

MINE CLOSURE: A Toolbox for Governments



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Acknowledgements

This report—Mine Closure: A Toolbox for Governments—is a product of the World Bank Energy and Extractives Unit (IEEXI). The World Bank task team is comprised of Boubacar Bocoum, Lead Mining Specialist and Task Team Leader; Kirsten Lori Hund, Senior Mining Specialist; Narine Tadevosyan and Gary McMahon, Consultants; and Gloria Whitaker, Program Assistant (all from IEEXI). The work was supported by an extended team composed of Ruxandra Floroiu, Lead Environmental Specialist (SAEE2); Gayane Minasyan, Lead Environmental Specialist (GEN03); and Qing Wang, Senior Environmental Specialist (GEN03).

The World Bank task team acknowledges the contributions of SRK, the author of this document, prepared by Jeff Parshley PG, CPG, CEM, Group Chairman and Corporate Consultant; Hilde Van Vlaenderen, PhD, Principal Consultant (Social and Environmental); Zhanar Faizuldayeva BSc, Consultant (Environmental); Adam Nott BA, JD, LL.M, General Counsel; Ian McIntosh, Consultant (Mine Engineering), and Aaron Fultz MSc, Principal Advisor (Technical Communication). SRK's in-country partners included Gergili LLC (from Georgia) and Ameria MAS (from Armenia).


The World Bank task team would also like to thank Riccardo Pulliti, Global Director Energy and Extractives (IEEDR); Sebastian Molineus, Country Director (ECCSC); Christopher Sheldon, Practice Manager (IEEXI); Sylvie K. Bossoutrot, Country Manager (ECCAR); Abdulaziz Faghi, Program Leader (IECDR); Wolfhart Pohl, Lead Environmental Specialist (GENDR); Keith W. Mclean, Lead Governance Specialist (GGODR); Morten Larsen, Senior Mining Specialist (IEEXI); Satoshi Ishihara, Senior Social Development Specialist (SEAS2); and the many other colleagues from the World Bank including those in the country offices of Armenia, Georgia, and Kyrgyz Republic for their support.

The World Bank task team would like to also recognize the contribution of mining companies, governments, and civil society organizations in Armenia, Georgia, Kyrgyz Republic, and elsewhere for their participation in the country-specific studies and consultations.

The World Bank would also like to thank the Extractives Global Programmatic Support trust fund for financing this work.



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Abbreviations



APEC	Asia-Pacific Economic Corporation
ARD	acid rock drainage
BC	British Columbia
BLM	Bureau of Land Management
CA	California
EIA	environmental impact assessment
EPA	Environmental Protection Agency
GIIP	good international industry practice
ICMC	International Conference on Mine Closure
ICMM	International Council on Mining and Metals
IFC	International Finance Corporation
IGF	Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development
LOM	life of mine
ML	metal leaching
MMSD	Mine Minerals and Sustainable Development
NAC	Nevada Administrative Code
NGO	non-governmental organization
NM	New Mexico
NSW	New South Wales
PEOA	Protection of Environmental Operations Act
PNG	Papua New Guinea
PPP	public-private partnerships
QLD	Queensland
SMARA	Surface Mining and Reclamation Act
SMART	specific, measurable, assignable, realistic, time-related
SPE	special purpose entities
SPV	special purpose vehicles
SRCE	Standardized Reclamation Cost Estimator

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1 Introduction

SRK Consulting (U.S.) Inc. has been commissioned by the World Bank Group to develop a toolbox for governments to use in the development of mine closure governance frameworks. The proposed tools and checklists are based on good practice for mine closure including technical, social, environmental, and cost estimating aspects. Guidance is also provided for financial assurance implementation, management, and release.

Mining is a finite economic activity that provides temporary socioeconomic benefits to communities, shareholders, and owners. In low- and middle-income countries, it can also constitute a significant portion of the economy (Figure 1). The benefit of economic activity lasts beyond the life of the mine depends on many policy choices including the use and allocation of resource revenues as well as whether post-closure socioeconomic impacts are reconsidered when undertaking the project. In addition to the socioeconomic benefits, long-term social and environmental impacts exist, which if not properly managed, can become complex issues and liabilities in the form of abandoned and improperly decommissioned mines.

The global history of abandoned sites and their consequences has resulted in the rise of governance frameworks intended to prevent abandonment and ensure that mine sites are closed in a safe and sustainable manner. The global development of these regulations has been uneven with some jurisdictions still having little or no regulation in the matter, while others possess a robust governance



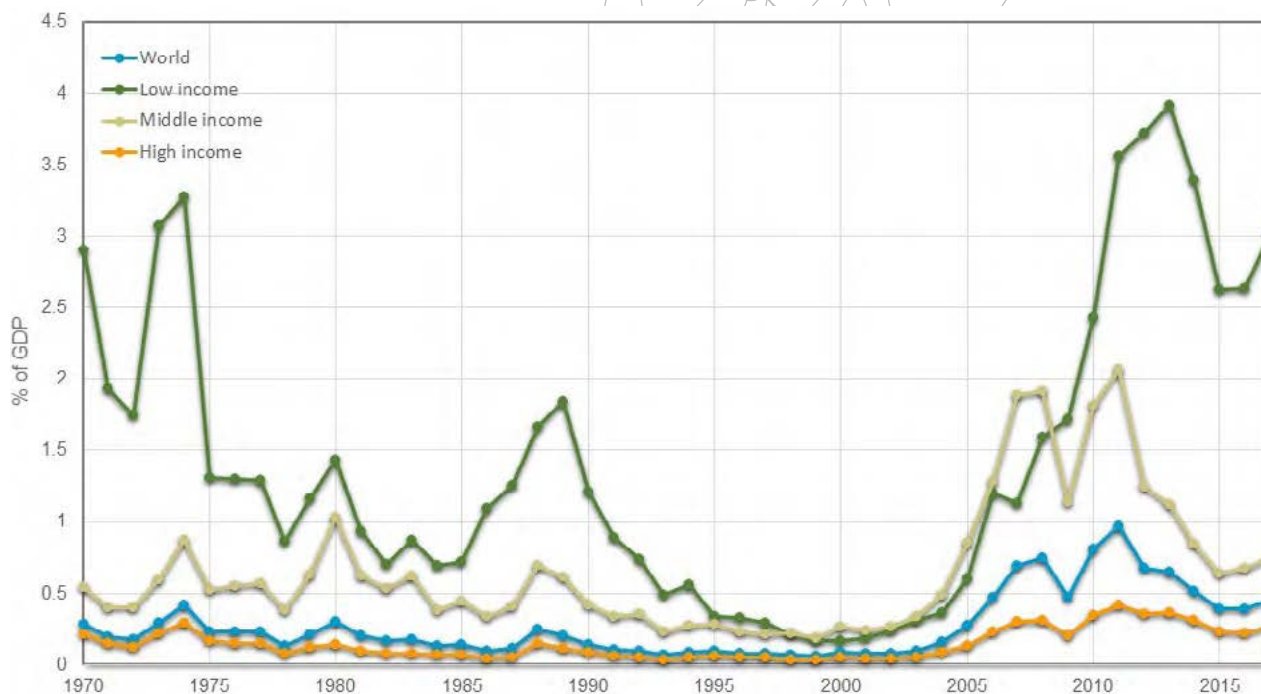
framework. In other words, methods for addressing closure, financial assurance of those obligations, and remediation of legacy mines vary.

The objective of this toolbox is to provide policy makers, governmental administrators, and lawmakers with the information needed to develop a broad governance framework that reduces the risks of an improperly managed mining industry and helps ensure successful mine closure. Every jurisdiction is unique and will require a solution that fits their legislative, cultural, economic and historical context. The toolbox is meant to provide examples of good international industry practice and basic legislative requirements that should be in place to facilitate closure. It also provides practical guidance and explanations for the key components of and process for developing a governance framework specific to mine closure. The tools found herein are based on GIIP including ICMM's "Integrated Mine Closure: Good Practice Guide"¹, APEC's "Mine Closure Checklist for Governments"², and other guidelines^{3,4,5}, frameworks, and standards. The ICMM and APEC publications include excellent information (e.g. checklists), which can be used in conjunction with this toolkit to guide the development of these frameworks.

Section 5 sets out the legal elements that should be in place to facilitate closure, while sections 6 and 7 highlight the socioeconomic and technical requirements of closure respectively. In each section guidance has been provided on key items that should

1 [ICMM. Integrated Mine Closure: Good Practice Guide, 2nd Edition, 2019.](#)
 2 [APEC Mining Task Force, 2018. Mine Closure Checklist for Governments, February.](#)
 3 [ICMM. Planning for Integrated Mine Closure: Toolkit, 2008.](#)
 4 [MVLWB/AANDC. 2013. Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories. November 2013.](#)
 5 [Jones AB. 1989. Mineral Titles Recording Policy. Ministry of Energy, Mines and Petroleum Resources. Victoria, British Columbia.](#)

Figure 1 Mineral Rents and a Percent of GDP



Mineral rents are the difference between the value of production for a stock of minerals at world prices and their total costs of production. Minerals included in the calculation are tin, gold, lead, zinc, iron, copper, nickel, silver, bauxite, and phosphate.

be included in legislation, as well as suggested content to appear in policies and guidelines. Sections 8, 9, and 11 provide additional tools that are relevant for governments and other stakeholders in assessing

and implementing closure practices. Section 10 addresses some of the unique challenges that arise from legacy mines that were not closed in accordance with good international industry practice.

2 What Is Mine Closure?

Mine closure is a process that occurs when mining operations cease ore extraction activities with the intent of restoring, to the extent practical, land disturbed by mining to a beneficial and sustainable post-closure land use. Many of the developed nations have relatively advanced closure policies created with the assumption that large, well-funded regulatory bodies would provide oversight. This assumption may not apply in the developing world¹ and international standards have tended to precede national ones in less developed nations. Although defined and regulated by governments in many mining jurisdictions, mine closure has also become a core business practice for most international mining companies.²

Although mine closure and mine closure planning has been required and regulated by some governments for nearly 50 years, most of the commonly accepted principles of mine closure have been developed and refined in the last 20 years, particularly as they relate to social and economic considerations (Figure 2).³ Governments preparing to implement a closure governance framework need to ensure that, in developing their framework, certain legal, stakeholder engagement, institutional capacity, technical, and financial aspects are carefully considered and incorporated in a manner appropriate for their country.

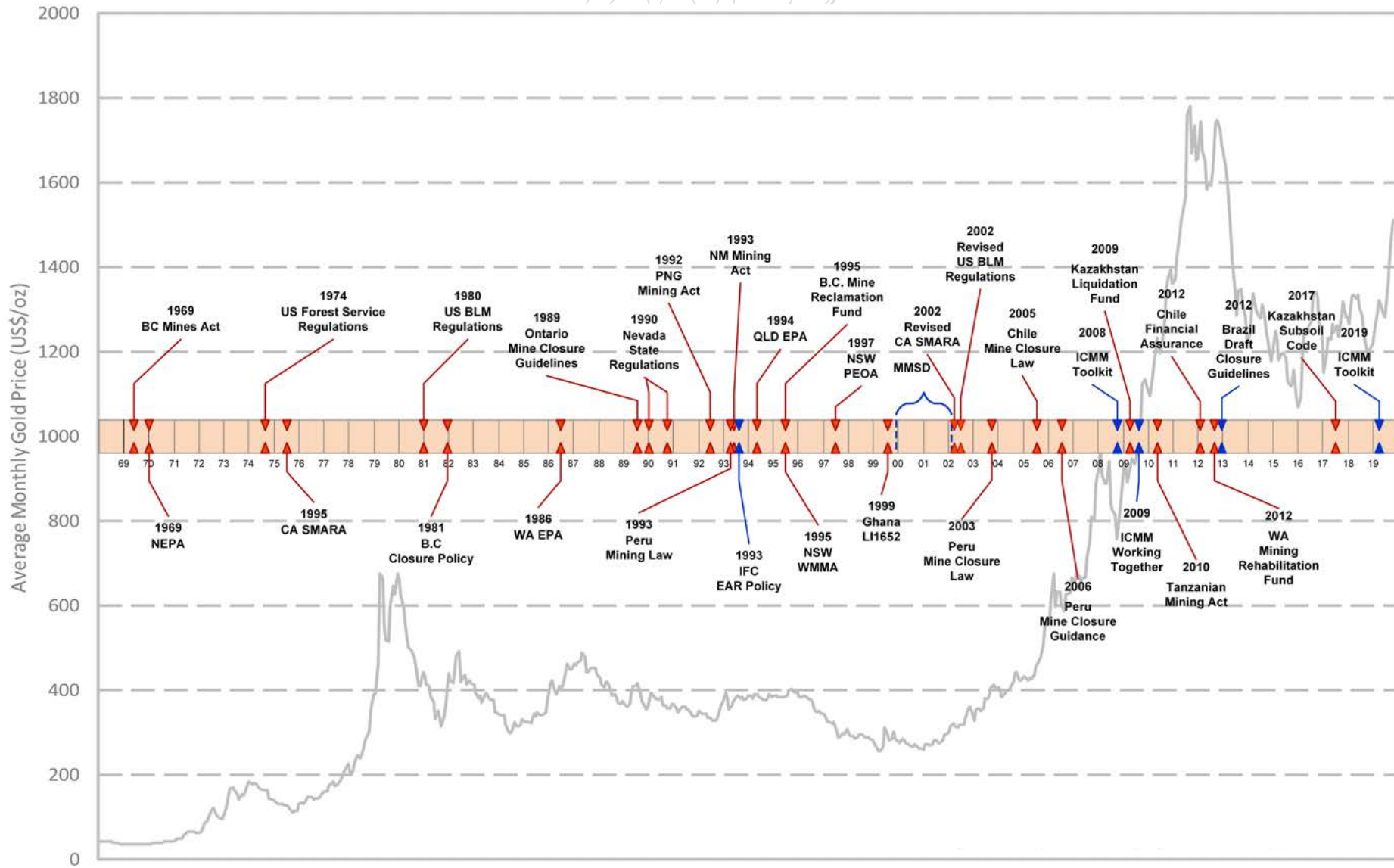


¹ [APEC Mining Task Force. 2018. Mine Closure Checklist for Governments. February.](#)

² [Anglo American. 2013. Mine Closure Toolbox Version 2.](#)

³ [International Institute for Environment and Development \(IIED\) and World Business Council for Sustainable Development \(WBCSD\). 2002. Breaking New Ground: Mining, Minerals and Sustainable Development Project \(MMSD\) Final Report.](#)

Figure 2 A Partial History of Mine Closure Laws and Guidelines



See "Abbreviations" list for explanation of acronyms in this figure.

Useful Definitions

Many major mining jurisdictions and international organizations have definitions of key mine closure terminology. Broad definitions of commonly used closure-related terms are provided below based on definitions from ICMM¹ and the State of Nevada (United States). These terms are sometimes used interchangeably.

Closure – processes and actions planned for and implemented when a mine ceases operation or a portion of a mine (or mine facility) is permanently removed from use for mining purposes, including rehabilitation or reclamation, remediation, decommissioning, demolition and/ or dismantling.²

Reclamation – actions performed during or after an exploration project or mining operation to shape, stabilize, revegetate or otherwise treat the land in order to return it to a safe, stable condition consistent with the establishment of a productive post-mining use of the land and the safe abandonment of a facility in a manner which ensures the public safety, as well as the encouragement of techniques which minimize the adverse visual effects (NAC 519A.075).³

Progressive (Contemporaneous) Closure (Reclamation) – implementation of closure activities during the operating life of a mine providing opportunities to test and demonstrate the effectiveness of closure activities, validate success criteria, and build trust with communities and the regulators. Progressive closure is also used to reduce the reclamation burden at final closure (ICMM).

Socioeconomic Transitioning – efforts to promote, to the extent practical, a smooth transition from a

mining socioeconomic context to a post-mining one. Where practicable, the net socioeconomic impact on the affected region should be beneficial. These efforts should begin early and occur throughout the LOM (after ICMM).

Repurposing – activities that have the possibility to generate income from closure activities. This may facilitate transfer of the site to a third party for relinquishment or provide an offset for ongoing post-closure operating and maintenance costs (ICMM).

Rehabilitation – return of land to a stable, productive, and self-sustaining condition after considering beneficial uses of the site and land. Reinstatement of degrees of ecosystems and function where restoration is not the objective.

Revegetation – the establishment of the pre-exploration or pre-mining vegetation or a comparable vegetative cover (NAC 519A.080).

Remediation – the action of remedying something, i.e. reversing or stopping environmental damage. Often used in context of contaminated soils or water. Remediation may include activities carried out to clean up or mitigate contaminated land or water.

Relinquishment – the process of transferring ownership to another party following the successful completion of mine closure and monitoring. Relinquishment may not always be possible, but it should be a desirable endpoint of the life of asset.

TEMPORARY CLOSURE is when mine operations are suspended, but the site is maintained with the intent that operations will resume when market conditions improve.

SUDDEN CLOSURE occurs when a mining company halts operation activities due to economic conditions such as a sudden drop in commodity price, or operational hardship or mine owner going into liquidation.

ABANDONED SITES are mine site where there is no clear owner or responsible party. Often created by the bankruptcy or dissolution of the company that formally owned the mine. Historically, this has resulted in sites where no closure measures have been undertaken, and a variety of physical or environmental issues can persist.²

¹ ICMM. *Integrated Mine Closure: Good Practice Guide, 2nd Edition, 2019.*

² MVLWB/AANDC. 2013. *Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories.* November 2013.

³ APEC Mining Task Force. 2018. *Mine Closure Checklist for Governments.* February.

3 Closure Governance Framework

3.1 What Is a Closure Governance Framework?

An effective closure governance framework typically consists of legislation (laws and regulations), and guidance (policies and guidelines) that define the requirements for developing and implementing closure as part of the regulated mine life cycle (Figure 3). The ability to ensure the legislation and guidance achieves the objectives is further dependent upon the institutional capacity and experience of the government and industry.

Several international jurisdictions have developed good governance frameworks for mine closure, but all have been uniquely tailored for the needs of each jurisdiction. However, a few international^{1,2} and corporate standards and guidelines³ developed in the last few decades define basic principles and objectives of good closure planning practice that can be used as a basis for developing a governance framework for mine closure. Although the details of these standards and guidelines vary somewhat, all have a few common aspects.

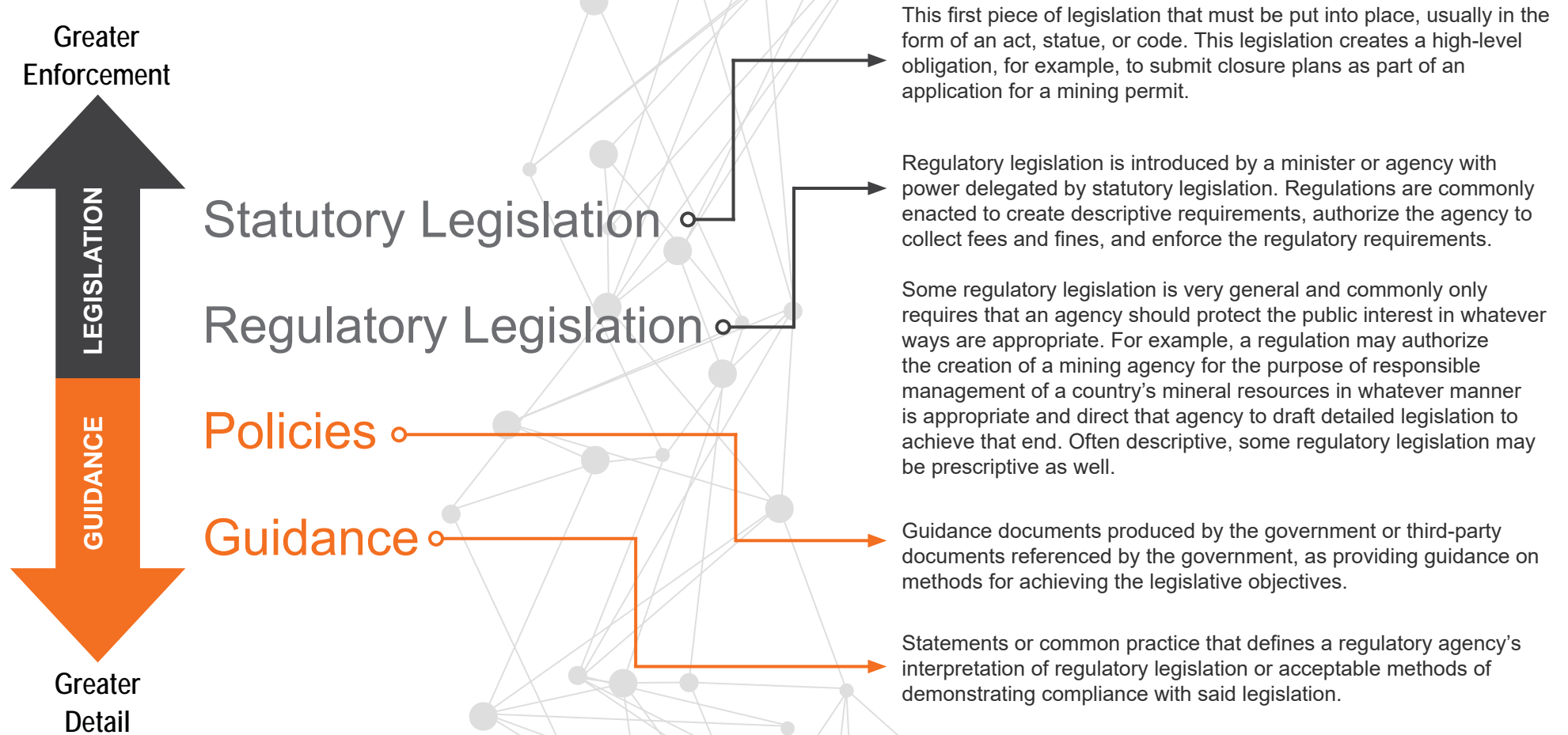


¹ ICMM. *Integrated Mine Closure: Good Practice Guide, 2nd Edition, 2019.*

² APEC Mining Task Force. *2018. Mine Closure Checklist for Governments, February.*

³ Anglo American. *2013. Mine Closure Toolbox Version 2.*

Figure 3 Effective Closure Governance Framework Consists of Legislation and Guidance



- 
- 1. Preparation of a closure plan at the beginning of a project.** For mining companies this means developing a closure plan during the project planning and development phase of a project. For a government, this means requiring a closure plan or to approval of a mining permit. Closure objectives (Section 4), legislative requirements (Section 5) and technical requirements (Section 8) must be clearly established.
 - 2. Definition of productive, sustainable post-closure land use(s).** Because the definition of post-closure land use is a critical component of closure planning, a good governance framework should include a requirement to and recommended approaches for assessing and selecting appropriate post-closure land uses. This often includes the establishment of both physical and geochemical post-closure requirements (Section 8.2) and socioeconomic post-closure (Section 7.2.2).
 - 3. Definition of key technical assessments that must be included in closure plans.** Typically, closure plans should include actions to ensure chemical and physical stability, measures to protect water resources, and procedures to minimize the need for long-term active management requirements (Section 8).
 - 4. Preparation of a closure cost estimate based on the closure plan.** A closure cost estimate based on the total anticipated cost to implement the approved closure plan should be developed (Section 5.3).
 - 5. Placement of a financial assurance based on the closure cost estimate.** To protect the government from financial risk in the event of a mining company bankruptcy, mining companies should be required to post an approved financial instrument as a guarantee against the cost of closing the mine as determined by the closure cost estimate (Section 5.5).
 - 6. Regular updates of the closure plan and cost estimate.** Both the closure plan and cost estimate should be subject to periodic review and update and updated in the event of any significant change in the operation (Sections 5.3 and 5.5.4).
 - 7. Involvement of diverse stakeholders.** Development of a good closure governance framework should involve federal and local regulators, industry representatives, and critical stakeholders (Sections 5.2, 5.4, 7.1.1, and 7.2.1).
 - 8. Management of socioeconomic transitioning.** To mitigate the negative social, cultural, and economic impacts of mine closure, early planning for the transition is required (Section 7).
 - 9. Collection of relevant data.** Collection of data necessary to understand of the environmental, social and economic risks associated with closure of a site are required.
 - 10. Preparation of a final closure plan/design near the end of the operational phase of the project.** During the operational phase of the mine life cycle, operations typically evolve significantly from the originally permitted design. In addition, progressive reclamation and closure activities

Common Elements of Good Closure Planning Practice

1. Preparation of a closure plan at the beginning of a project
2. Definition of productive, sustainable post-closure land use(s)
3. Definition of key technical assessments that must be included in closure plans
4. Preparation of a closure cost estimate based on the closure plan
5. Placement of a financial assurance based on the closure cost estimate
6. Regular updates of the closure plan and cost estimate
7. Involvement of diverse stakeholders
8. Management of socioeconomic transitioning
9. Collection of relevant data
10. Preparation of a final closure plan/design near the end of the operational phase of the project

along with data collected during operations improve the information available for final closure planning as the project approaches closure. Normally, a final closure plan developed to a construction design level should be developed within two to five years of the planned closure date. There must be clear legislative obligations for creating closure plans (Section 5.1) for creating and reviewing closure plans (Section 5.4), as well as the institutional capacity to support the review and implementation of those plans (Section 6).

In APEC's "Mine Closure Checklist for Governments"¹, the Asia Pacific Economic Cooperation Mining Task Force (2018) identified a hierarchy of closure elements that define which aspects of mine closure should be encouraged with incentives and which should be required as part of a mine closure governance framework (Figure 4). Closure components in the lower half of the pyramid are those that are typically addressed in the legislative elements of a mine closure framework and those in the upper half are typical suggested expectations set out in policy and described in guidance. Governments would then manage the lower components through enforcement, while the upper components are often encouraged through incentives and developed through the closure stakeholder engagement process.

3.2 How to Develop a Closure Governance Framework

The process of developing a closure governance framework will vary based on existing government structures, the importance of mining to a country, and the environmental and social context of the country. Developing a framework can be lengthy, but proper planning and collaboration with key stakeholders can expedite the process and improve the likelihood that the framework will meet the primary objectives and obtain acceptance from stakeholders.

A mine closure governance framework consists of legislation, policy, and guidance. These three tools serve different purposes and have varying degrees of enforceability.

Typically, legislation contains the purpose, objectives, and requirements of the framework (the what) and guidance, i.e. policies and guidelines, provide an indication of acceptable methods for complying with the legislation (the how). The legislative component defines the compulsory aspects, and care should be taken in creating overly prescriptive legislation for a closure governance framework. Avoiding highly prescriptive language in mine closure legislation benefits the governance framework for two reasons: every mine is different requiring every closure plan to be site-specific; and the technology of mine closure is constantly changing. To allow regulatory agencies flexibility to address site-specific contexts and constantly changing closure technology on a case-by-case basis, only prescriptive requirements

Example of Flexible Legislative Language

"The Department may approve an alternate method for stabilizing ore that has been leached if the holder of the permit can clearly demonstrate that the condition in which the materials will be left will not create a potential for the waters of the State to be degraded."

Nevada Administrative Code, NAC 445A.430.3. Nevada Administrative Code, NAC 445A.430.3.

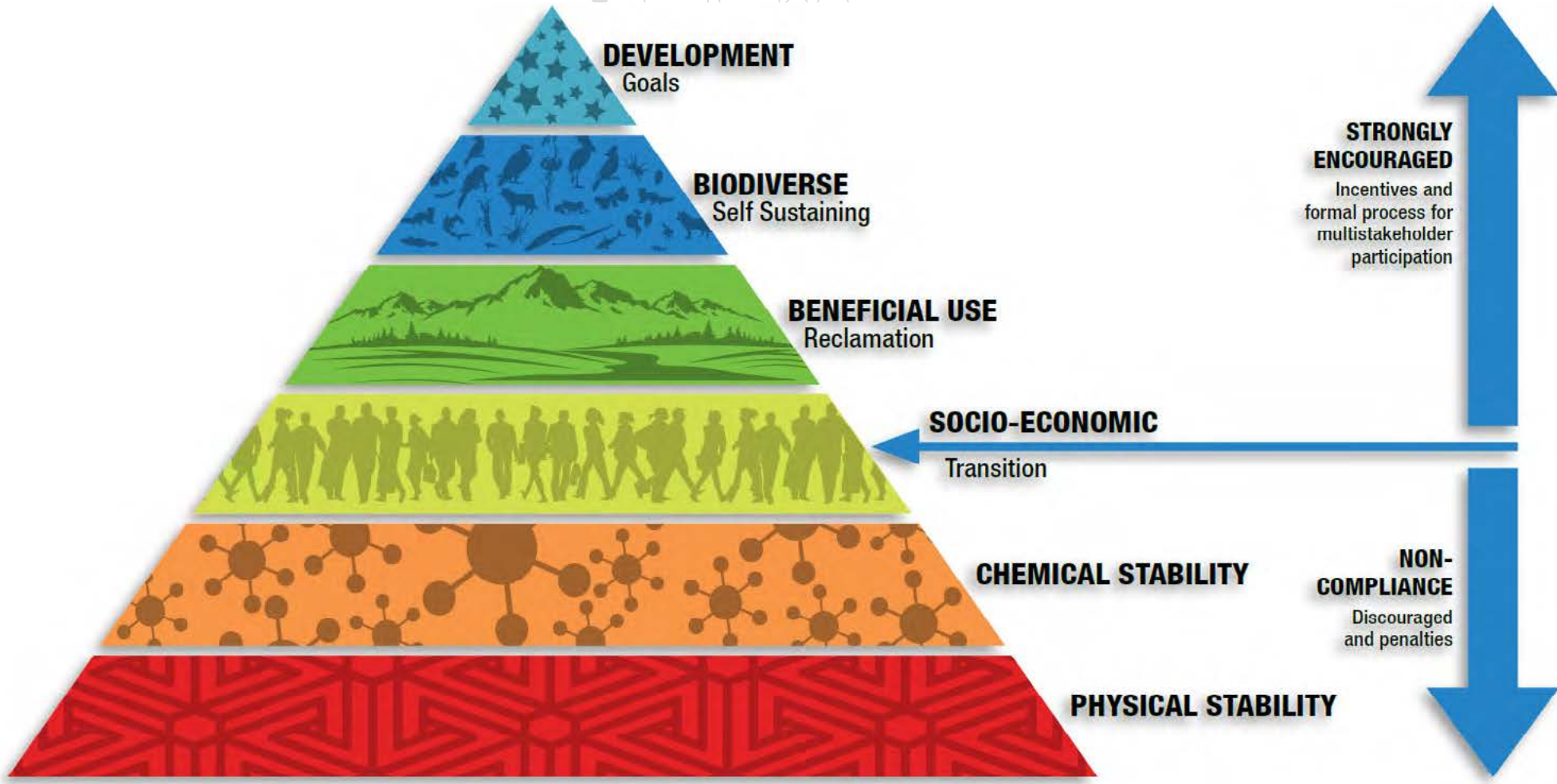
that must apply to all sites should be included in legislation. Even when legislation includes prescriptive requirements, many governments also include language that allows a government agency to deviate from prescribed requirements provided it meets the intent of the legislation.

