**Strategic Materials for a Low-Carbon Future: From Scarcity to Availability**
**2-3 November 2017 – Session Summary**

## Groundwork session 2: Primary resource availability in a low-carbon transition

In the shift towards resource availability, physical factors like geological availability may not be the prime constraint to meeting demand for extracted materials. Rather, the limits may be environmental, social, political, or economic. Limits also arise from interdependencies with water, land or energy, for which there are competing social needs. These tensions are particularly prevalent in the extraction of metals and minerals – often in developing countries where social needs are acute and governance is less clear. What are the key limiting factors and what technical and organisational innovation can mitigate their impact? What is the impact of a low-carbon transition on the extractive industries? What will these industries look like in a low-carbon future, and what are the second-order implications down the road? How can governance mechanisms in extractive industries evolve to make the industry sustainable?

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**Sheila Khama**, Practice Manager, Energy and Extractives Global Practice, World Bank Group
**Oscar Landerretche**, Chairman of the Board of Directors, CODELCO
**Bernice Lee**, Executive Director, Hoffman Centre for Sustainable Resource Economy, Chatham House
**Karina Litvack**, Independent Non-Executive Director, Eni SpA

Moderated by Ian Goldin, Oxford University Professor of Globalisation and Development and Director of the Oxford Martin Programme on Technological and Economic Change

Summary [200-400 words]

- The speakers began by outlining the major technical challenges faced by the mining sector, such as the need for new technologies to address productivity. Such technologies are needed not only to maximise the efficiency of processing to recover more diverse metals, but also to remediate and prevent environmental impact.
- However, they felt the major limitation on the mining industry's license to operate was not technical but social. Previous missteps, like exploitation, pollution and land grabs, have produced public distrust in local communities. Artisanal mining has been "inadvertently criminalised", and is both a human rights and an environmental issue: an intensely sensitive area to legislate.

- Uneven geographical distributions of raw materials also poses complex risks. For example, Chile dominates global copper production, putting out about a third of the world's copper. This is a risk for the Chilean economy as well, which depends on copper production for 10- 40% of fiscal revenues and recognises its need to diversify.
- Mining markets are increasingly 'financialised' and attuned to short-term investor cycles, which is particularly stifling for technological innovation. Codelco have set up a separate company to focus on R&D innovation. Their hope is that there will be a technological arms race, for instance in leaching and smelting reductions, or in the use of desalination facilities to reduce freshwater use.
- Speakers agreed that better global and national governance of mining is needed to maximise the benefit from primary extraction and minimise the impact. Eventually, even countries with 'dirtier' current production or consumption may self-regulate their impacts as well, and this is beginning to happen: For example, gas producer Algeria has invested in solar capacity and ships its domestically produced gas out of the country.
- An era of 'radical transparency' may be imminent, with far more ability to access supply chain information. However further technologies for traceability are needed. If copper, for instance, can become de-commoditized, producers can be rewarded for better products - but it is still a great challenge to the industry to use 'ethical pricing' or to guarantee that you aren't fostering corruption along the supply chain.

Speakers and audience questions also considered whether primary material demand will really increase substantially in the future. External trends such as automation, the sharing economy, changes in travel and consumption patterns, artificial intelligence and the ability to access supply chain information more rapidly, will all affect the demand for primary extraction of material. Some circular economy models are on the rise in primary extractive industries, such as oil refinery networks repurposing oil waste into diesel fuel.