



# Resourcing Future Generations

An Industry Perspective

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# Why we are here today

## Agenda

The outlook for demand

The role of major companies in the mining industry

Achieving the balance

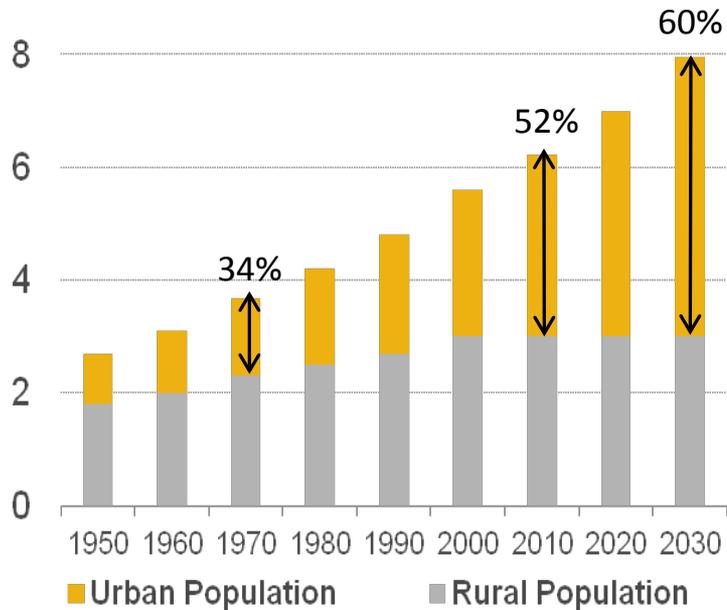
Facing the challenge

Final remarks



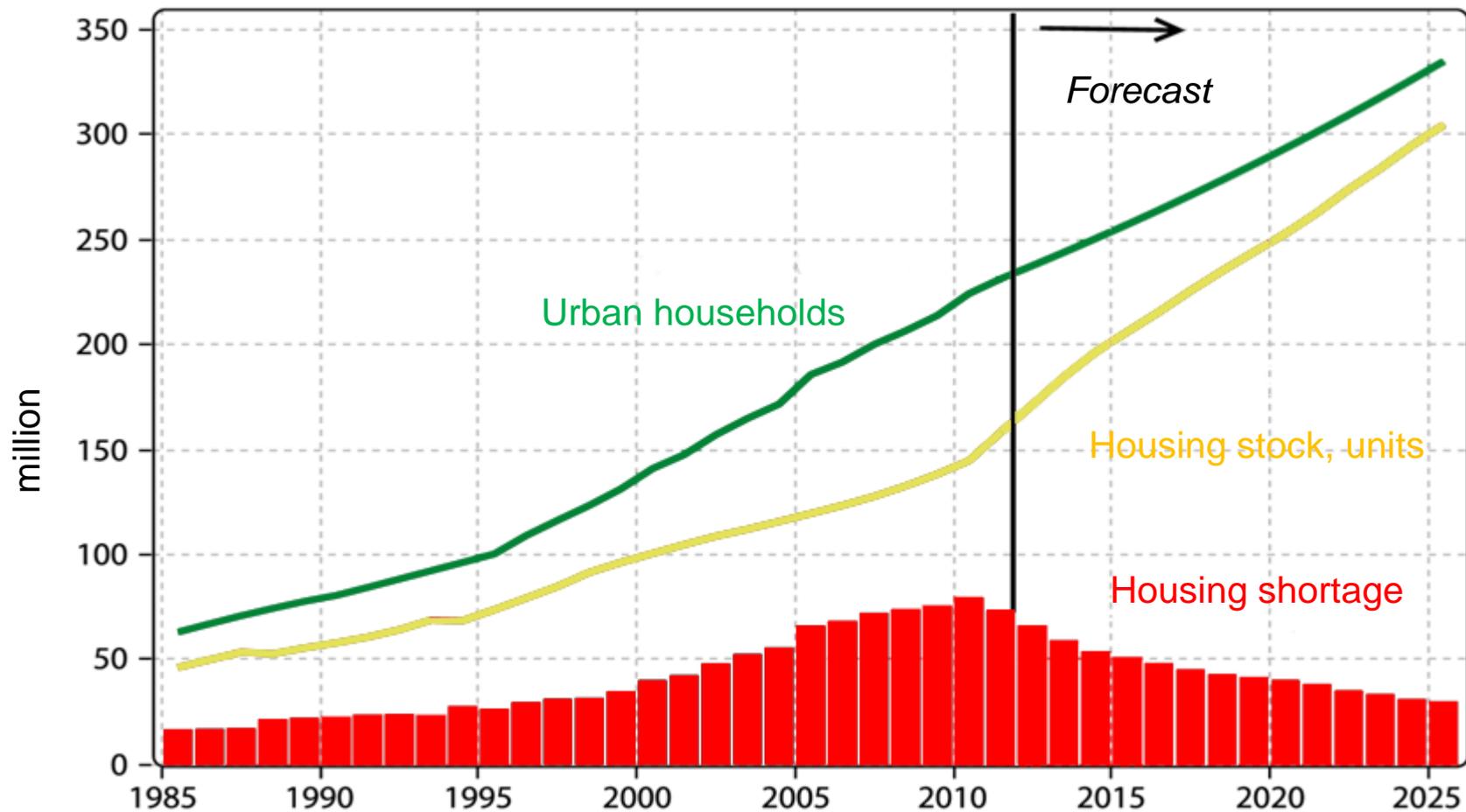
The drivers for mineral demand growth are closely linked to urbanization and an increase in per-capita income and related investments aimed at improving the quality of living in emerging markets. These drivers are expected to remain strong for several decades.