Finally, placing most prescriptive requirements in policy and guidance rather than legislation facilitates changes in the governance framework because they are typically easier to modify than legislation.

This process of creating a country-specific closure governance framework typically involves a series of steps designed to build consensus on the overall purpose and objectives, develop critical components of the framework, and create a plan for

¹ [APEC Mining Task Force, 2018, Mine Closure Checklist for Governments, February.](#)

Figure 4 The Hierarchy of Closure Needs¹



¹ APEC Mining Task Force, 2018, Mine Closure Checklist for Governments, February.

implementation. (See also "Process for Creating a Country-Specific Closure Governance Framework".)

Step 1 – Initiation. The goal of this step is to define the overall purpose of the framework. Typically, this is prepared by government officials, but could also involve key stakeholders, such as the mining industry and environmental groups. Although the purpose of existing frameworks vary somewhat based on the jurisdiction, they are typically designed to encourage responsible development of country's mineral resources. Key components of mine closure (Figure 4) and mine closure objectives (Section 4) should be kept in mind when designing the framework.

Step 2 – Form working group. After identifying the need for and purpose of a mine closure governance framework, the next step in the process is to develop a working group comprising key stakeholders who can work together to create a risk-based framework that will be acceptable to all parties

The members should represent key ministries of the mining industry, finance, environmental and land use planning bodies. For efficiency the groups should not be larger than 10 people. Members of the working group should be selected based on the criteria of willing to achieve the overall objective through collaboration. The working group should have high level government support.

This working group can consult with a wider range of stakeholders including NGOs, mining communities and mining companies.

Considering that the working group will be reviewing frameworks from other jurisdictions and conducting gap analysis of current systems the members envisioned to be knowledgeable and experienced in legal review. In cases where identifying such member within governmental bodies is not possible, a third-party legal assistance can be added to the task force.

Step 3 – Define objectives. During the initial working group meeting the first task would be to define the objectives of the new framework. These should include general objectives and specific objectives. These objectives may be derived from frameworks from other jurisdictions and/or international guidelines (Appendix A). They should also consider related legal frameworks currently existing or in development in the country as well as baseline requirements for closure legislation (Section 5).

After defining objectives, the working group should compare current legal systems related to mine closure, if any, to determine what gaps exist relative to the defined objectives and selected international guidelines and standards (Appendix A).

One of the critical early steps would be to identify critical elements of the framework that are essential for success. Whether these are included in a law or regulation, a mine closure policy, or guidelines for the framework will determine the level of detail that will be required in defining those elements.

Step 4 – Draft framework. Once the objectives are identified, the working group would prepare a draft framework. This would require participation by legal



Process for Creating a Country-Specific Closure Governance Framework

1

Initiate Planning

Define overall purpose

2

Form Working Group

Identify stakeholders
Select working group based on specific criteria

3

Define Objectives

Convene initial working group meeting
Define objectives
Review frameworks from other jurisdictions
Conduct gap analysis of current systems
Identify essential framework components

4

Develop Draft Framework

Prepare draft statutory and regulatory laws
Prepare draft policies
Outline guidelines
Conduct voluntary trial(s)
Public review

5

Finalize Framework

Prepare final statutory laws and regulatory laws
Prepare final policies
Prepare technical guidelines

6

Develop Implementation Plan

Develop implementation schedule including transition period
Enact statutory law
Create program to develop government capacity, as needed
Develop implementation guidance
Introduce and enact regulatory law as required, and adapt as dictated by learned experiences and improvements in methodologies

experts familiar with the legal context of the country as well as technical experts in mine closure and related disciplines including scientists, engineers, economists, and social engagement specialists. Legal or technical expertise from outside of the country may be required to supplement local knowledge when frameworks are first being designed.

This would include preparation of any required draft laws or regulations, as well as a draft closure policy and an outline of the required guidance documents. Depending on the legal context of the country, the framework may be released in draft form for public comment.

Also, during this step of framework development, the working group should solicit one or more companies to voluntarily agree to conduct a trial of the framework on one or more of their sites. This would provide a useful, real world test of the practicality of the framework and the ease with which it could be implemented. Such a test would also provide information that could result in modifications of and identify gaps in the draft framework.

Step 5 – Final framework. Once the draft framework has been reviewed by relevant parties, possibly including the general public, the working group would finalize the components of the framework. Feedback generated during any trials would also be incorporated into the final framework.

The final framework would likely comprise a combination of legislation (law/regulation), guidance (policy and guidelines) and institutional capacity.

Step 6 – Develop implementation plan. Before the framework becomes a legal requirement, implementation of the framework should be carefully planned. This is particularly important in countries with little or no prior experience with mine closure or implementation of such a framework. The plan should carefully consider the schedule for implementation, recognizing the need to allow the government and industry to develop additional capacity required and prepare for implementation of the framework. This is likely to include additional training in the form of workshops or seminars, meetings with individual operators to discuss site specific requirements for closure and development of a schedule for compliance with the framework. Experience has shown where this step has been omitted or poorly executed, the time required for implementation has taken longer and led to confusion and poorly developed closure plans.

Depending on the number of mines that will need to comply with the framework, the number of closure plans and cost estimates received by the government could be significant. To avoid overwhelming the available resources, some jurisdictions have scheduled the operations for compliance based on factors such as life cycle phase of the project (Kazakhstan initially focused on new mines) or the risk or size of the operation (Western Australia prioritized higher risk project first).

As discussed below in more detail, the implementation of the financial assurance component of the framework should be scheduled to limit

the financial impacts on the mining industry while reducing the risk to the government within a reasonable timeframe.

APEC provides The Implementation Checklist that addresses group of questions that will ensure transition from exiting legal framework to new closure governance framework is successful and implemented. Following items are included in the checklist:

- Consultation with key stakeholders
- Communicating draft framework ahead of time with stakeholders
- Establishing and communicating timelines to allow all stakeholders to plan
- Considering running a pilot project to test out as many aspects of the new closure policy as possible
- Transition period for financial assurance (Section 5.5.2)
- Clarify interactions with existing regulations and development legal framework targets and goals
- Evaluation of administrative resources needed (Section 6.1)
- Provide mechanisms for feedback and improvement to ensure errors and areas for improvement will be identified

More information is provided in APEC's "Mine Closure Checklist for Governments".¹

¹ [APEC Mining Task Force. 2018. Mine Closure Checklist for Governments. February.](#)

Step 7 – Monitoring, review, and revision. Every major mine closure governance framework that has been in existence for more than 20 years has undergone revisions for several reasons. Among these are evolving technologies, experience with mine closure, changes in the social, cultural or economic context of the country, or implementation of new international standards, and changes in corporate culture. This indicates the need to periodically review the framework and revise it as needed. By limiting the detailed and prescriptive components to policies and guidelines rather than in the laws and regulations, revisions to the framework are generally more easily implemented. A balance between regulatory requirements and policy guidance must be maintained to ensure enforceability of core requirements while allowing for flexibility in achieving those requirements.

3.3 Time Required to Create a Framework

Because the legal systems vary considerably by country, the time required to create an effective closure governance framework will be country specific. Based on recent examples of development or modification of governance frameworks in several jurisdictions, the entire process can take three or more years, depending on the time required to create and pass the required legislation. Creation of Kazakhstan's new subsoil use law that incorporated mine closure requirements began in 2015 with the announcement of the government's intent to update the law and ended in 2018 when it became effective. Even if the legislative process requires less time,

creation of policies and guidelines, and enhancing government capacity can require additional time.

Even after the framework is implemented, changes in the system should be anticipated. As additional data regarding the impacts of climate change on closure become available, additional modifications to existing governance frameworks should be expected.

With a deliberate approach, amendments to legislation can be done to ensure the key components of a legal framework for mine closure exists. Laws can be implemented in a relatively short period of time. This is unlikely to be a successful venture however, unless proper guidelines, policies, resources, education regarding international standards, and governmental and corporate institutional capacity to support the implementation of new laws are also in place. Without that support there will likely be poor governance of mine closure with uncertainty and variance in practice prevailing and objectives unlikely to be achieved. A legal framework must be supported by practical and flexible guidelines, institutional capacity, and reference to existing GIIP, a process that will take several years.

Although the process of developing governmental capacity should begin during the development of the mine governance framework, it is likely to extend beyond the time required to create the framework, probably for years. This is because the building capacity in jurisdictions without a history of mine closure requires considerable training and education. Furthermore, capacity development is a continuous process that must address new technologies as they are introduced and experience of the government and the mining industry as mines are closed.



4 Closure Objectives and Goals

Closure objectives help to define the purpose and overall intent of a closure governance framework and guide the development of legislation. They are typically included in the preamble to the legislation and/or included in the general provisions at the beginning of the legislation. Objectives are typically general statements and may describe the benefits of mining to the country and the importance of proper closure as part of the responsible development of a country's mineral resources. They often contain statements of purpose with respect to the protection of human health and the environment, the concept shared benefits of all stakeholders, and the need to manage mineral extraction in a way that leaves a positive legacy after closure is complete.

4.1 Site-Specific Closure Goals

In the closure planning process for a mining operation, site-specific goals are often added to augment the objectives defined in the framework and account for site context. These may be related to the entire site, specific facilities, or environmental aspects. Site-specific objectives guide the planning process and the closure actions selected by defining the goals desired from the closure planning process. These may also be determined by corporate closure standards or policies.

To determine if the general and site-specific closure objectives are achieved at each site, closure criteria are developed for each objective. They are used to determine if selected closure activities have met



the closure objectives for each project component. Closure criteria can be site-specific or adopted from regional/national standards and can be narrative statements or numerical values.

Examples of site-specific closure goals include the following:

- Transfer usable infrastructure to the communities/ government for alternative uses
- Assist suppliers to develop other procurement opportunities
- Reduce the time required for active post-closure site management
- Ensure adequate year-round water supply to downstream users
- Post-closure pit lake water quality will meet human contact (recreation) standards
- Restore water quality to support fishery
- Create self-sustaining vegetative community

4.2 Closure Success Criteria

Closure success criteria must be meaningful, measurable, achievable, and realistic to ensure successful closure of project components. The criteria might also have a temporal aspect to consider, e.g., a standard may have to be met for a pre-defined number of years. (See also "The SMART Approach to Setting Closure Criteria".)

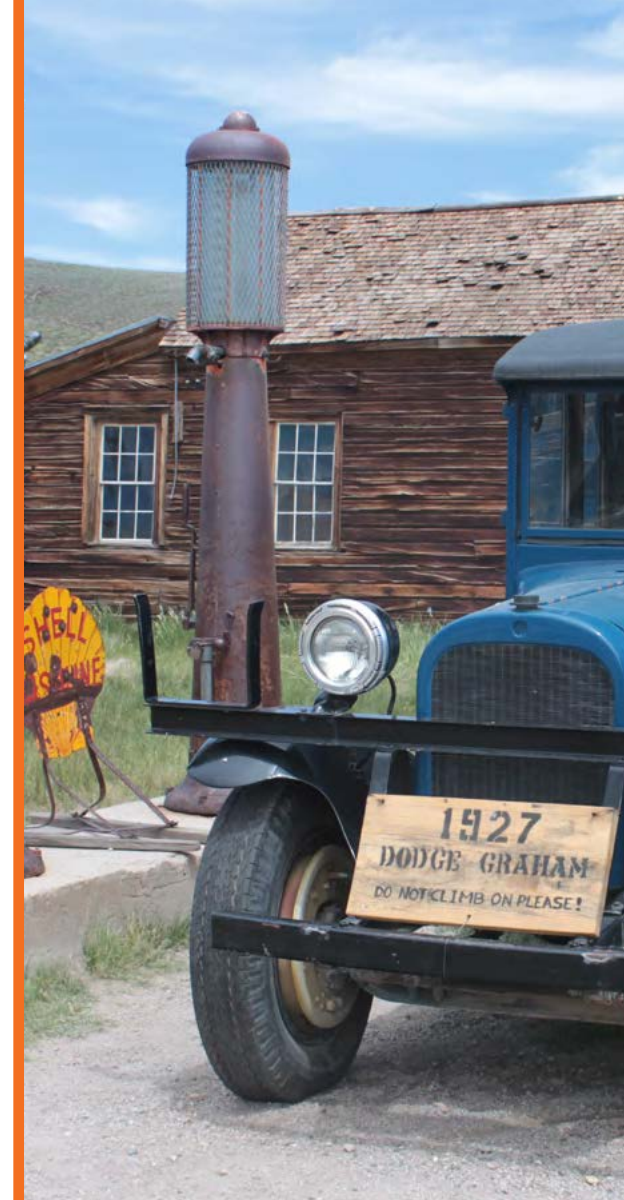
Stakeholders should be involved in discussions in the early stages of project development following licensing as part of the closure success criteria.

Normally such criteria are expanded upon during the development of interim closure plans and finalized as closure planning approaches the end of operations in the final closure design.

In the later stages of project development, certain closure criteria may be modified based, in part, on the results of site environmental monitoring programs or site-specific reclamation research. A brief description of, or references to, the ongoing or future reclamation research related to the development of success criteria should be provided along with the timeframe by which the work will be completed.

Examples of common closure objectives include the following:

- Closure actions should ensure health and safety of the public
- Realistic and beneficial post-closure land use options should be identified
- Closure plans will consider input from stakeholders
- Closure plans must include measures to ensure the site will be physically and chemically stable
- Measures should be taken to limit the socioeconomic impacts of closure
- Adequate financial assurance must be provided based on an accurate estimate of the closure costs
- Require post-closure monitoring of environmental and socioeconomic parameters to ensure success of closure
- Mine closure plans should be adaptive





The SMART Approach¹ to Setting Closure Criteria



Specific

Target a specific area for improvement



Measurable

Quantify or at least suggest an indicator of progress



Assignable

Specify who will do it



Realistic

State what results can realistically be achieved, given available resources



Time-related

Specify when the result(s) can be achieved

¹ Drucker PE. 1954. The Practice of Management.

5 Legal Elements

An effective closure regime requires the commitment and engagement of all stakeholders, technical expertise, and a clear set of closure objectives and requirements. Properly closing a mine is a benefit to all stakeholders, yet legal requirements are often required to ensure closure is undertaken and to set the expectations regarding the technical (Section 8), financial (Section 5.5), and procedural requirements in the context of the local mining economy.

Although legal systems vary from country to country, legislation will consist of two levels of legislation: statutory and regulatory. Statutory legislation includes acts, statutes, or codes that set out a broad set of rights and obligations with respect to mining. The legislation will then delegate authority to a minister or agency to create regulatory law in the form of regulations, by-laws, or ordinances. These are enacted to provide further detail on the specifics of the statutory legislation. Although both create the legal obligations and rights of the state, the project proponent and the public are generally best crafted with the details in the regulation as those laws can be more readily implemented and adjusted. Regulatory legislation should be descriptive rather than prescriptive with respect to technical requirements for achieving the legislative objectives.

Government policies and guidelines are non-compulsory tools that clarify the intent of the legislation, describe the government's expectations, and provide guidance on good practice for achieving



obligations or demonstrating when they are met. These terms are often used interchangeably and there is no widely accepted definition that differentiates between the two pieces of guidance.

For the purposes of this toolbox, we differentiate the two as policies and guidelines. Policies include qualitative statements about intent of the legislation and the methods and processes that are acceptable to demonstrate compliance with the legislation. Guidelines are documentation, either produced by the government or third parties that is used to provide methodologies for achieving the objectives. These guidelines may be merely guidance and suggested standards, or they may specifically be referenced in the legislation as containing possible methods for meeting the obligations contained therein.

The closure governance framework in Nevada (United States), provides a good example of the level of detail in different parts of the framework. The Nevada Revised Statutes are statutory legislation that require that a site be reclaimed to a stability comparable to adjacent areas. The Nevada Regulations then provide further legal obligations with greater detail on aspects of those closure plans. With respect to slope stability, they must be in a stable condition that minimizes hazards. An informal policy used by the state acknowledges slopes not steeper than 3H:1V are stable. If steeper slopes are designed, then the operator must demonstrate that they will be stable. (See "Example of Legal Elements of a Mine Closure Governance Framework" this page.)

Governance frameworks are not created in a void. They are heavily influenced by the historical, social, economic, and environmental realities of the industry and the local region. Where the process of closure governance framework development has been most successful, it has invariably involved a diverse group of interested parties, including federal and local regulators, industry representatives, and special interest groups. A few examples of this are the state of Nevada (United States), Peru, Chile, and Western Australia. All are places where regulators and industry representatives worked closely together to create governance frameworks that meet the needs of the public, while allowing the industry to meet the expectations of their shareholders.

Legislation can mandate a closure plan but does not ensure the plan is effective. That requires a clear policy on the in-country requirements for closure, technical expertise, stakeholder engagement, and a plan adopted to local conditions. There is an important distinction between legislation and guidance (policy and guidelines) in governing a mine closure regime. While it is important to establish clear legal requirements for closure plans and how they interact with other aspects of the project, an overly prescriptive legal regime curtails innovative solutions and could require closure actions that are unnecessary, not appropriate, or even potentially detrimental for a site. Instead, a closure governance framework should define in law only the elements that are required and use policies and guidelines to describe how that can be done. This creates opportunities for closure plans to be created based on site-specific risks.

Example of Legal Elements of a Mine Closure Governance Framework

STATUTORY LEGISLATION – GENERAL

For the reclamation of all land disturbed by the exploration project or mining operation to a stability comparable to that of adjacent areas. (Nevada Revised Statutes 519A.230.1.c)

REGULATORY LEGISLATION – SPECIFIC

As used in this section, “ensures public safety” includes minimizing hazards in areas to which the public may have legal access by, if applicable: ...leaving slopes in a structurally stable condition. (NAC 519A.315.3.d)

INFORMAL POLICY

The bureau will deem dump slopes as stable if they are reclaimed to a slope not steeper than 3H:1V; if steeper, standard engineering methods must be applied to demonstrate physical stability

INFORMAL GUIDANCE

Use standard methods for determining slope stability including standard modeling tools to predict the stability of the final slope under static and pseudostatic conditions

All legislation for mine closure based on GIIP should address several elements. These legislative requirements include the following:

- An obligation to create a closure plan and a description of the general contents required
- A commitment to engage stakeholders in the process
- Estimation of closure costs
- Periodic governmental review or when the mine plan is changed
- Placement of financial assurances to fund the closure plan if the project proponent is unable or unwilling to do so

Regulatory legislation can then be used to describe in greater detail the specific processes, general content guidelines, periods for review, and financial assurance mechanisms and payment schedules.

In addition, it is important to have clear documentation that provides guidance regarding technical and socioeconomic expectations of the content of the plan. This will be found in

- government policies and/or guidance on the required content of the closure plan,
- comments on closure plans provided by trained and knowledgeable government staff (or external consultants while local capacity is trained), and
- third-party documentation in the form of industry knowledge, international association guidance, and other best practice documents.

5.1 Obligation to Create a Closure Plan

All countries with mining activity should require project proponents to create and maintain a closure plan as part of the approval process. While the details of the obligation will vary by country, at a minimum, the legislation should require that a closure plan:

- Be completed and submitted as part of any mining permit or license to extract
- Involve stakeholders in the development and review of the closure plan
- Describe the environmental and socioeconomic context and risks of the operation relative to closure and post-closure
- Define and describe post-closure land uses
- Discuss implications of temporary and early closure scenarios
- Provide sufficient detail to allow the preparation of an accurate closure cost estimate
- Include cost estimates based on the detailed plan
- Be reviewed regularly (typically one to five years)
- Discuss the physical, environmental and socioeconomic impacts of closure and possible mitigation thereof, if not addressed under another governance program
- Include a plan for monitoring and remediating post-closure impacts

Closure Plan Creation

Basic Legislative Requirements

- Require closure plans
- Establish a list of main features required in a closure plan
- Establish when a plan must be submitted and updated
- Post-closure review and report to ensure the work has been completed

Additional Policy and Guidelines

- Reference international standards
- Provide examples of content and methodologies for creating required portions of closure plan
- Establish guidelines for level of detail required at various project phases
- Clarify government objectives behind planning for closure

The legislative requirements should recognize the differences between existing operations and new mines that are proposed after the framework is created. This could include differences in the timing for submittal of closure plans, and possibly in the actions that are proposed because the existing conditions at the mine may preclude some standard methodologies being used. For example, if no topsoil or growth media has been saved during operations, alternative revegetation may be acceptable, or standards may need to be relaxed. Policy and guidelines to provide examples of content and methodologies will supplement the legislation. This provides guidance and pointers for people who are unfamiliar with the specifics, as well as confirming the expectations behind the policy. This approach is preferred as it ensures flexibility in approaches rather than strict adherence to a methodology that may not be appropriate or efficient. International guidelines are provided in Appendix A.

The legislation must also include a description of the process for governmental review and approval, including timeframes, the basis for rejection and revision, and resubmittal of an improved plan. As noted in APEC's "Mine Closure Checklist for Governments", "[t]he reason or reasons for the rejection must be clear and cannot be arbitrary or unfounded." Furthermore, the legislation should allow the proponent an opportunity to modify the plan to rectify the basis for rejection and resubmit the plan.¹

¹ APEC Mining Task Force. 2018. Mine Closure Checklist for Governments. February.

5.2 Stakeholder Engagement

Legislation should include a requirement to engage with key stakeholders during the development of a closure plan, during any changes, and before and during closure implementation. The primary purpose of closure stakeholder engagement is to develop a common shared vision of a post-mining future for the area with all key stakeholders including the government, local communities, and the mine operator.

Most countries have an EIA law requiring review of any projects with a potential impact on health, the environment, safety, and cultural and social aspects of stakeholders. These laws typically include requirements for stakeholder engagement as part of that process. Mining projects are normally subject to this process and often serve to satisfy the requirement for stakeholder engagement for mine closure during initial project development and permitting. Review of mine closure plans should be a part of that review. During later phases of the mine life closure specific stakeholder engagement should be performed on any modifications to the closure plan.

In addition to developing a common shared vision for the post-mining, stakeholder engagement should include a review and discussion of the impacts of closure of the mine, address the transition from a mining economy to a post-mining one, as well as actions proposed to close the mine and mitigate socioeconomic impacts.

Stakeholder Engagement

Basic Legislative Requirements

- Establish framework for review
- Establish content to be reviewed, and where in the regulatory process reviews must occur
- Set out in required stakeholders
- Establish timeframes for submission, review
- Create a dispute process for stakeholders and proponents if review outcome is contested
- Establish a term length for validity of successful review
- Mandate review of economic, environmental, health and social issues
- Set criteria of projects that are subject to review and any exempted projects

Additional Policy and Guidelines

- Methods for advertising and stakeholder outreach
- Reference to best practices for engaging variety of stakeholders
- Guidelines on ensuring meaningful engagement of all stakeholders
- Provide institutional capacity for reaching stakeholders with notices and results of review

5.3 Cost Estimation

One of the most significant risks to government with respect to mine closure is having to assume the liability for closure in the event an operator fails to or is incapable of closing the mine in a responsible manner. The primary mitigation approach for this risk is to require that all operators post financial assurance for the estimated cost to implement an approved closure plan. For this reason, any mine closure legislation should require that the operator provide an estimate of the full costs of closure assuming that the government would be responsible for implementing the closure plan. The legislation must also require that the operator provide financial assurance in that amount in a form acceptable to the government.

The closure cost estimate should include all costs associated with the closure activities and post-closure monitoring used to physically and chemically stabilize the mine site and prepare the site for the selected post-closure land use(s). Costs for some final closure studies, such as final investigation and design or environmental and socioeconomic impact assessments, may also be included in the cost estimate. Cost associated with community development program and retrenchment and reskilling plans are normally included in the operating budget of the mine, and therefore are often excluded from the closure cost estimate.

Repurposing Costs – *If portions of the site or project infrastructure will be repurposed, the closure cost estimate should include costs to prepare the site or infrastructure for redevelopment or an alternative land*

use. The operator's responsibility should be to leave the site in a condition that it could be redeveloped by other parties for the selected post-mining land use.

For financial assurance requirements to be an effective method of mitigating risks to the government, the cost estimate must be accurate and based on current costs, not future costs discounted to the current year. The accuracy of the closure cost estimate is directly related to the quality and detail of the closure plan, and the methods used to calculate the costs. A closure cost estimate is only as good as the information used in its development and the quality and detail of the information available can be expected to improve as the mine approaches closure.

Acceptable calculation methods are normally developed with the mining industry and documented in policy or guidelines. There are several methods used in the industry, but the most accurate are those based on first principles using good site data, good engineer's estimates, or estimates by qualified contractors. Methods based on average costs, sometimes called, standard unit costs, do not account for site-specific conditions and can lead to inaccurate estimates.

The life of most mines is measured in years or decades and most mines expand during operations. This causes the cost of closure to change over time. Generally, the cost will increase due to expansions of existing facilities or construction of new ones. Some of these cost increases may be offset by progressive closure of completed facilities. The cost of labor, equipment, and materials also change over time. To account for these changes closure legislation should

Cost Estimation

Basic Legislative Requirements

Require all closure cost to be based on estimates that are

- as accurate as possible,
- are not discounted, and
- reviewed periodically.

Additional Policy and Guidelines

- Review period should be between one and five years (may be legislated)
- Do not legislate method for costing, provide guidance of acceptable methods, or what must be shown to demonstrate an acceptable method
- Consider SRCE or similar tools

require that cost estimates are periodically reviewed and updated.

If the closure framework allows operators to provide financial assurance in phases as the mine develops, then the initial closure plan should provide estimates for both the total cost of closure and an estimate of the cost of closure for the current phase.

5.4 Closure Plan Review

Conditions are constantly changing on operating mine sites, so too should the closure plan. The plan created during project development is typically based on the project configuration used for project financing and permitting. As the operation continues to collect additional information during operations, the mine plan and mine configuration may change. When this happens, the closure plan, including the cost estimate, needs to be reviewed and revised to reflect those changes. Good mine closure legislation should include a requirement to review and update the closure plan when any material changes to the operation occur.

Costs for services needed for closure of the mine also regularly change. The closure cost estimate should therefore be reviewed periodically, even if the closure plan has not changed. Countries with good mine closure legislation require that the closure cost estimate be reviewed and updated every few years, typically every three to five years.

Most jurisdictions require the operator to prepare a final closure plan as the mine approaches actual closure. These final closure plans contain all the data

relevant to closure that has been collected during the operating period along with any changes to the closure objectives, post-closure land use, and the costs. These plans are often prepared as detailed designs, suitable for construction.

5.5 Financial Assurance

Requiring detailed closure plans with accurate fair market value cost estimates is a key piece of a well-regulated mining industry. Unfortunately, a closure plan is only an effective risk management tool for the government when properly funded. There are many situations though where a project may be abandoned before closure is complete or long-term monitoring and management is required for which no funding is available. In those cases, the abandoned mine becomes a public liability.

To prevent this transfer of liability to the government and to encourage progressive closure, financial assurance requires project proponent to provide the security to cover the costs associated with closure of the mine. In addition, many governance frameworks now requiring financial assurance for post-closure monitoring, maintenance, and management obligations. Financial assurances are not funds that are paid from the project proponent to the government to pay for the closure costs at a future date, rather they are a cash deposit or financial instrument held by a third-party as a guarantee to ensure that the closure liabilities of the project proponent are met. Furthermore, financial assurances are not to be used to collect funds for other defaults or for abandoned mines, which must be addressed separately (Section 11).

