

DESIGNED FOR YOUR WORLD

SDA Bocconi
SCHOOL OF MANAGEMENT

THE DARK SIDE OF ENERGY TRANSITION

The case of cobalt and the Democratic Republic of Congo



How to address **sustainability concerns** affecting **cobalt** mining in the Democratic Republic of Congo



The key role of the **artisanal mining sector** for inclusive and sustainable energy supply chains



COBALT: A FUNDAMENTAL COMPONENT FOR THE LITHIUM-ION BATTERY MARKET



Innate properties

Thermal stability and high energy density.

Huge potential

Vehicle electrification is recognized as being the biggest growth area for cobalt use in the years to come.



Key element in the lithium battery industry

Today, over half of the world's cobalt supply is consumed in rechargeable batteries which are used in portable electronics, energy storage systems, electric vehicles and numerous other applications.

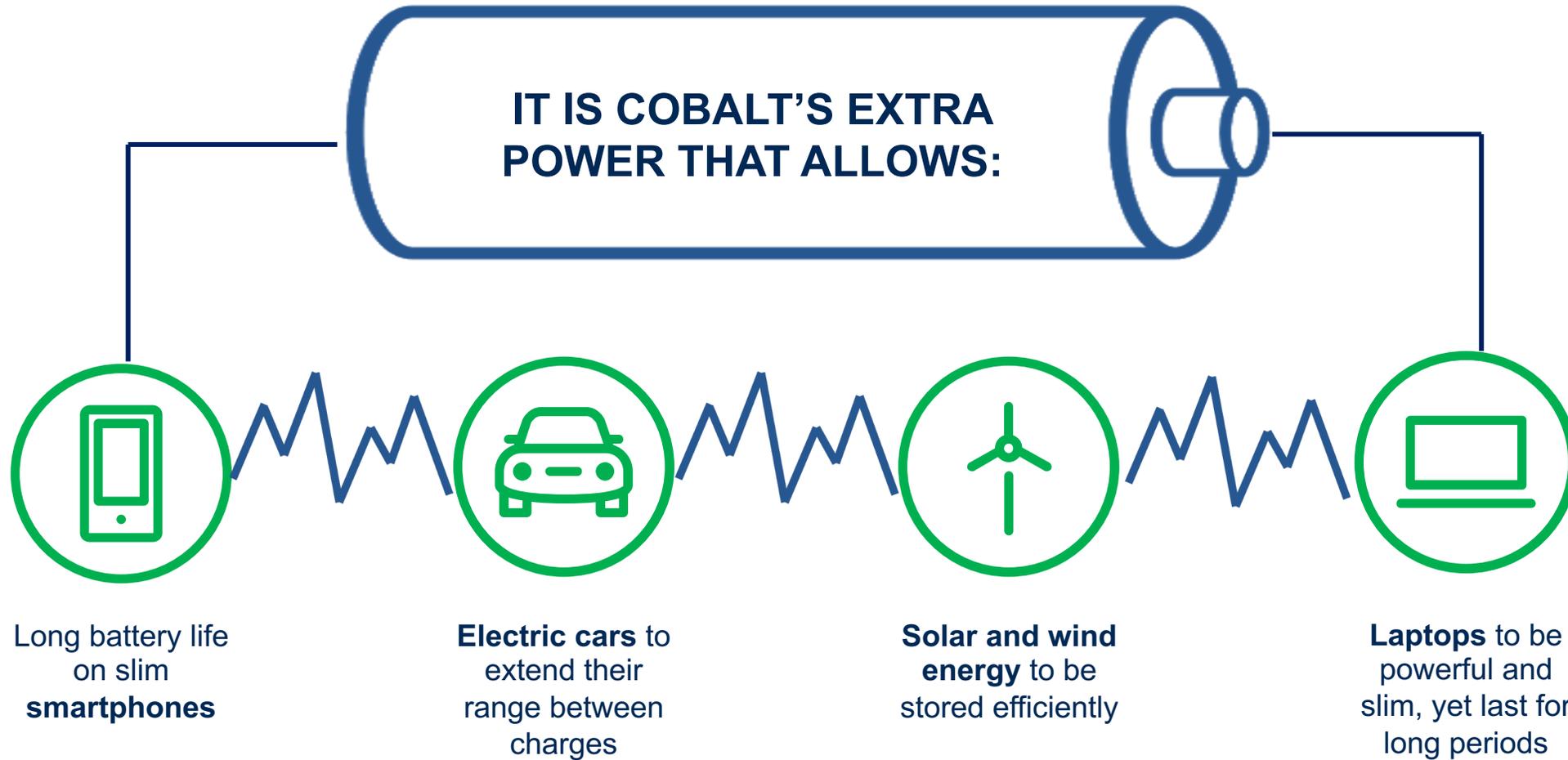


A critical mineral

in Europe and in the US, cobalt is included in the list of critical resources, among other 30 materials.



