for mitigation of large-scale earthquake impact, there is plan on conducting a study on quake resistance, draft revision of seismic resistant design standards, and technical transfer for seismic strengthening works of bridges in and around Metro Manila.
Emergency response and recovery		The OCD, PHIVOLCS and relevant authorities have published a pamphlet, poster, and video, and also conducted nationwide earthquake evacuation drills targeting school.

Appendix A10.2.8 Measures Taken for Natural Disasters: Earthquake / Singapore

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	No comprehensive disaster management law exists, only related laws to tackle each disaster. These are the Fire Safety Act (1986) and Environmental Pollution Control Act (2002). In relation with emergency response, there are the Civil Defense Act (1986) and Civil Defense Shelter Act (1997). Policy focus is on urban disaster rather than natural disaster.
	Plan for Disaster Management	Singapore has an Operation Civil Emergency (Ops CE) Plan, which is a national contingency plan. The National Tsunami Response Plan has been developed. However, it is considered that the expected damages by tsunamis caused by possible earthquakes in South China Sea are just minor levels. Therefore, it is just required to establish an early warning system for tsunamis.
	Organization for Disaster Management	Singapore has "Home-front Crisis Management System" in which all ministries are engaged. These are composed of the "Home-front Ministry Group", "Home-front Crisis Executive Group" and "Statutory Board". The Home-front Crisis Executive Group" in charge of policy level is chaired by the Permanent Secretary of Home Affairs. Singapore Civil Defense Force (SCDF), which is Incident Manager (IM) for civil emergencies, is placed for strategic level. Twenty-seven key agencies, including the SCDF itself, armed forces, police, and other ministries are located in tactical level.
Risk assessment		No historical earthquake disaster is recorded and investigation and study focusing and limited to this country area are not found.
Early warning		The National Environment Agency (NEA) provides weather surveillance and multi-hazard warning services on a 24/7 basis to the public, industry and relevant agencies in Singapore. NEA established the Meteorological Service Singapore (MSS). MSS provides the country's weather forecasts, heavy rain warnings, smoke haze advisories, and information of earthquake/tremor/tsunami.
Disaster management information		No historical earthquake disaster is recorded and it is considered that the disaster database is not required.
Disaster management at community level and disaster education		There are wide ranges of community-based activities. For example, the Community Emergency Preparedness Programme (CEPP) provides basic first aid, one-man cardio-pulmonary resuscitation (CPR) and automated external defibrillator (AED), fire safety and casualty evacuation, emergency procedures, and terrorism. The Country Emergency Rescue Team (CERT) is formed by community volunteers. The SCDF works closely with the Ministry of Education (MOE) to incorporate emergency preparedness as a subject within the Civics and Moral Education syllabus for students in the primary and secondary levels. As part of emergency preparedness (EP), SCDF introduces short EP modules on essential skills and knowledge in surviving emergencies for schools to conduct during assembly periods.
Preparedness for effective response		The Operations Civil Emergency (Ops CE) Plan is Singapore's national contingency plan. The communities are provided with Community Emergency Preparedness Program (CEPP) by SCDF. Community exercises are conducted and the public is provided with civil emergency handbooks.
Emergency response and recovery		The SCDF under the Ministry of Home Affairs is responsible for emergency response to urban disasters including fire, having 5600 staffs (35% permanent staff and 62% full time national service). SCDF also has 8300 stand-by staff as of April 2012.

Appendix A10.2.9 Measures Taken for Natural Disasters: Earthquake / Thailand

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	The Disaster Prevention and Mitigation Act were issued in 2007. Implementation of HFA is addressed by and materialized into the Strategic National Action Plan for Disaster Risk Reduction (SNAP) 2010-2019, which identifies strategic priorities. Disaster risk reduction is now one of top priorities of the country.
	Plan for Disaster Management	National Level: The "National Disaster Prevention and Mitigation Plan (NDPMP) 2010 - 2014" was issued in 2010. The NDPMP is composed of; i) management principle, ii) countermeasure procedure, and iii) security threat management & countermeasure procedure. Disaster countermeasure procedure shows 14 disaster cases and the standing order for each of them. A contingency plan is planned to be prepared in April 2012. Local Level: Using NDPMP as a guideline, it is expected that local DPMPs are supposed to be prepared. The Department of Disaster Prevention and Mitigation (DDPM) provides training opportunities for provinces and districts to prepare local plans.
	Organization for Disaster Management	National Level: "The National Disaster Prevention and Mitigation Committee (NDPMC)" is established for overall disaster management. The Director-General of DDPM (under the jurisdiction of the Ministry of Interior) assumes the secretariat function for NDPMC. Local level: The Provincial Governor is the Provincial Director responsible for disaster prevention and mitigation operation (Clause 15 of the Act). DDPM in the local level provides the secretariat function. The same applies to different local levels.
Risk assessment		There are few small-scale nationwide studies. The DMR has produced an active fault distribution map and an earthquake risk map which assessed risk in four levels. The DMR has conducted a survey not only about active fault distribution but also their past activities through trench surveys.
Early warning		The earthquake and tsunami observation network of Thailand has been implemented and strengthened after the catastrophe brought by the tsunami in 2004. It is consist of 41 broadband seismographs and 22 strong motion accelerographs. The TMD has a plan to increase the number of stations by 20 for each. The TMD disseminates earthquake and tsunami information to mass media and relevant authorities via fax and SMS within about 15 minutes after an earthquake occurs.
Disaster management information		Various agencies responsible for monitoring meteorological, hydrological and earthquake information (e.g. NDWC, TMD, DWR and RID) collect sets of data (e.g. rainfall, water levels, and seismic data) using observation networks and manage data on database systems. However, they are not integrated effectively.
Disaster management at community level and disaster education		There are several projects on Community-based Disaster Reduction Management (CBDRM) that have been implemented. For example, JICA has assisted DDPM to be an enabling agency in order to improve the capacity of the local governments and the communities for disaster management through the Project on Capacity Development in Disaster Management. According to the HFA Progress Report (2009-2011), there is no primary school or secondary disaster prevention and mitigation school curriculum, although various organizations are conducting disaster education at schools in each local government.
Preparedness for effective response		Emergency relief system together with other arrangements for disaster management is a part of "Thailand's National Economic and Social Development Plan (both the 10th and the 11th plans)". "The National Disaster Prevention and Mitigation Plan (2010-2014)" contains the strategies on "preparedness arrangement" and "disaster emergency management". Also contained are "standing orders on disaster" which instruct the different ministries with additional duties in emergency situations and "disaster countermeasure procedures". The law regarding quake resistance standards was enacted in 1997 but it was applicable only to ten prefectures. The law was amended in 2007 to increase the applied areas from 10 to 22 prefectures based on distribution of active faults and soft/unconsolidated foundation.
Emergency response and recovery		In case an earthquake and/or a tsunami occur, the NDWC is responsible for disseminating warnings through the warning system such as the warning towers. Such warnings are based on information and observation results provided by the TMD and/or international organizations.

Appendix A10.2.10 Measures Taken for Natural Disasters: Earthquake / Vietnam

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	"The Disaster Management Bill" has been drafted with the support of the United Nations Development Programme (UNDP). It is expected to be approved and enacted after the National Assembly in 2013. "The National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020" was issued in 2007. It is in the process of revision. Disaster management is considered from two aspects: (1) emergency response/preparedness, and (2) disaster mitigation. It is prioritized to prevent human loss.
	Plan for Disaster Management	National Level: The implementation plan of the National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020" was issued in 2009 as the guideline for other ministries/agencies and local governments to apply according to local situations. Local Level: Provinces prepare local implementation plans following this national framework.
	Organization for Disaster Management	National Level: There are two main committees: (1) Central Committee for Flood and Storm Control (CCFSC), and; (2) National Committee for Search and Rescue (NCSR). At the central government level, there is also a ministerial committee concerning both flood and storm control and search/rescue. Local Level: The above two main committees are integrated. Provisional level is named the Provincial Committee for Flood and Storm Control and Search and Rescue (PCFSC&SR). Same applies to the district (DCFSC&SR) and commune (CCFSC&SR) levels.
Risk assessment		No historical earthquake disaster is recorded and investigation and study focusing and limited to this country area are not found.
Early warning		Broadband seismographs will be installed at 15 other stations in Vietnam. New seismographs will be connected with the existing system.
Disaster management information		At the national level, disaster monitoring systems installed in Disaster Management Centers (DMC) are placed to monitor, archive and disseminate data on key hazards and damages caused by disasters.
Disaster management at community level and disaster education		Community participation for disaster reduction management has been emphasized by the Prime Minister's Decision (Decision 1002/QD-TTg) in 2009. Community engagement is traditionally the principle in disaster response and recovery / rehabilitation stages. There is no primary or secondary school curriculum regarding disaster prevention and mitigation according to the HFA Progress Report (2009-2011)-interim. However, there have been numerous educational projects led by the Vietnam National Red Cross (VNRC), donor countries and INGOs.
Preparedness for effective response		100% of commune level local entities is preparing the plan for disaster preparedness and response with reviewing past lessons. However, a detailed disaster management plan has not been prepared yet for earthquake and tsunami. The requirement of the ordinance is that every government agency and individual should stockpile sufficient material reserves such as i) rock, sand bag, stone, bamboo for rescuing infrastructure failure, ii) life vest, lifebuoy, boat for rescuing people, and iii) foods, fuel medicines for surviving.
Emergency response and recovery		No information for earthquake is found.

Measures Taken for Natural Disasters

A10.3 Tsunami

Appendix A10.3

Appendix A10.3.1 Measures Taken for Natural Disasters: Tsunami / Brunei

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	Disaster Management Order (DMO) was enacted in 2006. It is the legal basis and guideline of disaster management. DMO prescribes the responsibilities and authority of the "National Disaster Council (NDC)" and "National Disaster Management Center (NDMC)". A disaster management component is included in each sector by sector law. Therefore, it is considered that a comprehensive disaster management law is not required. Outlines of Strategy and Policy for Development (OSPD), 2007-2017 shows policy as "developing further appropriate systems and organizations, for responding quickly and effectively to threats from natural disasters, infectious diseases, acts of terrorism, and other emergencies."
	Plan for Disaster Management	Article 18 in the DMO requests NDC to prepare a national disaster management plan. The NDMC explains that the plan is composed of the national "standard operating procedures (SOP)" and the Strategic National Action Plan for Disaster Risk Reduction 2012-2025.
	Organization for Disaster Management	The NDC is the highest authority for disaster management. Under NDC, the NDMC is established as the implementation agency. NDMC has put up the Disaster Command Center in place. In a disaster, an Incident Command Post (ICP) is established. Brunei's local administration is composed of four districts. In all districts, a District Disaster Management Center and District Emergency Operation Center are established.
Risk assessment		No historical tsunami disaster is recorded and investigation and study focusing and limited to this country area are not found.
Early warning		The meteorological agency of Brunei is monitoring and getting international tsunami information through its existing networks. However, monitoring and early warning system are not implemented. NDMC plans to implement a new tsunami warning system.
Disaster management information		Any DMIS and/or disaster loss database has not been established. However, disaster losses are systematically reported, monitored and analyzed. These reports are then used in planning.
Disaster management at community level and disaster education		Each district prepares a "response plan" following the DMC guideline (SOP), which is provided as a community-based disaster risk management program. Hazard map is prepared by every community as one of the program components. The Ministry of Education is in charge of educating the public regarding disaster prevention and mitigation. Disaster risk reduction (DRR) has yet to be incorporated in school curricula. However, outreach programs have been taken up seriously through other means such as the ASEAN Regional Drawing Competition for students. These programs are held to promote awareness on disaster resilience among students, teachers and parents. The Ministry of Education is going to implement a new education program (SPN-21) to the public that includes a systematic curriculum for disaster prevention and mitigation. Drills for the public are held once a year based on the program of NDMC and other relevant agencies.
Preparedness for effective response		No information
Emergency response and recovery		No information

