



Comisión
Nacional de
Productividad

PRODUCTIVITY IN THE CHILEAN COPPER MINING INDUSTRY



BACKGROUND



LARGEST COPPER PRODUCER IN THE WORLD

2015 COPPER PRODUCTION (% GLOBAL PARTICIPATION)



ALMOST A THIRD OF THE WORLD'S COPPER RESERVES ARE IN CHILE



- Australia 12,2%
 - Peru 11,4%
 - Mexico 6,4%
 - USA 11,4%
 - China 4,2%
 - Rusia 4,2%
 - Congo 2,8%
 - Zambia 2,8%
 - Canada 1,5%
- Source: USGS



MINING ACCOUNTS FOR OVER 10% OF THE GDP AND OVER 50% EXPORTS. ADDITIONALLY, IT ACCOUNTS FOR ALMOST 15% OF THE PAST DECADE'S TAX REVENUES.

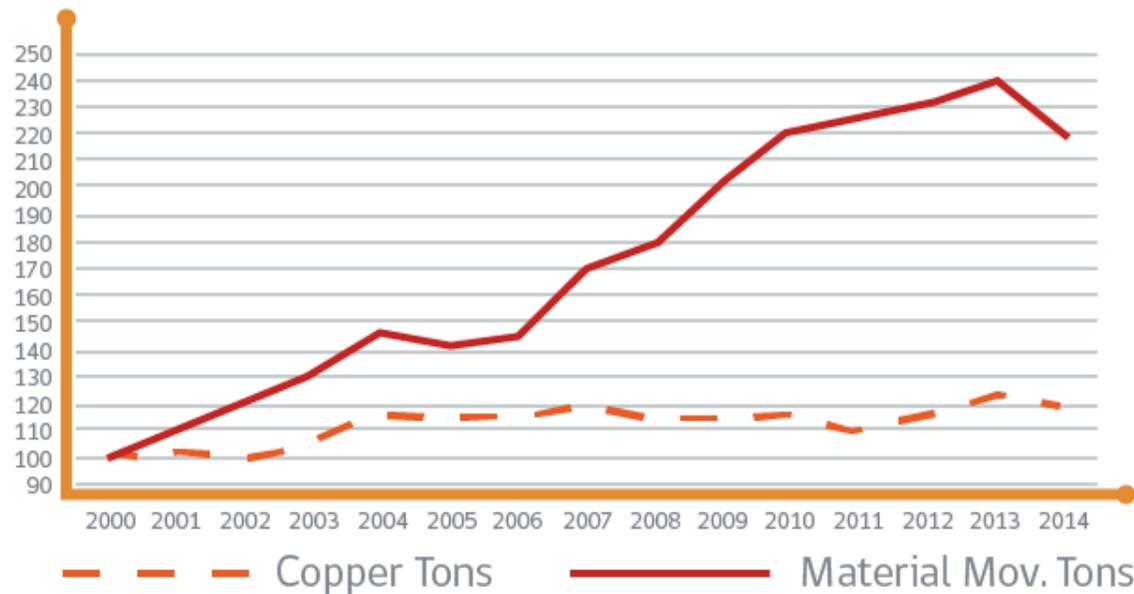
SOURCE: WORLD BANK AND UNITED STATES GEOLOGICAL SURVEY (USGS)

COPPER PRODUCTION ROSE 19% BETWEEN 2000 AND 2014

BUT IT REQUIRED:

TO INCREASE THE MATERIAL MOVED BY 120%

COPPER PRODUCTION AND MATERIAL MOVED INDEX IN THE COPPER MINING INDUSTRY (BASE 2000 = 100)



SOURCE: COCHILCO

79% ADDITIONAL ENERGY

157% ADDITIONAL LABOR

178% ADDITIONAL CAPITAL INVESTMENT

THE NATIONAL PRODUCTIVITY COMMISSION'S MANDATE

To analyze the copper mining industry's productivity and propose recommendations to improve it.

To identify the main barriers to the growth of mining productivity in the country.

To propose actions to improve the sector's performance.

METHODOLOGY

1

BENCHMARKING

Between 12 Chilean Mines and 7 international mines specially selected for being international best practice.

2

Sample includes 35% of world copper production and 50% of the production of over **100,000 TONS** per year.

3

Interviews with over **500 PEOPLE** linked to the mining industry, including operators, supervisors, executives, analysts, civil servants, members of civil society and experts.

4

Open public hearings with over **700 ASSISTANTS** in the cities of Antofagasta, Iquique, Calama, La Serena, Copiapo, Sierra Gorda, Coquimbo and Santiago.

5

Visits to mines considered best practices in **AUSTRALIA, CANADA, UNITED STATES, SWEDEN AND PERU.**

6

Opinions of executives, workers and experts in **INTERNATIONAL.**

7

Meetings with government entities and the national and international **INDUSTRY.**



