



**INTERNATIONAL  
ANKARA CONGRESS ON  
SCIENTIFIC RESEARCH VI**

**April 1-3, 2022  
Ankara - TURKEY**

**THE PROCEEDINGS BOOK**

**EDITOR:  
Prof. Dr. Müslüme NARİN**

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*Ankara*



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## FLOODING IMPACT ON SEISMIC HAZARD INCREASING OF URBAN TERRITORIES

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### ABSTRACT

Technogenic activities in the mining regions of various countries, including Ukraine, have reached such scale that could cause the artificial earthquakes, dips and landslides. Gradually, with the mining operations development at the initial stage there is the weak technogenic seismicity in the mine seismicity form and weak shocks, and then after decades as a result of intense and prolonged impacts on the subsoil there are strong natural technogenic earthquakes.

Urban development and technogenic impact on the environment increase water consumption, increase industrial and urban construction, change natural riverbeds, create reservoirs, develop flooding processes, which, in turn, could increase seismic hazards for industrial buildings, even in areas were not in the affected by earthquakes area. Earthquakes destroy environmentally hazardous objects, roads, bridges and the most reliable buildings with the steel frame, interrupt the water supply, gas and electricity, cause explosions and fires. This leads to emergencies<sup>1</sup>.

The destruction of modern reliable structures during the earthquake is usually associated not with poor construction quality, but with the unfavorable behavior of the base soils and caused by the following effects: selective intensification of certain frequencies, flooding or partial loss of strength, landslides, and as the result of soil flooding<sup>2</sup>.

Researches of destroyed buildings on different soils types have shown the dependence of seismic intensity on the soil type and its water saturation. It has been proved that with increasing water saturation in shallow sediments, the theoretically calculated seismic velocities decrease in clay and increase in sand due to the corresponding stresses between particles in these media.

The 10 m and more groundwater level does not affect the magnitude of the seismic intensity of the earthquake. Within the upper 10-meter stratum, the increase in the groundwater level from 10 to 0 m leads to the increase in the earthquake intensity, and its intensity also depends on the soil stratum type.

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<sup>1</sup> Sierikova E., Strelnikova E., Gnitko V., Kryutchenko D. Reservoirs seismic resistance. Proceedings book of 6th International Congress on Innovative Scientific Approaches. December 19-20, 2021, Samsun, Turkey. IKSAD GLOBAL Publishing House. 2021. P. 264-267.

<sup>2</sup> Sierikova E., Strelnikova E., Kryutchenko D. Seismic loads estimation on the storage tanks for toxic and flammable liquids. Bulletin of V.N. Karazin Kharkiv National University series «Mathematical modeling. Information technology. Automated control systems» issue 51, 2021. P. 70–80. <https://doi.org/10.26565/2304-6201-2021-51>

In some cases S.V. Medvedev noted the explosions of seismometric observations showed the increase in the speed of oscillations almost twice on water-saturated soils compared to soils in the natural humidity state<sup>3</sup>.

The scientific research analysis has shown that in large cities of Ukraine, first, there is no necessary monitoring system to control the groundwater regime, caused by economic difficulties<sup>4</sup>. Therefore, assessing and forecasting the flooding development in recent years in these areas is much more difficult. Methods and techniques for flooding forecasting of urban areas require the models development that take into account such complex technogenic factors as artificial coatings that reduce transpiration through plants, evaporation from groundwater and changes in groundwater balance under the influence of additional replenishment and groundwater abstraction. Thus, the processes and factors of groundwater level change research in forecasting their maximum rise, which will quantify the flooding risk, is the urgent scientific and applied issue in terms of large cities environmental safety<sup>5</sup>.

The flooding development monitoring and the hydrogeological maps creation should be the important contribution to the seismic intensity forecasting and emergencies provoked by this phenomenon prevention<sup>6</sup>.

Therefore, in seismically hazardous areas, buildings with anti-seismic reinforcement should be erected in vulnerable areas of the structure and taking into account the possible tendency to technogenic earthquakes and baldness increasing in the region.

**Keywords:** earthquakes, technogenic seismicity, flooding

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<sup>3</sup> Sierikova E., Strelnikova E. Evapotranspiration factor in 3D mathematical modeling of groundwater level changes. II. International Hazar Scientific Researches Conference. (April 10 - 12, 2021) Khazar University, Baku, Azerbaijan. 2021. P.334–336.

<sup>4</sup> Sierikova E.N., Strelnikova E.A. Mathematical Modeling of Groundwater Level Changing with Considering Evapotranspiration Factor. International Journal of Modern Studies in Mechanical Engineering (IJMSME). Volume 6, Issue 1, ARC Publications, LLC, USA. 2020. P. 19–25. DOI: <http://dx.doi.org/10.20431/2454-9711.061003>

<sup>5</sup> Sierikova, E.; Strelnikova, E.; Pisia, L.; Pozdnyakova, E., (2020). Flood risk management of Urban Territories. Ecology, Environment and Conservation 26 (3): 1068-1077

<sup>6</sup> Sierikova E., Strelnikova E. Environmental safety of building development on the Kharkiv city flooding areas example. Noble International Journal of Scientific Research. Vol. 03, No. 08. 2019. pp. 72-78.