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The impact of mine dump pollution on vegetation in the Tsumeb area, central Namibia

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This study investigated the impacts of environmental contamination from mine dumps and tailings on plant communities in Tsumeb, central Namibia. Concentrations of selected heavy metals were determined in soils by Kribek et al. [1] followed by further sampling by the authors and the collated samples collected from over 120 locations in the polluted areas of the town of Tsumeb and 10 sample plots in control sites unaffected by pollution at Lake Otjikoto, some 16 km away from Tsumeb. Of the eleven elements analysed for, concentrations of Cu, Pb, Zn, As, and U were significantly higher ($p < 0.01$) in the polluted area than in control area while that of Fe and Rb were significantly higher ($p < 0.01$) in the control area than in polluted area. The former is due to pollution from the mine dump while it is noted that Fe and Rb are naturally high in normal soils of the area. Species richness and diversity were significantly higher ($p < 0.01$) in the control than in polluted area, as were tree ($p < 0.01$) and shrub ($p < 0.04$) densities. Canonical Correspondence Analysis (CCA) shows that polluted plots were associated with high levels of As, Zn, Cu, Sr Ni, Hg, Pb and Cr. Overall, the influence of heavy metals on vegetation was significant ($F = 1.3$, $p < 0.04$) and they accounted for 55.6% of the observed variation in species data. This study clearly demonstrates that heavy metal-intolerant plant species have given way to tolerant species (some may be opportunistic) in the polluted area but the latter area has remained relatively species-poor due to the stress imposed by heavy metals. Differences in vegetation attributes brought about by heavy metal pollution are a result of differential responses of the various plant species to pollution. Some plant species can tolerate heavy metals using various strategies while others are sensitive to pollution and simply die off.

References:

[1] Kribek B et al. (2016) Appl Geochem 64:75-91