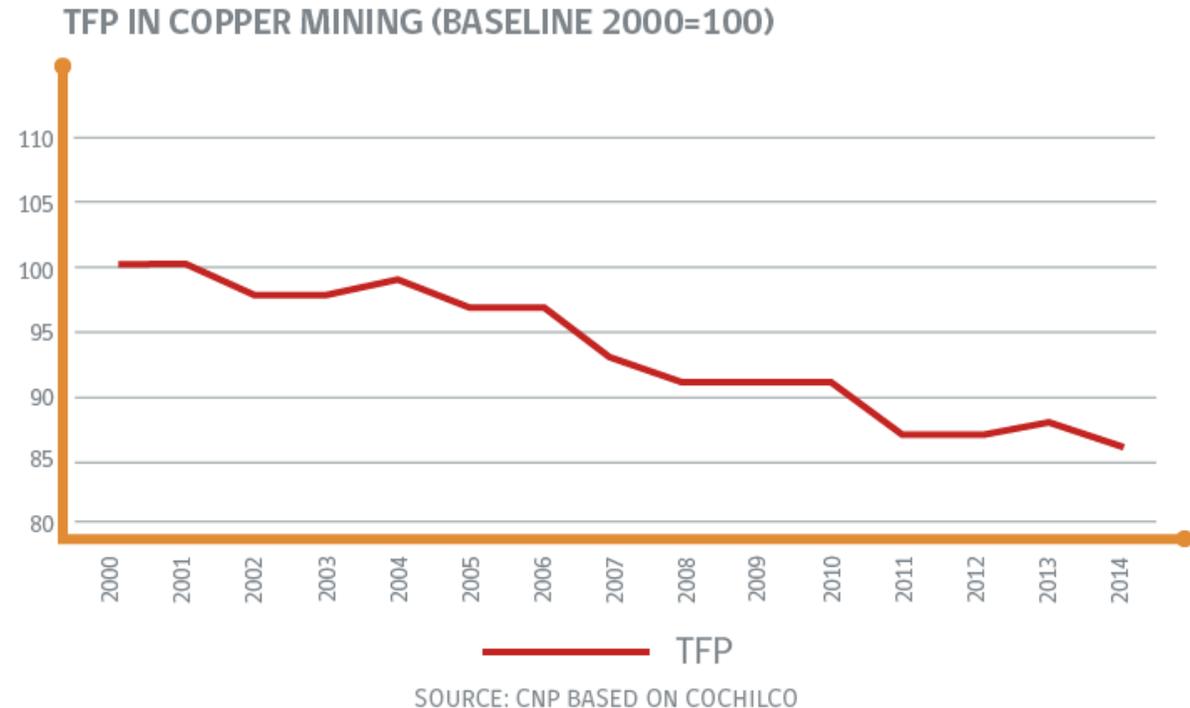
RESULTS



Chile does not control the copper's price nor its mineral grade, BUT IT CAN CONTROL ITS PRODUCTIVITY AND, THEREFORE, ITS COSTS.

PRODUCTIVITY FELL 14% DURING THE YEARS 2000- 2014

● Productivity of copper mining, measured as Total Factor Productivity and corrected by both endogenous and exogenous factors to the operation, shows a drop of 1% per year between 2000 and 2014, accumulating a reduction of 14% in the period.



BENCHMARK SAMPLE

12 LARGE SCALE CHILEAN COPPER MINES



75% OF THE CHILEAN COPPER PRODUCTION

7 INTERNATIONAL OPERATIONS



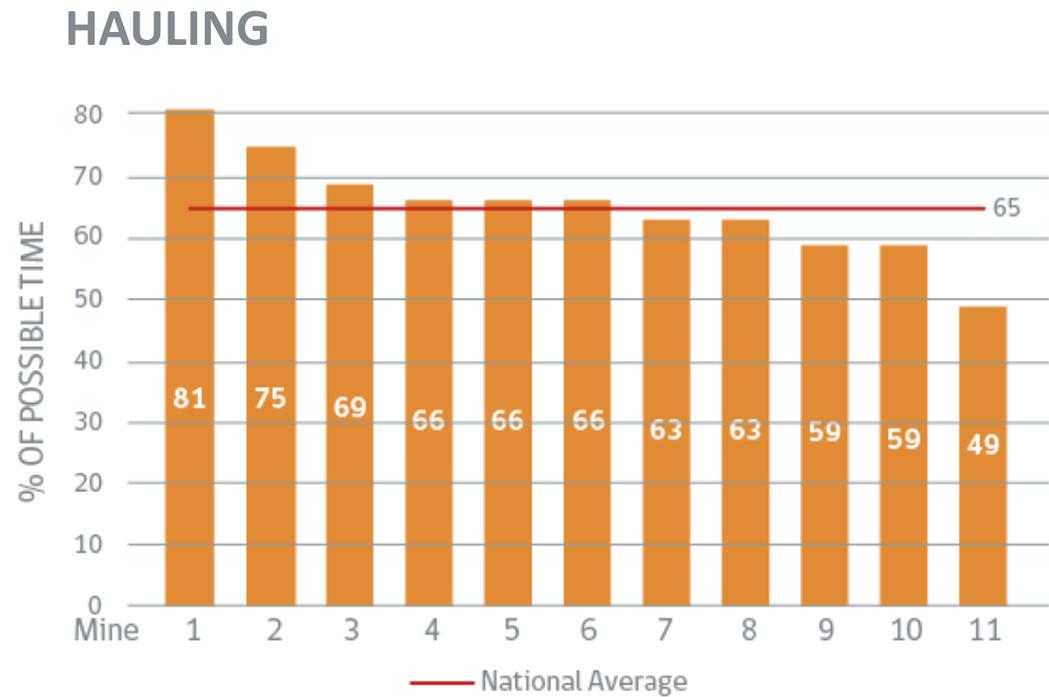
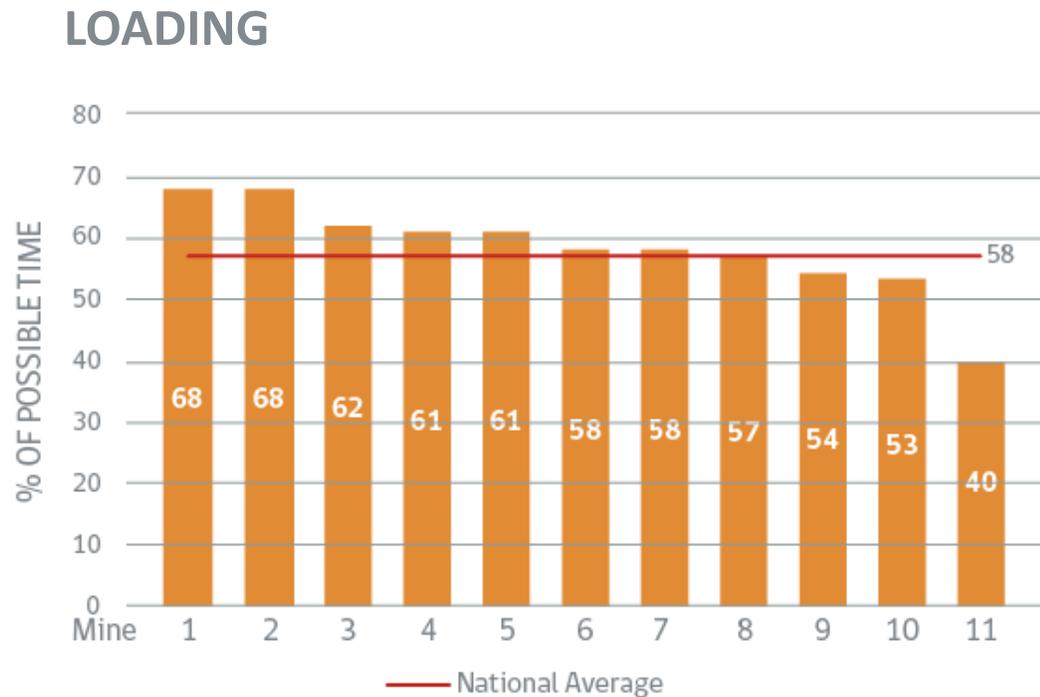
WORLD COPPER PRODUCTION



