Attempt for Self -Seismic Evaluation and GIS Mapping

Seismic Evaluation, Geographic Information System, Community Based Disaster Mitigation

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ABSTRACT

A simple GIS composed of free (open source) software is being prepared for locating the vulnerable dwellings in maps of a scale so large that individual dwellings can be identified, the expected users of which are the practitioners of CBDM activities.

Satellite images of a high resolution or/and aero photographs are expected to be used as the base map of GIS.

A search for simple methods for self-evaluation of seismic vulnerability is also being done, the target of which is not a decision making for strengthening but awareness of dwellers for that they get interested in the vulnerability of their own dwellings and go to consult professionals.

Majority of death is caused by collapse of houses and buildings

Example: In Kobe city, about 5,500 death were counted.

Cause of death during 1995 Kobe Eq.

3.9%

12.8%

83.3%

- ☐ Collapse of houses
- ■ Burnd to death
- ☐ Others
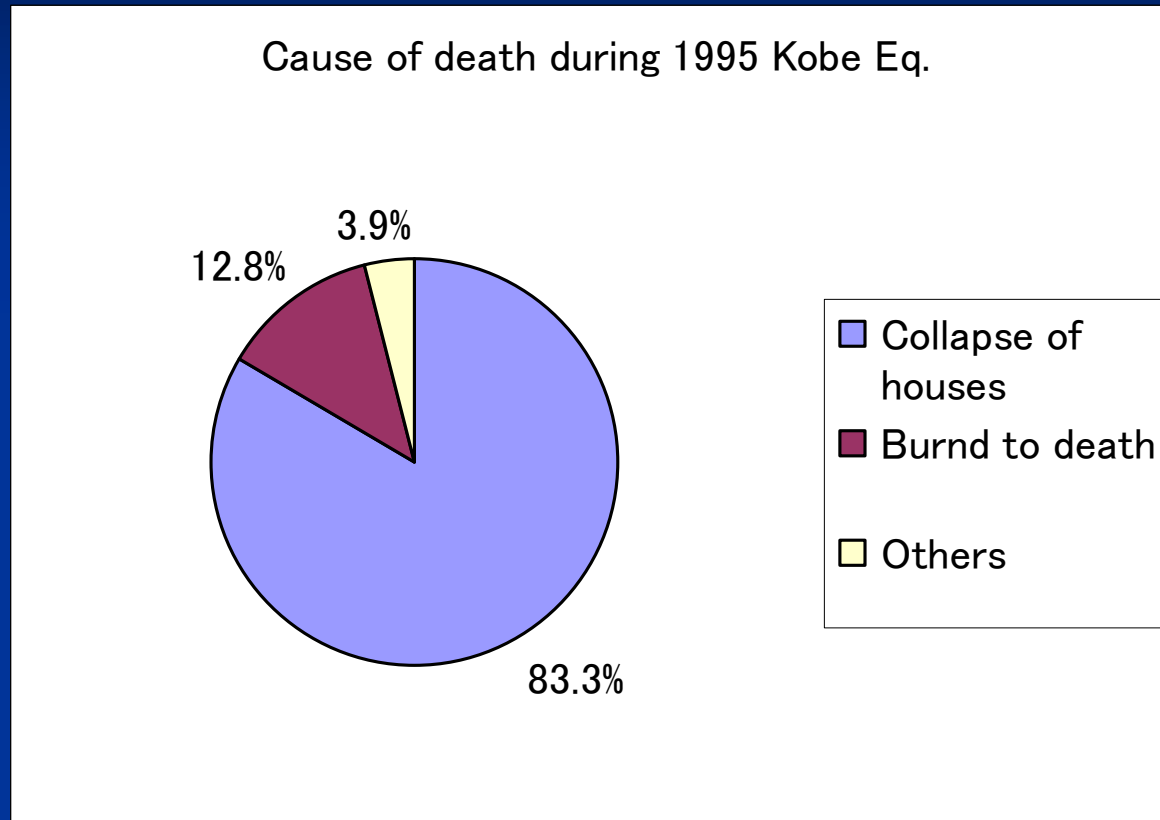
"Burned to death" includes those who were trapped in collapsed houses and burned. Autopsy has shown that 90% of victims were died within 15min. from Eq. occurrence.

