



## **Land destruction and redevelopment – the use of computer based landscape evolution models for post-mining landscape reconstruction**

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Mining provides essential resources for the global economy as well as considerable employment and economic benefits for the community. Mining is necessary for the modern economy. However, in recent decades the scale and environmental impact of mining has grown in line with the global demand for resources. This requires ever increasing areas of land to be disturbed. In particular, open-cast mining removes topsoil, disrupts aquifers and removes uneconomic material to depths of many hundreds of metres. Post-mining, this highly disturbed landscape system requires rehabilitation. The first and most important component of this process is to construct an erosionally stable landform which then can ecologically integrate with the surrounding undisturbed landscape. The scale and importance of this process cannot be overstated as without planned rehabilitation it is likely that a degraded and highly erosional landscape system will result. Here we discuss computer based landform evolution models which provide essential information on the likely erosional stability of the reconstructed landscape. These models use a digital elevation model to represent the landscape and dynamically adjust the surface in response to erosion and deposition. They provide information on soil erosion rates at the storm event time scale through to annual time scales. The models can also be run to assess landscape evolution at millennial time scales. They also provide information on the type of erosion (i.e. rilling, gullying) and likely gully depths (and if they will occur). Importantly, the latest models have vegetation, armouring and pedogenesis submodels incorporated into their formulation. This allows both the surface and subsurface landscape evolution to be assessed. These models have been widely used and have huge benefits for the assessment of reconstructed landscapes as well as other disturbed landscape systems. Here we outline the state of the art.