

# Seismic hazard in Kosovo

## Florim Grajçevci<sup>a</sup>, Labeat Misini<sup>a</sup>

<sup>a</sup> Faculty of Civil Engineering, University of Pristina

### Summary

Kosovo is situated in a region of significant tectonic activity, primarily influenced by the Adriatic-Ionian and Eurasian plates. The complex interactions of these tectonic plates result in frequent seismic events of varying magnitudes, making seismic hazard an essential consideration in the region.

For the Kosovo state, the first step in seismic regulations was the adoption of a temporary technical regulation for building loads, officially approved in document FNRJ 61/48. This regulation was in use from 1948 to 1964 and provided basic guidelines. However, it is considered a pre-code regulation, offering minimal protection against seismic actions and primarily focusing on horizontal earthquake loads on structures.

From 1964 to 1981, the regulatory framework transitioned to what is classified as "Low-Code."

The period from 1981 to 1999 marked the implementation of upgraded seismic design codes with an emphasis on ductility. Structures built during this time incorporated more advanced seismic resistance principles. As in many European countries, Kosovo adopted the European standard EN 1998 (Eurocode 8 or EC8) for the design of earthquake-resistant structures. Eurocode 8 comprises six parts and serves as a comprehensive framework for modern seismic design.

For more than two decades, the constructed buildings, infrastructure, and other works in this area have demonstrated sustainability and performed adequately under live loads, with no significant deficiencies observed over time.

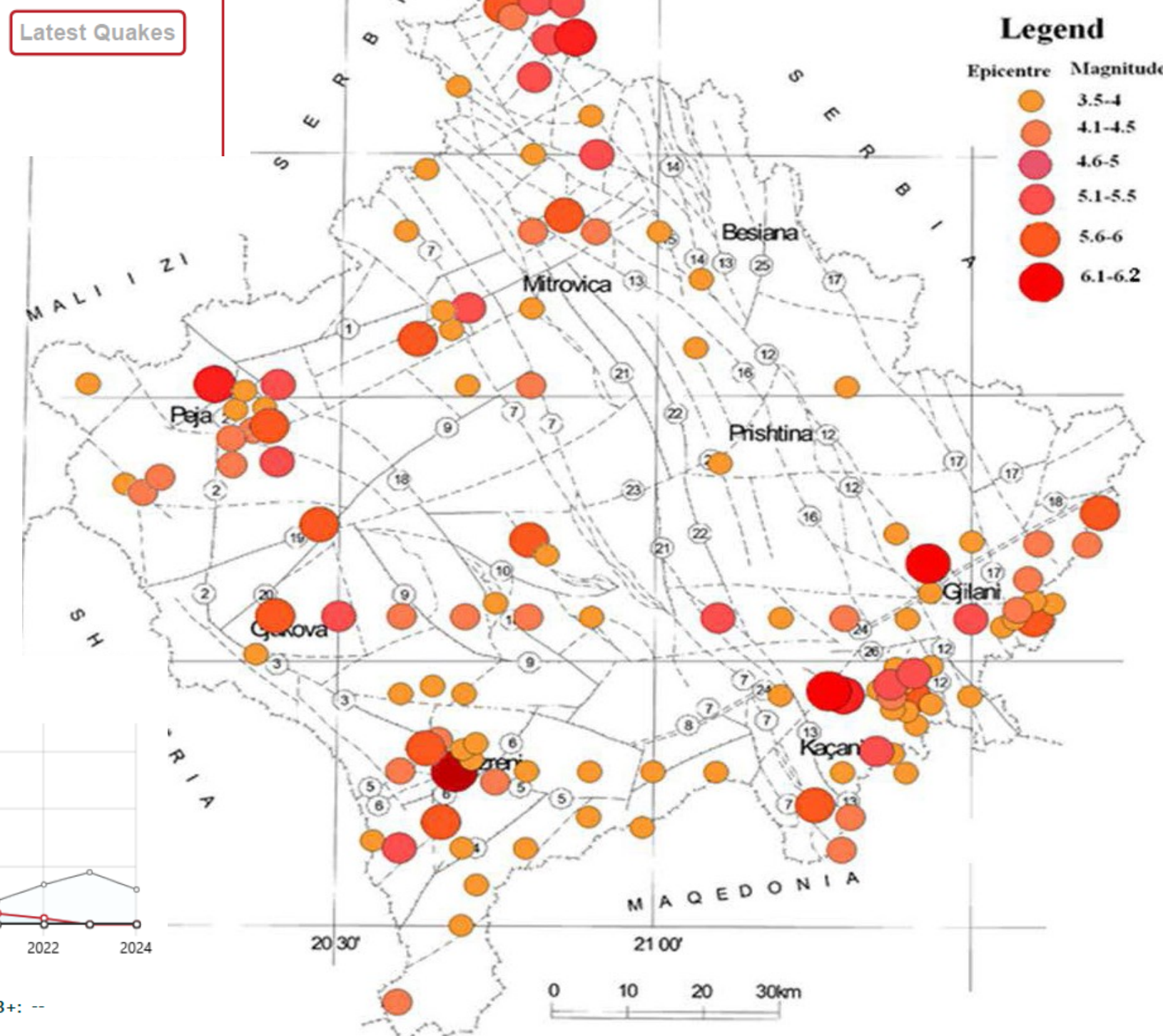
### Earthquake epicenters in Kosovo for time of 1456 to 2017

