



# Knowledge FOR Resilient soCiEtY

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SEISMIC RISK PROFILE OF SHKODRA REGION

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## Purpose Of The Study

The main purpose of this paper is to evaluate the expected economic loss that results from the buildings damages due to the earthquakes in the region of Shkodra





## City Of Shkodra

Shkodra is a city which lies in Northwestern Albania. It represents the largest city in northern Albania. Earthquakes that hit the city of Shkodra and the surrounding area have a long history and significant damage.





## Literature Review

Samardijeva and Badal (2002) have constructed a quantitative model that combine the earthquake magnitude (M) and the population density (D) in order to compute the number of human losses (N).

$$\log N_K(D) = a(D) + b(D)M(3)$$



## Samardijeve and Badal "a" & "b" coeficients

Population density	a	b	r	$\sigma$
D < 25	-3.11	0.67	0.84	0.343
D = 25-50	-3.32	0.75	0.85	0.342
D = 50-100	-3.12	0.84	0.82	0.345
D = 100-200	-3.22	0.92	0.70	0.397
D > 200	-3.15	0.97	0.75	0.348



## Andrews (2016) classification of earthquake damages

Moment magnitude	Earthquake effects
2.0 to 2.9	Usually not felt
3.0 to 3.9	Often felt
4.0 to 4.9	Minor damage
5.0 to 5.9	Moderate damage
6.0 to 6.9	Substantial damage
7.0 to 7.9	Substantial widespread damage
Over 8	Total destruction near epicenter



## Bakshi (2019) classification

<i>in % of Building Value</i>	<b>Slight</b>	<b>Moderate</b>	<b>Extensive</b>	<b>Complete</b>
<b>Structural</b>	0,2	1	5	10
<b>Nonstructural drift-sensitive</b>	0,7	3,1	15,5	30,9
<b>Nonstructural acceleratio-sensitive</b>	0,6	3,1	9,5	31,8
<b>Contents</b>	0,2	1,2	3,6	11,9
<b>Total</b>	<b>1,7</b>	<b>8,4</b>	<b>33,6</b>	<b>84,6</b>



## Methodology And Data Set

To perform the calculations we have used some of the models presented in literature review and the data collected from Institute of Statistics in Albania and other studies on evaluation of earthquake damages in Shkodra, Albania and world





## Estimations

### Estimation

The fine art of guessing





## Estimations

Concerning the probability of occurrence of earthquakes Kociu provides the following information for the Albania calculated over a time period of 475 years (Kociu 2005)



<b>Magnitude Richter scale</b>	<b>Times of occurrence</b>	<b>Probability</b>
$\geq 8$	4	0.80%
4.2-7.9	15	3.20%
0-4.1	1037	100%



## The Value Of The Property On Risk

The reference price = 58,000 ALL/m<sup>2</sup>

Dwelling area = 244,420,509,528 m<sup>2</sup>

Average value = € 1,987,643,405.12





## Estimations

Retaking in consideration the model proposed by Samardijeva and Badal for human fatalities we have estimated the fatalities for each magnitude measured on degree Richter





**SCREW  
CALM  
It's  
RESULTS  
TIME**



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## Calculation of expected loss in Eur

Magnitude Richter scale	Probability	% of proper Value Loss	Expected loss in EUR
$\geq 8$	0.80%	84.60%	13,452,370.57
4.2-7.9	3.20%	15.40%	9,795,106.70
0-4.1	100%	0%	-





## Calculation of expected value of fatalities

Magnitu de Richter scale	Theoretical value of fatalities	Probability	Expected value of fatalities
1	0.007	100.00%	6.01
2	0.062		
3	0.575		
4	5.370		
5	50.119	3.20%	156.45
6	467.735		
7	4,365.158		
Over 8	40,738.028	0.80%	325.90





Thank you  
for your attention  
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