Land reclamation and restoration challenges in the South African mining industry.

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Land Reclamation Specialist
• With the advent of mining, which impacts on large areas of productive agricultural land, the mining industry is forced to **relook their environmental policies.**

• There has been a comprehensive re-think about
  – the impacts of different mining operations and
  – the development of rehabilitation plans to
    • restore production potential of soils and
    • to minimize impacts on water resources
    • Restore biodiversity
Introduction

- Negative impacts are largely ignored when
  - Waste dumps and
  - Tailings dams of mines

in urban areas pose a
  - dust hazard and
  - polluted water

and is forcing a response from industry

- Many research projects focus on the protection against erosion
Apart from the different minerals being mined there are a range of mining techniques which have different impacts on the environment.
DMR rehabilitates derelict and ownerless mines, not abandoned sites

“Currently, there are about 5 858 derelict and ownerless mines in South Africa,

with the biggest number, some 1 037, in the Northern Cape, followed by 945 in the North West province.

The DMR’s yearly performance plan for 2012/13 committed it to the rehabilitation of 12 derelict and ownerless mines”

Megan Wait
17th September 2012
Mining Weekly
Abandoned, ownerless and derelict mines
(Unknown Source, 2009)
Vegetation of South Africa

Rainfall of South Africa
Future Coal mining in Mpumalanga
Surface coal mining vs agriculture
Sites of Biodiversity Value

Emery et al., 2002
Site Specific Rehabilitation

- Water erosion
- Wind erosion
- Sponcom – air pollution
- Generation & treatment of AMD or salinity
Pre-mining assessment (Biophysical environment)

- **Land Capability Classes / Land Use**
  - Arable (Crop production)
  - Planted Pasture (Hay)
  - Planted Pasture (Grazing)
    - *Dry land*
    - *Irrigation*
  - Natural Rangeland Grazing
  - Wilderness / Wetland

- **Soil / substrate**
  - [Chemical Properties](#)
  - [Physical Properties](#)
  - [Biological Properties](#)
**LAND USE (Agricultural potential) ASSESSMENT**

<table>
<thead>
<tr>
<th>Class</th>
<th>Production Potential</th>
<th>Erosion risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prime Farmland</td>
<td>high</td>
<td>none</td>
</tr>
<tr>
<td>Farmland</td>
<td>med - high</td>
<td>low</td>
</tr>
<tr>
<td>Poor Farmland</td>
<td>low</td>
<td>med</td>
</tr>
<tr>
<td>Permanent pasture</td>
<td>med-high</td>
<td>med</td>
</tr>
<tr>
<td>Rangeland</td>
<td>low</td>
<td>med</td>
</tr>
<tr>
<td>Sensitive rangeland</td>
<td>Low-none</td>
<td>high</td>
</tr>
<tr>
<td>Wilderness (Conservation)</td>
<td>none</td>
<td>high</td>
</tr>
</tbody>
</table>
Pre-mining environments
Pre-reclamation environments
Post reclamation / mining environments
Poor reclamation observations
Land Preparation and Soil Management (Pre-mining)

Pre-mining land use

Soil stripping

Mining

Soil placement

Post mining Land use
Rehabilitation Planning and design

<table>
<thead>
<tr>
<th>CLASS</th>
<th>SLOPE</th>
<th>EMPR Land Capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1:14 or flatter (&lt;4°)</td>
<td>ARABLE</td>
</tr>
<tr>
<td>2</td>
<td>1:7 - 1:14 (4°-8°)</td>
<td>GRAZING</td>
</tr>
<tr>
<td>3</td>
<td>1:7 or steeper (&gt;8°)</td>
<td>WILDERNESS</td>
</tr>
</tbody>
</table>

Land Preparation and Soil Management (Post-mining)
Revegetation

Rehabilitation monitoring
Monitoring and Assessment Methodologies

Agricultural Function

- Biomass production (Yield)
- Grazing capacity
- Basal cover
- Forage Quality
- Soil conditions
- Animal performance / production
- Botanical composition

Ecological Function

- Botanical composition
- Basal cover
- Soil condition indices
- Plant Successional status
- Grazing capacity

Ecological Index Methods

Landscape Function Analyses

Agricultural techniques
Addressing problem areas
Maintenance and land management systems

RECLAMATION OBJECTIVES

- Slope stabilization
- Surface stabilization
- Top soil protection

- Agricultural production
  - Crop production
  - Forage production
    - Irrigation
    - Dryland
  - Grazing
WHAT IS RECLAMATION SUCCESS?

• Meeting EMP Commitments
• Reinstating Agricultural Potential
• Economic Production Potential
• Achieving Biodiversity
• Achieving Ecological Stability
• Ensuring Ecosystem Functionality
• Illustrating Reclamation Progress - Monitoring Records

ADAPTIVE MANAGEMENT !!!!!!
Adaptive land use management and
MINE CLOSURE PLANNING

RECLAMATION SUCCESS

• Biophysical Environmental Monitoring
  (according to land capability class)
• Continuous Rehabilitation maintenance &
  management
• End land use systems economic evaluation
• Rehabilitated Land use training and involvement

ADAPTIVE MANAGEMENT RECOMMENDATIONS
Never start a RECLAMATION or RESTORATION PROJECT until all the resources are known, understood and available!!!
LaRSSA
LAND REHABILITATION SOCIETY OF SOUTHERN AFRICA

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