Environmental Impact Assessment Guidelines for Mine Development and Tailings Disposal

Overview

Disposal of tailings constitutes one of the most significant areas of potential environmental risk associated with coastal and island mine development. Placing vast quantities of waste rock or tailings in the environment smothers habitat, changes watercourses and displaces people. It can contaminate air, land and water, and otherwise affect neighbouring and especially downstream uses.

This fact sheet summarises knowledge about tailings disposal in tropical coastal areas, and the associated environmental risks. It also provides a clear outline of the main licensing procedures and gathering of environmental data at each stage of mine development from exploration to closure.

This information is intended specifically for the Pacific islands region, for use by Regulatory Agencies and the mining industry. However, it can also be used by concerned citizens for information and a checklist of potential actions.

For more detailed information, see the complete manual, *Environmental Impact Assessment Guidelines for Mine Development and Tailings Disposal at Tropical Coastal Mines* (SRS 95) available from the South Pacific Regional Environment Programme, Apia, Western Samoa.

Basic principles

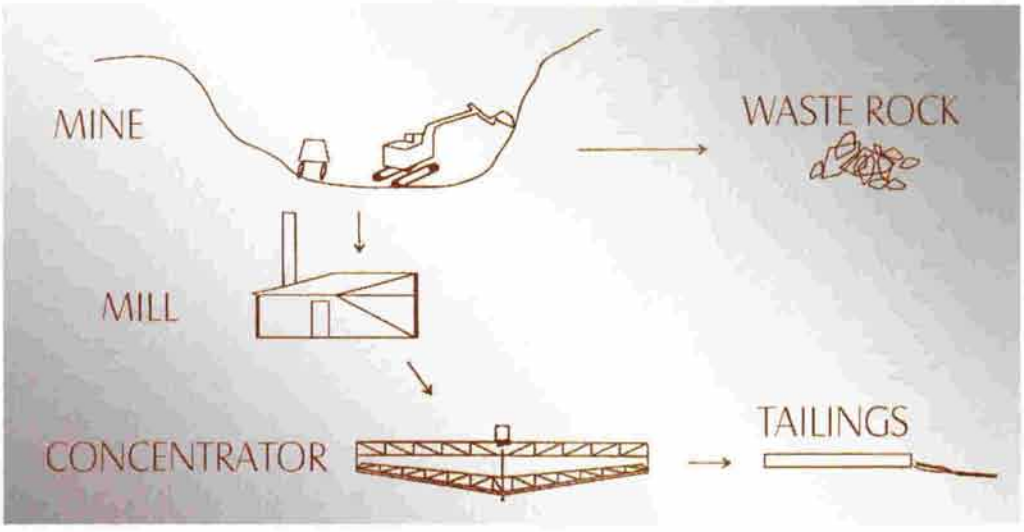
The Guidelines have adopted the following basic principles:

1. There will be compensation to persons who are relocated because of mine development, or who lose the use of land or other resources.
2. After the mine is closed and the ore body removed, the habitat will be reclaimed.
3. The industry concerned will bear the costs of government action through its Regulatory Agencies by way of appropriate financial arrangements.

Production of waste rock and tailings

The mining process for metal extraction usually consists of mining and milling. The *mining* component is the extraction of metal-bearing ore from rock. The *milling* component generally crushes, grinds and extracts a concentrate in a series of mechanical and/or chemical processes. At both stages waste is produced.

Tailings is a waste product from the milling process. It is a finely ground waste, composed mainly of silt, which has had the mineral product removed. The amount of tailings produced is usually huge compared to the amount of metal extracted.



