Mining in Chile: Future and Challenges

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Mining and Metals in Latin America: Current Status and Future Prospects
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II. Structural Challenges

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I. Mining in Chile and investments
Why Chile is attractive for mining investment?

Economic Development

- **Tax Revenue (2014)**
  - 9% of total
  - US$ 4.9 billion

- **Foreign Direct Investment (2009 – 2013)**
  - 45%
  - US$ 45.3 billion

  - 13% nominal

Source: Central Bank of Chile, COCHILCO
Why Chile is attractive for mining investment?

Competitive in comparison with other mining countries

Source: COCHILCO, 2014
Why Chile is attractive for mining investment?

Geological potential

Source: USGS Mineral Commodity Summaries (2014)
Mining in Chile

World copper mining participation

Source: COCHILCO and others
## World copper mine production

### Thousands of tons

<table>
<thead>
<tr>
<th>Country</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chile</strong></td>
<td>5,776</td>
<td>5,745</td>
</tr>
<tr>
<td>China</td>
<td>1,707</td>
<td>1,632</td>
</tr>
<tr>
<td>Peru</td>
<td>1,376</td>
<td>1,380</td>
</tr>
<tr>
<td>USA</td>
<td>1,240</td>
<td>1,346</td>
</tr>
<tr>
<td>D.R. Congo</td>
<td>817</td>
<td>999</td>
</tr>
<tr>
<td>Australia</td>
<td>996</td>
<td>963</td>
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<tr>
<td>Zambia</td>
<td>839</td>
<td>759</td>
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<tr>
<td>Russia</td>
<td>720</td>
<td>720</td>
</tr>
<tr>
<td>Canada</td>
<td>632</td>
<td>696</td>
</tr>
<tr>
<td>Mexico</td>
<td>480</td>
<td>513</td>
</tr>
<tr>
<td>Others</td>
<td>3,705</td>
<td>3,677</td>
</tr>
<tr>
<td><strong>World</strong></td>
<td>18,288</td>
<td>18,428</td>
</tr>
</tbody>
</table>

### 2014 Distribution

- **Chile**: 31%
- **China**: 9%
- **Peru**: 8%
- **USA**: 7%
- **D.R. Congo**: 5%
- **Australia**: 5%
- **Zambia**: 4%
- **Russia**: 4%
- **Canada**: 4%
- **Mexico**: 3%
- **Others**: 20%

Source: COCHILCO and others.
Mining projects portfolio

General concepts - conditions for inclusion in the portfolio

✓ The portfolio consists of investment projects in the mining of copper, gold, industrial minerals and iron.

✓ Consider initiatives with investments of over US $ 90 million.

✓ Initiatives that companies have announced publicly.

✓ At least they have started their pre-feasibility studies.

✓ Its investment decision is expected no later than 2019.
Mining projects portfolio

General concepts – Project stages

2. Mining in Chile and investments

Investment decision

Project Portfolio
## Mining projects portfolio

### General concepts – Levels of certainty

<table>
<thead>
<tr>
<th>Levels of certainty</th>
<th>Type of project</th>
<th>Stage of advancement</th>
<th>Environmental licenses</th>
<th>Start up</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BASE</strong></td>
<td>Anyone</td>
<td>Construction</td>
<td>Approved</td>
<td>2015 - 2019</td>
</tr>
<tr>
<td></td>
<td>Anyone</td>
<td>Suspended construction</td>
<td>Approved or legal claim</td>
<td>2015 - 2019</td>
</tr>
<tr>
<td><strong>PROBABLE</strong></td>
<td>Anyone</td>
<td>Feasibility</td>
<td>Approved</td>
<td>2015 - 2019</td>
</tr>
<tr>
<td></td>
<td>Replacement or Expansion</td>
<td>Feasibility</td>
<td>In process</td>
<td>2015 - 2019</td>
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<tr>
<td></td>
<td>Replacement or Expansion</td>
<td>Suspended Feasibility</td>
<td>In process</td>
<td>2015 - 2019</td>
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<tr>
<td></td>
<td>Replacement or Expansion</td>
<td>Feasibility</td>
<td>Not submitted</td>
<td>2015 - 2019</td>
</tr>
<tr>
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<td>New</td>
<td>Feasibility</td>
<td>In process or not submitted</td>
<td>2015 - 2019</td>
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<tr>
<td></td>
<td>Anyone</td>
<td>Feasibility</td>
<td>Approved</td>
<td>2020 - 2024</td>
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<td>Replacement or Expansion</td>
<td>Feasibility</td>
<td>In process or not submitted</td>
<td>2020 - 2024</td>
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<tr>
<td><strong>POSSIBLE</strong></td>
<td>Anyone</td>
<td>Suspended Feasibility</td>
<td>Anyone</td>
<td>2020 - 2024</td>
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<td>New</td>
<td>Feasibility</td>
<td>In process or not submitted</td>
<td>2020 - 2024</td>
</tr>
<tr>
<td></td>
<td>Anyone</td>
<td>Prefeasibility</td>
<td>Anyone</td>
<td>Anyone</td>
</tr>
<tr>
<td><strong>POTENTIAL</strong></td>
<td>New</td>
<td>Feasibility</td>
<td>In process or not submitted</td>
<td>2020 - 2024</td>
</tr>
<tr>
<td></td>
<td>Anyone</td>
<td>Prefeasibility</td>
<td>Anyone</td>
<td>Anyone</td>
</tr>
</tbody>
</table>
Current status of investment portfolio

