

**International Raw Materials Conference
Promoting Sustainability in the Raw Materials Sector**

Sustainability Challenges in the Chilean Mining



SONAMI

Iván Cerda
General Manager
Technological Foundation
Chilean Mining Association

Berlin, November 11, 2015



Mining and Raw Materials



➤ Mining is essential for the availability of raw materials.

➤ Demand for raw materials is constantly growing.

➤ Mining Features

- Mines have limited availability of mineral resources
- Remote locations
- Huge investments
- Cyclical product prices
- Declining productivity over time

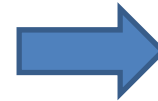
- Mining features influence the economic sustainability.
- Economic sustainability is necessary, but it is not enough.



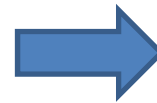
The Current Scenario

"Development is sustainable when it meets the needs of the present generation without compromising the ability of future generations to meet their own needs."

(Bruntland Report, 1987)



**Economic
Sustainability**



**Environmental and
Social Sustainability**



From Financial Report to Sustainability Report

Financial Report

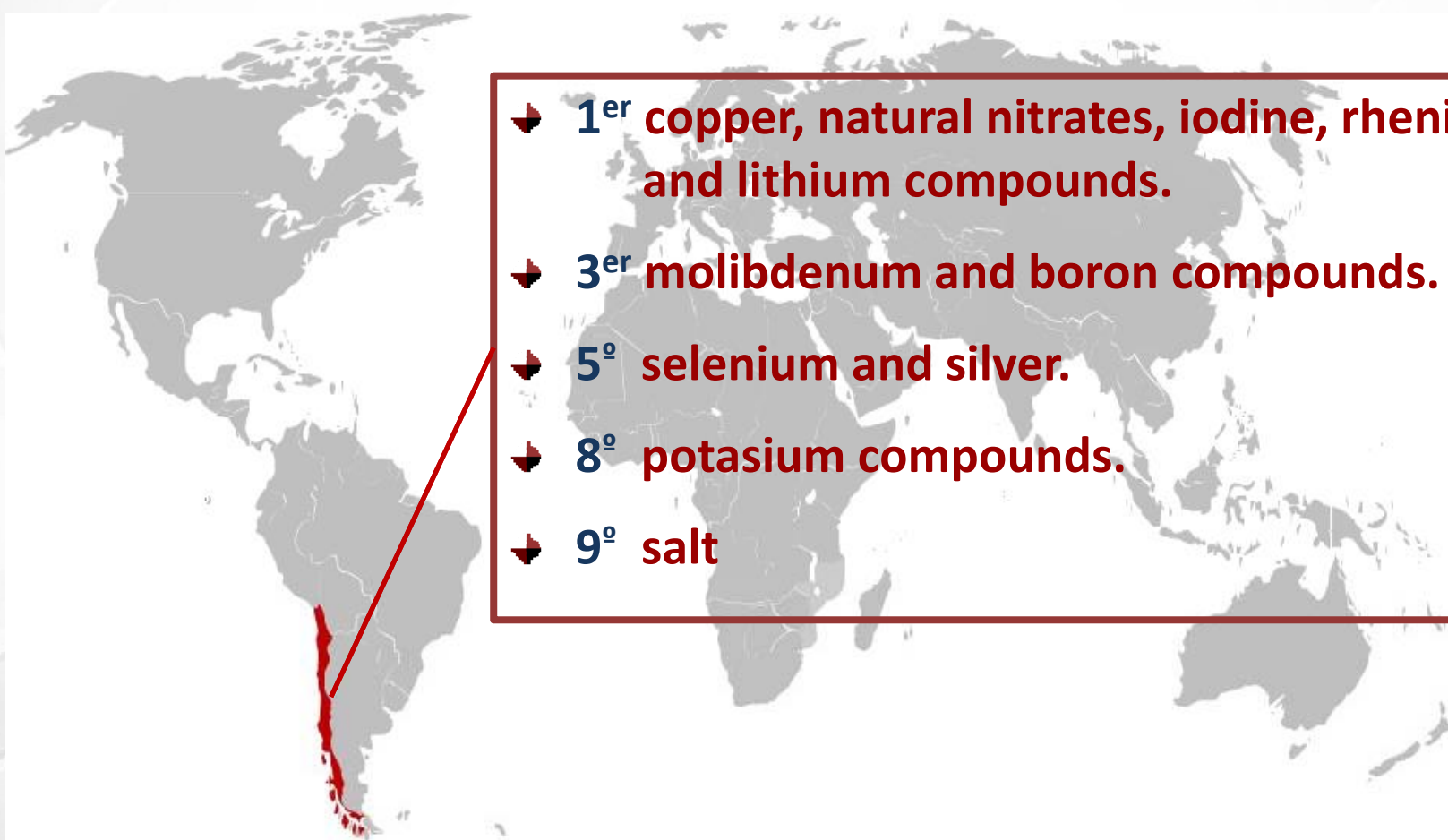