Closure Plan Review

Basic Legislative Requirements

- Require regular review of closure plans
- Require review of closure plans when material change
- Require stakeholder engagement when closure plan is amended
- Require updated costing and financial assurance when closure plans amended

Additional Policy and Guidelines

- Policy and guidelines will follow guidelines for preparing and costing plans
- Regular review should be considered in tandem with other mine planning or permitting (e.g. every five years)

The quantum of the financial assurance should reflect the cost that the government would incur to implement the approved closure plan for the operation and to monitor the effectiveness of the closure actions including socioeconomic transition. Based on the experience of several jurisdictions, the quantum of the financial assurance be based on a site-specific calculation to implement the closure plan as approved. This is the approach used in the United States, Canada, and Chile. **SRCE** is an example of one such tool. It is a free, comprehensive cost estimating tool that uses a combination of first principles, cost databases, and user input to create a detailed cost estimate. However, because SRCE is fairly complex, SRK developed a **simple cost estimating tool** as part of this project for jurisdictions beginning the process of developing a mine closure governance framework. As the government and industry becomes familiar with closure cost estimating, we recommend the use of more detailed and comprehensive tools, such as SRCE.

All closure and short-term, post-closure costs (e.g. monitoring) should be calculated as current costs, not as net present value because the purpose of the financial assurance for closure obligations is to provide a financial guarantee to the government of an unplanned closure or abandonment. Net present value assumes the project proceeds in accordance with a plan and schedule. If the government accepts financial assurance in the quantum of a net present value, there is a risk that sufficient funds would not be available in the event of an early default (Figure 5).

5.5.1 Types of Financial Instruments

A variety of financial assurance regimes have been established since the 1970s. With industry downturns and bankruptcies by mining proponents many of the legal regimes have been refined and best practice now requires financial assurance for 100% of the financial closure obligations prior to closure, and often before the mining permit is issued. In addition, the forms of financial assurance continue to be restricted with forms of soft security such as corporate guarantees, assignment of rents or securitization in the underlying minerals no longer being allowed as security in some jurisdictions. International best practice is to require financial assurance in the form of hard security: bank guarantees, lines of credit, cash, or other methods that are not impacted by the liquidity and financial viability of the proponent or the project. Despite this clear best practice, there remains considerable variation in practice, even amongst countries with GIIP. In addition to a legislative framework for financial assurances, institutional capacity for managing the funds also needs to be developed (Section 5).

Cash Deposits – *Cash deposits are allowed for under all legislative systems, but few project proponents opt to utilize this mechanism due to the high cost. Where utilized, cash deposits are placed in escrow in a third-party bank (i.e. not a state-owned bank) and strict conditions for release are included.*

Financial assurance is often split into two categories, hard security and soft security. The recently enacted Chilean legislation on financial assurance was

Financial Assurance

Basic Legislative Requirements

- Require financial assurance for all closure obligations
- Clarify amount of closure cost that must ultimately be secured (GIIP is 100%)
- Clarify timing for first deposit (GIIP is to require this prior to construction)
- Define review and update period for financial assurance (GIIP is 3 to 5 years)
- If the financial assurance is phased, clarify how each phased deposit will be calculated (GIIP is to estimate the maximum liability that will exist before the next update)
- List types of financial assurance (GIIP limits to hard security in the form of cash, letters of credit, surety bonds, trusts and bank guarantees)
- Clarify institutions that can provide or hold financial assurance

Additional Policy and Guidelines

- Transparent guidelines on how financial assurances will be managed, adjusted and refunded should be provided to industry
- Provide a list of known entities or rating agencies that meet criteria for providing financial assurances

designed to allow for a mix of types of financial assurances, with soft security being allowed as a temporary transition tool. Chile's legislation is one of the only modern frameworks to allow soft security. Although not suggested as best practice,

the legislation does provide an example of the types of security that can be used for financial assurances. Hard financial assurance instruments that are considered best practice include the following:

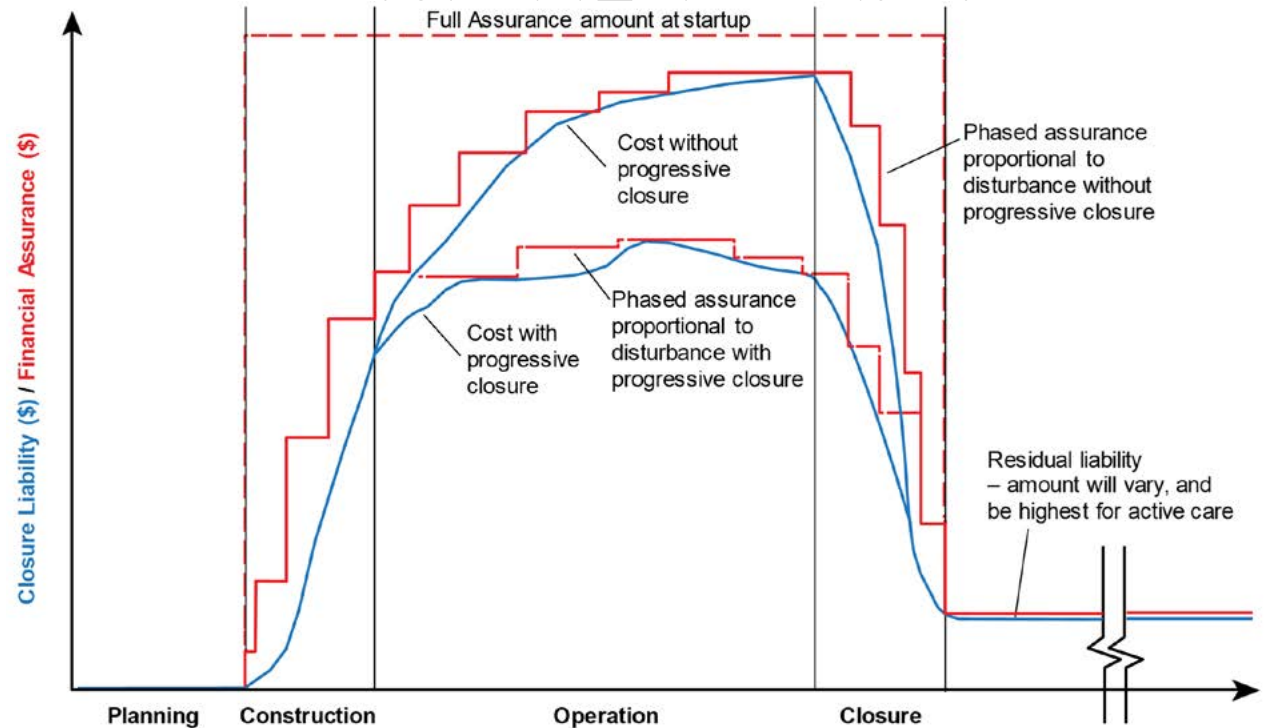
- Cash deposits
- Bank guarantees
- Surety bond
- Bank letter with risk rating of at least A
- Trust funds

Although some frameworks allow for soft forms of financial assurance, often for a limited period, it is not generally considered good practice to accept these as financial assurances. These forms of financial assurances, most commonly corporate guarantees, are tied to the economic viability of the project and/or the project owner. If the financial assurance is required, it is most likely because one or both the project and the proponent are no longer solvent, which results in a zero value of the corporate guarantee.

Surety Bonds – Similar to bank guarantees except that the surety can include other third-parties, most often an insurance company.

Acceptance of such instruments may be acceptable for a portion of the required financial assurance during the early years of the mining life cycle (as

Figure 5 Stage of Mine Life: Financial Assurance for Long-term Costs Is Typically Provided in the Form of a Trust Fund



Source: [APEC Mining Task Force, 2018, Mine Closure Checklist for Governments, February.](#)

is done in the early stage of projects in Chile), or during initial implementation of a governance framework, but as the asset is depleted, the risk of failure of the operation and/or operating company increases significantly while the resale value of the asset decreases. Furthermore, management of such instruments requires skilled resources in the government and diligent reviews of the operation and company on a very frequent basis, as well as the willingness and authority to require a company to replace corporate guarantees on short notice.

5.5.2 Transitions to Financial Assurance Legislation

The introduction of a new legislative requirement for financial assurances, or a major adjustment to the amount of financial assurance required can be disruptive to the industry and counterproductive to the goal of ensuring funding is securitized before the project is abandoned. Two practices have emerged to help transition established mining industries to new financial assurance regimes.

5.5.2.1 Transition Period

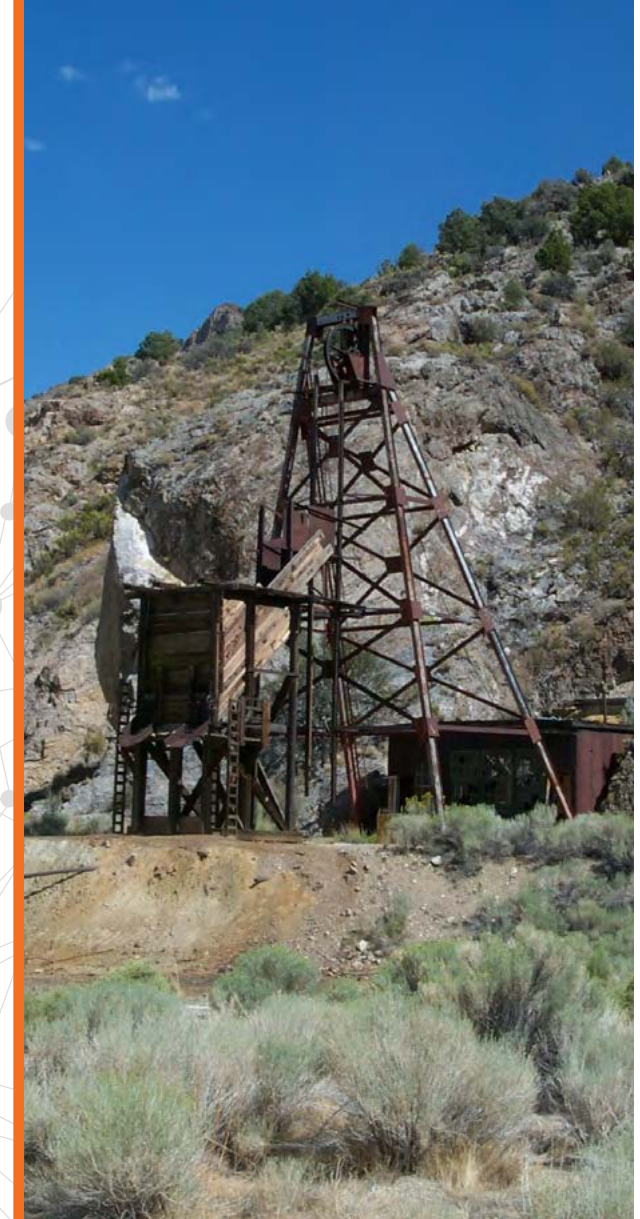
Adding a transition period reduces the economic impact of new financial assurance requirements on operating mines. This period also offers governments time to ensure they have the capacity to process the increased volume of work required to implement the amendments. This is likely not required where there is sufficient institutional capacity and where mines are operating with reasonable financial guarantees. A typical period between the introduction of new financial assurance legislation and its application is two to five years.

5.5.2.2 Phasing of Financial Assurances

Legislation can allow for financial assurance to be provided in phases. This may be done based on the closure liabilities associated with periodic reviews of a closure plan and cost estimates, or by requiring the proponent to move from current levels of financial assurance to a new legislated amount of securitization over several phases. Models vary, but many jurisdictions require a portion of financial assurance upon issuance of permits, with 100% of the closure costs being required well before closing. Three jurisdictions that utilize phased assurances are the United States (Nevada and other states), Chile, and Quebec in Canada. Nevada (United States) and other states require financial assurance for 100% of the closure costs for the current financial phase, but do not require financial assurance for project components that will not exist during that phase.

In Nevada (United States), closure cost estimates are updated every three years by the project proponent and typically include cost for only those facilities that will exist by the end of the next review period. During each review, any closure activities that have been completed and approved can be removed from the financial assurance after approval by the government. This is reflective of best practice for an established financial assurance system but does not provide immediate economic relief when new systems are put into place.

Phasing of assurances (as shown in "Approaches to Securing Closure Obligations with Financial Assurances" on the next page) can also be achieved by requiring a set amount upon implementation of the legislation, with a graduated increase towards



Approaches to Securing Closure Obligations with Financial Assurances

Approaches to Financial Assurances	Requirements	Examples
Projects that require financial assurance	All mining projects	British Columbia, Canada; Nevada, United States; Chile; Queensland, Australia; Sweden; Peru
Percentage of financial assurance required prior to construction	20% 50% 100% Discretionary	Chile* Quebec, Canada Ontario, Canada; Nevada, United States** Sweden; British Columbia, Canada
Time between start of mine and full costs being secured	2 to 15 years	Quebec allows for a two-year transition period Chile allows up to 15 years
Types of financial assurance instruments allowed	Cash, letters of credit, bank guarantees	British Columbia, Canada; Nevada, United States; Chile; Queensland, Australia; Sweden; Peru
	Corporate guarantees and other soft security	Chile allows for alternative financial assurances for a limited period as a transition to full security through the above instruments

* Financial security must be placed within a number of years based on a prescribed formula and a NPV of the costs. The maximum time permitted is the lesser of 15 years from permitting and half of the life of mine.

** The amount of financial assurance posted is often based on the near-term (1-5 years) closure liabilities, with the total accumulating to 100% of all phases during the life of mine.

100% assurance of the obligation over time. Quebec, Canada, requires 50% of the closure costs to be secured within 90 days of the issuance of a permit. The remaining 50% of the estimated closure cost must be paid in two equal payments. These payments are made on the first and second anniversary of the issuance of the permit. In contrast, Chile has a slightly longer period for phasing to 100% financial security. In the first year, 20% of the closure costs must be secured, with a pro-rata of the remaining 80% being paid over a number of years equal to the lesser of two-thirds of the LOM or 15 years. This method is much more gradual and has a higher risk that closure costs will be passed to the public.

Every jurisdiction must find the right balance for its circumstances. Even in countries with long-established requirements to collect financial assurance, review and modifications of existing programs are ongoing. Nevada and Washington in the United States legally allow for corporate guarantees as financial security in their legislation, but administrative policy has removed this as a viable form of security. In Sweden and British Columbia, Canada, legislation requires financial assurance, but the amount of the security is set by an administrative body on a case-by-case basis. Public reviews have been issued in both countries calling for reforms of the legislation to bring them in line with the best practices noted above.

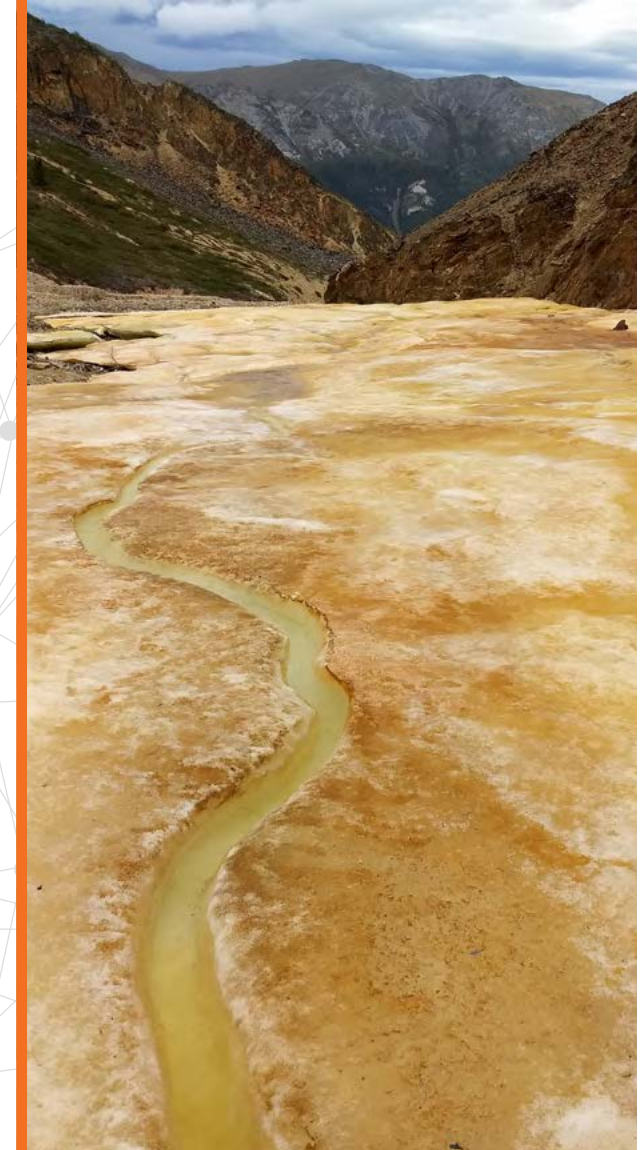
5.5.3 Long-term Trusts

Post-closure financial assurances differ from financial assurances for closure costs. Closure can be implemented progressively throughout the project, and final closure can often be achieved within a

relatively short period after the end of the economic life of the mine. In contrast, post-closure obligations can potentially exist for decades or centuries. To provide financial assurance for these obligations, many jurisdictions allow for the use of a trust to cover the post-closure costs. This is not a financial assurance that provides a mechanism for covering the costs of closure in the event of default. Instead, trusts are used to create a source of capital that can be used to pay for the post-closure costs as are incurred. This type of instrument can also be used to create a trust fund for communities.

Self-sustaining trust funds are an industry standard method to provide adequate annual funds for post-closure activities such as long-term water treatment or maintenance. The quantum of the required fund depends on the annual funding required, the assumed interest rate, and the year in which the fund will be used to determine the principle required in the fund. The principle amount is normally calculated based on the cost of annual operating costs, sustaining capital costs, and monitoring costs. Initial capital costs would normally be included in the closure capital costs. For example, if long-term water treatment will be required, the initial capital to construct the water treatment facilities would be included as closure capital cost, whereas annual costs for water treatment operations, periodic capital expenditures to upgrade or replace the treatment plant, and monitoring costs would be included in the trust fund principle.

Maintaining long-term financial assurance instruments such as irrevocable letters of credit for an indefinite post-closure period is expensive and



may not even be possible. For these reasons, the use of self-sustaining trust funds is the standard practice to provide assurance that funds will be available to fund long-term activities or address uncertain risks.

Self-sustaining trust funds are funded by the operator during operations to ensure that when the post-closure period begins there is sufficient revenue from the trust to fund all ongoing costs without depleting the principle amount before the trust is no longer needed. If perpetual care is required, then the trust fund must be perpetually self-sustaining (i.e. the principle must never be depleted). The amount of annual investment needed to create the fund depends on amount of principle required, the assumed interest rate and the number of years before the fund will first be required.

Although there several models used by various government to estimate the quantum of a trust, most of them rely on a net present value estimate of all included costs over a sufficiently long period of time that any additional years become immaterial. A more appropriate approach to calculating a trust fund quantum is to estimate the fund quantum as one would an annuity using conservative assumptions regarding interest and inflation. Interest rates used are typically based on stable investments such as government bonds, and interest rates based on recent economic data.

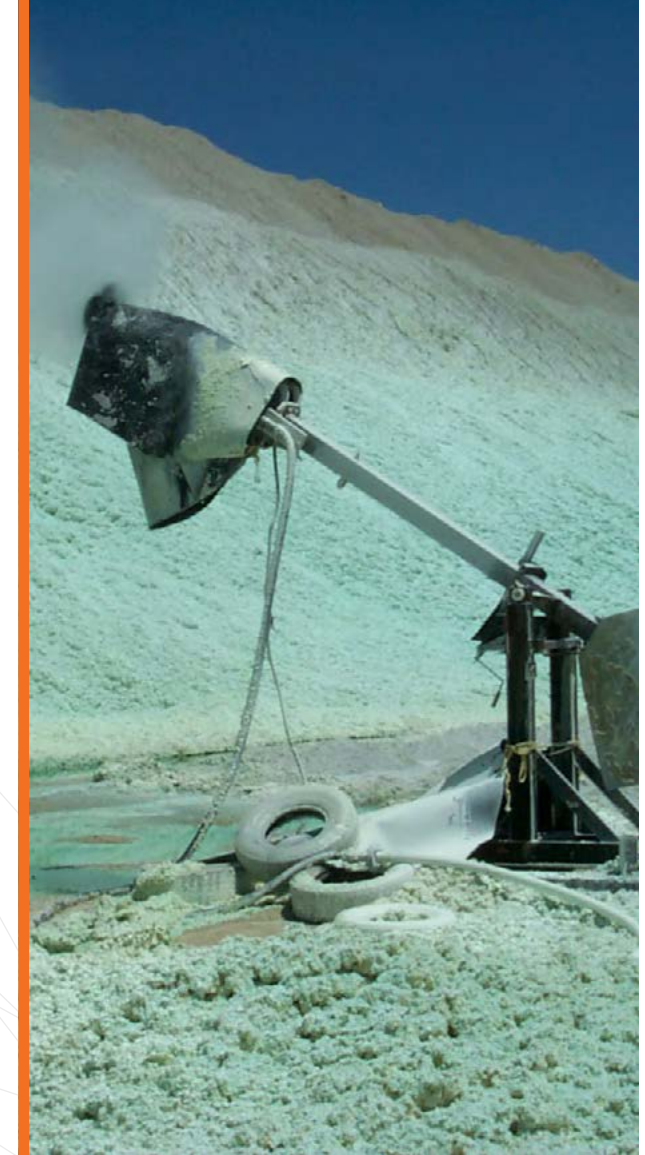
To the extent financial assurance for long-term obligations is required under a new financial assurance regime, the government should allow for the use of trusts by proponents. The specific rules for calculating the amount to be placed in a trust fund

may be defined in existing laws, can be borrowed from other jurisdictions, or use basic annuity planning principles (see for example [Training Guide for Reclamation Bond Estimation, USDA - Forest Services 2004](#) and [Bureau of Land Management \(United States\) Guiding Principles for Long-Term \(Post-Mining\) Trust Documents](#)).

5.5.4 Management and Release of Financial Assurances

As discussed above, the form of financial assurances that are allowed varies across jurisdictions. Most financial assurances are now provided through third parties in the form of letters of credit, surety bonds and bank guarantees. In those situations, the funds are held by a third party and managed in accordance with the terms of the specific financial instrument.

Where financial assurances are in the form of cash payments, GIIP would suggest that the funds be deposited in an independent third-party bank, with similar terms governing the release of funds. However, not all systems do separate cash payments in this manner. Indeed, some systems require payment of the financial assurance to a government agency. In some cases, these funds will be intermixed with other financial assurances or placed into general revenue. This is not consistent with GIIP as it threatens the ability to remediate the specific project in the event of default. By mixing funds, the financial assurance has essentially become a levy for remediation. If financial assurances are to be provided through cash, it is extremely important to ensure that cash financial assurances are maintained in separate accounts and ledgers and are not mixed



with other funds. This will ensure that those funds are available in the event of a default, or if refunds are to be made as closure cost estimates decrease.

Regardless of whether financial assurances are made in the form of cash or other methods (surety bonds, letters of credit, or guarantees), the financial institution holding the funds or offering the securitization should meet criteria set out in regulations. Some jurisdictions create a list of approved financial institutions on the assumption that those listed will provide appropriate financial controls and stability over the long-term. This method, however, requires regular review and updating and can lead to situations where inappropriate institutions are added to the list, or appropriate institutions are left off. The most appropriate method for providing a list of approved institutions, it to have a government institution that has the capacity to perform the review be responsible for that list. In Ontario, Canada for example, banks and guarantee companies are approved sources of financial assurance if they meet the Bank Act (Canada) or the Insurance Act (Canada). This removes the requirement for the provincial Ministry of Energy, Northern Development and Mines from having the required institutional capacity to review financial institutions. Even with this method, local institutional capacity is required to review the financial assurances offered by project proponents to ensure they are from listed providers.

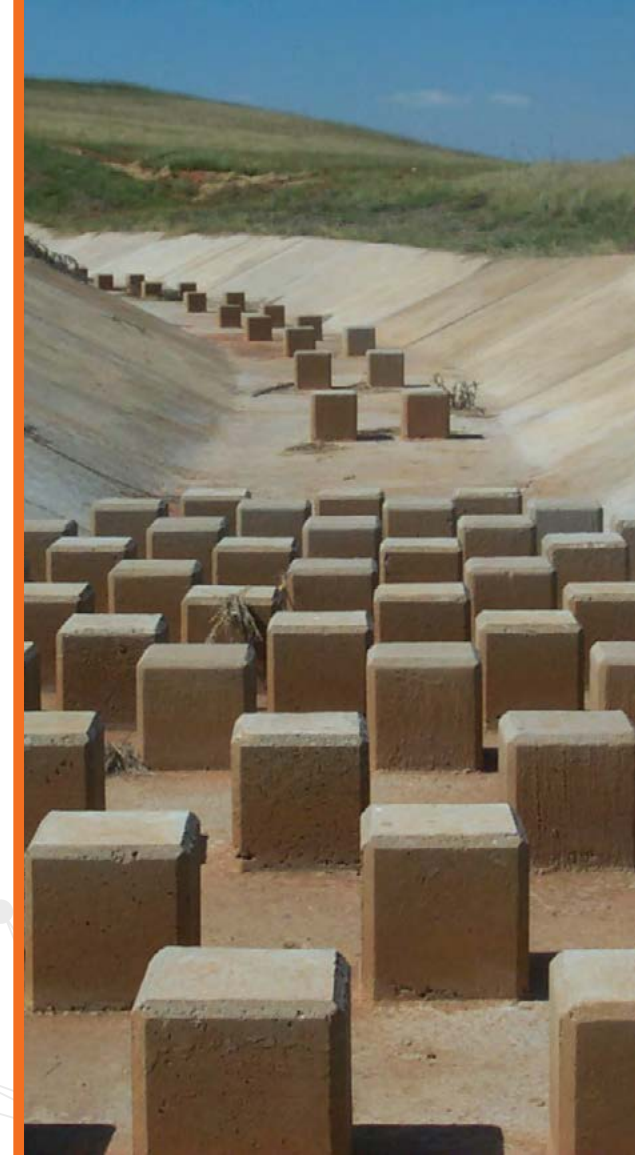
Where there is no established national capacity or approved list of institutions, or to provide for a broader framework of potential sources of financial assurance, GIIP is to provide a list of independent

and verifiable criteria that institutions are required to meet if a project proponent would like to use their services for financial assurances. An example set of criteria would be to allow any financial institution or surety provider that meets a financial test and can provides services in country. The financial tests can be simple and use third parties for verification, for example allowing for companies or institutions meeting a minimum ranking with Dominion Bond Rating Service Limited, Fitch Ratings, Moody's Investors Service or Standard & Poor's institutions. That minimum should be a prime rating, such as a BBB (low), Baa3, BBB- or similar.

Under either system of verifying financial institutions, there will be a need for the responsible ministry to review the offered financial assurance against those guidelines. In addition, standard legal terms that outline the release conditions for financial assurances should be prepared. This ensures consistency in approach, that closure liabilities are met, and provides certainty to the industry that such funds will only be used to meet the closure liabilities in the event the proponent fails to meet their legal obligations.

5.5.4.1 Release of Financial Assurance Liabilities

In addition to managing the types of financial assurance mechanisms and approving the institutions allowed to issue them, it is also important to continuously manage the quantum of financial assurance. As discussed, this is best done by ensuring proper estimates of closure costs are prepared, and then periodically reviewing and amending the amount of financial assurances, as required.



As closure costs increase, additional financial assurance should be requested. Conversely, as closure costs decrease, the financial assurance liabilities should be reduced or released (in the case of third party held funds) or returned (in the case of government held funds).

Although the amount of the financial assurance required may increase or decrease over time, the ultimate release of the funds occurs only under very specific circumstances. The third party or government should only release the financial assurances upon certain predefined conditions being met—specifically, some or all the approved closure plan are implemented.

GIIIP states that financial assurances should only be released to government authorities if the project proponent fails to meet the objectives of the closure plan and is unable to do so due to financial insolvency or dissolution. Similarly, financial assurances the project proponent should not be released from liability until (a) all the actions in the approved closure plan have been successfully completed; and (b) the obligations of the closure plan have been achieved. Some jurisdictions provide sample surety bond documents in their guidelines that are required for financial assurances (see for example, [Reclamation Surety Bond Template, British Columbia, Canada](#) and [Bureau of Land Management Bond Forms, United States](#)).

In most jurisdictions, the amount of the required financial assurance is reduced as closure obligations are met, but some financial assurances will remain in place during the post-closure monitoring period. Partial releases of financial assurance for completed closure work is an effective incentive for mining companies to implement closure activities progressively throughout the mine life cycle, thereby reducing the financial risk of the government.

To determine if the closure plan, or a portion thereof, has been properly implemented, the operator should submit an as-built report and the government should inspect the work to confirm compliance with the closure plan requirements. Typically, release of the final portion of the financial assurance is contingent upon demonstration that the site is stable, and the closure objectives have been met, or are on a trajectory to do so. This usually requires a post-closure monitoring period of five or more years.

Financial assurance instruments are intended as a guarantee against non-performance of a mining company with respect to their closure obligations. If a company fails to meet those obligations, the government should demand payment of the third-party instrument or transfer the cash into an account from which the closure work can be funded. The government will then enter into a contract with a company qualified to implement the closure plan.



6 Institutional Capacity

Institutional capacity is crucial to oversee the creation and implementation of a closure governance framework. During introduction of a new framework, the government must have the qualified resources to develop the framework. As the framework is implemented, the government must be capable of regulating closure activities and managing closure of abandoned or improperly closed mine sites.