THE CRUCIAL ROLE OF COBALT IN THE GREEN ECONOMY



ALLOYS



- Aerospace, prosthetics, cutting tools, automotives and industrial equipment

HEALTHCARE



- Measuring vitamin B12 absorption and diagnosing vitamin B12 deficiency
- Prosthesis (hip, knee and tooth implants)
- Detecting tumours and metastases
- Radiotherapy, particularly in treatment for brain tumours
- Sterilisation of medical equipment
- An essential component of the fermentation process used to create biomolecules

CATALYSTS



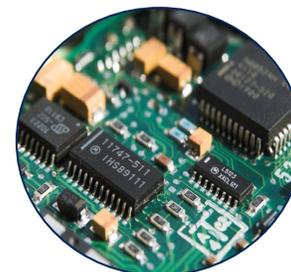
- Removing sulphur moieties from natural gas and refined petroleum products
- Synthesis of polyester precursors
- Production of aldehydes from alkenes in the OXO reaction
- Other industrial reactions

INKS AND PIGMENTS



- Glass, porcelain, ceramics, paints, inks and enamelware

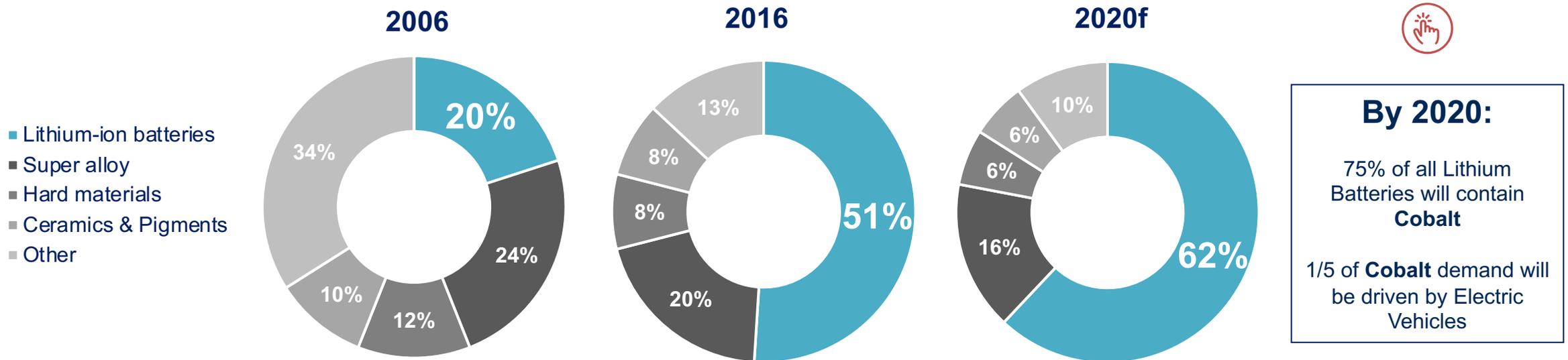
ELECTRONICS



- All modern electronic devices or systems contain cobalt in integrated circuits and semi-conductors