Sustainability Report

- Economic Performance
- Environmental and Social Performance



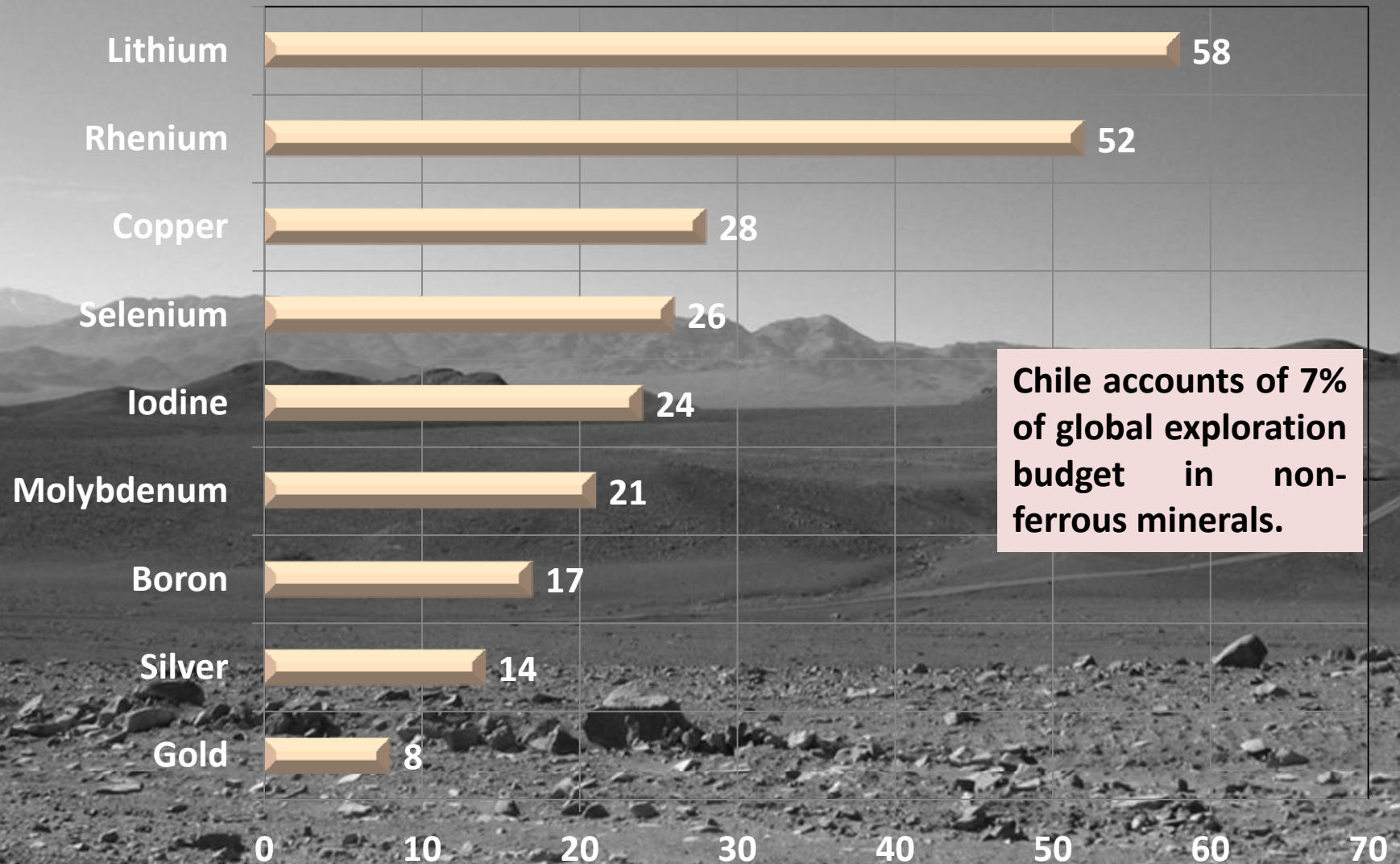
What about Chile

Top Ten in Metallic and Non Metallic Mining Production

- 
- **1^{er}** copper, natural nitrates, iodine, rhenium and lithium compounds.
 - **3^{er}** molibdenum and boron compounds.
 - **5^o** selenium and silver.
 - **8^o** potasium compounds.
 - **9^o** salt



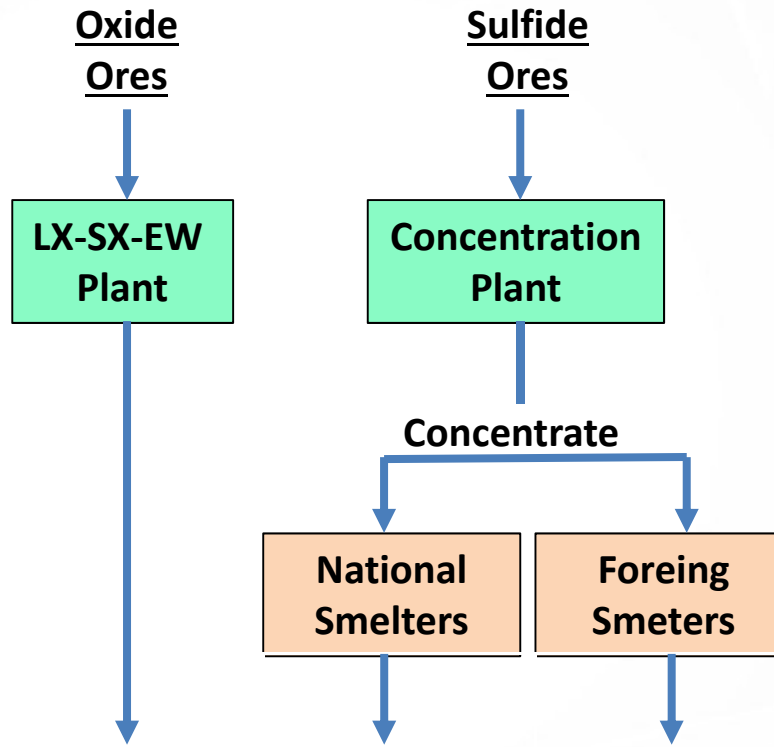
Main Mineral Reserves (% Total World)



Chile accounts of 7% of global exploration budget in non-ferrous minerals.