Evaluation Based on Typology: EMS-98

Class B					
Damage L.	1	2	3	4	5
Intensity					
V	Few				
VI	Many	Few			
VII		Many	Few		
VIII			Many	Few	
IX				Many	Few
X					Many
XI					Most
XII					

Class C					
Damage L.	1	2	3	4	5
Intensity					
V					
VI	Few				
VII		Few			
VIII		Many	Few		
IX			Many	Few	
X				Many	Few
XI					Many
XII					Most

	Type of Structure	Vulnerability Class A B C D E F
MASONRY	rubble stone, fieldstone	
	adobe (earth brick)	
	simple stone	
	massive stone	
	unreinforced, with manufactured stone units	
	unreinforced, with RC floors	
	reinforced or confined	
REINFORCED CONCRETE (RC)	frame without earthquake-resistant design (ERD)	
	frame with moderate level of ERD	
	frame with high level of ERD	
	walls without ERD	
	walls with moderate level of ERD	
	walls with high level of ERD	
STEEL	steel structures	
WOOD	timber structures	

○ most likely vulnerability class; — probable range;
····· range of less probable, exceptional cases

Correspondence of the typologies to the vulnerability classes (left) and that of the intensity to the vulnerability classes (above) (Grunthal, 1998)

Evaluation Based on Typology: GESI

GESI programmed on MicroSoft Excel Sheet (by Dr. T. Saito, BRI)

