



The need for CZOs on massively disturbed sites such as rehabilitated mine lands, hazardous waste repositories and highly disturbed agricultural sites

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Most field sites worldwide that are described as CZOs are situated on natural or lightly disturbed sites. While much can be learnt generically about environmental processes on these types of sites, there is an emerging need to underpin the science being used to design and assess the environmental impact of man-made landforms, soilscales and ecosystems. A greater diversity of CZOs would acknowledge the impact humans have had on the environment. While there are a (very) small number of mining CZO-like sites (e.g. Chicken Creek, Germany; Ranger Mine, Australia) they are typically focussed at resolving immediate term issues for the mining companies. This may be satisfactory for understanding single, isolated processes. However, recent work with coupled landform-soilscale-ecosystem evolution models has highlighted significant catchment scale coupling between landforms, soilscales, hydrology and vegetation. This coupling calls for a more holistic study of these processes for man-made landscapes. Many short term solutions also often ignore the longer term behaviour of the landscape. Furthermore some processes that are relatively stable and/or minor on natural landforms become dominant on man-made landforms. For example, hillslope profiles are not equilibrium profiled, drainage paths are not natural (in cross-section, plan or profile), and soil profiles and catenas are in disequilibrium with climate and erosion processes. Because these processes are in disequilibrium landform and soilscale changes can be rapid, which impacts on the longer term stability of the man-made landscape. This paper will show some examples from our previous work of science uncertainties and their impact on environmental performance, and highlight how a dedicated mine rehabilitation CZO might assist in resolving those issues.