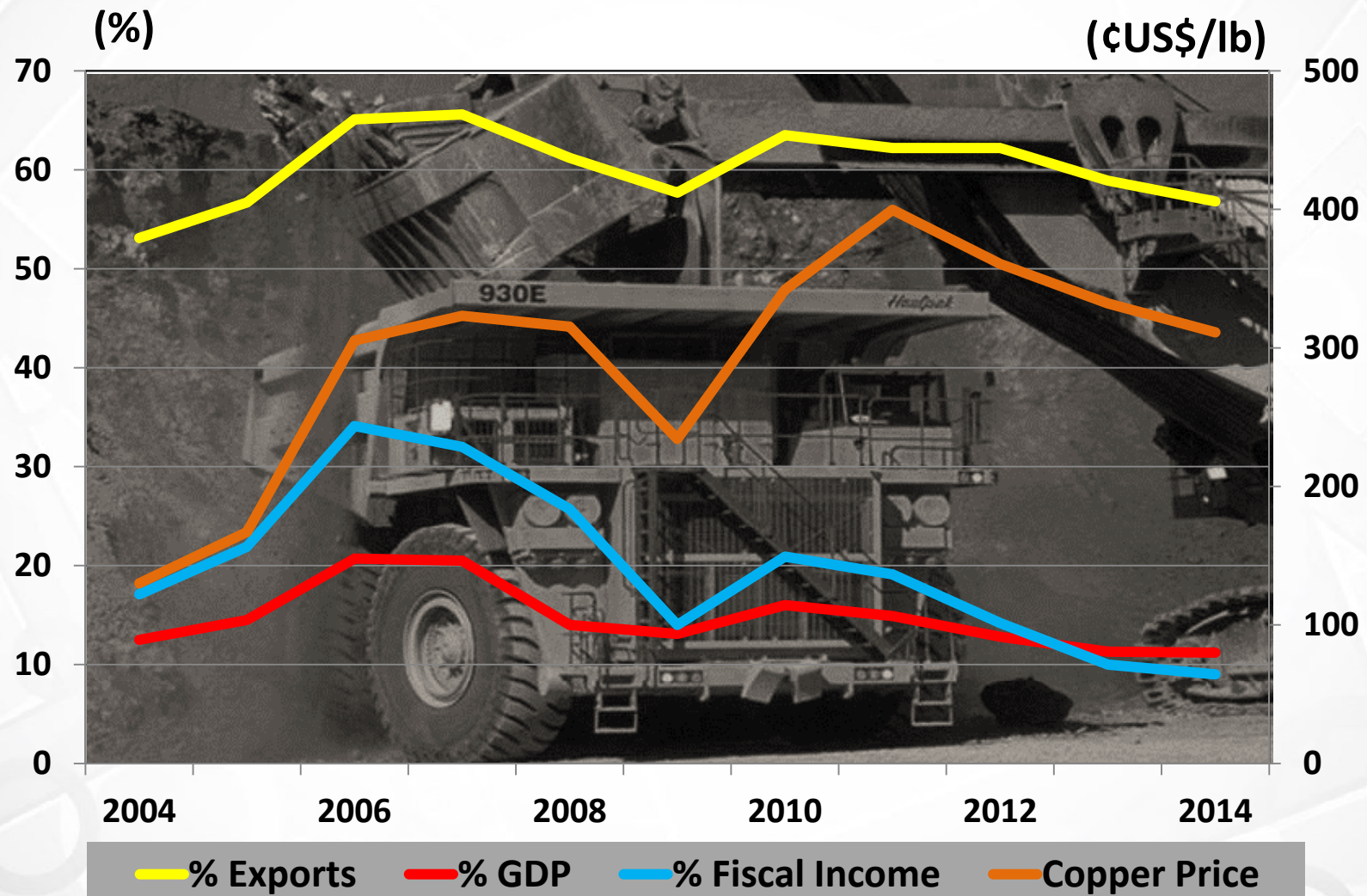
Chilean Copper Production



				Total
Copper Cathodes (Mton)	1,9	1,4	2,5	5,8
Distribution	33 %	24 %	43 %	100 %



Mining Contribution in Chile (%) and the Copper Price





Challenges in the Chilean Mining

**Stagnant Copper
Production and High
Production Costs**



**Energy and Water
Management**



