SLOPE INSTABILITY ZONING MAPPING OF LANDSLIDE HAZARDOUS AREA FOR THE STABILIZATION SYSTEM (3991)

by

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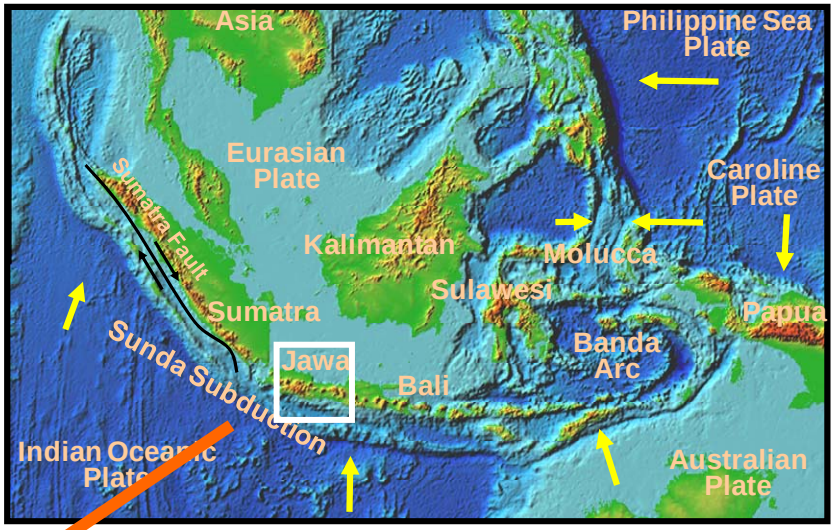
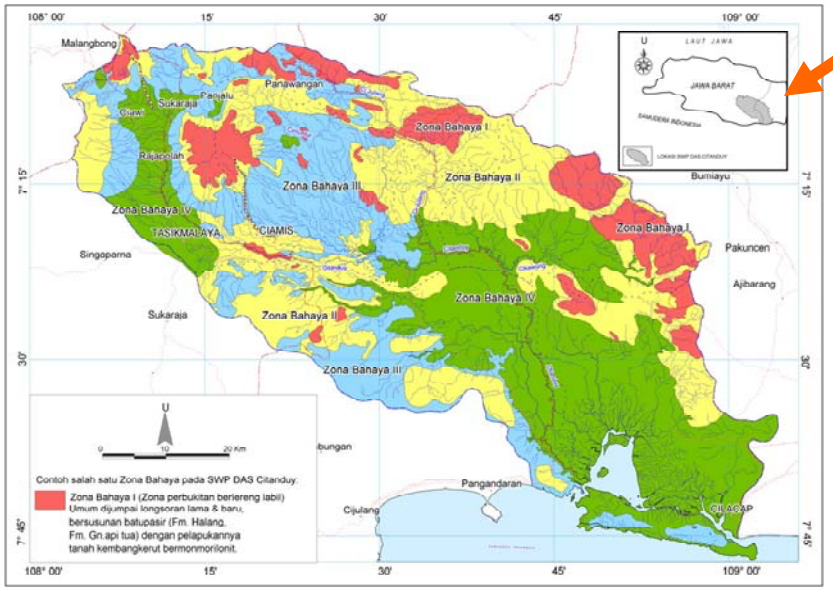
Indonesia as an active tectonic region