Wastes produced through the mining and milling processes

Tailings disposal methods

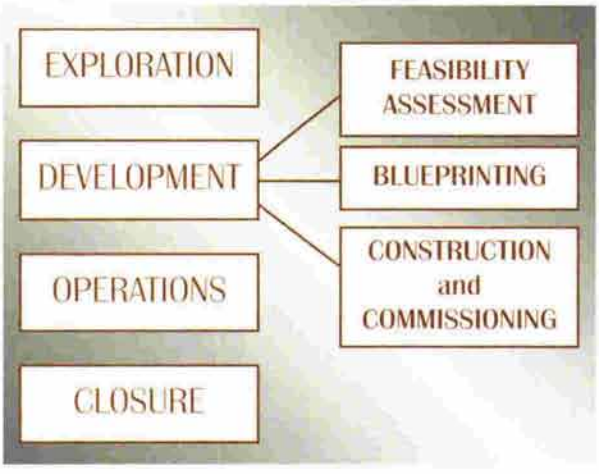
There are several options for disposing of tailings.

- Return to source (the pit or underground)
- Containment behind a dam on land
- Discharge into a river, with uncontrolled dispersal downstream
- Discharge into a lake
- Discharge into the sea

Each option has associated risks. Environmental Impact Assessment during mine development helps determine the best location for the mine and the best tailings disposal method.

Overall environmental protection depends on a clear sequence of licensing procedures and gathering of environmental data at each stage of mine development from exploration to closure.

Stages in developing a mine



Exploration

✪ At the **exploration** stage the **Developer** should:

1. Apply for an exploration licence, and provide preliminary information on existing landowners and resource users in the area under application.
2. Receive copy of mining environmental guidelines.
3. Cooperate with Regulatory Agency and consult with landowners and resource users.
4. Receive or be refused exploration licence.
5. Comply with requirements if the licence is received.

✪ At the **exploration** stage the **Regulatory Agency** should:

1. Receive application for the exploration licence.
2. Provide applicant with a copy of the mining environmental guidelines.
3. Approve or reject application for exploration license.
4. If approve, apply usual national licensing conditions.

Development: Feasibility assessment

Production of a conceptual plan and a feasibility report, containing a preliminary environmental screening

✪ In the **feasibility** stage the **Developer** should:

1. Develop a conceptual mine plan and a preliminary Environmental Impact Assessment (EIA) for a feasibility report, identifying sources of previously available information and any new data obtained. The feasibility report should include information on:
   - the ore body and mill location
   - the milling and concentration processes to be used
   - processing chemicals to be used
   - water sources needed including hydrological data
   - power demands and energy sources
   - necessary access roads, worker accommodation, and other infrastructure
   - expected wastes (types, rates of production, total amount, chemical composition and ARD [Acid Rock Drainage] Potential)
   - site(s) for marginal ore stockpiling, expected amounts, and area(s) to be affected
   - waste disposal systems and receiving areas
   - potential social consequences from resource losses
   - baseline environmental studies

These baseline environmental studies should include:

- ▼ weather data, hydrological data, marine current and tidal data (and sources of information)
- ▼ preliminary models of waste disposal including dilution, dispersion and assimilation, showing where final deposition will occur
- ▼ inventory of other local resources identifying which are at risk
- ▼ basic ecosystem parameters such as plant and animal communities, and endangered species
- ▼ inventory of sites of traditional importance to local residents

2. Provide initial funds for needed actions by the Regulatory Agency.
3. Explore with community representatives a community review group to meet routinely during development and operations.
4. Prepare the feasibility report and submit it to the Regulatory Agency. This is to include an executive summary understandable by the public.

✪ In the **feasibility** stage the **Regulatory Agency** should:

1. Review the feasibility report, and decide whether the development can proceed to detailed design stage (blueprinting) and final decision.
2. Define environmental impacts of initial concern.
3. Identify remedial action needed to minimise conflicts over resources.
4. Request more assessment data if needed.
5. Approve the conceptual plan in principle, subject to remedial action needed, or deny permission to proceed further.

Note: Approval in principle is not a license to proceed. More detailed investigation of risks may show that some are unacceptable.

Development: Blueprinting

During the blueprinting phase, a detailed mining plan is completed, and all the associated environmental risks identified. Ways to minimise impacts from the mine are defined so as to avoid conflicts later on in the development.