Appendix A10.3.2 Measures Taken for Natural Disasters: Tsunami / Cambodia

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	The Law on Disaster Management is in the progress. The National Committee for Disaster Management (NCDM) issued its policy document for disaster management in 1997; nevertheless, no actions have been taken except for responsive activities. A national contingency plan to tackle flooding and drought has been formulated since 2011, which requires a decree of the improvement and update by sector respectively.
	Plan for Disaster Management	The Strategic National Action Plan for Disaster Risk Reduction (2008-2013) was officially launched in 2009, and it has gradually implemented by the relevant stakeholders through cross sectors in Cambodia.
	Organization for Disaster Management	NCDM has been established in 1995 as a core institution and assistance to the Royal Government of Cambodia to lead, manage, and coordinate the disaster management tasks. The secretariat-general of NCDM shall consist of an "Emergency Coordination Center" under its management structure. NCDM shall consist of the sub-national committee for disaster management that composted of city-provincial committee for disaster management, town-district committee for disaster management and commune committee for disaster management.
Risk assessment		No historical tsunami disaster is recorded and investigation and study focusing and limited to this country area are not found.
Early warning		No information for tsunami is found.
Disaster management information		The NCDM is developing an information system for emergency management and early warning supported by the World Bank. The system will be installed to the Emergency Coordination Center, which is under construction. The system will be used to share disaster information among national and provincial agencies. NCDM will collect disaster-related information from various administrative and other agencies at all levels under their jurisdiction. Such agencies include the NCDM, PCDM, DCDM, CCDM and other organizations related to agriculture, health, rural development, the Cambodia Red Cross, etc. The system will be used in normal situations for monitoring meteorological and hydrological information at provincial levels. During emergency situations when disasters occur in a province, the provincial staff shall use the system to report to NCDM the actual situation (damages, activities and/or so on) as well as requests for emergency relief. NCDM plans to install this system in eight out of 24 provincial offices as a pilot project. The system will include a disaster loss database.
Disaster management at community level and disaster education		The commune level has disaster management committee structure. As instructed by NCDM, the commune-sangkat chiefs is supposed to issue an order to establish the Village Disaster Management Team (VDMT) comprising people in order to strengthen the community-based disaster risk management.
Preparedness for effective response		NCDM has drafted the National Emergency Management Policy since 1997, while the Cambodia Red Cross prepares its own response policy. NCDM, on the other hand, is expanding its emergency response function by establishing an Emergency Coordination Center. NCDM has prepared a National Contingency Plan, which is still subject for approval by issuing a decree, since 2011. It is expected that this national plan will be used as a guideline for provinces for the preparation and implementation of the provincial contingency plan.
Emergency response and recovery		No information for this issue is found.

Appendix A10.3.3 Measures Taken for Natural Disasters: Tsunami / Indonesia

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	The Disaster Management Law (No. 24) was enacted in 2007. Ancillary regulations for this law in below are enacted in 2008. 1) Regulation No. 22 on Disaster Aid Financing and Management 2) Regulation No.23 on Participation of International Institutions and Foreign Non-Governmental Organizations in Disaster Management 3) Regulation No.8 on National Agency Disaster Management.
	Plan for Disaster Management	National Level: The National Action Plan for Disaster Reduction 2006-2009 (2006) The National Action Plan for Disaster Risk Reduction 2010-2012 (2010) The National Disaster Management Plan 2010-2014 Local Level: All 33 provinces have prepared provisional versions of their respective plans (at March 2012)
	Organization for Disaster Management	National Level: BNPB (National Agency for Disaster Management) was established as a agency equal to ministry in 2008. BNPB is a self-contained agency comprising "steering committee" and "management executing body". Local Level: BPBD (Local Disaster Management Agency) is planned to be established at every province, district, and city. BPBDs have already established for all 33 provinces, while 395 for 405 regencies and 97 cities.
Risk assessment		Several seismic hazard maps have been developed. BNPB is disclosing thematic maps of tsunami hazard
Early warning		The early warning system for tsunami called InaTEWS (Indonesia Tsunami Early Warning System) has been introduced to Indonesia through the support from Germany and it has been operated by the BMKG. InaTEWS is an integrated system composed of seismic and tsunami observations, analysis, judgment, and dissemination.
Disaster management information		Two database systems, GEOSPASIAL1 and DIBI2, are run by BNPB, GEOSPASIAL is a Web-GIS database system that shows; (1) disaster/damage information caused by disasters occurring within 30 days, (2) various types of hazard maps, and (3) administrative boundaries on maps. DIBI is a database that stores information on historical disaster events in Indonesia. After a disaster has emerged, BNPB collects the disaster information from the national government,
Disaster management at community level and disaster education		Clauses 26 and 27 of the Disaster Management Law No.24 prescribe the rights and obligations of the community in disaster management. Several activities have been conducted by government agencies and donors. However, it is considered that the current procedure needs to be improved in general. Database called DIBA (Data dan Informasi Bencana Aceh) discloses disaster information in Aceh Province on the website. A pilot project which supported the preparedness and education in schools was carried out by Syiah Kuala University. The Aceh Tsunami Museum was constructed to educate people on tsunamis, and also to be used as a tsunami evacuation building that could accommodate 6000 people. Educational materials on tsunami disaster prevention were published by the TDMRC.
Preparedness for effective response		The following guidelines were published and upgraded by RISTEK, and are utilized as national standards: 1) Guideline Tsunami Evacuation Map 2) Guideline Tsunami Evacuation Sign Boards 3) Guideline Tsunami Evacuation Building Development 4) Guideline Tsunami Evacuation Drill Implementation for City and Regency was edited and published by RISTEK as a national guideline. Educational materials on tsunami disaster prevention were published by LIPI.
Emergency response and recovery		InaTEWS is considered an effective method for dissemination of tsunami information. Twenty four units of the Tsunami siren have been installed in six provinces and are being operated by the BMKG in Jakarta. BPBA developed the SOP for tsunami disaster prevention including an evacuation plan and the contingency plans in all districts of Aceh Province. There are four evacuation buildings in Aceh Province constructed by a Japan's grant aid project; however, they are not protected by breakwaters and seawalls.

Appendix A10.3.4 Measures Taken for Natural Disasters: Tsunami / Lao PDR

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	It is expected that the Prime Minister's Decree to order the preparation of a Disaster Management Law will be issued by around October 2012. If the decree is issued as assumed, the law will be started to be prepared targeting to be enacted within 2013.
	Plan for Disaster Management	National Level: "Strategic Plan on Disaster Risk Management in Lao PDR 2020, 2010 and Action Plan (2003-2005)" was issued in the form of Decree No.158 by the Ministry of Labour and Social Welfare (MLSW) in 2003. The plan lists long-term aims up to 2020 and goals for the medium-term until 2005 and 2010. The new plan called the National Disaster Management Plan 2012-2015 has been drafted and reviewed. A decree from the Prime Minister is necessary for the above new plan to be implemented even after it is finalized. Local Level: Five out of 17 provinces1 and some of their districts have prepared provincial/district disaster management plans.
	Organization for Disaster Management	National Level: Prime Minister Decree No. 158 was issued in 1999 in order to establish the National Disaster Management Committee (NDMC) and to position the NDMO within MLSW. Local Level: NDMC, which consists of the ministries, is chaired by the Deputy Prime Minister. Committees are also established in all the provinces (PDMC) and districts (DDMC). The Village Disaster Protection Unit (VDPU) is also set up at the village level.
Risk assessment		Lao PDR is inland country and tsunami is out of the scope.
Early warning		Lao PDR is inland country and tsunami is out of the scope.
Disaster management information		Lao PDR is inland country and tsunami is out of the scope.
Disaster management at community level and disaster education		Lao PDR is inland country and tsunami is out of the scope.
Preparedness for effective response		Lao PDR is inland country and tsunami is out of the scope.
Emergency response and recovery		Lao PDR is inland country and tsunami is out of the scope.

Appendix A10.3.5 Measures Taken for Natural Disasters: Tsunami / Malaysia

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	Malaysia has no specific disaster management law. However, it has a disaster management policy and mechanism known as the National Security Council (NSC) Directive No. 20 approved by the Prime Minister in 1997. NSC Directive No.20 is in the course of revision to shift its paradigm from emergency response to disaster prevention and mitigation as agreed among ASEAN countries. NSC is considering to prepare a disaster management law once the new NSC No.20 is approved.
	Plan for Disaster Management	There is no specific disaster management plan but preparation of one is intended once the new NSC No.20 is approved. A budget for mitigation measures for flood and its monitoring activities is allocated to the implementing agency, i.e., the Department of Irrigation and Drainage. Local disaster management plans have not been considered necessary.
	Organization for Disaster Management	National Level: The Central Disaster Management and Relief Committee (CDMRC) were established at the federal National Level. The NSC is the implementing agency for disaster management and establishes a Disaster Management Division (DMD). The NSC local departments play the secretariat roles for respective state and district levels of the committee. Local Level: The state (SDMRC) and district (DDMRC) committees are also established. It depends on the scale of the affected area what level of committee is responsible for principal response. Monsoon-related flood is seasonal and tends to have nationwide effect, which is mainly handled by CDMRC.
Risk assessment		Tsunami risk assessment has not been fully conducted yet in tsunami expected areas. A possible earthquake and tsunami scenario should be assumed. Tsunami simulation analysis including damage estimation is required, based on the scenario. Also, the socioeconomic condition and infrastructure distribution in the possible tsunami area assessment is required for taking necessary mitigation measures or evacuation planning.
Early warning		A seismograph network and tsunami monitoring and early warning system has already been established (MNTEWS). Seventeen broadband seismographs, 191 GPS, 3 buoys, 23 sirens and others have already installed.
Disaster management information		The National Disaster Data and Information Management System (NADDI) are coordinated by NSC and MACRES. NADDI emphasizes on the utilization of remote sensing, geographical information system (GIS) and global positioning system (GPS) technologies to provide an up-to-date and reliable data to support the three components of disaster management, which are: 1) Early warning, 2) Detection and monitoring, and 3) Mitigation and relief for pre, during and post disaster management activities coordinated by NSC and implemented by relevant authorities.
Disaster management at community level and disaster education		Malaysia has disseminated disaster information to communities and implemented community-based disaster management programs, which helps in improving people's awareness of disaster management. Disaster drills are also conducted regularly. In 2011, a "Disaster Awareness Day" campaign was organized with selected role-model cities, which is aimed in particular to encourage other cities to be active in disaster awareness in respective local context. However, the education sector do not have primary and secondary school curriculum for disaster risk reduction yet.
Preparedness for effective response		A tsunami disaster management plan needs to be compiled based on simulation analysis. Along with this guideline, detailed tsunami disaster management activities will be conducted such as CBDRM, evacuation drills, checking of food and water supplies, operation of evacuation sites, and so on.
Emergency response and recovery		In case of a disaster, an On Scene Command Post (OSCP) is established as a command structure and control base. The OSCP coordinates with the Disaster Operations Control Center (DOCC) at each management level. DOCCs are set up according to the 3 levels of disaster. Enhancement of emergency response to tsunami disaster depends on community-based disaster management practice. In a potential tsunami disaster area or community, regular carrying out of drills and trainings for evacuation are recommended. Through drills and trainings together with school education, people's awareness on tsunami disaster would improve.