Evaluation within a Type: Speculation
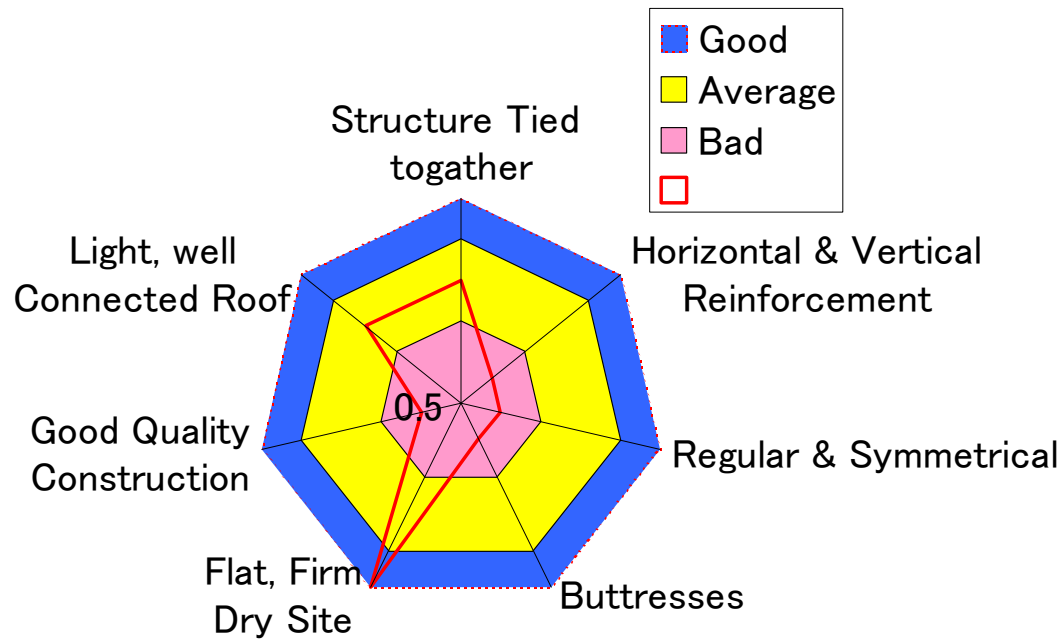
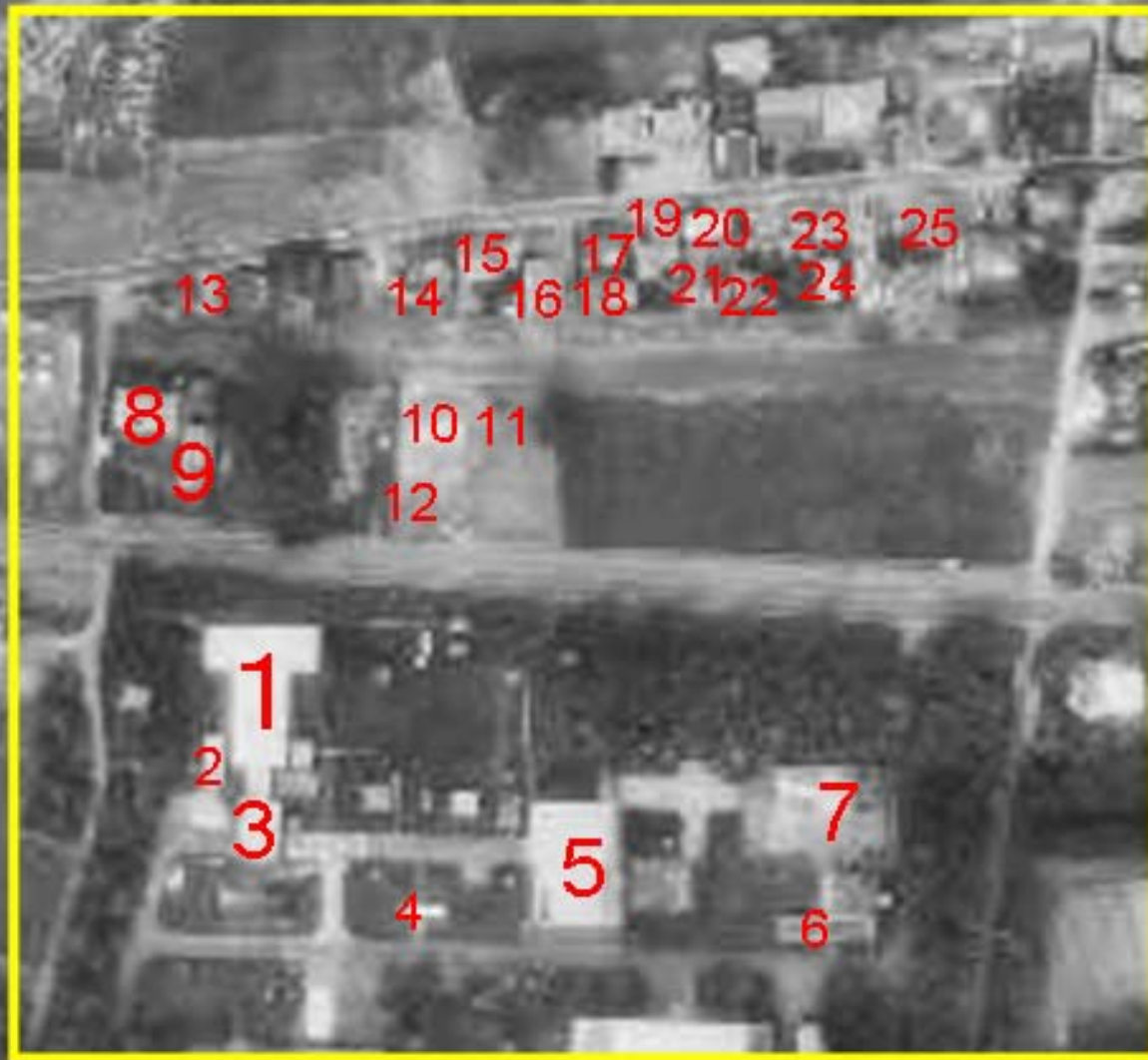**An image of expression in a radar chart. The items are after Blondet et al.(2003).**