Pristina has relatively few earthquakes. On average, about 19.35 mostly small quakes occur every year.

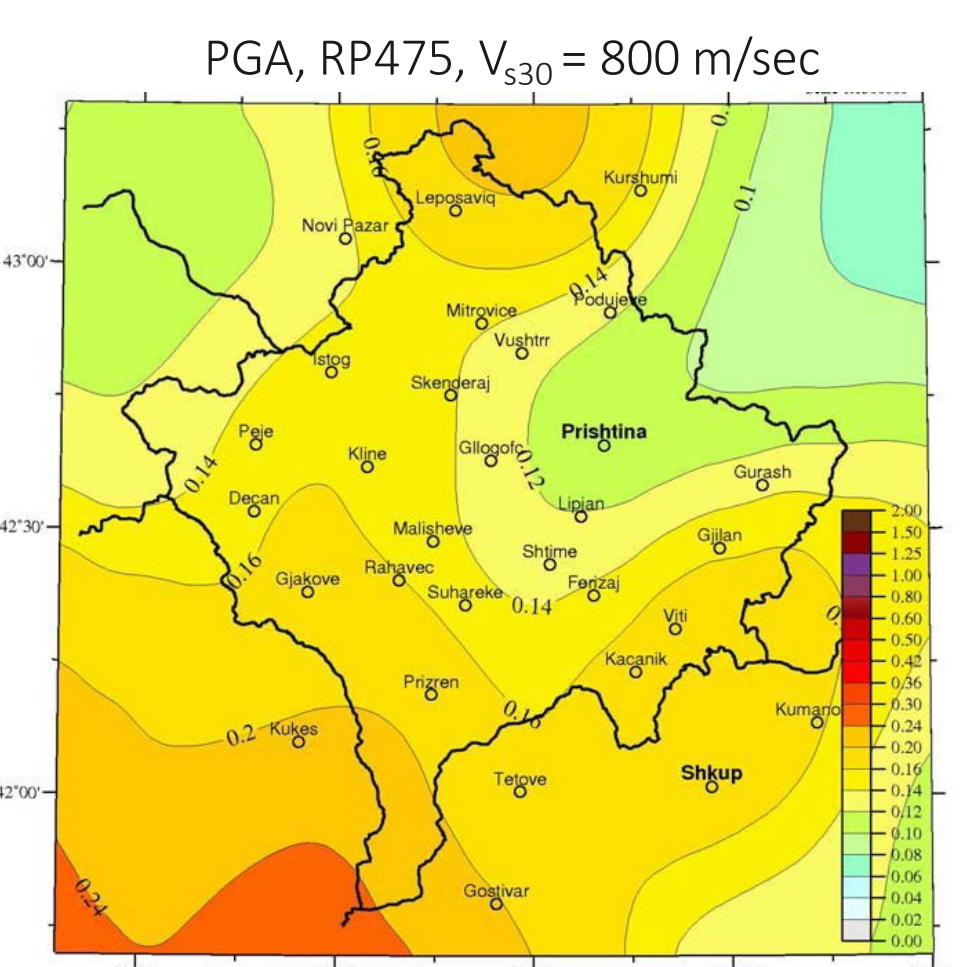