Appendix A10.3.6 Measures Taken for Natural Disasters: Tsunami / Myanmar

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	The Disaster Management Bill has been drafted and submitted to the Union Attorney-General for scrutiny. It would then be submitted to the Parliament for approval. Disaster management policies and guidelines have been prepared by the Central Committee on National Disaster Prevention (currently renamed as the Myanmar Disaster Preparedness Agency, MDPA) established in 2005.
	Plan for Disaster Management	National Level: The Myanmar Action Plan on Disaster Risk Reduction (MAPDRR) 2009-2015 has been prepared but it requires endorsement of the national government to be a formal document. Nevertheless, some of the project components indicated in MAPDRR have been implemented on stand-alone basis, most likely with donor support. Local Level: Apart from regional/state flood protection plans, comprehensive disaster management plans and/or action plans does not seem to have been prepared at the local level.
	Organization for Disaster Management	National Level: The Minister of Social Welfare, Relief and Resettlement Department chairs MDPA. The Minister of Defense and the Minister of Home Affairs are co-vice-chairmen for MDPA. The Deputy Minister of MSWRR is the secretary, and RRD's Director General is the joint secretary for MDPA. Ministerial level of the committees is also organized. Local Level: At the state/regional level, the Chief Minister chairs the committee following the new administrative structure under the new Constitution. Similar structure and chairmanship are applied to districts, township and towns/wards/village-tract levels, respectively.
Risk assessment		No tsunami hazard map has been developed yet. However, the evacuation routes have been planned and tsunami evacuation drills have been conducted using such routes, at the area affected by Sumatra earthquake in 2004. Preparedness for tsunami disaster prevention has been cooperatively addressed by the national and local governments.
Early warning		Regarding tsunami observation, there are only two tide gauges installed in Myanmar by the Hawaii Sea Level Center. However, DMH does not access the data directly, DMH needs to access the HP of Hawaii University to acquire the data. Therefore, a tsunami warning is disseminated based on information from foreign observation agencies and international organizations through GTS, even though a local tsunami occurred near the coast. Therefore, it is concerned that timely warning could be issued.
Disaster management information		There is no comprehensive DMIS and disaster loss database in Myanmar, but hazard profiles are conducted (titled "Hazard Profile of Myanmar"). The report includes historical data of natural disaster and results of the analysis of each natural hazard in Myanmar.
Disaster management at community level and disaster education		International organizations, Red Cross and NGOs have provided grassroots level assistance to the communities affected by Cyclone Nargis in 2008, which has made them to institutionalize disaster preparedness setup. However, the same setup has not developed for other areas. MAPDRR includes community-based disaster preparedness and risk reduction programs. Search and rescue drills are provided at township levels by the fire services department.
Preparedness for effective response		In the delta area where the tsunami in 2004 and the cyclone Nargis caused damage, the tsunami evacuation shelters were built using donated funds from the citizens and private companies. However, such tsunami shelters have not been built in coastal cities including Sittwe along the west coast. The Myanmar government has promoted mangrove plantation as a countermeasure to reduce tsunami damage along the front coast of the delta area. The Standing Order has been the principal document for preparedness in Myanmar. The document served as a contingency plan since it was prepared in 2009.
Emergency response and recovery		RRD under MSWRR plays a central role for the provision of relief items and reception of foreign aid. Emergency medical services are provided by the health department and military medical team. Corpse management is handled by the National Search and Rescue Committee established by the Presidential Decree in 2011. The tsunami evacuation shelters were built in tsunami and high tide disaster areas, and the evacuation drills including provision of relief supplies were conducted. Evacuation sign boards showing evacuation routes and sites, and warning facilities such as sirens and loud speakers have yet to be installed in many disaster prone areas.

Appendix A10.3.7 Measures Taken for Natural Disasters: Tsunami / Philippines

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	The Disaster Risk Reduction and Management Act (Republic Act 101211) were issued in 2010 aiming at strengthening disaster management system with the management framework. The act also institutionalizes the management plan and appropriation fund. The act contains the paradigm shift from emergency response to disaster prevention and mitigation. Republic Act 101211 complements with the Climate Change Act (Republic Act 9729) in terms of implementing rules and regulations. The Philippines has formulated the roadmap known as the Strategic National Action Plan 2009-2019 to sustain disaster risk reduction initiatives stated some decades ago in Presidential Decree 1566. The action plan enforces institutionalization of disaster risk reduction to be integrated into government policy.
	Plan for Disaster Management	National Level: In February 2012, the National Disaster Risk Reduction and Management Plan (NDRRMP) 2011-2028 were approved. NDRRMP covers four thematic areas, namely, i) disaster prevention and mitigation, ii) disaster preparedness, iii) disaster response, and iv) disaster rehabilitation and recovery. Local Level: Although local level disaster risk reduction management plans are to be prepared, the guideline for planning is still in preparation.
	Organization for Disaster Management	The National Disaster Coordination Council was renamed as the National Disaster Risk Reduction Management Council (NDRRMC)" by Republic Act 101211. More authority is granted to NDRRMC than NDCC. The Administrator of the Office of Civil Defense (OCD) of the Department of National Defense (DND) is the Executive Director for NDRRMC.
Risk assessment		PHIVOLCS conducted tsunami simulations in the "Tsunami Mitigation Program" from 2006 to 2007. Based on the simulations, tsunami hazard maps with scales of 1:100,000 to 1:50,000 in the three islands of Luzon, Mindanao, and Visayas were developed. PHIVOLCS has also produced the software Rapid Earthquake Damage Assessment (REDAS) which anticipates seismic damages after a strong earthquake occurs. They held training seminars on REDAS in local government units (LGUs) and other relevant authorities in order to promote REDAS to other organizations.
Early warning		Regarding tsunami observation, PHIVOLCS has one tsunami detecting instrument called "WET sensor" used for monitoring. PHIVOLCS disseminates tsunami warning through mass media (TV and radio) and to the OCD and LGUs. PHIVOLCS has planned to increase five tsunami WET sensors. However, cooperation with NAMRIA which conducts high accuracy tide level observation is also required for tsunami warning. Tsunami information has been acquired from international agencies including the Japan Meteorological Agency (JWA) and the Pacific Tsunami Warning Center (PTWC) for tsunami warning.
Disaster management information		The National Disaster Risk Reduction Management Council (NDRRMC) has established an operations center. During emergencies, the NDRRMC Operations Center is activated into an NDRRMC Emergency Operations Center (EOC) and conducts; 1) Alert and monitoring, 2) Multi-agency operational coordination, 3) Response resource mobilization, 4) Information management.
Disaster management at community level and disaster education		The NDRRMP indicates that for Issue 2: Disaster preparedness, the target of capacity development of community including improvement of disaster risk awareness should be set. Metro Manila, in the National Capital Region, has implemented community support through local government units within the region.
Preparedness for effective response		The DPWH has constructed a seawall for high tides and storm surges on the coastal area of Roxas Boulevard in Manila.
Emergency response and recovery		The evacuation plan and evacuation route signboards based on the tsunami hazard maps created in the READY Project have been developed.

Appendix A10.3.8 Measures Taken for Natural Disasters: Tsunami / Singapore

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	No comprehensive disaster management law exists, only related laws to tackle each disaster. These are the Fire Safety Act (1986) and Environmental Pollution Control Act (2002). In relation with emergency response, there are the Civil Defense Act (1986) and Civil Defense Shelter Act (1997). Policy focus is on urban disaster rather than natural disaster.
	Plan for Disaster Management	Singapore has an Operation Civil Emergency (Ops CE) Plan, which is a national contingency plan. The National Tsunami Response Plan has been developed. However, it is considered that the expected damages by tsunamis caused by possible earthquakes in South China Sea are just minor levels. Therefore, it is just required to establish an early warning system for tsunamis.
	Organization for Disaster Management	Singapore has "Home-front Crisis Management System" in which all ministries are engaged. These are composed of the "Home-front Ministry Group", "Home-front Crisis Executive Group" and "Statutory Board". The Home-front Crisis Executive Group" in charge of policy level is chaired by the Permanent Secretary of Home Affairs. Singapore Civil Defense Force (SCDF), which is Incident Manager (IM) for civil emergencies, is placed for strategic level. Twenty-seven key agencies, including the SCDF itself, armed forces, police, and other ministries are located in tactical level.
Risk assessment		No historical tsunami disaster is recorded and investigation and study focusing and limited to this country area are not found.
Early warning		The National Environment Agency (NEA) provides weather surveillance and multi-hazard warning services on a 24/7 basis to the public, industry and relevant agencies in Singapore. NEA established the Meteorological Service Singapore (MSS). MSS provides the country's weather forecasts, heavy rain warnings, smoke haze advisories, and information of earthquake/tremor/tsunami.
Disaster management information		No historical tsunami disaster is recorded and it is considered that the disaster database is not required.
Disaster management at community level and disaster education		There are wide ranges of community-based activities. For example, the Community Emergency Preparedness Programme (CEPP) provides basic first aid, one-man cardio-pulmonary resuscitation (CPR) and automated external defibrillator (AED), fire safety and casualty evacuation, emergency procedures, and terrorism. The Country Emergency Rescue Team (CERT) is formed by community volunteers. The SCDF works closely with the Ministry of Education (MOE) to incorporate emergency preparedness as a subject within the Civics and Moral Education syllabus for students in the primary and secondary levels. As part of emergency preparedness (EP), SCDF introduces short EP modules on essential skills and knowledge in surviving emergencies for schools to conduct during assembly periods.
Preparedness for effective response		The Operations Civil Emergency (Ops CE) Plan is Singapore's national contingency plan. The communities are provided with Community Emergency Preparedness Program (CEPP) by SCDF. Community exercises are conducted and the public is provided with civil emergency handbooks.
Emergency response and recovery		The SCDF under the Ministry of Home Affairs is responsible for emergency response to urban disasters including fire, having 5600 staffs (35% permanent staff and 62% full time national service). SCDF also has 8300 stand-by staff as of April 2012.

Appendix A10.3.9 Measures Taken for Natural Disasters: Tsunami / Thailand

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	The Disaster Prevention and Mitigation Act were issued in 2007. Implementation of HFA is addressed by and materialized into the Strategic National Action Plan for Disaster Risk Reduction (SNAP) 2010-2019, which identifies strategic priorities. Disaster risk reduction is now one of top priorities of the country.
	Plan for Disaster Management	National Level: The "National Disaster Prevention and Mitigation Plan (NDPMP) 2010 - 2014" was issued in 2010. The NDPMP is composed of; i) management principle, ii) countermeasure procedure, and iii) security threat management & countermeasure procedure. Disaster countermeasure procedure shows 14 disaster cases and the standing order for each of them. A contingency plan is planned to be prepared in April 2012. Local Level: Using NDPMP as a guideline, it is expected that local DPMPs are supposed to be prepared. The Department of Disaster Prevention and Mitigation (DDPM) provides training opportunities for provinces and districts to prepare local plans.
	Organization for Disaster Management	National Level: "The National Disaster Prevention and Mitigation Committee (NDPMC)" is established for overall disaster management. The Director-General of DDPM (under the jurisdiction of the Ministry of Interior) assumes the secretariat function for NDPMC. Local level: The Provincial Governor is the Provincial Director responsible for disaster prevention and mitigation operation (Clause 15 of the Act). DDPM in the local level provides the secretariat function. The same applies to different local levels.
Risk assessment		Tsunami hazard maps with scale of 1:5,000 for the southern six prefectures have been developed based on tsunami risk assessment. Tsunami damages not only due to earthquake but also volcanic activity including volcanic sector collapse have been anticipated in Nicobar Island in Andaman Sea based on tsunami simulation.
Early warning		The tsunami observation buoys were installed under the DART Project as carried out by the US in 2006. One of the three tsunami observation buoys was broken due to the tsunami generated by the 7.4 magnitude earthquake in 2010. This buoy is still not working at present. The TMD disseminates earthquake and tsunami information to mass media and relevant authorities via fax and SMS within about 15 minutes after an earthquake occurs. After the earthquake in the Indian Ocean off the coast of Sumatra in 2004, warning towers have been built in 328 sites not only in tsunami disaster areas but throughout the entire country including mountainous areas
Disaster management information		Various agencies responsible for monitoring meteorological, hydrological and earthquake information (e.g. NDWC, TMD, DWR and RID) collect sets of data (e.g. rainfall, water levels, and seismic data) using observation networks and manage data on database systems. However, they are not integrated effectively.
Disaster management at community level and disaster education		There are several projects on Community-based Disaster Reduction Management (CBDRM) that have been implemented. For example, JICA has assisted DDPM to be an enabling agency in order to improve the capacity of the local governments and the communities for disaster management through the Project on Capacity Development in Disaster Management. According to the HFA Progress Report (2009-2011), there is no primary school or secondary disaster prevention and mitigation school curriculum, although various organizations are conducting disaster education at schools in each local government.
Preparedness for effective response		Emergency relief system together with other arrangements for disaster management is a part of "Thailand's National Economic and Social Development Plan (both the 10th and the 11th plans)". "The National Disaster Prevention and Mitigation Plan (2010-2014) "contains the strategies on "preparedness arrangement" and "disaster emergency management". Also contained are "standing orders on disaster" which instruct the different ministries with additional duties in emergency situations and "disaster countermeasure procedures". A considerable number of warning towers and tsunami shelters have been built in tsunami disaster areas.
Emergency response and recovery		In case an earthquake and/or a tsunami occur, the NDWC is responsible for disseminating warnings through the warning system such as the warning towers. Such warnings are based on information and observation results provided by the TMD and/or international organizations.

