

Climate Change Risks for Safety of the Mining Tailing Dams and Proposition for Some Solutions



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Introduction

Geotechnical construction could suffer greatly in the future due to the accelerating climate change, with soil covers used in mining tailing dams as some of the most vulnerable. Tailing dams failures have been increasingly common during 20 century especially during 1950's-1970's causing human life loss. It is crucial to eliminate these constructions in the future, but before that tailing sludge could be used in various technologies. Case study here focuses on Bosnia and Herzegovina (B&H) which has



the most intensive mining activities in Europe in recent years

Red mud-bauxite processing tailing, Zvornik city, B&H Iron ore processing tailing, Prijedor city, B&H Lead/zinc ore processing tailing, Bratunac city, B&H

Climate change considerations in Bosnia and Herzegovina's mining regions



Climate change in Bosnia and Herzegovina-very pronounced in the past few decades. Manifested through an increase in air temperature, changes in the pluvimetric regime and an increase in the intensity and frequency of climate extremes. 1961-2016 official data by natonal Hydrometeorological Institutesfor Banja Luka and Tuzla regions show increase in the number of days with intense rainfall of 20mm. These are two regions with large number of tailings. Intense precipitation can cause a fast inflow of large amounts of water in a small area. Rapid water contact can pose a threat to tailings in Prijedor and Zvornik. In addition to these precipitations, the presentation will show analysis of the changes in five-day precipitation with 60 mm accumulations and their expected change according to the climate scenario RCP8.5 by the end of the XXI century, for three time horizons (2011-2040, 2041-2071 and 2071-2100)..

Climate projections indicate that there will be an increase in the number of days with intense rainfall (R5D60) in the interval from 1.5 to 3 at the investigated locations. Such changes can pose a threat to large inflows of water, floods and spills of contents from reservoirs into the surrounding area.



Expected change of intensive precipitation (climate index R5D60) in Bosnia and Herzegovina for the period 2011-2040. in relation to the base period (1971-2000)

Proposition for application of the mining tailings as the metal-source for nanotechologies: results in our team on red mud and iron mine in recent years

RED MUD tailings: contain significant amounts of rare and critical earth elements









References:

- 1. References:
- Ahmad, F. (2018). Effect Of Climate Change on a Monolithic Desulphurized Tailings Cover. https://yorkspace.library.yorku.ca/xmlui/handle/10315/35835
- Atlagić, S. G., Tankosić, L., Pržulj, S., & Mirošljević, D. (2021). Recent Patents in Reuse of Metal Mining Tailings and Emerging Potential in Nanotechnology Applications. Recent Patents on Nanotechnology, 14. https://doi.org/10.2174/1872210514666201224104555
- 4. Azam, S., & Li, Q. (n.d.). Tailings Dam Failures: A Review of the Last One Hundred Years. 4.

Conclusions

- The mining can and should be done in a "greener" manner, Europe needs self-suficiency
- Not only ore deposits, but tailings as well hold a potential for raw material exploitation
- Tailings, which are endangered by the climate change, HAVE to be eliminated in the future
- Use of metal mine tailings as the resource for nanotechnology-huge potential energy savings



5. Gotovac Atlagić, S., Dal Santo, V., & Senatore, A. (2021). Synthesis of the Hematite Nanoparticles from the Iron Mine Waste Sludge

Accumulations (Institute for Intellectual Property of Bosnia and Herzegovina Patent No. BAP203346A).

6. Hoelzl, C. (n.d.). Tailings dams. Retrieved 28 May 2021, from https://www.ruffer.co.uk/Thinking/Articles/Responsible-

investment/2020-10-Tailings-dam