Loading a Base Map to QGIS
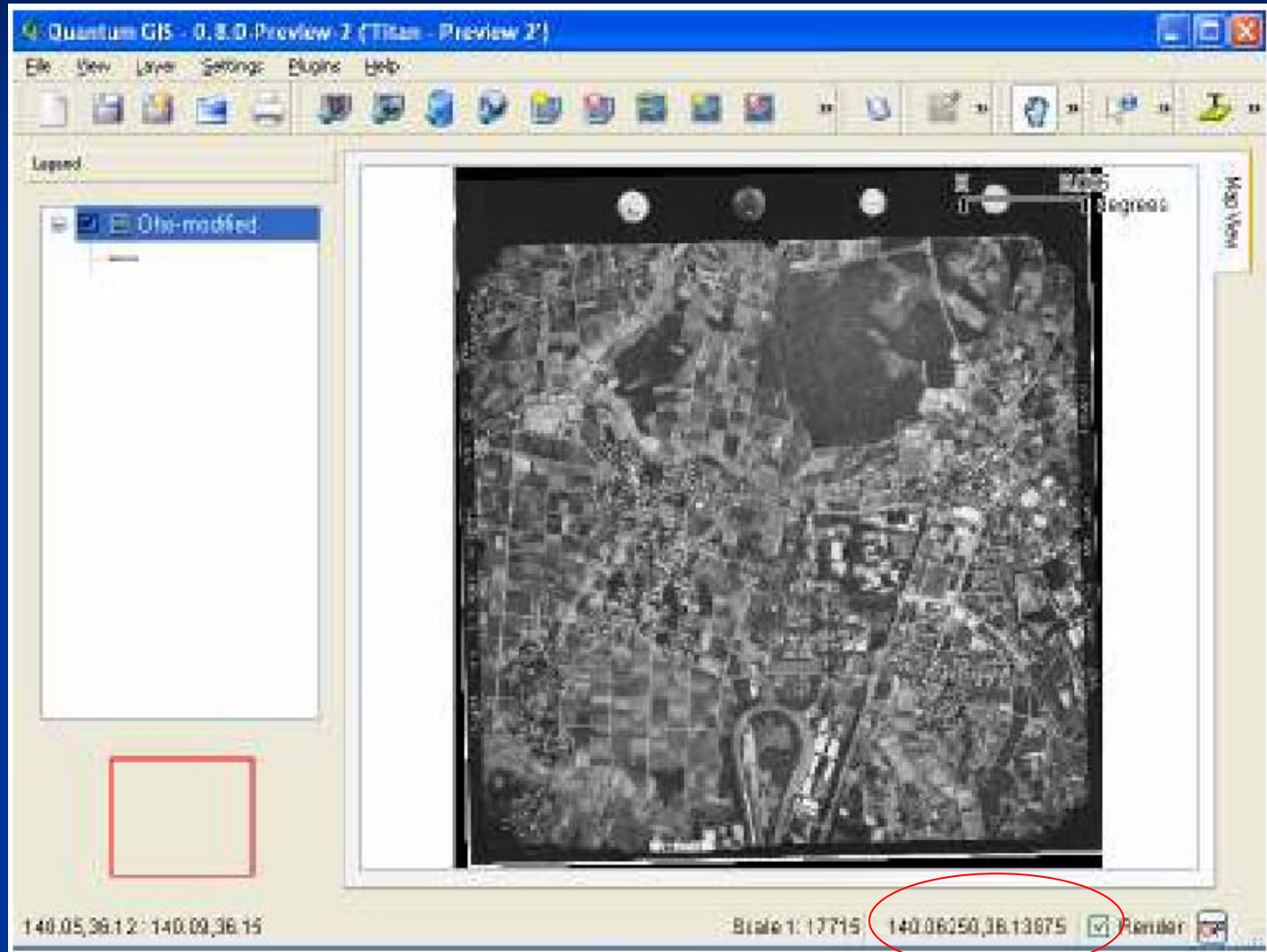
Overlaying a Raster Layer
