

LANDSLIDE HAZARD MITIGATION STRATEGY IN INDONESIA

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CONDITION OF INDONESIA

- Archipelago of Indonesia geographically lays in 6° N - 11° S latitude and 95° E - 141° E longitude
- Indonesia has 1540 big and small islands, more than 30 culture, divide into 33 provinces and Jakarta as Capitol City.
- Population in Indonesia about 211 millions, national language is Bahasa Indonesia, national symbol is Burung Garuda and national Anthem song is Indonesia Raya.



POSITION OF INDONESIA

- Indonesia lies between three major active plates; Eurasia, Indo-Australia and Pacific.
- Consequences Indonesia that lying in interaction of triple junction Plate :

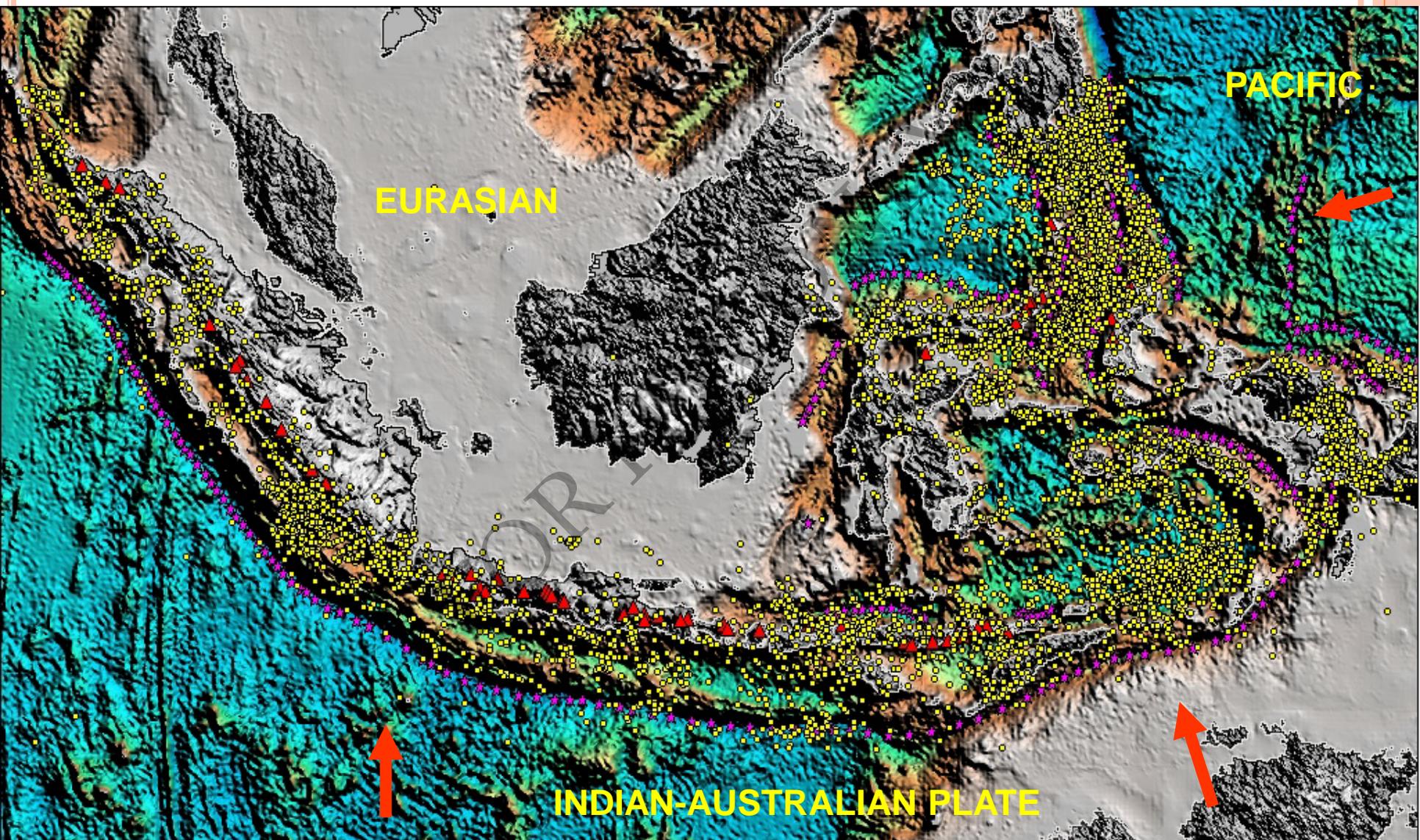
Positif Consequences :

