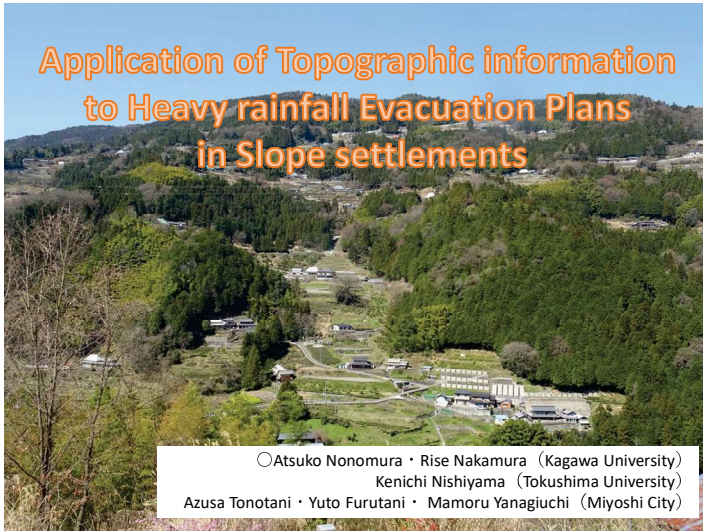


Application of Topographic information to Heavy rainfall Evacuation Plans in Slope settlements



Evacuation Planning for Sloping- Communities for Heavy Rainfall

【 General Evacuation Plan 】

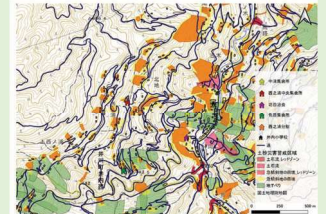
During the rainfall: Evacuate to the designated shelter or other safe buildings

Pre-disaster measurement: Check the hazard by using the hazard map

【 Evacuation Plan in slope settlements 】

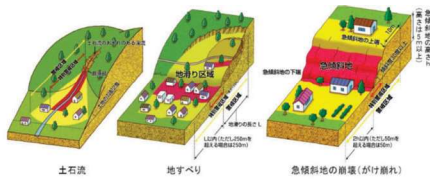
The designated shelter is located too far to evacuate safely

Map of sediment disaster hazard zone



Sediment disaster hazard zone

Sediment disaster hazard zones are designated in the vicinity of residential areas.

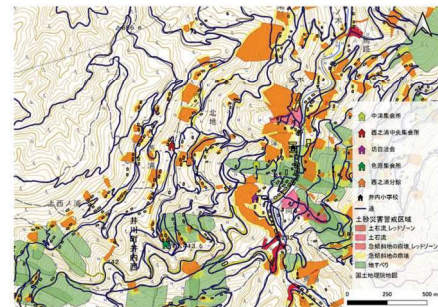


An area where it is deemed that there is a risk of **harm to the lives or bodies of residents** in the event of a sediment disaster

Especially, an area where the magnitude of the force acting on buildings due to the sediment disasters could cause serious harm to the lives or bodies of residents

<https://d-keikai.metro.tokyo.lg.jp/help/guide/hazardzone.html?lang=en>

Sediment disaster hazard map in slope settlement



- * The “designated hazard zones” are discontinuous, because houses are scattered.
- * Since the roads located far from residential areas, it has not been designated as a hazard zone despite the risk of landslides.

- Almost the entire area surrounding the houses have been designated as a danger zone

Background and the aim of this study

【Background】

- Under the lack of lead time, it is necessary to identify relatively safe evacuation sites and evacuation routes around their own house
- In slope settlements, it is difficult to find relatively safe places by using the hazard map

【Aim of this study】

To generate information from topographic data that can be used in evacuation plans for heavy rain in slope settlements.

Member of Disaster Prevention Project in Slope settlements

Residents of the living in the slope settlements



Crisis Management Division

- ✓ Government assistance
- ✓ Municipal Disaster Prevention Measures

Geoparks Promotion Division

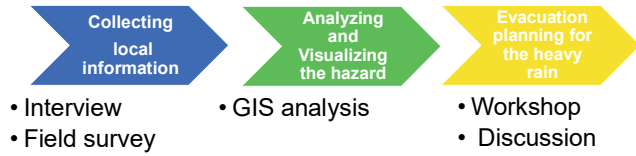
- ✓ Promote disaster preparedness in geological approach
- ✓ Geo-Education and communication

Researchers

- ✓ Data analysis and field survey
- ✓ Estimating and visualizing the hazard

Disaster Prevention activities in Sloping- Communities

Flow of this research



Collecting local information through interview

Ask several questions related to the rainfall-induced disaster

Are there any places where ground water flow during heavy rain?

