

Notes and Comments

Landslide database of Indonesia

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Abstract: Topographic, geologic and rainfall factors of Indonesia show her Archipelago having high potential of landslide hazard. Based on the frequent occurrences and the loss of human life, landslide hazard is one of the major geologic hazards in Indonesia.

All obtained data from the investigation are recorded on the landslide database in order to facilitate the monitoring of landslide hazard status, and to support the DEG scientists in landslides research and landslide mitigation.

1. Landslide hazard in Indonesia

There are three main factors that cause Indonesian Archipelago having high potential of landslide hazard, i.e., topographic, geologic, and rainfall factors. A wide areas of hilly and mountainous with steep to very steep slope, various of weak zone (discontinuities of bedding, formation, fault plane, etc), unconsolidated bedrock and earthquake, and heavy rainfall in the range of 50-200 mm per week in duration of 4-5 months per year give Indonesia a serious problem in landslide hazard. In some case, landslide also occurs when big earthquake strikes. In the recent years, human activities also trigger landslide hazard by cutting slope for settlement expansion, road construction and quarrying for construction material.

Landslides can occur anywhere at hilly or mountainous areas especially in rainy season, causing damage and the loss of financial, even human life. During the yearly rainy season, 30-40 landslides in average occur in Indonesia. Actually more than 40 landslides occur every year, but not all of these occurrences were recorded yet by Directorate of Environmental Geology (DEG).

Landslides causing many loss of human life, although rarely occur are the debris slides occurring on the slope of volcanic mountains and succeeded by debris flow hit the settlement in the lower slopes, such as in the Talaga area, Majalengka, West Java, causing 153 peoples killed (1980), G. Marpi, West Sumatra took 73 lives (1979), and G. Ilie Mandiri in Larantuka, East Flores causing 144 peoples killed (1979).

Other type of landslides that frequently occurred are the debris slides and slump with dimension 10-50 m

height, 30 to 500 meter width, and 50 to 1,000 m long. These landslides often take place on steep slope in hilly and mountainous area that have been developed as agricultural as well as settlement areas. These areas are usually built up of volcanic rocks (tuffaceous breccia, tuffaceous sandstone, and tuff), which are not yet consolidated.

Landslides of great extension with deep sliding plane generally occur in the moderate steep slopes with Tertiary sedimentary rock basement, for example, the typical and large landslide events in southern part of Cianjur, southern part of Sukabumi and in West Java, and those in Tertiary clays in northern part of Banjarnegara, Central Java and Bobonaro, East Timor.

Some landslide induced by earthquakes are found in the surroundings of large epicenters or along the Sumatra Fault System such as Blangkejeren, Aceh, Tarutung, North Sumatra, Curup-Kepahyangan, Bengkulu, Liwa, Lampung, and along the fault zone of the Jayawijaya, Irian Jaya. Kurima landslides occur at several locations in Jayawijaya mountain, Irian Jaya, are the landslides due to the earthquake having 120 peoples killed (1989).

One of the large landslides caused by quarrying occurred in Padangpanjang, West Sumatra that took 130 lives (1987). Landslide caused by cutting slope for settlement expansion occur in Garut, West Java killed 37 peoples (1985).

2. Landslide Information

To mitigate the landslides disasters, it is important to collect and manage all information about the landslide investigation and research, into the landslide database. The Directorate of Environmental Geology (DEG) as the government institution is assigned to

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conduct landslide mapping and landslide study in order to mitigate the landslide disasters in Indonesia, providing landslides information for public services.

2.1 Landslide susceptibility map

This map shows the zones of very low, low, moderate, and high susceptibility to landsliding, and identifies where landslides might occur in the area. This map is very useful in supporting the regional landuse planning, in order to avoid damage of construction and the development in the area. Until now (1995) 14 detail maps of the scale of 1:100,000 have been completed, and six of these have been published.

2.2 Landslide investigation report

There are two kinds of landslide reports in Indonesia. One landslide investigation report presents the result of evaluation and investigation of landslide hazard, factors causing the landslide, landslide mechanism, recommendations of landslide protection works, and the safe locations for resettlement, for each individual landslide having been investigated by DEG. Another report is landslide monitoring report, presents the result of monitoring of recurrent landslide areas, consisting of the study of mechanism of landslides, correlation of rainfall density, pore water pressure, and magnitude of movement.

2.3 Landslide database

Recording of landslide hazard data in DEG was started in 1991 stored in spreadsheet file, and since 1993 it has been developed by a local software with database file. Transferring data from database file into the Map Info software makes it possible to display the distribution of landslide's location including all the information derived from the database.

