Utilization of Sentinel-1 for Landslide Hazard Zoning on Agricultural Land Cover in Sumedang Regency

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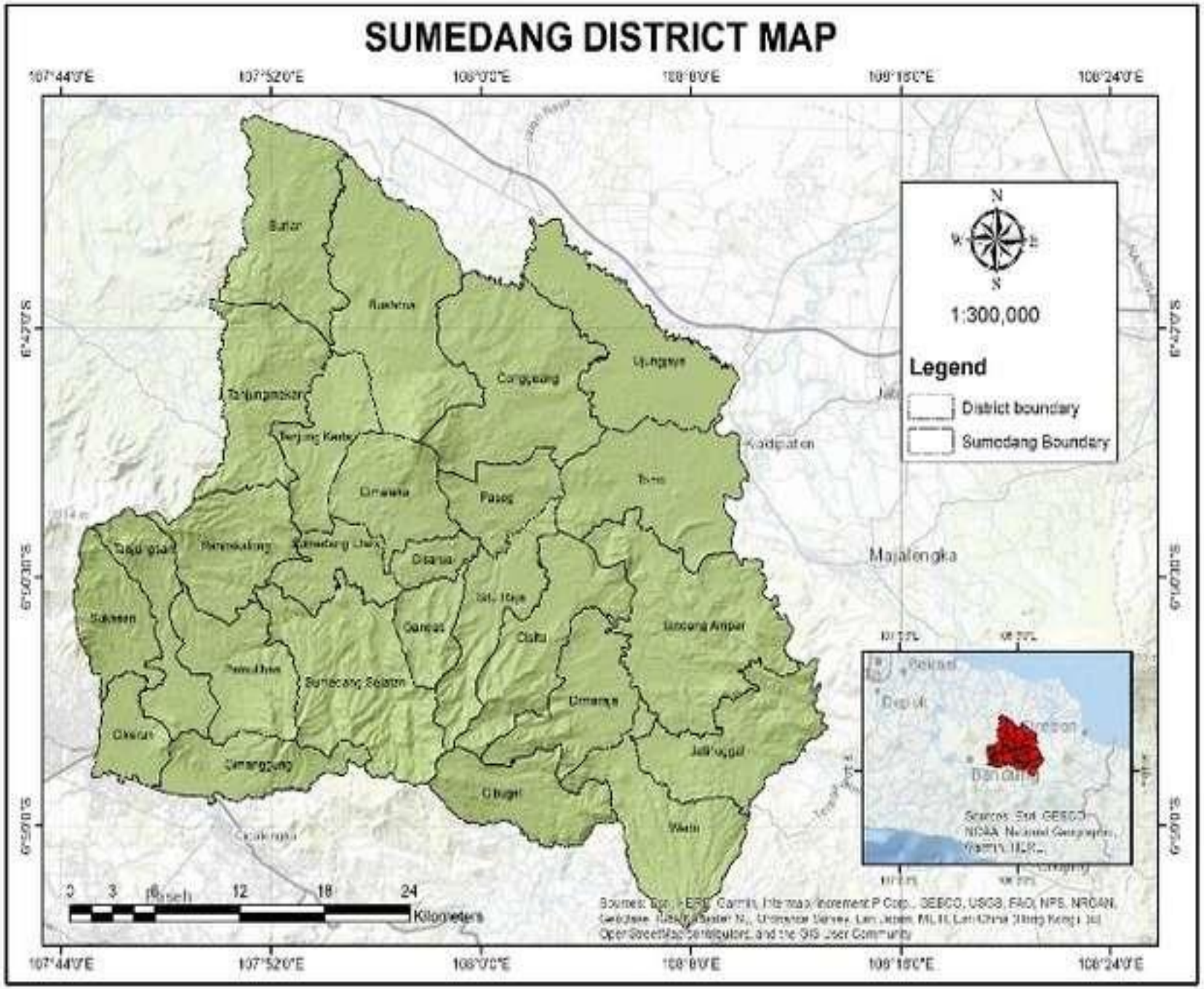
Introductory

- Sentinel-1 product is good enough to be used in landslide studies in mountainous areas with slope parameters.
- Landslide hazard can be mapped using GIS technology with empirical supporting parameters.
- Landslides can be a disaster if there are affected assets, one of which is agricultural areas, plantations and rice fields.
- The area has large material assets which are a source of food for the community, so it is very important to map.

