



Mining liabilities in Chile, Towards a National Law

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Keywords: Mining Environmental liabilities (PAM), mining, abandoned mining sites, mines, mine closure

I. Introduction

Mining is considered one of the engines of economic development. There is evidence that nations that have adopted modern mining laws attract private sector investment, contributing to growth and development.

28% of the world's copper reserves are in Chile. Although the development of mining activity has been essential for the progress of Chile, it has also had a negative effect on our environment, one of its main consequences being "environmental liabilities" (PAM).

The current Chilean extractive model has concentrated the national production in the north of the country and, consequently, also these mining environmental liabilities (PAM).

Mining has contributed, on average, about 12% of GDP between 2008 - 2017, while in the social sphere, mining has generated jobs and social development, as well as conflicts due to the potential deterioration of the environment where it works. The extraction of mineral resources brings a series of negative consequences for the environment: it consumes a lot of water, generates atmospheric emissions and a large amount of waste that is potentially harmful to human health and the environment.



In 2003, the National Registry of Abandoned and/or Paralyzed Mining Works began. To date, 1,338 abandoned mining sites have been identified by the Ministry of Mining, understanding that one mining site may contain more than one PAM. Also, there is 742 tailings deposits, of which 104 are active, 463 are inactive, 173 are abandoned (Sernageomin 2019). These numbers place Chile as the third country with the largest number of tailings deposits in the world.

In Chile there is no legislation focused on PAMs, the closest regulatory framework being a Mine Closure Law that ensures that new mines and those in operation calculate their closure costs and submit a bond to the State.

However, this law is focused on prevention and does not include existing PAMs. It is essential that Chile moves towards a PAM Law, developed through a participatory process that includes public discussion with emphasis on the integration of communities that are directly or indirectly affected and that allows to solve, in part, the potential risk situations associated with the generation of acid drainage and the physical and chemical stability, as well as other socio-environmental problems derived from the existence of PAM.

Finally, it is important to focus on a new law oriented to the rehabilitation/remediation of PAM, increasing the requirements to the safety factors of physical and chemical stability, forcing to owners of projects to take the responsibility of their PAM with objective that prevention, compensation, mitigation and repair actions will be implemented; with a view to comprehensive management by mining companies.

II. Materials and Methods

The methodology for the development of this work was based on analyzing national and international norms and regulations whose content was related to mining works closure plans, PAM, reprocessing and remediation of PAM, PAM cadastres in Chile, among others.

The analysis of information was performed as follows:

- 1. Collection of relevant background information:** A search was made for national and international standards that included the concepts of closure plans, mining operations,



environmental liabilities, abandoned operations, mineral reprocessing, remediation, rehabilitation, among others. In addition, other studies carried out both in Chile and in other countries were reviewed, where national and international regulations related to the construction, operation and closure of mining operations were compared.

- 2. Review and Analysis of information collected:** Those antecedents defined as significant in the formulation of this regulation proposal were reviewed in detail, identifying aspects applicable to the national situation about PAM. In this way, information was classified, discarding those norms or regulations that did not incorporate in their contents issues associated with closure, post-closure of mining environmental liabilities.

After this classification, the selected standards were analyzed to identify those relevant points for the formulation of this proposal; generating a second categorization of the information associated with content, differentiating between minimum normative technical content (present in all the revised standards), technical content with the potential to be improved, and content that is missing or not included in the standards or regulations currently in force.

In this way, those criteria defined as minimum were immediately incorporated as part of the base contents that the proposed national standard must contain. Secondly, the normative criteria with the potential to be improved as a whole were incorporated, and thirdly, those contents that are not currently described or included in the information reviewed and analyzed were identified and incorporated.

- 3. Results and Conclusions:** At the end of the review of the background, the most relevant aspects that should be incorporated into the proposed national regulation were identified, as well as those to be improved and, finally, those that are not included in the reference information and that are incorporated for this proposal, ending with a list of minimum technical contents that should be considered by the national law for the regulation, remediation or rehabilitation of PAM in Chile.



III. Background

International Context

Countries that currently have standards or regulations related to mining environmental liabilities and/or closure of mining sites and Facilities are listed in Table 1-1.

