

# LANDSLIDE HAZARD MITIGATION STRATEGY IN INDONESIA

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## CONDITION OF INDONESIA

- Archipelago of Indonesia geographically lays in  $6^{\circ}$  N -  $11^{\circ}$  S latitude and  $95^{\circ}$  E -  $141^{\circ}$  E longitude
- Indonesia has 1540 big and small islands, more than 30 culture, devide 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

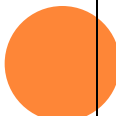
- Indonesia lies between three major active plates; Eurasia, Indo-Australia and Pacific.
- Consequences Indonesia that lying in interaction of triple junction Plate :



## **Positif Consequences :**

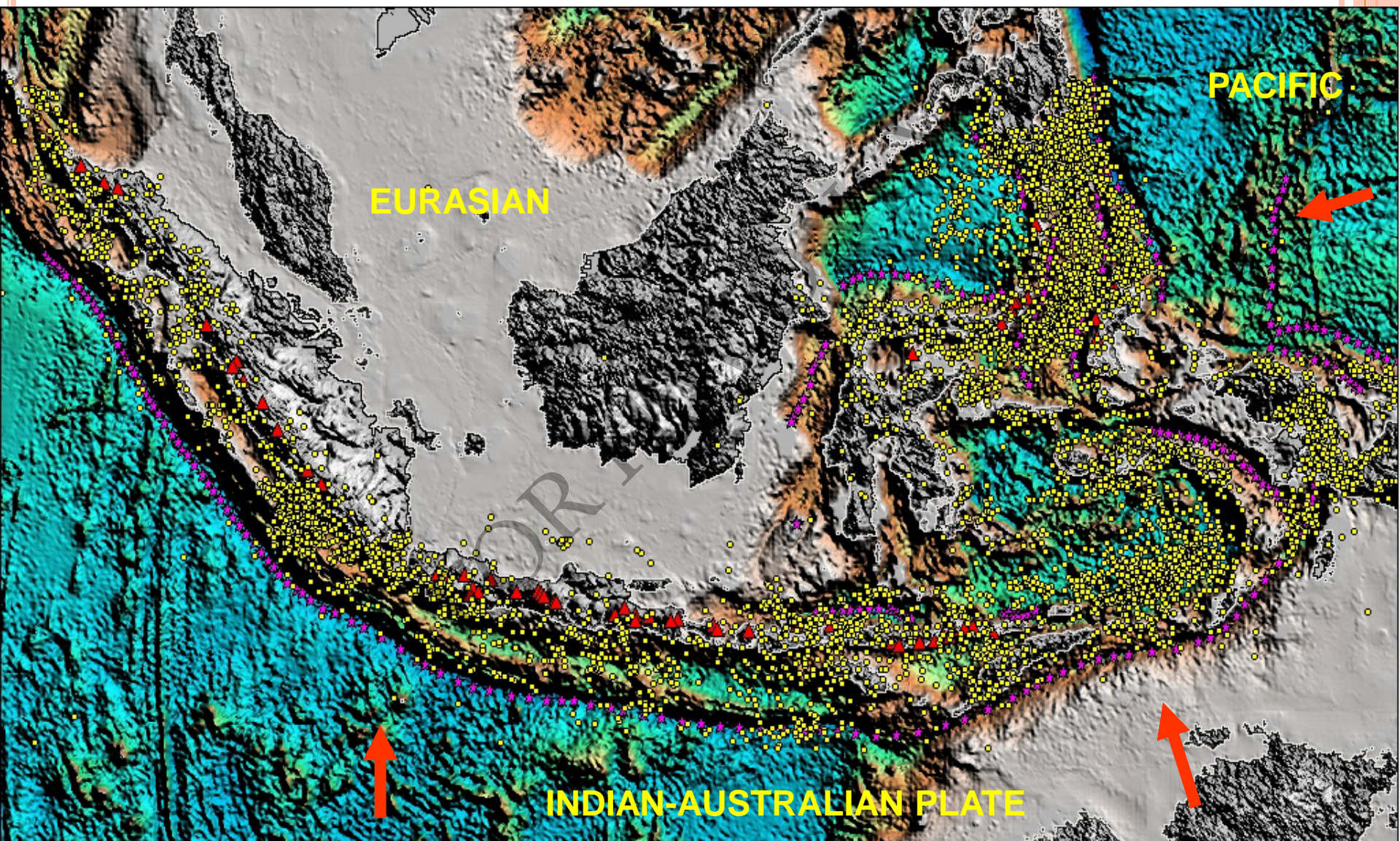
1. Prosperius Land
2. Beautiful View
3. Abundant of Precious Mineral
4. Oil and Gas Deposits

