Disaster Risk Management And Cadastre

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Disaster

- Natural disasters and crises cause fatalities and considerable economic losses worldwide every year.
- Floods, landslide, forest fires, earthquakes, tsunamis and droughts have a significant impact on society, the environment, the economy and the well-being of the population.

Disaster

In 2014, 245 million people were affected worldwide by natural disasters, with a death toll of 7700 and overall losses (including insured and economic losses) totaled $110 billion.

Number of events	980
Overall losses in US$ m (original values)	110,000
Insured losses in US$ m (original values)	31,000
Fatalities	7,700

Disaster and Risk Assessment

- The disaster contents set of concepts such as hazards, element at risk, vulnerability and risk information.
- The meaning of core concept of disaster is "intersection of hazard and vulnerability" which is sometime described as "element at risk"

- **Risk** is a function of the probability of a hazardous event and its results with natural hazard defined as the probability of occurrence of a potentially damaging phenomenon within a specified period of time, within a given area and magnitude, consequence meaning the (potential) outcomes arising from the occurrence of a natural phenomenon and the elements at risk referring to people, houses, etc.

Disaster and Risk Assessment

- Risk assessment defines that planning preventions and studies before hazards and risks being disaster.
- In risk assessment studies;
  - hazards and risks are determined,
  - risk scenarios are prepared,
  - prevention and mitigation measures are selected,
  - results are presented as current maps and graphics,
  - decision of the most suitable options and priorities about disaster prevention and response are implemented

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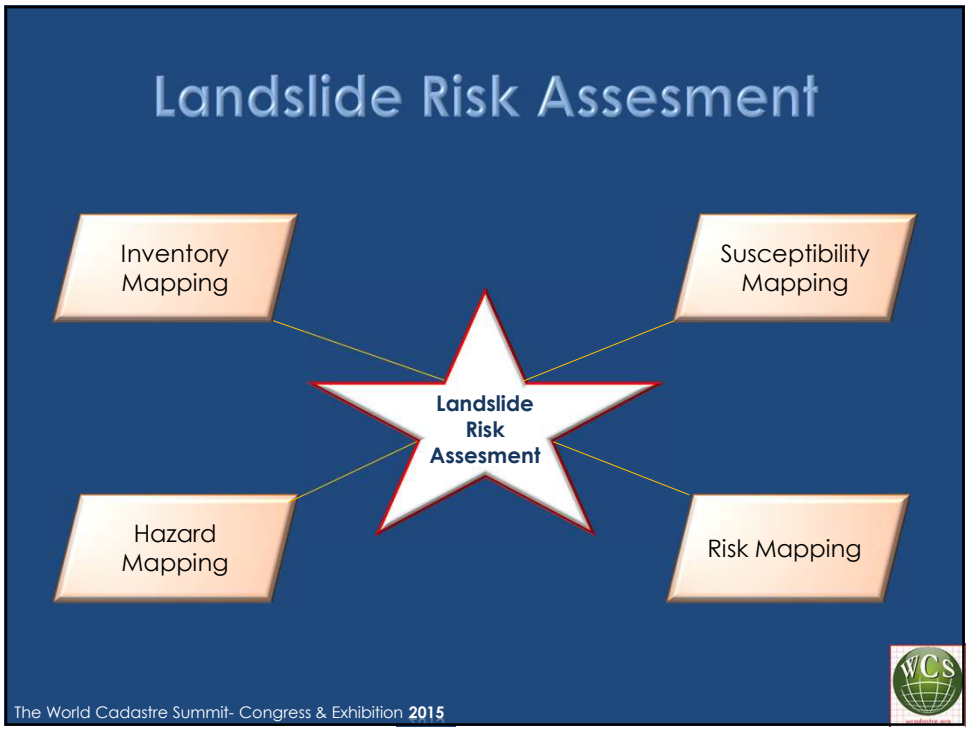
Landslide



Spatial Data For Landslide Risk Assesment

- Due to the identification and collection of spatial data is the first and essential step in risk assessment and also will be the input data for all spatial analysis, accurate and current spatial data are required.
- The main data layers required for landslide susceptibility, hazard and risk analysis can be subdivided into four groups:
  - landslide inventory data,
  - environmental factors,
  - triggering factors and
  - elements at risk (Soeters and van Westen 1996; Van Westen et al., 2008).