WORLD COPPER PRODUCTION FROM MINES YIELDING OVER 100 THOUSAND TONS

RESULTS OF THE NATIONAL BENCHMARK FOR CAPITAL PRODUCTIVITY

ASSET EFFICIENCY IN 2015

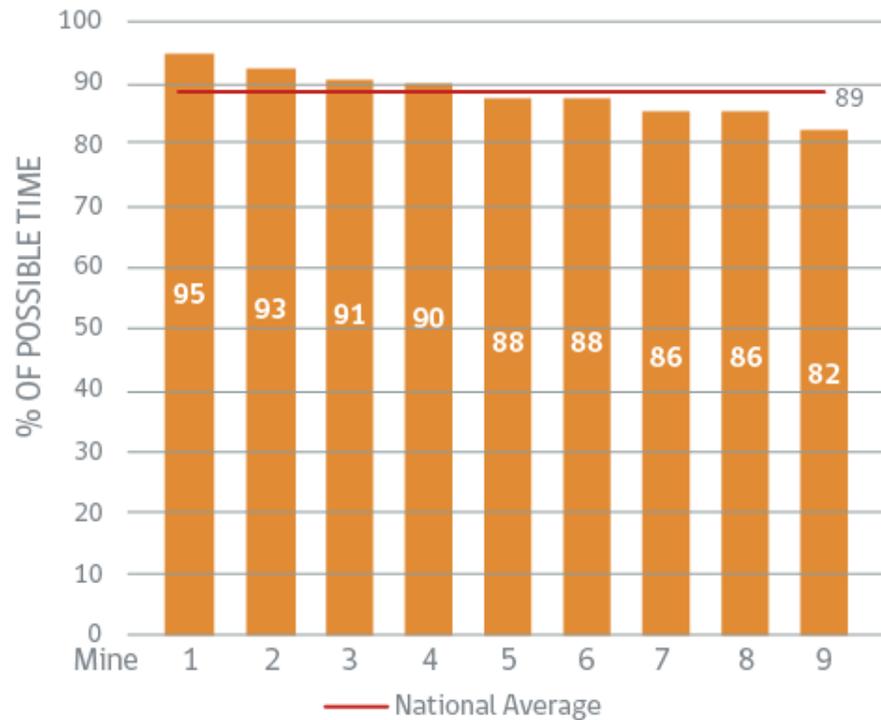


Source: National Productivity Commission based on MatrixConsulting.

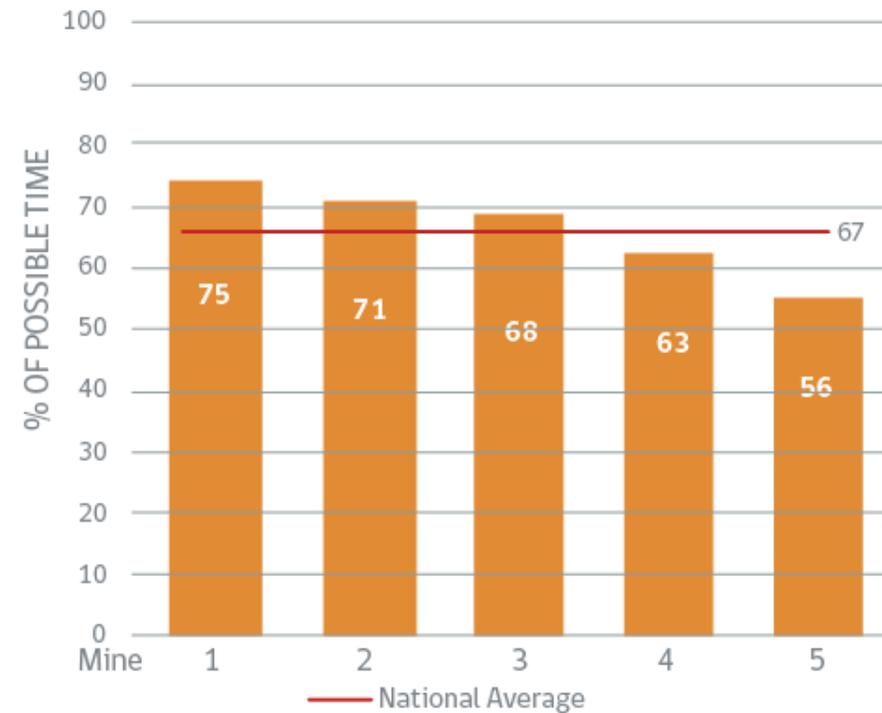
NATIONAL BENCHMARK RESULTS FOR CAPITAL PRODUCTIVITY