## **Negative Consequences :**

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

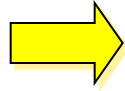


# INTERACTION OF TRIPLE JUNCTION PLATE





# **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											
<b>TOTAL</b>	<b>125</b>	<b>582</b>	<b>224</b>	<b>2025</b>	<b>463</b>	<b>1014</b>	<b>21</b>	<b>5</b>	<b>7</b>	<b>3061</b>	<b>20</b>

## 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							
<b>TOTAL</b>	<b>87</b>	<b>91</b>	<b>77</b>	<b>544</b>	<b>234</b>	<b>996</b>	<b>30</b>	<b>11</b>	<b>29</b>	<b>690</b>	<b>100</b>

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# LANDSLIDE HAZARD MITIGATION

▪ Quick  
Response

▪ Socialization

▪ Landslide  
Early  
Warning  
System

▪ Landslide  
Monitoring

▪ Landslide Hazard  
Susceptibility  
Mapping





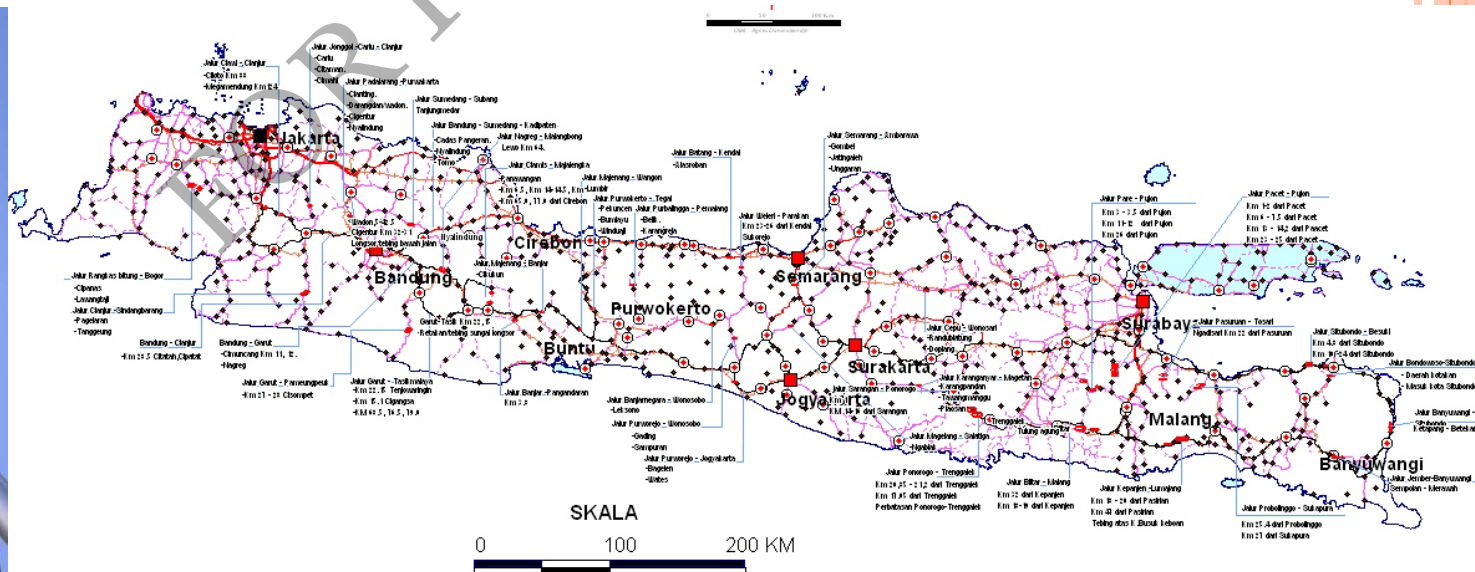




# LANDSLIDE MONITORING

- 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

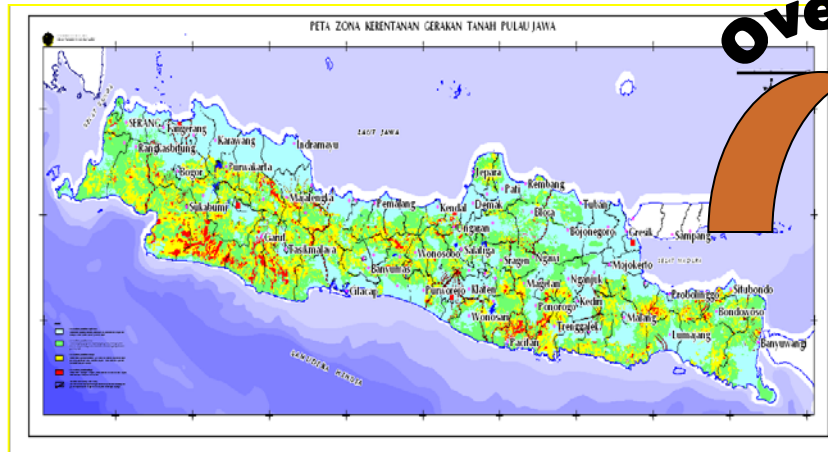
example: New road at Ciloto and slope stabilizaton at Citatah, West Java is recommendation from CVGHM