COBALT DEMAND: THE CURRENT GLOBAL SITUATION

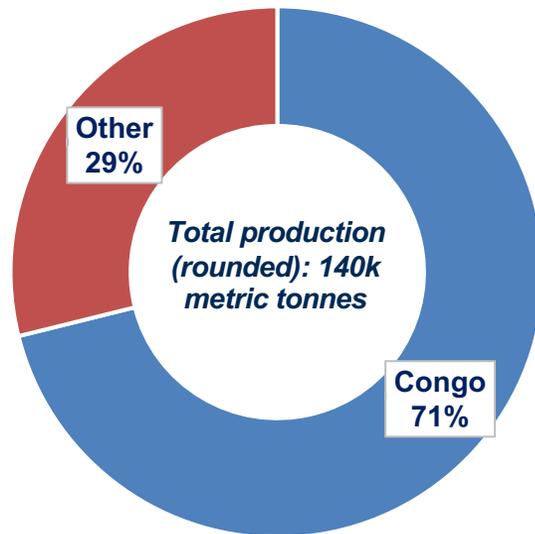
- Darton Commodities estimates that global demand for cobalt is expected to exceed **120,000 tonnes** in 2020, an increase of 30% compared to 2016 mainly driven by the electric vehicle market.
- The **electric car market** alone would capture one fifth of total demand, again demonstrating the importance of cobalt in the transition to renewables.
- It is estimated that the battery of a smartphone contains between 5 and 10 grams of refined cobalt, while an electric car battery can contain up to 15 kilos!



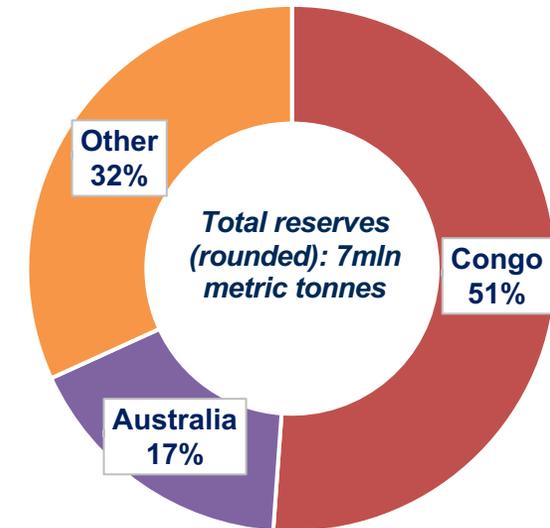
COBALT PRODUCTION AND RESERVES IN 2019¹

- The Democratic Republic of Congo is the world's leading source of mined cobalt, supplying approximately **70% of world cobalt mine production**.
- The country is among the world's richest countries in terms of natural resources, but its people remain among the world's poorest.