ASSET EFFICIENCY IN 2015

CONCENTRATOR PLANT



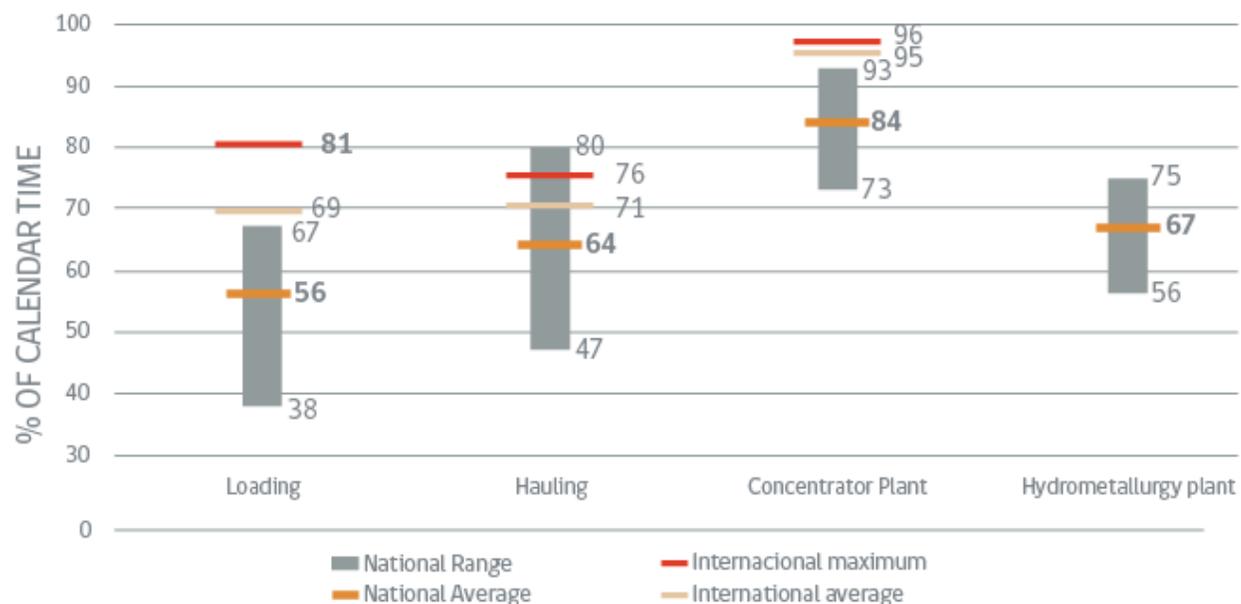
HYDROMETALLURGY PLANT



Source: National Productivity Commission based on MatrixConsulting.

NATIONAL AND INTERNACIONAL BENCHMARK RESULTS FOR CAPITAL PRODUCTIVITY

NATIONAL AND INTERNATIONAL BENCHMARK SYNTHESIS FOR CAPITAL



Source: National Productivity Commission based on MatrixConsulting.

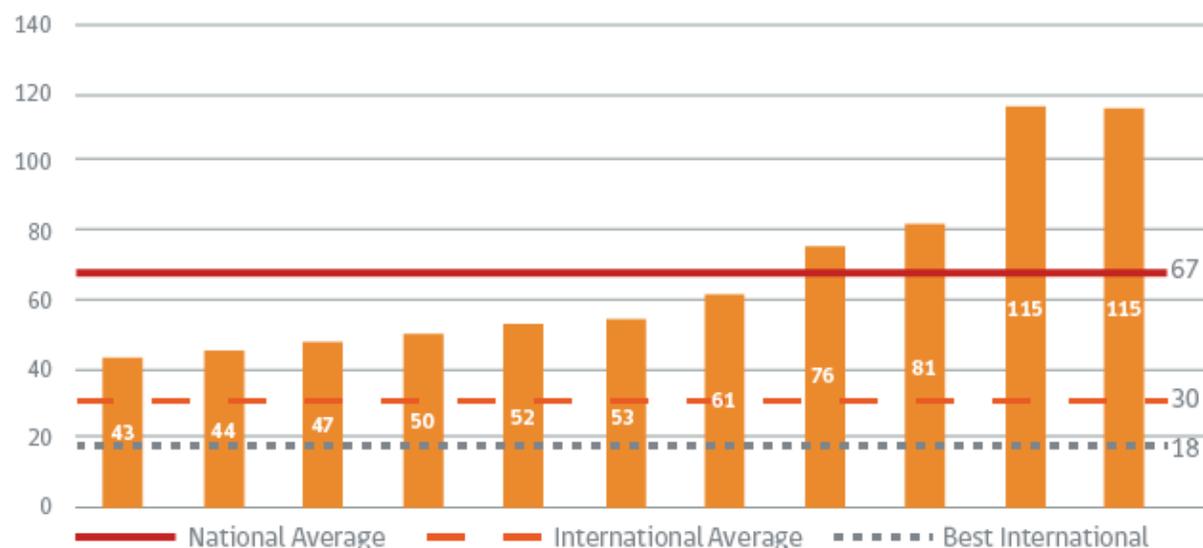
- The main gaps are in open pit mine process: loading and hauling.

In the case of hauling there is a greater dispersion of productivity between national mines. In the case of loading there are greater gaps regarding international operations.

Note: There is no international information for hydrometallurgy plants. The base time for this process is possible time and not calendar time.

NATIONAL AND INTERNACIONAL BENCHMARK RESULTS FOR CAPITAL PRODUCTIVITY

PARTIAL LABOR PRODUCTIVITY, 2015 (MAN-HOURS PER KILOTON OF MOVED MATERIAL IN THE OPERATION)



Source: National Productivity Commission based on MatrixConsulting.

- The most efficient national mine required 43 man-hours to move 1,000 tons of material. The least efficient mine required 115
- The average benchmark mines require little less than half the man-hours that the national average.
- One of the reasons for this productivity gap is that in Chile, 1.8 people work in plant and support for each worker in the mine, while in an international mine that ratio is 1.3

THERE IS ROOM FOR IMPROVEMENT

1. Increase the productivity of less efficient Chilean operations to the level of the best in the country, which is mainly the mining companies' responsibility

2. Raise the national average to international levels, and bring them closer to best international practices, which requires improvements in public and regulatory policies

COVERING THREE AREAS

- 1. PRIVATE GOOD:** A significant part and the bulk of short-term gains in productivity will depend on factors that can be managed by the mining companies.
- 2. PUBLIC GOOD:** An important part will depend on better public policy and regulation.
- 3. SECTORAL GOOD:** Other factors are dependent on the relationships amongst the companies, or with their suppliers and contractors (a "sectoral good").



The set of recommendations proposed by the National Productivity Commission, are the foundation of a mining strategy that ensures the continuity of the sector, its expansion and adaptation to new technological challenges and social demands.



RECOMMENDATIONS

APPROVAL OR REJECTION OF PROJECTS

- The "repertoire of permits and regulatory obligations for a mining project" from the Ministry of Mining lists some 2,067 normative articles applicable to mining projects, which in turn give rise to 220 sectoral permits needed for a project.
- Leading countries such as Canada and Australia have a *Large Projects Office*.