Appendix A10.3.10 Measures Taken for Natural Disasters: Tsunami / Vietnam

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	"The Disaster Management Bill" has been drafted with the support of the United Nations Development Programme (UNDP). It is expected to be approved and enacted after the National Assembly in 2013. "The National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020" was issued in 2007. It is in the process of revision. Disaster management is considered from two aspects: (1) emergency response/preparedness, and (2) disaster mitigation. It is prioritized to prevent human loss.
	Plan for Disaster Management	National Level: The implementation plan of the National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020" was issued in 2009 as the guideline for other ministries/agencies and local governments to apply according to local situations. Local Level: Provinces prepare local implementation plans following this national framework.
	Organization for Disaster Management	National Level: There are two main committees: (1) Central Committee for Flood and Storm Control (CCFSC), and; (2) National Committee for Search and Rescue (NCSR). At the central government level, there is also a ministerial committee concerning both flood and storm control and search/rescue. Local Level: The above two main committees are integrated. Provisional level is named the Provincial Committee for Flood and Storm Control and Search and Rescue (PCFSC&SR). Same applies to the district (DCFSC&SR) and commune (CCFSC&SR) levels.
Risk assessment		No historical tsunami disaster is recorded and investigation and study focusing and limited to this country area are not found.
Early warning		The Institute of Geophysics is in charge of tsunami early warning. It has established the operations center for Earthquake Information and Tsunami Warning and has installed ten siren towers in Da Nang. The operations center monitors possible tsunami impact in the area of Vietnam. When a tsunami occurs, early warning is issued and the operations center disseminates the warning to Da Nang directly and relevant agencies/organizations. However, the means of dissemination is limited in Da Nang.
Disaster management information		At the national level, disaster monitoring systems installed in Disaster Management Centers (DMC) are placed to monitor, archive and disseminate data on key hazards and damages caused by disasters.
Disaster management at community level and disaster education		Community participation for disaster reduction management has been emphasized by the Prime Minister's Decision (Decision 1002/QD-TTg) in 2009. Community engagement is traditionally the principle in disaster response and recovery / rehabilitation stages. There is no primary or secondary school curriculum regarding disaster prevention and mitigation according to the HFA Progress Report (2009-2011)-interim. However, there have been numerous educational projects led by the Vietnam National Red Cross (VNRC), donor countries and INGOs.
Preparedness for effective response		100% of commune level local entities is preparing the plan for disaster preparedness and response with reviewing past lessons. However, a detailed disaster management plan has not been prepared yet for earthquake and tsunami. The requirement of the ordinance is that every government agency and individual should stockpile sufficient material reserves such as i) rock, sand bag, stone, bamboo for rescuing infrastructure failure, ii) life vest, lifebuoy, boat for rescuing people, and iii) foods, fuel medicines for surviving.
Emergency response and recovery		No information for tsunami is found.

Measures Taken for Natural Disasters

A10.4 Volcano

Appendix A10.4

Appendix A10.4.1 Measures Taken for Natural Disasters: Volcano / Brunei

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	Disaster Management Order (DMO) was enacted in 2006. It is the legal basis and guideline of disaster management. DMO prescribes the responsibilities and authority of the "National Disaster Council (NDC)" and "National Disaster Management Center (NDMC)". A disaster management component is included in each sector by sector law. Therefore, it is considered that a comprehensive disaster management law is not required. Outlines of Strategy and Policy for Development (OSPD), 2007-2017 shows policy as "developing further appropriate systems and organizations, for responding quickly and effectively to threats from natural disasters, infectious diseases, acts of terrorism, and other emergencies."
	Plan for Disaster Management	Article 18 in the DMO requests NDC to prepare a national disaster management plan. The NDMC explains that the plan is composed of the national "standard operating procedures (SOP)" and the Strategic National Action Plan for Disaster Risk Reduction 2012-2025.
	Organization for Disaster Management	The NDC is the highest authority for disaster management. Under NDC, the NDMC is established as the implementation agency. NDMC has put up the Disaster Command Center in place. In a disaster, an Incident Command Post (ICP) is established. Brunei's local administration is composed of four districts. In all districts, a District Disaster Management Center and District Emergency Operation Center are established.
Risk assessment		No historical volcanic disaster is recorded and investigation and study focusing and limited to this country area are not found.
Early warning		Monitoring and early warning system are not implemented.
Disaster management information		Any DMIS and/or disaster loss database has not been established. However, disaster losses are systematically reported, monitored and analyzed. These reports are then used in planning.
Disaster management at community level and disaster education		Each district prepares a "response plan" following the DMC guideline (SOP), which is provided as a community-based disaster risk management program. Hazard map is prepared by every community as one of the program components. The Ministry of Education is in charge of educating the public regarding disaster prevention and mitigation. Disaster risk reduction (DRR) has yet to be incorporated in school curricula. However, outreach programs have been taken up seriously through other means such as the ASEAN Regional Drawing Competition for students. These programs are held to promote awareness on disaster resilience among students, teachers and parents. The Ministry of Education is going to implement a new education program (SPN-21) to the public that includes a systematic curriculum for disaster prevention and mitigation. Drills for the public are held once a year based on the program of NDMC and other relevant agencies.
Preparedness for effective response		No information
Emergency response and recovery		No information

Appendix A10.4.2 Measures Taken for Natural Disasters: Volcano / Cambodia

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	The Law on Disaster Management is in the progress. The National Committee for Disaster Management (NCDM) issued its policy document for disaster management in 1997; nevertheless, no actions have been taken except for responsive activities. A national contingency plan to tackle flooding and drought has been formulated since 2011, which requires a decree of the improvement and update by sector respectively.
	Plan for Disaster Management	The Strategic National Action Plan for Disaster Risk Reduction (2008-2013) was officially launched in 2009, and it has gradually implemented by the relevant stakeholders through cross sectors in Cambodia.
	Organization for Disaster Management	NCDM has been established in 1995 as a core institution and assistance to the Royal Government of Cambodia to lead, manage, and coordinate the disaster management tasks. The secretariat-general of NCDM shall consist of an "Emergency Coordination Center" under its management structure. NCDM shall consist of the sub-national committee for disaster management that composted of city-provincial committee for disaster management, town-district committee for disaster management and commune committee for disaster management.
Risk assessment		No historical volcanic disaster is recorded and investigation and study focusing and limited to this country area are not found.
Early warning		No information for volcano is found.
Disaster management information		The NCDM is developing an information system for emergency management and early warning supported by the World Bank. The system will be installed to the Emergency Coordination Center, which is under construction. The system will be used to share disaster information among national and provincial agencies. NCDM will collect disaster-related information from various administrative and other agencies at all levels under their jurisdiction. Such agencies include the NCDM, PCDM, DCDM, CCDM and other organizations related to agriculture, health, rural development, the Cambodia Red Cross, etc. The system will be used in normal situations for monitoring meteorological and hydrological information at provincial levels. During emergency situations when disasters occur in a province, the provincial staff shall use the system to report to NCDM the actual situation (damages, activities and/or so on) as well as requests for emergency relief. NCDM plans to install this system in eight out of 24 provincial offices as a pilot project. The system will include a disaster loss database.
Disaster management at community level and disaster education		The commune level has disaster management committee structure. As instructed by NCDM, the commune-sangkat chiefs is supposed to issue an order to establish the Village Disaster Management Team (VDMT) comprising people in order to strengthen the community-based disaster risk management.
Preparedness for effective response		NCDM has drafted the National Emergency Management Policy since 1997, while the Cambodia Red Cross prepares its own response policy. NCDM, on the other hand, is expanding its emergency response function by establishing an Emergency Coordination Center. NCDM has prepared a National Contingency Plan, which is still subject for approval by issuing a decree, since 2011. It is expected that this national plan will be used as a guideline for provinces for the preparation and implementation of the provincial contingency plan.
Emergency response and recovery		No information for this issue is found.

Appendix A10.4.3 Measures Taken for Natural Disasters: Volcano / Indonesia

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	The Disaster Management Law (No. 24) was enacted in 2007. Ancillary regulations for this law in below are enacted in 2008. 1) Regulation No. 22 on Disaster Aid Financing and Management 2) Regulation No.23 on Participation of International Institutions and Foreign Non-Governmental Organizations in Disaster Management 3) Regulation No.8 on National Agency Disaster Management.
	Plan for Disaster Management	National Level: The National Action Plan for Disaster Reduction 2006-2009 (2006) The National Action Plan for Disaster Risk Reduction 2010-2012 (2010) The National Disaster Management Plan 2010-2014 Local Level: All 33 provinces have prepared provisional versions of their respective plans (at March 2012)
	Organization for Disaster Management	National Level: BNPB (National Agency for Disaster Management) was established as a agency equal to ministry in 2008. BNPB is a self-contained agency comprising "steering committee" and "management executing body". Local Level: BPBD (Local Disaster Management Agency) is planned to be established at every province, district, and city. BPBDs have already established for all 33 provinces, while 395 for 405 regencies and 97 cities.
Risk assessment		Several volcanic hazard maps have been developed. BNPB is disclosing thematic maps of volvanic hazard
Early warning		BMKG prepares shake maps by using USGS software and discloses them after earthquakes (http://inatews.bmkg.go.id). BMKG shares information with BNPB.
Disaster management information		Two database systems, GEOSPASIAL1 and DIBI2, are run by BNPB, GEOSPASIAL is a Web-GIS database system that shows; (1) disaster/damage information caused by disasters occurring within 30 days, (2) various types of hazard maps, and (3) administrative boundaries on maps. DIBI is a database that stores information on historical disaster events in Indonesia. After a disaster has emerged, BNPB collects the disaster information from the national government,
Disaster management at community level and disaster education		Clauses 26 and 27 of the Disaster Management Law No.24 prescribe the rights and obligations of the community in disaster management. Several activities have been conducted by government agencies and donors. However, tit is considered that he current mechanism needs to be improved in terms of the participatory process
Preparedness for effective response		A database on all disasters in Indonesia called DIBI (Data dan Informasi Bencana Indonesia) has been developed and disclosed on the website of the BNPB (http://dibi.bnpb.go.id).
Emergency response and recovery		-