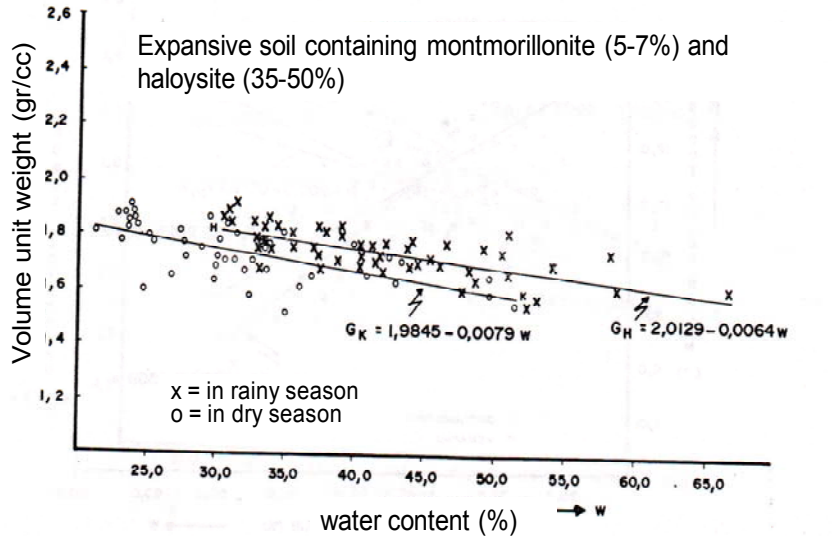
The complex tectonic plates convergence

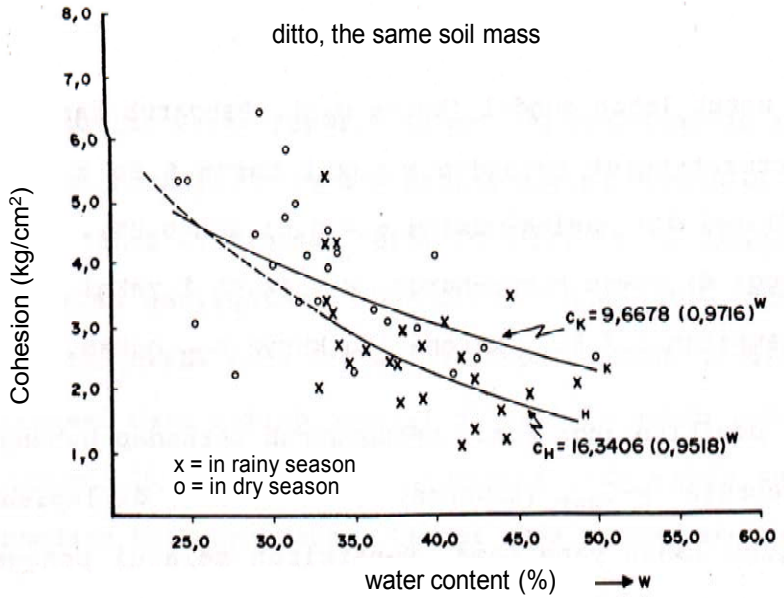
TECTONIC MAP OF INDONESIA AND THE PHILIPPINES



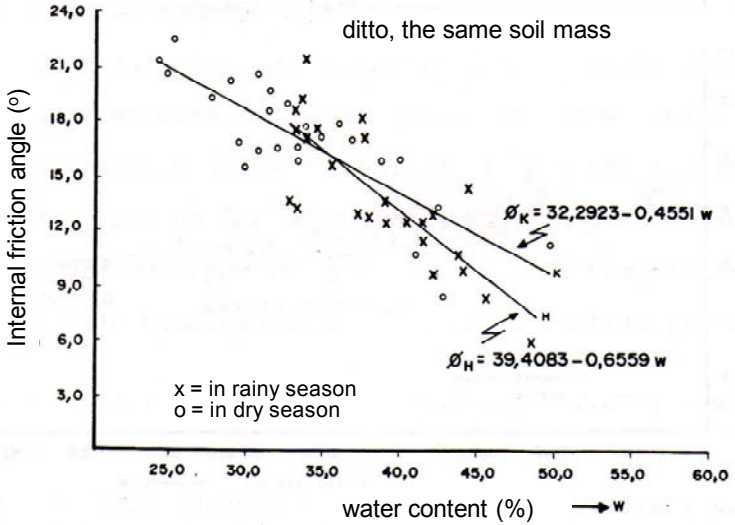
Gambar 1. Contoh pemetaan Zonasi tingkat kestabilan lereng di SWP DAS Citanduy.

Water content – volume unit weight relationship





Water content – internal friction angle relationship



Slope stability affected by vegetation

		Safety factor Fs							
		Dry Season				Rainy season			
LA	vs LO	1,484	1,452	3,664**	2,23	1,204	1,168	16,499**	3,00
LP	vs LO	1,523	1,452	5,334**	4,94	1,219	1,168	21,687**	4,31
LAP	vs LO	1,554	1,452	7,710**	7,07	1,255	1,168	20,386**	7,28
LA-P-	vs LO	1,552	1,452	7,553**	6,89	1,254	1,168	20,833**	7,36
LA-P+	vs LO	1,561	1,452	8,365**	7,51	1,261	1,168	22,807**	7,96

NOTE :