2007

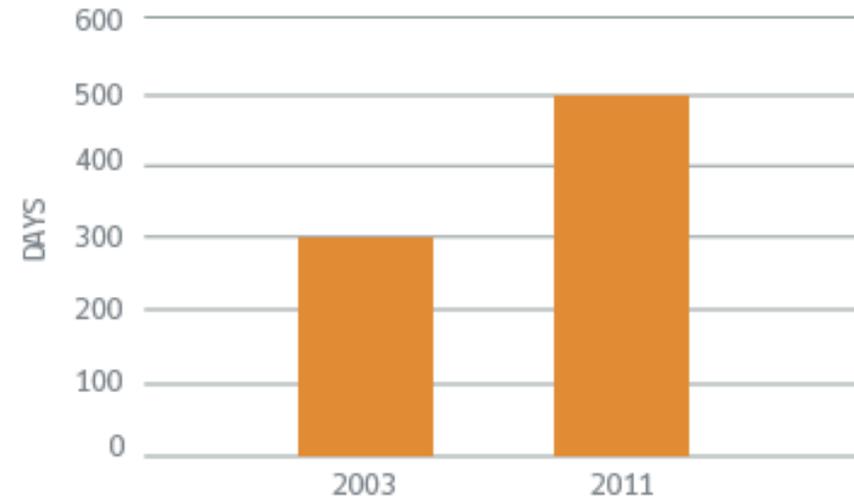
Canada's Major Projects
Management Office (MPMO)



2013

Productivity Commission
Major Project Assessment Inquiry

AVERAGE TIME (IN DAYS) FOR THE OBTENTION OF THE RCA

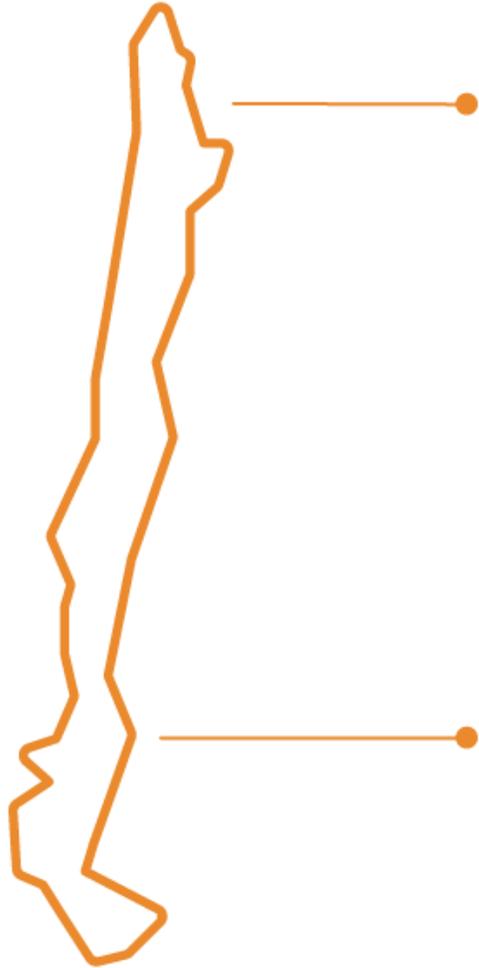


Source: Lagos (2014).

RECOMMENDATIONS: APPROVAL OR REJECTION OF PROJECTS

- Establish a Large Projects Office.
- Support the project executor in his relationship with the authority, and in meeting the requirements to make the project viable.
- Support the State agencies in their coordination with each other, and in the relationship with the executor.
- Deliver the decision on the project rejection or approval, as soon as possible.

EXPLORATION



CHILE POSSESSES THE MAIN KNOWN COPPER RESERVES IN THE WORLD

Copper reserves per country 2013

- Peru 10%
- EEUU 6%
- Australia 13%
- Rusia 4%
- Mexico 6%
- Otros 33%



SOURCE: COCHILCO

IT IS THE WORLD'S 4TH MOST IMPORTANT EXPLORATION DESTINY, WITH A 7 % OF THE TOTAL



1°



2°



3°



4°

GOOD INSTITUTIONS AND GEOLOGICAL INFORMATION ARE KEY

VARIOUS ASPECTS TO IMPROVE IN MINING CONCESSIONS



- The concessions are misused, often for speculative purposes and as insurance against potential litigation.
- Establishing mining concessions involves long terms, with delays of 6 to 8 months for exploration and 24 to 29 months for exploitation
- Chile shows a significant lag in both availability and quality of precompetitive geological information.
- There is low territory availability for exploration in the country's main metallogenic strips.

RECOMMENDATIONS: EXPLORATION AND MINING CONCESSIONS

- Increase the annual patent, both in exploration and exploitation, so that it increases over time but allowing a reduction of the patent payment through mechanisms of consideration by the mining concessionaire (geological information, works, among others).
- Equate the non-metallic patent to the metallic ones.
- Establish incentives and sanctions to comply with the delivery of geological information.
- Adequately strengthen Sernageomin in budget and functions.

RECOMMENDATIONS: EXPLORATION AND MINING CONCESSIONS

- To reduce the application, evaluation and constitution terms of concessions.
- To equate the conditions between experts and authorized engineers to perform surveying tasks.
- To restrict the immediate and consecutive request for exploration concessions between related persons.
- To improve the auctioning process of abandoned mining concessions.
- To update the mining rights coordinate system to WGS84.
- To adopt a grid system in the medium term.

OPERATIONAL CONTINUITY



The normal workday in mining is classified as an “exceptional workday”, consisting of a shift of 12 hours and cycles of a workday per rest day (usually 7x7).

85% of the mining workers in Chile use it and 80% evaluate them positively.

- The Labor Directorate requires an authorization process for an “exceptional workday”, which takes, on average, 40 days. This affects initiation times of mine activity, and impacts mining suppliers.
- Internationally, the best practices in large-scale mining adopt shifts that favor operational continuity. In none of the countries visited for this study was an act of prior approval by an administrative body required.
- To allow workers and companies agree on conditions of mutual accord is fundamental for operational continuity

RECOMMENDATIONS: OPERATIONAL CONTINUITY

- To establish “adaptability pacts” to facilitate agreements between companies and workers.
- Given certain requirements, expand the “Exceptional Workdays” without prior Labor Directorate approval from 4x3 to 4x4 and 7x7 shifts.

LABOR MARKET

60% of the sector's workforce is outsourced.

In 2016, a total of 208,000 jobs in mining were registered.

Accreditation times for entering large copper mining operations in Chile are very heterogeneous.



15 DAYS
The most efficient company



75 DAYS
The least efficient company

RECOMMENDATIONS: LABOR MARKET

- To simplify the exceptional systems authorization, expediting the approval of exceptional days for contractors and suppliers.
- To continue incorporating information technologies into the authorization process of the Labor Directorate's exceptional days.
- To advance in the homologation of basic requirements for access to mines, for safety talks, standards of light vehicles, and health concern.
- To implement a Mining Passport that grants mobility to workers and contractors.