Appendix A10.4.4 Measures Taken for Natural Disasters: Volcano / Lao PDR

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	It is expected that the Prime Minister's Decree to order the preparation of a Disaster Management Law will be issued by around October 2012. If the decree is issued as assumed, the law will be started to be prepared targeting to be enacted within 2013.
	Plan for Disaster Management	National Level: "Strategic Plan on Disaster Risk Management in Lao PDR 2020, 2010 and Action Plan (2003-2005)" was issued in the form of Decree No.158 by the Ministry of Labour and Social Welfare (MLSW) in 2003. The plan lists long-term aims up to 2020 and goals for the medium-term until 2005 and 2010. The new plan called the National Disaster Management Plan 2012-2015 has been drafted and reviewed. A decree from the Prime Minister is necessary for the above new plan to be implemented even after it is finalized. Local Level: Five out of 17 provinces1 and some of their districts have prepared provincial/district disaster management plans.
	Organization for Disaster Management	National Level: Prime Minister Decree No. 158 was issued in 1999 in order to establish the National Disaster Management Committee (NDMC) and to position the NDMO within MLSW. Local Level: NDMC, which consists of the ministries, is chaired by the Deputy Prime Minister. Committees are also established in all the provinces (PDMC) and districts (DDMC). The Village Disaster Protection Unit (VDPU) is also set up at the village level.
Risk assessment		No historical volcanic disaster is recorded and investigation and study focusing and limited to this country area are not found.
Early warning		No information for volcano is found.
Disaster management information		No information for volcano is found.
Disaster management at community level and disaster education		Community-based disaster management programs are implemented by various donors targeting not only village people but local governments. Programs of education for disaster prevention and mitigation are under the responsibility of the Ministry of Education. There is a curriculum for elementary school students in 3rd, 4th and 5th grade regarding the matter. Textbooks that deal with fire, floods, droughts, landslides, a contagious disease have already been published. However volcano is not included.
Preparedness for effective response		Preparedness and contingency plans have been prepared for certain disasters. However it is mainly for flood. The current contingency plan is being reviewed to be revised. Some resources for emergency are allocated to the national as well as provincial levels. The Ministry of Labor and Social Welfare, of which NDMO is part as a division, has allocated stocks such as shelter materials and food for emergency assistance at various administrative levels.
Emergency response and recovery		The emergency response is supposed to be headed by local level disaster management organizations for mobilizing assistance resources from the government, the army and local communities. In case of a disaster, the Ministry of Foreign Affairs will ask for international/local NGOs to mobilize assistance. The establishment of a Disaster Response Coordination Center is proposed. NDMO is in need of an Emergency Operation Center as its internal function.

Appendix A10.4.5 Measures Taken for Natural Disasters: Volcano / Malaysia

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	Malaysia has no specific disaster management law. However, it has a disaster management policy and mechanism known as the National Security Council (NSC) Directive No. 20 approved by the Prime Minister in 1997. NSC Directive No.20 is in the course of revision to shift its paradigm from emergency response to disaster prevention and mitigation as agreed among ASEAN countries. NSC is considering to prepare a disaster management law once the new NSC No.20 is approved.
	Plan for Disaster Management	There is no specific disaster management plan but preparation of one is intended once the new NSC No.20 is approved. A budget for mitigation measures for flood and its monitoring activities is allocated to the implementing agency, i.e., the Department of Irrigation and Drainage. Local disaster management plans have not been considered necessary.
	Organization for Disaster Management	National Level: The Central Disaster Management and Relief Committee (CDMRC) were established at the federal National Level. The NSC is the implementing agency for disaster management and establishes a Disaster Management Division (DMD). The NSC local departments play the secretariat roles for respective state and district levels of the committee. Local Level: The state (SDMRC) and district (DDMRC) committees are also established. It depends on the scale of the affected area what level of committee is responsible for principal response. Monsoon-related flood is seasonal and tends to have nationwide effect, which is mainly handled by CDMRC.
Risk assessment		No historical volcanic disaster is recorded and investigation and study focusing and limited to this country area are not found.
Early warning		No information for volcano is found.
Disaster management information		The National Disaster Data and Information Management System (NADDI) are coordinated by NSC and MACRES. NADDI emphasizes on the utilization of remote sensing, geographical information system (GIS) and global positioning system (GPS) technologies to provide an up-to-date and reliable data to support the three components of disaster management, which are: - Early warning, - Detection and monitoring, and - Mitigation and relief for pre, during and post disaster management activities coordinated by NSC and implemented by relevant authorities.
Disaster management at community level and disaster education		Malaysia has disseminated disaster information to communities and implemented community-based disaster management programs, which helps in improving people's awareness of disaster management. Disaster drills are also conducted regularly. In 2011, a "Disaster Awareness Day" campaign was organized with selected role-model cities, which is aimed in particular to encourage other cities to be active in disaster awareness in respective local context. However, the education sector do not have primary and secondary school curriculum for disaster risk reduction yet.
Preparedness for effective response		Volcano is not included in SOPs
Emergency response and recovery		In case of a disaster, an On Scene Command Post (OSCP) is established as a command structure and control base. The OSCP coordinates with the Disaster Operations Control Center (DOCC) at each management level. DOCCs are set up according to the 3 levels of disaster.

Appendix A10.4.6 Measures Taken for Natural Disasters: Volcano / Myanmar

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	The Disaster Management Bill has been drafted and submitted to the Union Attorney-General for scrutiny. It would then be submitted to the Parliament for approval. Disaster management policies and guidelines have been prepared by the Central Committee on National Disaster Prevention (currently renamed as the Myanmar Disaster Preparedness Agency, MDPA) established in 2005.
	Plan for Disaster Management	National Level: The Myanmar Action Plan on Disaster Risk Reduction (MAPDRR) 2009-2015 has been prepared but it requires endorsement of the national government to be a formal document. Nevertheless, some of the project components indicated in MAPDRR have been implemented on stand-alone basis, most likely with donor support. Local Level: Apart from regional/ state flood protection plans, comprehensive disaster management plans and/or action plans does not seem to have been prepared at the local level.
	Organization for Disaster Management	National Level: The Minister of Social Welfare, Relief and Resettlement Department chairs MDPA. The Minister of Defense and the Minister of Home Affairs are co-vice-chairmen for MDPA. The Deputy Minister of MSWRR is the secretary, and RRD's Director General is the joint secretary for MDPA. Ministerial level of the committees is also organized. Local Level: At the state/regional level, the Chief Minister chairs the committee following the new administrative structure under the new Constitution. Similar structure and chairmanship are applied to districts, township and towns/wards/village-tract levels, respectively.
Risk assessment		No historical volcanic disaster is recorded and investigation and study focusing and limited to this country area are not found.
Early warning		No information for volcano is found.
Disaster management information		There is no comprehensive DMIS and disaster loss database in Myanmar, but hazard profiles are conducted (Title of report is "Hazard Profile of Myanmar"). The report includes historical data of natural disaster and results of the analysis of each natural hazard in Myanmar.
Disaster management at community level and disaster education		International organizations, Red Cross and NGOs have provided grassroots level assistance to the communities affected by Cyclone Nargis in 2008, which has made them to institutionalize disaster preparedness setup. However, the same setup has not developed for other areas. MAPDRR includes community-based disaster preparedness and risk reduction programs. Search and rescue drills are provided at township levels by the fire services department.
Preparedness for effective response		The Standing Order has been the principal document for preparedness in Myanmar. The document served as a contingency plan since it was prepared in 2009.
Emergency response and recovery		RRD under MSWRR plays a central role for the provision of relief items and reception of foreign aid. Emergency medical services are provided by the health department and military medical team. Corpse management is handled by the National Search and Rescue Committee established by the Presidential Decree in 2011.

Appendix A10.4.7 Measures Taken for Natural Disasters: Volcano / Philippines

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	The Disaster Risk Reduction and Management Act (Republic Act 101211) were issued in 2010 aiming at strengthening disaster management system with the management framework. The act also institutionalizes the management plan and appropriation fund. The act contains the paradigm shift from emergency response to disaster prevention and mitigation. Republic Act 101211 complements with the Climate Change Act (Republic Act 9729) in terms of implementing rules and regulations. The Philippines has formulated the roadmap known as the Strategic National Action Plan 2009-2019 to sustain disaster risk reduction initiatives stated some decades ago in Presidential Decree 1566. The action plan enforces institutionalization of disaster risk reduction to be integrated into government policy.
	Plan for Disaster Management	National Level: In February 2012, the National Disaster Risk Reduction and Management Plan (NDRRMP) 2011-2028 were approved. NDRRMP covers four thematic areas, namely, i) disaster prevention and mitigation, ii) disaster preparedness, iii) disaster response, and iv) disaster rehabilitation and recovery. Local Level: Although local level disaster risk reduction management plans are to be prepared, the guideline for planning is still in preparation.
	Organization for Disaster Management	The National Disaster Coordination Council was renamed as the National Disaster Risk Reduction Management Council (NDRRMC)" by Republic Act 101211. More authority is granted to NDRRMC than NDCC. The Administrator of the Office of Civil Defense (OCD) of the Department of National Defense (DND) is the Executive Director for NDRRMC.
Risk assessment		PHIVOLCS developed volcano hazard maps with scale of 1/25,000 for 14 out of the 23 active volcanoes. The hazard maps have been created to identify hazardous items such as volcanic ash, lava flow, pyroclastic flow, lahar, and volcanic mud flow, and utilize such for evacuation plans, quick response and land use.
Early warning		PHIVOLCS has set up observatories for six volcanoes and installed observation systems to monitor volcanic activity. The observation sites and contents are as follows. - Taal, Pinatubo, Mayon, Bulusan, Hibok-hibok, Kanlaon. - Ground shaking, ground deformation, gas and water quality analysis, specific resistance and electromagnetic ray. The SATREPS project "Enhancement of Earthquake and Volcano Monitoring and Effective Utilization of Disaster Mitigation Information Project" by JICA and JST has been conducted. In this project, it has been planned to install instruments such as broadband seismograph, low-frequency microphone and GPS at Mt. Taal and Mt. Mayon.
Disaster management information		The National Disaster Risk Reduction Management Council (NDRRMC) has established an operations center. During emergencies, the NDRRMC Operations Center is activated into an NDRRMC Emergency Operations Center (EOC) and conducts; 1) Alert and monitoring, 2) Multi-agency operational coordination, 3) Response resource mobilization, 4) Information management.
Disaster management at community level and disaster education		The NDRRMP indicates that for Issue 2: Disaster preparedness, the target of capacity development of community including improvement of disaster risk awareness should be set. Metro Manila, in the National Capital Region, has implemented community support through local government units within the region.
Preparedness for effective response		The DPWH has constructed structural measures such as sabo dams (check dams) and dykes (mega dikes, super dikes) at Pinatubo and Mayon volcanoes. PHIVOLCS and the DPWH have conducted evacuation drills in CBDRM on a per project basis.
Emergency response and recovery		Since community-based disaster prevention plans have not yet been developed, emergency response has not been prepared systematically.