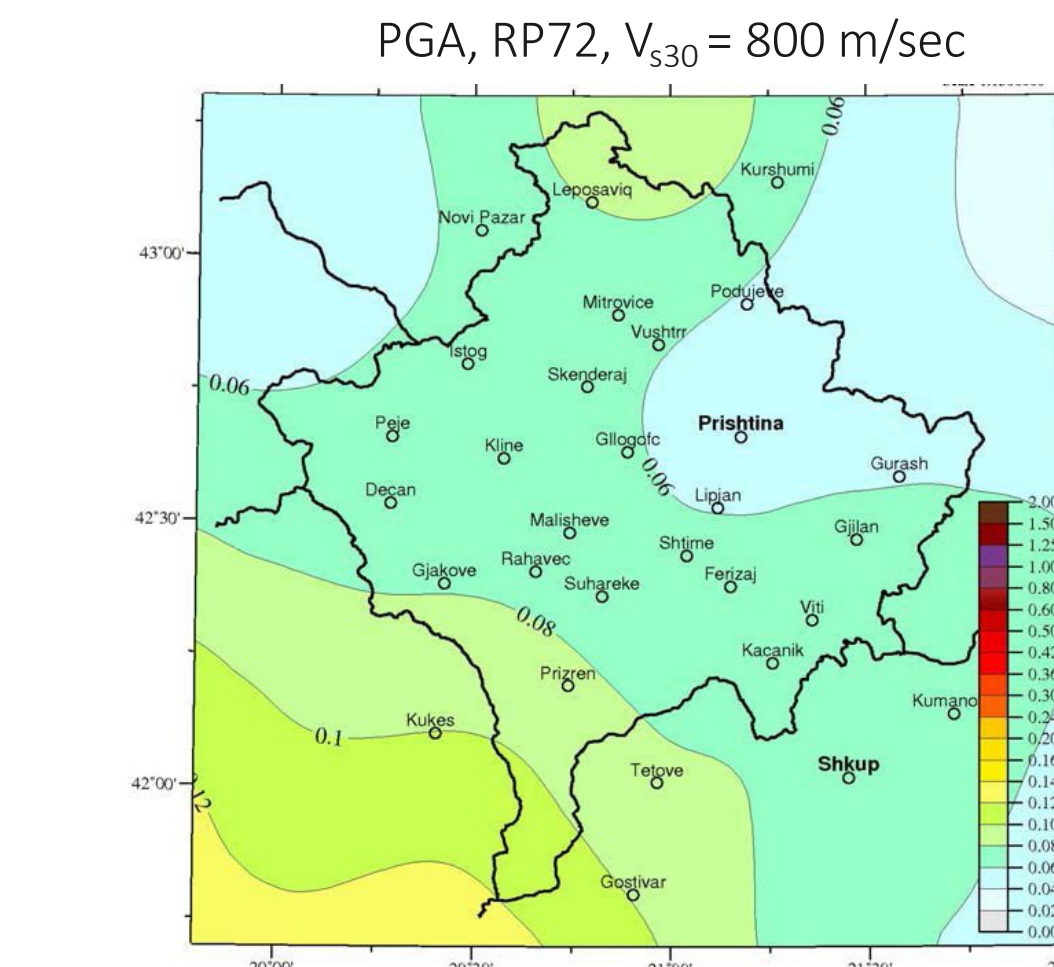
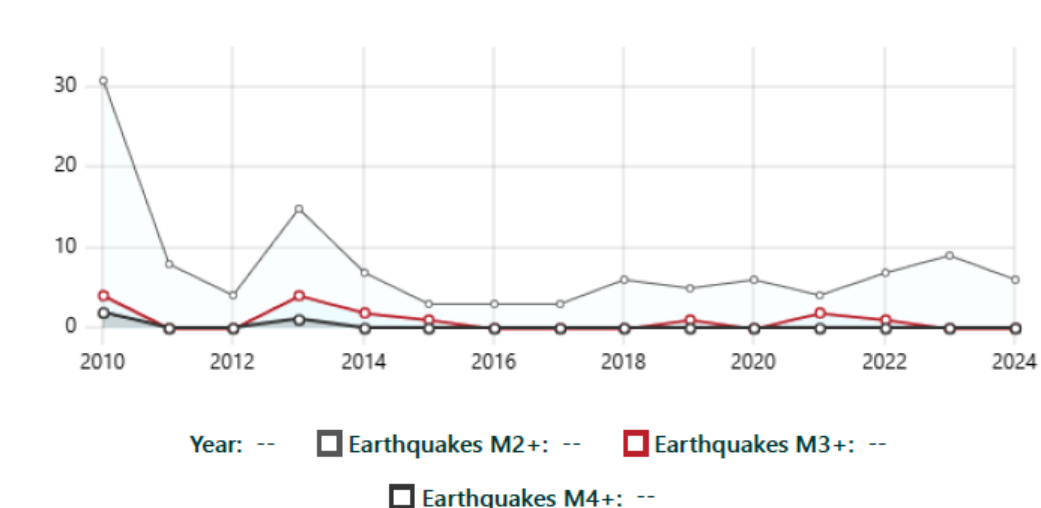
There were no significant confirmed earthquakes in or near Pristina in the past 24 hours.