- Pampa Hermosa (MUS$ 1,033)
- Cerro Negro Norte (MUS$ 1,200)
- Escondida Nueva Pila de Lix. De Óxidos (MUS$ 721)
- Planta Nitrato Potasio – Coya Sur (MUS$ 250)
- Sierra Gorda (MUS$ 4,240)
- Bellavista (MUS$ 143)

- Actualización Quebrada Blanca (2016 – MUS$ 165)
- Arbiodo (2017 – MUS$ 503)
- Los Bronces / Fase 7 (2017 – MUS$ 112)
- Spence Growth Option (2019 – MUS$ 3,300**)

Source: COCHILCO, 2015.
(*) in operation in 2014
(**) Including desalination plant
Projects under review*

- **Jerónimo** (Gold, MUS$ 423)
- **Lomas Bayas III Sulfuros** (Priv. mining - Cu, MUS$ 1,600)
- **Tovaku** (Mid. Min. – Cu, MUS$ 600)
- **Lobo Marte** (Gold, MUS$ 800)
- **Inca de Oro** (Mid. Min. – Cu, MUS$ 600)
- **Volcán** (Gold, MUS$ 800)
- **Cerro Casale** (Gold, MUS$ 6,000)
- **El Morro** (Gold, MUS$ 3,900)
- **Collahuasi Expansión Fase III** (Priv. mining – Cu, MUS$ 6,500)
- **Ampliación Los Pelambres IV** (Priv. mining – Cu, MUS$ 7,000)

*Source: COCHILCO, 2015.*

(*) Projects out from the portfolio to be under review process without starting or investment decision clarified by companies
The portfolio of mining projects 2015 - 2024 considered 42 initiatives, broken down as follows, according to sector.

Source: COCHILCO
Mining projects portfolio

Investment by type of company

- **GOLD, IRON ORE AND IND. MIN**
  - MUS$ 10,255
  - 13.3%
  - 11 projects

- **CODELCO**
  - MUS$ 29,177
  - 37.8%
  - 10 projects

- **MIDSIZE PRIV. MINING**
  - MUS$ 2,073
  - 2.7%
  - 4 projects

- **PRIVATE MINING**
  - MUS$ 35,785
  - 46.3%
  - 17 projects

Source: COCHILCO

(*) CODELCO investment includes metallurgical plants, other development projects, information projects and five structural projects.
Mining projects portfolio

Levels of certainty

Each project has considered attributes that give it a graduality associated with greater or lesser certainty meet its deadlines of materialization.

Source: COCHILCO
Mining projects portfolio

Regional investment

- Tarapacá: 6,222 MUS$
- Antofagasta: 32,966 MUS$
- Atacama: 11,138 MUS$
- Coquimbo: 1,814 MUS$
- Valparaíso: 8,141 MUS$
- Metropolitana: 504 MUS$
- O'Higgins: 6,249 MUS$

Millions of US$
In the last thirteen years (2002 - 2014) Copper mine production grew 25.5% at an average annual rate of 1.8%. The project portfolio has a potential production growth of 18.7% copper mine at an average annual rate of 1.3%.
2.55 Mt of copper in concentrate exported in 2014, 65.3% of concentrate production in the country. In 2026 would potentially be exported 4.4 million tons of concentrates, 73.6% of the chilean concentrate production that year.
Copper concentrate production forecast

Increased mineral processing

![Graph showing increased mineral processing with 90.5% and 51.2% increases in 2020 and 2018, respectively.]
Daily production of tailings around 1.54 Mt, due to mining copper sulphide, the project portfolio will increase to 2.95 Mt of tailings daily production to 2026, a growth of 91%.

