



Mongolia:
Enhancing Resource
Management through
Institutional Transformation

Lifecycle of a Mine

Stage 3: Production

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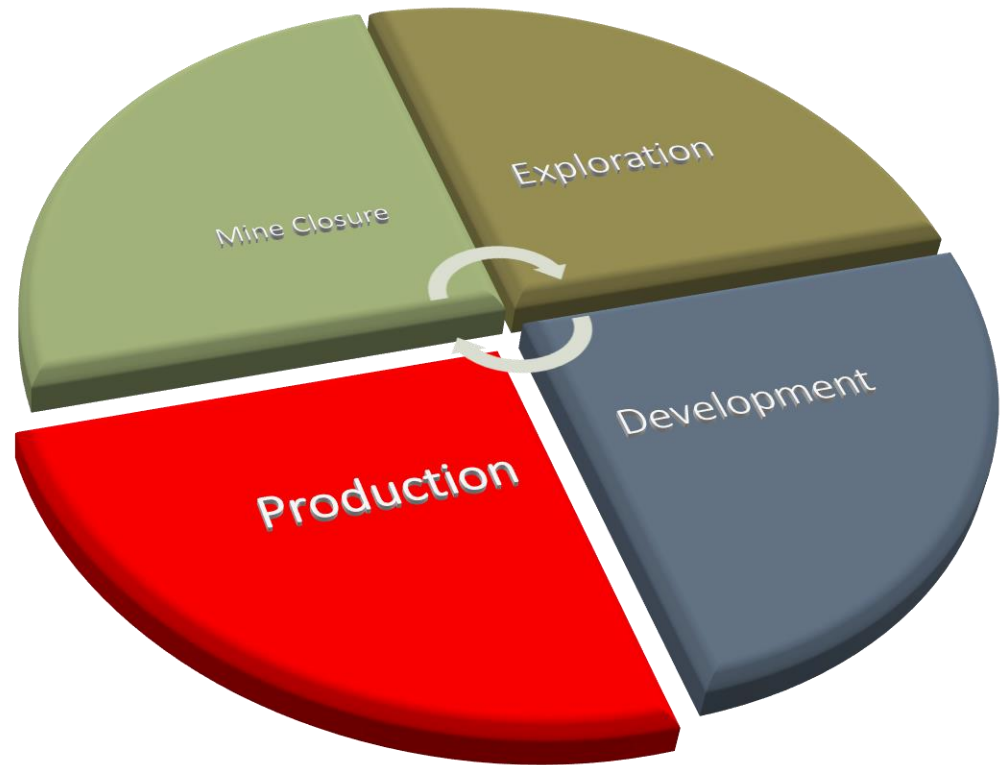
Section 3: Production

Production

Mine operation is the third phase of the mineral developmental cycle. It is the process of producing a mineral or other product for the benefit of society, stakeholders and shareholders.

A mine is operating when earth and/or rock are being excavated from the ground and the processing plant is producing saleable product.

There are two types of mines: underground and open pit.