1. Prosperius Land
2. Beautiful View
3. Abundant of Precious Mineral
4. Oil and Gas Deposits

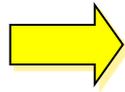
Negative Consequences :

1. Geological Hazard Prone
2. Such as Earthquakes /
3. Tsunami
4. Landslide
5. Volcanic eruption

INTERACTION OF TRIPLE JUNCTION PLATE



LANDSLIDE



The most common types of natural disaster, which frequently occurs in Indonesia.

Landslide maybe triggered by natural causes such as earthquake or heavy rainfall aggravated by man-made causes such as denudation of forests, man's modification of the terrain slope, etc. Landslides have been one major problem of geohazard in Indonesia, especially during the rainy season.



LANDSLIDE DISASTER 2009 PERIODE IN INDONESIA FOR EACH PROVINCE

| PROVINCE | EVENT | D | I | DB | DsT | TB | DA | DOB | Valley | ROAD | IR |
|------------------|------------|------------|------------|-------------|------------|-------------|-----------|----------|----------|-------------|-----------|
| West java | 69 | 92 | 39 | 426 | 45 | 365 | 7 | 1 | 1 | 114 | 20 |
| Central Java | 27 | 7 | 6 | 258 | 49 | 583 | 2 | 3 | 6 | 945 | |
| East Java | 4 | | | 65 | | | 2 | | | | |
| DIY | 4 | | | | 271 | | | | | 2 | |
| Banten | 1 | 185 | 179 | 250 | | | | | | | |
| Lampung | 1 | 1 | | 653 | 23 | | | | | | |
| West Sumatera | 10 | 286 | | 321 | 42 | | | | | | |
| Riau | 1 | | | | | | | | | | |
| NAD | | | | | | | | | | | |
| Papua | 1 | 4 | | | | | 9 | | | | |
| NTB | 3 | | | 49 | | 1 | 1 | | | 2000 | |
| NTT | 1 | | | | 31 | | | 1 | | | |
| Sulawesi Selatan | 3 | 7 | | 3 | 2 | 65 | | | | | |
| Central Sulawesi | | | | | | | | | | | |
| East Kalimantan | | | | | | | | | | | |
| Maluku | 125 | | | | | | | | | | |
| North Sulawesi | | | | | | | | | | | |
| TOTAL | 125 | 582 | 224 | 2025 | 463 | 1014 | 21 | 5 | 7 | 3061 | 20 |

Explanation :

D : Dead

I : Injured

DB : Damage Buildings

DsT : Destroyed Buildings

TB : Threaten Buildings

DA : Damage another buildings

DOB: Destroyed another buildings

IR : Irigation



LANDSLIDE DISASTER 2010 PERIODE IN INDONESIA FOR EACH PROVINCE (until April 18, 2010).

| PROVINCE | EVENT | D | I | DB | DsT | TB | DA | DOB | Valley | ROAD | IR |
|--------------------|-----------|-----------|-----------|------------|------------|------------|-----------|-----------|-----------|------------|------------|
| West Java | 54 | 64 | 18 | 360 | 119 | 966 | 26 | 11 | 29 | 290 | 100 |
| Central Java | 6 | 3 | 41 | 8 | | | | | | | |
| East Java | 7 | | | 13 | | 30 | | | | | |
| DI. Yogyakarta | 2 | | | 15 | | | | | | 350 | |
| West Sumatera | 9 | 6 | 17 | 19 | 14 | | 3 | | | 50 | |
| South Sumatera | 1 | | | | | | | | | | |
| North Sumatera | 2 | 6 | | 11 | 1 | | 1 | | | | |
| Riau | | | | | | | | | | | |
| NAD | | | | | | | | | | | |
| Papua | | | | | | | | | | | |
| NTB | | | | | | | | | | | |
| NTT | 2 | | | | | | | | | | |
| West Sulawesi | 1 | | | | | | | | | | |
| Southeast Sulawesi | 1 | 9 | | 26 | | | | | | | |
| Jambi | 1 | 1 | | 60 | 100 | | | | | | |
| North Maluku | 1 | 2 | 1 | 32 | | | | | | | |
| TOTAL | 87 | 91 | 77 | 544 | 234 | 996 | 30 | 11 | 29 | 690 | 100 |