Are there any places where debris flow occurred during heavy rain?

Are there any places where landslide and rock fall occurred before ?



Slope Classification for Understanding Slope Geomorphology and Disaster Propensity

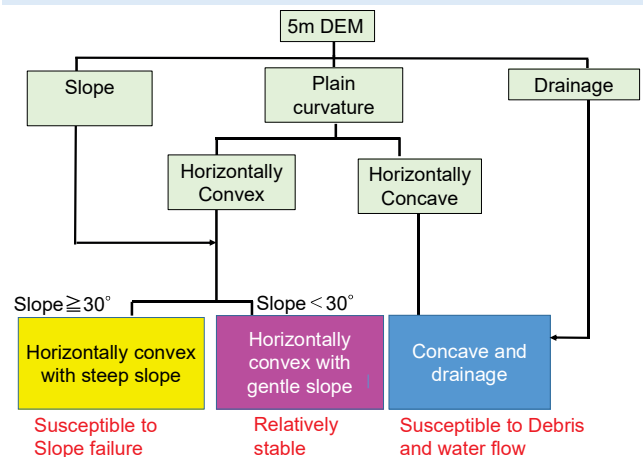
		Curvature across the slope		
		Convex	Flat	Concave
Curvature along the slope	Convex			
	Flat			
	Concave			

• **Non-drainage areas**
 • Relatively safe during heavy rain, however, **Steep slopes (Slope $\geq 30^\circ$) are susceptible to slope failure**

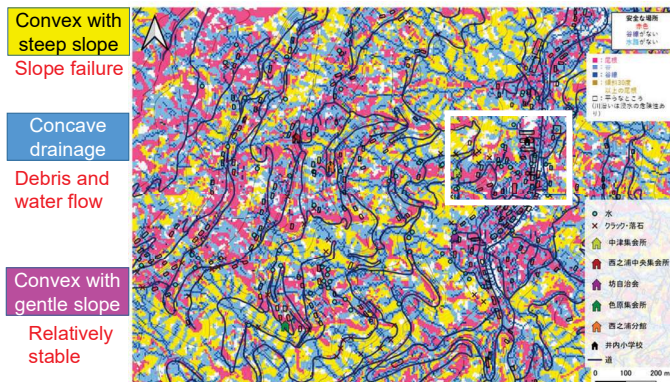
• **Drainage topography**
 • Cautious of water flow and debris flows is required

9

Slope classification by using DEM



Visualizing the topography with local historical information



Validation by field surveys with local community members

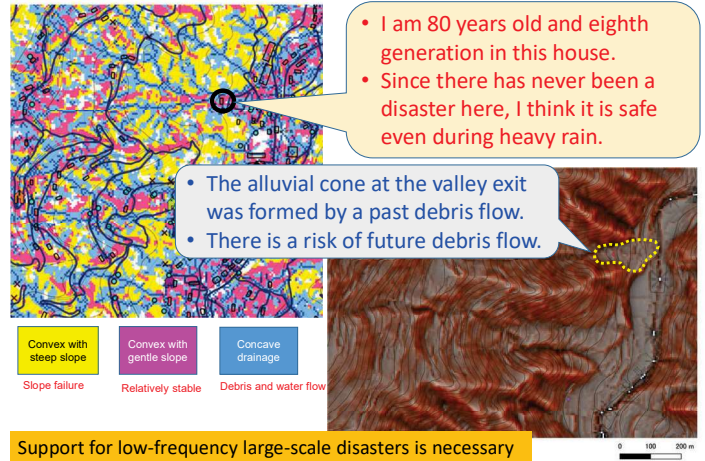


Evacuation planning by using the topographic map



- Find areas with hazardous and relatively stable terrain in their residential areas by using the map
- × Insufficient consideration of the surrounding terrain and large-scale and low frequent disasters

Can we say it is “Stable slope” ?



Conclusion

[Results]

- Propose a method for supplementing landslide hazard maps in slope settlements by utilizing topographic data
- Visualized the risks associated with high-frequency disasters

[Future Challenges]

Visualizing the risks associated with low-frequency, large-scale disasters