Research Location

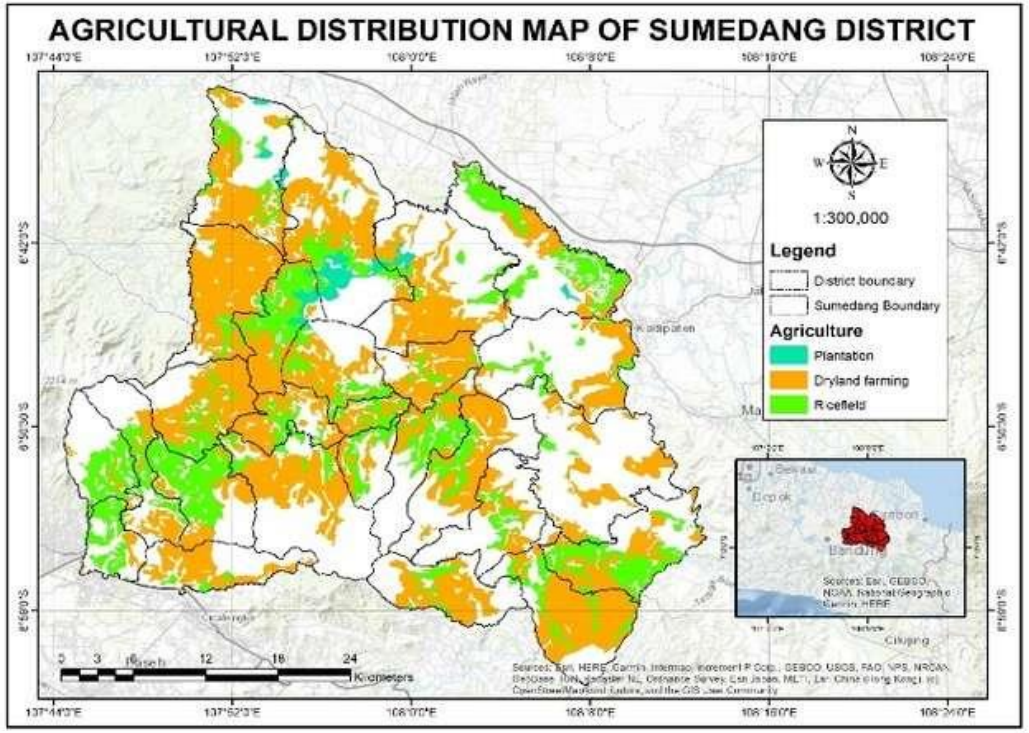


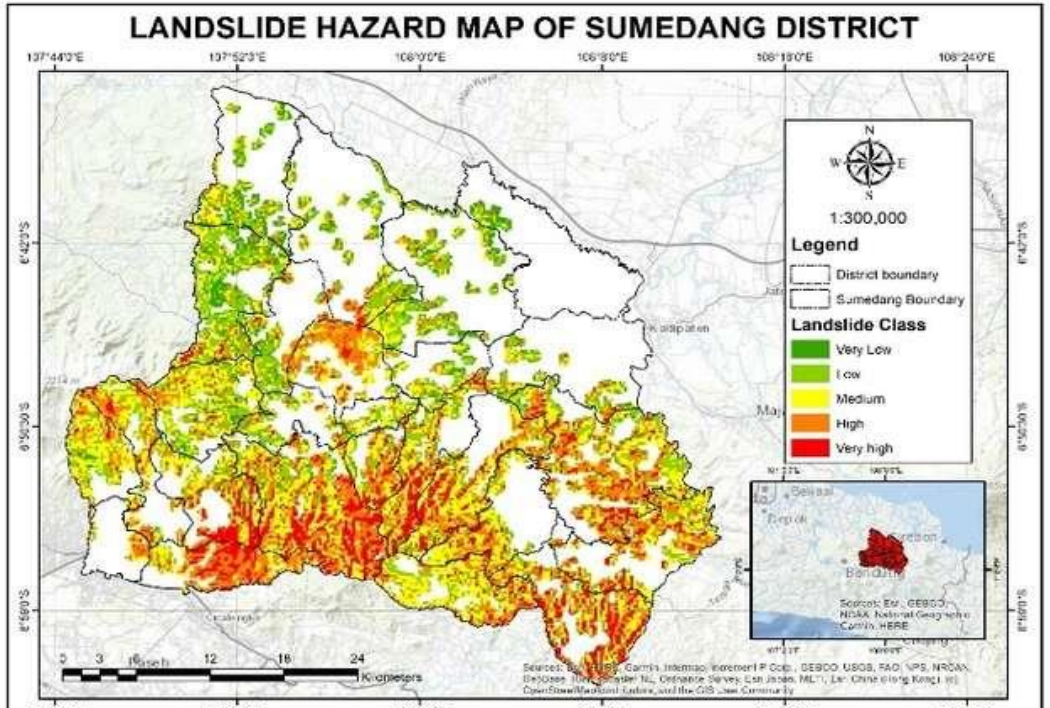
Method

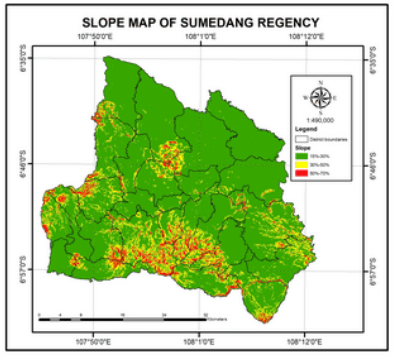
- The landslide hazard zoning model refers to the Indonesian Disaster Risk book from BNPB. The weighting and scoring are taken from the model developed by BNPB, but there are modifications to the soil part, namely there is no soil solum, so that in this study the values for the soil solum are replaced with the Topographic Wetness Index values

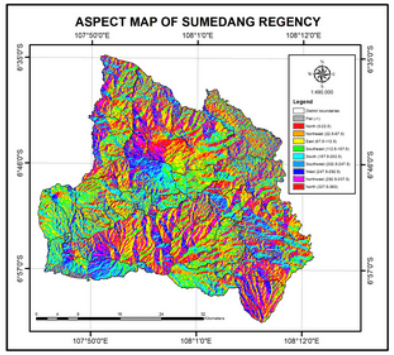
No	Data	Parameter	Classification	Class Value	Score	Weight
1	Sentinel-1 / SAR	Slope	15% – 30%	1	0.250	0.3
			30% – 50%	2	0.500	
			50% - 70%	3	0.750	
		Aspect	Flat	0	0.000	0.05
			North	1	0.125	
			Northwest	2	0.250	
			West	3	0.375	
			Northeast	4	0.500	
			Southwest	5	0.625	
			East	6	0.750	
			Southeast	7	0.875	
			South	8	1.000	