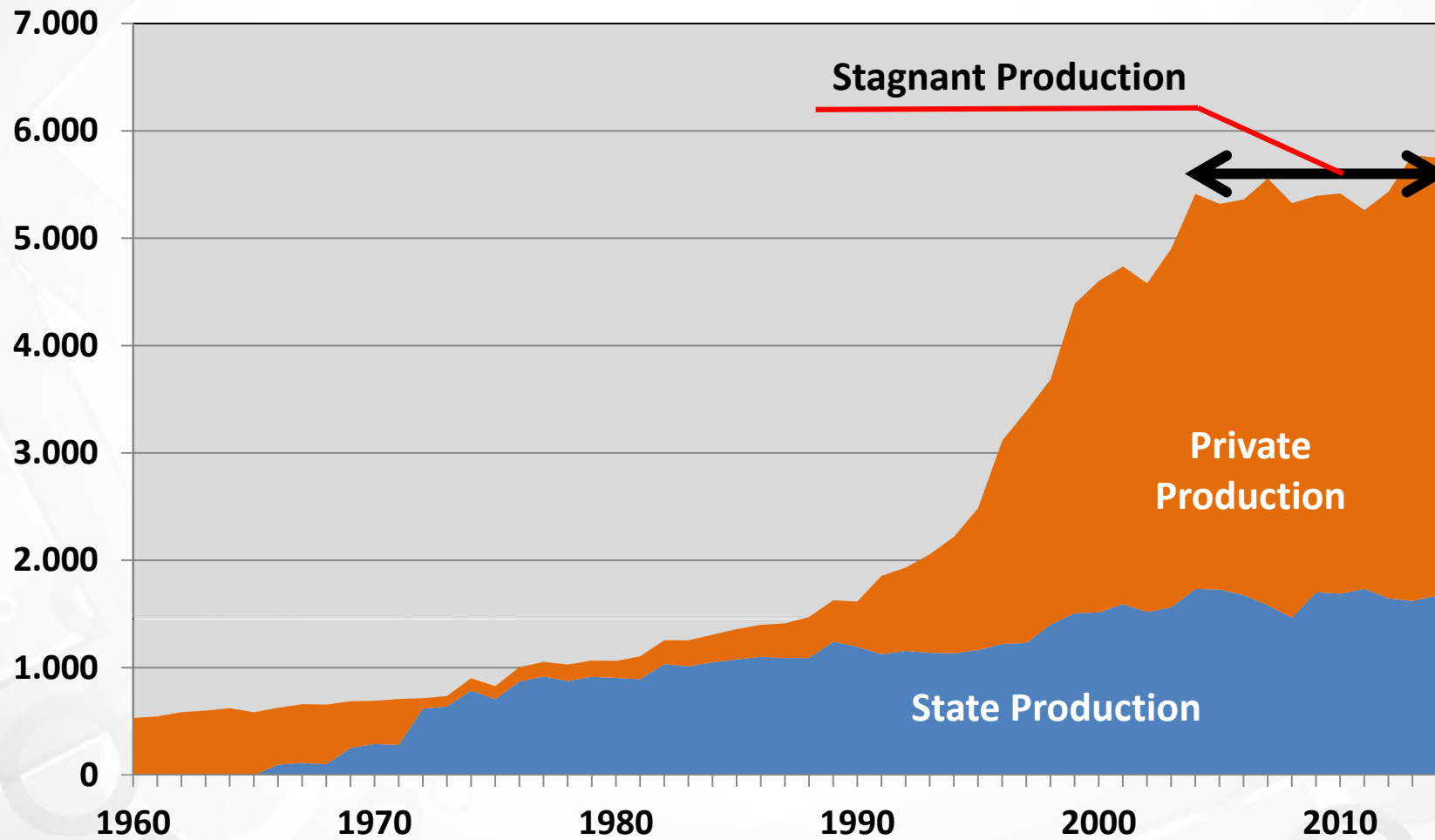
**Recruitment and
Training of Workforce**



**Environment Issues
Community Relations**



State and Private Copper Production (thousand tons)





Production Challenges

Deeper Mines

- Greater distance transport of ore and waste.
- Open pit to underground mining transition.
- Safety issues.

