

Designing a Mine that Contributes to Sustainable Development

Responsible Large-Scale Mining: Global Perspectives

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Topics

- Every mine site is unique
- Mine life cycle
- Seven questions to evaluate the contributions to sustainable development
- Project development process
- Principles, practices, criteria and standards

Every Mine is Unique

- The location of the ore is not negotiable
- Developing a mine requires careful considerations of site conditions

Photo courtesy of Ron Schmiermund

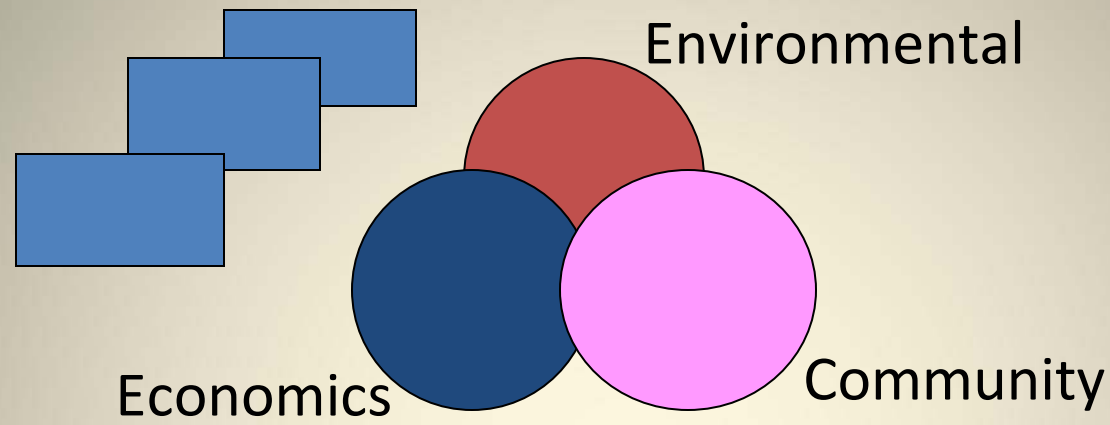


Mine Life Cycle

- Mine life cycle stages:
 - Exploration
 - Development
 - Feasibility study
 - Baseline studies and environmental assessments
 - Funding and permitting
 - Construction
 - Operations
 - Closure
 - Post-Closure

Technology

Scale: local, regional, national, global



Governance



Time

Multi-Generational

Elements of Mining and Sustainable Development

Seven Questions to Sustainability

- www.iisd.org/mmsd/publications.asp
- Objectives:
 - To develop a set of practical principles, criteria, and/or indicators that could be used to guide or test the exploration for, design, operation, closure, post-closure and performance monitoring of individual operations, existing or proposed, in terms of their compatibility with concepts of sustainability; and
 - To suggest approaches or strategies for effectively implementing such a test/guideline.
- Importance:
 - Clarifying what sustainability means in practice
 - Establishing consistency across applications
 - Clarifying the case for sustainability

Seven Questions to Sustainability

1. **Engagement.** Are engagement processes in place and working effectively?
2. **People (Human Wellbeing).** Will people's wellbeing be maintained or improved during and after the project or operation?
3. **Environment (Ecological Wellbeing).** Will the integrity of the environment be taken care of in the long term?