Table 1-1 International laws about PAM and/or Closure of mining sites

Country	Standard	Name of Standard	Component of regulation
Argentina	Ley N°24.585	Environmental protection Law for mining activity.	Disposal of waste whatever its nature and activities aimed at the closure of the mine.
	Ley N°1.919	Mining Code	Environmental protection for mining activity including mine closure activities.
Bolivia	DS N°24.782	Environmental Regulation for Mining Activities	Prohibition of dumping, abandoning or depositing solid mining-metallurgical waste in unauthorized areas and in a scattered or disorderly manner.
	Ley N°535	Mining and Metallurgy Law	Close of operations.
Canada	Guía	Guidelines for Preparing Mine Closure Plans (Quebec)	Guide to the safe construction of tailings dams and other dams.
	FEMA 93	Federal Guidelines for Dam Safety	Strict security standards for practices and procedures.
United State of America	FEMA 333	Federal Guidelines for DAM Safety: Hazard Potential Classification System of Dams	Potential danger classification system, simple, clear and precise.
	FEMA 64	Federal Guidelines for Dam Safety: Emergency Action Planning for Dam Owners	Security standards in practices and procedures to be applied by federal agencies.
	EPA 910-B-00-001	Abandoned Mine Site Characterization and Cleanup Handbook	Remediation of abandoned mining sites
Mexico	NOM-141	Procedure to characterize the tailings, as well as specifications and criteria for the characterization and preparation of the site, Project, construction, operation, post-operation of tailings PAM.	Characterization of tailings, mitigation of environmental impacts in stages of construction, operation and post-operation.
		Ley 28.090	Implementation of environmental remediation measures by the mining owner.
Peru	Ley 28.271	Implementation of environmental remediation measures by the mining owner.	Environmental liabilities of the mining activity.
	DS N°078-2009-EM	Implementation of environmental remediation measures by the mining owner.	Environmental remediation measures.



	DS N°2003-35-EM	Regulations for the closure of mines.	Closure measures for mines.
	RD N°001-2015-EF/ 63.01	General guide for the identification, formulation and social evaluation of public investment projects, at the profile level and guidelines for the preparation of public investment projects for PAM remediation.	Mining environmental liabilities remediation projects.
	DS N°059-2005-EM	Regulation of Environmental Liabilities of mining activity	Regulates management of mining environmental liabilities.
	Ley 28.526	Law that modifies articles 5, 6, 7 and 8, which regulates the PAM of the mining activity and adds a third complementary and final provision.	Regulates management of mining environmental liabilities.
	DS N°003-2009-EM	Modifies regulation of PAM DS N°59-2005-EM. It establishes mechanisms for the reuse and reuse of PAM not yet remedied.	Remediation of mining environmental liabilities.
United Kingdom	Act (estatuto)	Mines and Quarries (Tips)	Management and control of mines and quarries (mentions Fencing of abandoned quarries).
	Reglamento	The Mines and Quarries Regulations	Regulatory framework for regulations related to mines and quarries.
	Act (estatuto)	The Environmental Protection Act	
South Africa	632	Regulations Regarding the Planning and management of residue stockpiles and residue deposits from a prospecting, mining, exploration or production operation	Planning and management of waste and waste deposits derived from the prospecting, extraction, exploration, or production operation.

National Context

In recent years, Chile has made a significant progress in the development of a regulatory framework for the closure of mining operations and facilities, through the entry into force of Law N°20.551/2011 (which bears the same name); the Regulation of the Environmental Impact Assessment System (D.S. 40/2012); the Regulation for the approval of projects for the design, construction, operation and closure of tailings deposits (D.S. 248/2007) and the regulation for the Closure of mining facilities and operations (D.S. 41/2012). Table 2-1 details the national regulations described above.

Tabla 2-1 National Standards associated with PAM and/or Closure of Mining Sites.

	Standard	Name	Component of regulation
Chile	Ley N°20.551/2011	Regulates the closure of mining operations and facilities.	Closure of mining operations and facilities.
	DS N°248/2007	Regulation for the approval of design, construction, operation and closure of tailings deposits projects.	Construction, operation and closure of DR and its complementary works.



DS N°41/2012	Regulation of the Law of Closure of Mining Sites and Facilities.	Closure of mining operations and facilities.
D.S N° 132/2004	Mining Safety Regulations.	General regulatory legal framework for operations in the extractive mining industry.
D.S N°40/2012	Regulation of the Environmental Impact Assessment System.	Construction, operation and closure of mining operations.

IV. Results

Based on the analysis realized on the different legal standards that currently exist and that regulate some aspects of the PAMs, we propose the minimum technical contents that should be incorporated in the Chilean proposed standard.

(i) Objective and scope of the Proposed Regulations for Environmental Management and Regulation of PAMs.

The following proposal focuses on the minimum technical, environmental, and social aspects for the recovery or remediation of mining environmental liabilities in Chile.

(ii) Minimum technical contents proposed for a National Regulation for the regulation and remediation of PAM.