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LANDSLIDE HAZARD MITIGATION

▪ Quick
Response

▪ Socialization

▪ Landslide
Early
Warning
System

▪ Landslide
Monitoring

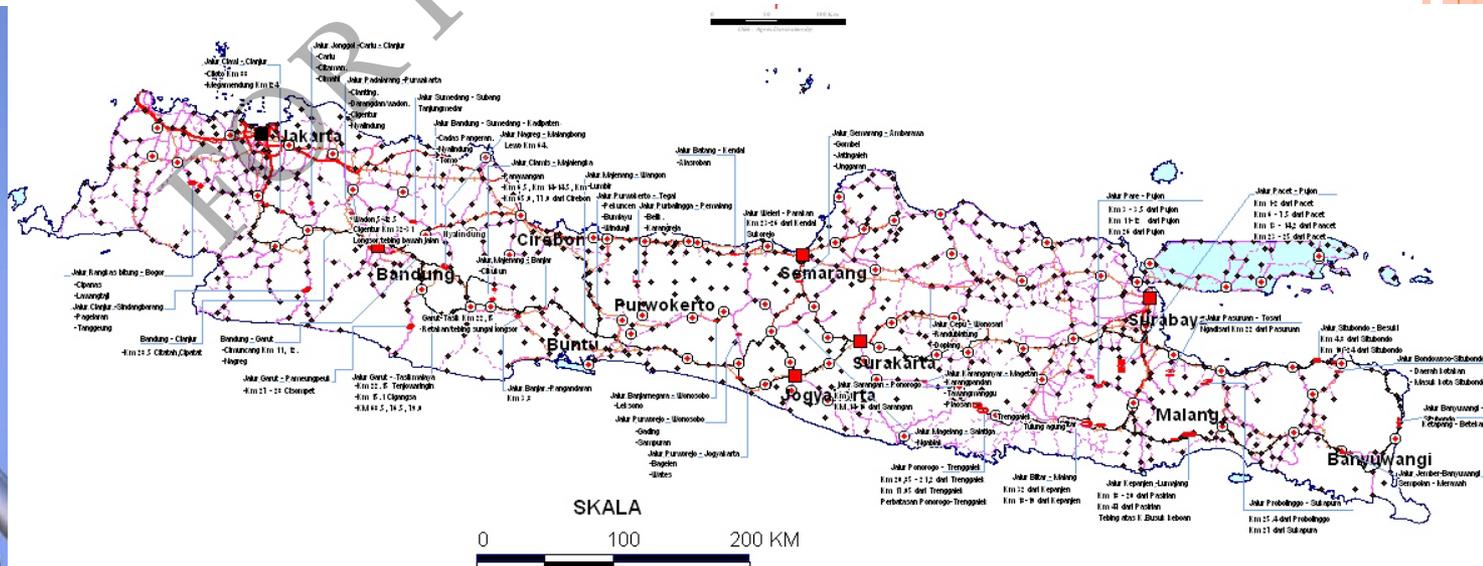
▪ Landslide Hazard
Susceptibility
Mapping