Appendix A10.4.8 Measures Taken for Natural Disasters: Volcano / Singapore

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	No comprehensive disaster management law exists, only related laws to tackle each disaster. These are the Fire Safety Act (1986) and Environmental Pollution Control Act (2002). In relation with emergency response, there are the Civil Defense Act (1986) and Civil Defense Shelter Act (1997). Policy focus is on urban disaster rather than natural disaster.
	Plan for Disaster Management	Singapore has an Operation Civil Emergency (Ops CE) Plan, which is a national contingency plan. The National Tsunami Response Plan has been developed. However, it is considered that the expected damages by tsunamis caused by possible earthquakes in South China Sea are just minor levels. Therefore, it is just required to establish an early warning system for tsunamis.
	Organization for Disaster Management	Singapore has "Home-front Crisis Management System" in which all ministries are engaged. These are composed of the "Home-front Ministry Group", "Home-front Crisis Executive Group" and "Statutory Board". The Home-front Crisis Executive Group" in charge of policy level is chaired by the Permanent Secretary of Home Affairs. Singapore Civil Defense Force (SCDF), which is Incident Manager (IM) for civil emergencies, is placed for strategic level. Twenty-seven key agencies, including the SCDF itself, armed forces, police, and other ministries are located in tactical level.
Risk assessment		No historical volcanic disaster is recorded and investigation and study focusing and limited to this country area are not found.
Early warning		The National Environment Agency (NEA) provides weather surveillance and multi-hazard warning services on a 24/7 basis to the public, industry and relevant agencies in Singapore. NEA established the Meteorological Service Singapore (MSS). MSS provides the country's weather forecasts, heavy rain warnings, smoke haze advisories, and information of earthquake/tremor/tsunami. Volcanic information is not included.
Disaster management information		No historical volcanic disaster is recorded and it is considered that the disaster database is not required.
Disaster management at community level and disaster education		There are wide ranges of community-based activities. For example, the Community Emergency Preparedness Programme (CEPP) provides basic first aid, one-man cardio-pulmonary resuscitation (CPR) and automated external defibrillator (AED), fire safety and casualty evacuation, emergency procedures, and terrorism. The Country Emergency Rescue Team (CERT) is formed by community volunteers. The SCDF works closely with the Ministry of Education (MOE) to incorporate emergency preparedness as a subject within the Civics and Moral Education syllabus for students in the primary and secondary levels. As part of emergency preparedness (EP), SCDF introduces short EP modules on essential skills and knowledge in surviving emergencies for schools to conduct during assembly periods.
Preparedness for effective response		The Operations Civil Emergency (Ops CE) Plan is Singapore's national contingency plan. The communities are provided with Community Emergency Preparedness Program (CEPP) by SCDF. Community exercises are conducted and the public is provided with civil emergency handbooks.
Emergency response and recovery		The SCDF under the Ministry of Home Affairs is responsible for emergency response to urban disasters including fire, having 5600 staffs (35% permanent staff and 62% full time national service). SCDF also has 8300 stand-by staff as of April 2012.

Appendix A10.4.9 Measures Taken for Natural Disasters: Volcano / Thailand

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	The Disaster Prevention and Mitigation Act were issued in 2007. Implementation of HFA is addressed by and materialized into the Strategic National Action Plan for Disaster Risk Reduction (SNAP) 2010-2019, which identifies strategic priorities. Disaster risk reduction is now one of top priorities of the country.
	Plan for Disaster Management	National Level: The "National Disaster Prevention and Mitigation Plan (NDPMP) 2010 - 2014" was issued in 2010. The NDPMP is composed of; i) management principle, ii) countermeasure procedure, and iii) security threat management & countermeasure procedure. Disaster countermeasure procedure shows 14 disaster cases and the standing order for each of them. A contingency plan is planned to be prepared in April 2012. Local Level: Using NDPMP as a guideline, it is expected that local DPMPs are supposed to be prepared. The Department of Disaster Prevention and Mitigation (DDPM) provides training opportunities for provinces and districts to prepare local plans.
	Organization for Disaster Management	National Level: "The National Disaster Prevention and Mitigation Committee (NDPMC)" is established for overall disaster management. The Director-General of DDPM (under the jurisdiction of the Ministry of Interior) assumes the secretariat function for NDPMC. Local level: The Provincial Governor is the Provincial Director responsible for disaster prevention and mitigation operation (Clause 15 of the Act). DDPM in the local level provides the secretariat function. The same applies to different local levels.
Risk assessment		No historical volcanic disaster is recorded and investigation and study focusing and limited to this country area are not found.
Early warning		No information for volcano is found.
Disaster management information		No information for volcano is found.
Disaster management at community level and disaster education		There are several projects on Community-based Disaster Reduction Management (CBDRM) that have been implemented. For example, JICA has assisted DDPM to be an enabling agency in order to improve the capacity of the local governments and the communities for disaster management through the Project on Capacity Development in Disaster Management. According to the HFA Progress Report (2009-2011), there is no primary school or secondary disaster prevention and mitigation school curriculum, although various organizations are conducting disaster education at schools in each local government.
Preparedness for effective response		Emergency relief system together with other arrangements for disaster management is a part of "Thailand's National Economic and Social Development Plan (both the 10th and the 11th plans)". "The National Disaster Prevention and Mitigation Plan (2010-2014)" contains the strategies on "preparedness arrangement" and "disaster emergency management". Also contained are "standing orders on disaster" which instruct the different ministries with additional duties in emergency situations and "disaster countermeasure procedures". However, no information focus on volcano is found.
Emergency response and recovery		In case an earthquake and/or a tsunami occur, the NDWC is responsible for disseminating warnings through the warning system such as the warning towers. Such warnings are based on information and observation results provided by the TMD and/or international organizations. However, no information focus on volcano is found.

Appendix A10.4.10 Measures Taken for Natural Disasters: Volcano / Vietnam

Item		Findings
Organization and Institution	Law and Policy for Disaster Management	"The Disaster Management Bill" has been drafted with the support of the United Nations Development Programme (UNDP). It is expected to be approved and enacted after the National Assembly in 2013. "The National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020" was issued in 2007. It is in the process of revision. Disaster management is considered from two aspects: (1) emergency response/preparedness, and (2) disaster mitigation. It is prioritized to prevent human loss.
	Plan for Disaster Management	National Level: The implementation plan of the National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020" was issued in 2009 as the guideline for other ministries/agencies and local governments to apply according to local situations. Local Level: Provinces prepare local implementation plans following this national framework.
	Organization for Disaster Management	National Level: There are two main committees: (1) Central Committee for Flood and Storm Control (CCFSC), and; (2) National Committee for Search and Rescue (NCSR). At the central government level, there is also a ministerial committee concerning both flood and storm control and search/rescue. Local Level: The above two main committees are integrated. Provisional level is named the Provincial Committee for Flood and Storm Control and Search and Rescue (PCFSC&SR). Same applies to the district (DCFSC&SR) and commune (CCFSC&SR) levels.
Risk assessment		No historical volcanic disaster is recorded and investigation and study focusing and limited to this country area are not found.
Early warning		No information for volcano is found.
Disaster management information		At the national level, disaster monitoring systems installed in Disaster Management Centers (DMC) are placed to monitor, archive and disseminate data on key hazards and damages caused by disasters.
Disaster management at community level and disaster education		Community participation for disaster reduction management has been emphasized by the Prime Minister's Decision (Decision 1002/QD-TTg) in 2009. Community engagement is traditionally the principle in disaster response and recovery / rehabilitation stages. There is no primary or secondary school curriculum regarding disaster prevention and mitigation according to the HFA Progress Report (2009-2011)-interim. However, there have been numerous educational projects led by the Vietnam National Red Cross (VNRC), donor countries and INGOs.
Preparedness for effective response		100% of commune level of local entities is preparing the plan for disaster preparedness and response with reviewing past lessons. The requirement of the ordinance is that every government agency and individual should stockpile sufficient material reserves such as i) rock, sand bag, stone, bamboo for rescuing infrastructure failure, ii) life vest, lifebuoy, boat for rescuing people, and iii) foods, fuel medicines for surviving. However, no information focus on volcano is found.
Emergency response and recovery		No information for volcano is found.

Appendix A12

Record of Study Trip 1

A 12.1

Natural Disaster Risk Assessment and Area Business Continuity Plan Formulation
for Industrial Agglomerated Areas in the ASEAN Region

Time schedule of the Study Trip1

	Date	Day	Team Leader / Regional BCP 2 / Disaster Management Plan (Takahashi) Coordinator / Secretariat / Geological Hazard (Nonaka)	Deputy Team Leader / Regional BCP 1 (Tsuji) Leader of Disaster Risk Assessment (Segawa)	Accommodation
1	Feb. 10	Sun	11:20 Tokyo →17 : 20 Jakarta JL725		Jakarta
2	Feb. 11	Mon	09:00 JICA 11:00 Japan Embassy in Indonesia 13:40 AHACentre 17:30 ASEAN Secretariat		Jakarta
3	Feb. 12	Tue	09:00 BNPB (AHA Centre Focal Point) 10:00 Tokunaga JICA Expert (Disaster Management Policy) 16:00 LIPI		Bandung
4	Feb. 13	Wed	08:40 BAPPEDA West Java province 10:50 BPBD West Java province 16:20 KIIC		Bekasi
5	Feb. 14	Thu	09:40 BAPPEDA Bekasi 11:30 BAPPEDA Karawang 14:00 BAPPEDA Bekasi city	(Tsuji) 22:05 Jakarta JL726→	Jakarta (Tsuji: flying overnight)
6	Feb. 15	Fri	08:30 AHA Centre 10:10 Mr. Tokunaga (JICA Expert) 14:20 Ministry of Industry 15:50 JETRO	(Tsuji) → 07:15 Tokyo (Segawa) 22:05 JakartaJL726→	Jakarta (Segawa: flying overnight)
7	Feb. 16	Sat	14:15 Jakarta →16:50 Singapore SQ959	(Segawa) → 07:15 Tokyo	Singapore
8	Feb. 17	Sun	Data compiling		Singapore
9	Feb. 18	Mon	Data compiling		Singapore
10	Feb. 19	Tue	09:25 Singapore Civil Defense Force (AHA Centre Focal Point) P.M. NTU Symposium[1]		Singapore
11	Feb. 20	Wed	13:40 Singapore→14 : 40 Kuala Lumpur MH606 17:00 JICA Malaysia office		Kuala Lumpur
12	Feb. 21	Thu	09:30 National Security Council (AHA Centre Focal Point) 11:30 UKM 13:30 JETRO		Kuala Lumpur
13	Feb. 22	Fri	07:40 Kuala Lumpur→ 08 : 30 Penang MH1134 09:25 University of Science Malaysia (Penang) 12:20 Penang→13:15 Kuala Lumpur MH1145 14:50 JMG 16:55 JICA Malaysia office		Kuala Lumpur
14	Feb. 23	Sat	12:25 Kuala Lumpur→ →13:30 Bangkok MH788	Bangkok GIS and Database(Hasegawa)	accommodation

[1] Organized by Prof. Pan, NTU
Annual International Symposium on "Evolving Risks due Extreme Risks in Asia Pacific" (19-20 Feb 2013)