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Spatial data requirements for landslide risk assessment

Activities				Data Requirement		Literature
Risk Map.	Hazard Map.	Susceptibility Map.	Inventory Mapping	Environmental Factors	Topographic Factors (Slope, Aspect, Elevation, Roads…) Natural Factors (Soil map, Land use, Land cover…) Geological Factors (Lithology, faults, geomorphological units…)	AGS (2007) JTC-1 (2008) Abella, 2008 SafeLand, 2010
				Triggering Factors	Rain Temperature Change Seismic Data Peak ground acceleration	Fell et all, 2008 Van Westen et all., 2008 Jaedicke et all., 2013 Corominas J et all. 2014
				Elements at Risk	**Structures** **Parcels** Road Networks Agriculture Areas Natural Resources…	Guzzetti, 2012 OFAT et all, 1997

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Cadastre Integrated Risk Management Model in Landslides

- Cadastral data used as a base data in most of the planning works.
- In this context, using cadastral data is unavoidable for the landslide risk assessment which is considered as a planning.
- Information such as parcel, structure which are collected as a result of cadastral surveys and subject to registration needs to be used as elements at risk in disaster risk assessment
- During the cadastral works, in addition to boundary information, other spatial information such as topographic and land use of the area is collected. These data can be also used as environmental factors for considering landslide risk assessment.

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Cadastre Integrated Risk Management Model in Landslides

- An effective way to use the maps produced as a result of the risk assessment, these maps should be used as a basis for all scales of planning.
- Thus, precautions will be taken on the region in terms of disaster risk.
- Especially, with the placed annotations of parcels at high risk, precautions will be taken for some operations.
- Such as
  - valuation works,
  - expropriation works and
  - purchase-sale ...

related to parcels at risk, those concerned will have information about the parcel in terms of disasters.

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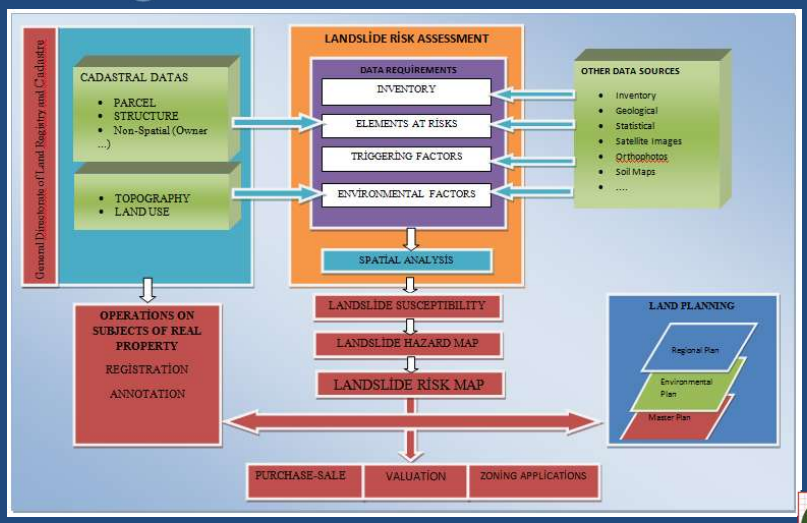
Cadastre Integrated Risk Management Model in Landslides



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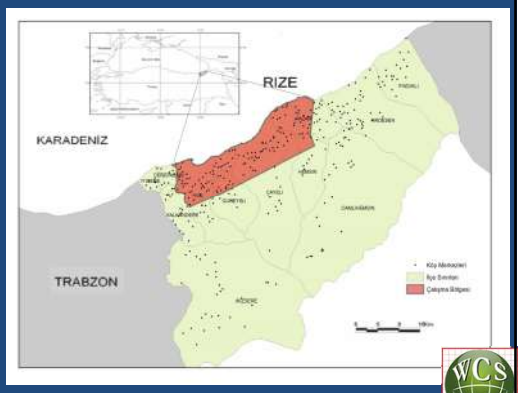
Pilot Study Area

- Rize province one of the most prone areas for landslides in Turkey
- Study area is selected for landslide analysis Rize, Güneysu, Çayeli, Hemşin and Pazar district because landslide occurs mostly in these areas



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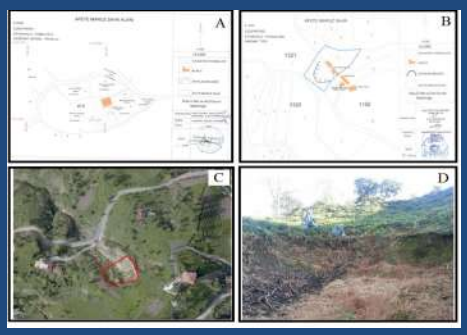
Data Used

Inventory Data

For the first step of producing landslide maps, inventory data had been collected and landslide inventory map had been created.



