Earth Materials: The Foundation for Development

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Review of historical and present-day mineral demand and its connections to the economy and technology

UNESCO Lecture Series

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### Mineral Wealth and Social Justice

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Historical context - mineral extraction and human development

- Early history of human development and minerals
- Explorers and the colonial project
- Current trends
  - Optimal mining policy regimes
  - Responsible mineral supply chains
Early history of human development and minerals

- Stone Age
- Bronze Age
- Iron Age
History of mining in southern and east Africa

Ancient mines

- World’s first underground mine at Lion Cavern, Swaziland; built by San people (20 000-43 000 BP years)

- Engraved ochre from Blombos Cave was the first evidence of human art (75 000 BP years)

Iron, copper and tin smelting (c. AD 200)

- Venda-type iron smelting furnace from 1888

- Traditional products, such as, hoes, arrow heads, and assegais produced until ~1950s

Gold artefact found at Mapungubwe (c. 1220-1270)
Explorers and the colonial project

• The quest for natural resources (minerals included)
  • Africa
  • Americas
  • Australia and the Far East (Oceania)
Current focus on optimal resource exploitation:

**Key focus areas for mineral policy development**

<table>
<thead>
<tr>
<th>Focus Area</th>
<th>Description</th>
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<tr>
<td>Fiscal regime and revenue management</td>
<td>e.g. Whether fiscal regime is supporting, in revenue collection</td>
</tr>
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<td>Geological and mineral information systems</td>
<td>e.g. Whether the role of geology is understood by ordinary communities, with provisions for ongoing improvement of knowledge</td>
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<td>Building human and institutional capacity</td>
<td>e.g. Whether the country has policies and strategies on capacity development that: Promote a knowledge-driven and internationally competitive minerals economy</td>
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<tr>
<td>Artisanal and small-scale mining</td>
<td>e.g. Whether there is an adequate policy framework for artisanal and small-scale mining (ASM), and whether it is optimally aligned with the country’s development agenda</td>
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<td>Mineral sector governance</td>
<td>e.g. Whether tax issues are managed properly as evident from having mechanisms and instruments in place to provide for fair sharing of benefits</td>
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<td>Linkages, investment and diversification</td>
<td>e.g. Whether there are considerations for upstream or backward linkages evident in the existence of a local content policy</td>
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<td>Environment and social issues</td>
<td>e.g. Whether there are policies and legislation in place to prevent and mitigate environmental and social impacts of mining</td>
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Mineral policy development process

Understanding the key challenges
- Review current regime and national priorities
- Geopolitics and political economy of mineral resource extraction
- Social dynamics

Identifying key actors and potential roles
- Championed at the highest political level
- Coordinated by the ministry responsible for mineral resources
- Inclusive of all stakeholders with women and vulnerable groups

Formulating a collective agenda
- Consultative process with tradeoffs
- Theory of change
- Transformation of the sector

Implementation plan
- Stakeholder engagement
- In-depth analysis of the issues
- Gap analysis against good practice
- Understanding the key constraints
- Formulating solutions
- Policy drafting
- Implementation of policy, including M&E
Responsible mineral supply chains

https://doi.org/10.1016/j.resconrec.2019.02.040
Where do the minerals come from?

- Mineral extraction process – mining lifecycle
- The different types and levels
- World production of key minerals (African examples)
Mining Lifecycle

ICMM, Mining’s contribution to sustainable development (2012)
## ASM vs LSM

<table>
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<tr>
<th>Features</th>
<th>ASM</th>
<th>LSM</th>
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<tr>
<td>Who are they?</td>
<td>Dominated by local people, the operations being largely informal</td>
<td>Dominated by multinational companies</td>
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<tr>
<td>What minerals do they mine?</td>
<td>Dominated by precious minerals, but also include base metals and development minerals</td>
<td>All mineral commodities</td>
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<tr>
<td>What are the drivers for their activities?</td>
<td>Needs for livelihoods</td>
<td>Profit, providing input into industries in developed economy industries</td>
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**Dynamics between ASM and LSM**
- Conflict arising from competition for resources
- Need for coexistence models
## ASM vs LSM