### Urbanization (billion people)



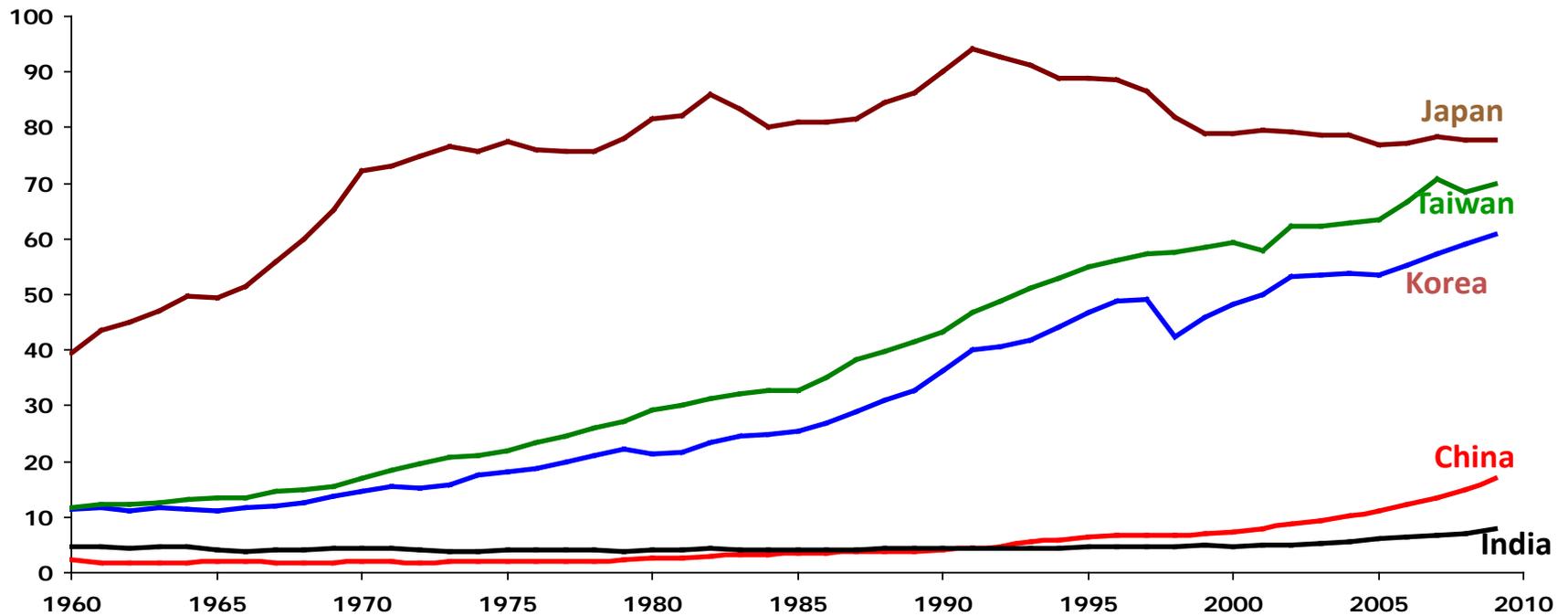
- Urbanization of emerging economies and the consequent growth of cities will drive global economic expansion in next 15-20 years.
- These consumers will demand new residential buildings, “urban infrastructure, durable goods and will promote a large consumption of proteins
- To meet the increased demand considerable investments in mining will be needed