Lower Ores Grades

- Higher ore extraction to maintain production.
- Higher global inputs of water and energy.
- Higher amount of mining waste and emissions.

Complex Mineralization

- Complex metallurgical processes.
- Impurities and by-products issues.

Harder Ores

- Lower crushing and grinding efficiency.
- Higher energy consumption.

R&D will be key to increase the productivity of the mining sector.



Energy Challenges



- 35% of electric generation is consumed by mining operations, and its cost doubles the energy cost in other countries in the region.
- Given the copper production forecast, in 2025 the electric energy demand will be 60% higher. Most copper projects are intended to produce copper concentrates.



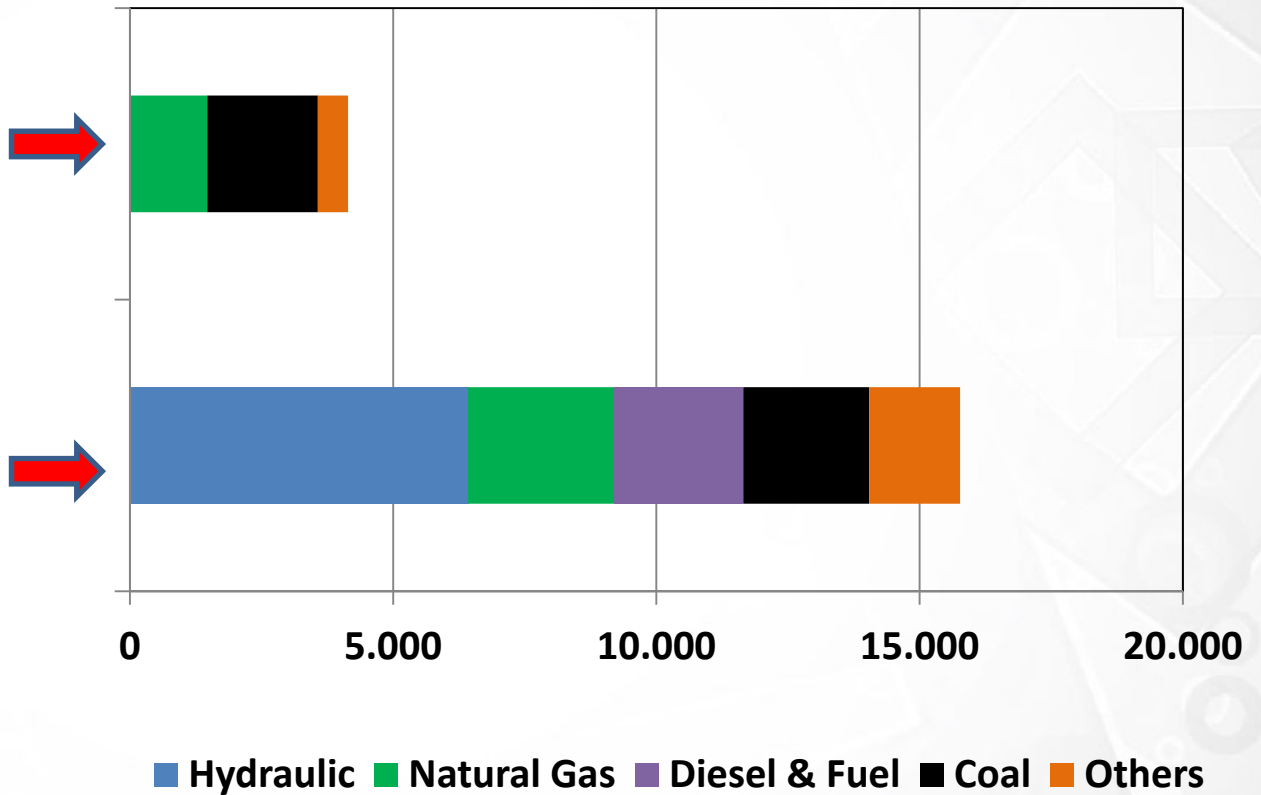
Current Electrical Power (MW)



Great North
Interconnected
System

Central
Interconnected
System

Other Small
Interconnected
System





Facing Energy Challenges

Connecting the Most Important Electrical Systems

- Optimizing each of the connected systems, with a lower energy cost for users.
- More robust and secure system for energy generation and consumption for the next 20 years.