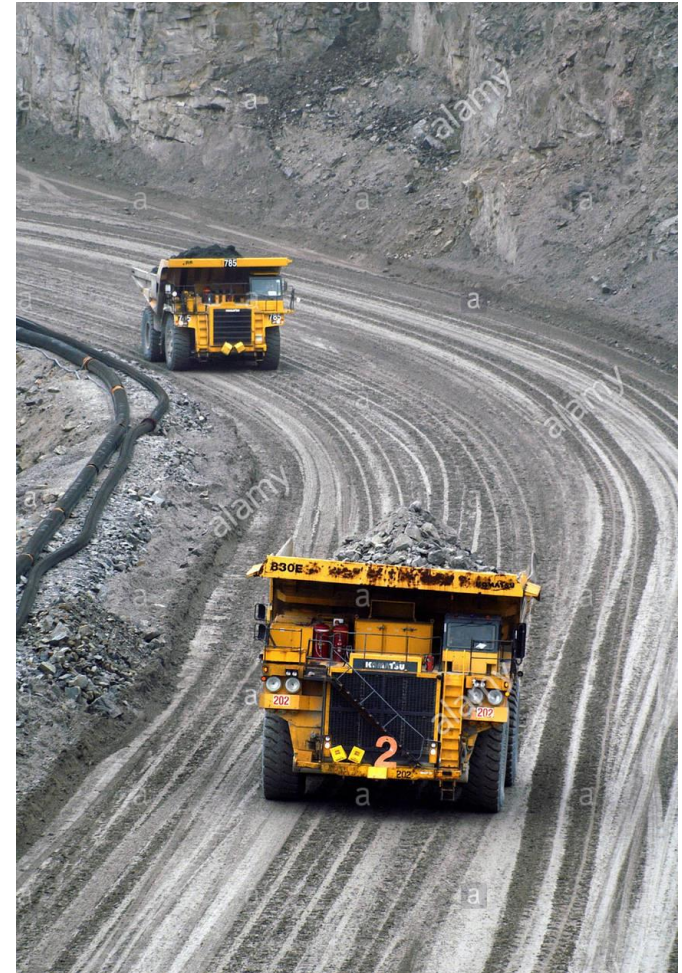
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A mine operation has four main work areas:

- excavation areas
- processing plant
- waste storage, and
- support facilities.

The excavation areas are where earth and rock containing the mineral are excavated.

Typical jobs for excavation areas include haul truck drivers, excavation equipment operators and blasters for above ground mines and underground miners, equipment operators and blasters for underground mines.



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Surface mining operation or open pit mining.



Section 3: Production

Underground mining.



Section 3: Production

Mineral Processing

The processing plant (mill) separates the rock that contains saleable material (**ore**) from the surrounding rock that is not saleable (**waste rock**).

Mineral processing is done in multiple stages (e.g., concentrator or mill, wash plant) and uses different processes depending on what is being mined.

Some mine operations do not have a processing facility on site so the mined material is sent elsewhere to be processed.



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Waste Rock Pile



Section 3: Production

Lay down area and
warehousing.



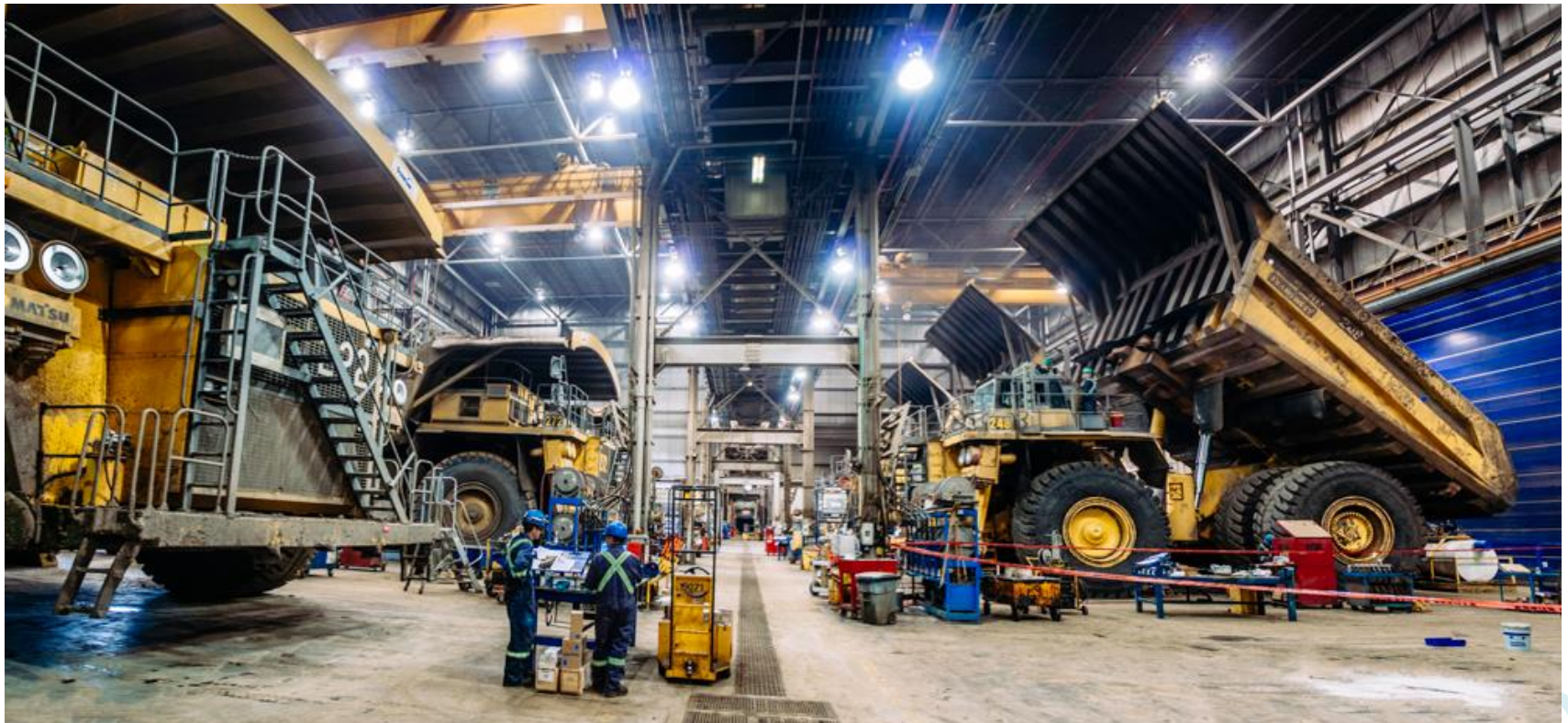
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Worker accommodation