To develop the framework, the government must have at least a basic understanding of mine closure practice or have access to resources that do. This knowledge can be obtained through education of government staff, associations with academic institutions, or collaboration with other governments.

Once the framework is developed, the government must also have qualified resources to implement it. Proper review of closure plans is critical to ensure that the operations will meet the objectives of legislation and to mitigate risks resulting from inadequate or inappropriate closure measures, and insufficient provision of financial assurances.

Experience with new closure regulations in countries such as Chile and Kazakhstan, and reference to APEC's "Mine Closure Checklist for Governments"¹ indicate that the following capacities need to be supported and enhanced to ensure effective implementation of a closure governance framework.



¹ [APEC Mining Task Force. 2018. Mine Closure Checklist for Governments. February.](#)

- Establish a dedicated inter-departmental mine closure plan review team and consider supplementing with third-party review of closure plans while building capacity
- Ensure the size of the team dedicated to review mine closure plans is sufficient to address the projected workload
- Provide and achieve a reasonable timeline for review of mine closure balancing industry expectations and thoroughness
- Ensure the responsible staff have the technical background and relevant specialist training required to review mine closure plans
- Ensure the responsible agency has the capacity to manage and administer approved types of financial assurance instruments
- Ensure the banking and insurance systems have the capacity to introduce and use a variety of financial assurance instruments in a variety of currencies

6.1 Assessing of Existing Capacity

In many jurisdictions mine closure is regulated by number of different departments (i.e. mining, land, forestry, environmental protection, and water). To avoid overlapping or gaps in the regulatory oversight, an assessment of the existing regulatory frameworks should be conducted to assess current capacity and gaps.

¹ APEC Mining Task Force. 2018. *Mine Closure Checklist for Governments*. February.

² Edumine. <https://www.Edumine.com/>

Where overlaps could exist, coordination with other government agencies is critical to avoid creating duplicative requirements under separate frameworks and unnecessary expenditures. Where gaps exist, consideration of methods to address those gaps could include training, hiring, or short-term contracts with qualified third parties.

The APEC “Mine Closure Checklist for Governments”¹ provides several tools to assess current institutional capacity. These include the following questions:

- Are there specialists with appropriate training in closure issues available to the governing body to review closure plans?
- Is there a mechanism for the regulator to contract third-party expertise and provide specialist review of the documents?
- Is required number of specialists to accommodate review of expected mine closure plans available? Is there capacity to carry out geochemical studies or model ARD/ML?

Additional assessment of the administrative resources needed to deal with the new law is also necessary and should include the following questions:

- If closure plans are being required for the first time, how many will be coming in for review over what time period?
- How many reviewers will be needed?

- Are the resources in place to provide adequate technical review? Will all plans be coming on the same date, or is there a mechanism to distribute them through the year?
- Are the appropriate institutions in place to administer financial assurance instruments?

6.2 Training and Education

There are multiple sources for GIPP and guidelines that can be accessed by various stakeholders. One of the obstacles to understand and learn from these documents is the knowledge of language. Online tools for translation are continuously improving and can be used for translation, however, some jurisdictions will benefit from professional translation of guidelines.

This section provides an overview of training available online and at universities, and a technical conference related to mine closure. This list is not complete and should be used as starting point for training ideas. Many regional conference and training centers provide region centered trainings as well.

6.2.1 Online Training

The Edumine² platform is Accredited Provider of Continuing Education and Training that provides professional development training for people in the mining industry. Edumine provides following course on mine closure:

- Mine Closure: The Basics of Success
- Reclamation and Revegetation for Mines in Arid Climates

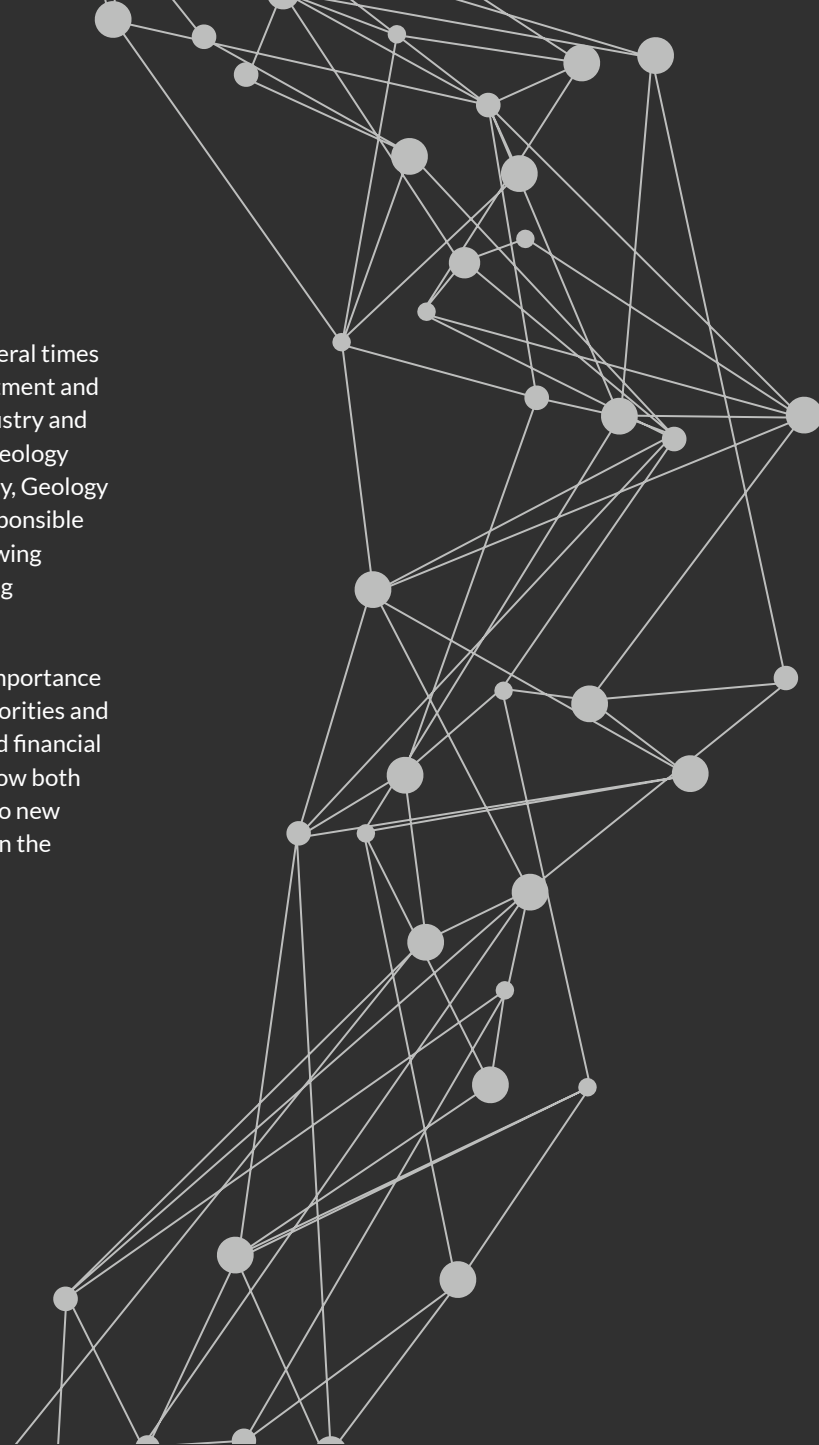
Case Study: Kazakhstan – Implementation of New Closure Plan Instructions

In 2018, Kazakhstan introduced a new Subsoil and Subsoil Use Code and associated Instructions for the development of closure plans. The implementation of the new Code included transition clauses. Under transition clause existing “liquidation” (closure) designs remained legitimate until mining plan/design is changed. The transition clause was introduced to provide time both for government and industry to adapt and implement new regulations.

Implementation of new regulations included consultation with industry and limited training of the governmental staff. Unfortunately, the initial plan to introduce a “liquidation operator” within governmental structure to be responsible for closure and financial assurance management did not pass review in Parliament. This created gap in responsible authority for closure plan reviews and approval within Ministry of Investment and Development.

The responsible authority has been changed several times from Mining Department with Ministry of Investment and Development (now re-named to Ministry of Industry and Infrastructure Development) to Committee of Geology and finally with newly formed Ministry of Ecology, Geology and Natural Resources. Frequent changes of responsible authority have led to untrained specialists reviewing closure plans and the associated risk of approving incomplete or inadequate mine closure plans.

The situation in Kazakhstan demonstrates the importance of identification and training of responsible authorities and staff for review and approval of closure plans and financial assurance estimates. The transition period to allow both government and industry to prepare and adapt to new regulations is important but must be used to train the authorized agency.



- Surface Reclamation Techniques 1: Topsoil, Hydrology and Topography
- Surface Reclamation Techniques 2: Wildlife and Vegetation
- Surface Reclamation Techniques 3: Drilling Program and Postmining Land Use

6.2.2 Capacity Building and University Courses

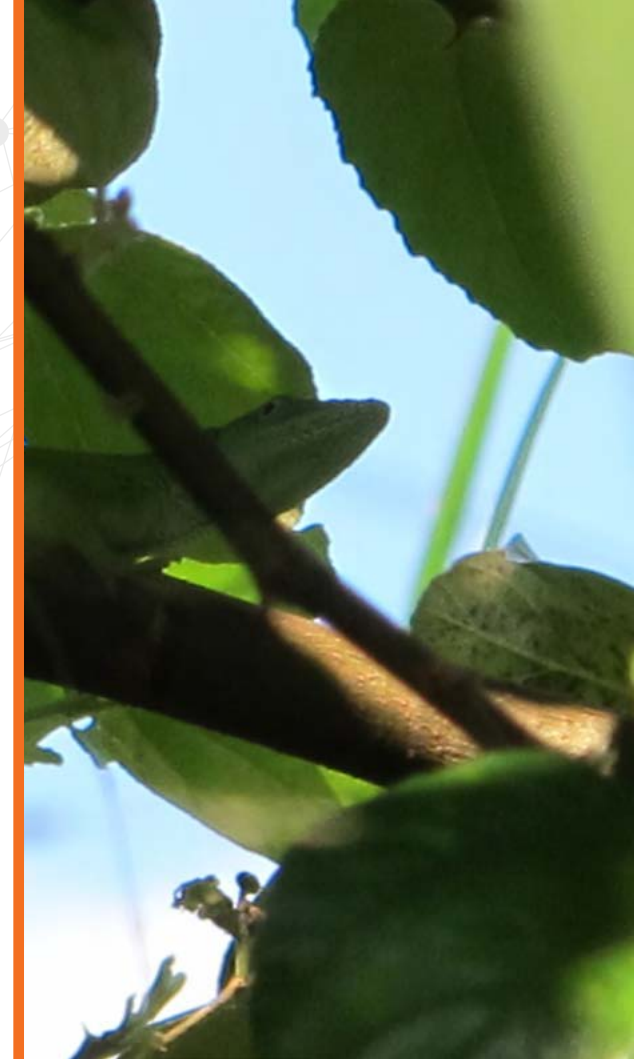
The IGF¹ secretariat provides capacity-building training and workshops to member countries upon request. Training up to date covers following topics, but can be tailored to the specific needs of member governments and are prepared to provide training on all aspects of mining policy:

- Mine Closure Workshop on Legal Frameworks
- Towards Sustainable Mining Practices Among ASEAN Countries
- Community Development and Mining: UEMOA regional workshop

At this time, there are very few university programs that are specifically designed to teach mine closure, and those that do exist are typically undergraduate courses on specific topics such as mine waste design or general topics such as mining and sustainable development^{2,3} or post-graduate extension programs.⁴ However, the Sustainable Minerals Institute at The University of Queensland provides postgraduate research projects in ecosystem assessment, restoration and resilience; industrial ecology and circular economy; and mine closure and sustainable landforms.

6.2.3 Conferences

The annual ICMC⁵ is the platform event for the global mining industry. It provides opportunities to network and explore the latest mine closure methodologies and technique breakthroughs. This meeting provides a forum for attendees from a variety of disciplines to exchange ideas about their work and to learn about new developments in the field of mine closure.



1 [Intergovernmental Forum Workshops](#)

2 [University of Nevada, Reno - Mackay School of Engineering and Science, MINE 456 - Mining and Sustainable Development](#)

3 [University of British Columbia, MINE 486 \(3\) Mining and The Environment, 2020](#)

4 [Pontificia Universidad Católica de Valparaíso, Postítulo en Cierre de Faenas Mineras](#)

5 [Mine Closure 2020 - 13th Annual International Conference.](#)

7 Socioeconomic Aspects of Closure

Until relatively recently mine closure focused entirely on physical, environmental, health and safety issues. The socioeconomic impacts of closure received little attention. During the past 10 years, the notion of social closure, which focuses on the socioeconomic impacts of closure, has gained significant importance. More recently the concept of “social closure” has been replaced by the notion of “socioeconomic transitioning,” as mining host communities are not closing but rather transitioning from a mining context to a post-mining one.

7.1 Good Practice

Good practice guidelines on social aspects of closure are gradually proliferating. The most comprehensive and recent guidelines are contained in the ICMM guide on Integrated Mine Closure (2019)¹. The core components are outlined below:

7.1.1 Stakeholder Engagement

Stakeholder engagement is vital for successful closure. The mining company, government, local business, local NGOs, mine local labor force and the wider host communities, as a minimum, need to be included in stakeholder engagement.

An effective stakeholder engagement strategy for closure planning should start early (environmental and social impact assessment stage) and focus on realistic, achievable socioeconomic transitioning



¹ [ICMM. Integrated Mine Closure: Good Practice Guide, 2nd Edition, 2019.](#)

goals and objectives. Stakeholder engagement should be intensified pre, peri and post-closure to manage stress of local communities and to stay abreast of stakeholder needs and vision.

7.1.2 Post-closure Vision – Socioeconomic Transitioning, Post-closure Land Use, and Infrastructure Repurposing

A vision of the post-closure socioeconomic environment, including post-closure land and infrastructure use and post-closure local economic activities, should be developed in the mine feasibility study phase as part of the environmental and social impact assessment to enable consideration of post-closure land and infrastructure use in project decisions and design. The vision needs to be regularly reviewed throughout the LOM. Where possible post-closure visions should be aligned with governmental or donor funded local, regional, and national development goals and plans.

7.1.3 Socioeconomic Transitioning and Repurposing Aligned with Social Investment During the Life of Mine

Mining companies should implement social investment programs during the LOM which prepare mine host communities for post-closure sustainable livelihoods and which are aligned with the post-closure vision.

7.1.4 Pre-closure Socioeconomic Baseline and Impact Assessment

Socioeconomic transitioning and repurposing strategies should be informed by a pre-closure

socioeconomic impact assessment and risk analysis. To conduct an effective impact assessment, up to date socioeconomic baseline data should be gathered. Host communities often change during the LOM. These processes have a major effect on the socioeconomic character of mining areas and regions.

7.1.5 Partnerships

Socioeconomic transitioning and post-closure repurposing are best undertaken as a partnership between government, host communities, the mining company and potentially development NGOs.

7.1.6 Retrenchment

A fair retrenchment package should be negotiated with the mine labor force well in advance of closure.

7.1.7 Post-closure Monitoring

In parallel with post-closure environmental monitoring, there should be a process of periodic monitoring of socioeconomic conditions of the host communities, using the pre-closure impact assessment as the baseline.

7.2 Legislation and Policy

To date, socioeconomic aspects of closure are not well regulated globally.¹ As a result, mining operations look towards GIIP for guidance. The workflow on the next two pages outlines the recommended role of government in the application of GIIP in the social aspects of mine closure. The social aspects and the government's role are further outlined below.

The Role of Stakeholders in Effective Closure Planning

Effective mine closure planning and implementation considers the views, concerns, aspirations, efforts, and knowledge of internal and external stakeholders to identify mutually beneficial closure outcomes for the company and its host communities.

ICMM. 2019. Integrated Mine Closure: Good Practice Guide, 2nd Edition.



¹ [Center for Social Responsibility in Mining. 2020. Social Aspects of Mine Closure: Governance and Regulation. University of Queensland.](#)

► Pre-operational

► Life of Mine

Stakeholder Engagement

Development and Refinement of Vision and Objectives

Development and Refinement of Social Aspects of Closure Plan

Development of post-closure vision and objectives including post-closure land and infrastructure use and economic activities.

Initial local impact assessment including impacts from closure

Socioeconomic transitioning

Repurposing of land and infrastructure

Items to Legislate

Require stakeholder engagement in designing and executing closure plan

Require assessment of closure impacts at ESIA stage

Identify post-closure land use

Items for Policy

Provide a framework for minimum thresholds and suggested processes for stakeholder engagement

Provide clear guidelines on expected post-closure uses in accordance with government development and land use policies

Review

Initial SIA

Closure stakeholder engagement plan

Repurposing plan

Provide Input

Post-closure vision (alignment with national and regional development plans)

Legal constraints with regards to repurposing

Items to Legislate

Require social investment programs (typically addressed in mine licensing legislation)

Items for Policy

Provide guidelines to link social investment programs to post-closure socioeconomic sustainability and national and regional development plans

Review

Social investment plan

Provide Input

Partnership in terms of social development programs

Building capacity to manage infrastructure and services transferred post-closure

► Pre-closure

► Closure

► Post-closure

Stakeholder Engagement

Development and Refinement of Vision and Objectives

Development and Refinement of Social Aspects of Closure Plan

Social impact and risk assessment

Preparation for socioeconomic transitioning and retrenchment

Final closure plan (socioeconomic aspects)

Retrenchment

Socioeconomic transitioning

Repurposing of land and infrastructure

Social monitoring

Items to Legislate

Require pre-closure socioeconomic impact assessment for closure plans

Require consideration of retrenchment package in law and possible guidelines in policy

Items for Policy

Provide guidelines for the execution of the socioeconomic impact assessment

Provide guidelines on the content of a retrenchment plan

Pre-closure Review

Social impact assessment

Final social closure plan

Items to Legislate

Require stakeholder engagement in designing and executing closure plan

Require assessment of closure impacts at ESIA stage

Identify post-closure land use

Items for Policy

Provide a framework for minimum thresholds and suggested processes for stakeholder engagement

Provide clear guidelines on expected post-closure

uses in accordance with government development and land use policies

Review

Initial SIA

Closure stakeholder engagement plan

Repurposing plan

Provide input

Post-closure vision (alignment with national and regional development plans)

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Items for Policy

Provide guidelines to link social investment programs to post-closure socioeconomic sustainability and national and regional development plans

Review

Social investment plan

Provide Input

Partnership in terms of social development programs

Building capacity to manage infrastructure and services transferred post-closure

7.2.1 Stakeholder Engagement

Stakeholder engagement is a core component of the mine closure process, and stakeholder engagement should be required as part of any closure law (Section 5.2).

Stakeholders are individuals or groups who are potentially impacted by mine closure and who have an influence over or interest in the closure of a mine. Many jurisdictions have laws requiring stakeholder engagement as part of any project development including mining projects. However, although governments can require stakeholder engagement to occur, they do not typically control the narrative or outcomes.

7.2.1.1 Stakeholder Analysis

Stakeholder engagement tools are outlined in the IFC handbook of 2007.¹ Stakeholder analysis is the initial step in good stakeholder engagement. Potential stakeholders are outlined in the next page.

Identified stakeholders should be analyzed in terms of the nature and level of impact the mine closure may have on them, the level of influence they may have over the mine closure or the level of interest they may have in the mine closure. The level is rated as low, medium or high. This process also aims to identify vulnerable groups (those groups that may be particularly vulnerable to negative impacts of closure or who lack the means to manage the negative impacts). The intensity of engagement with each stakeholder should be commensurate with their level of impact, influence or interest. The higher the level

of impact or the level of influence the more intense the level of engagement.

7.2.1.2 Stakeholder Engagement Issues

The primary purpose of closure stakeholder engagement is to develop and execute a common shared vision of a post-mining future for the mined area with all key stakeholders. As a minimum the government, local communities, and the mine operator and its employees should be included. To achieve this objective stakeholder engagement activities are undertaken with regards to the following aspects of closure:

- Post-closure visioning (from EIA phase through pre-closure) including socioeconomic transitioning and repurposing, i.e., identification of post-closure land and infrastructure use
- Closure impact assessment
- Negotiation of retrenchment packages
- Closure Plan (closure plan updates) review
- Post-closure social and environmental monitoring

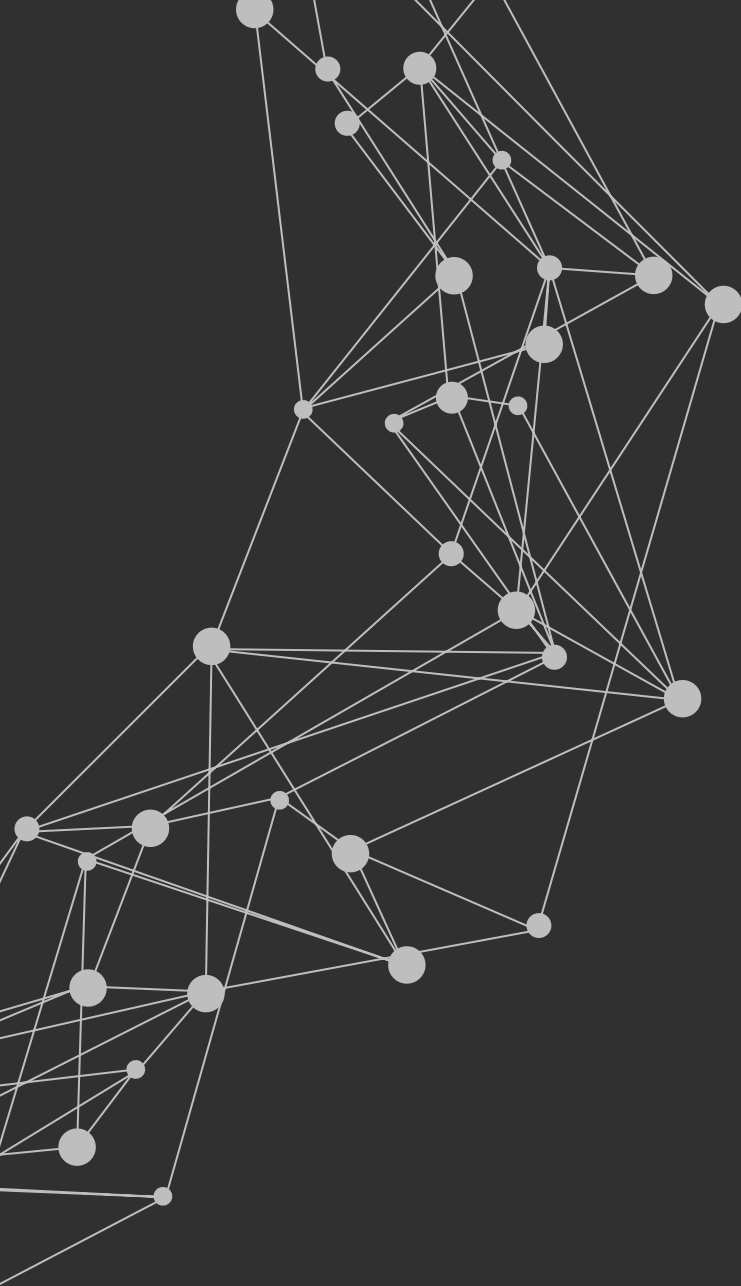
Tools for Stakeholder Engagement

A closure planning working group should be established with representatives of the key stakeholders to enable ongoing collaboration on closure planning throughout the mine's life. It is the responsibility of the mining company to constitute and manage the working group. Important stakeholders in the working group are local government and community representatives.

Setting Stakeholder Expectations

It is critical to set realistic expectations regarding the implications of closure on a variety of stakeholders. However, during project development, permitting, and operations, the focus of stakeholder engagement tends to be on employment, value sharing, community development programs, public health and safety, and environmental protection. In these early phases of the mine life cycle, closure is often viewed as an abstract, future issue that may not even impact the current generation of decision makers. This can make true collaboration on post-closure visioning difficult, but effective leadership and coordination from the government can help to alleviate this issue.

¹ [Stakeholder Engagement: A good Practice Handbook for Companies Doing Business in Emerging Markets](#)



Stakeholder Group

Key Issues

Mining Company

Responsible for preparing and implementing closure plan

Responsible for cost of closure

Employees and Families

Social impacts as a result of job loss and support

Suppliers

Loss of direct revenue from mine, current and future capacity for non-mine business

Local Businesses

Loss of direct and/or indirect revenue

Local/Regional Residents

Loss of access to social programs and infrastructure supported by mine

Impacts to vulnerable groups and minorities

Local Government

Reduced tax revenue

Reduced contributions to development programs

Impact monitoring

National Government

Environmental and technical closure issues

Responsible for approval of closure plan

Loss of revenues from mine – tax payments, tariffs, etc.

Impacts to trade balance if mine is significant

NGOs

Means to maximize the positive impact of mine contributions prior to closure

Stakeholder engagement should be executed through a diversity of platforms including seminars and workshops with working groups, community meetings, focus groups (including separate groups with women and with vulnerable groups) individual interviews, teleconferences, local government led committees, road shows, open houses, mail, or information sessions. An example of a stakeholder engagement platform is provided in the box on the right. Minority and disadvantaged subgroups are considered separately in community engagement programs as they both play a critical role in the social dynamics of any community. More vulnerable and least resilient community members may include women, children, elderly, the disabled, religious or ethnic minorities, and other less privileged groups in the community.

Records of stakeholder engagement events should be kept (including attendance lists and minutes of meetings) and attached to closure update reports.

Closure Stakeholder Engagement Plan: Table of Contents

A table of contents for a closure stakeholder engagement plan should include the following:

- Objective of the closure plan
- Stakeholder identification and analysis (including vulnerable groups)
- Topics covered by engagement
- Engagement methods and materials
- Stakeholder engagement program throughout the LOM
- Recording of engagements
- Human resources
- Budget

7.2.1.3 Government Role in Stakeholder Engagement

Law

There should be a legal requirement to prepare a closure plan that is subject to stakeholder engagement. Stakeholder engagement needs to occur with each closure plan update.

Example Stakeholder Engagement Platform

Teck Alaska operates the Red Dog mine in north western Alaska. Although ore reserves will last through 2031 or longer, the operation developed a comprehensive closure and reclamation plan that addresses the concerns of local communities. A closure planning team consisting of Teck and [Native corporation] NANA employees, along with [their] consultants, implemented a structured methodology that allowed a variety of stakeholder groups to have a balanced voice in the development of the plan. Initially, the team prepared a set of reports describing the technically viable closure options. The options were presented at a series of regional public meetings. The team also produced an Inupiaq-language DVD and provided it to all of the homes in the nearby communities. The closure planning team facilitated two multi-stakeholder workshops that systematically reviewed the options and offered a pathway for stakeholder groups to provide clear feedback. Workshop participants, over 100 in total, included representatives of the nearby communities, elder hunters from the region, Teck and NANA staff, State of Alaska regulators, NGO's, and technical specialists. Participants were grouped according to their primary interest, and each group was asked a series of questions that reflected their own perspective. Answers were gathered from each group and compiled to show group preferences. Individuals were also polled and their preferences compiled. The group and individual results showed clear preferences that became the basis of the closure and reclamation plan.¹

¹ [Hockley DE and Coulter G.A. 2010. Many Voices, One Plan: Eliciting and Integrating Stakeholder Feedback.](#) In Fourie AB, Tibbett M, and Wiertz J (Eds.), Proceedings of the Fifth International Conference on Mine Closure. Australian Centre for Geomechanics, Viña del Mar. Pages 167-180.

Policy

A framework for minimum thresholds and suggested processes for stakeholder engagement in line with the above outlined process (Section 7.2.1).

Review

Review of closure stakeholder engagement plans should occur during development of the initial conceptual closure plan.

- Are all stakeholders identified (including women and vulnerable groups)?
- Is stakeholder engagement planned at all relevant stages?
- Are all relevant topics included for discussion with stakeholders?
- Is an appropriate strategy for engaging stakeholders identified (including women and vulnerable groups)?
- Is appropriate documentation of stakeholder engagement planned?
- Are financial and human resources allocated?

Review of subsequent closure plans and stakeholder engagement records should include an analysis that, among other questions, asks: Is the stakeholder engagement being executed according to the plan? and Is stakeholder input being integrated in subsequent closure plan updates?

7.2.2 Post-closure Vision – Socioeconomic Transitioning, Post-closure Land, and Infrastructure Use

The core social aspect of mine closure is mitigation of the loss of socioeconomic benefits provided

by an operational mine (i.e. direct and indirect employment, economic development, health services and mining social investment programs). Mine closure necessitates a socioeconomic transitioning of the host communities (and often the region) from an operational mine context to a post-mining context. This section provides a proposed policy for post-closure visioning, land and infrastructure repurposing, examples and lessons learned from repurposing projects across the world and provides guidelines for government with regards to involvement in this aspect of closure.

Closure should include the development of a shared vision of a post-closure context by all stakeholders during mine exploration and construction, which should contribute to the mine design and construction plan. This requires the creation of a post-closure vision for a post-closure sustainable economy and social fabric and the accompanying repurposing of mine affected land and infrastructure. To develop a sound vision of a post-closure context the following are required:

- Knowledge of the mining zone of influence, socioeconomic and environmental context and stakeholder relationships.
- Understanding of governmental and/or donor funded local, regional and national development goals and plans. This may facilitate financing of socioeconomic transitioning.
- Dialog among stakeholders on the best post-closure economic context, including assessment of local stakeholder capacity and skillsets.