Upgrading of existing poor quality housing and the alleviation of a housing shortage in China are important sources of growth in the consumption of minerals



Overall, there is still a long way for China in the process of convergence to the income standards of developed countries

## Per capita GDP/US per capita GDP %



Demand will also set the pace of resource consumptions for years to come. A modest growth rate considerably reduces the remaining years of available resources

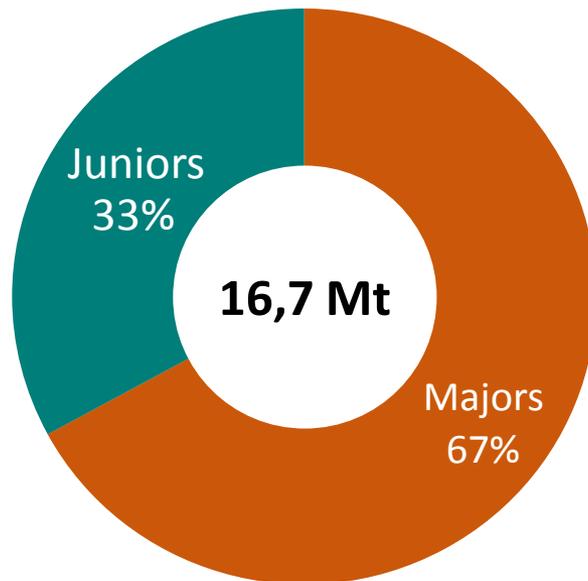
Commodity	Mine Production in 2012 Mt	Global Reserves (Mt of contained commodity)	Remaining years of 2012 production	Remaining years of production (2% annual growth)	Remaining years of production (3% annual growth)
Phosphate	210	67,000	<b>319</b>	<b>100</b>	<b>79</b>
Potash	34	9,500	<b>279</b>	<b>95</b>	<b>75</b>
Coal*	7.678	1,004,000	<b>131</b>	<b>64</b>	<b>53</b>
Copper	17	680	<b>40</b>	<b>29</b>	<b>26</b>
Nickel	2.1	75	<b>36</b>	<b>27</b>	<b>24</b>
Iron Ore	3,000	80,000	<b>27</b>	<b>21</b>	<b>19</b>

USGS commodities statistics information, 2012

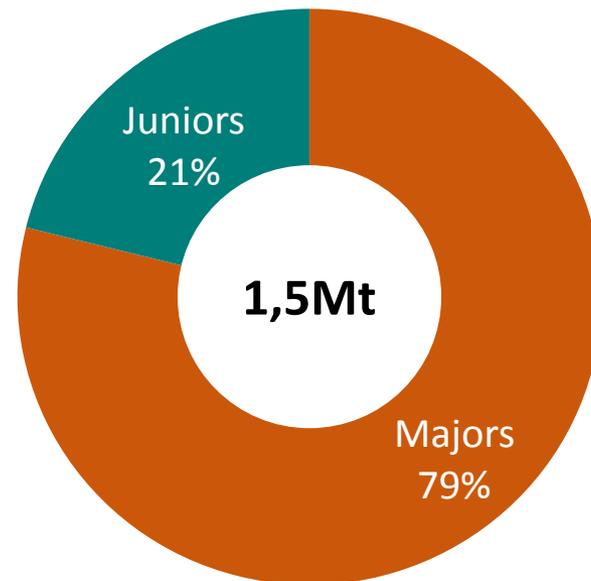
\*Coal: World Coal Association, 2011. Reserves from the German Federal Institute for Geosciences and Natural Resources (BGR)

Major companies play a very important role in the global mining industry, being responsible for producing and trading a large proportion of some minerals that society currently consumes