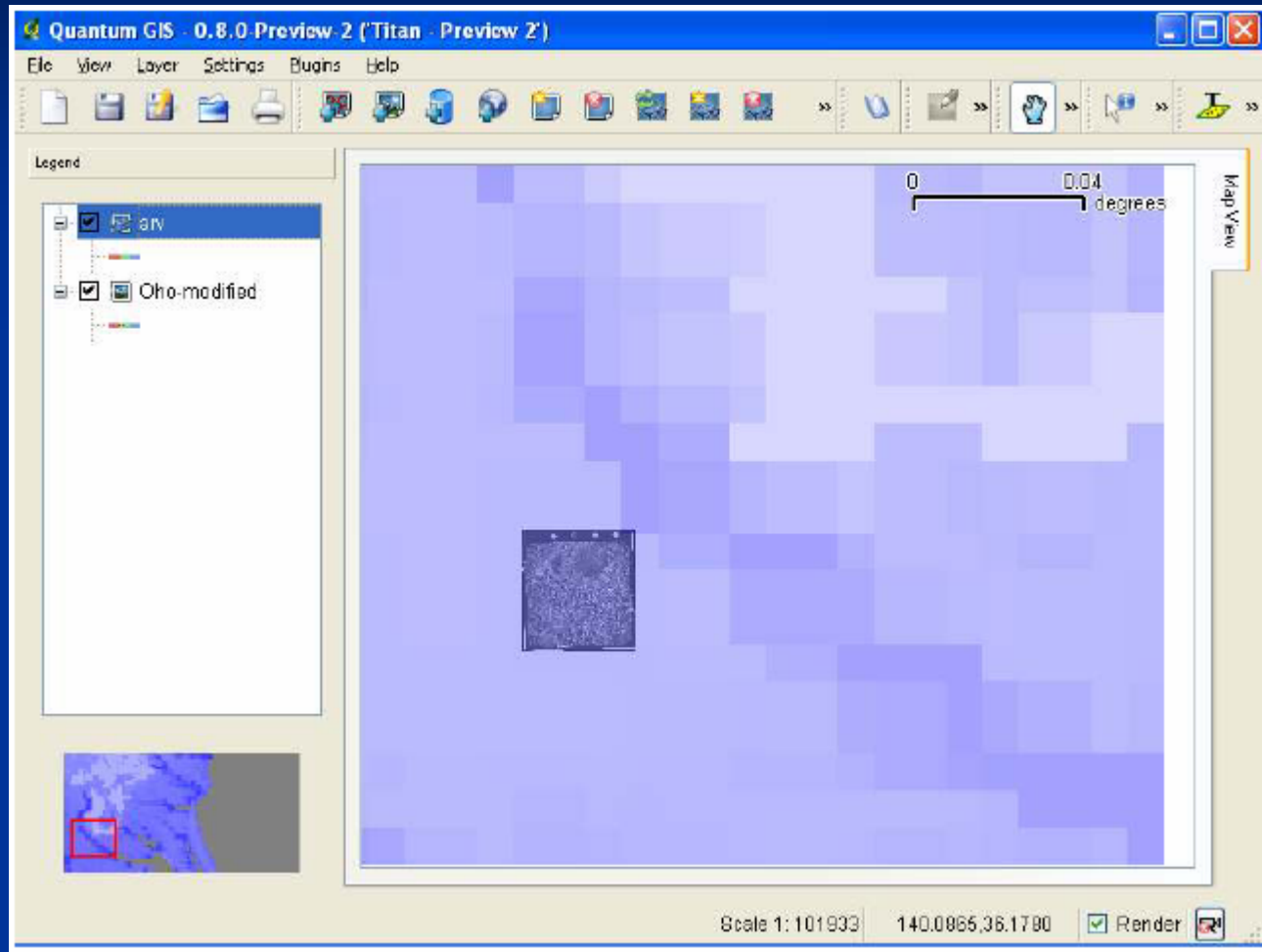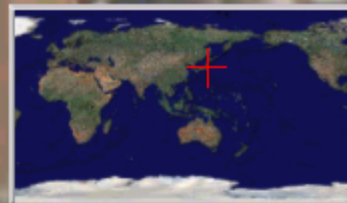