COBALT PRODUCTION

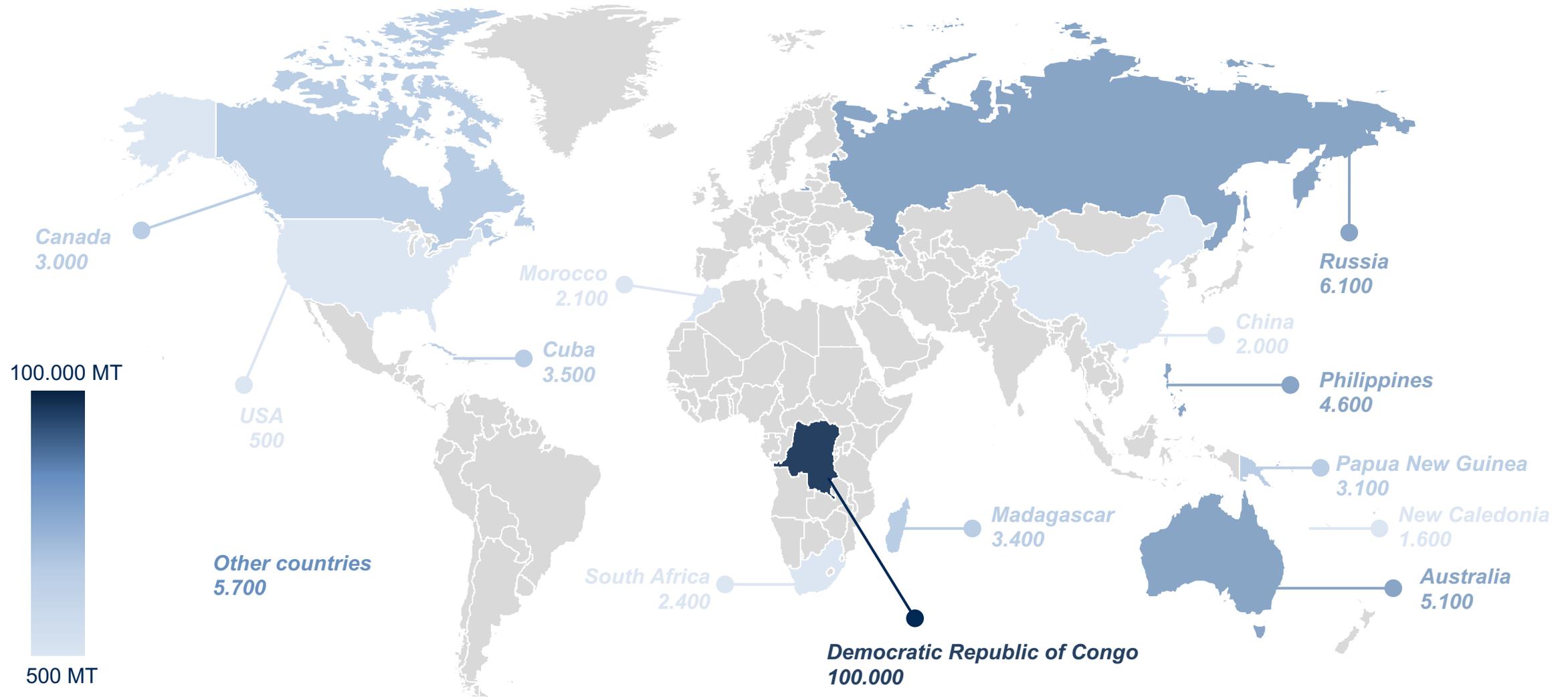


COBALT RESERVES



¹ Estimated
Source: USGS Mineral Commodities Summary 2020

COBALT PRODUCTION IN 2019¹ (IN METRIC TONNES)