LANDSLIDE MONITORING

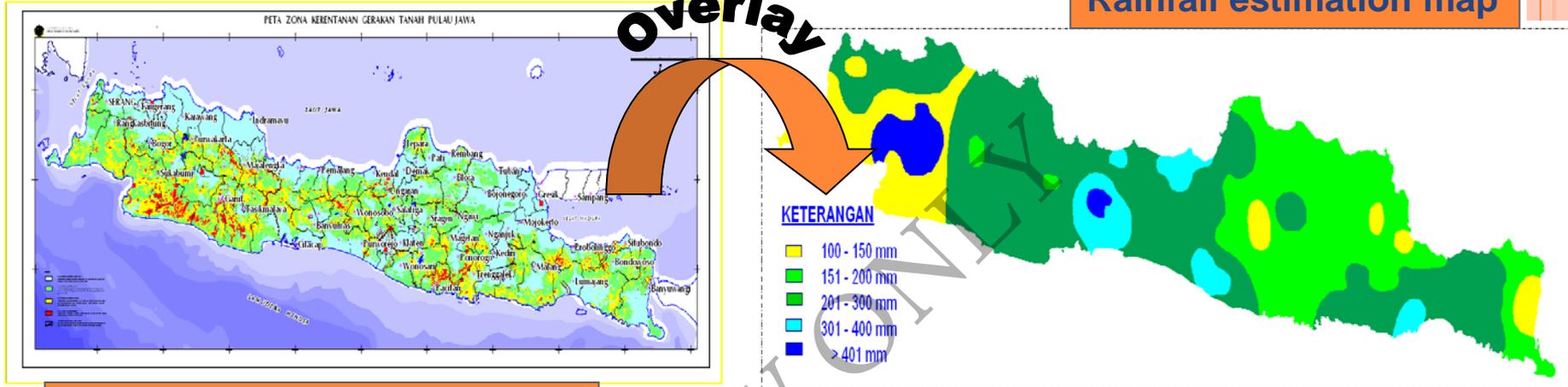
- Criteria: Settlements, Vital and strategis road (examples; Bogor-Puncak-Cianjur, Sumedang, Majenang-Wangon)
- Aims ; To know activity of landslide based on direction, velocity of landslide movement, to reduce socio-economics impact of landslide
- Method: Monitoring by using GPS (*Global Positioning System*)
- Result: Rate of landslide movement and technical recommendation

example: New road at Ciloto and slope stabilization at Citatah, West Java is recommendation from CVGHM