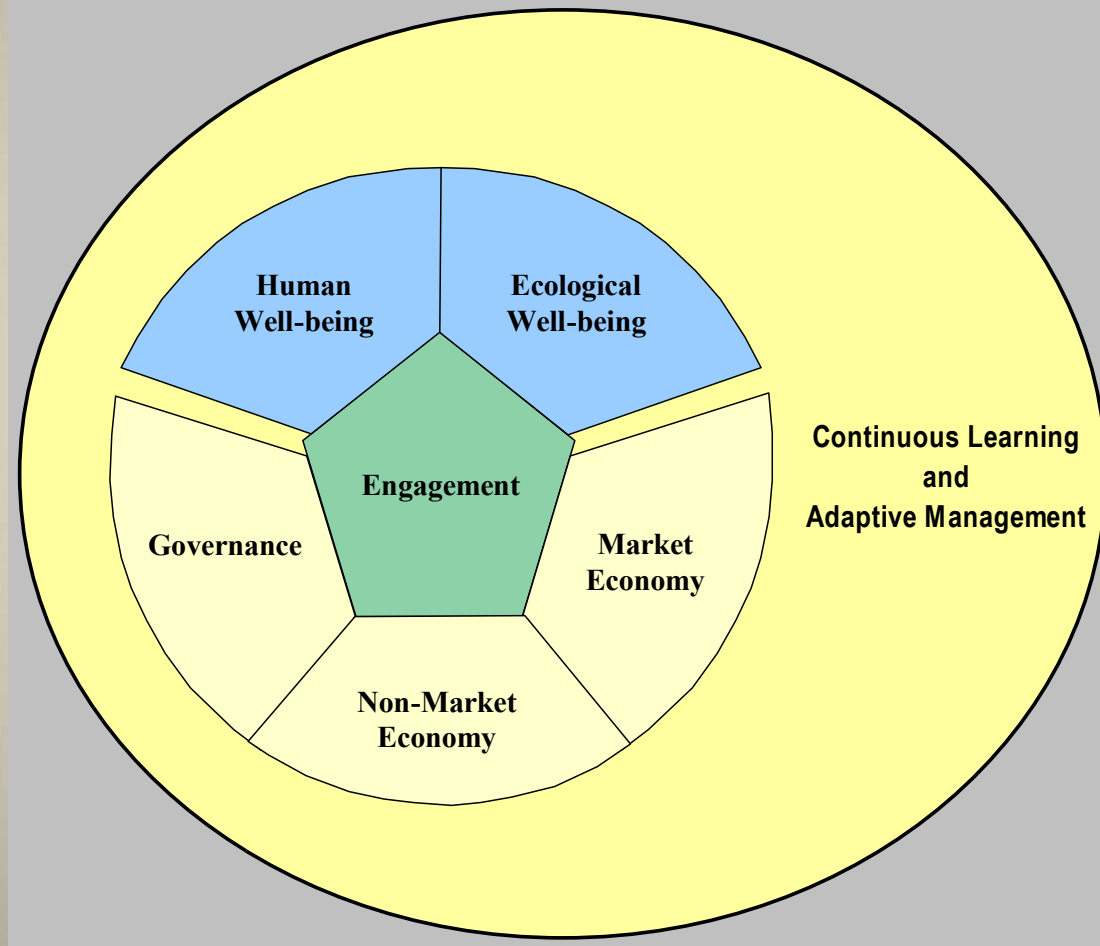
Seven Questions

4. **Economy (Market Economy)**. Is the economic viability of the company assured; is the community and regional economy better off not only during operation but into post-closure?
5. **Traditional and Non-Market Activities (Non-Market Economy)**. Is the viability of traditional and non-market activities in the community and surrounding area maintained or improved with the project or operation?

Seven Questions

6. **Institutional Arrangements and Governance**. Are the rules, incentives, and capacities in place now and as long as required to address project or operational consequences?
7. **Synthesis and Continuous Learning (Continuous Learning and Adaptive Management)**. Does a synthesis show the project to be net positive or negative for people and ecosystems; is the system in place to repeat the assessment from time to time?

Seven Questions to Evaluate the Contributions to Sustainable Development



Graphic courtesy of Ian Thompson, On Common Ground

**Project Development Process:
Designing a mine – from concept
to metal production**

Design Process

- Location of the ore is fixed, however there are options for the development of the mine
- Identify options for processes and locations of facilities
- Important concept: decisions made early in the design process will determine the long term performance of the mine
- Evaluate the options and develop a screening process

Screening Criteria

- Screening criteria should be based on the contributions to sustainable development, must include at least:
 - Environmental
 - Social/community
 - Governance
 - Economics
- There must be a clear description of the relative importance/weight of each criterion

Outcome and Next Steps

- Select preferred mine design, including facility locations and processes
- Refinement of design/final design
- Development of construction planning
- Procurement
- Construction
- Start-up

Principles, Practices, Criteria and Standards

Principles

- Sustainable development
- Equity
- Participatory decision making
- Accountability and transparency
- Precaution
- Efficiency
- Polluter responsibility (the “polluter pays” principle)

Source: Miranda, M., Chambers, D. and Coumans, C. (2005) Framework for Responsible Mining, www.frameworkforresponsiblemining.org

Practices

- Full life cycle assessments
 - E.g. closure planning must be done during initial mine design; accepted practice in US
- Seven questions for contribution to sustainable development
 - E.g. use this approach for environmental and sustainable development audits of operations, previously applied by Kennecott Minerals

Practices (2)

- Various handbooks prepared in Australia by the *Leading Practice Sustainable Development Program for the Mining Industry* (<http://www.dcita.gov.au/cca>)

Practices (3)

- Example of evolving sustainable development practices (from presentation by Vânia Somavilla, Director of Sustainability, Vale):
 - V 1.0 - compliance
 - V 2.0 – responsible operator, reclamation, protection of water and air quality beyond compliance
 - V 3.0 – catalyst for regional development; must leave region better off than before mining
- The corporate approach of Rio Tinto: “Net positive effect”

Criteria

- Federal, state and local regulations, including water and air quality, dam safety, explosives, etc.
 - This is standard practice in the development of new mines
- Corporate criteria/targets
 - E.g. desulfurization of tailings; Rio Tinto Resolution copper mining project, Arizona

Criteria (2)

- World Bank and other recognized international criteria
 - E.g. these were implemented in the development of the Antamina mine in Peru
- International Cyanide Management Code

Standards

- ISO 14001 – Environmental management systems
- ISO 26000 – Social responsibility
- IFC Environmental and Social Standards
 - E.g. all projects where funding requires adherence to the Equator Principles
- Various laboratory testing standards

Closing Comments

- Large scale mine development must clearly address the contributions that it will make to sustainable development
- A life cycle management approach must be adopted in the design and development of all project components
- Local communities and other stakeholders must be engaged and their expectations must be incorporated in the overall decision framework