Increasing participation of Non Conventional Renewable Energies (NCRE)

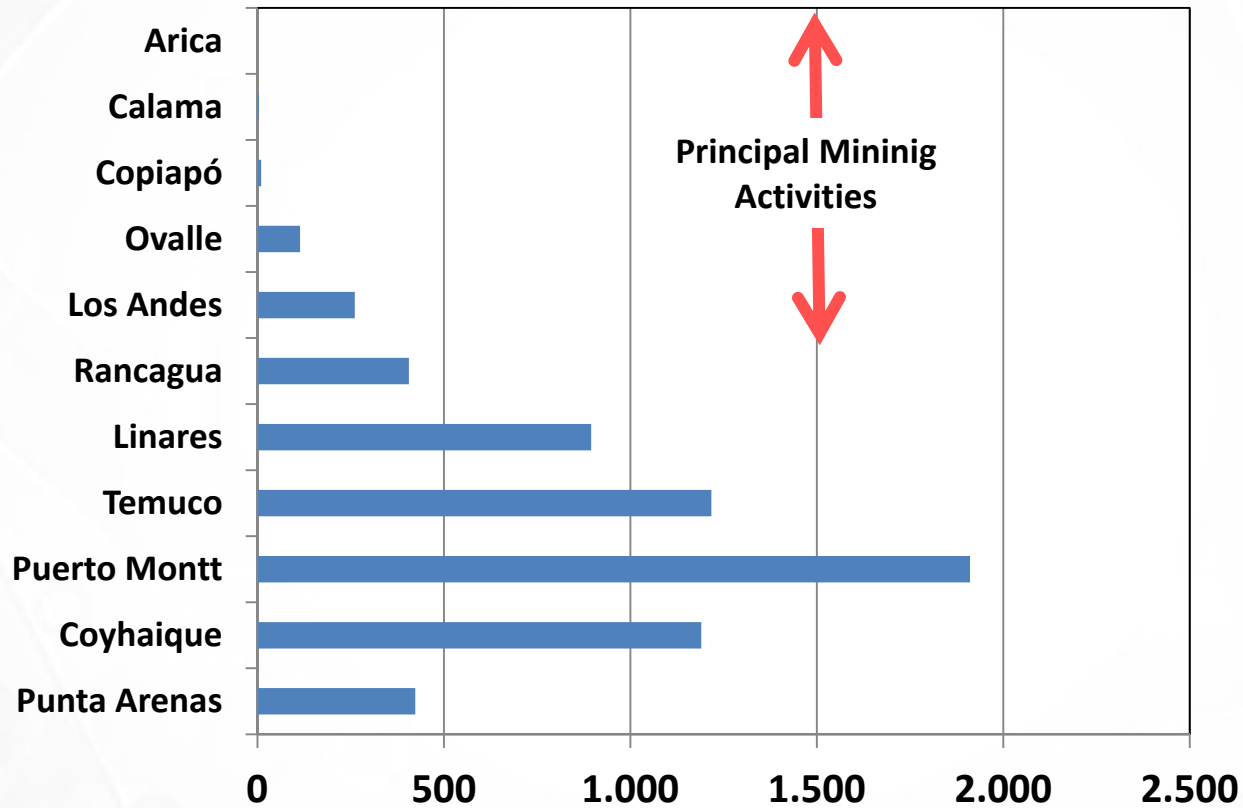
- Increase by 20% participation of NCRE generation and energy storage technologies.
- A cleaner, more efficient and sustainable energy grid.