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Equipment repair shop



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Mines require power. This may come from coal, diesel or other types of fuel ...



... or from renewable forms of energy

Section 3: Production

Waste storage facilities include areas for both waste rock and the material rejected from a mill (called **tailings**).



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Every mine operation has mining and processing target rates.

One key element is to determine rates of mining and processing that will ensure that all costs can be covered from sales of the product.

These rates are evaluated during the feasibility studies before a mine starts operating.

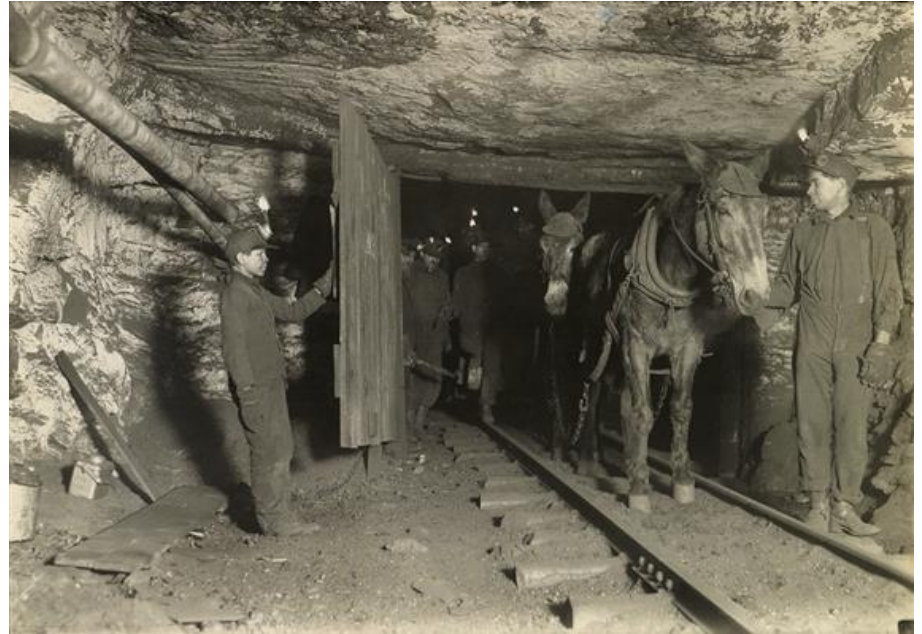
The rates are calculated to provide the highest level of efficiency (need to match the capital investment, size of the ore body, and the life of the mine).

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Time Frames

The operating life of a mine can be as short as several years or as long as 50-100 years or more.