**2012 Copper Mine production**



**2012 Nickel Mine production**

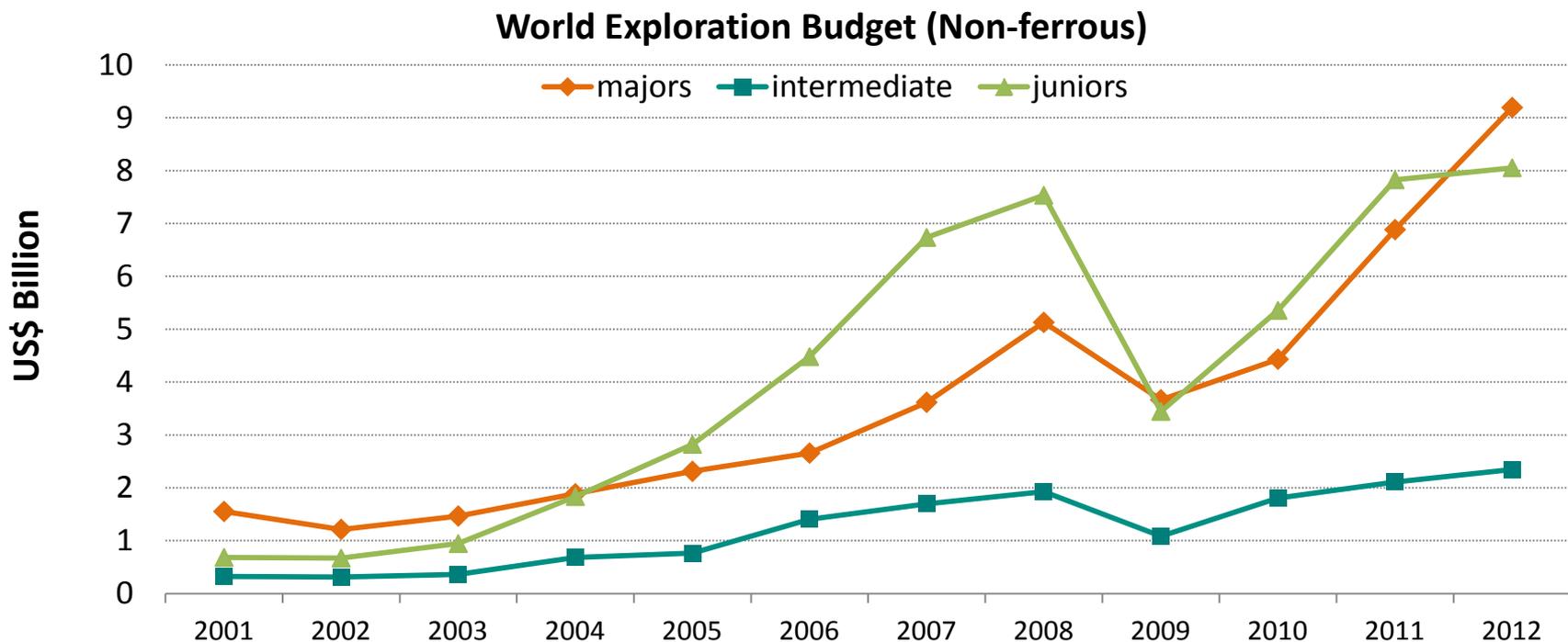




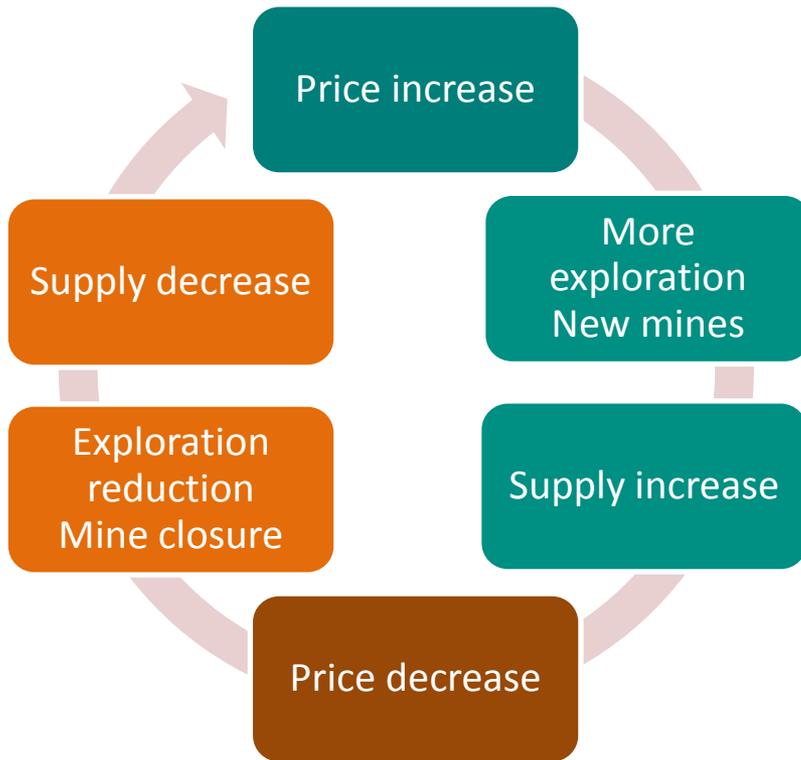
Carajás Mine in Pará  
Salviano Machado / Agência Vale