Copper concentrate production forecast
Tailings, 2014 vs 2026
III. Structural challenges
3. Structural challenges

Critical supplies

OPEX

Source: COCHILCO, 2014
Critical supplies

CAPEX

Source: COCHILCO, 2014
Energy (Electricity+Fuels)

Expected consumption forecast, 2014 - 2025

It is expected that electricity demand increase by 80.3% in the period 2014-2025.

Source: COCHILCO, 2014
Water

Expected consumption forecast, 2014 - 2025

An increase of 66.2% in water consumption in mining is expected in the period 2014-2025.

3. Structural challenges

Water

Expected consumption forecast of fresh water and sea water, by level of certainty

**Fresh Water**

**Sea water**

Sulphuric acid

Market balance, 2015 - 2025

Source: COCHILCO, 2015
3. Structural challenges

Lime

Consumption forecast, 2014 - 2020

Starting in 2018, the entry into operation of new mining projects will push up the price of lime, as the domestic supply cannot meet demand.

Source: “Análisis del mercado de insumos críticos en la minería del cobre”, Cochilco 2015
Grinding balls

Consumption forecast, 2014 - 2020

Source: Análisis del mercado de insumos críticos en la minería del cobre, Cochilco 2015

- From 2019, the domestic supply fails to meet demand for a scenario in which all mining investments materialize, a situation that would push up the price of the grinding balls.
Mining trucks

Current imports and additional quantity required by 2025

Import models most used in the Private Mining, period 2002-2014

- **Caterpillar**
  - (773-775-777-785-789-793-795)
- **Komatsu**
  - (730E-830E-930E-960E-HD465-HD605-HD785)
- **Liebherr**
  - (T282)

- For the period 2015 -2025 expected a need for 700 mining trucks, which is mainly explained by the replacement needs of existing units in operation for compliance with the estimated useful life.

Source: “Análisis del mercado de insumos críticos en la minería del cobre”, Cochilco 2015
What is Chile doing to stay competitive?

**CNID**
- **Research and Development Commission**
  (Comisión de Investigación y Desarrollo)
  - Advises the President of Chile on the identification, formulation and implementation of policies and actions to strengthen innovation and competitiveness in Chile.

**CMDCh**
- **Mining and Development Commission of Chile**
  (Comisión Minería y Desarrollo de Chile)
  - Mining and Development Commission of Chile Team with representatives of public-private sector summoned to build a strategic vision of the challenges (gaps) facing copper mining development.

**Agenda**
- **Mining: A platform for the future of Chile**
  (Minería: Una plataforma de futuro para Chile)
  - Mining: A platform for the future of Chile Strategic agenda and guidance to bring the Chilean mining to a virtuous mining (competitive and productive), inclusive (communities) and sustainable (socially and environmentally).
  - One of the strategic commitments, beginning in 2015, corresponding to generate collaborative initiatives and fund R & D + i.
What is Chile doing to stay competitive?

Roadmap

ENABLING ELEMENTS /RESOURCES

SUPPLIERS DEVELOPMENT

HUMAN CAPITAL

DRIVING CORES

TENDENCIES/DRIVERS

BUSINESS OPPORTUNITIES

TECHNOLOGIES

PROJECTS R&D+i

TAILINGS

SMART MINING

SINTER & REFINING

ENERGY & WATER

OTHERS

VISION AND OBJECTIVES

US$M 10,000 in exports

290 world-class suppliers

80% of industry in first cost quartiles

3. Structural challenges

Chilean Copper Commission - COCHILCO
IV. Final Comments
4. Final Comments

• Despite a fall in the Chilean portfolio, it continues to lead the global copper industry.

• The change in the offer composition from cathodes to concentrates suppose new challenges to our industry in technology, environment and strategy.

• The copper mining growth in Chile presents significant opportunities for the supply industry.
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