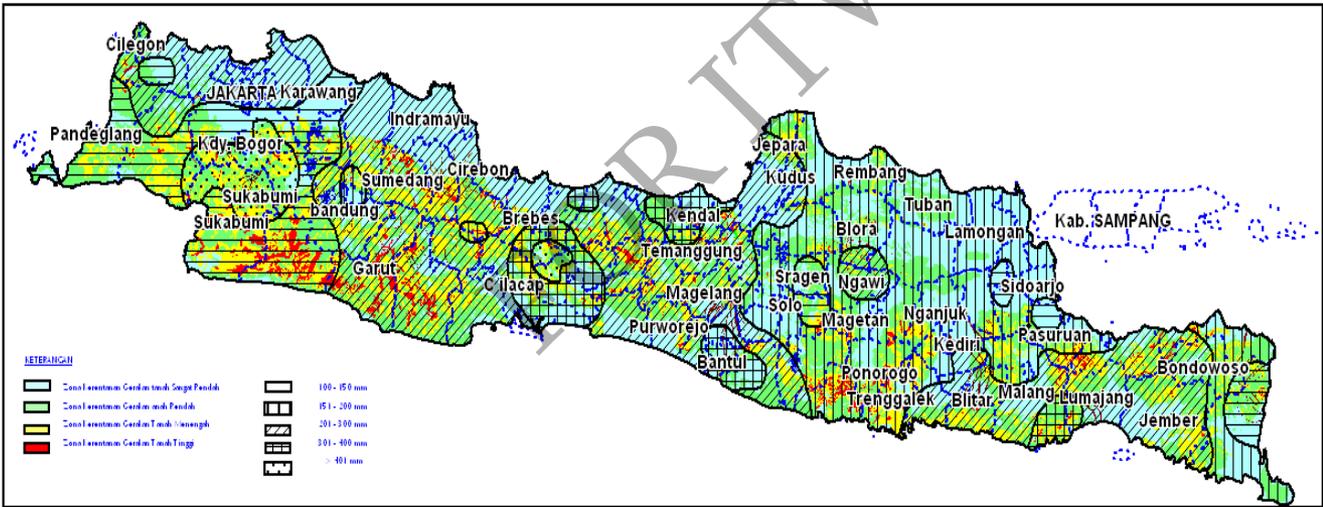


Landslide early warning system

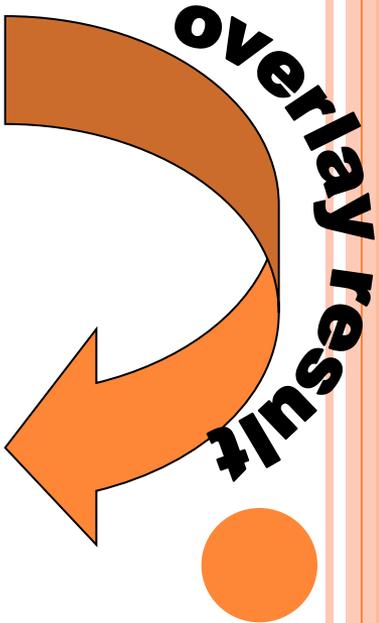
Rainfall estimation map



Landslide Susceptibility map



Overlay map of Landslide Susceptibility



LANDSLIDE SOCIALIZATION

Aim and objectivity

- Landside hazard early warning system
- Information of susceptibility to landslide zone
- To calm down community in the landslide area
- To improve understanding and awareness on geohazard phenomena as well as on the importance of local community, local governments, decision makers and public education.
- Develop appropriate strategy and program for public education.



QUICK RESPOND

Quick respond team will be assigned to landslide hazard area to make an observation (geophysical & geological investigation) .

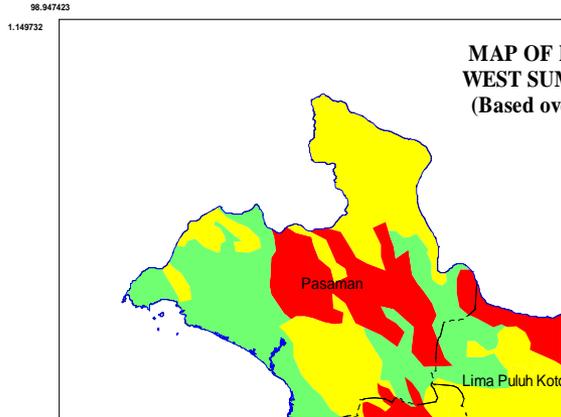


Output :

- Obtain the mechanism and condition of landslide
- Technical Recommendation to Local Government and the people who live in landslide area



EARLY WARNING SYSTEM



Due to early warning system of landslide mitigation, every month CVGHM publish the map of potential landslide prediction which is made by overlaying the Landslide Susceptibility Map with the rain intensity.

FOR ITW ONLY



Sending Quick Respond Team

Quick respond team will come to landslide hazard, They will give the technical recommendation to prevent the landslide and reduce the impact of landslide hazard .



Figure 1. (a) Landslide located in Campaka District, Cianjur Regency, West Java caused 13 peoples died, 4 peoples injured ,30 houses destroyed and 24 hoses threaten (November 14, 2008). (b) Landslide located in Campakamulya District, Cianjur Regency, West Java caused, 98 houses destroyed ,37 hoses threaten and 20 ha Valley destroyed (November 15, 2008).