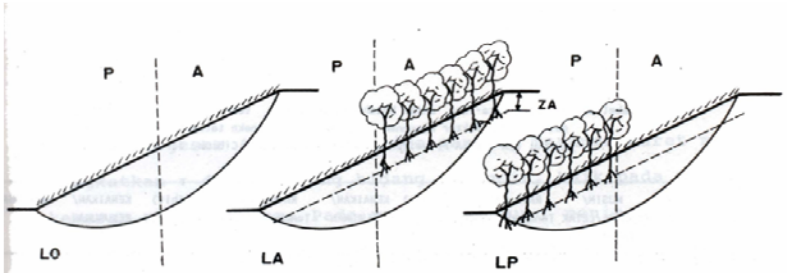
**) significant at α = 0.01

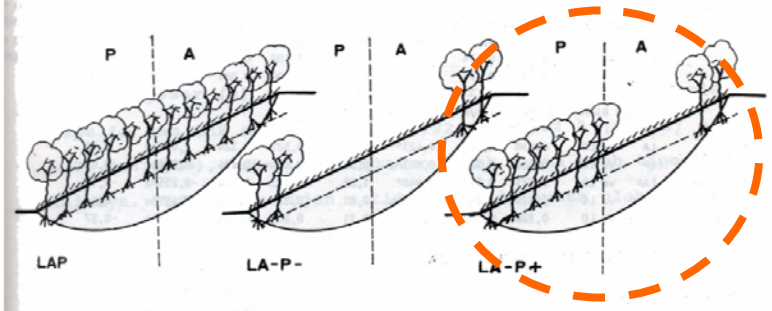
LA-P+ is the most effective position of vegetation which raises largest Fs in both dry- and rainy seasons

Earth-quake coeff.	Angle of slope (°)	Vege-tation	Depth of slip sur-face (m)	Length of slip sur-face (m)	Shear strength (Ton)	Shear force (Ton)	Safety factor/stability
0.00	14.26	No	47.00	450.224	1.387	1.334	1.039/unstable
0.05	14.26	No	27.50	443.006	1.216	1.071	1.136/critical
0.05	14.26	Yes	27.50	443.047	1.216	1.069	1.139/critical
0.10	14.26	No	19.50	439.743	1.079	0.922	1.171/critical
0.00	12.26	No	47.00	452.917	1.379	1.247	1.106/critical
0.05	12.26	Yes	27.50	444.411	1.195	0.978	1.222/critical
0.05	12.26	Yes*)	27.50	444.403	1.197	0.978	1.224/critical
0.10	12.26	Yes	19.50	440.663	1.052	0.824	1.276/stable
0.05	11.26	Yes*)	27.50	445.042	1.184	0.932	1.271/stable
0.10	11.26	Yes*)	19.50	441.051	1.039	0.777	1.338/stable
0.05	10.26	Yes	27.50	445.661	1.168	0.886	1.319/stable
0.10	10.26	Yes	19.50	441.429	1.020	0.729	1.399/stable

*) double vegetation density

Result of simulation of the effects of α_{hor}, i, and W_{veg} on FS





A = Zona aktif
P = Zona pasif
ZA = Kedalaman zona akar

Letak tanaman di permukaan lereng :

LO = Gundul (tanpa tanaman)
LA = Bagian atas
LP = Bagian bawah
LAP = Seluruh permukaan
LA-P- = Ujung atas dengan ujung bawah baji

