

# Rating Multinatural Hazard Assessment for Mountainous Regions in Example of North Ossetia-Alania Territory

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## ABSTRACT

**Introduction.** The Greater Caucasus can serve as a natural laboratory in terms of the variety and intensity of manifestations of dangerous natural processes, where geodynamic processes of a seismotectonic nature, as of a continental scale, continuously occur of different orders due to the collision of the Scythian and southern microplates, prop up the Arabian Plate, and regional scale caused by the intensification of seismic activity in the deep fault zones (Zaalishvili et al., 2018). High seismicity due to active deep geodynamic processes and stresses in the zone of collision plates affects a strongly dissected relief, activates many dangerous exogenous processes (mudflows, landslides, avalanches, landslides) (Svalova et al., 2019).

A quantitative assessment of possible risks is especially important at the regional level, especially for the North Caucasus, characterized by the development of geographic geological processes, a high population density in combination with a difficult socio-economic situation.

**Methods.** The purpose of the assessment is to weigh the risk in the interests of developing solutions aimed at reducing it. Risk assessment includes: assessing the probability of adverse events, determining the structure of possible damage, building laws for the distribution of damage. To predict the possible consequences of earthquakes, landslides, floods or other natural disasters, for sustainable development planning and natural risks mitigation rating assessment methodology can be applied. It's based on rating assessment of geological, seismic, geomorphological and other features. Cyclic recurrences of different processes are given in Table 1. According to the developed approach, each factor has its own hazard level scale (Table. 2). Further, each factor value was assigned its weight rating in the total hazard, also established from past experience. The basis of this classification is the experience of past natural processes. The following ratio was used to calculate the total multinatural hazard assessment:

$$H = W \times D$$

Table 1. Return periods of catastrophic events for the territory of North Ossetia -Alania

N	Natural process	Return period	Background activity
1	Earthquakes	1/100 years	
2	Landslides	1/20 years	Some landslides may occur annually
3	Mudflows	1/15 years	Some mudflows may occur in 5-7 years
4	Snow avalanches	1/10 years	A series of avalanches descends annually

Table 2. Rating indicators of factors of various nature

Factors	Units	Hazard level, D			Weight coefficient, W
		1	2	3	
Seismicity	points, MSK-64	7	7 - 8	8	2.0
Geological settings	category	I	II	III	0.5
Topography	slope	< 5°	5 – 15°	> 15°	1.0



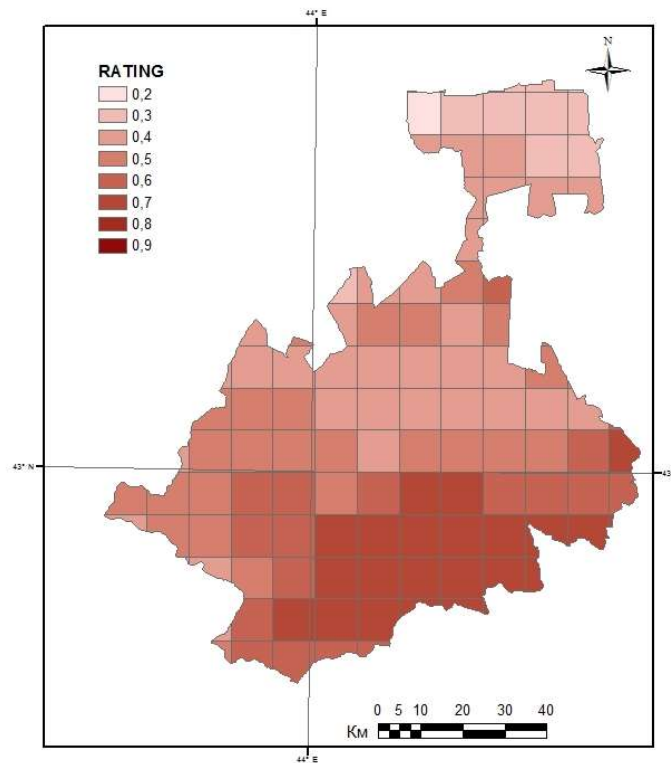


Figure 1. The rating map of various natural hazards susceptibility for RNO-Alania territory

**Conclusions.** Multiple hazard based approaches basically do not exist (Armonia, 2006). A spatial understanding of natural disasters should take into account all types of hazards using a multiple risk approach at all spatial levels (regional and local). A quick express rating assessment of the potential vulnerability for the territory is proposed, which allows a quick assessment at the regional level using the territory of North Ossetia-Alania as an example. The zone of minimal impact is flat, the most urbanized part, which includes the cities of Beslan and Ardon, which in this case is the optimal area for the development of the Republic. The mountain part with the presence of historical settlements and objects related to mining. This part is exposed to the greatest level of natural impact. The most important lifelines pass here: gas pipeline, highways, they determine high possible technogenic risks.

## References

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