1. Definition of the Standard Objective.
2. Scope of application.
Corresponds to the scope of the standard, which in this case should focus on the management of abandoned environmental liabilities or in the closure and post-closure stage of mining operations.
3. Definition of responsibilities in relation to PAMs.
 - a. Identification of the Project that gives rise to the PAM.
 - b. Identification of the Owner of the project that gives rise to the PAM and of the proposed remediation and/or recovery measure.
4. Definition of competent authority in the revision, approval and control of the projects for remediation or recovery of PAM.
It should be mentioned here the importance that this process considers not only SERNAGEOMIN, but also Health Authority, and other actors.
5. Glossary of terms and definitions.



6. PAM characterization.
 - Determination of physical stability of the PAM: It is the security scenario.
 - Determination of Geochemical Stability of the PAM.
 - Determination of Hydrological Stability, regarding water management.
 - Determination of acid drainage.
 - Static laboratory test.
7. Definition of criteria for the recovery of the PAM.
 - Revegetation.
 - Recovery.
 - Reprocessing of material.
 - Other uses.
8. Justification of the PAM recovery or remediation measure.
 - Comparative table between the different possibilities of remediation or recovery to be able to see why one is chosen over the other.
 - Comparative table between base case (PAM) and selected recovery or remediation measure, with the aim of justifying why one is chosen over the other.
 - Consider the incorporation of a risk matrix for the PAM with and without the project to confirm that the remediation of the PAM or recovery is the best management alternative.
 - Consider the identification of social impacts associated with the PAM with and without a recovery or remediation project that allows confirming which is socially the best management alternative. Criteria should be established such as: proximity of the PAM to the community, perception surveys, externalities, aspects associated with health, among other variables.

The general objective of this point is to verify with total certainty that the remediation or recovery of a PAM is better than leaving it as it is, ensuring chemical and physical stability.

9. Remediation or recovery methodology proposed that details the way in the community is incorporated and relates to the project.
 - a. Technical background



- Determination of physical stability of the PAM
 - Determination of Geochemical Stability of the PAM.
 - Determination of Hydrological Stability, regarding water management.
 - Determination of acid drainage.
 - Laboratory Static Test
- b. A program that identifies milestones, dates and commitments should be considered.
- Description of the different stages of the project; construction, operation, and maintenance of the work.
- c. Compliance indicators and verifiers must be incorporated based on the proposed program.
- d. d. Consideration should be given to the delivery of quarterly reports to the competent agencies that allow the project's compliance to be checked, as scheduled.
10. Methodology for the incorporation of the social and environmental variable during the development of the PAM recovery or remediation project.
- a. Describe how the community relates to the different stages of execution of the PAM remediation or recovery project.
 - b. Describe how the environmental variable is incorporated in the different stages of project execution.
 - c. Compliance indicators and verifiers must be incorporated based on the proposed program associated with social and environmental variables.
11. Identification of technical, environmental, and social commitments arising from the defined recovery and/or remediation measure.
12. Schedule of activities.
13. Monitoring and Follow-up Program.
- a. The monitoring and follow-up points must be identified and technically justified.
14. Program for compliance with commitments and objectives.
15. Describe how the management of the PAM is incorporated and related to the Closure Plan (which must be previously approved) of the mining site.



V. Conclusions

Despite the fact that in recent years Chile has made significant progress in terms of environmental regulation and closure of mining operations; through the generation of standards, laws and regulations, among other legal tools, there is still a long way to go in terms of the management that should be given to the PAM, whether existing, abandoned, those that are being generating (in projects that are currently in the operation stage), as well as those that are part of a project that is beginning to be designed.

Chile currently has Law N° 20,551/2012 that Regulates the Closure of Mining Sites and Facilities, which, despite incorporating within its technical content the assurance of the physical and chemical stability of facilities, such as tailings deposits, dumps, cracks, etc., in its closing and post-closing stage, it does not consider issues associated with their repair/remediation, as it is established, within their respective legal regulations, by countries such as Peru, Canada, the United Kingdom, the United States and South Africa.

According to the above, it is urgent to create and implement national regulations that establish the minimum parameters that must be considered for the remediation and regularization of PAMs, incorporating criteria such as: physical and chemical stability of PAMs, tolerance range for concentration of toxic or potentially harmful substances for humans and the environment present in soil, air, water, as well as establishing the way in which the environmental and social component is integrated during the different stages of execution of the recovery/remediation project of the PAM.

Finally, it is key that a new regulation clearly establishes which are the organisms responsible for the design and their respective approvals, for the implementation and follow-up of the PAM recovery/remediation Project, Generating consequently, strategies at the governmental level for an effective control by the different Authorities.

As an additional factor to what has already been mentioned, we believe it is important to incorporate external figures into the regulatory and oversight process (community



representatives, social actors, community groups, indigenous peoples, among others), in order to improve oversight and monitoring work through the formation of multidisciplinary teams, which can provide views from other perspectives and new criteria that come to complement the standards already established in the current instruments of national regulation.

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