Towards a holistic framework for responsible mineral resource management

Nic Bilham (University of Exeter Business School / Camborne School of Mines)
Responsible mining

Sustainable mining

Green mining

Responsible sourcing of minerals

Responsible sourcing and certification of minerals

Responsible procurement

Sustainable sourcing of minerals

Sustainable supply chain management

Green mineral supply chains

Chain of custody
Responsible mining  ?  Responsible sourcing

Image credit: Global Witness
Responsible mining

Maximise the positive impacts, minimise the negative impacts (economic, social, environmental)
A responsible mine should...

- Make money and provide resources!
- Comply with laws (and more – follow or even lead best practice)
- Ensure financial transparency and fairness
- Engage with communities and stakeholders throughout
- Avoid environmental pollution (air, water, soil...)
- Be resource efficient (i.e. extract as much ore as possible with as little waste as possible) and manage waste responsibly
- Use energy and water efficiently and responsibly (alongside communities’ other needs)
- Minimise greenhouse gas emissions
- Look after the health, safety and wellbeing of the workforce and local communities
- Provide fair labour opportunities and terms of work
- Not cause or exacerbate conflict or human rights abuses (e.g. re child labour)
- Protect and respect cultural heritage
- Plan for and deliver positive long-term legacies (beyond site remediation – employment, biodiversity, ecosystems...)

...which all mean different things for different places, communities, resources, deposit types
Responsible sourcing

• Manufacturing companies ‘supply chain due diligence’
• Upstream intermediaries put under pressure to meet customer demand
• An emerging shared priority – but not (usually) joined up with responsible mining
• Should include ‘secondary resources’ (recycling, etc) – but rarely considered together
‘Circular economy’...?

Image credit: Waste and Resources Action Programme (WRAP)
A more realistic circular economy model

Source: Ellen MacArthur Foundation
Responsible mineral resource management

Circular economy / secondary resource production / recycling etc

Linear supply chains / primary resource production / mining
Some partial typologies/frameworks...
Responsible mining schemes

- NamiRo/BGR report (Kickler & Franken, 2017): ‘Sustainability schemes for mineral resources: A comparative overview’

- In fact, a comparison of 17 schemes (mostly) for responsible/sustainable mining (looking ‘downstream’ along the supply chain) – with the aim of improving harmonisation

- Categorised by:
  - Minerals/commodities covered
  - Geographic focus
  - Soc/env/econ impacts addressed
  - Sector (ASM / LSM)
  - Extent of certification along supply chain
  - Assessment approach
  - Rigour/flexibility, etc
# Responsible mining schemes

<table>
<thead>
<tr>
<th>Commodity focus</th>
<th>Scheme</th>
<th>Target Region</th>
<th>Actual Target Sector</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>All minerals</td>
<td>GRI</td>
<td>Global</td>
<td>x</td>
<td>De-facto LSM: Applied especially by large companies due to the great number of reporting indicators. Originally destined for both sectors.</td>
</tr>
<tr>
<td>IFC</td>
<td>Developing Countries</td>
<td>x (x)</td>
<td>De-facto LSM: No information provided. From IFC case studies a focus on investing in large-scale projects was concluded.</td>
<td></td>
</tr>
<tr>
<td>IRMA</td>
<td>Global</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAC</td>
<td>Canada</td>
<td>x</td>
<td>Developed for use by MAC industrial members.</td>
<td></td>
</tr>
<tr>
<td>ICMM</td>
<td>Global</td>
<td>x</td>
<td>Developed for use by ICMM industrial members.</td>
<td></td>
</tr>
<tr>
<td>Gold and associated</td>
<td>Cyanide Code</td>
<td>Global</td>
<td>x</td>
<td>De-facto LSM: Developed to be adopted by both small and large scale mining operations, however, the program so far includes operations producing at minimum 25,000 ounces of gold annually (700 kg).</td>
</tr>
<tr>
<td></td>
<td>WGC</td>
<td>Global</td>
<td>x</td>
<td>Developed for use by WGC industrial members. WGC however also deals with external sourcing of gold from legitimate ASM.</td>
</tr>
<tr>
<td></td>
<td>FM</td>
<td>Developing countries</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FT</td>
<td>Developing countries</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>Tin, tantalum, tungsten, and gold</td>
<td>RCM</td>
<td>Great Lakes Region</td>
<td>x</td>
<td>Varying red and yellow flags for LSM and ASM; it is the only scheme with two distinct sets of requirements</td>
</tr>
<tr>
<td></td>
<td>ITSCI</td>
<td>Great Lakes Region</td>
<td>x</td>
<td>ITSI provides mineral traceability and due diligence for supply chains beginning at both ASM and LSM. However, there are almost no industrial mines in the Great Lakes Region but instead many semi-industrial companies and ASM.</td>
</tr>
<tr>
<td></td>
<td>CTC</td>
<td>DR Congo</td>
<td>(x)</td>
<td>Requirements developed especially for ASM which forms the majority of mining in the DR Congo. The original CTC from Rwanda was developed as minimum requirements for both LSM and ASM, though.</td>
</tr>
<tr>
<td>Natural stone</td>
<td>FS</td>
<td>China, India, Vietnam</td>
<td>x</td>
<td>Minimum requirements applicable to both ASM and LSM.</td>
</tr>
</tbody>
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<th>Actual Target Sector</th>
<th>Explanation</th>
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</thead>
<tbody>
<tr>
<td>Diamonds, gold, plat.</td>
<td>XF</td>
<td>India, China, Vietnam</td>
<td>x</td>
<td>Minimum requirements applicable to both ASM and LSM.</td>
</tr>
<tr>
<td>Aluminum</td>
<td>ASI</td>
<td>Global</td>
<td>x</td>
<td>Aluminium is extracted by a small number of industrial mining companies worldwide.</td>
</tr>
<tr>
<td>Coal</td>
<td>BC</td>
<td>Global</td>
<td>x</td>
<td>No information provided. Since BC was founded by major coal companies and members pay a fee of 35.000 Euro, we assume a focus on LSM though coal is also mined by ASM in some parts of the world.</td>
</tr>
</tbody>
</table>