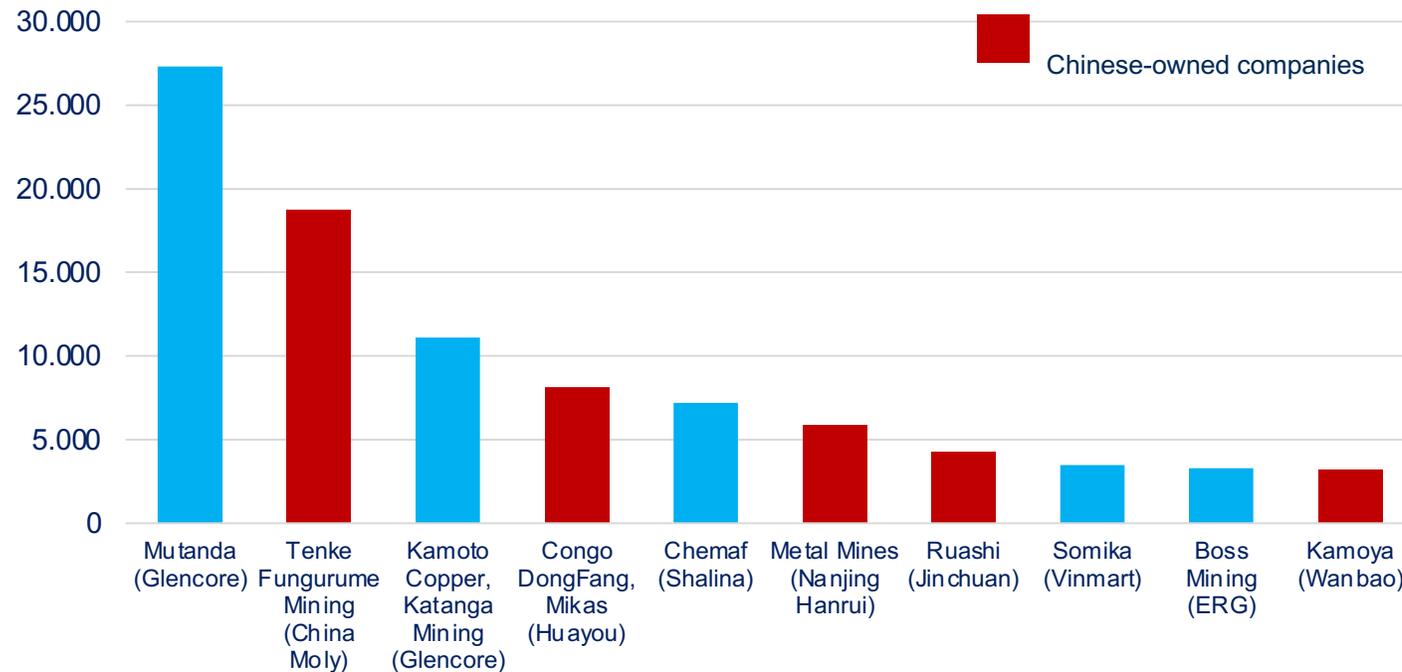


¹ Estimated

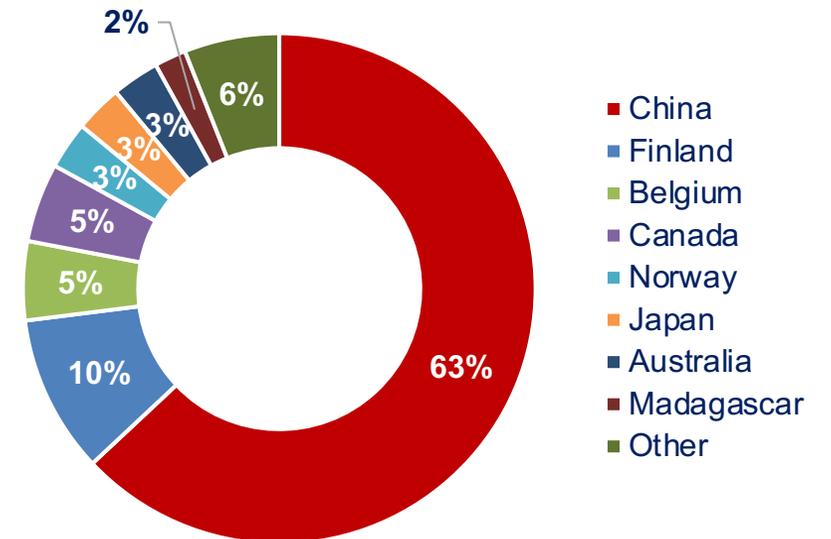
Source: Author's elaboration on the basis of the *USGS Mineral Commodities Summary 2020*

- China has assured important **mining concessions** in the DRC and Chinese companies are among the top world's cobalt producers.
- China is also the **world's leading producer of refined cobalt**, most of which is produced from partially refined cobalt imported from DRC.

TOP 10 COMPANIES EXTRACTING COBALT IN THE DRC IN 2018 (TONNES)