✪ In the **blueprinting** phase, the **Developer** should:

1. Develop a detailed mine plan containing as much supporting detail as possible. This detailed mine plan should:
   - clearly identify the total production of wastes over the lifetime of the mine
   - detail water extraction systems specifying sources, extraction procedures, pipelines, rates of use and expected changes during mine lifetime. Update initial hydrological data
   - provide details of all waste disposal systems
   - detail energy demands through mine lifetime and means for meeting them
   - detail receiving areas for wastes, and update weather and tidal/current data
   - describe potential for "acid rock" generation and relief measures to be used
   - provide detailed inventory of resources at risk, including seasonal variability, to provide a basis for comparison after the mine is operational
   - provide a plan for monitoring the mine development
   - detail any special environmental constraints to be implemented during construction and commissioning
   - provide remedial plan for social impacts such as relocation of landowners and possible compensation
   - describe concept for eventual Closure Plan, including general reclamation targets for affected areas
2. Conduct initial community group meetings, documenting proceedings, resource uses, and any social impact assessment surveys.
3. Provide a comprehensive EIA one year prior to desired start-up date.
4. Provide further funds to meet costs of Regulatory Agency reviews.

The mine monitoring plan should include:

- all parameters to be measured
- methods of measurement and testing
- personnel responsible for testing
- cost estimates including costs to Regulatory Agency for reviewing the monitoring data

✪ In the **blueprinting** phase, the **Regulatory Agency** should:

1. Review all documents provided, and request more information if required for a final decision whether mine may proceed.
2. Define issues of concern and specify environmental controls such as rate and composition of waste discharges.
3. Review and approve tailings disposal system.
4. Define remedial action needed and compensation costs, and estimate own costs.
5. Identify any further assessments needed.
6. Define any environmental constraints during construction and commissioning, referring to the full Guidelines for a description of these constraints.

Development: Construction and commissioning

Construction risks include changing flows of streams and rivers, hence causing downstream impacts. Commissioning risks include release of wastes at levels in excess of those permitted during operation.

✪ During **construction**, the **Developer** should ensure that the construction contractor follows environmental constraints imposed at that time, and the **Regulatory Agency** should make frequent site visits to inspect and document progress of the work. The Agency may also use its authority to halt construction if constraints are violated.

✪ During **commissioning**, the **Developer** should monitor wastes as required. Again, the **Regulatory Agency** should make frequent site visits to document findings, and review social impacts and loss of resources by local landowners and other industries. If constraints are violated, the Regulatory Agency should use its authority to halt commissioning immediately.

Coastal mining in the Pacific islands requires careful planning to protect fragile island environments. Photo: SPREP

Operations

- Throughout the working life of the mine, the **Operator** should monitor the environmental impacts of the mining. The tailings discharge should be subjected to specifically timed monitoring to check that constraints are not violated. The tests outlined in the Guidelines should be carried out by the Operator (see diagram below).
- The role of the **Regulatory Agency** during actual operation of the mine is straightforward. The Agency should review all reports from the Operator and make spot tests and checks of monitoring procedures. It also reviews operational, monitoring and reporting procedures.

Closure

- The **Operator** should begin developing a closure plan five years before the intended closure of the mining operation. This must be reviewed and negotiated with the Regulatory Agency. This plan should aim to reclaim land and waste disposal sites for beneficial uses. The Operator should monitor the recovery of the reclaimed land, the social response to this recovery, and post a bond for implementing the recovery plan. The Operator should also provide an annual report to document the monitoring process.
- The **Regulatory Agency** should review the closure plan, and collect any necessary additional information to set the closure bond. It should also review the annual reports and charge necessary remedial measures to the bond. The Regulatory Agency should give approval to the Operator to terminate the monitoring process.

Further information

The South Pacific Regional Environment Programme has experience and knowledge of regulations that apply to mine development in the region. For further information please contact:

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The responsibilities of the operator during the operational life of the mine.

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