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<tr>
<th>ASM</th>
<th>LSM</th>
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<tr>
<td>![ASM Image 1]</td>
<td>![LSM Image 1]</td>
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<td>![ASM Image 2]</td>
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<td>![ASM Image 3]</td>
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<td>![ASM Image 7]</td>
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<td>![ASM Image 8]</td>
<td>![LSM Image 8]</td>
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African contribution to global mineral wealth

https://www.weforum.org/agenda/2016/05/africa-is-rich-in-resources-but-tax-havens-are-keeping-its-people-poor/
Why are minerals important?

ECONOMIC TRANSFORMATION: MINERAL-BASED INDUSTRIALISATION

LIVELIHOODS: SUSTAINABLE LIVELIHOODS APPROACH

DEVELOPMENT MINERALS
Mineral based industrialisation: Resource Linkages

Spatial Linkages
Infrastructure (transport, power, ICT) and LED

Forward Linkages
Intermediate products => Manufacturing, logistics and other sectors (agriculture, forestry, fisheries, etc.)

Fiscal Linkages
Resource rent capture and deployment: long-term human and physical infrastructure development

Resource Extraction
Mining: Concentration, smelting, refining => metal/alloy

Knowledge Linkages
HRD: skills formation
R&D: tech development
Geo-knowledge (survey)

Backward Linkages
Inputs:
Capital goods
Consumables and Services

http://www.miningforchange.co.za/assets/files/SIMS_M4C.pdf
Adapted Sustainable Livelihoods Approach Framework

**VULNERABILITY CONTEXT**
- Human, social, natural, physical and financial determinants of health and wellbeing
- Factors affecting influence, access and control
- Factors contributing to or mitigating vulnerability

**POLICIES, PROCESSES AND INSTITUTIONS**
- Central and local government, private sector, organisations, policies and legislation
- Factors affecting influence, access and control

**LIVELIHOOD ASSETS**
- **HUMAN**
  - Health, education, labour, security, demographic composition
- **SOCIAL**
  - Networks, organisations, cohesion and trust, social safety nets
- **FINANCIAL**
  - Income, noncash assets, savings, access to credit and markets
- **NATURAL**
  - Land, minerals, water, air, fauna, flora
- **PHYSICAL**
  - Roads, schools, clinics, and hospitals, housing

**LIVELIHOOD OUTCOMES**
- Health and Wellbeing
- Socio-economic status
- Autonomy, voice and choice

*After: World Bank - Gender and ASM Toolkit, 2016*
Development minerals

“Development minerals are minerals and materials that are mined, processed, manufactured, and used domestically in industries such as construction, manufacturing, and agriculture.”

“Development minerals are economically important close to the location where the commodity is. They include industrial minerals, construction materials, dimension stones and semi-precious stones.”
Mining, Minerals, and the Sustainable Development Goals (SDGs)

- Environmental, Social and Governance (ESG) Criteria
- Mapping mining to sustainable development goals (SDGs)
- Mapping ASM to SDGs
Environmental, Social and Governance Criteria

Environmental, social and governance (ESG) criteria are a set of standards for a company’s operations that socially conscious actors use to ensure that economic activities, particularly those by investment, are implemented responsibly.

Environmental criteria are about stewardship of nature.

Social criteria consider interactions between stakeholder in the sector.

Governance criteria deal with leadership and strategy, and policy and regulation.
Mining and SDGs Mapping

Mining and the 17 SDGs: Indicative Priorities

Enhancement

Mitigation

Indirect
Moderately Direct
Very Direct
Positive contributions to nearly all SDGs, but also negative impacts

Formalization mitigates negative impacts and amplifies positive impacts on the SDGs
The future – value proposition

- Capacity building of mining economies regulatory capacity
- Community development agreements
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