Two benefits may be expected by using the software with database file, i.e.:

*Easy and quickly getting the information about the status of landslide hazards, area with dense land-

slide distribution, damaged, and human losses;

*All data of any individual landslide can be displayed, facilitating scientists in getting information about the occurrences of landslides in specific lithology, soil slope, and rainfall, analyzing the correlation of each parameter that causes landslide in any specific area.

The database have 44 fields of data in total, and nine of them are the key fields, i.e. date, province, lithology type, soil type, slope, rainfall, No. of report, author, and No. of data (Table 1).

The database contains information regarding the number of landslide events, damage and live losses for all data in Indonesia, each province or district in certain periods. Beside that database also contains data number of each individual landslide, and coordinates of landslide which affect in specific rock type, soil type, slope, and rainfall density which occurred within a sub district. Database also presents the information of the author.

As of Today the DEG database has recorded 611 landslide data, distributed in 101 sub districts in 56 districts in Indonesia, resulting in the damage as shown on Table 2.

The actual number of total landslide evidences, destruction damages, and human life losses caused by landslide hazard in Indonesia may be bigger than the number as listed on Table 2, due to not all landslide data of occurrences have been recorded in DEG landslide database.

Information about the DEG landslide database may be obtain and available through Mr. Yousana O. P. Siagian, Engineering Geology Division, Directorate of Environmental Geology, Phone : +62 62 774760, Facsimile : 62 22 706167 or Internet E-mail : geologitl@telkom.go.id

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Table 1 A data sheet format for landslide investigation.

LANDSLIDE SECTION, SUB DIRECTORATE OF ENGINEERING GEOLOGY DIRECTORATE OF ENVIRONMENTAL GEOLOGY		
LANDSLIDE INVESTIGATION DATA		
Number of data : 9293-50	Number of queue :	Number of map's location :
Sub village	: Sindanghurip	
Village	: Cikalong	
Sub district	: Sodonghilir	
District	: Tasikmalaya	
Province	: West Java	
Latitude	: 7.285000	Date of investigation : 07-10-1992
Longitude	: 108.050500	Date of evidence : 09-10-1992
Cultivation, damaged	(Ha) :	7.00
Road, filled	(m) :	100.00
Road, broken off	(m) :	0.00
Traffic, stopped	(day) :	0
Bridge, damaged	(unit) :	0
Irrigation channel, broken off	(m) :	0.00
House, destroyed	(unit) :	0
Public building, destroyed	(unit) :	0
House, damaged	(unit) :	13
Public building, damaged	(unit) :	0
Livestock	(animal) :	0
Human, loss of life	(human) :	44
Human Injure	(human) :	5
The type of landslide	:	Debris landslide
Landslide age	:	New
Length of landslide	(m) :	500
Width of landslide	(m) :	50
Depth of sliding surface	(m) :	-
Moving direction	(° , N - E) :	-
Velocity	:	Fast
The type of rock	:	Tuffaceous Breccia
Existing of fault	:	(Y/N)? N
Existing of joint	:	(Y/N)?
Rock's age	:	Quarter
Type of soil	:	Sandy Silt
Thickness of soil	(m) :	3
Natural slope	(°) :	45
Rainfall	(mm) :	0
Slope cutting	:	(Y/N)(N) Slope (°) = °
Landuse	:	Cultivation and housing
Seismicity ?	:	(Y/N) (N), Magnitude M = Richter
Number of report	: 02.18	Author : Anas Luthfi
Remarks	: -	
		Bandung, 19 Data collector

Table 1 List of damages and human losses caused by landslides in Indonesia, in the periode of 1980-1995, collect by DEG.

<u>Total landslides: 611 occurrences</u>	
3,862 ha	cultivation, damaged
5,205 m	road, filled
33,285 m	road, broken off
239 days	traffic, stopped
29 units	bridge, damaged
568 m	irrigation channel, broken off
5,491 units	house, damaged
701 units	public building, damaged
980 units	house, destroyed
172 units	public building, destroyed
668	livestock, killed
740 peoples,	loss of life
144 peoples,	injured

インドネシアの地すべりデータベース

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要 旨

インドネシアの地形・地質・降雨などの要素は、同地域に高い地すべり災害ポテンシャルを与えている。地すべり災害は、インドネシアにおいてその高い発生頻度と人命損失の観点から主要地質災害の1つとなっている。地すべりの調査記録は、地すべり災害をモニターし、その研究や地すべり災害軽減に役立てられるためにデータベース化された。収録データは1980-1995年にかけて611件740名の人命が失われている。