Closing a Mine Site Should Support Post-closure Activities

At a minimum mining, companies should close the mining site in such a manner that post-closure activities agreed upon can easily be executed. Post-closure activities and repurposing can become the responsibility of government, mining companies, host communities, the private sector, or a combination of these. A partnership between various stakeholders is the preferred option.



Green Energy and Mines

Because mining sites are often remote and must generate their own power, renewable energy alternatives are becoming a more popular power generation option for operating mines.* Many of these projects could continue to operate to provide power to local communities and/or provide economic development opportunities following closure of the mine. Renewable energy generation has also become an opportunity for post-closure use of portions of some operating and legacy mine sites.* In the United States, this has included development of solar energy facilities on closed tailings impoundments (Questa Mine, New Mexico; Mission Mine, Arizona), micro-hydroelectric plants to power long-term water treatment facilities (Summitville Mine, Colorado). Similar post-closure green energy repurposing opportunities are being considered at several other mine sites,† including at the Kidston Mine in Queensland, Australia.‡

* Umar, A. 2019. *Going Green: Renewable Energy Projects at Mines Around the World*. December.

† Columbia Center on Sustainable Investment. *The Renewable Power of the Mine: Accelerating Renewable Energy Integration*. December 2018.

‡ Kidston Pumped Storage Project.

- Understanding of local land ownership (and past land conflicts) to ensure closure does not cause or re-open land ownership conflicts.
- Assessment of infrastructure and services which may serve host communities post-closure and local capacity to maintain the infrastructure and services. This will require an understanding of users in the affected area, reliance on power for economic activities, decision of local population to out migrate, and other ways in which the community relies on the services and infrastructure of the mine.

The vision should be translated into clear socioeconomic objectives and indicators to measure the achievement of objectives (Section 4). Regular updates and refinements of the objectives should be developed throughout the mine life. Detailed and SMART objectives (Section 4) should be finalized in the final closure plan.

Pre-closure agreements should be defined in terms of responsibilities for post-closure land and infrastructure use.

7.2.2.1 Post-closure Socioeconomic Context and Repurposing of Land And Infrastructure

A post-closure socioeconomic vision and repurposing will depend on the specific context of each mine, which will determine what types of repurposing are

- economically practical,
- technically achievable and appropriate,

- consistent with national and regional context,
- appropriate for the natural and socioeconomic conditions, and
- compliant with the legal framework.

Detailed studies on repurposing are not readily available. The examples available in the public domain, in particular for former Soviet Union countries, are generally lacking^{1,2}. The majority of examples are based in developed countries and have large financial implications. Some examples available in the public domain are provided in Appendix C.

Lessons Learned

The Centre for Social Responsibility in Mining has developed a global database of repurposing cases.¹ Their results are presented in Figure 6.

Some observations from the database include:

- Overall, there are very few examples of repurposing relative to the number of closed mines. Government websites occasionally have information about closed and abandoned mines, but rarely include detailed information.
- There is no clear, extant framework for assessing what constitutes a robust regulatory regime for governing social aspects of closure.
- The most prevalent land categories in terms of repurposing (in order of most to least prevalent include: community and culture (especially repurposing infrastructure into cultural heritage

1 Holcombe S and Keenan J. 2020. *Mining as a Temporary Land Use Scoping Project: Transitions and Repurposing*. Centre for Social Responsibility in Mining. University of Queensland, Australia.

2 Pearman G. 2009. 101 Things to Do with a Hole in the Ground. The Post Mining Alliance.

purpose), conservation and eco-system services, non-intensive recreation (public or botanical gardens, paths for walking, hiking, running, cycling and horse riding and ecotourism), education and research, construction, intensive recreation, lake or pool, agriculture, light industrial, alternative power generation, and forestry.

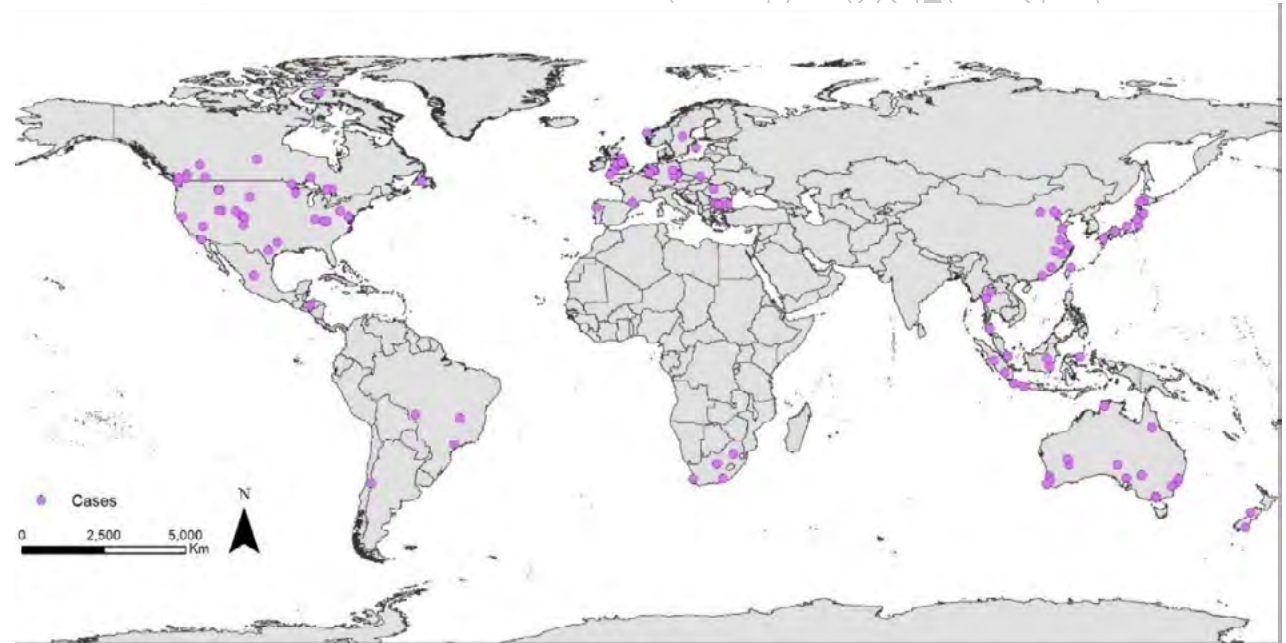
- When a mine is repurposed, there is often more than one land use
- The main funders of repurposing in terms of prevalence are (most to least prevalent) mining companies, the state, public-private partnership and private companies

In addition to the preceding list, external factors positively influencing repurposing include:

- proximity to communities and towns which may have residents who champion repurposing and economic transitions
- good connectivity to existing infrastructure (roads, railways, energy networks)
- an ecological value of the mine location (in regional context) and its potential to add to eco-system services
- economic viability, i.e., a balanced local supply and demand
- concurrent or progressive reclamation is more likely to lead to positive post-mining land-use transition
- well established mines with long-term engagement with local communities have more likely successful repurposing initiatives

Applying basic land use viability principles to define potentially viable land uses can ensure that selected land use for mine repurposing are viable and

Figure 6 Mines Across the World Where Repurposing Has Taken Place



sustainable.¹ Engagement with key stakeholders on the issue of post-closure land use and repurposing should begin as early as possible in the mine life cycle, but typically requires at least some environmental and socioeconomic baseline data be collected before beginning. The process begins with identification of potential future land uses followed by an analysis of the requirements and constraints of each potential land use (Figure 7). Based on this analysis, non-viable land uses can be eliminated and a final list of potentially viable land uses prepared for consultation with stakeholders. Clear documentation and open discussions regarding the rationale for selection of the preliminary list of land uses are critical to a collaborative process with stakeholders. Stakeholders may propose other potentially viable land uses as well as additional information including community requests, local and regional development plan goals, and other information related to the local socioeconomic context. However, the final land use, or uses, should be based on primarily on viability and sustainability, but consider stakeholder desires to the extent possible.

Repurposing Examples

Based on available literature and an assessment in Armenia, Georgia and Kyrgyzstan, the following potentially feasible post-closure land and infrastructure repurposing options were identified:

- **Education and culture** – dismantled mine camp buildings repurposed for educational and cultural facilities
- **Tourism** – repurposing of mining areas for

tourism (watersports in pit lake, nature park, industrial tourism linked to mining infrastructure, mining infrastructure repurposed for tourism accommodation and tourism information centers)

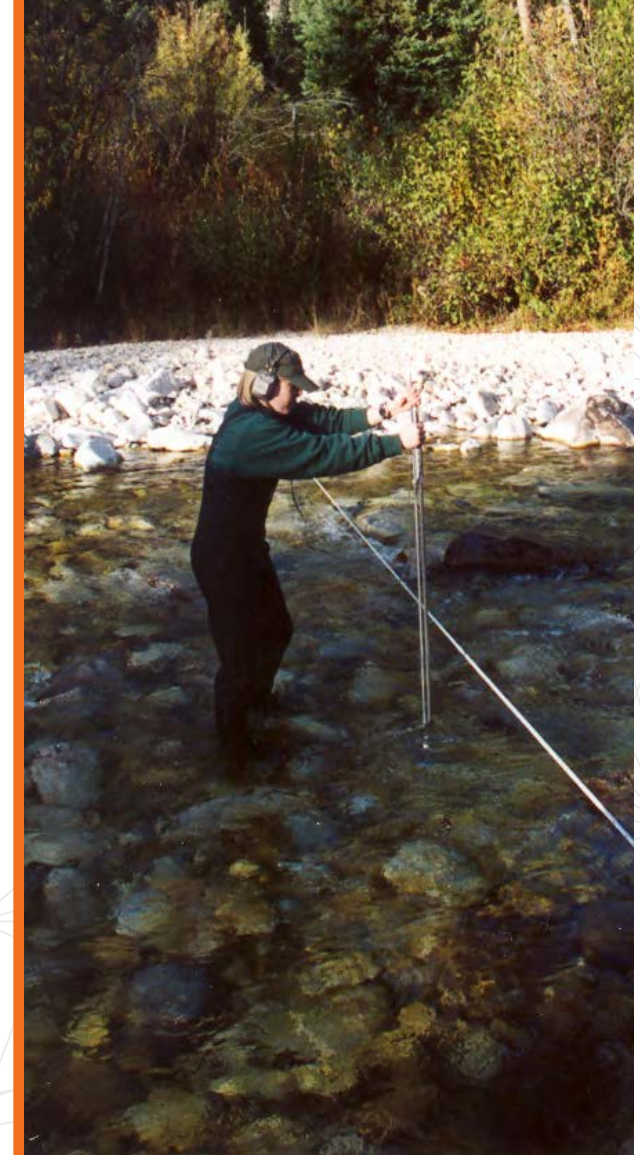
- **Nature conservation** – creation of biosphere reserve, protected area, nature trails
- **Energy** – mining land repurposed as solar panel or wind farms
- **Forestry** – mining land repurposed for woodlots
- **Agriculture** – mining land repurposed for crop land, bee keeping, grazing land, intensive agriculture (greenhouses), dairy farms, and mining infrastructure being repurposed for agricultural processing facilities
- **Aquaculture** – pit lakes used for fish farming
- **Water reservoir and hydroelectric dams** – Pit lakes repurposed as water reservoirs
- **Small and medium enterprises** – mining land and infrastructure repurposed for the development of small and medium enterprises
- **Clean energy** – use of abandoned mines for solar farms and wind turbines

Often different areas of the mining lease are repurposed in different ways.

7.2.2.2 Government's Role in Post-Closure Visioning and Repurposing Land Use

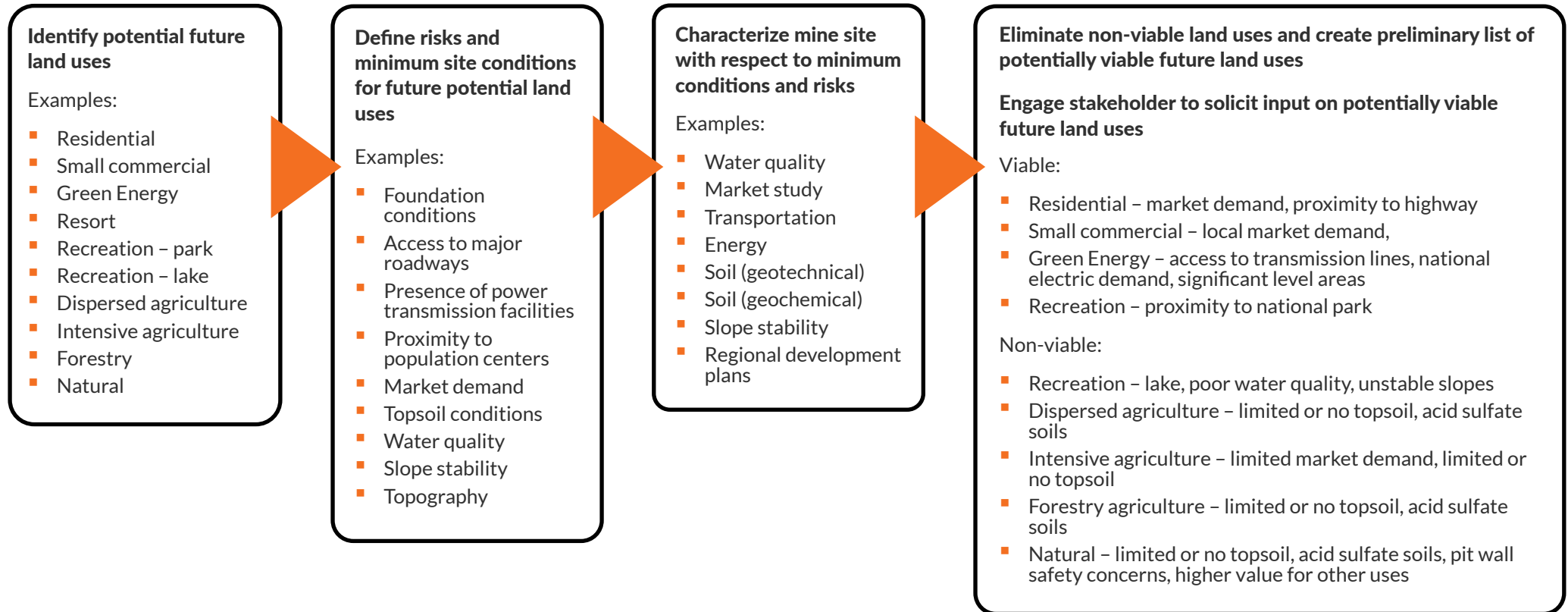
Law

Require closure plan to identify post-closure vision and land use(s). Countries or regions may consider land use plans with post-closure land use captured in development plan.



¹ Stewart WJ, et al. 2013. *A Rigorous, Systematic and Integrated Methodology to Assess Viable Land Use Options for Mine Closure: A Case Study from Suriname*. Mine Closure 2013 – Tibbett, M, Fourie AB, and Digby C (Eds), September.

Figure 7 Land Use Approach



Determine future land use(s)

Policy

Provide clear guidelines on expected post-closure uses in line with national and regional land use plans. Post-closure vision including repurposing of land and infrastructure and post-closure economic development needs to be conducted in line with government policy (Section 7.2.2).

Support opportunities for public-private partnerships.

Review

Review of repurposing of land and infrastructure in closure plan

- Is there a post-closure vision and SMART objectives?
- Are there clear indicators to measure the achievement of objectives?
- Is the vision and repurposing based on sound understanding of the affected area (socioeconomic, environmental)?
- Has repurposing of land and infrastructure been included and motivated?
- Have national and regional development plans been considered for repurposing?
- Does the repurposing consider the physical, environmental, financial, economic, and legal constraints?
- Has the vision been developed jointly with key stakeholders?
- Review of subsequent closure plans

- Has the repurposing been (re)considered?
- Have potential changes in vision and repurposing been motivated?

Review of final version of the closure plan

- Has a final repurposing been identified? Is the method for identifying repurposing alternatives transparent?
- Is the final repurposing plan informed by a pre-closure impact assessment?
- Were key stakeholders consulted?
- Are responsibilities for repurposing and socioeconomic transitioning in place?
- Are funds available for the repurposing and initiation of the transitioning? What is the source of funding? Will it be sustainable?

Participation

- Government to develop a forum to encourage repurposing of land and infrastructure through alignment with national, regional, and local development plans (stakeholder engagement)
- Potential government responsibility for post-closure repurposing and economic transitioning, as a sole actor or in partnership with other stakeholders
- Government to communicate legal constraints for repurposing to mining company (land tenure and land management plans, access to natural resources, environmental protection, watershed protection, health and safety standards, etc.)

The Importance of Partnership

Based on a partnership that commences during the LOM, linked to the mine social investment program, socioeconomic transitioning and post-closure repurposing is best undertaken as a partnership between government, host communities, the mining company and potentially development NGOs.



7.2.3 Socioeconomic Transitioning and Repurposing Aligned with Social Investment During the Life of Mine and Executed as a Partnership

A closure policy should be developed that requires alignment of mining social investment projects with socioeconomic transitioning. This section covers the proposed policy and provides guidelines for government involvement in this aspect of social closure.

Effective socioeconomic transitioning requires thorough preparation, which should start early in the LOM as part of the original visioning. If repurposing includes agriculture, tourism development, small and medium enterprises, fisheries, or other activities, these will require sufficient capacity and skills to execute the post-closure economic activities. Training and capacity building are generally required to prepare host communities for closure. This will need to occur during the LOM.

The post-closure vision should form the basis of the mine's social investment process and sustainable livelihood training should begin early on in the LOM and intensify towards the end of mine life when post-closure land use and activities have been finalized. Partnerships between various stakeholders should start during the LOM.

Planning for the transfer of facilities and services should be implemented during the operational period to support a sustainable

transfer. Facilities may include clinics, training centers and accommodation and services may include transport, water, electricity and road maintenance. Sufficient lead time will be necessary to provide government and other recipients the time to identify and allocate budgets and other resources needed for the running and maintenance of facilities and/or services.

A trust fund may be established by the mining company (not compulsory) for ongoing social development or infrastructure maintenance. In such case a management body with capacity to manage this fund should be developed prior to closure to ensure it can be sustained and meet its objectives.

7.2.3.1 Government's Role in Transitioning and Repurposing

Law

Mining companies are required to produce and fund a social investment plan as part of the licensing obligations and taking into consideration the goals of the closure plan.

Policy

Socioeconomic transitioning should be addressed in the closure plan.

Social investment plans should be aligned with socioeconomic transitioning.

Public-Private Partnerships (PPP) and Special Purpose Vehicles (SPV) or Special Purpose Entities (SPE)

"The private party to most PPP contracts is a specific project company formed for that purpose—often called a Special Purpose Vehicle (SPV). This project company raises finance through a combination of equity—provided by the project company's shareholders—and debt provided by banks, or through bonds or other financial instruments. The finance structure is the combination of equity and debt, and contractual relationships between the equity holders and lenders."¹

An example of an SPV being used to fund and manage a project is the partnership between two mining companies and a municipality in South Africa. "To improve waste water infrastructure needs, the Municipality of Rustenburg created the Rustenburg Water Services Trust (RWST) to finance and upgrade infrastructure. The Trust secured revenues from municipal bulk water sales and an off-take agreement with two local mines. This revenue security, and the ring-fencing of the RWST as a special purpose vehicle (SPV), enabled commercial finance to be accessed in the form of a bank loan. The establishment of a Trust, with revenues ring-fenced from the municipality and strong operating arrangements, provided comfort to the lenders and helped to soften lending terms. Revenues provided by the two mines for the purchase of effluent created a strong revenue stream for the Trust, and helped secure a commercial loan from ASSA bank. The public sector [including the Department of Water Affairs and Rustenburg Municipality] played a key role to help structure a transaction that addressed critical water resource needs for the municipal area."²

¹ World Bank, et al. 2014. *Public-Private Partnerships Reference Guide, Ver. 2.0*.
² World Bank. 2016. *Municipal Finance in the Municipality of Rustenburg (South Africa). Case Studies in Blended Finance for Water and Sanitation*, August.

Review

Review of the social investment plan.

- Is there a social investment plan?
- Is the plan consistent with the post-closure vision?
- Does the plan outline clear objectives and criteria for success?
- Does the plan include local capacity building?
- Does the plan consider transfer of infrastructure and services?
- Is the plan adequately funded?
- Is the plan executed by capable agents?
- Is the social investment plan regularly updated?

Regular monitoring of the results of the social investment program.

Participation

Government may partner with the mining company in capacity building programs during the LOM.

Local government may need to build its capacity to manage transferred infrastructure and services.

When a mine contributes to social services, facilities, or infrastructure during part of its life, agreements should be made with the government prior to closure to ensure these can be sustained without the mine except where they are purposely discontinued. Where local government resources or capacity are unlikely to sustain a project, service, or facility, it may be advisable to seek alternative organizations that can provide this. These may include dedicated development organizations (i.e. donors and

NGOs) with resources and capacity to takeover. Alternatively, a trust fund may be set up by the mine to provide community support post-closure.

7.2.4 Pre-closure Socioeconomic Baseline and Impact Assessment

To develop effective social transitioning and repurposing strategies, a pre-closure socioeconomic impact assessment and risk analysis should be conducted, based on current socioeconomic baseline data. In most mining jurisdictions, social impact assessments are generally required at the EIA phase; however, host economies often change because of a large number of mining employees, mining social investment activities and improved communication and infrastructure networks. These processes have a major effect on the socioeconomic character of mining areas and regions.

Ideally, closure socioeconomic impacts should be included in the premining EIA and the pre-closure socioeconomic baseline and impact assessment should be an update of the EIA. A pre-closure social baseline should include the following:

- National context
- Regional context
- Local context
- Governing system
- Demographics (community cohesion in and out migration)
- Livelihood strategies e.g. fishing, agriculture (crops or grazing), tourism, business, industry, and employment
- Land use and land tenure (land use demand)



- Ecosystem services (natural resources use)
- Public Infrastructure and services
- Housing
- Health
- Education and training
- Social, traditional, economic and political networks, institutions and processes
- Human rights issues and mechanisms to deal with human rights issues
- Vulnerable groups
- Security and crime
- Gender
- Development needs
- Trends and changes over the LOM

An impact and risk assessment should be conducted with core stakeholders, including local government and host communities and any active local NGO and private sector stakeholders. The impact assessment should, as a minimum, include impacts on the following:

- Demography (including migrations)
- Standard of living
- Health
- Livelihood activities, economy, and employment
- Social cohesion
- Feeling of wellbeing
- Land use
- Infrastructure and services

Impacts should be rated in terms of severity and disaggregated in terms of different receptors (i.e. gender, vulnerable groups, livelihood groups (local business, farmers, etc.).

Identified post-closure land and infrastructure use, socioeconomic transitioning plans and retrenchment developed as part of the initial closure plan and its updates should be informed and where necessary adapted based on the results of the impact assessment.

The pre-closure socioeconomic impact assessment should be conducted five years prior to closure, to inform the final closure plan.¹

7.2.4.1 Government's Role in Pre-closure Socioeconomic Baseline and Impact Assessment

Law

The final version of the closure plan should incorporate the results of a pre-closure socioeconomic impact assessment

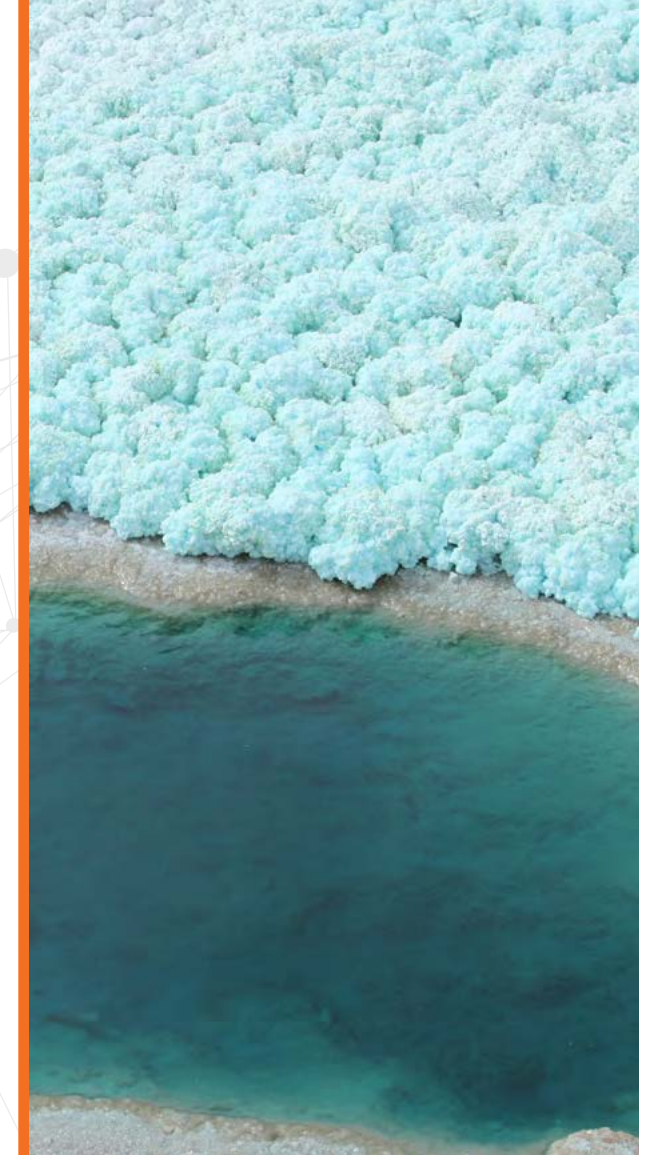
Policy

A pre-closure socioeconomic impact assessment should be conducted in line with policy outlined in this section (Section 7.2.4).

Review

The pre-closure social impact assessment review should consider the following:

- Has the social impact assessment been conducted in line with the policy?
- Is the baseline current and comprehensive, and does it focus on local conditions?



¹ IAlA. 2015. [Guidance for Assessing and Managing Social Aspects of Projects](#). A useful guide for conducting social impact assessments.

- Is the impact assessment transparent and based on an accepted methodology?
- Has the baseline and impact assessment been conducted by a qualified agency?
- Have stakeholders been involved in the impact assessment?
- Are the mitigation actions proposed consistent with the socioeconomic transitioning plan and the retrenchment plan?
- Is the final closure plan informed by the social impact assessment?

Participation

Government should participate in an impact assessment workshop with other stakeholders.

7.2.5 Retrenchment

Requirements for retrenchment may be addressed under other than mining laws, such as labor laws. In some jurisdictions, where such requirements are absent, a good practice closure policy should include the requirement for a fair retrenchment package as part of a socioeconomic transitioning plan.

These plans should be informed by:

- Anticipated impacts on retrenched workers and communities
- Eligibility of retrenched workers for unemployment or other benefits
- Prospects for retrenched workers (market demand for their skills and alternative sources of income/employment)
- The overall socioeconomic transitioning vision

Retrenchment plans should include.¹

- The timescale (reasonable notice is required)
- Who will be consulted (should include direct employees and those employed through labor brokers), workers representatives/trade unions?
- How alternative jobs will be sought
- How severance pay will be calculated (informed by government regulations)
- What measures are in place to assist those losing their jobs to seek new work / retrain
- How broader community impact issues are to be addressed
- Anticipated impacts on retrenched workers and communities
- Prospects for retrenched workers (market demand for their skills and alternative sources of income/employment)
- Voluntary training programs, career counselling, assistance to set up micro-enterprises, financial counselling, re-employment programs
- Monitoring of the retrenchment process (documentation of how the retrenchment process is executed)

Retrenchment measures need to acknowledge that there are different groups amongst those to be retrenched, based on criteria such as age, life stage, gender and family situation. Therefore, early pension may be appropriate for one group, reskilling or assistance with reemployment for another group, while assistance with alternative family livelihood

Post-closure Social Monitoring

A social monitoring should be conducted by experts 1, 5, and 10 years post closure.

The pre-closure social baseline should provide the key indicators for the post-closure monitoring of the standard of living of the host population. Key indicators should include health, education, income, access to facilities and services. The monitoring should involve a household survey of a sample of host households and focus groups in the host community. The results of the monitoring survey should be shared with the host communities.

¹ [European Bank for Reconstruction and Development, 2010, EBRD Retrenchment Guidance, April.](#)

activities may benefit another group. It is equally important to link retrenchment assistance to local economic development. Support for with local economic development projects, which can provide alternative employment, should be considered as part of retrenchment.

Retrenchment packages should to be negotiated between the mine labor force (including trade unions) and the operator well in advance of closure and in line with national regulations.

Small-scale, local suppliers to the mining company which majorly relies upon should be given the opportunity to join in the reskilling program and the mining company should be encouraged to assist these suppliers in developing other market opportunities.

7.2.5.1 Government's Role in Retrenchment

Law

Closure plan should identify any retrenchment agreements.

Policy

A retrenchment package should be prepared in line with government policy (as described in this section) and any applicable laws and described in the final version of the closure plan.

Review (Retrenchment Package)

- Is the severance payment spelled out (and how was it calculated)?
- Does the package align with all applicable government regulations?