Inventory data had been collected from previous study (TUBİTAK, 2009), intuitions archive, orthophotos and fieldwork.

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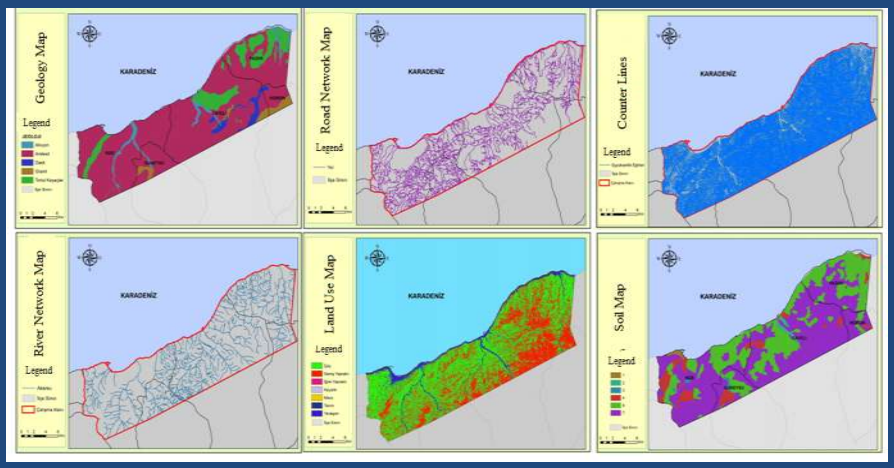
Data Used

- **Environmental factors** for produce landslide susceptibility map had been chosen such as
  - Elevation,
  - Slope,
  - Aspect,
  - Lithology,
  - Soil map,
  - Proximity to the road,
  - Proximity to the river and
  - Land use.

In this context data about that factors are collected from previous studies that made on the same area (TUBİTAK, 2009) and base maps.

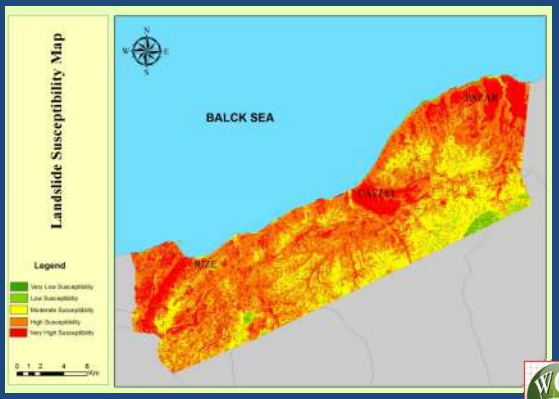
Data Used



Landslide Susceptibility Map

In this study analytic hierarchy process (AHP) technique which is mostly used on landslide susceptibility in literature had been used.

Weights of the factors are calculated with AHP and landslide susceptibility map had been created.



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Landslide Hazard Map

- Guzzetti et all. (2005) define that for creating landslide hazard map
  - spatial probability,
  - event (size) probability and
  - temporal probability

must be all calculated.

$$PH = PS \times PE \times PZ$$

- Landslide susceptibility maps shows spatial probability of study area.

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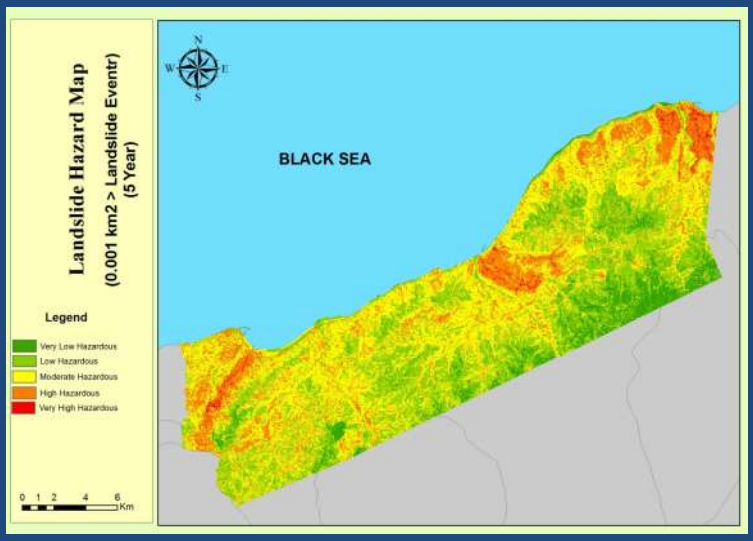
Landslide Hazard Map