NO.	MUSIM/ PENCIRI/LETAK TANAMAN +)	RATA-RATA Tanaman	RATA-RATA Gundul	t(hit)	KENAIKAN/ PENURUNAN (%)	RATA-RATA Tanaman	RATA-RATA Gundul	t(hit)	KENAIKAN/ PENURUNAN (%)	KETERANGAN
		KEMARAU				HUJAN				
1.	τ PADA BIDANG GELINCIR (Ton/m²)									DK = 14
	LA vs LO	0,490	0,474	12,583**	3,38	0,395	0,381	13,676**	3,67	t(0,05) =
	LP vs LO	0,500	0,474	4,012**	5,49	0,397	0,381	10,806**	4,20	2,145
	LAP vs LO	0,514	0,474	5,813**	8,49	0,408	0,381	11,457**	7,09	t(0,01) =
	LA-P- vs LO	0,510	0,474	5,531**	7,59	0,408	0,381	20,741**	7,09	2,977
	LA-P+ vs LO	0,512	0,474	5,888**	8,02	0,408	0,381	21,575**	7,09	
2.	s PADA BIDANG GELINCIR (Ton/m²)									
	LA vs LO	0,330	0,327	4,423**	0,92	0,327	0,324	2,002ns	0,95	
	LP vs LO	0,328	0,327	0,893ns	0,31	0,324	0,324	-0,200ns	-0,06	
	LAP vs LO	0,331	0,327	2,948*	1,22	0,323	0,324	-0,235ns	-0,17	
	LA-P- vs LO	0,329	0,327	1,508ns	0,61	0,324	0,324	0,479ns	0,14	
	LA-P+ vs LO	0,328	0,327	1,040ns	0,31	0,323	0,324	-1,046ns	-0,37	
3.	PANJANG BIDANG GELINCIR (L-glc, m)									
	LA vs LO	92,202	92,222	-0,767ns	-0,02	86,907	86,884	1,215ns	-0,03	
	LP vs LO	92,161	92,222	-1,417ns	-0,06	86,820	86,884	-1,892ns	-0,07	
	LAP vs LO	92,106	92,222	-2,236*	-0,13	86,822	86,884	-3,440**	-0,07	
	LA-P- vs LO	92,099	92,222	-2,906*	-0,13	86,878	86,884	-4,040**	-0,01	
	LA-P+ vs LO	92,124	92,222	-1,895ns	-0,11	86,891	86,884	0,167ns	-0,01	
4.	FAKTOR KEAMANAN LERENG (FS)									
	LA vs LO	1,484	1,452	3,664**	2,23	1,204	1,168	16,499**	3,00	
	LP vs LO	1,523	1,452	5,334**	4,94	1,219	1,168	21,687**	4,31	
	LAP vs LO	1,554	1,452	7,710**	7,07	1,255	1,168	20,386**	7,28	
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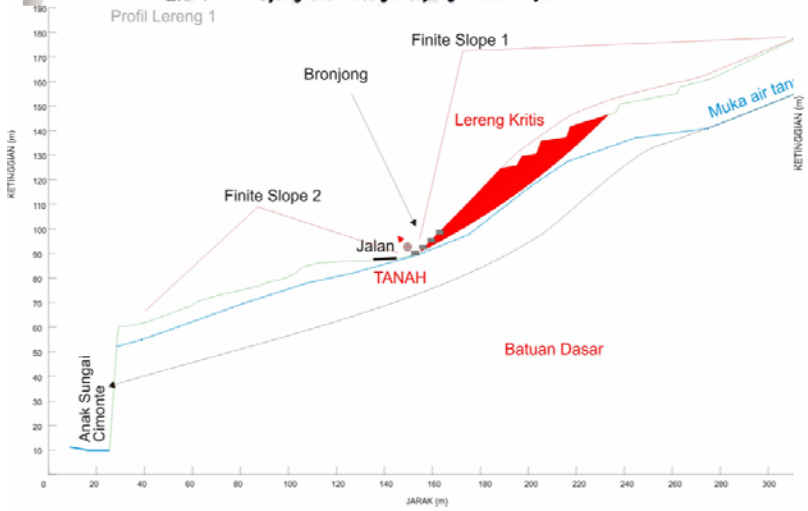

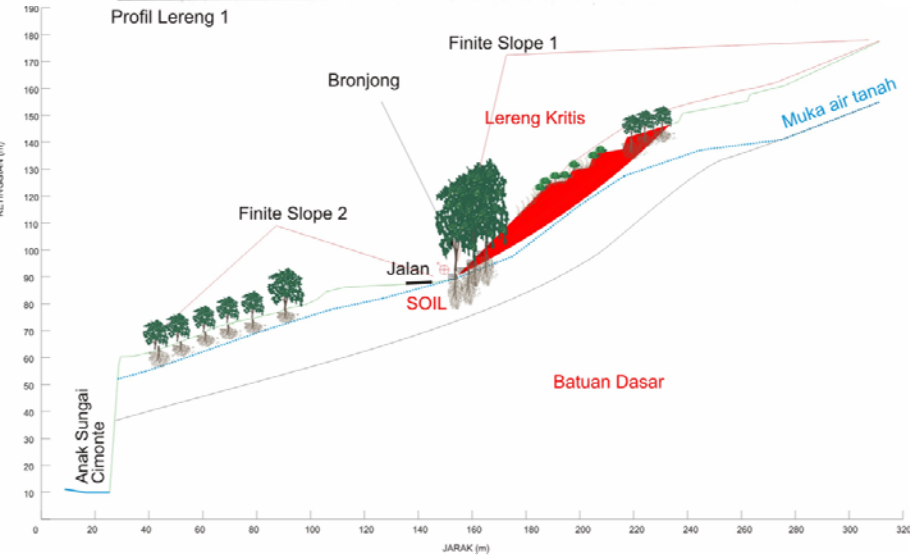

Discussion & Conclusion

- Effect of rain water on soils and slope stability : soil strength deceases with increasing soil water content → slope safety factor (F) decreases with increasing soil water content (w)
- Effect of vegetation on slope stability : slope safety factor (F) increases with both increasing weight of biomass on slope toe and decreasing biomass of slope summit
- Effect of eathquake loading on slope stability : slope safety factor (F) decreases with increasing earthquake coefficient (α_{hor})
- Simulation to stabilize critical slope stability → conducted to stabilize slopes at earthquake loading condition at max α_{hor} and densest rainy season using slope geometry modification and vegetation planted at maximal weight on toe part of slope and minimal weight on summit of slope to achieve F ≥ 1,25 (Long Term Deep Seated Stability) and F = 1 (Seismic or Pseudo-static Stability) as the design criteria.

THANK YOU VERY MUCH