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Sustainable Development Goal Conflicts in Re-Mining of Tailings

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The Davidschacht tailings storage facility (TSF), operated from 1944 to 1964, represents one of the largest tailings dams in the historic Freiberg mining district. It contains a volume of 760,000 m³ of sulfidic flotation tailings, residues of former base metal and silver ore beneficiation. The tailings material still contains elevated concentrations of valuable elements such as zinc (0.4 wt.% on average), lead (0.2 wt.%) and copper (0.05 wt.%) as well as indium (10 ppm). The material has thus become the focus of efforts to enable eventual re-mining and recovery of valuable metals. However, such efforts have to take into account a number of important interests of the public. The first of these is the fact that the unrehabilitated tailings pose a significant risk to the environment. Cd (44 ppm on average) and As (0.6 wt.%) concentrations are particularly high – and have a marked influence on the adjacent water bodies, such as the Freiberg Mulde river. Curbing this influence has been the subject of multiple remediation studies, but pressure to act has risen recently due to increasing regulatory demands on the quality of surface water (EU Water Framework Directive of 2000). This is, in principle, very much in favor of re-mining the tailings in an effort to remove also hazardous components. Counteracting this reclamation scenario is the fact that the TSF is part of the UNESCO World Heritage Site “Erzgebirge / Krusne Hory” that was awarded in 2019. Another restriction pertains to the highly protected status of individual species (esp. sand lizard) settling on the TSF surface. This constellation obviously provides ample space for discussion as to how to deal with the tailings material contained in the Davidschacht TSF in future. Different sustainable development goals (SDG) have to be weighed against each other in order to find a holistic and sustainable. Airlift reactor-based bioleaching has been considered as an opportunity to maximize the sustainability of re-mining activities on the Davidschacht TSF. This innovative approach – and its circumstantial limitations – are documented in this contribution.