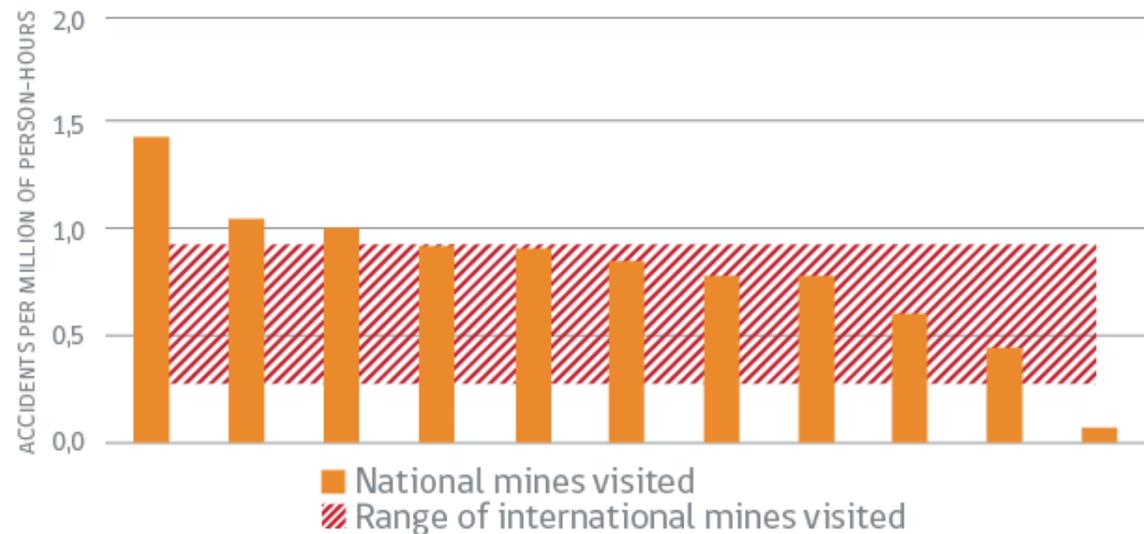
MINING SAFETY:

ONE OF THE LOWEST RATES OF ACCIDENTABILITY OF THE NATIONAL ECONOMIC SECTORS, AND SIMILAR TO BENCHMARK MINING COUNTRIES

- The sector has had an important evolution in terms of job security, where accidents and fatalities show negative trends.



RATE OF ACCIDENT FREQUENCY WITH TIME LOST PER MILLION HOURS WORKED IN 2015



Source: National Productivity Commission based on data of MatrixConsulting

INFORMATION AND GOOD INSTITUTIONS ARE FUNDAMENTAL

RECOMMENDATIONS: SAFETY

- To continue improving the results in security, production and productivity, through the joint effort of companies, workers, suppliers and government.
- To adapt the Ministry of Health's Supreme Decree 594, regarding work at high altitudes, in light of the results that the Superintendence of Social Security's study will deliver in the future.

HUMAN CAPITAL

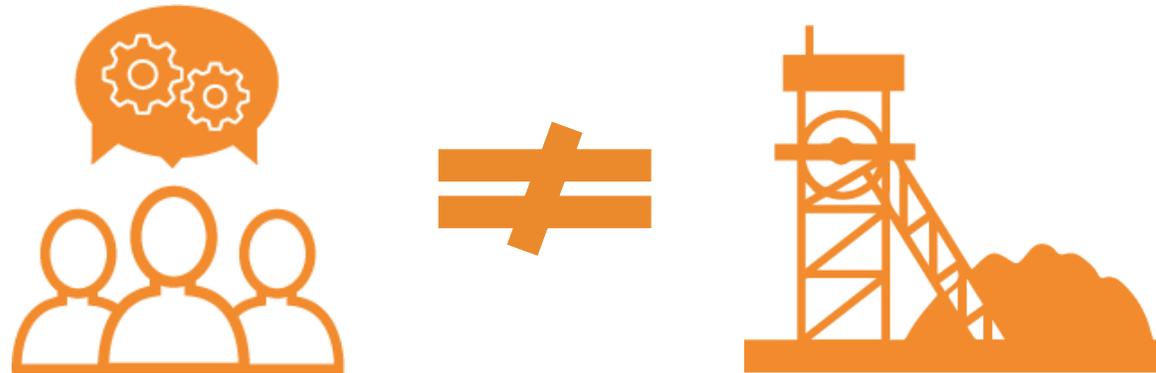
There is a significant qualitative and quantitative human capital gap in the mining industry.

QUALITATIVE

Differences between the training profiles and the needs of the industry.

QUANTITATIVE

Differences between the available supply of some professionals and technicians, and its demand.



RECOMMENDATIONS: HUMAN CAPITAL

- To link professional technical training (high school and higher education) with the Mining Qualifications Framework developed by the Mining Competencies Council.
- To increase the industry's training level, aligning it with the Mining Qualifications Framework.
- Update skills' profiles according to specialty, keeping in mind the requirements of an increasingly automated and digitized world.

INNOVATION AND SUPPLIERS

- The Chilean mining industry relies heavily on its suppliers of equipment, material and permanent services.
- Both suppliers and innovators can contribute to productivity:
 - Better solutions
 - Intensive in knowledge and technology
- They can be a new and important source of export within the global mining value chain.



US\$20.000 MILLION
ANNUAL SALES TO MINING



COMPANIES SELL PRODUCTS
AND SERVICES TO MINING

INNOVATION AND SUPPLIERS

Innovation is key to solving strategic challenges such as: water, energy and productivity.



Moving towards a more productive and intelligent mining, which takes advantage of automation, requires mining equipment to operate exchanging data with each other.



THE CREATION OF INNOVATIVE CAPABILITIES ALLOWS CONFRONTING THE MINES' INCREASING COMPLEXITIES.

RECOMMENDATIONS: INNOVATION AND SUPPLIERS

- To give continuity to public and private associative efforts such as the National Alta Ley Program and its components, such as the Open Innovation Platform.
- To ensure the availability of test and pilot spaces for innovations, according to the gaps prioritized in the Technological Roadmap 2015–2035.
- To develop interoperability standards in all mining production processes in conjunction with suppliers and companies.

COMPANY–COMMUNITY RELATIONSHIP

- Regulation is essential to establish a basic framework for dialogue.
- Early, continuous, accurate and reliable information between parties is essential for the creation of trust.
- The State and local governments are fundamental for the company – communities relationship.



SOCIAL LICENSE TO OPERATE (LSO)

The development of trust between the company and the communities is one of the main challenges for obtaining it.