Since 2024, Pristina has had 25 quakes of magnitudes up to 2.7.

Latest Quakes



Number of quakes per year



### Institutional, in accordance of Seismic code for territory of Kosova

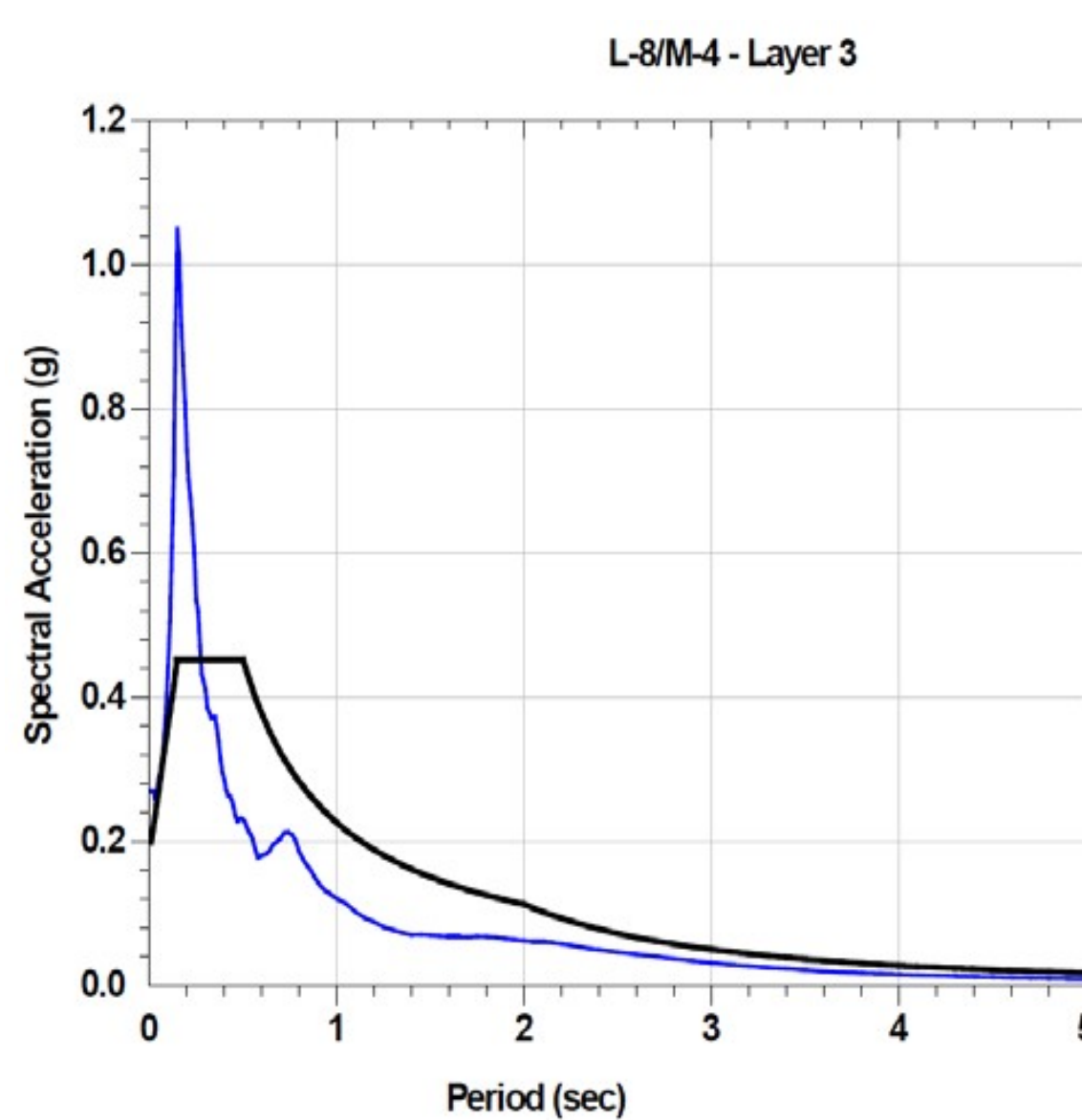
In accordance of the Construction Law of Kosova, the Ministry of Environmental and Spatial Planning, create the administrative order – Instruction no. 06/2017 on setting procedures for submission and review of applications for terms of Constructions, Construction Permit and demolition permit for category I and II of Construction, based in Eurocode Standards for Structure.

According to the Administrative Order, all Municipalities in Kosova, respect the criteria for the Structural Design assessment.

In Case of making Structural Design of any Building, structure or their members, It is required for fulfilling the European Standards.

Mainly Urban zones – Cities, are required from Structural Designers to respect the Standards and norms for Design in seismic condition in accordance with the EC8.

For the cases of verification of Existing Buildings, Designers shall respect all criteria and requirements for the existing building.



The Ministry of Economic Development, in the September of 2012 provide the seismic micro zonation study for the Urban zone of City Gjiçane, Kosova.



### Historical, seismic activity in territory of Kosova

In the World seismic map, the territory of Kosova, belong to the Mediterranean Alpine seismic belt were the mentioned zone includes a wide possible encounter of African lithospheric discs to Eurasian. For the identify of our territorial seismic zone, are complicated heaving in consideration that the in zones appears the several tectonics discs as well as the way the energy accumulated during the process of plastic deformation is released in most of it.

For the time period of 1456 to 2014, Kosovo has 152 earthquake strikes with magnitude of 3,5 to 6,3 of Richter scale.

