Building Minerals Education Capacity in Africa – The First Steps

David Laurence
Director
The Australian Centre for Sustainable Mining Practices
University of New South Wales
Sydney Australia

May Hermanus
(fmr) Director
Centre for Sustainability in Mining and Industry
University of the Witwatersrand
South Africa
Outline

- Africa the continent
- Africa’s mining potential
- Africa’s mineral education – a snapshot
- Case study - Zimbabwe
Mining and Development – A Philosophy

- Responsible development of mineral resources using sustainable mining practices can reduce poverty and improve the lives of people living in affected communities.
Africa Mining Vision (2011)

- The AMV envisages mining becoming “a key component of a diversified, vibrant and globally competitive industrializing African economy”
- “Strengthening institutions: building capacity and developing networks”
Africa – a snapshot
Africa – a snapshot

- Population, total (millions) 874.8
- Population growth (annual %) 2.5
- GDP (current US$) (billions) 1,266.0
- GDP per capita (current US$) 1,447
- GDP growth (annual %) 4.7
- Life expectancy at birth, total (years) 54.6
- Mortality rate, infant (per 1,000 live births) 69.4
- Literacy rate, youth female (% of females ages 15-24) 66.8
- Prevalence of HIV, total (% of population ages 15-49) 4.9 (World Bank 2011)
Issues limiting development

• Sovereign risk
• Governance
  • civil wars
  • transparency
  • bureaucracy
  • certainty of tenure
• Infrastructure
• Financing
• Safety
• Environment
• Community

• Skills
Africa’s mineral resources

• more than 60 metal and mineral products and 30% global mineral resources
• major producer of gold, diamonds, iron ore, coal, PGMs, uranium, nickel, cobalt, chromium, bauxite etc
• 5% of global exploration and mining budget
Commodities

- **Diamonds:** 46% of the world - Botswana 35%; Congo (Kinshasa) 34%; South Africa 17%; Angola, 8%
- **Gold:** 21% of the world - South Africa 56%; Ghana, 13%; Tanzania, 10%; and Mali, 8%
- **Uranium:** 16% of the world - Namibia 46%; Niger 44%; South Africa < 10%
- **Bauxite:** 9% of the world - Guinea 95%; Ghana 5%
- **Copper:** 5% of the world - Zambia 65%; South Africa 15%; Congo (Kinshasa) 13%
- **Platinum/Palladium:** 62% of the world - South Africa 97%
- **Coal:** 5% of the world - South Africa 99%
Mining’s (+O&G) Contribution to GDP (US$ millions - 2011)

- Algeria, 53808
- Angola, 44500
- Libya, 53544
- Nigeria, 78124
- South Africa, 29257
- Senegal, 313.2
- Tunisia, 4192
- Zambia, 633
- Mozambique, 143.7
- Namibia, 806
- Morocco, 8059
- Mauritania, 1329
- Mali, 713.4
- Niger, 384
- Botswana, 3946
- Burkina Faso, 1120
- Congo, Democratic Republic, 1850
- Ethiopia, 426
- Ivory Coast, 991
- Ghana, 2468
- Kenya, 201
- Guinea, 1156
- Lesotho, 126.5
- Ivory Coast, 991
Mineral Education Institutions 2012
A Snapshot

• Desk-top study
• Internet databases
• Contacts/networks
Institutions

- Algeria: 9
- Nigeria: 9
- South Africa: 18
- Egypt: 5
- Morocco: 7
- Angola: 4
- Democratic Republic of the Congo: 1
- Benin: 2
- Botswana: 1
- Burkina Faso: 1
- Burundi: 1
- Cameroon: 5
- Cape Verde: 2
- Central African Republic: 1
- Chad: 1
- Comoros: 1
- Equatorial Guinea: 1
- Eritrea: 1
- Ethiopia: 3
- Gabon: 2
- Gambia: 1
- Ghana: 1
- Guinea: 2
- Guinea-Bissau: 2
- Kenya: 2
- Liberia: 1
- Libya: 3
- Lesotho: 1
- Madagascar: 1
- Mali: 2
- Malawi: 1
- Mauritania: 1
- Mozambique: 1
- Namibia: 1
- Niger: 2
- Sao Tome and Principe: 0
- Somalia: 2
- Seychelles: 1
- Senegal: 3
- Sierra Leone: 1
- Sudan: 4
- South Sudan: 1
- Togo: 2
- Tunisia: 2
- Uganda: 2
- Zambia: 2
- Zimbabwe: 7
Minerals-related Programs

