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Forming artificial soils from waste materials for mine site rehabilitation

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Surface mining activities often produce large volumes of solid wastes which invariably requires the removal of significant quantities of waste rock (overburden). As mines expand, larger volumes of waste rock need to be moved which also require extensive areas for their safe disposal and containment. The erosion of these dumps may result in landform instability, which in turn may result in exposure of contaminants such as trace metals, elevated sediment delivery in adjacent waterways, and the subsequent degradation of downstream water quality. The management of solid waste materials from industrial operations is also a key component for a sustainable economy. For example, in addition to overburden, coal mines produce large amounts of waste in the form of fly ash while sewage treatment plants require disposal of large amounts of compost. Similarly, paper mills produce large volumes of alkaline rejected wood chip waste which is usually disposed of in landfill. These materials, therefore, presents a challenge in their use, and re-use in the rehabilitation of mine sites and provides a number of opportunities for innovative waste disposal.

The combination of solid wastes sourced from mines, which are frequently nutrient poor and acidic, with nutrient-rich composted material produced from sewage treatment and alkaline wood chip waste has the potential to lead to a soil suitable for mine rehabilitation and successful seed germination and plant growth. This paper presents findings from two pilot projects which investigated the potential of artificial soils to support plant growth for mine site rehabilitation.

We found that pH increased in all the artificial soil mixtures and were able to support plant establishment. Plant growth was greatest in those soils with the greatest proportion of compost due to the higher nutrient content. These pot trials suggest that the use of different waste streams to form an artificial soil can potentially be used in mine site rehabilitation where there is a nutrient-rich source of waste.