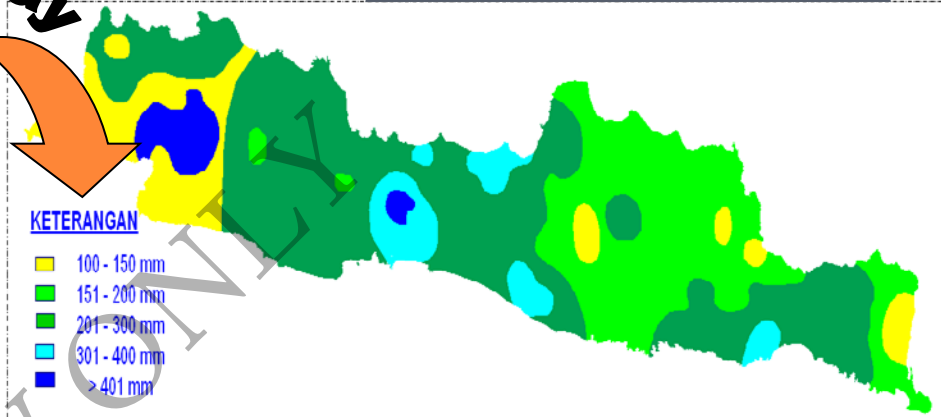


# Landslide early warning system

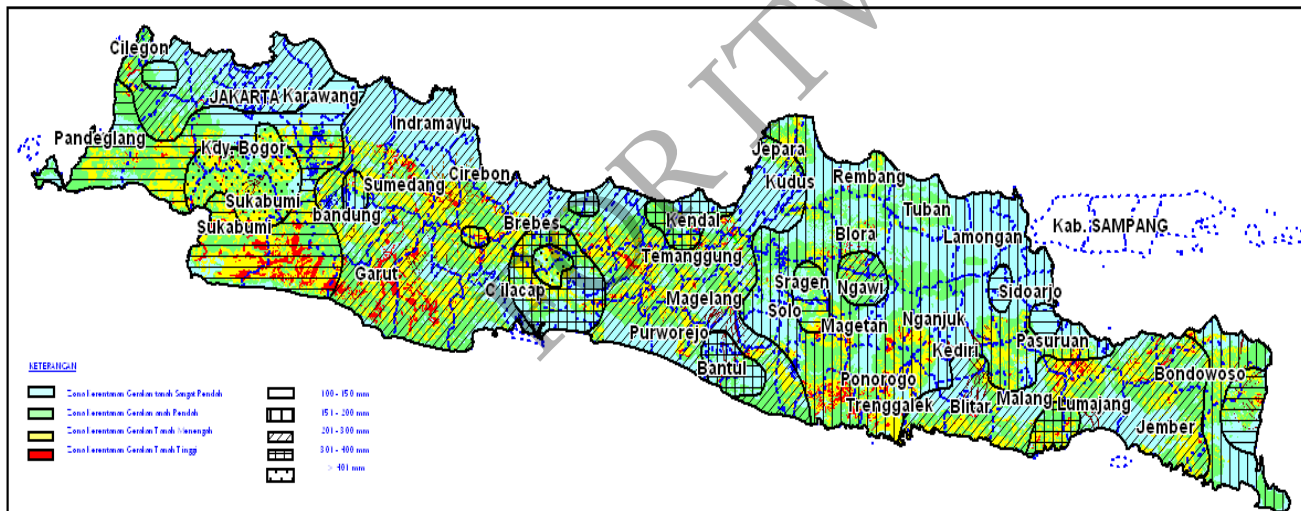
Rainfall estimation map



Overlay



Landslide Susceptibility map



Overlay result

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) .



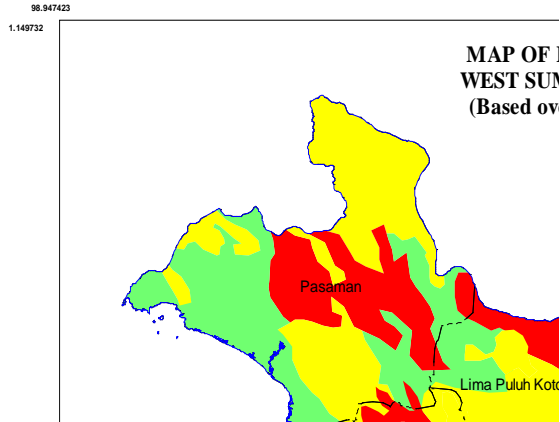
## Output :

- 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.



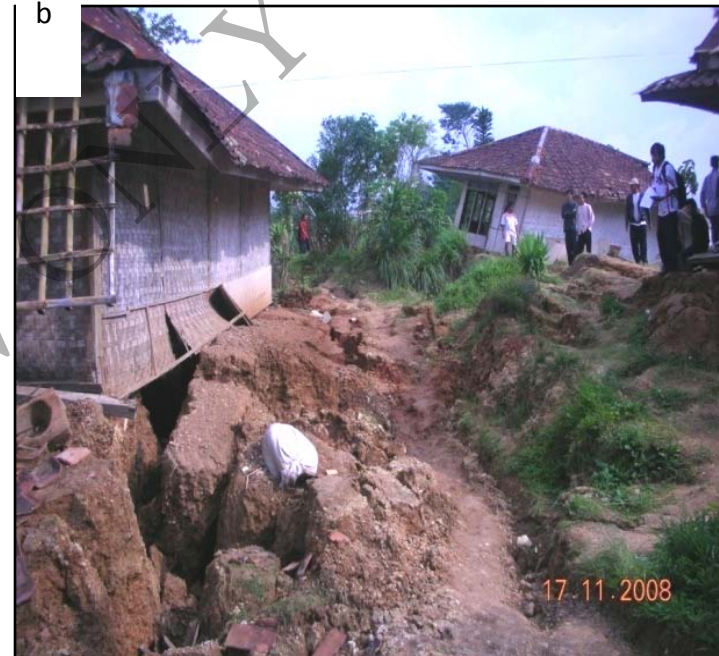


## Sending Quick Respond Team

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 .



a



b

**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.





A photograph showing a large landslide of brown earth and debris that has partially buried several traditional houses in a village. The houses have white walls and dark tiled roofs. In the background, a dense forest of tall, thin trees covers a hillside. The scene is one of significant natural disaster damage.

**THANK YOU  
TERIMA KASIH**