From NamiRo/BGR report: ‘Sustainability schemes for mineral resources: A comparative overview’ (Kickler & Franken, 2017)
Responsible sourcing

• Typology of multi-tier ‘supply chain due diligence’ management approaches (Tachizawa & Wong, 2014):
  ▫ Direct influence through suppliers
  ▫ Indirect (through more capable intermediate suppliers)
  ▫ Third party approaches (working with NGOs, governments, competitors, etc)
  ▫ ‘Don’t bother’ (focus on first-tier suppliers only)

• Analysis of company characteristics associated with different approaches

• All focus on identifying and eliminating specific supply chain risk factors (mostly conflict minerals) – so how does this join up with mining schemes?
Certification and traceability

- Typology of ‘chain of custody’ approaches (van den Brink, Kleijn, Tukker & Huisman, 2019)
  - Identity preservation
  - Physical segregation
  - Mass balance model
  - Book and claim / credit trading
- Other emerging possibilities, e.g. blockchain technology
- Legislation and quasi-regulation (e.g. by trading exchanges) are a strong driver of traceability
Responsible/sustainable investment

- Typology of sustainable investment strategies (Global Sustainable Investment Alliance, 2018)
  - Negative/exclusionary screening
  - Positive/best-in-class screening
  - Norms-based screening
  - ESG integration
  - Sustainability themed investing
  - Impact/community investment
  - Corporate engagement and shareholder action
So why do we need a holistic framework?

• Limited value in comparisons based on partial typologies, out of context
• Clarify objectives (often unclear in existing ‘localised’ frameworks...)
• Look for opportunities to join up a fragmented and opaque system
• Synergies between circular economy and responsible mining/sourcing:
  ▫ Shared drivers – maximising net positive impacts, maximising resource efficiency
  ▫ Common need for traceability and certification of resources
  ▫ Need to link actor objectives with system objectives
  ▫ Can identify feedback loops missing from current CE models, e.g. reprocessing of mine wastes, ‘urban mining’
  ▫ Initiatives peripheral to linear and circular models may be overlooked – but could be central to an integrated approach to responsible mineral resource management
• Contextualise and complement (rather than replace) existing frameworks
Steps towards a holistic framework for responsible mineral resource management...

System objective:
• Meet the raw material needs of society
System objectives:
- Shape/constrain the raw material needs of society
- Meet these raw material needs
- Minimise negative social/environmental/economic impacts
- Maximise positive social/environmental/economic impacts
System objectives:
- Shape/constrain the raw material needs of society
- Meet these raw material needs
- Minimise negative social/environmental/economic impacts
- Maximise positive social/environmental/economic impacts
Consumer choice/pressure
Shareholder pressure
Leadership
Employee pressure
Responsible mining/supply and certification
Investor demands
Responsible sourcing and traceability
Legislation/regulation

Original content – credit: Bilham (2019)
Consumer choice/pressure
Shareholder pressure
Employee pressure
Leadership

Legislation/regulation
Investor demands

Responsible mining/supply and certification
Responsible sourcing and traceability

CSR reporting
Consumer labelling

Original content – credit: Bilham (2019)
<table>
<thead>
<tr>
<th>Standards (OECD guidelines, GRI, ISO, etc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tools, technologies, management approaches…</td>
</tr>
<tr>
<td>Responsible mining/supply mechanisms</td>
</tr>
<tr>
<td>Certification and traceability mechanisms (CoC, blockchain, etc)</td>
</tr>
<tr>
<td>Responsible sourcing mechanisms (SCDD, etc)</td>
</tr>
<tr>
<td>Whole-chain (e.g. commodity-specific) schemes and mechanisms</td>
</tr>
</tbody>
</table>

### Scope factors

<table>
<thead>
<tr>
<th>Mineral/commodity</th>
<th>End-use application</th>
<th>Geography</th>
<th>Soc/env/econ impact type</th>
</tr>
</thead>
</table>

### Map mechanisms and actor objectives, barriers etc to system objectives

<table>
<thead>
<tr>
<th>Actor drivers/objectives</th>
<th>Miner</th>
<th>Manufacturer</th>
<th>Investor</th>
<th>…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actor needs/facilitating factors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Actor barriers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
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Original content – credit: Bilham (2019)
PhD plan...

- Explore practices, drivers, needs, barriers etc for 3 case studies across the system, e.g.:
  - A mining company
  - A manufacturer
  - A mine waste reprocessing or urban mine project
- Map to system objectives, and to responsible mineral resource management mechanisms (mining schemes, supply chain due diligence approaches, CE models, standards, tools, technologies...)
- Make recommendations at actor and system level
- Refine initial responsible management framework
Thank you!

Questions?

Nic Bilham (University of Exeter Business School / Camborne School of Mines)

nb533@exeter.ac.uk

3rd International Critical Metals Meeting
1 May 2019