- Major companies can cope with large project development investments;
- Work in a more integrated way with different knowledge areas;
- Maintain their own exploration and technology development teams;
- Access to large capital pools required to develop world class deposits.

Investments in mineral exploration reached an unprecedented level in 2012 after recovering from the 2008 financial crisis. Investment is predicted to fall some 35% in 2013 when compared to 2012



Mining industry works in cycles: to be “on time” is essential to retrieve the largest value from mineral projects, while maintaining supply levels in line with demand



- Governments must be aware of the timing to propose regulatory changes and taxation increase
- Risk perception changes dramatically
  - Investors tend to expect the same level of dividends throughout the cycle
- For some commodities the cycle is shorter than the expected time of discovery and implementation of mineral projects

The challenge: to maintain long term, constant investment levels during the cycle.

# For the next decades, mining companies must find the equilibrium between technical and social challenges

- Scarcer discoveries
- Lower grades
- Increasing costs
- Complex ores
- Deeper mines
- More mine waste
- Political instabilities
- Resource Nationalism
- Environmental issues, sustainability
- Clients and stakeholder pressures
- Employees welfare and career development



Several governments have been implementing or are considering legislation aiming at a greater role, larger benefit or direct participation of the State in the mineral industry

### Top ten mining risks as perceived by the industry

## 2008

01	Skills shortage
02	Industry consolidation
03	Infrastructure access
04	Maintaining a social license to operate
05	Climate change concerns
06	Rising costs (cost inflation)
07	Pipeline shrinkage
<b>08</b>	<b>Resource nationalism</b>
09	Access to secure energy
10	Increased regulation

## 2012

<b>01</b>	<b>Resource nationalism</b>
02	Skills shortage
03	Infrastructure access
04	Cost inflation
05	Capital project execution
06	Maintaining a social license to operate
07	Price and currency volatility
08	Capital management and access
09	Sharing the benefits
10	Fraud and corruption

In this scenario, geoscientists and mining industry professionals will have an increasingly important role in creating and unlocking value

- There will always be mining activities. Most of our mineral and energy natural resources are increasingly harder and more costly to be replaced. Geoscientists play a key role in their proper exploration, development and implementation.

"Just as mines have 25-year mining plans, they should also have 25-year HR plans."

But skill shortages represent a significant risk for the continuation and prosperity of minerals industry:

1. **Impact on production output**
2. **Delay, downsizing or cancellation of projects**
3. **Global mobility**
4. **Increasing labor costs**



# Sustainability will remain an important issue



**How do we provide for the consumption needs of a population of 9 billion?**

**Planet Earth and Humanity – an interdependent relationship**



Two limits need to be respected:

**Assuring a baseline quality of life (health, education, housing, nourishment, liberty, energy) for all Earth's inhabitants**

**Our impact should be restricted to the planet's limits of resilience**

Through the cycle of a mineral project, several initiatives can be undertaken to improve exploration success, the economics of future operations, environmental compliance and social acceptance