CONCLUSIONS

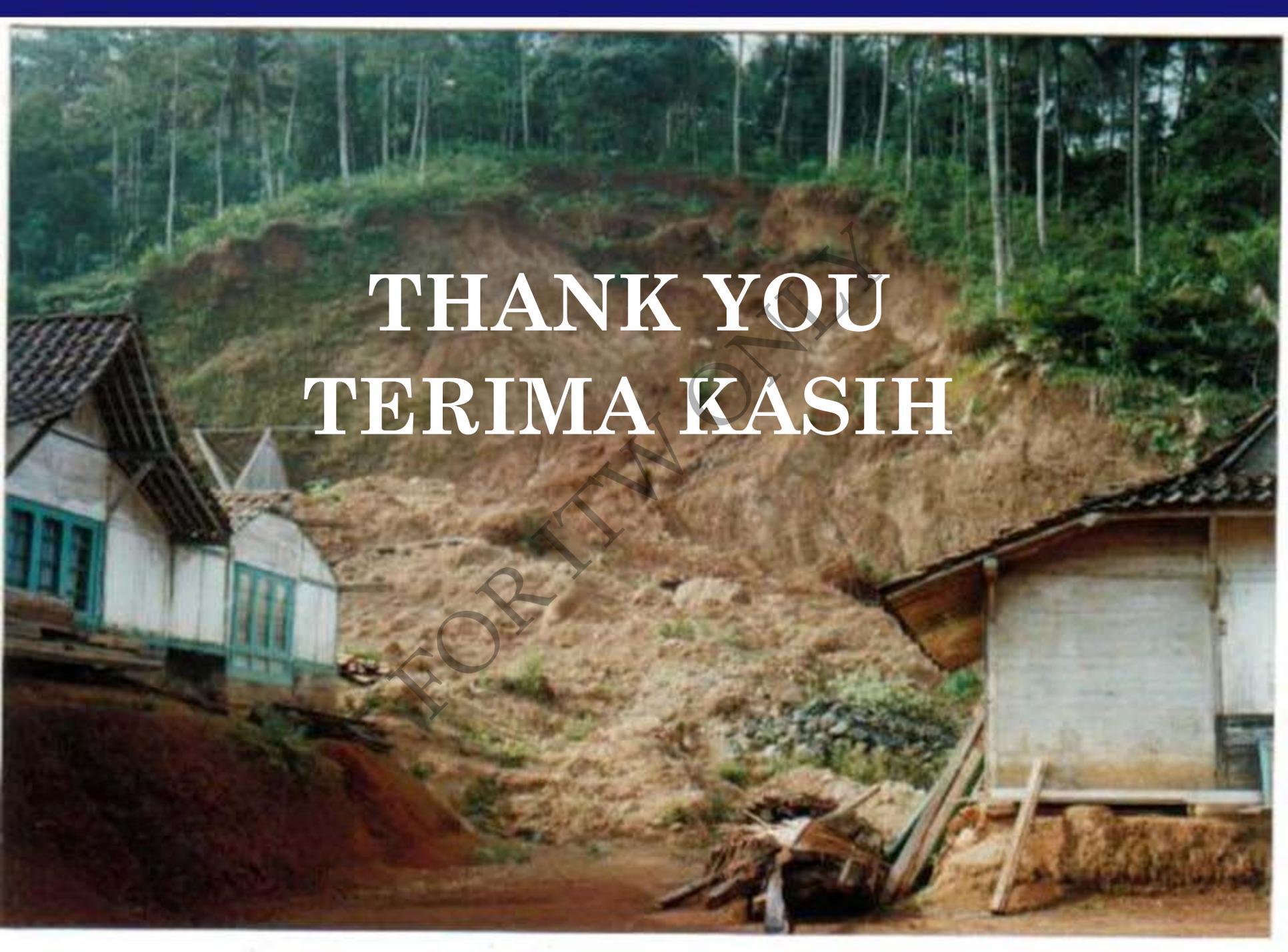
- 1. We are not able to avoid geological hazard in Indonesia. However the impact of the those hazards can be reduced or minimized.**
- 2. The successful of the geological hazard mitigation depend on :**
 - Data Accuracy and information.**
 - Quick dissemination of information from government/institution to people.**
 - Application of geological hazard information to the society/local people.**



3. Human victims and socio-economic losses caused by landslide, due to

- Many of the settlements and public activity still growing in medium – high susceptibility area to landslide
- Landslide Susceptibility Map and Early Warning System not optimally used as a database for land use planning and regional development based on geological hazard threat.
- Early education in school concerning the geological hazard as a part hazard management, formally not yet included in the curriculum.





**THANK YOU
TERIMA KASIH**