- No. of Institutions – 133
- Data from 49 countries
- 4 countries no data
- Masters – 41 institutions
- Bachelors - 105
- Diplomas - 18
Minerals-related Programs
Minerals-related disciplines
Mining’s (+O&G) GDP/Institution (US$ millions)

- Libya, 17848
- Angola, 11125
- Nigeria, 8680
- Botswana, 3946
- Namibia, 806
- Morocco, 1151
- Mozambique, 144
- Mauritania, 1329
- Senegal, 104
- South Africa, 1625
- Algeria, 5979
- Zambia, 317
- Tanzania, 220
- Tunisia, 2096
- Mali, 357
- Burkina Faso, 1120
- Congo, Democratic Republic, 1850
- Egypt, 4948
- Ghana, 2468
- Ethiopia, 142
- Lesotho, 127
- Guinea, 578
- Kenya, 101
- Ivory Coast, 496

ACSMP

UNSW
Results

- As expected, geoscience programs dominant compared with mining and metallurgical engineering
  - most geoscience programs non-mining related
- Many countries have no minerals education programs or dormant
- Very little evidence of sustainability courses
- South Africa is the benchmark
  - number of institutions and
  - ratio of mining’s contribution to GDP /minerals institution
Results

• Opportunities to build educational capability in many countries where
  • (GDP/institution) ratio is high eg: Angola; Nigeria; Algeria; Egypt; Botswana; Ghana; DRC
  • high mining growth rate or mining potential countries including Burkina Faso; Morocco; Tunisia; Madagascar; Ethiopia and Zambia
  • Political stability is returning - ?Zimbabwe
Zimbabwe and Mining

- One of reasons British settled
- Strong regulations
- > 40 commercial minerals
- Formerly numerous companies including Rio, Anglo etc
- Gold
  - Formerly no. 3 in Africa
- Copper
- Ferrochrome
- Nickel
- Coal
- Diamonds
Mining constraints

- Governance
- Access to foreign currency
- High risk investment
- Nationalising mineral assets
- Small scale miners harassment
- Brain drain/skills gap
Zimbabwe – Precious Metal Mines

Precious metals
Au, Ag, PGE's

Subcatchments
Rivers and dams/lakes

Mines
- Au: >10000 kg
- Au: 1000-10000 kg
- Au: 50-1000kg
- PGE: >10kg
- Silver: >1000 kg
Zimbabwe – Alluvial Gold and Artisanal Chrome Mining

Alluvial Au and small-scale Cr mines

Subcatchments
Rivers and dams/lakes
Small scale & alluvial mining
River segments with extensive alluvial mining
Numerous small-scale Cr workings

Great Dyke
Archaean greenstone
Proterozoic Piriwi Phyllite
Zimbabwe & Sustainable Mining

- Skills – technical, managerial
- Resource utilisation
- Safety and health
- Legacy sites
- Air quality
- Water – ARD etc
- Small scale mining
- Loss of biodiversity etc
Open cut coal mining
Rehabilitation – challenges
Rehabilitation - successes
Acid Mine Drainage
Zimbabwean minerals education

• University of Zimbabwe
  • German funded – 1990-96
  • No funding leading to closure – 1997-2012
  • Zimplats chair - 2013

• Bulawayo School of Mines
  • Camborne funded – 1990s
Building capacity – the challenges

• Needs
  • Infrastructure
    – Classrooms, laboratories
  • Faculty/staff
    – With relevant experience; research qualified

• Roadblocks
  • Funding
    • Government? Private sector?
    – Career path
      • Salary; promotion; research opportunities
    – Curriculum content
      • Cutting edge; sustainability
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Australian Centre for Sustainable Mining Practices