		Curvature	<200 m	1	0.250	0.05
			200 – 500m	2	0.500	
			500 – 1000m	3	0.750	
			>1000m	4	1.000	
		Topograhic Wetnes Index	0.509 – 6.122	1	0.250	0.05
			6.122 – 9.981	2	0.500	
			9.981 – 22.874	3	0.750	
2	Geology	Rock Type	Alluvial Rock	1	0.333	0.2
			Sedimentary Rock	2	0.667	
			Volcanic Rock	3	1.000	
		Distance from the Fault	>400	1	0.200	0.05
			300 – 400m	2	0.400	
			200 – 300m	3	0.600	
			100 – 200m	4	0.800	
			0 – 100m	5	1.000	
3	Soil	Soil Texture	Sand	1	0.333	0.1
			Clay – Sand	2	0.667	
			Clay	3	1.000	
4	Meteorology	Rainfall	<2000 mm	1	0.333	0.2
			2000 – 3000 mm	2	0.667	
			>3000 mm	3	1.000	

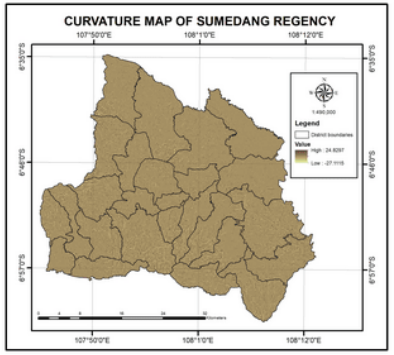
Results

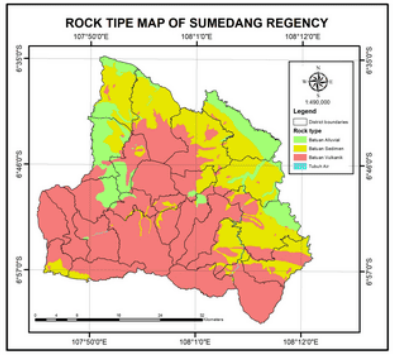

AGRICULTURAL DISTRIBUTION MAP OF SUMEDANG DISTRICT
1:300,000
Legend
District boundary
Sumedang Boundary
Agriculture
Plantation
Dryland farming
Ricefield
Kilometers