A 12.1

	date	day	Team Leader / Regional BCP 2 / Disaster Management Plan (Takahashi) Coordinator / Secretariat / Geological Hazard (Nonaka)		Deputy Team Leader / Regional BCP 1 (Tsuji) Leader of Disaster Risk Assessment (Segawa)	accommodation
15	Feb. 24	Sun	Data compiling 18:00 Tanaka(flood1), Watanabe(Coordinator)	Bangkok	From Dakka 07:30 Jakarta SQ950	Jakarta
16	Feb. 25	Mon	Rojana Industrial Park Data compiling	Bangkok	AHA Centre	Jakarta
17	Feb. 26	Tue	09:25 JICA Thailand office 10:25 JETRO Bangkok 12:35 DDPM(AHA Focal Point) 15:30 Japanese Chamber of Commerce, Bangkok	Bangkok	AHA Centre	Jakarta
18	Feb. 27	Wed	07:45 Bangkok→ → 11:55 Manila TG620 15:00 JICA Philippine office	Manila	AHA Centre	Jakarta
19	Feb. 28	Thu	09:00 MMDA 10:10 OCD JICA Project (P.M.) Data compiling	Manila	AHA Centre	Jakarta
20	Mar.	Fri	09:30 PHIVOLCS 13:15 JETRO Manila office, The Japanese Chamber of Commerce & Industry of the Philippines 15:50 OCD (AHA Focal Point)	Manila	23:55 Jakarta JL752→	flying overnight
21	Mar. 2	Sat	09:00 Laguna Techno Park, Cavite Economic Zone	Manila	→07:15 Tokyo	-
22	Mar. 3	Sun	Data compiling			Manila
23	Mar. 4	Mon	16:00 JICA Philippine office			Manila
24	Mar. 5	Tue	12:25 Manila→14 : 35 Hong Kong CX900 19:00 Hong Kong→20 : 05 Hanoi CX6727			Hanoi
25	Mar. 6	Wed	09:00 MARD DMFSC (AHA Focal Point) 13:30 Japan Embassy in Vietnam			Hanoi
26	Mar. 7	Thu	14:20 Hai Phong city DARD (Sub-Department of Dyke Management) Nomura Hai Phong Industrial Park			Hai Phong
27	Mar. 8	Fri	08:30 Vietnam Chamber of Commerce and Industry Workshop (Nonaka) 10:00 UNDP (Takahashi) 13:30 The Japan Business Association in Vietnam 15:00 JETRO 16:50 JICA 23:55 Hanoi JL752 →			flying overnight
28	Mar. 9	Sat	→ 06:40 Tokyo			-

Abbreviation

AHA Center	:	ASEAN Coordination Center for Humanitarian Assistance on Disaster Management
BAPPEDA		Planning and Development Board
BNPB	:	National Agency for Disaster Management
BPBD	:	Badan Penanggulangan Bencana Daerah (Regional Disaster Management Agency)
DDMFSC	:	Department of Dike Management and Flood, Storm Control
DDPM	:	Department of Disaster Prevention and Mitigation
JETRO		Japan External Trade Organization
JMG	:	Mineral Geoscience Department Malaysia
KIIC	:	Karawang International Industrial City
LIPI	:	Indonesian Institute of Sciences
MMDA	:	Metropolitan Manila Development Authority
NTU	:	Nanyang Technological University
OCD	:	Office of Civil Defense
PHIVOLCS	:	Philippine Institute of Volcanology and Seismology
VCCI		Vietnam Chamber of Commerce and Industry

Study Trip participants

Expertise	Name	Visited Countries	Period
Team Leader / Area BCP 2 / Disaster Management Plan	Masakazu TAKAHASHI	Indonesia, Singapore, Malaysia, Thailand, Philippine and Vietnam	10 February – 9 March 2013
Deputy Team Leader / Area BCP 1	Yoshiyuki TSUJI	Indonesia	10– 15 February 2013
Leader of Disaster Risk Assessment	Shukyo SEGAWA	Indonesia	10– 16 February 2013
GIS and Database	Koichi HASEGAWA	Indonesia	24 February – 2 March 2013
Coordinator / Secretariat / Geological Hazard	Hiromi NONAKA	Indonesia, Singapore, Malaysia, Thailand, Philippine and Vietnam	10 February – 9 March 2013

A 12.1

Places Visited

Agencies/ Industrial Park	Indonesia	Singapore	Malaysia	Thailand	Philippine	Vietnam
JICA Representative office	○	-	○	○	○	○
Japan Embassy	○	-	-	-	-	○
JETRO	○	-	○	○	○	○
The Japan Chamber of Commerce and Industry	○	-	-	○	○	○
AHA Centre	○	-	-	-	-	-
ASEAN Secretariat	○	-	-	-	-	-
Government Agencies for Disaster management	○	○	○	○	○	○
Government Agencies for Economy	○	-	-	-	-	-
Local Administrative Organ in Pilot Site	○	-	-	-	△	○
Candidates for the Post of Panel Member	○	○	○	-	○	○
Industrial Park	KIIC (Karawang Regency)	-	-	Rojana Industrial Park (Ayuttaya)	Cavite Economic Zone, Laguna Technopark	Nomura Hai Phong industrial Zone
Seminar Participation	-	Risk assessment seminar	-	-	-	VCCIseminar (Relevant of BCP)

A12.2

Indonesia

No.	Name	Organization	Department	Position
1	Hideki Katayama	JICA	Indonesia Office	Disaster Management Advisor
2	Masaya Yaguchi	JICA	Indonesia Office	Representative
3	Yoko Yamoto	JICA	Indonesia Office	Representative for ASEAN Coordination
4	Rasityo Utomo Suhud	JICA	Indonesia Office	Coordinator for ASEAN-JICA Regional Cooperation
5	Takako Ito	Embassy of Japan in Indonesia	-	Depty Chief of Mission
6	Yasuhiro Nagasaka	Embassy of Japan in Indonesia	-	First Secretary
7	Saiko Saito	Embassy of Japan in Indonesia	-	Second Secretary
8	Khaim Jin Lee	AHA Centre	-	Head of Corporate Affairs & Programme Devision
9	Janggam Adhityawarma	AHA Centre	-	Senior Disaster Monitoring and Analysis Officer
10	Bachtiar Andy Musaffa	AHA Centre	-	Disaster Monitoring and Analysis Officer
11	Olivia Christina	AHA Centre	-	Receptionist
12	Adelina Dwi Ekawati Kamal	ASEAN Secretariat	Disaster Management & Humanitarian Assistance Division	Head of Division
13	Sugeng Triutomo	National Agency for Disaster Management (BNPB)	Prevention and Preparedness	Dupty Chief
14	Yoshio Tokunaga	National Agency for Disaster Management (BNPB)	-	Expert on Disaster Management Policy
15	Hery Harjono	Lembaga Ilmu Pengetahuan Indonesia	-	Executive Director
16	Herryal Z. Anwar	Lembaga Ilmu Pengetahuan Indonesia	Redearch Centre for Geotechnology	Disaster risk Management - Engineering Geologist
17	Linda Al-Amin	BAPPEDA West Java Province	-	-
18	Ahmad Adehadean Syah	BAPPEDA West Java Province	-	-
19	Deny Ramadan	BAPPEDA West Java Province	-	-
20	Ervina F	BAPPEDA West Java Province	-	-
21	Ali Nugroho	BAPPEDA West Java Province	-	-
22	Atus Ruswandi	BAPPEDA West Java Province	-	-
23	Udjwalaprana Sigit, MM	BPBD West Java	-	-
24	Andrie Setiawan, Sip	BPBD West Java	-	-
25	Yayan Sofian	Disperindag kor & UMKM, Bekasi City	-	-
26	Rahayu Lestari	BAPPEDA Bekasi City	-	-
27	R.A.Koesoemo Roekmi	BAPPEDA Bekasi City	-	-
28	Juniardiana R	Disperindag kot & UMKY, Bekasi City	-	-
29	M.Ridwan	BAPPEDA Bekasi City	-	-
30	Venty Novioanti	BAPPEDA Bekasi City	-	-
31	M.A. Supratman	BAPPEDA Bekasi City	-	Secretary
32	Sahat MB Nahor	BAPPEDA Bekasi City	-	-
33	Agustien N	BAPPEDA Bekasi City	-	-
34	Agus M	BAPPEDA Karawan Stop BPLH City	-	-
35	Hanati	BAPPEDA Bekasi City	-	-
36	Muhrodi Surur	BAPPEDA Bekasi City	-	-
37	Lusi Asela	BAPPEDA Bekasi City	-	-
38	Supriatna	BAPPEDA Bekasi City	-	-

39	Dindin Rachmadhf	BAPPEDA Bekasi City	-	-
40	Ir. Agut suwadawiana, MM	BAPPEDA Bekasi City	-	-

No.	Name	Organization	Department	Position
41	Puguh T.H.	BAPPEDA Karawan Regency	-	-
42	Kustantinah	BEKASI City	-	-
43	Uki Subandi	PDAM Tirta Bagarasi	-	-
44	Tito Hazauru	BMTARTH	-	-
45	Denden Hudaeni	PLN Area BEKASI City	-	-
46	Sugiamto	PLN Area BEKASI City	-	-
47	Kunio Yano	KIIC	-	President Director
48	Akira Takami	KIIC	-	Acting Director Marketing & Tenant Relation
49	Dedi Mulyadi	Ministry of Industry	-	Director General for Industrial Region Development
50	Achmad Sigit Dwiwahjono	Ministry of Industry	-	Director of Industrial Facilitation Development for Region III
51	Endang Supraptini	Ministry of Industry	-	Directorate of Industrial Facilitation Development for Region II Director General for Industrial
52	Kazuhiro Aizawa	JETRO	-	Vice President Director
53	Yusuke Yoshida	JETRO	-	Senior Director

Malaysia

No.	Name	Organization	Department	Position
1	Kyoko Okubo	JICA	Malaysia Office	Senior Representative
2	Yoshiko Miura	JICA	Malaysia Office	Representative
3	Habiban Lateh	Malaysia Science University	School of distance Education	Dean
4	Jainambn	Malaysia Science University	School of distance Education	Researcher
5	Anton Abdulbasah Kamil	Malaysia Science University	School of distance Education	Researcher
6	Zarina Md Nor	Malaysia Science University	School of distance Education	Researcher
7	Chan Harah Yong	Malaysia Science University	School of distance Education	Project manager
8	Nurzafirah A Khadar	Malaysia Science University	School of distance Education	Redearch Assistant
9	Takayuki Sakurai	Malaysia Science University	School of distance Education	Project Coordinator
10	Joy Jacoueune Pereira	UKM	-	Depty Director
11	Koh Fui Pin	UKM	-	Research officer
12	Mohd Khairul Zain bin	UKM	-	Science officer
13	Siti Mariam Binti Abu	National Security Council prime Minister's Department	Disaster Management Division	Assistant Secretary
14	Munirah Binti Zulkaple	National Security Council prime Minister's Department	Disaster Management Division	Princepal Assistant Secretary
15	Mohd Ariff Baharom	National Security Council prime Minister's Department	Disaster Management Division	Under Secretary
16	Tsuneo Tanaka	JETRO	-	Senior Adviser
17	Dato'hj Zakaria Bin Mohamad	JMG	-	Director
18	Mustapha Mohd. LIP	JMG	-	Dupty Director General
19	Mohd Badzran Bin Mat	JMG	-	Principal Assistant Director

Phillipine

No.	Name	Organization	Department	Position
1	Sachiko Takeda	JICA	Phillipine Office	Senior Representative
2	Hayato Nakamura	JICA	Phillipine Office	Project Fomulation Advisor
3	Kazushi Suzuki	JICA	Phillipine Office	Project Fomulation Advisor
4	Corazon T Jimenez	MMDA	-	General Manager

A12.2

5	Joeely M Moten	MMDA	Planning	Officer
6	Deha H Cagonaz	MMDA	Div. 2	Officer
7	Myra Nazanes	MMDA	EA II	Officer
8	KUSAKABE Takaaki	JICA	-	OCD Policy Advosor
9	Ryo Matsumaru	JICA TT Project	-	Team Leader
10	Yoshihiko Uchikura	JICA TT Project	-	-
11	Renato U. Solidum, Jr.	PHIVOLCS	Department of Science and Technology	Director
12	Ryoichi Ito	JETRO	Manila	Executive Director
13	Nobuo Fujii	The Japanese Chamber of Commerce and Industry of the Philippines	-	Vice president/Excutive Director
14	Miragros C Tigno	OCD	Planning	Plans Div.
15	Sonny Patron	OCD	Operations Div.	AO
16	Blanchb T Gobbncrong	OCD	Admin Div.	C. AD
17	Mance	OCD	-	-