Factor of Amplification due to surface geology

Aero photograph (GSI, Japan), in jpg format

Satellite Image (Google Earth)

ter 36°08'04.08" N 140°04'29.07" E   elev 111 ft   Streaming |||||||||| 100%   Eye alt   1203

Classifying Layer

Geo-referencing
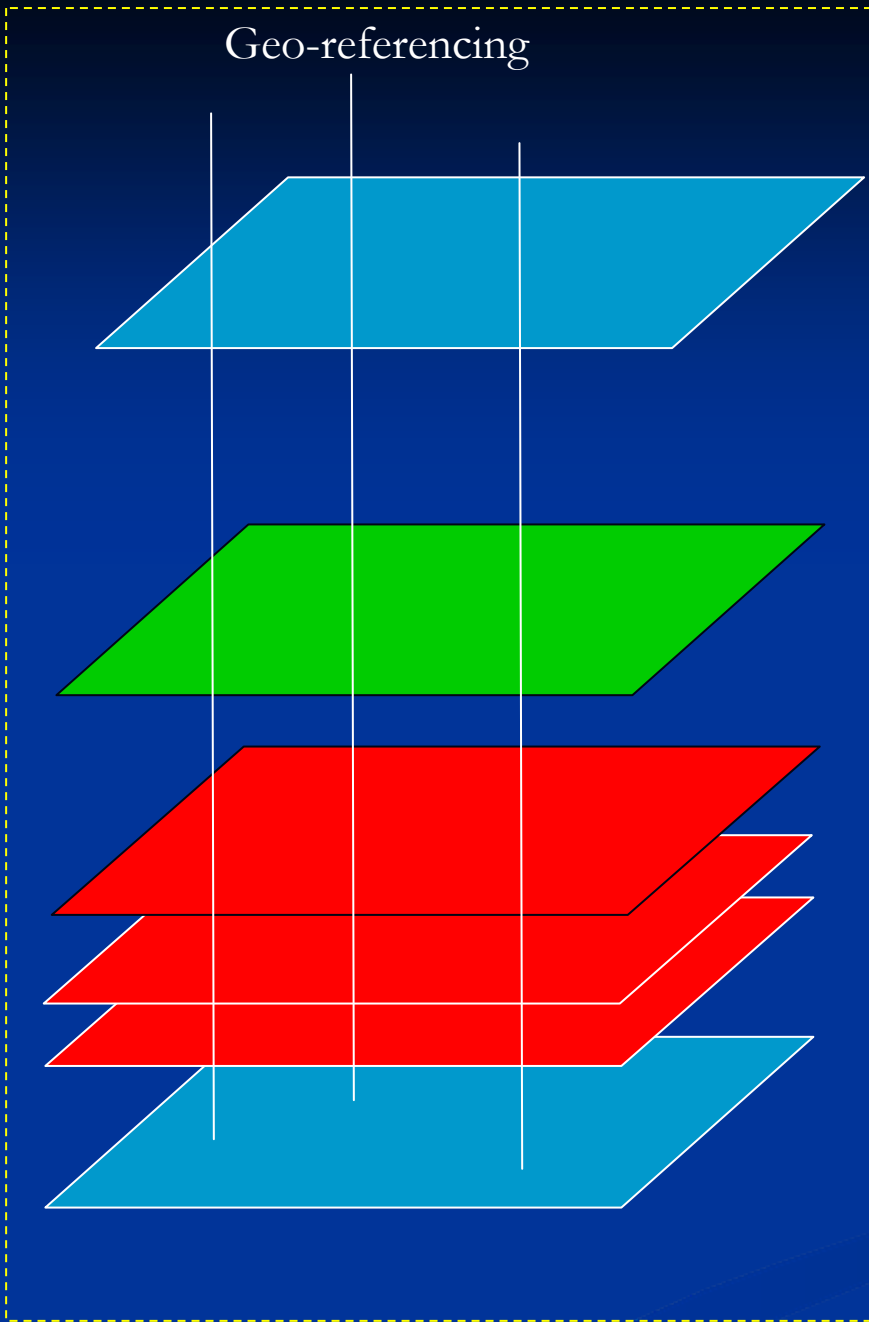
Risk Map for Dwellings

Vulnerability Map for Dwellings

Hazard Map: PGA at the surface
  (Output from RADIUS, etc.)
Amplification Factor
  due to Surface Geology, etc.
Hazard Map: PGA at the bedrock
  (GSHAP etc.)

Base Map: Satellite image, Aero
  photograph etc.

CONCLUSIONS

As this attempt was started in this JFY, we do not have anything completed, yet. Only selecting and checking the functionality of free (Open Source) GIS-Database engines have been done.

For simplicity and flexibility:
> GIS engine is used only for mapping, indexing and data management.
> Database is used only for data storage and management.
> Evaluation is done as an exterior process separated from GIS-Database.

Next step is experiments using real data for small area:
> Setting evaluation method by professional engineers
> A in site workshop for self-evaluation of dwellings by dwellers
> Making risk map of dwellings

As awareness is firmly related with cultural context including construction style, a firm collaboration with the participating countries is essential, especially, for the instruction of the self-evaluation.