RECOMMENDATIONS: COMPANY-COMMUNITY RELATIONSHIP

- To strengthen local governments (municipalities) for greater transparency and efficiency.
- To implement the recommendations of the Presidential Advisory Commission of the Environmental Impact Evaluation Service (SEIA) to have the best possible environmental assessment.
- Implement a dispute and conflict resolution system such as the one promoted by Valor Minero.

FUTURE CHILEAN MINING WILL HAVE TO DEVELOP AT A MEDIUM SCALE

FACTORS THAT AFFECT PRODUCTIVITY IN MEDIUM SCALE MINING

INTERNAL FACTORS OF OPERATIONS	FACTORS EXTERNAL TO OPERATIONS
<ul style="list-style-type: none">• Capital and labor management• Culture and Organizational Structure• Growth strategy• Financial capability	<ul style="list-style-type: none">• ENAMI• Human Capital Offer• Water and Energy Supply• Infrastructure• Mine Closure• Environmental Impact Assessment System

Source: CNP based on data from Cochilco (2016)

In the last fifteen years, productivity of the medium-scale mining sector has fallen annually twice as much as that of the large-scale mining industry.

Between 2000 and 2014, the annual production of the medium-scale mining industry increased from 185,000 tons of copper to 225,000

RECOMMENDATIONS: MEDIUM SCALE MINING

- To agree on a definition of the medium scale mining segment, continue with the sector's characterization, and incorporate analysis of productivity gaps.
- To bring closer the financial and mining sectors to develop more exploration projects and expand the mine closure instruments.
- To modernize the National Mining Company (ENAMI) according to OECD guidelines.

WATER RESOURCES



Ensuring the availability and efficiency in the use of the resource is a major challenge.

PUBLIC POLICY CAN BOOST THAT TREND

WATER USE IN MINING 2015



40.4M³/SEC
RECIRCULATED



13.1M³/SEC
CONTINENTAL



2.3M³/SEC
SEAWATER

Seawater use is expected to increase by 14% per year, which will be equivalent to the use of continental water by 2026

10,8M³/SEC IN 2026 

RECOMMENDATIONS: WATER RESOURCES

- To promote better use of the shared water infrastructure (desalinators, pipelines).
- To establish a road map for the approval of desalination plants (permits and terms).
- To regulate desalination plants' waste according to the best international standards.

THE KEY PILLARS FOR IMPROVING PRODUCTIVITY AND PRODUCTION IN CHILE

Efficiency in public management and regulatory quality (public goods).

Greater collaboration and coordination between companies, with their contractors and suppliers, and with the communities (sectoral goods).

Company management according to the best international practices (private goods).



ANNEXES

PROJECT APPROVAL OR REJECTION

RECOMMENDATIONS

1.1 To establish a Large Projects Office, whose function would be reducing project approval or rejection deadlines, through greater efficiency and coordination among the various public agencies involved in the process at national and regional level. The LPO should be institutionalized and endowed with action mechanisms to those of best international practices, including transparency criteria.

5.1 To establish the obligation to inform the National Water Bureau of a miner's water finding, but avoid generating permits that allow exploitation.

3.1 Through the Chilean Copper Commission, or another agency that the government deems appropriate, produce indicators and periodic studies of productivity in the mining sector similar to those in this chapter, such as to complement the regular studies of competitiveness that the Chilean Commission Copper is already doing.

5.4 To establish a specific chapter on regulations for wastewater treatment plants, concerning desalination plants in compliance with international environmental standards.

EXPLORATION AND MINING CONCESSIONS

RECOMMENDATIONS

8.1 To increase the Annual Patent from a linear to a progressive one, which increases over time, both in exploration and in exploitation, but allowing a reduction of the patent payment through mechanisms of consideration by the mining concessionaire (geological information, works, among others).

8.2 To match the Annual non-metals substance Patent with the one for metal substances.

8.3 To establish incentives and sanctions for non-compliance with the geological information obligation, laid down in Article 21 of the Mining Code.

8.4 To strengthen Sernageomin, granting broader powers and clear control parameters to its departments, with the purpose of maximizing the impact of each one of its work areas.

EXPLORATION AND MINING CONCESSIONS

RECOMMENDATIONS

8.6 To restrict the consecutive and immediate request for exploration concessions between related persons.

8.7 To reduce the times involved in the application, evaluation and constitution procedures.

8.8 To redesign the auctioning process of abandoned mining rights, using actions that tend to the coordination and fast transmission of information among all those involved in those processes.

8.9 To update the coordinate system and datum of mining rights from PSAD56/ SAD69 to WGS84.

8.10 To adopt a grid system for requesting mining concessions in the medium term.

8.11 To develop a training program in financing projects in exploration and mining with the aim of reducing the information gaps between the financial and the mining sector.

EXPLORATION AND MINING CONCESSIONS

RECOMMENDATIONS

8.12 To establish a mixed protection system through the payment of a patent, the granting of geological information to the State and the formulation of minimum work plans for the application and renewal of exploration rights, as well as evidence of mineralization and minimum work for exploitation rights.

8.13 To increase exploration concession periods from two to three years and allow two extensions instead of one, totaling a maximum of nine years.

8.14 To establish a temporary limit on the mining concession of a maximum of 30 years, subject to priority and unlimited renewals for an equal period.

8.15 To modify the provisions of Article 15 et seq. of the Mining Code, which exclude certain activities (vineyards and groves) from the general rule of submitting to the competent judge, the request for permission to dig upon refusal by the owner. This action's purpose is to equate judicial treatment for the resolution of conflicts between all activities, favoring good coexistence, in adequate environmental standards and appropriate compensation.

OPERATIONAL CONTINUITY

RECOMMENDATIONS

7.3 The Ministry of Health should institute unique and explicit criteria for the establishment of mobile dining rooms not subject to interpretation and thus expedite the process of approval/rejection of the request.

7.6 Restore the “adaptability pacts” discussed in the recent labor reform, but vetoed in the final text. This would ease the agreement between companies and workers in order to ensure “operational continuity”.

7.7. Add the 4x4 and 7x7 shifts to the possibility stipulated in Article 375 of the Labor Code, so that these working times benefit from the exempted resolution by the Labor Directorate.

LABOR MARKET

RECOMMENDATIONS

7.4 Simplify Service Order No. 5 of November 20, 2009, from the Labor Directorate regarding the authorization of exceptional systems of distributing work and resting times, expediting the approval of exceptional working time for contractors and suppliers.