- Prizren Earthquake, June 16, 1456 (MS=6.0; 42.200°N, 20.700°E) with intensity in epicenter of 8 scale
- Peja Earthquake, November 11, 1662 (MW=6.0; 42.700°N, 20.300°E) with intensity in epicenter of 8 scale
- Ferizaj Earthquake, February 26, 1755 (M=6.1; 42.500°N, 21.900°E) with intensity in epicenter of 9 scale
- Ferizaj-Vitia Earthquake, August 18, 1921 (ML=6.1; 42.300°N, 20.300°E) with intensity in epicenter of 9 scale
- Vitia Earthquake, August 15, 1921 (MW=5.4; 42.020°N, 21.020°E) with intensity in epicenter of 8 scale
- Gjiçane Earthquake, September 02, 1921 (MW=5.0; 42.024°N, 21.030°E) with intensity in epicenter of 8 scale
- Kacanik Earthquake, October 03, 1921 (MW=5.6; 42.700°N, 20.300°E) with intensity in epicenter of 8 scale
- Gjakova Earthquake, September 03, 1922 (MW=5.3; 42.025°N, 21.020°E) with intensity in epicenter of 7.5 scale
- Prizren Earthquake, September 26, 1945 (MW=5.0; 42.700°N, 20.045°E) with intensity in epicenter of 7 scale
- Klina Earthquake, February 05, 1947 (MW=5.2; 42.030°N, 21.045°E) with intensity in epicenter of 8 scale
- Kopaonik Earthquake, May 18, 1980 (MW=5.2; 43.307°N, 20.867°E) with intensity in epicenter of 8 scale
- Gjiçane Earthquake, April 24, 2002 (MW=5.7; 42.440°N, 21.590°E) with intensity in epicenter of 8 scale
- Gjiçane Earthquake, September 02, 1921 (MW=5.0; 42.024°N, 21.030°E) with intensity in epicenter of 8 scale
- Istog Earthquake, March 10, 2010 (MW=5.2; 42.76344°N, 20.628110°E) with intensity in epicenter of 7 scale
- Vushtrri Earthquake, November 18, 2013 (MWW4.8; 42.900°N, 21.014°E) with intensity in epicenter of 6.5 scale

- Probability Seismic Hazard Maps for the Territory of Kosova
- Given for rock conditions seismicity safety levels RP95, RP475, RP975, RP2475, RP5000 and RP10000
- Expressed in PGA and Sa=0.1, 0.2, 0.3, 0.5, 1.0, 2.0sec

### Conclusions

The seismic hazard in Kosovo varies across its territory. Regions closer to active fault lines, such as the Dukagjin Plain and along the Vardar Zone, are more susceptible to higher seismic intensities. Historical data indicate seismic intensities ranging from VII to IX on the Mercalli–Cancani–Sieberg (MCS) scale in certain areas.

Past seismic events have demonstrated the vulnerability of older buildings and infrastructure to earthquakes. Notable earthquakes in the region have caused considerable damage, emphasizing the need for improved seismic design standards and risk mitigation strategies.

Kosovo has made significant progress in adopting seismic design standards. The shift from temporary regulations (pre-1964) to Low-Code (1964–1981), Ductility-Based Codes (1981–1999), and finally to Eurocode 8 has improved the seismic resilience of newly constructed buildings. However, challenges remain in ensuring compliance across all new and existing structures.

Urban areas like Pristina, where many mid-20th-century buildings remain, require systematic assessments of seismic risk. Retrofitting vulnerable structures, particularly schools, hospitals, and residential buildings, is crucial for reducing the potential for loss of life and property damage.

Enhanced seismic monitoring networks and ongoing geological research are needed to refine hazard maps and predict seismic risks more accurately. Collaborative regional studies with neighboring countries can also provide valuable insights into shared tectonic systems.

In conclusion, while Kosovo faces significant seismic hazards, the adoption of modern codes and proactive measures can greatly reduce vulnerabilities and enhance the resilience of its communities and infrastructure.



co-organized by the European Center for Geodynamics and Seismology (ECGS) and the European Facilities for Earthquake Hazard and Risk (EFEHR)