It can also be seasonal or can be operating all year, and shipments can be seasonal (if access is difficult).



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Factors that affect how long a mine will operate include:

- **Commodity** price (demand, competition, and prices for the product in the world market)
- Production costs and production rates
- Quality (grade) and quantity of ore that is economic to mine in the deposit
- Size and shape of the body of material to be mined
- Best possible economic mining rates
- Mining methods, equipment, and associated costs
- Depth of mining required below surface
- Ground conditions and ability to mine safely, and
- Location.

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Costs

Mining uses labour, capital, energy and other inputs, all of which cost money. During mine operations, labour is usually the highest cost.

Power, fuel and other consumables - shotcrete, heavy equipment, drill bits, tires, spare parts, etc. - are the next greatest expense.



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Transportation and logistics



Section 3: Production

Location

The location of a mine has a major effect on both construction and operating costs.

If the mine is located in a remote area, the mine operator may have to build a winter road to bring in supplies and take out ore or concentrate and install a power plant to generate electricity.

A major expense for remote mines is transportation costs to fly workers in and out of the mine.



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Workforce

When a mine goes into operation, it needs to hire both permanent employees and contractors.

If local communities do not have candidates with the required skills and professional qualifications, the company must look “outside” and the recruitment search is extended regionally, nationally, and sometimes internationally.

Mining operations often have a work force that work on a rotational basis such as 2 weeks on and 2 weeks off.



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Training

All new employees receive orientation training before starting on the job.

This training helps employees to understand the operation, but more importantly, to make sure they are safe on the job.

Other training for employees may include on-the-job training, cross-cultural training, trades training, apprenticeships, and literacy and life skills training.



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Mine Expansion

Some mines may experience an expansion phase.

Mine expansion can include:

- Enlarging the existing mine
- Opening up more mine areas
- Buying more equipment and hiring more people
- Expanding the processing plant to process more ore
- Changing the processing plant to process faster; and
- Doing more exploration work to try to find more ore

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Legislative Requirements

All mines must operate according to standards:

- 1) A country mining law and regulations
- 2) A company's own internal standards for Health, Safety and Environment
- 3) International Standards for HSEQ – Health Safety Environment, Quality Management
 - 1) ISO 14001
 - 2) ISO 45001

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The company will be entitled to operate by completing and having these documents.

In the start:

- License
- Feasibility Study
- Detailed environmental impact assessment
- Protocol proving the coordinates of the site boundary
- Commissioning protocol for the State Committee receipt
- Land use permission /Contract and certificate obtained under soum governor's order/

Annually:

- Annual Exploration and Mining Plan
- Environmental Management Plan
- Water permission /conclusion, contract and certificate/

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Environmental Monitoring

Companies and governments continually monitor the mining operation to test environmental performance, demonstrate compliance with environmental legislation, refine operational practices, and safeguard the interests of both the mining company and the surrounding community.

In Mongolia the report on the implementation of the EM Plan must be submitted to the amaig Environmental department prior to Nov. 1. It must be at 80% compliance with the EM plan to maintain license to operate the following year.



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Health and Safety

The International Standards Organization (ISO) has developed a new standard, ISO 45001, *Occupational health and safety management systems - Requirements*, that will help organizations reduce this burden by providing a framework to improve employee safety, reduce workplace risks and create better, safer working conditions, all over the world.

The standard was developed by a committee of occupational health and safety experts, and follows other generic management system approaches such as ISO 14001



Section 3: Production

Jobs During Production

Underground Miners
Heavy Equipment Operators
Trades Persons (electrical, millwright, mechanics, carpenters, welders, instrumentation technicians, heavy duty technicians)
Environmental Advisors
Accountants
Warehouse workers
Purchasers
Planners
Community relations
Drillers and Blasters
IT specialists

Safety Advisors
Site Services
Housekeeping
Kitchen staff
Geotechnical advisors
Surveyors
Humans resources
Trainers
Security
Health and hygiene
Legal
Marketing
Geologists
Engineers (Lots!)

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Other Economic Opportunities

What are other economic opportunities?