- **Event probability** had been calculated by using Power- Law distribution which is generated by Malamud et al. (2004) with inventory data. Probability of occurrence landslide bigger than 0.001 km^2 had been determined **0.98.**
- **Temporal probability** had been determined for 5 year periods by assuming that the temporal distribution of landslides are equal up to the present in study area. The temporal probability had been determined **0.672** for 1/5 year period (Bilgilioğlu, 2014).

Landslide Hazard Map



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Landslide Risk Map

- Element at risk must be described for producing landslide risk assessments. In this study **cadastre data** had been used as element at risk
- **Cadastre parcels** and **structure** that registered had been chosen for elements at risk and vulnerability map had been produced and landslide risk map had been created with the probability of occurrence in **next 5 year** and **bigger than 0.001 km²** in study area.

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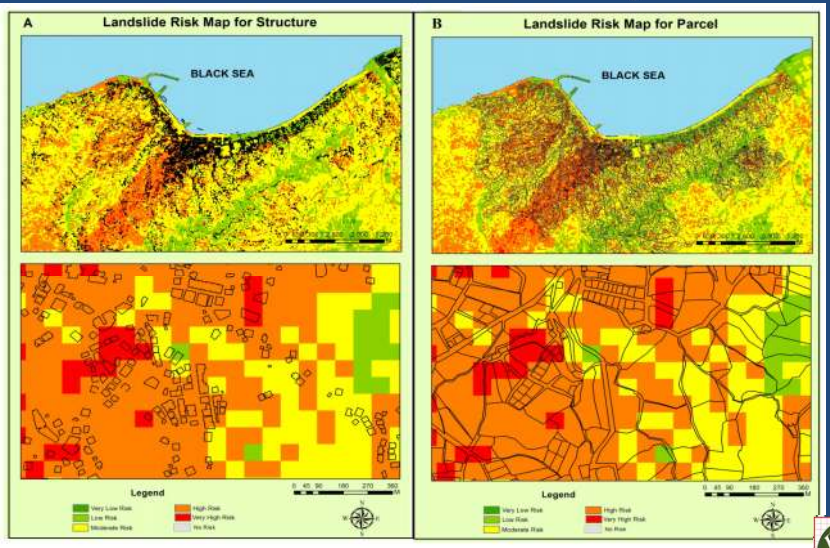
Landslide Risk Map



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Landslide Risk at Elements

Structure	Percent (%)	Amount
Very Low Risk	5.22	519
Low Risk	25.03	2488
Moderate Risk	30.31	3013
High Risk	21.02	2089
Very High Risk	4.32	429
No Risk	14.11	1403
Total		9941

Parcel	Percent (%)	Amount
Very Low Risk	11.08	137
Low Risk	22.15	274
Moderate Risk	27.00	334
High Risk	19.89	246
Very High Risk	3.31	41
No Risk	16.57	205
Total		1237

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Landslide Risk at Elements

- Following the risk assessment 2518 structure in total 9941 and 287 parcel in total 1237 was detected that under high and more risk for landslide
- With the developed model it is recommended that annotation about the risk must be added in land registry of parcels and structure that detected.
- Thus, it will be the data input and consideration for
  - purchase- sale,
  - expropriation,
  - valuation and
  - urban transformation projects and works.
- In addition that risk areas will be used for large scale plans such as master plans.

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Conclusion

- Spatial data thought to be collected for scope of multi-purpose cadastre should be examined using in disaster management.
- Because there is need for reliable and current data in order to do better disaster risk assessment.
- Minimize loss of life and property is possible thereby taking measures to natural disaster. Although nevertheless recovery activities will be occurring is important after the disaster, it is difficult to avoid economic losses and social impact of its.
- Therefore, it is necessary to determine potential risks areas in countrywide and used as a data input in planning.
- Parcel that under risk should be specified on land register by adding annotation.
- So determined risk areas will be considered in the operations on subjects (purchase-sale, valuation e.g.) of real property.

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