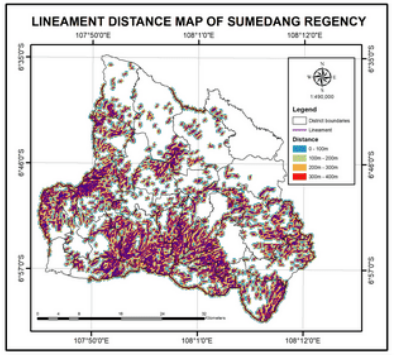

LANDSLIDE HAZARD MAP OF SUMEDANG DISTRICT
1:300,000
Legend
District boundary
Sumedang Boundary
Landslide Class
Very Low
Low
Medium
High
Very high
Kilometers

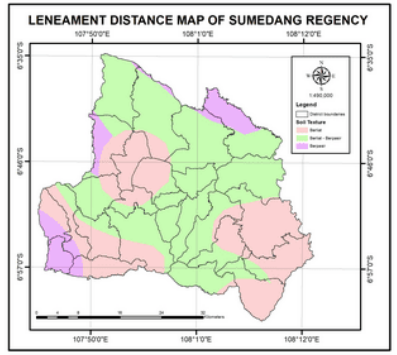

SLOPE MAP OF SUMEDANG REGENCY

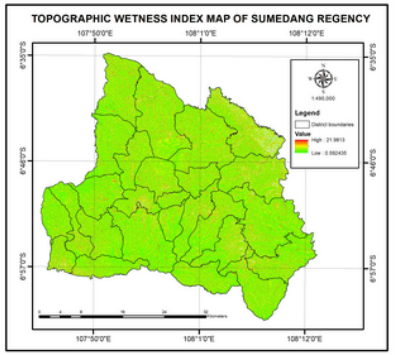

ASPECT MAP OF SUMEDANG REGENCY

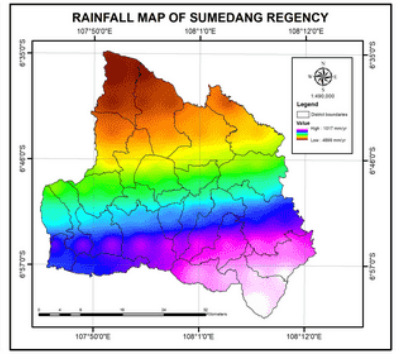

CURVATURE MAP OF SUMEDANG REGENCY


ROCK TIPE MAP OF SUMEDANG REGENCY


LINEAMENT DISTANCE MAP OF SUMEDANG REGENCY

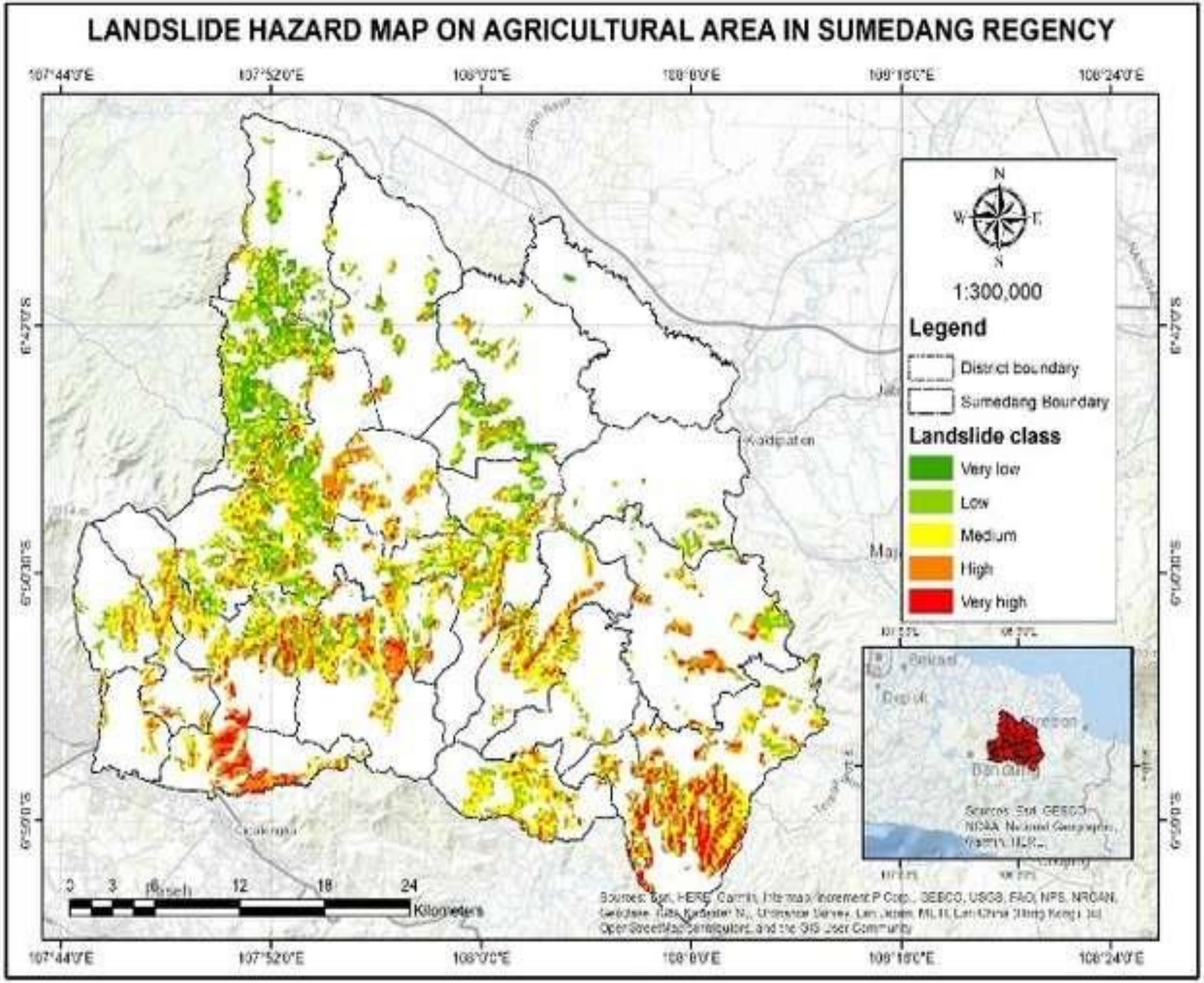

LENEAMENT DISTANCE MAP OF SUMEDANG REGENCY


TOPOGRAPHIC WETNESS INDEX MAP OF SUMEDANG REGENCY


RAINFALL MAP OF SUMEDANG REGENCY

Results

Agriculture	Classification	Area ha	Percentage	Total Percentage
Dryland farming	Very low	32063093.83	7.60%	75.75%
	Low	88976621.02	21.10%	
	Medium	103744425.51	24.60%	
	High	65932756.29	15.64%	
	Very high	28691337.37	6.80%	
Ricefield	Very low	6284947.02	1.49%	23.13%
	Low	25526360.04	6.05%	
	Medium	33660405.12	7.98%	
	High	21829507.69	5.18%	
	Very high	10249774.63	2.43%	
Plantation	Very low	708385.92	0.17%	1.12%
	Low	1613172.18	0.38%	
	Medium	1092661.39	0.26%	
	High	1119632.96	0.27%	
	Very high	191469.63	0.05%	
Total		421684550.60	100%	100%



CONCLUSION

- Landslide areas in Sumedang Regency tend to spread in the Southern Region. This area is a complex of hills with steep slopes, old volcanic parent rock which is quite brittle, high rainfall, clay soil texture, and the largest area of lineaments. Other landslide-prone areas are located around Mount Tampomas, whose geographical conditions are not much different from the Southern Region of Sumedang Regency. The biggest proportion of landslide hazard lies in dry land agriculture with a percentage of 75.75%, while the lowest is plantations around 1.12% and paddy fields with 23.13%. Sentinel-1 can be an alternative to landslide mapping by building a radar product into several slope parameters. The landslide locations in the high and very high classifications correspond to the slope aspect parameters built by Sentinel-1

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