- Is the package informed by an impact assessment?
- Does the package include voluntary reskilling and assistance with reemployment?
- Is there a time scale identified?
- Does the package include assistance with reemployment?
- Are local small suppliers and main subcontractor employees included I the retrenchment program?
- Has the retrenchment been discussed with affected people?
- Is there a monitoring plan included?
- Is there an adequate budget for retrenchment?

7.2.6 Post-closure Monitoring of Social Aspects of Closure

A good practice closure policy should include a requirement for a post-closure social monitoring plan. This should be informed by:

- Closure objectives identified in the closure plan and indicators for success
- The pre-closure baseline and impact assessment

The monitoring plan should be agreed by all stakeholders.¹ Both the former workforce and communities transitioning to a post-closure economy should be included in the monitoring plan.

Recommended indicators (not exhaustive and adapted to specific conditions) for monitoring include the following².



¹ Evering JA, Mackenzie S, and Svobodova K, 2020. Participatory Processes, Mine Closure and Social Transitions. Centre for Social Responsibility in Mining, University of Queensland.

² ICMM. Integrated Mine Closure: Good Practice Guide, 2nd Edition, 2019.

- Post-closure earnings by individual/household compared to pre-operation, during operations
- Proportion of households in affected communities generating alternative incomes
- Proportion of businesses operating post-closure
- Former employee and supplier rates
- Proportion of new businesses
- Proportion of lost land restored to a productive capacity
- Changes in yield or productivity of crops
- Proportion of social investment programs continuing post-closure
- Social investment program performance
- Local migration trend
- Productivity measures for hunting, fishing, and traditional food/medicine plant sources

Methods for monitoring and evaluation can include stakeholder perception surveys, household surveys, community consultation meetings, and analysis of trends in community grievances.

Socioeconomic monitoring may be carried out by:

- The mining company
- Government, which can help to ensure a monitoring program is consistent with development plans and that monitoring results are considered in future planning decisions
- NGOs (active in local area often have existing relationships with local communities; understand local socioeconomic issues, needs and capacity; and may have ongoing community development programs to meet company's social investment and social transition objectives and programs)
- Community members

7.2.6.1 Government's Role in Post-closure Monitoring of Social Aspects of Closure

Law

Post-closure social monitoring should be required as a commitment in the closure plan. It may be included as part of a comprehensive post-closure monitoring plan.

Policy

Post-closure social monitoring should be executed in line with policy as outlined in this section.

Review

Review of the post-closure social monitoring plan.

- Is the post-closure monitoring plan informed by closure objectives?
- Are the indicators based on the pre-closure baseline?
- Are the indicators SMART?
- Are financial and human resources allocated to the monitoring?
- Has the duration of the monitoring period been set out and motivated?
- Has the monitoring plan been discussed with all stakeholders?
- Are both ex-employees and the wider host communities involved in the monitoring?
- Are appropriate methods used for the monitoring?
- Is the duration of monitoring period appropriate?

Review of the regular monitoring:

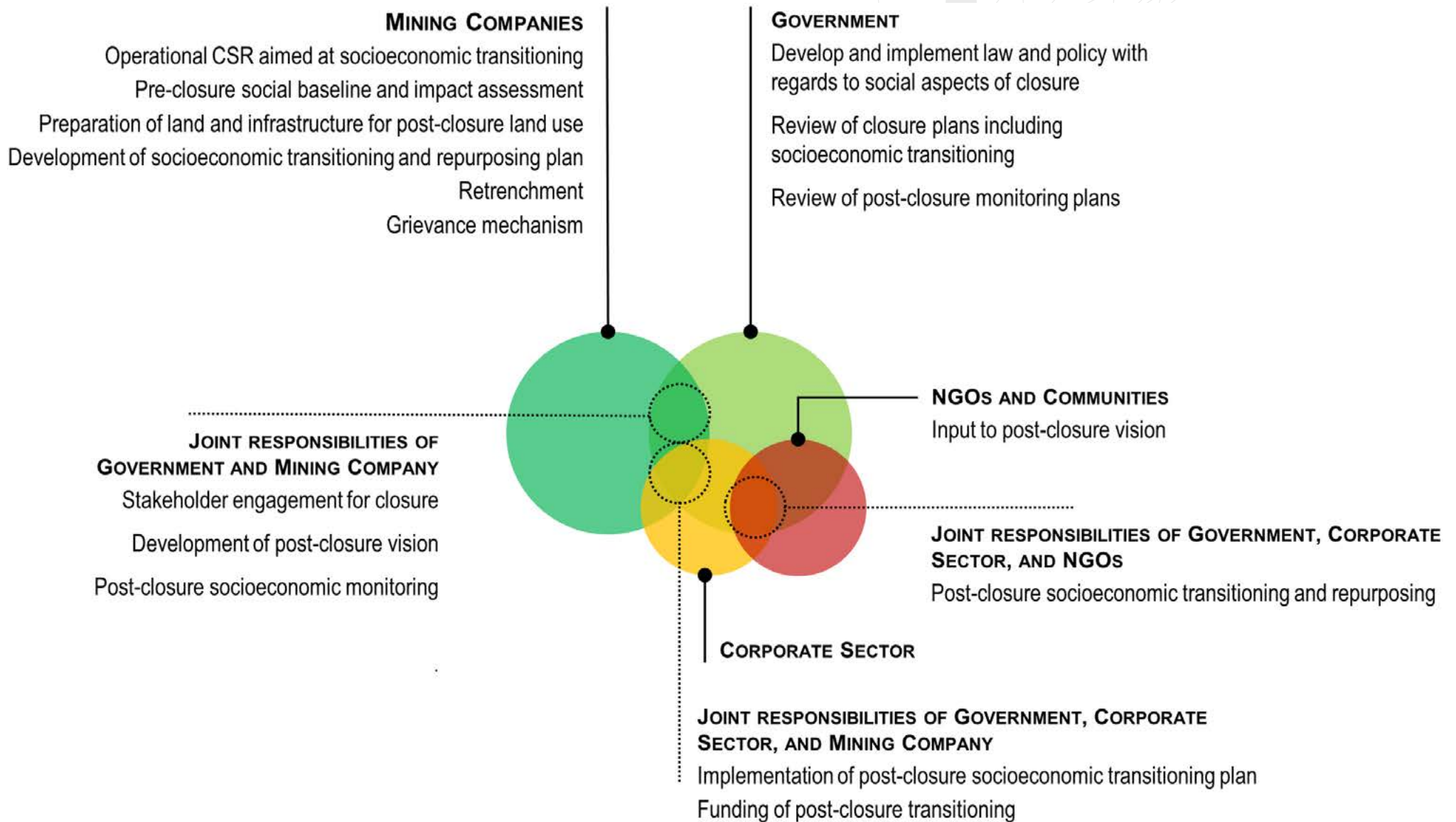
- Is the monitoring executed in line with the plan?
- Are remedial measures taken where the monitoring reveals potential problems?

Participation

Government agencies may be involved in executing the monitoring, or certain aspects of the monitoring (to be agreed through stakeholder engagement). Figure 8 provides a summary of the responsibilities and costing in post-closure socioeconomic activities.



Figure 8 Responsibilities and Costing for Post-Closure Socioeconomic Mitigation



8 Technical Requirements of Closure

Good practice guidelines on closure are continuously evolving. The most comprehensive and recent guidelines are contained in the ICMM¹ and APEC.²

One of critical component of closure policy is the technical content of a closure plan. Based on the guidelines, the minimum technical aspects of closure that should be addressed in any closure governance framework are physical stability, chemical stability, post-mining land use, biodiversity, and contaminated media. Of these, the first two are included as critical requirements in all closure governance frameworks meeting GIIP, because these two aspects present the greatest risks to human health and the environment as well as posing the highest financial risks to a government.

Because the site-specific context of each site is different and approaches in the different technical guides vary, it is best for closure legislation and policies to permit the use of multiple options and allow operators to propose other standards, if appropriate. Evaluating the range of options available and assessing the adequacy of the technical measures selected by the proponent, requires considerable professional knowledge and judgement.² Institutional capacity assessment to review and accept mine closure plans is provided in Section 7.1.



¹ ICMM. *Integrated Mine Closure: Good Practice Guide, 2nd Edition, 2019.*

² APEC Mining Task Force. *2018. Mine Closure Checklist for Governments, February.*

The overarching closure policy can be defined, but not limited to: “Return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities.” According to ICMM this may include goals for biodiversity and for a self-sustaining ecosystem that will be viable in the long term without ongoing mining company support, and compatible with the proposed land use.¹

Much of the following information is sourced from international guidelines. In this GIIP is elaborated to provide guidelines for design considerations, post-closure monitoring and recommendations are made for the role of government in terms of regulation and policy development, mining practice review and active participation in closure planning and execution.

8.1 Physical Stability

There is considerable technical guidance available on the design and operation of tailings dams, and accepted industry guidelines should be used, such as the documents produced by the Mining Association of Canada (MAC)¹ or the International Commission on Large Dams.²

Waste rock facilities should be designed and constructed with closure in mind because it may be difficult or impossible to augment the stability of a waste rock facility after placement. To limit long-term risks from structural failures and maintain the effectiveness of the selected closure activities for

landforms that remain on-site following mine closure, the physical and geotechnical stability of these landforms must be preserved.

Designs need to be sufficiently robust to withstand potentially detrimental processes that relate to physical stability such as

- erosion (e.g. wind, water, and waves) during extreme climatic events
- processes that relate to geotechnical stability such as slope instability (i.e. related to high pore pressures or seismic loading) and settlement

Because the design of many of these types of structures are based on stability during the operational life of the mine, design criteria used such as design storm or seismic events—while suitable for the operational period—may not be suitable as long-term, post-closure designs.

8.2 Chemical Stability

Mines typically have several potential sources of geochemical risks primarily associated with mine and processing wastes and voids (i.e. pits and underground workings). These risks may be associated with naturally occurring geochemical conditions such as ARD/ML, naturally occurring geochemical conditions that have enhanced by mining (e.g. increased exposure of potentially ARD/ML materials), or residual effects from processing mineralized ore.

The Acid Rock Drainage Process - The Global Acid Rock Drainage (GARD) Guide

The primary process responsible for generation of ARD, NMD, or SD of concern is weathering of sulphide minerals, in particular, pyrite. In some cases, the generation of ARD, NMD, or SD may also be due to oxidation of elemental sulphur. Weathering, or oxidation, of pyrite occurs naturally when exposed to atmospheric conditions, either through geologic processes or anthropogenic activities that involve removal of material (e.g., mining, highway construction).

Mining and other forms of earth moving, however, greatly accelerate the weathering of reactive sulphides because they create conditions that tend to facilitate movement of air and water, expose large volumes of material, increase the surface area of the reactive component, and create the opportunity for colonization by microorganisms that catalyze the oxidation processes in the presence of acidity. As a consequence, the potential environmental consequences of human activities can be significantly more noticeable than those resulting from natural processes

The sources of ARD include the mine and process wastes and mine and process facilities that contain reactive sulphide and potentially neutralizing minerals involved in mitigation of acidity.

¹ [Mining Association of Canada. A Guide to the Management of Tailings Facilities, Version 3.1, 2019.](#)

² [International Commission on Large Dams.](#)

The ARD/ML potential of pit walls, tailings, overburden material, and other mine-related materials such as paste backfill should be considered and evaluated in detail in closure plans.

According to ICMM all mine waste materials should be geochemically characterized to predict if ARD/ML will be generated. The Global Acid Rock Drainage (GARD) Guide¹ provides a comprehensive and authoritative resource in making such predictions. The GARD Guide provides additional discussion of common treatment technologies for mine water.

The geochemical assessment of ARD/ML potential can be complex and involve some long-term tests taking months or years to complete. Therefore, understanding the potential of ARD/ML in the early stages of mine planning and design (and continuing to enhance this understanding during the life of the mining operation) will ultimately improve the design of the closure options.

Residual water from mineral processing (e.g. tailings supernatant solutions or heap leach drainage) may contain process solutions and elevated constituents due to the processing methods. Management of such solutions until the drainage and/or metal concentrations decrease to acceptable levels must be considered in a closure plan.

8.3 Contaminated Soils and Water Sources

Fuel, chemicals, tailings, ore-associated metals, and other substances can contaminate soils and groundwater through accident or failure of management systems. Contaminated groundwater refers to all water below the ground surface that these substances have contaminated.

Process facility decommissioning and removal of infrastructure activities also generate wastes including contaminated soils, hazardous materials, and liquid wastes. Generally, these are removed from the site to a licensed disposal facility or in some cases treated or permanently stored on site.

Removal can be considered but options for licensed (trusted and reliable) disposal facility not always available in remote sites.

In situ methods for contaminated land treatment involve methods of immobilizing, stabilizing, washing, transforming or separating contaminants in the soil. The success of selected method and feasibility of in-situ treatment required further studies at each site. Furthermore, in line with success criteria for closure, regulators will also need assurances that the level of clean-up taking place is defensibly measurable, so a post-closure monitoring plan will be provided and approved.

IFC's Environmental, Health, and Safety (EHS)

Guidelines for Contaminated Land provides a summary of management approaches for land contamination due to anthropogenic releases of hazardous materials, wastes, or oil, including naturally occurring substances.²

8.4 Biodiversity

Biodiversity is one of the International Finance Corporation Performance Standards – PS 6 “Biodiversity Conservation and Sustainable Management of Living Natural Resources³.” In the PS6 it is stated that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. Mining operations adversely impact habitats and have a potential for temporary or permanent alteration of terrestrial and aquatic habitats.

Although there are many guidelines and academic papers focusing on managing impacts on ecosystems, closure planning is primarily about identifying and implementing opportunities for rehabilitation and conservation enhancement. In mine closure planning post-closure vision will determine consideration towards replacement of habitat that is beneficial for future ecological use.

¹ http://www.gardguide.com/index.php?title=Main_Page

² International Finance Corporation, 2007, Environmental, Health, and Safety (EHS) Guidelines - General EHS Guidelines: Environmental- Contaminated Land.

³ International Finance Corporation, 2012, Performance Standard 6 - Biodiversity Conservation and Sustainable Management of Living Natural Resources.

ICMM developed The Good Practice Guidance for Mining and Biodiversity¹ for mining professionals to improve biodiversity management throughout the mine cycle and to support relationships between mining and biodiversity professionals by promoting enhanced mutual understanding. Chapter 4 of the Guidance provides overview for Integrating Biodiversity into Closure Planning and Implementation. Closure planning presents an opportunity for restoration of biodiversity affected during the exploration and operational phases, at least to some extent. It should consider the findings of baseline and ongoing biodiversity surveys and monitoring. An important focus of closure planning should be the long-term sustainability of conservation, mitigation and rehabilitation measures and any related monitoring requirements.

8.5 Legislation and Policy

Much of the following information is sourced from international guidelines. In this GIIP, including the workflow on the next three pages, is elaborated to provide guidelines for design considerations, post-closure monitoring and recommendations are made for the role of government in terms of regulation and policy development, mining practice review and active participation in closure planning and execution.

8.5.1 Physical Stability

8.5.1.1 Design Considerations

Following design considerations for physical stability should be included:

- Design landforms such as covered tailings and waste rock, to maintain long-term stability.
- Design landforms to blend in with surrounding landscape features.
- Implementation of construction controls such as surveys, material quality control, compaction control, and instrumentation monitoring.
- Development of design criteria for dams, spillways, and cover systems that consider post-closure scenarios.

8.5.1.2 Post-closure Monitoring

The purpose of post-closure monitoring for physical and geotechnical stability is to ensure that remaining landforms remain safe for humans and wildlife and are compatible with future use. Monitoring activities may include the following:

- Maintaining a consistent monitoring record from a constant point of observation from construction through to post-closure.
- Inspecting landforms to ensure no ongoing deformations exist that could lead to instability or unsafe conditions or that could compromise the effectiveness of selected closure activities or the post-closure use of the site.
- Employing remote sensing techniques to assess large-scale deformations of individual project components being reclaimed (e.g. settlement of tailings disposal area).

The minimum length of time required for post-closure monitoring of structures is typically included in



¹ ICMM, 2006. Good Practice Guidance for Mining and Biodiversity.

► Pre-operational

Physical stability

Geochemical Stability

Contaminated Soils and Water Resources

Biodiversity

Baseline studies

Environmental Impact Assessment (EIA)

Development of post-closure vision and objectives.

Initial environmental impact assessment including impacts from closure

Design mining components (open pit, tailing and waste rock management facilities for closure include closure considerations

Law

Require EIA to address all phases of the mine life cycle including closure and post-closure, including baseline studies characterizing physical and geochemical context, and existing biodiversity and vegetation.

Require closure plan prior to any construction and mining operations.

Require site-specific closure plan and establish measures to ensure physical and chemical stability after closure

Policy

All mine sites require baseline studies to document pre-mining condition of environmental and EIA

Return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities

Closure planning should be risk-based, taking into account results of materials characterization, data on the local environmental and climatic conditions, and consideration of potential impacts through contaminant pathways (including but not limited to site activities or infrastructure) and environmental receptors.

Review

Environmental Impact Assessment

Environmental management plan

Mine design and/or mining plan

Closure plan

Input

Post-closure vision

Approve closure objectives and criteria

► Life of Mine

► Pre-Closure

Physical Stability

Geochemical Stability

Contaminated Soils and Water Resources

Biodiversity

Regular update of closure plan
 Environmental monitoring
 Geotechnical stability assessment
 Reclamation testing
 Progressive reclamation

Impact and risk assessment of closure plan and closure actions
 Final closure design

Law

Require update of closure plan
 Require a monitoring plan that includes post-closure:
 Regular environmental monitoring reports
 Regular ecological monitoring reports
 Geotechnical stability assessment

Policy

Return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities
 Requirement to consider progressive

reclamation where technically possible (this could be included in the law)

Review

Environmental management plan and monitoring reports
 Ecological monitoring reports
 Geotechnical stability audit/inspection
 Reports on completed activities for progressive reclamation
 Updates of closure plan

Input

Update closure objectives and criteria
 Monitoring of reclaimed sites

Law

Develop final closure design (2 years prior to closure)
 Prepare closure impact assessment, if not fully addressed in pre-operational EIA

Policy

Return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities

Review

Closure impact assessment
 Final closure design

► Closure

► Post-Closure

Physical stability

Geochemical Stability

Contaminated Soils and Water Resources

Biodiversity

Implementation of closure activities
Monitoring

Monitoring and maintenance
Relinquishment

Law

Closure activities will be implemented based on mine closure design and schedule

Policy

Return the mine site and affected areas to viable and, wherever practicable, self- sustaining ecosystems that are compatible with a healthy environment and with human activities

Review

Periodic check of implementation of closure design

Input

Participation in monitoring

Law

Monitoring is carried out to validate model predictions and determine if success criteria have been achieved

The minimum length of time required for post-closure monitoring

Land is not returned until success criteria is reached

Policy

Return the mine site and affected areas to viable and, wherever practicable, self- sustaining ecosystems that are compatible with a healthy environment and with human activities

Post-closure monitoring is site-specific and based on risk assessment

Review

Monitoring plan
Relinquishment

Input

Participation in monitoring
Relinquishment – acceptance of land after closure success criteria is reached

the legislative component of a framework, but governments should reserve the right to extend that period based on project-specific considerations.

Based on the selected closure criteria monitoring includes following methods: visual inspection to identify signs of instability and erosion; survey to supplement visual inspections and evaluate settlement or quantify other types of movement of the ground surface; use of geotechnical instrumentation used to quantify ground movement; soil analysis to check evaluate if soil contamination is present; remote sensing to collect information.

8.5.1.3 Government Role

Law

Any project component that remains after closure should be constructed or modified at closure to be physically stable, ensuring it does not erode, subside, or move from its intended location under natural extreme events or disruptive forces to which it may be subjected. Closure and reclamation will not be successful in the long-term (e.g., 1000 years) unless all physical structures are designed such that they do not pose a hazard to humans, wildlife, aquatic life, or environmental health and safety.

Policy

Return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities.

Review

Mine design/mining plan

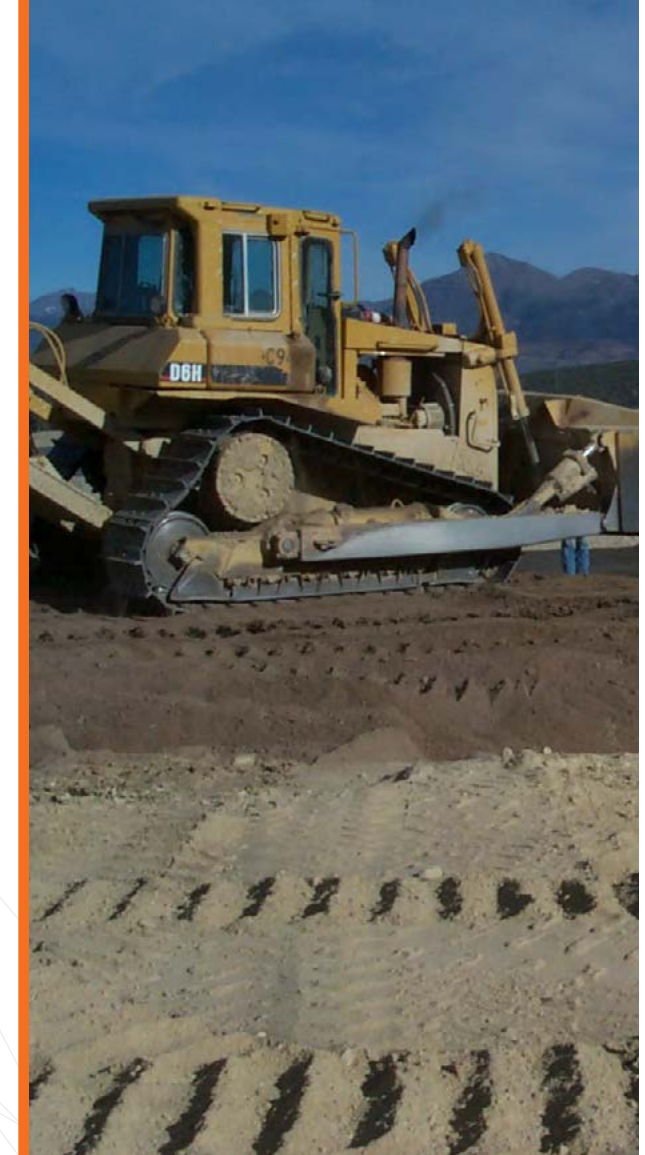
- Design the tailings facility for closure and include closure considerations in the selection of tailings management options.
- Ensure that all common failure modes for physical stability are considered in evaluating the long-term design of the dam: overtopping, slope instability, seismic effects, tailings liquefaction, wave erosion, runoff erosion, wind erosion.
- Evaluate consequences of future dam failure. Where consequences are high, ensure best design and operation practices are in place: qualified review boards and engineers of record; operation, maintenances and surveillance plans; emergency preparedness plans.
- In seismic regions, design should consider long return period earthquakes and effects of rock weathering.
- Consider closure needs and desired final landform at the time of waste placement.

Review of closure plan

- Closure objectives should be defined for each facility.
- Design criteria are measurable and are generally more stringent for closure condition than operations due to the long time period.

Relinquishment

- Evaluate implemented closure actions against closure goal and success criteria



8.5.2 Geochemical Stability

8.5.2.1 Design Considerations

Following needs to be consider the following during development and operational stages of the project to minimize post-closure efforts with respect to the control and treatment of ARD/ML:

- Design of physical control measures (if used) to mitigate a geochemical risk not just managing impact (i.e. prevent chemical reaction from occurring versus collecting any runoff)
- Identification of a comprehensive set of geochemical analyses that characterize the mine- and process-waste materials and then determination of their potential for long-term chemical risks
- Static and kinetic ARD/ML prediction testing (e.g. acid-base accounting, laboratory tests with humidity cells and columns, and field tests with bins and piles) along with field testing and monitor site seepages from mine wastewater
- Evaluation of the use of cover systems, diversion ditches, and berms to minimize exposure to surface water (infiltrations and runoff) and atmospheric oxygen

8.5.2.2 Post-closure Monitoring

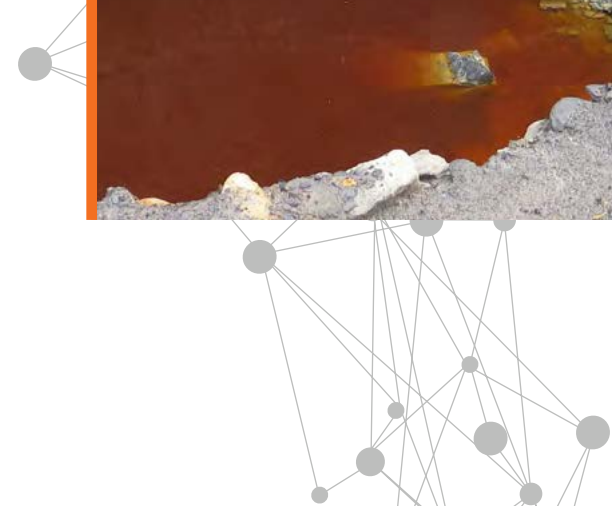
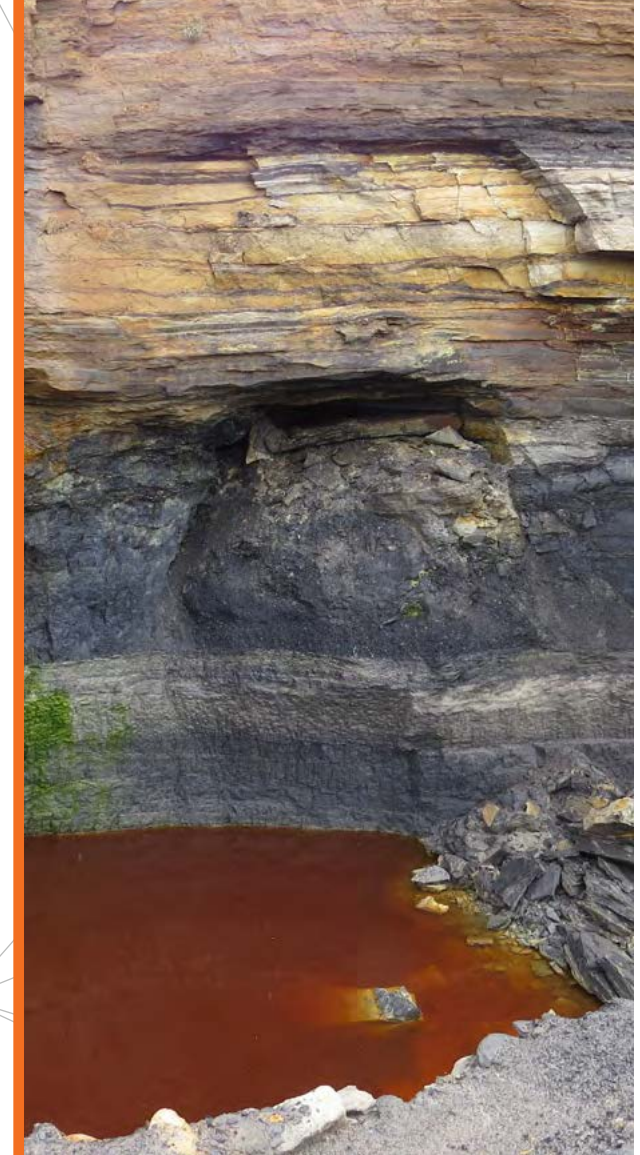
Post-closure monitoring with respect to geochemical stability should be required to ensure the potential for geochemical impacts are minimized or mitigated. Monitoring should also confirm requirements for long-term maintenance. Specific activities may include the following:

- Inspect the physical and geotechnical stability of the mine site to ensure that no erosion, slumping, or subsidence will occur that would cause exposure of deleterious materials to atmospheric conditions (water, oxygen).
- Inspect any preventative and control measures (e.g. cover systems) to ensure they operate according to their design specifications
- Confirm there is enough water supplied to maintain an appropriate water depth in designed water covers
- Compare predicted water quality and measured water quality
- Evaluate existing monitoring locations and frequency on a site-by-site basis and adjust where necessary

The last point above may involve creating new monitoring locations where possible contaminated drainage is generated or removing existing monitoring stations where drainage can be integrated into the water management system or released into the environment)

The minimum length of time required for post-closure monitoring of structures is typically included in the legislative component of a framework, but governments should reserve the right to extend that period based on project-specific considerations. In some cases, the post-closure characteristics of the site may require permanent or very long periods of ongoing monitoring. This is often the case for closure configurations that include large water-retaining dams, or active treatment of ARD/ML.¹

¹ ICMM, 2019. *Integrated Mine Closure: Good Practice Guide, 2nd Edition*.