### **Access to areas and exploration:**

- New exploration concepts and ideas
- Exploration technology

### **Development, approval and construction**

- Innovative engineering solutions
- New mineral processing technology

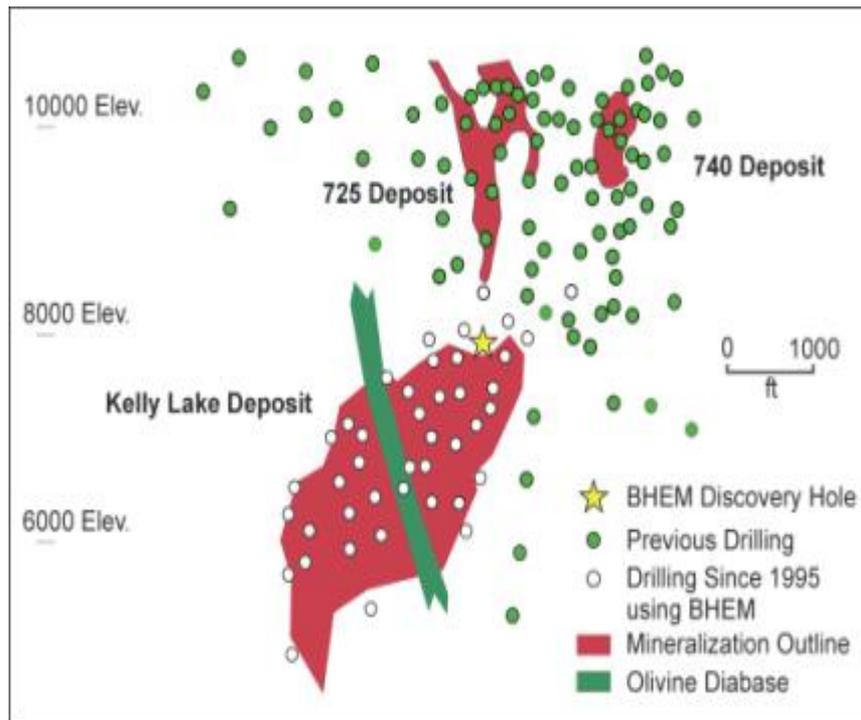
### **Operation and Closure**

- Safer/cleaner operations
- Greater resource utilization
- Productivity gains
- Greater social acceptance

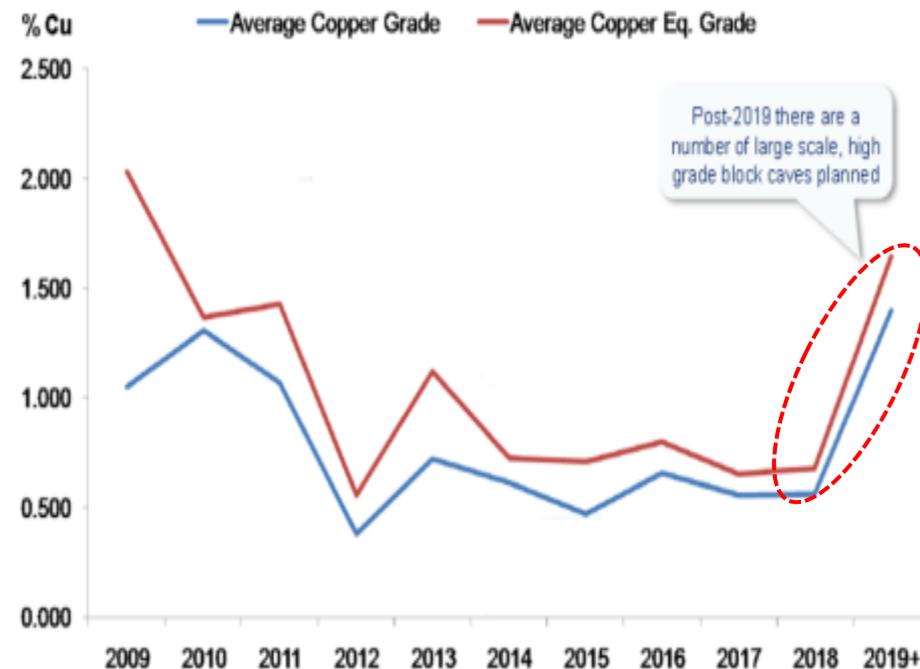
- Stable legislative environments are required in order to stimulate mining operation and capital intensive investments

# Technology development is the key factor in finding and developing new resources

- Discovery and early stage delineation of the Kelly Lake deposit using drilling and BHEM



- New mining technologies may unlock deeper, large deposits: the block caving example





## Final Remarks

- The mining industry is subjected to cyclical economic, social, environmental and regulatory trends
  - The challenge is to maintain long term investment levels during the cycles
- We believe that there will be sufficient mineral resources to maintain the future needs of consumption for the next decades, but:
  - many of today's known resources will face hurdles in becoming viable operations in the future
  - it is essential to keep our current resources consumption in a sustainable trend

Mining companies have the key role of discovering the resources and developing projects which will promote sustainable development for all stakeholders.

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