Singapore

No.	Name	Organization	Department	Position
1	COL Anwar Abdullah	Singapore Civil Defence Force	Operations Department	Director
2	CPT Md Shahdele Bin Isma	Singapore Civil Defence Force	Operation Centre Operation Department	Commander
3	LTC Albert Seow	Singapore Civil Defence Force	Operation Centre Operation Department	Assistant director
4	Abdul Kalam	SSO International projects	Organisation Development Branch Strategic Planning Department	-
5	Pan Tso-Chien	Nanyang Technological University	Institute of Catastrophe Risk Management	Professor & Exective Director
6	Osamu Kobayashi	JST	Singapore Representative office	Director

Thailand

No.	Name	Organization	Department	Position
1	Yojiro Miyashita	JICA	Thailand Office	Representative
2	Seiya Sukekawa	JETRO	Bangkok	Vice President & Senior Economist (Asia Region)
3	Noboru Jitsuro	JICA Project	JICA Project	Expert
4	Arun Pinta	DDPM	-	Chief of Foreign Relations Sub-Bureau
5	PANNAPA NA NAN<Aimee>	DDPM	-	—
6	Yoshito kato	Japanese Chamber of Commerce,Bangkok	-	Membership Coordinator

Vietnam

No.	Name	Organization	Department	Position
1	Mr. Vu Van Tu	MARD	Dept. of Dyke, Flood and Storm Management	Deputy Director
2	Mr. Nguyen The Luong	MARD	Dept. of Dyke, Flood and Storm Management/ Flood and storm control Division	Head of Division
3	Mr. Nguyen Van Hai	MARD	Dept. of Dyke, Flood and Storm Management	Expert
4	Mr. Nguyen Duc Thang	MARD	Dept. of Dyke, Flood and Storm Management	Expert
5	Mr. Nguyen Xuan Tung	MARD	Dept. of Dyke, Flood and Storm Management	Expert
6	Mr. Duong Duc My	MARD	Dept. of Dyke, Flood and Storm Management	Expert
7	Mr. Nguyen Van Anh	MARD	Dept. of Dyke, Flood and Storm Management	Expert
8	Hiep	MARD	Dept. of Dyke, Flood and Storm Management	Expert
9	Shigeru Kishida	Embassy of Japan in Vietnam	-	First Secretary
10	Hirotsugu Terado	Embassy of Japan in Vietnam	-	Researcher
11	Duong Van Gang	Hai Phong DARD	Dept. of Dyke, Flood and Storm Management	Deputy Director
12	Mr. Nguyen Duc Tho	Hai Phong DARD	Dept. of Dyke, Flood and Storm Management/ Flood and storm control Division	Head of Division
13	Masanori Ogura	The Japan Business Assosciation in Vietnam	-	Secretary general
14	Sotaro Nishikawa	JETRO	Hanoi office	Director
15	Jiro Hosono	JETRO	Hanoi office	Senior Investment / Economic Partnership Agreement Advisor
16	Fumihiko Okiura	JICA	Vietnam office	Senior Representative

A12.2

17	Nozomi Ui	JICA	Vietnam office	Representative
18	Nguyen Thi Thanh	The Asia Fundation	-	Senior Program Officer
19	Dau Anh Tuan	VCCI	-	-
20	Nguyen Huu Phuc	MARD	Natural Disaster Prevention, Response and Mitigation Center	Director

A12.3

Country	Name	Organization	Position	E-mail	Tel	Remarks
Brunei	-	-	-	-	-	
Cambodia	-	-	-	-	-	
Indonesia	Sugeng Triutomo	National Agency for Disaster Management (BNPB)	Deputy Chief	striutomo@bnpb.go.id striutomo@gmail.com	(62.21)380-2392 (62.21)350-3682	
Indonesia	Linda Al-Amin	BAPPEDA Province Jawa Barat		bundahlf@gmail.com	-	
Indonesia	Endang Supraptini	Ministry of Industry	Director of Industrial Facilitation Development for Region II Directorate General of Industrial Region Development	endangsupraptini@yahoo.com	(62.81)29-281-931	
Laos	-	-	-	-	-	
Malaysia	Mohd Ariff Baharom	National Security Council Prime Minister's Department	Under Secretary Disaster Management Division	ariff@mkn.gov.my	(60.38)063-5907	Ext. 104
Malaysia	Munirah Binti Zulkaple	National Security Council prime Minister's Department	Disaster Management Division	munirahz@mkn.gov.my	(60.38)063-5907	
Maymar	-	-	-	-	-	
Philippine	Corazon T Jimenez	MMDA	General Manager	coratecjimenez@yahoo.co.ph	(63.91)72-985-282	
Philippine	-	OCD	-	-	-	
Singapore	COL Anwar Abdullah	Singapore Civil Defense Force	Director Operation Department	Anwar_Abdullah@scdf.gov.sg	(65.68)48-3300	
Thailand	Arun Pinta	DDPM	-	arunpinta@gmail.com	(66.26)373-654	
Thailand	PANNAPA NA NAN <Aimee>	DDPM	-	aimee_pb@yahoo.com	(66.26)37-3665	
Vietnam	Vu Van Tu	MARD	Deputy Director	tuvuvan@yahoo.com.vn	(84.4)37335695	
Vietnam	Vu Kiem Trung	MARD	TBC (On business trip to Mosque)			
Vietnam	Hiep	MARD	Expert	nguyen.hiep.vn@gmail.com	(84.4)37335695	

A 12.4

Government Agencies for Disaster Management (AHA Centre Focal Point)

Country	Organization	Request Items	Remarks
Indonesia	National Agency for Disaster Management (BNPB)	▪ Cooperative. Contact person hasn't been appointed.	Cooperate with Tokunaga JICA expert
Singapore	Singapore Civil Defense Force (SCDF)	▪ Very cooperative. Contact person was appointed. Coordination with domestic relevant agencies. Assist for data collection.	
Malaysia	National Security Council (NSC)	▪ Very cooperative. Contact person was appointed. Coordination with domestic relevant agencies. Assist for data collection.	
Thailand	Department of Disaster Prevention and Mitigation (DDPM)	▪ Very cooperative. Contact person was appointed. Coordination with domestic relevant agencies. Assist for data collection.	
Philippine	Office of Civil Defense (OCD)	▪ Cooperative. Contact person hasn't been appointed. As the visited day, 2 March, was organizational change day, contact person hasn't been appointed.	Cooperate with Kusakabe JICA expert
Vietnam	Ministry of Agriculture and Rural Development (MARD)	▪ Cooperative. Contact person was appointed. Coordination with domestic relevant agencies. Assist for data collection.	

A 12.4

Expectation for the study from Government Agencies for Disaster management (AHA Centre Focal Point)

Country	Organization	Expectation for the study
Singapore	Singapore Civil Defense Force (SCDF)	▪ BCP system is available. The government is strongly supporting formulation of BCP for enterprises. ▪ Singapore has cluster plan based on risk mapping for each industry. ▪ The result of this study can be applicable for BCP formulation in nationwide. ▪ Natural disaster does not occur so much in Singapore but the position is to help the neighboring countries in case natural disaster occurred. Therefore, information of the neighboring countries is important
Malaysia	National Security Council (NSC)	▪ The government is discussing that lessons from Thailand flood such as planning method. ▪ The study is very timely for Malaysia. ▪ This is new field. Have to work on holistic ▪ The study can encourage the public sector and private sector for formulation for BCP.
Thailand	Department of Disaster Prevention and Mitigation (DDPM)	▪ DDPM is discussing countermeasure for reducing the impact by flood damage. The study is very timely

A 12.4
Local Administrative Organ

Country	Organization	Feedback	Action
Indonesia	BAPPEDA West Java	▪ Cooperative.	▪ Need to organize the concept of industrial agglomerated area and coordinate the roles of West Java province, regency and city.
	BAPPEDA Karawang regency	▪ Cooperative. ▪ Showing aggressive attitude for providing information to participate in the meeting.	▪ Need to coordinate the roles of 3 local. 3 local Administrative Organ(Karawang regency, Bekasi regency and Bekasi city). ▪ Advancing mutual understanding of the positioning of this study. ▪ Need to re-examine the activities, method and timing for starting. ▪ Promoting an understanding of Area BCP.
	BAPPEDA Bekasi regency		
	BAPPEDA Bekasi city		
	BPBD West Java	▪ Cooperative.	-
Philippine	MMDA	▪ Cooperative.	▪ Waiting for response from the chairman of MMDA.
	Cavite State, Laguna State	▪ Couldn't contact focal person because of the election planed in May.	▪ Considering the confusion of the election, the activities can be started after July 2013. ▪ To get out of step with other two countries.
Vietnam	Hai Phong DARD	▪ Cooperative. ▪ Information providing structure is prepared under the direction of MARD.	▪ Need to conduct the same activities with Indonesia. ▪ Need to set a meeting with all relevant agencies through Hai Phong People's Committee.

A 12.5

Panels of Experts (Draft)

Natural Disaster Risk Assessment

Expertise	Name	Titles and Affiliations
Indonesia (Pilot Country)		
Earthquake / Structure	Dr. Haji Pariatmono Sukamdo	Director for Empowering Science and Technology for Government Institutions, Head of Information Center for Research on Natural Disaster (PIRBA),] Ministry of Research and Technology
Philippine (Pilot Country)		
Earthquake / Tsunami / Volcano	Dr. Renato U. Solidum, Jr.	PHIVOLCS Director
Flood / Typhoon	Dr. Susan R. Espinueva	Chief of Hydrometeorolgy Division, DOST - PAGASA
Vietnam (Pilot Country)		
Flood / Meteorological Phenomenon(Forecasts and Warnings)	Ms. Dang Thi Thanh Mai	Deputy Director of National Center for Hydro-meteorological Focasting (NCHMF)
Flood	Dr. Tran Ngoc Anh	Associate Prof., Faculty of Hydrology, Meteorology and Oceanography, Hanoi University of Science, Vietnam National University
Singapore(Resource Country)		
Earthquake / Risk Management	Prof. Pan Tso-Chien	Professor & Executive Director, Institute of Catastrophe Risk Management, Nanyang Technological University
Malaysia(Resource Country)		
Landslide	Dato' Haji Zakaria Bin Mohamad	Director, Minerals & Geoscience Dept. Malaysia (JMG) of Selangor
Thailand(Resource Country)		
Flood / Water Resource management	Chukiat Sapphaisal	Managing Director of Technical Sections of Water Development Consultants group Co. Ltd Former Associate Prof., Department of Water Resources Engineering, Faculty of Engineering, Kasetsart University.

Area BCP

Expertise	Name	Titles and Affiliations
Indonesia (Pilot Country)		
Local Governing / Community Development	Dr. Max Hasudungan Pohan	Deputy Minister of BAPPENAS for Regional Autonomy and Regional Development and Local Autonomy Affairs
Philippine (Pilot Country)		
Economics		Asian Institute of Management
Policy		NEDA
Vietnam (Pilot Country)		
the Chamber of Commerce and Industry (Private Sector)	Mr. Dau Anh Tuan	Director of Legal Department, Viet Nam Chamber of Commerce and Industry
Singapore(Resource Country)		
Emergency response	Col. Anwar Abdullah	Director of Operation, Singapore Civil Defense Force,
BCM / Disaster Reconstruction Plan (Private Sector)	Dr. Goh Moh Heng	BCM Institute, President
Malaysia(Resource Country)		
Economics risk Assessment	Prof. Dr. Hj. Mohd Rashid Hussain	Prof. in Risk Management, School of Economics, Finance and Banking, UUM College of Business
Thailand(Resource Country)		
Flood / Water Resource Management	Chukiat Sapphaisal	Managing Director of Technical Sections of Water Development Consultants group Co. Ltd Former Associate Prof. Department of Water Resources Engineering, Faculty of Engineering, Kasetsart University.


JICA