8.5.2.3 Government Role

Law

Any project component (including associated wastes) that remains after closure should be chemically stable; chemical constituents released from the project components should not endanger human, wildlife, or environmental health and safety should not result in the inability to achieve the water quality objectives, and should not adversely affect soil or air quality in the long term

Policy

Return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities

Review

Mine design/mining plan

- Plan development for mine waste management including impact mitigation, material characterization, material handling, waste disposal, site closure, site water management, monitoring, and maintenance
- Optimization of mining and mineral processing to minimize the impacts on the environment
- Assessment of methods that can be used to prevent ARD/ML at the site including (a) limiting exposure to oxygen (e.g. water covers, dry covers, water saturation), (b) performing chemical or physical intervention (e.g. blending, covers, additives), (c) isolating acid generating materials, and (d) dry stacking filtered tailings or storing paste tailings on the surface to minimize potential future migration of contaminants from the area

Review of closure plan

- Review and approve mine closure objectives and success

Post-closure monitoring

- Monitoring program
- Monitoring schedule

Relinquishment

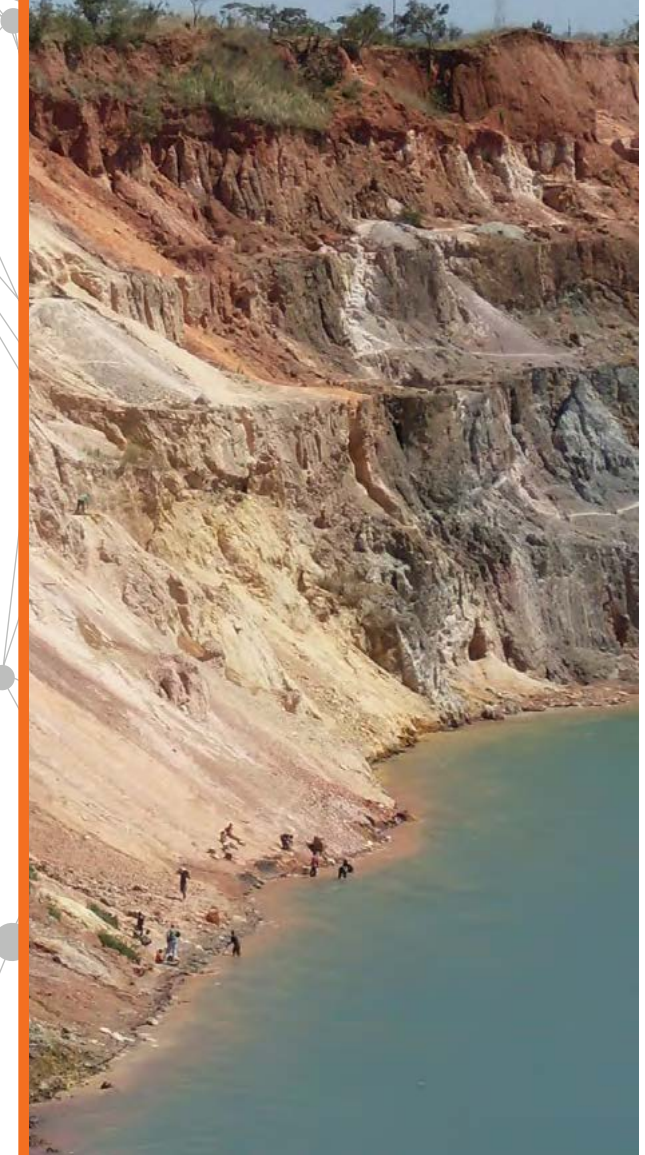
- Evaluate implemented closure actions against closure goal and success criteria

8.5.3 Contaminated Soils and Water Resources

8.5.3.1 Design Considerations

The following should be considered by project proponents and checked for by governmental bodies in the mine design stage to minimize post-closure reclamation efforts and impacts with respect to contaminated soils and groundwater:

- Consider environmental practices/operating procedures that eliminate or reduce the use of harmful substances or require materials less detrimental to the environment.
- Contain potentially environmentally harmful products (such as fuel and other chemicals) in properly designed (lined) facilities to limit the environmental impacts should an uncontrolled release occur.
- Consider diverting surface water flow (using ditches, swales, or berms) around active storage facilities and/or impacted zones to reduce infiltration, groundwater contamination, and contaminant mobilization.



- Construct land farm or soil treatment pad/facilities in an appropriate location.
- Identify optional treatment and remediation technologies (destruction, immobilization, separation).
- Consider dusting, and its control, during the design of any tailings storage facility.

8.5.3.2 Post-Closure Monitoring

The purpose of post-closure monitoring of contaminated soil and groundwater remediation areas is to ensure successful remediation such that the area is not a significant source of contamination and is compatible with future uses. Because removal of sources is often the best approach, post-closure monitoring is not typically required for sources that have been removed as part of closure activities. Monitoring activities may include the following:

- Collect enough confirmation samples to ensure the complete removal of impacted soils or the successful treatment of impacted groundwater
- Undertake periodic monitoring where complete contaminant removal is not possible
- Analyze trends in monitoring data often to assess the effectiveness of selected closure activities
- Visually monitor the physical stability of contaminated soil excavation or containment sites.

8.5.3.3 Government Role

Law

Contaminated soils and water resources should be treated to reach closure criteria

Policy

Return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment and with human activities

Review

Mine design/mining plan/environmental management plan

- Environmental practices/operating procedures that eliminate or reduce the use of harmful substances or require materials less detrimental to the environment.

Review of closure plan

- Review and approve closure objectives and success

Post-closure monitoring

- Monitoring program
- Monitoring schedule

Relinquishment

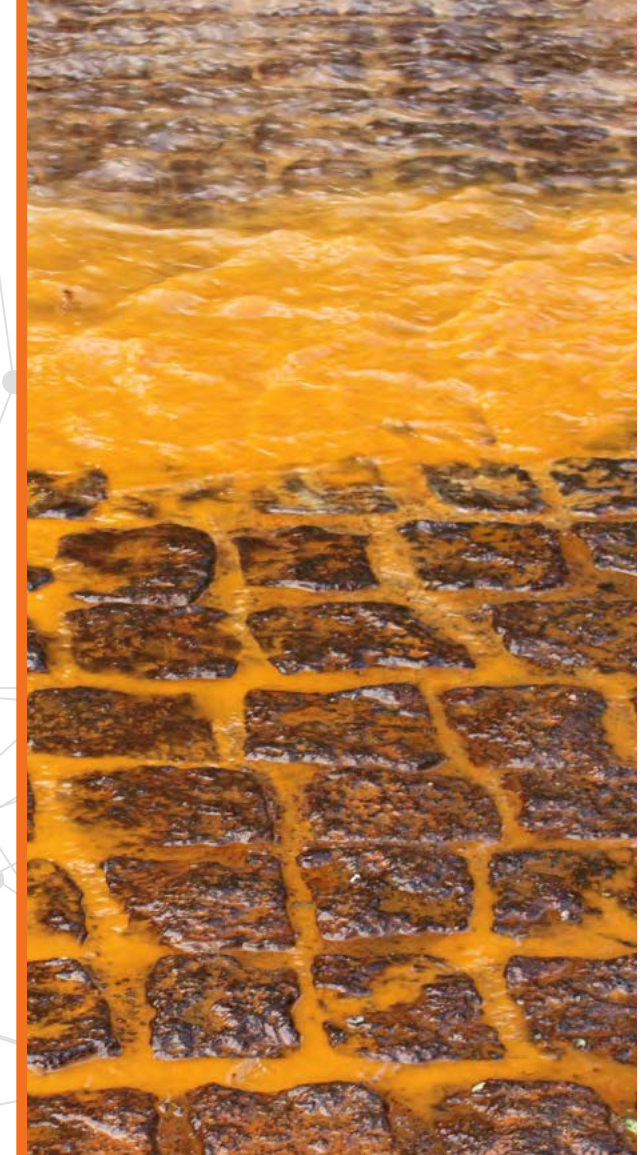
- Evaluate implemented closure actions against closure goal and success criteria

8.5.4 Biodiversity

8.5.4.1 Design Considerations

Following design considerations for biodiversity should be included:

- Determine baseline ecological conditions prior to disturbance



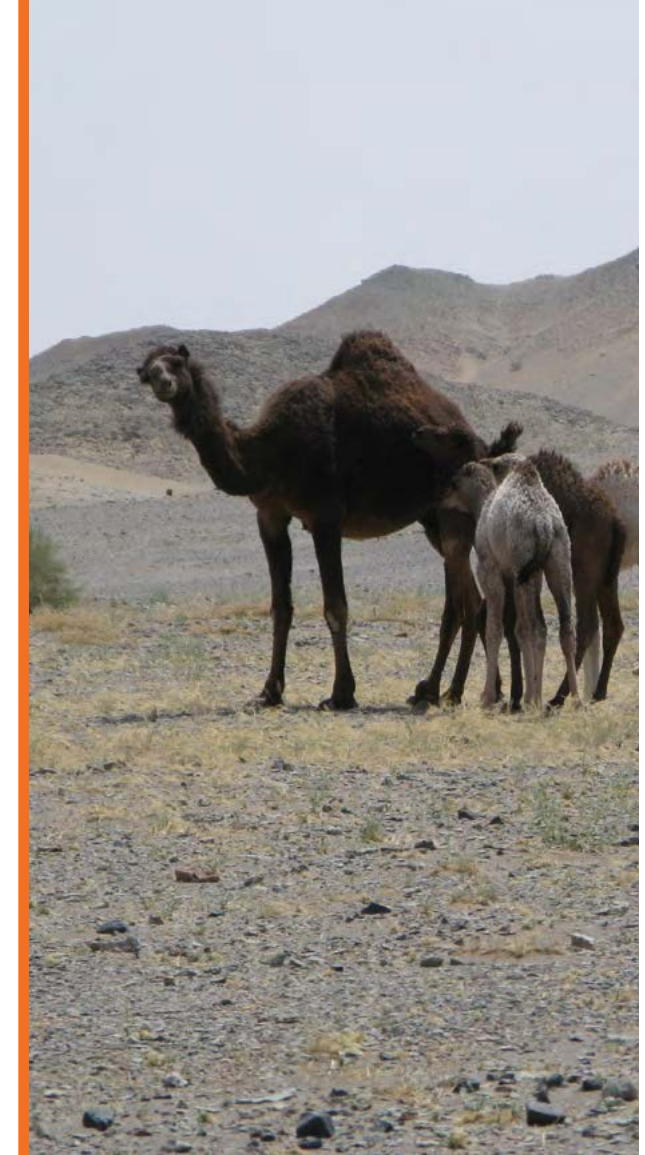
- Based on the pre-mining biodiversity values, closure planning will need to consider whether these can realistically be replaced, using recognized good practice rehabilitation methods with adaptive management
- Conduct local soil assessments to determine whether organic supplements should be used (e.g., peat, biosolids) if enhanced revegetation measures may be required.
- Include native plant collection and propagation methods, successional processes, and final plant communities that provide biodiversity and sustainability to reclaimed sites in the research plan.
- Consider bioengineering (use of living organisms or other biological systems for environmental management) approaches to stabilize soils, control erosion, and enhance natural re-vegetation.
- Strip, stockpile, and properly cover organic and fine-grained soils from disturbed areas (such as open pits, waste rock piles, infrastructure, and tailings facility footprints)
- Record volumes of soil salvaged for later consideration in closure and reclamation planning.
- Consider revegetation of waste rock piles through slope stabilization and enhancement with finer grained materials.
- Technical limitations due to significant changes to soil characteristics, microclimate, topography, and hydrology needs to be considered in the restoration of vegetation.

8.5.4.2 Post-closure Monitoring

Post-closure ecological monitoring can be organized into the monitoring of terrestrial and aquatic flora and fauna.

Terrestrial Flora

- Inspect revegetated areas periodically following initial planting until vegetation is successfully established and self-sustaining in accordance with closure criteria.
- Conduct soil analyses for nutrients and pH until the vegetation is successfully established and self-sustaining in accordance with the agreed criteria.
- Monitor metals uptake in vegetation and conduct risk assessments, if needed, to determine if uptake poses unacceptable risk to human, wildlife, and environmental health.
- Monitor areas where growth of vegetation may be impacting the subsurface thermal regime.
- Monitor growth rates and succession of vegetation species.
- Monitor expansion of growth areas outside planted zones and determine if the impacts are beneficial or detrimental to performance of selected closure activities.
- Monitor for propagation of non-native or undesirable species.
- Inspect vegetated areas that may be obscuring possible cracks and other problems on dams and embankments.



- Inspect root systems of vegetation that are colonizing the surface of cover systems to observe if they are contained within the growth medium (e.g., soil, rock fill) and are not penetrating underlying cover materials.
- Consider appropriate maintenance (brushing) options if vegetation encroachment (deep rooting species) results in disruption of cover materials.
- Identify excessive vegetation stress or poorly established areas and implement contingency measures if required
- Where necessary, re-plant and add amendments to ensure long-term revegetation success.
- Depending on the extent of the revegetation effort, consider passive monitoring approaches including aerial surveillance and remote sensing.

Terrestrial Fauna and Avifauna:

- Evaluating the abundance and diversity of species in a given area.
- Monitor wildlife use of revegetated areas to determine if viable wildlife habitat has been created.

Aquatic Flora:

- Flora species survey
- Characterization of the different types of species in a given area

Aquatic Fauna:

- Surveys of amphibian and reptile communities
- Survey of fishes

8.5.4.3 Government Role

Law

Require biodiversity impact mitigation throughout LOM, closure and post-closure

Policy

Return the mine site and affected areas to viable and, wherever practicable, self-sustaining ecosystems that are compatible with a healthy environment, post-mining land use(s) and with human activities

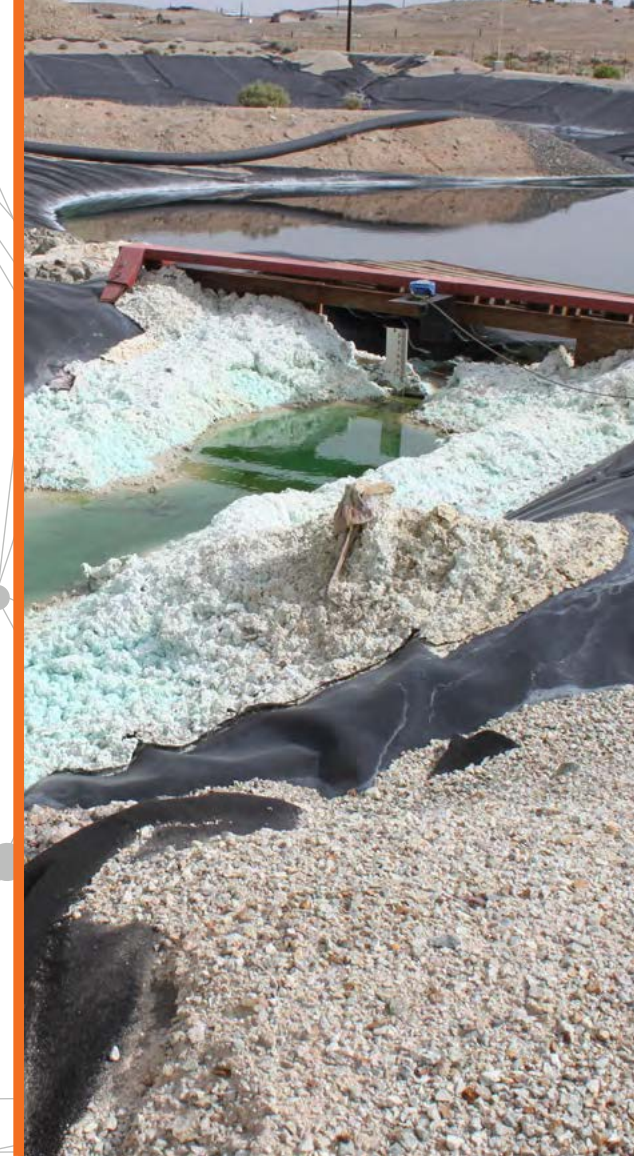
Review

Mine design/mining plan

- Salvage, stockpile, and properly cover organic and fine-grained soils from disturbed areas (such as open pits, waste rock piles, infrastructure, and tailings facility footprints)
- Record volumes of soil stripping for later consideration in closure and reclamation planning
- Review of closure plan
- Closure objectives should be defined.
- Design criteria are measurable and are in line with accepted post-closure land use.

Relinquishment

- Evaluate implemented closure actions against closure goal and success criteria



9 Closure Risk Assessments

All international guidelines and mature closure governance frameworks promote risk-based closure plans and design. Therefore, governance frameworks should encourage operators to design closure plans to mitigate long-term impacts and risks. Most countries require development projects, including mining, to evaluate the environmental and social impacts of the project. For mining projects, this should include all phases of the mine life cycle.¹

Risk assessment by the operator during closure planning typically begins at the start of the planning process but is often applied throughout the process as additional information is available and possible closure approaches are developed. Using standard risk assessment tools early in the planning process helps to identify and evaluate key risks and uncertainties associated with environmental and socioeconomic closure risks for a site. By identifying the risks and uncertainties early in the planning process, risk mitigation measures (e.g. operational design changes, technical studies, and development of alternative closure approaches) can be focused on the most important closure and post-closure risks. A closure risk assessment process can also redefine and reprioritize closure objectives, resulting changes to the closure plan.



¹ [International Finance Corporation. 2012. Performance Standards on Environmental and Social Sustainability - Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts Effective January 1, 2012.](#)

Risk-based approach to mine closure planning reduces cost and uncertainty in the closure process and includes the following benefits.

- Identifying a range of possible closure scenarios commensurate with risk
- Identifying potential risks to successful closure early
- Developing acceptable and realistic criteria to measure performance
- Establishing orderly, timely, and cost-effective closure outcomes
- Reducing uncertainty in closure costs
- Continually improving industry rehabilitation standards (e.g. cover design and management of contaminated drainage, erosion, and seepage).

Based on the pre-closure baseline, closure impacts on the environment, host communities, the broader

region and the main suppliers should be identified. This should include impacts on land use and local livelihoods, infrastructure, health and safety, economic activities, and standard of living.

In addition to the impact assessment prepared as part of the planning process, a risk assessment should be performed to evaluate alternatives to minimize the negative consequences of closure and maximizing the positive benefits of closure.

The following risks need to be considered:

- Economic
- Environmental
- Financial
- Health and safety
- Social

Key risks in these areas is found in Appendix D.

Risk Tools

Further details on risk assessment and management are provided in ICMM Tool 8.

Risk/opportunity assessment and management provides a risk/opportunity assessment process based on the risk management standards, AS ISO* 31000:2018 Risk Management – Guidelines, developed by the Council of Standards Australia and the Council of Standards New Zealand.

*International Organization for Standardization

10 Template for Mine Closure Plan

A closure plan is a dynamic document that needs to be regularly reviewed and progressively developed and refined over time to ensure that detail in the plan reflects current knowledge relevant to the development and rehabilitation status of the mine.

An example closure plan template incorporating minimum requirements for closure is included as Appendix B. The template identifies each required section within the plan and details about what proponents should include in that section.

The purpose of a template is to set realistic and consistent expectations for the content of closure plans to simplify the review process for stakeholders and to reduce ambiguities for proponents. The template's design makes it compatible with each stage of development, so as the operation evolves from advanced mineral exploration through to mine development, the same order and type of information is required but in more detail. The template only serves as a guide; proponents should be encouraged to offer suggestions to better describe site-specific context or improve the plan overall.



11 Legacy Mine Sites

Legacy mine sites are historic mine sites that have been abandoned and the original operator no longer exists or has no legal responsibility under current laws. Many legacy sites were operated and abandoned before current environmental and mine closure laws existed, so they did not implement the appropriate operating and closure practices. These often leave impacts to the environment and in some cases have left communities to fend for themselves.

Almost all mining countries have legacy sites that pose a risk to environment and/or public safety. These risks are often the responsibility of the government, but rarely are there enough funds to address the risks and impacts from these sites. A good governance framework should consider legacy sites and the burden they place on the government.

11.1 Policy on Legacy Mine Sites

APEC provides the following are key elements of successful policy for abandoned sites¹:

- Establishing a jurisdictional registry of abandoned sites
- Developing criteria to prioritize remediation of the sites
- Determining the cost of abandoned site remediation
- Financing the remediation of abandoned sites

¹ [APEC Mining Task Force, 2018, Mine Closure Checklist for Governments, February.](#)



The IGF recommends governments to consider accepting a leadership role for orphaned and abandoned mines in their jurisdiction¹ by:

- Working in partnership with entities that collectively constitute the mining industry to explore options for developing technological solutions (including the reprocessing of mining wastes) or contributing expertise or other resources to help resolve the legacy issue of orphaned or abandoned mines.
- Working in partnership with those countries whose economies benefitted from the flow of low-cost industrial inputs that came at least in part from mines that are now orphaned or abandoned that contribute to the resolution or management of abandoned mines.
- Working in partnership with entities that collectively constitute the mining industry to explore options for developing technological solutions (including the reprocessing of mining wastes) or contributing expertise or other resources to help resolve the legacy issue of orphaned or abandoned mines.
- Working in partnership with those countries whose economies benefitted from the flow of low-cost industrial inputs that came at least in part from mines that are now orphaned or abandoned that contribute to the resolution or management of abandoned mines.
- Using targeted fiscal arrangements to encourage the reactivation of those mines to create economic activity, fund remediation, and provide

for post-closure management in cases where such a mine or its wastes have economic potential.

- Seeking recognition by multilateral agencies and organizations that the historical and legal situation of such mines, particularly in developing countries, requires their leadership in managerial, advisory, hortatory and financial forms.

In developing the registry of abandoned sites:

- Ensure there is a common definition of what constitutes an abandoned mine site
- Catalog current information and collect new information about each abandoned site using a common format
- Complete inspections to collect information about the area affected including structures remaining, discharges, proximity to human and environmental receptors, and impacts observed
- Train site inspectors in the identification of hazards both for updating the registry and to ensure they are not exposed to unnecessary risks during site investigations
- Evaluate methods to generate funds to mitigate the impacts from abandoned sites

11.2 Funding Legacy Mine Cleanup

One approach to fund closure of these sites that has been successfully implemented in several jurisdictions is to use fees paid by current and new operators to create an abandoned mine land fund.

Another effective approach is to provide legal relief for current operators or other organizations from environmental legislation if they voluntarily implement measures to improve the condition of and reduce the impacts from these sites. These “good Samaritan” laws provide an opportunity to mining companies (and other organizations) to demonstrate good corporate citizenship without incurring additional liability for these abandoned sites.

Abandoned mines and the legacy of mining is an issue for countries around the world. No country has found a solution to remediating the impacts of historical mines, nor for funding that remediation. There are, however, several mechanisms that can be considered. These include the establishment of funds for remediating legacy sites through a levy on new mining projects, or by funding the remediation of abandoned sites from funds retained from financial assurances retained on new projects. In general, remediation is funded through general revenue.

Funding through levies on existing producers has had mixed results. The United States implemented a levy on coal production in 1977 under the Surface Mining Control and Reclamation Act to help fund the billions of dollars in coal mine remediation costs and some annual mineral title fees for metallic mines are used to fund activities intended to secure abandoned sites for public safety. Most funds for legacy mine cleanup come from agreement or litigation with original operators or successor companies under the Response, Compensation, and Liability Act (CERCLA or Superfund). Similarly, a portion of the license fee

¹ IGF, 2013. *The IGF Mining Policy Framework Mining and Sustainable Development*.

collected from aggregate producers is used to fund rehabilitation in Ontario, Canada. While the program in the United States has been largely successful, the levy in Ontario has been insufficient to ensure remediation of legacy aggregate sites.

In Western Australia, the Mining Rehabilitation Fund Act 2012 was implemented to collect a levy from all holders of mining tenements to be used for abandoned sites. Although this created a fund for abandoned sites, it has been criticized as the system no longer requires financial assurances for each project, and instead relies on a pooled fund on the assumption that future defaults will be few and far between. Past history has shown that when the industry does have events that lead to default, these are rarely isolated to one or two operations.

In Queensland, Australia a new financial assurance regime has been recently established. Queensland has proposed that if a site with financial assurances is abandoned, both the newly abandoned site and the associated financial assurances would be rolled into an existing program for abandoned mine reclamation. In addition to streamlining the efficiency of managing the newly established program, Queensland has suggested that any excess financial assurances retained could then be used to help fund the remediation of other sites. This is an optimistic view and this approach has not been tested.

A review of a variety of options for funding legacy abandoned mines was published in the McGill International Journal of Sustainable Development Law and Policy. The article outlines several approaches to assessing levies designed to fund the reclamation of abandoned mines, as well as the impact on stakeholders. In general, the Canadian approach has been to fund reclamation of abandoned sites through direct government funding from general revenue. That funding is occasionally supplemented with government/private partnerships, or small levies or royalties on production.

In summary, most countries continue to struggle with an appropriate method for funding the reclamation of abandoned mine sites. A key first step is to ensure financial assurances for new and existing projects to ensure no more legacy sites are created. Where solutions are put in place to address abandoned sites, they should be done separately from the obligations to properly close existing projects. Where levies are put in place in lieu of financial assurance or where such contributions lead to a decrease in the appropriate amount of financial assurances, there is a large risk of continued growth of abandoned mines.

Financial Assurance for Legacy Sites

Potential Legislative Requirements

- Ensure financial assurance provided for operating mines are not mixed or utilized for abandoned mine sites
- If fees are levied to fund abandoned mines do not mix in general revenue
- Consider fee based on mineral tenure, tonnage, revenue, profit
- “Good Samaritan” laws to allow third parties to remediate sites without undertaking liability for existing pollution or other obligations relating to the site

Additional Policy and Guidelines

- Policy and guidelines will vary depending on funding methods
- Consider creating programs to access funds to rehabilitate abandoned sites using funds
- Consider partnering opportunities with third parties for post-closure use of abandoned sites

Appendix A: International Mining Standards, Guidelines, and Resources

Resource	Description
<p>Asia-Pacific Economic Cooperation (APEC)</p> <p><i>Mine Closure: Checklist for Governments. 2018.</i></p>	<p>A checklist for mine closure aimed at governments. The checklist is to provide policy makers in the APEC region with the essential elements of a successful mine closure governance framework based on leading international guidelines and standards, as well as experience.</p> <p>https://www.apec.org/-/media/APEC/Publications/2018/3/Mine-Closure-Checklist-for-Governments/218_MTF_Mine-Closure_Checklist-for-Governments.pdf</p>
<p>Australian Government: Department of Industry, Science, Energy and Resources</p> <p><i>Leading Practice Handbook: Mine Closure. 2016.</i></p>	<p>Sustainable development and closure, life of mine phases, closure planning, development of a closure plan, financial assurance, provisioning and environmental liability, decommissioning and closure, mine relinquishment.</p> <p>https://www.industry.gov.au/sites/default/files/2019-05/lpsdp-mine-closure-handbook-english.pdf</p>
<p>Australian Government: Department of Mines and Petroleum: Environmental Protection Authority</p> <p><i>Guidelines for Preparing Mine Closure Plans. 2016.</i></p>	<p>Regulatory and administrative context, planning for mine closure, structure and content of a mine closure plan, mine closure plan submission, mine closure plan checklist, example of a legal obligations register, examples of closure objectives, overview of specific mine closure issues, interim guidance on pit lake assessment through a risk-based approach, domain model, risk assessment and management, examples of completion criteria, sterilization report.</p> <p>http://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/DMP-EPA-Guidelines-Mine-Closure-Plans-080515.pdf</p>
<p>Extractive Industries Transparency Initiative (EITI)</p> <p><i>The EITI Standard 2019: The Global Standard for the Good Governance of Oil, Gas and Mineral Resources. 2019.</i></p>	<p>The EITI principles, becoming an EITI implementing country, requirements for EITI implementing countries (oversite by the multi-stakeholder group, legal and institutional framework (including allocation of contracts and licenses), exploration and production, revenue collection, revenue allocations, social and economic spending, outcomes and impact), EITI Board oversight of EITI implementation, overview of validation, protocol: participation of civil society, expectations for EITI supporting companies, articles of association, EITI openness policy, EITI constituency guidelines, EITI association code of conduct.</p> <p>https://eiti.org/files/documents/eiti_standard_2019_en_a4_web.pdf</p>
<p>Global Reporting Initiative (GRI), RG & MMSS</p> <p><i>Sustainability Reporting Guidelines & Mining and Metals Sector Supplement. 2010.</i></p>	<p>Introductory section for the mining and metals sector, the purpose of a sustainability report, orientation to the GRI reporting framework, orientation to the GRI guidelines, applying the guidelines, guidance for defining report content, principles for ensuring report quality, guidance for reporting boundary setting, strategy and analysis, organization profile, report parameters, governance, commitments, and engagement, management approach and performance indicators, economic, environmental, social: labor practices and decent work, social: human rights, social: society, social: product responsibility, data gathering, report form and frequency, assurance.</p> <p>https://www.icmm.com/website/publications/pdfs/commitments/gri-mining-and-metals-supplement</p>

