

Development of MINEROSion 4 :

A user friendly catchment/landscape Erosion
prediction model for post-mining landscapes in CQ

H.B.So , A Khalifa, C Carroll, H Ghadiri & B Yu



ACARP

Background: The Problem on open-cut coal mines



The use of drag-lines during open-cut coal mining in central Queensland creates a landscape of parallel spoil piles with slopes of approximately 75%. Highly saline and erodible.

Reshaping

To control erosion

Major cost of rehabilitation



Revegetation

What is the maximum slope that will result in acceptable rates of erosion* ?
And how can we determine this ?

What is the rate of erosion
-during early rehabilitation stages ?
-Risk of failure ?
- after the mine is decommissioned ?
- when all vegetation cover is removed by fire ?
- of the original (surrounding) undisturbed areas ?

Erosion can be measured at different scales and cost.

(Acarp 1629 & 4011: 1992-1998)

Experimental scale

Eptl - Real world scale

Lab Rainfall Simulation

Field Rainfall Simulation

Field Plots

Field Catchments



MINErosion 2.2

3m x 0.8 m

12m x 1.5 m

4m x 1.5 m

20m x 5 m

Up to 2.5 ha

Inexpensive
rapid, independent
of climatic conditions
(few weeks)

**Can laboratory
scale measurements
be used to predict
field scale erosion ?**

Expensive, slow
few plots/catchments,
data collection depends
on climatic conditions
(minimum 5 years)

Can laboratory scale measurements be used to predict field scale erosion ?

MINEROSION 2.2 : estimates sediment delivery (erosion rate) from unconsolidated hillslopes of any length and gradient.

Effectively it can simulate soil loss from any combination of slope length and gradient without having to run field plots, using data from flume-rainfall simulator plots.

It can also estimate sediment delivery from a few soil physical and chemical properties.

**MINEROSION 3.1: package to predict potential field scale, simple hillslope erosion from laboratory scale measurements, and to derive suitable combinations of slope gradient, length and (grass) vegetation cover that will result in acceptable erosion rates (< 40 t/ha/y). (You can design your landscape)
But it will not tell you erosion from the designed landscape !!!**

MINErosion 4.1:

Integrate MINErosion 3.1 with ArcGIS 9 and add a sedimentation subroutine.

FEATURES:

- **User friendly and easy to operate**
- **Large database of soil and spoil/overburden characteristics**
- **Detailed climate (EI30) information for Central Queensland**
- **Predict potential erosion from laboratory parameters and require only few parameters**
- **Catchment info as DEM, DXF(autocad) or ASCII files**
- **Currently linked to Arc-GIS 9, but can use other GIS**
- **Outputs: Maps of Erosion/deposition,
single rainstorm events, annual erosion,
Total off-site sediment discharge**

More details in poster and computer outside

Thank you.

If there is interest in this model,
we are prepared to come up for a day
to conduct a workshop
(in Rocky, Emerald, or on suitable
minesite in CQ).

If you are, please put your name
and contact details (phone
and email) on list near poster

Acknowledgements :

Australian Coal Association Research Program (ACARP)