7.5 The Labor Directorate should continue efforts to incorporate information technology into the exceptional working time authorization process and thus make the resolution process more efficient.

10.4 To implement a Mining Passport in the short term that grants mobility to workers of mining companies and contractors with special emphasis on its escalation.

SAFETY

RECOMMENDATIONS

7.1 To continue strengthening the joint effort carried out by companies, workers, suppliers and the government in the field of occupational safety, in order to keep reducing accident and death rates, while allowing production and productivity increase.

7.2 To adapt the Supreme Decree 594 of the Ministry of Health regarding work at high altitudes, as results from the Social Security Superintendence studies coming out in the future.

HUMAN CAPITAL

RECOMMENDATIONS

7.8 To associate the training of mining specialties in high school, technical and professional education, and Technical Training Centers with those defined in the Mining Qualifications Framework developed by the Mining Competencies Council. Moreover, adapt the accreditation of the program, the corresponding subsidy, and the student's exit to its certification.

7.9 To increase the levels of training in the industry, which should be in line with the Mining Qualifications Framework. Likewise, make greater efforts in the industry to certify workers, establishing clear commitments and schedules.

7.10 To update skills profiles by specialty according to the needs of an increasingly automated and digitized world.

9.5 To establish a local mining training policy in cities where mining employment is relevant, especially in areas where medium-sized mining operates. Local technical schools should further the developing of mining specialties, with infrastructure and equipment support, as well as promoting mining careers in Technical Training Schools (CFT in Spanish) in towns where medium-sized mining is important.

INNOVATION

RECOMMENDATIONS

10.7 To ensure the availability of test, trial and training spaces for innovations. Encourage the use of abandoned sites and periods of idle capacity in medium-sized mining.

10.8 To align the characteristics of these spaces with the gaps prioritized in the Technological Roadmap.

10.9 To encourage interoperability between communication and information systems in all mining production processes through the development of instruments (e.g. interoperability standards) in conjunction with suppliers and mining companies in the sector.

COMPANY–SUPPLIER RELATIONSHIP

RECOMMENDATIONS

10.1 To modify the Supreme Decree No. 99 of 19.3.2015 of the Ministry of Mining to establish a clear criterion and the possibility for companies to withdraw from the registration of the Homologated Course of Basic Induction in Mining Operations.

10.2 To establish a universal standard on the technical characteristics and other minimum criteria required for light vehicles. If an agreement between the companies is not possible, settle it through the Mining Security regulations and incorporate it into the Mining Safety Regulation (DS132).

10.3 To take into account all current pre-occupational and occupational exams held by an employee to avoid duplicating efforts.

COMPANY–COMMUNITY RELATIONSHIP

RECOMMENDATIONS

6.1 To implement the proposals of the Presidential Advisory Council against Conflicts of Interest, Influence, Peddling and Corruption regarding the funds received by local governments, so that local governments establish a better institutional framework, with greater transparency and efficiency.

6.2 Through the Ministry of Mining, promote and encourage permanent dialogue models for large projects between companies and communities through the development of a participation standard guide for large mining projects similar to that carried out by the Ministry of Energy for energy projects.

6.3 To implement the 25 measures from the Presidential Advisory Commission for the Environmental Impact Assessment System (SEIA) with the aim of having the best possible environmental assessment, facilitating a better dialogue between companies and communities. In particular, we emphasize the proposals of Early Relationship, Indigenous Consultation and Strengthening Citizen Participation in SEIA.

COMPANY–COMMUNITY RELATIONSHIP

RECOMMENDATIONS

6.4 To implement a dispute and conflict resolution system, such as that promoted by Valor Minero, in which the parts can request mediation, arbitration or conciliation, as well as establish a certification entity that empowers and enhances the organizations that participate in the dialogue process.

9.9 To implement the recommendations of the Presidential Advisory Commission for the SEIA Evaluation (2016). Most require only regulatory modifications, which lead to a rapid implementation of recommendations.

MEDIUM-SCALE MINING

RECOMMENDATIONS

8.11 To develop a training program in financing projects in exploration and mining with the aim of reducing the information gaps between the financial and the mining sector.

9.1 To agree among the sector stakeholders a precise definition of the medium-sized mining segment in order to produce comparable public and periodic statistics. This definition should focus more on production than employment size.

9.2 To instruct the Chilean Copper Commission to continue with their first characterization of the segment, with the aim of enhancing the understanding of medium-sized mining, given its increasing importance for Chile in the future of mining industry.

MEDIUM-SCALE MINING

RECOMMENDATIONS

9.3 To complement the gap analysis for large-scale mining conducted in this report, with a similar analysis for medium-sized mining in Chile, ideally with similar firms in related countries. This will allow defining a baseline to monitor the evolution of the segment.

9.4 To incorporate the OECD guidelines (2011) for public companies to ENAMI, modernizing their corporate government, and promoting transparency.

9.8 To expand the options of financial instruments to guarantee the closure of mining operations. Following the model of Western Australia, analyze the possibility of pooling a common fund of guarantees that also serves to rehabilitate abandoned tailings and dumps.

INFRASTRUCTURE

RECOMMENDATIONS

5.2 To promote greater use of shared infrastructure in water matters (desalination plants, pipelines, among others), either through the coordination among mining companies, through a third party that builds the infrastructure and assumes the costs of coordination, or using another feasible alternative, such as a water interconnection system.

5.3 To establish a clear road map of permits and times required for the approval of desalination plant projects.

5.4 To establish a specific chapter on regulations for wastewater treatment plants, concerning desalination plants in compliance with international environmental standards.

INFRASTRUCTURE

RECOMMENDATIONS

9.6 To increase the quantity and quality of road, railway, and maritime infrastructure, jointly investing in intermodality between the three modes, according to the guidelines of the National Council for Innovation for Development (2015).

9.7 To facilitate and encourage the incorporation of medium-scale mining to private infrastructure projects of large-scale mining (ports, desalination plants, among others), in that there are potential economies of scale.

PRIVATE INTERVENTIONS WITH PUBLIC SUPPORT

RECOMMENDATIONS

10.5 To continue with the public-private partnership efforts, such as Alta Ley National Mining Program and its components, evaluating their performance and possibilities for improvement over five years.

10.6 To establish clear innovation indicators that allow monitoring the impact of the Open Innovation Platform.



Comisión
Nacional de
Productividad

PRODUCTIVITY IN THE CHILEAN COPPER MINING INDUSTRY