<p>Global Tailings Review</p> <p><i>Global Tailings Standard: Draft for Public Consultation. 2019.</i></p>	<p>Overview of the standard, a systems approach, the role of the state, the role of other stakeholders, implementation, global tailings standard, knowledge base, affected communities, design, construction, operation and monitoring of the tailings facility, management and governance, emergency response and long-term recovery, public disclosure and access to information, consequence classification, external loading criteria required by the Standard, outline of the organizational structure referred to in the Standard.</p> <p>https://globaltailingsreview.org/wp-content/uploads/2019/11/EN-Global-Tailings-Standard_CONSULTATION-DRAFT.pdf</p>
<p>Initiative for Responsible Mining Assurance (IRMA)</p> <p><i>IRMA Standard for Responsible Mining IRMA-STD-001. 2018.</i></p>	<p>Introduction to the IRMA Standard (principles and objectives, scope of the IRMA Standard, chapter structure, language, basis for certification, continuing improvement, flagged items, associated documents and materials, collaboration with Related Standards and Certification Systems), Business integrity requirements (legal compliance, community and stakeholder engagement, human rights due diligence, complaints and grievance mechanism and access to remedy, revenue and payments transparency), planning for positive legacies requirements (environmental and social impact assessment and management, free, prior and informed consent (FPIC), obtaining community support and delivering benefits, resettlement, emergency preparedness and response, planning and financing reclamation and closure), social responsibility requirements (fair labor and terms of work, occupational health and safety, community health and safety, mining and conflict-affected or high-risk areas, security arrangements, artisanal and small-scale mining, cultural heritage), environmental responsibility requirements (waste and materials management, water management, air quality, noise and vibration, greenhouse gas emissions, biodiversity, ecosystem services and protected areas, cyanide management, mercury management).</p> <p>https://responsiblemining.net/wp-content/uploads/2018/07/IRMA_STANDARD_v.1.0_FINAL_2018-1.pdf</p>
<p>Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF)</p> <p><i>IGF Mining Policy Framework: Mining and Sustainable Development. 2013.</i></p>	<p>Mining and sustainable development, policy framework, legal and policy environment, financial benefit optimization, socioeconomic benefit optimization, environmental management, post-mining transition, artisanal and small scale mining (ASM); PART II: analysis, legal and policy environment, financial benefit maximization, socioeconomic benefit maximization, environmental management, post-mining transition, artisanal and small-scale mining (ASM).</p> <p>https://www.igfmining.org/wp-content/uploads/2018/08/MPF-EN.pdf</p>
<p>Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF)</p> <p><i>Guidance for Governments: Improving Frameworks for Environmental and Social Impact Assessment and Management (First Draft). 2019.</i></p>	<p>Guidance for governments for improving frameworks for environmental and social impact assessment and management. Introduction to environmental and social management across the mine life cycle, laying the foundation for good governance of environmental and social impacts: preparing for the permitting process, the prospecting and exploration phase, the mine planning phase, the construction and operation phases, final stages of mine closure and post-mining transition, checklist: laying the foundation for good governance of environmental and social impacts, checklist: the prospecting and exploration phase, checklist: the mine planning phase, checklist: the construction and operation phases, checklist: final stages of mine closure and post-mining transition.</p> <p>https://www.iisd.org/sites/default/files/publications/igf-guidance-for-governments-esia-en.pdf</p>

<p>Intergovernmental Forum on Mining, Minerals, Metals and Sustainable Development (IGF)</p> <p><i>State of Sustainability Initiatives Review: Standards and the Extractive Economy. 2018.</i></p>	<p>Sustainability issues in the mining sector, market drivers for sustainability standards, history of voluntary initiatives in the mining sector, the role of public policy vis-à-vis voluntary sustainability initiatives, situating voluntary sustainability initiatives (VSIs) as instruments of the market, how public policy shapes VSI design and uptake, how VSIs support public policy goods, reflections for policy-makers, the CARE (coverage, assurance, responsiveness, engagement) analysis of mining initiatives, selection criteria for standards and initiatives included in the CARE analysis, using the SSI (state of sustainability initiatives) analysis and understanding scores, overall findings, coverage, assurance, responsiveness, engagement, potential impacts, VSIs of potential relevance to the mining sector, profiles of sustainability schemes for mineral resources, methodology: the CARE framework applied to the analysis of mining initiatives, potential environmental and social impacts of extractive industries development.</p> <p>https://www.iisd.org/sites/default/files/publications/igf-ssi-review-extractive-economy.pdf</p>
<p>International Council on Mining & Metals (ICMM)</p> <p><i>Integrated Mine Closure – Good Practice Guide. 2019.</i></p>	<p>Integration into life of mine planning, knowledge base, closure vision, principles and objectives, post-closure land use, engagement for closure plan development, identifying and assessing risks and opportunities, closure activities, success criteria, progressive closure, social transition, closure costs, closure execution plan, monitoring, maintenance and management, relinquishment, temporary or sudden closure, closure governance.</p> <p>https://guidance.miningwithprinciples.com/integrated-mine-closure-good-practice-guide/</p>
<p>International Council on Mining & Metals (ICMM)</p> <p><i>Mining Principles. 2020.</i></p>	<p>Ethical business, decision making, human rights, risk management, health and safety, environmental performance, conservation of biodiversity, responsible production, social performance, stakeholder engagement, position statements, assurance & validation..</p> <p>https://www.icmm.com/mining-principles</p>
<p>International Cyanide Management Institute</p> <p><i>International Cyanide Management Code. 2018.</i></p>	<p>Cyanide code implementation, principles and standards of practice (production, transportation handling and storage, operations, decommissioning, worker safety, emergency response, training, dialogue), cyanide code management, administration, cyanide code signatories, cyanide code verification and certification (submission of audit results, finding of substantial compliance, finding of non-compliance, corrective action plan and completion report, pre-operational certification), certification maintenance, re-admission, re-designation and re-activation, auditor criteria and review process, dispute resolution.</p> <p>https://www.cyanidecode.org/about-cyanide-code/cyanide-code</p>

<p>International Finance Corporation (IFC)</p> <p><i>Environmental, Health and Safety Guidelines for Mining. 2007.</i></p>	<p>Industry-specific impacts and management, environmental (water use and quality, wastes, hazardous materials, land use and biodiversity, air quality, noise and vibration, energy use, visual impact), occupational health and safety (general workplace health and safety, hazardous substances, use of explosives, electrical safety and isolation, physical hazards, ionizing radiation, fitness for work, travel and remote site health, thermal stress, noise and vibration, specific hazards in underground mining), community health and safety, mine closure and post-closure, performance indicators and monitoring (environment, emissions and effluent guidelines, environmental monitoring), occupational health and safety performance (guidelines, accident and fatality rates, monitoring), general description of industry activity.</p> <p>https://www.ifc.org/wps/wcm/connect/595149ed-8bef-4241-8d7c-50e91d8e459d/Final%2B-%2BMining.pdf?MOD=AJPERES&CVID=jqezAit&id=1323153264157</p>
<p>International Finance Corporation (IFC)</p> <p><i>Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets. 2007</i></p>	<p>Stakeholder engagement, key concepts and principles of stakeholder engagement (stakeholder identification and analysis, stakeholder consultation, negotiation and partnerships, grievance management, stakeholder involvement in project monitoring, reporting to stakeholders, management functions, integrating stakeholder engagement with the project cycle (project concept, feasibility studies and project planning, construction, operations, downsizing, decommissioning, and divestment), a road map to IFC's performance standards and policy on disclosure of information, stakeholder engagement strategies for different project scenarios, stakeholder engagement plan, sample of stakeholder log, pro forma for advertising the disclosure of the draft environmental and social assessment report.</p> <p>https://www.ifc.org/wps/wcm/connect/a320adcf-805e-4924-a53f-2da3f078fcff/IFC_StakeholderEngagement.pdf?MOD=AJPERES&CVID=ltQXbp2</p>
<p>International Network for Acid Prevention (INAP)</p> <p><i>Global Acid Rock Drainage (GARD) Guide. 2014.</i></p>	<p>The GARD guide, the ARD process, corporate, regulatory and community framework, defining the problem, prediction, prevention and mitigation, drainage treatment, monitoring, management and performance assessment, ARD communication and consultation, ARD management in the future.</p> <p>http://www.gardguide.com/index.php?title=Main_Page</p>
<p>International Institute for Environment and Development (IIED)</p> <p><i>Breaking New Ground: The Report of the Mining, Minerals and Sustainable Development Project (MMSD). 2002.</i></p>	<p>Sustainable development, challenges faced by the minerals sector (visibility of the minerals industry, the control, use, and management of land, minerals and economic development, local communities and mines, mining, minerals, and the environment, an integrated approach to using minerals, access to information, artisanal and small-scale mining, sector governance: roles, responsibilities, and instruments for change), an agenda for change, a vision of the minerals sector, supporting sustainable development in the minerals sector.</p> <p>https://pubs.iied.org/pdfs/9084IIED.pdf</p>

<p>The Mining Association of Canada (MAC) <i>Tailings Guide Version 3.1. 2019.</i></p>	<p>Management of tailings facilities, tailings management framework (overarching principles, managing throughout the life cycle of a tailings facility), policy and commitment, planning (risk management, performance objectives, accountability and responsibility, management process), implementing the tailings management framework (operation, maintenance and surveillance manual, emergency preparedness, checklists), performance evaluation, management review for continual improvement, assurance, risk management framework and approach, best available technology and best available/applicable practice, assessment of alternatives, independent review, considerations for managing throughout the life cycle of a tailings facility, technical considerations.</p> <p>https://mining.ca/our-focus/tailings-management/tailings-guide/</p>
<p>The Mining Association of Canada (MAC) <i>Towards Sustainable Mining: 2019 Highlights (TSM). 2019.</i></p>	<p>What is Towards Sustainable Mining?, how TSM works, TSM protocols and indicators, TSM performance rating system, layers of TSM verification, COI advisory panel, communities and people, environmental stewardship, energy efficiency, TSM in Canada and beyond.</p> <p>https://mining.ca/wp-content/uploads/2019/12/TSM-Booklet-EN-Web.pdf</p>
<p>MVLWB/AANDC <i>Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories. 2013.</i></p>	<p>Expectations for closure and reclamation planning, closure and reclamation concepts - an objectives based approach, closure and reclamation plans - required regulatory submissions, financial security requirements, communication and engagement, template for preparing closure and reclamation plans, technical considerations for effective closure and reclamation, common site-wide mine closure and reclamation considerations, individual project component closure and reclamation considerations.</p> <p>https://mvlwb.com/sites/default/files/documents/wg/WLWB_5363_Guidelines_Closure_Reclamation_WR.pdf</p>
<p>National Orphaned/Abandoned Mines Initiative (NOAMI) <i>The Policy Framework in Canada for Mine Closure and Management of Long-Term Liabilities: A Guidance Document. 2010.</i></p>	<p>Methodology, policy element notes (mine closure overview, risk in mine closure planning, risk assessment, acid rock drainage, financial assurance, cost estimation, perpetual care, long-term monitoring and maintenance, corporate failure/premature closure, emergency legislation, relinquishment, consultation, institutional care, summary of questionnaire results, results of survey - Canadian respondents, results of survey - foreign respondents, policy framework (closure objectives, closure plans, financial assurance, post-closure care, relinquishment, institutional custodianship, consultation), recommendations, conclusions, example methodology for evaluating risk, example of present value determination, policy framework for mine closure and long-term liabilities questionnaire summary for Canada, policy framework for mine closure and long-term liabilities questionnaire summary for jurisdictions outside of Canada.</p> <p>http://www.abandoned-mines.org/pdfs/PolicyFrameworkCanforMinClosureandMgmtLiabilities.pdf</p>
<p>United Nations Development Programme (UNDP) <i>Extracting Good Practices. 2018.</i></p>	<p>Establish the foundations for resource stewardship: policy, regulations, institutions and the rule of law; participatory planning for extractives from exploration to closure; exploration; feasibility and licensing; mine development and construction; production; closure; post-closure; backgrounder - access to information, participation, access to remedy; using the ecosystem services approach for assessing the mining, ecosystems and human rights nexus; selected international standards and international good practice guidance.</p> <p>http://www.undp.org/content/dam/undp/library/Sustainable%20Development/Environmental-Governance-Project/Extracting_Good_Practices_Report.pdf</p>

<p>United Nations Development Programme (UNDP)</p> <p><i>Managing Mining for Sustainable Development, a Sourcebook. 2018.</i></p>	<p>Mining and sustainable development, impacts of mining during the life of mine (mineral exploration phase, mine development phase, mining operations phase, mine closure phase), orienting legal frameworks towards sustainable development (the domestic legal framework, mining contracts, international treaties, conventions and soft law, voluntary standards, customary rules), protecting the environment and people (trends and approaches in environmental regulation of mining, environmental and social impact assessment, environmental monitoring and auditing, community consultation, engagement and protection, managing mine closure), realizing and enhancing the benefits from mining (fiscal revenues, employment and economic growth, mining and local development, integrating mining into strategies and plans).</p> <p>https://www.undp.org/content/dam/undp/library/Sustainable%20Development/Extractives/UNDP-MMFSD-HighResolution.pdf</p>
<p>World Bank Multi-Stakeholder Initiative</p> <p><i>Towards Sustainable Decommissioning and Closure of Oil Fields and Mines: A Toolkit to Assist Government Agencies Version 3.0. 2010.</i></p>	<p>General toolkit guidance - trends, challenges, issues and setting priorities, tool 1 - policy and regulatory framework, tool 2 - environmental and social best practice and management systems, tool 3 - financial assurance mechanisms, tool 4 - monitoring and enforcement, tool 5 - stakeholder engagement and continuous improvement.</p> <p>http://documents.worldbank.org/curated/en/417371468149083097/pdf/827200WP0decom00Box379864B00PUBLIC0.pdf</p>
<p>World Bank Group</p> <p><i>The Extractive Industries Sector : Essentials for Economists, Public Finance Professionals, and Policy Makers. 2015.</i></p>	<p>Essentials for economists, public finance professionals, and policy makers. Defining sector policy objectives, the economics of the extractive industries sector, institutional framework, investment and production cycles, extractive industries policy, monitoring and enforcing contracts: legal obligations and institutional responsibilities, public infrastructure and investment, economic diversification and local content development, resource classification frameworks, types of economic rents, impact of income changes on commodity demand, effective resource contract enforcement: a checklist of guidelines.</p> <p>https://openknowledge.worldbank.org/bitstream/handle/10986/22541/The0extractive0s00and0policy0makers.pdf?sequence=1&isAllowed=y</p>
<p>World Economic Forum</p> <p><i>Voluntary Responsible Mining Initiatives: A Review. 2015.</i></p>	<p>Summary of findings, context - how we got here, role of innovations and disruption, recommendations, next steps.</p> <p>http://www3.weforum.org/docs/Voluntary_Responsible_Mining_Initiatives_2016.pdf</p>
<p>World Gold Council</p> <p><i>Responsible Gold Mining Principles. 2019.</i></p>	<p>The responsible gold mining declaration(governance, social, environment), related responsible mining and sourcing codes, the responsible gold mining principles (governance, social, environment), assurance requirements.</p> <p>https://www.gold.org/download/file/14254/Responsible-Gold-Mining-Principles-en.pdf</p>

Appendix B: Example Table of Contents for a Mine Closure Plan

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 - 4.1.1 Legal Requirements
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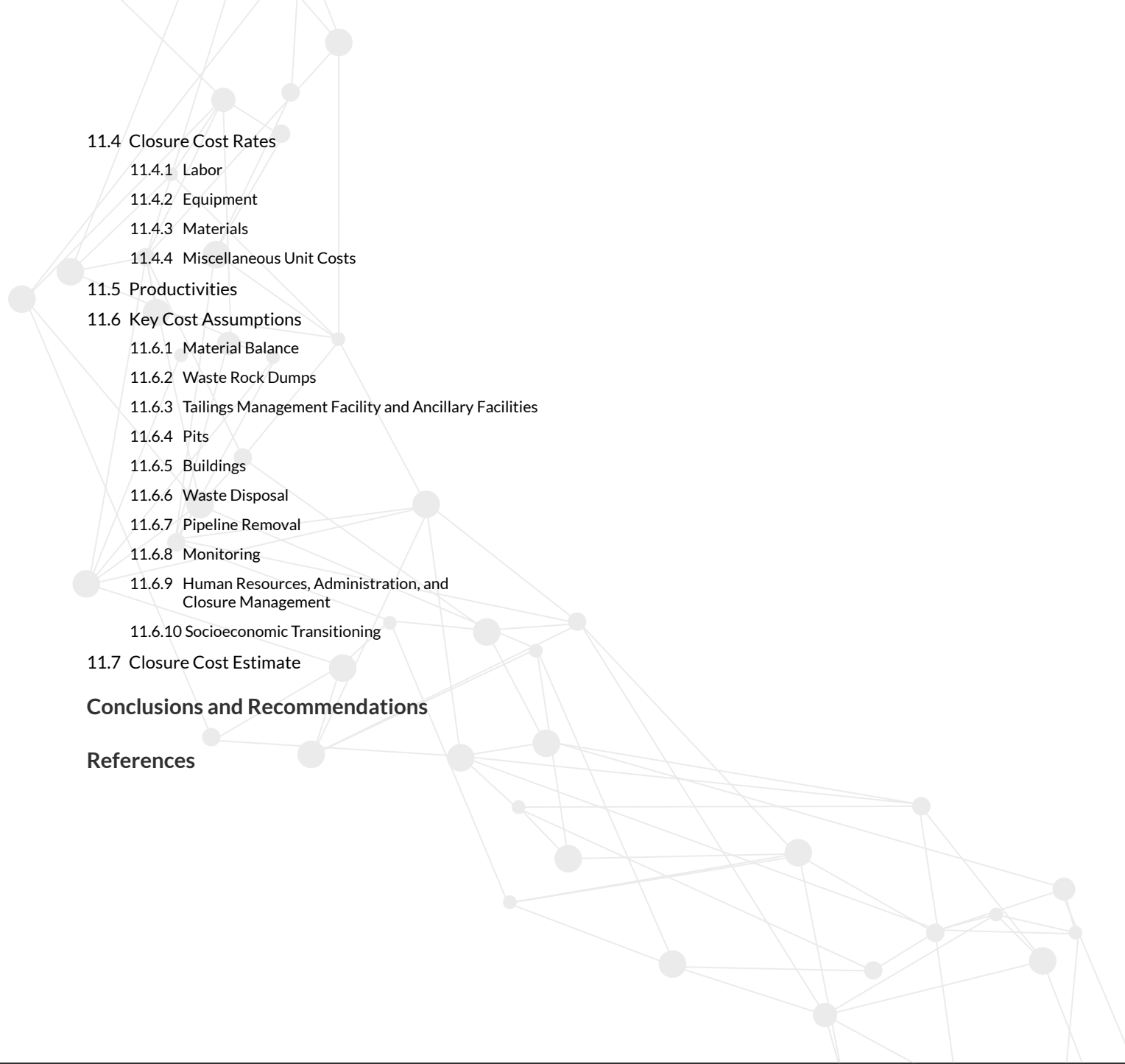
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Conclusions and Recommendations

References

Appendix C: Examples of Post-closure Socioeconomic Context and Repurposing of Land and Infrastructure

Detailed studies on repurposing are not readily available. The examples available in the public domain, in particular for FSU countries are generally lacking.^{1,2} The majority of examples are based in developed countries and have large financial implications. Some examples available in the public domain are provided in this appendix.

Indonesia

Newmont Minahasa Raya-operated (PTNMR) Mine Site

In use since 1996, the former PT Newmont Minahasa Raya-operated (PTNMR) mine was one of the first large-scale mines in Indonesia to close. PTNMR's closure plan, which focused on reclamation of the mining area, was submitted to the government in March 2002 and approved in December, with mineral processes continuing until 2004. Closure activities were eventually completed in 2006 and PTNMR's environmental monitoring lasted until 2010.

The Indonesian government started reforestation in 2011 with 155,814 trees and fruit crops planted on 200 ha of reclaimed land. The trees were selected based on a multi-purpose tree species system and are part of larger reclamation works to create a botanical garden that aims to attract tourists. The approval for the botanical garden, which required endorsement

of various local governments and research to assess a botanical garden's social, economic and environmental impacts, was gained in 2014.

The project involved the Indonesian Department of Forestry, the Indonesian Institute of Sciences, the University of Sam Ratulangi, the North Sulawesi Sustainable Development Foundation and other local constituents through a collaborative process. Input from local communities was sought through the community consultative committee, which consists of community leaders.

As part of the closure PTNMR also introduced sustainable social development programs to assist local communities with the post-closure transitioning, including micro finance, vocational training, fisheries and agriculture programmes.

Kelian Equatorial Mining (KEM)

The Kelian gold mine was closed in 2004. In October 2000 the Kelian mine closure strategy was started which sought full involvement of all stakeholders through the Kelian Mine Closure Steering Committee (MCSC) in the development of sustainable solutions which would enable communities to secure long-term benefits and minimize post-closure risks from the mining operations. This committee, jointly chaired by the Head (Bupati) of the regional

West Kutai government and the KEM President Director, with representatives from the local communities, governments and NGOs, developed a Charter, a website and evaluation criteria to ensure accountability and transparency. There were four technical working groups, consisting of representatives from the mine, local community leaders, NGOs, Universities, Local, Provincial and Central Government Departments, which reported to the Steering Committee. These working groups researched, developed and recommended sustainable options to the Steering Committee. The MCSC met quarterly to examine options in accordance with the criteria set out in the Charter and endorsed sustainable solutions which had support from Government, Community and the mine.

United Kingdom

Thoresby Colliery

Thoresby Colliery, a coal mine in Nottinghamshire, opened in 1925 and closed in 2015. Demolition and clearance of the pit heads and infrastructure was completed by the mine in 2018, which included filling and capping of the two mine shafts. Earthworks and infrastructure to facilitate the sale of serviced land to housebuilders started in 2018/2019. The associated cost will be funded by a service charge associated with the residential plots.

¹ Holcombe S and Keenan J. 2020. Mining as a Temporary Land Use Scoping Project: Transitions and Repurposing. Centre for Social Responsibility in Mining. University of Queensland, Australia.

² Pearman G. 2009. 101 Things to Do with a Hole in the Ground. The Post Mining Alliance.

Harworth Group of Restoration and Development bought the freehold and plans to deliver 800 new homes and a retirement village over a 10-year period. Land will also be engineered to build a new primary school and a new commercial space expected to create around 1,000 jobs. It is expected that the first house construction will start in 2020. Two of the original mining workshop buildings were retained and will be restored in terms of a cultural heritage plan and will be used as a community center. The restoration of the spoil heap commenced in 2016 and included the transformation into heathland to create a 350-acre country park consistent with the local landscape.

Thoresby Vale could potentially be part of the development of the world's first 5G "Connected Forest" which has five-million-pound funding from the government, which was matched by the industry equalling a 10-million-pound project.

Additional information:

<https://www.nottinghampost.com/news/nottingham-news/thoresby-colliery-set-transformed-800-666499>

<https://harworthgroup.com/projects/thoresby-vale/>

Southern Africa

De Beers

De Beers state that they take steps to create a secure future for the communities affected by their mine closure by transferring their responsibility for infrastructure and public services to the

relevant government authorities and by developing socioeconomic transitioning projects. Examples of De Beers initiatives in Namibia and Botswana are outlined below:

Namibia

In Namibia, De Beers has worked with Oranjemund Town Council to transfer municipal services from the company to the town council and have begun planning the transfer of property, currently owned by Namdeb, into private ownership. After extensive research, an agricultural pilot project has been launched as a first step towards establishing a sustainable post-mining economy.

Botswana

In Botswana, De Beers is planning for the eventual economic diversification of Orapa town in partnership with local and national government bodies. The plan will detail a long-term vision for the area adjacent to the Orapa mine, focusing on its potential as a tourism hub and center for light industry.

Canada

The Sullivan Mine

The Sullivan mine, a zinc, lead and silver mine in Kimberley, British Columbia that operated for more than a century, managed by the Consolidated Mining and Smelting Company of Canada (later Cominco, now Teck Resources) began engaging the local community on mine closure as far back as the 1960s. Today, the 1,100-hectare former mining area has a

privately-owned ski hill and golf course as well as a 1.05 MW solar farm that is owned and operated by Teck Resources. Teck continues to maintain responsibility for water treatment. By preparing for closure and engaging stakeholders early in the mine life, Sullivan's operators were ahead of their time.

Additional information:

<https://www.teck.com/news/stories/2016/closure-example--preparing-for-life-after-the-sullivan-mine->

Australia

The Woodcutters Mine

The Woodcutters lead-zinc mine, operated by Normandy in Australia's Northern Territory was decommissioned in 1999. Newmont acquired the site in 2002 and took on responsibility for the decommissioning and rehabilitation. Under the Woodcutters Agreement, the closure work was undertaken in collaboration with the traditional owners of the land (the Kungarak and the Warai people). This agreement's goal was to hand over the land to the traditional owners once all agreed closure criteria and objectives were met. The agreement also details local employment, training and stakeholder engagement commitments.

Newmont has completed filling in the mine pit and covering the land with native grass and tree species, which was completed in 2005.

A problem arose in 2011 when salt precipitates formed within the footprints of the reclaimed tailings dams. In order to avoid potential impacts to

waterways, Newmont consulted extensively with the traditional owners and other relevant stakeholders on remediation options focused on post-mining land use and agreed to a remediation plan that raised the ground elevation of the tailings dams. This project involved significant earthworks that required 480,000 cubic meters of material to backfill the tailings dams. As part of the plan, the material used would come from a newly constructed “borrow pit,” which would be reclaimed and turned into a wetland at completion.

The creation of a wetland was the preferred option chosen by the traditional owners. Aquatic ecologists from James Cook University were consulted on a design that would make the borrow pit conducive to forming a wetland, and hydrologists helped determine seasonal water levels so the borrow pit would be deep enough to retain water year-round and maintain aquatic life.

The company worked alongside groups such as the Indigenous Consulting Group, which aims to promote social and economic development for Aboriginal and Torres Strait Islander people in Australia, and Rusca Bros Services, a local mining and recruitment company owned and operated by indigenous groups, for the soil transfer project. Newmont has reported that Indigenous people made up 90% of the workforce for this project.

Additional information:

<https://www.decipher.com.au/blog/industry-news/find-out-how-newmont-has-rehabilitated-the-woodcutters-mine/>

Kidston Mine

Portions of the closed Kidston Mine in Queensland are being utilized to generate power for the national power grid. Two closed pits that have filled with groundwater will be used to generate hydro power, but unlike traditional hydroelectric power plants, water will be discharged in to one of the pits from the power generation plant from where it will be pumped back to first pit during off-peak hours using power from a solar generation facility also located at the former mine site. The project is expected to generate 270MW of solar power and 250MW of pumped hydroelectricity storage. The project is a public-private partnership between the Australian government and Genex Power Limited.

Additional information:

<https://arena.gov.au/projects/kidston-pumped-storage-project/>

The Wilkie Creek Mine

The Wilkie Creek coal mine, managed by Peabody, closed in 2013. The company has rehabilitated 395 ha of land since 2014, much of which has been given over to cattle farming. Rehabilitation is still ongoing, and the final landform planning process includes paddocks and cattle watering systems to support the end land use of grazing

Additional information:

<https://www.mining-technology.com/features/australian-mine-rehabilitation/>

<https://www.decipher.com.au/blog/industry-news/find-out-how-peabody-has-rehabilitated-the-wilkie-creek-mine/>

USA

BHP

The BHP’s North American Closed Sites team has attempted to find alternative land use for legacy mine sites that can be both an environmental benefit and bring jobs and industry back to local mining communities. The Rocky Mountain Institute (RMI) has teamed up with BHP to consider turning sites into independent solar or wind power plants and storage facilities, presenting the opportunity for a second useful life through renewable energy development.

Recently, BHP has advanced some of these identified opportunities, with a site in Arizona and New Mexico now in design and/or permitting phases. The site in New Mexico has now signed both a lease and lease option with a solar and storage developer.

Additional information:

<https://www.bhp.com/community/community-news/2018/01/renewable-energy-powering-our-closed-mine-sites/>

Appendix D: Table of Key Risks

Risks	Economic	Environmental	Financial	Health & Safety	Social
Failure to incorporate closure planning into project design and development	•	•	•	•	•
Failure to update closure plan on a regular basis	•	•	•	•	•
Failure to accurately estimate closure liability	•	•	•	•	•
Failure to make sufficient provision to implement closure plan	•	•	•	•	•
Closure objectives and goals are not defined	•	•	•	•	•
Closure goals are not site specific	•	•	•	•	•
Closure success criteria do not fit closure goal	•	•	•	•	•
Closure goals are not realistic	•	•	•	•	•
Release of contaminated water from site after closure – from pits, tailings, overburden material, and other mine waste materials		•	•	•	
Downgradient groundwater and or surface water quality does not meet closure criteria	•	•	•	•	•
Contaminated soil, hazardous materials, and liquid wastes remaining on site		•	•	•	
Erosion (e.g. wind, water, and waves) during extreme climatic events		•	•	•	
Slope failures (pit walls, WRD, etc.)		•	•	•	
Materials useful for closure (e.g. organic soil) were not salvaged and stockpiled	•	•	•		
Closure measures fail to achieve closure objectives	•	•	•	•	•



Risks	Economic	Environmental	Financial	Health & Safety	Social
Government lacks capacity for closure plan reviews	•	•		•	•
Insufficient review period for government review	•	•		•	•
Corrupt practice by governmental or third-party reviewers	•	•	•	•	•
Failure to engage or failure to engage appropriately with stakeholders regarding closure visioning and socioeconomic transitioning	•			•	•
Conflict between different stakeholders in terms of closure goals and process	•	•	•	•	•
Failure to manage unrealistic stakeholder expectations for socioeconomic transitioning	•		•		•
Lack of capacity for repurposing/socioeconomic transitioning in local communities/ private sector and government	•		•		•
Lack of capacity for post closure visioning in all stakeholders			•		•
Lack of capacity in governments to manage repurposed mine assets after closure			•	•	•
Lack of capacity in government to manage funds to manage residual impacts after closure		•	•	•	•
Land conflicts impeding post closure land repurposing	•	•			•
Lack of alignment between operational socioeconomic programs and post-closure economic sustainability	•				•
Inadequacy of retrenchment packages	•		•		•
Lack of government capacity for post closure social monitoring			•		•