Water Challenges

Rainfall (mm / year)



Mining activity concentrated in the north, where water is scarce



Facing Water Challenges



- Increased efficiency in the use of inland waters. In the period 2000-2014, the specific consumption decreased from 1.1 to 0.7 (m³ / ton ore) in concentration plants, and from 0.53 to 0.08 (m³ / ton ore) in hydrometallurgical plants.
- Very difficult new significant improvements in this area.
- 10% of current water consumption is provided by sea-water (with or without desalination). By 2025 it is projected that sea-water participation will increase to 40%.
- Sea-water use increases energy consumption.



Workforce Challenge



- The recruitment of specialized workforce, is currently a major challenge, and a serious risk to the objective of sustainable mining.
- The current direct employment in mining is around 230,000 (70% are contractors). This represents 3% of the country's workforce.
- With the expansions and new projects, by 2025 an increase of 20 - 30% of direct employment is forecast, focuses on mobile equipment and maintenance.
- Safety is a high priority target in Chilean mining. Mining is the economic activity with the lowest accident rate in the country.



Environmental and Communities Challenges



- Since 1994 (Environment Law), Chilean mining has moved toward more stringent regulations. Obtaining environmental permits has become a much slower and uncertain process.
- Communities, particularly those closer to the areas where it conducts or seeks to implement a project, have become an important actor.
- There are greater resistance to investment in mining and energy, which has led to prosecute various projects.
- That is why companies try to be involved with communities since the first stages of projects, in order to facilitate obtaining "license to operate".



Environmental and Communities' Challenges



- In this scenario, the social responsibility guidelines are practically a standard in the mining industry as part of its long-term strategic vision.
- One of the desirable outcomes of a sustainable mining should be a good acceptance and recognition of the industry by the community.
- The classic activities to this objective are the monitoring and responsible use of natural resources, especially water, the monitoring and preservation of the biotic (flora and fauna), and control over the management and disposal of mining and industrial waste.
- Besides, companies seek to support the development of communities, protecting or recovering their ecological and economic environments, including information and training.



Final Remarks

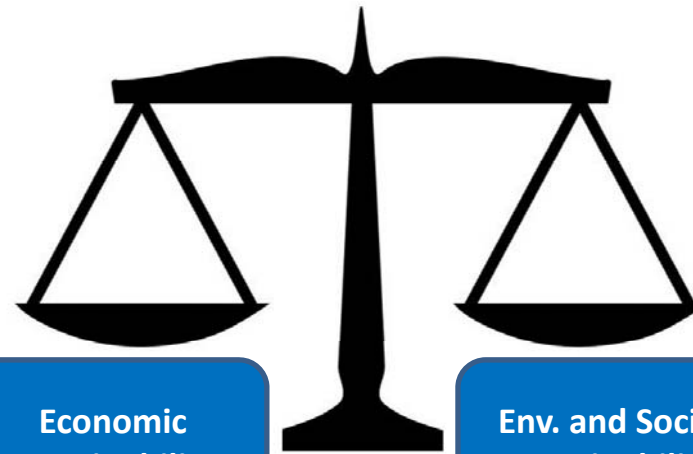


- Although mining companies are responsible for generating sustainable projects, is not the only actor involved to finally projects are executed and constitute a development opportunity for communities.
- Governments and mining companies must share the challenge of sustainability, especially in matters that concerns society as a whole. Institutional issues, regulations and legal certainty, must provide sufficient guarantees of sustainability, both for investors and for society.



Final Remarks

- Hence the importance of a permanent and constructive dialogue between mining companies, governments and communities, balancing the needs of sustainability in all its dimensions.



Economic
Sustainability

Env. and Social
Sustainability



**International Raw Materials Conference
Promoting Sustainability in the Raw Materials Sector**

**Sustainability Challenges in the
Chilean Mining**



SONAMI

Thank you for your attention...