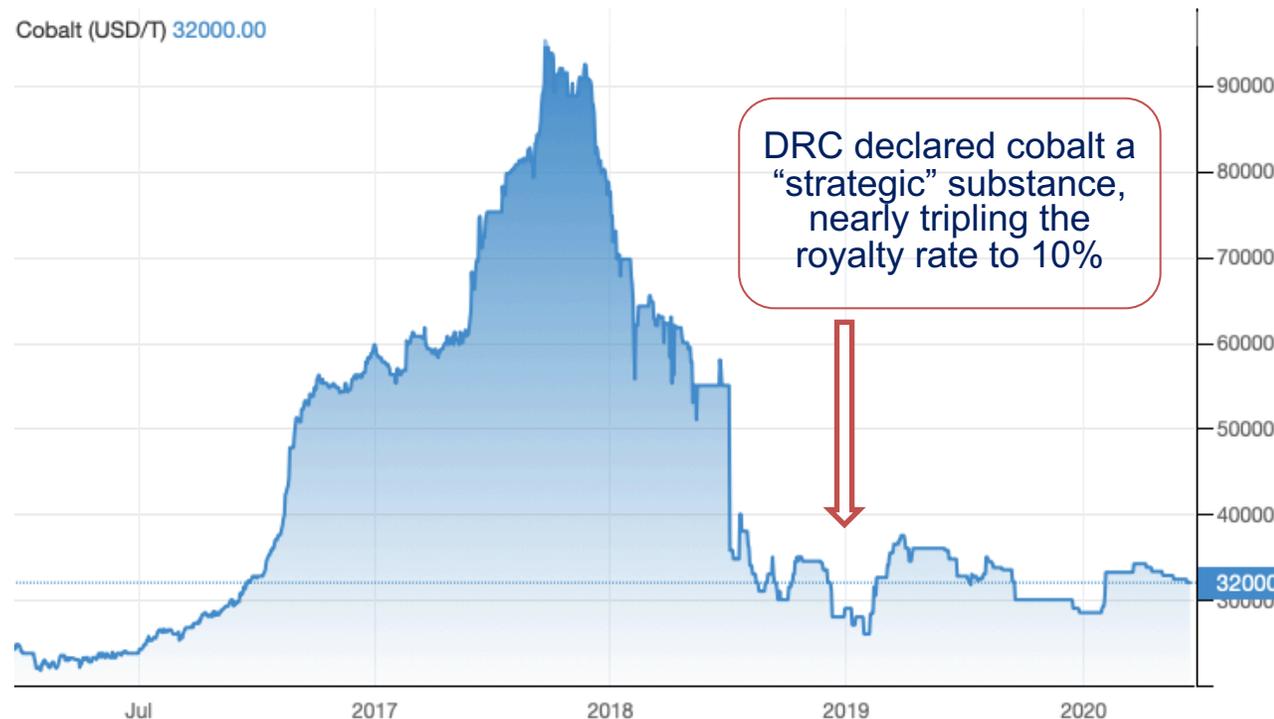


REFINED COBALT FOR CHEMICALS PRODUCTION BY COUNTRY IN 2018



COBALT PRICE TREND OVER THE LAST FIVE YEARS

- **The price of cobalt has collapsed starting from 2018**, putting a strain on the economy of the world's largest producer, the Democratic Republic of Congo.
- The market has been overwhelmed by a **surge in supply** of the metal from the DRC, especially from small-scale individual miners who dig up the metal by hand and who react quickly to higher prices, according to traders.



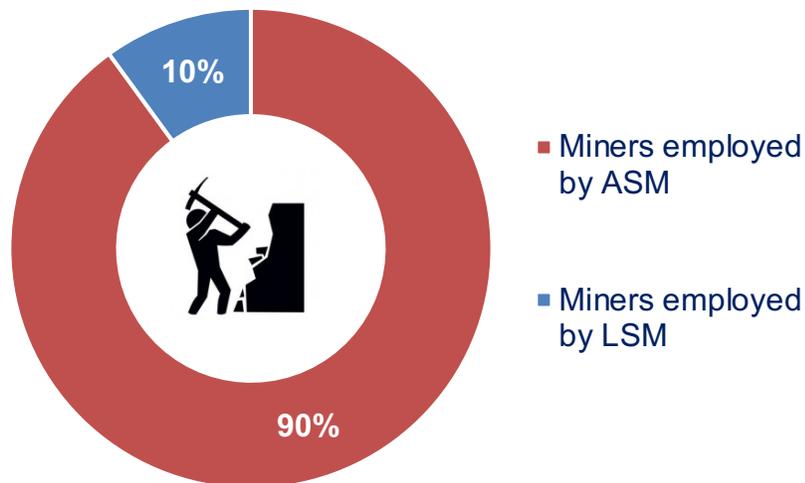
\$

December 2020:
32,000.00 USD/T

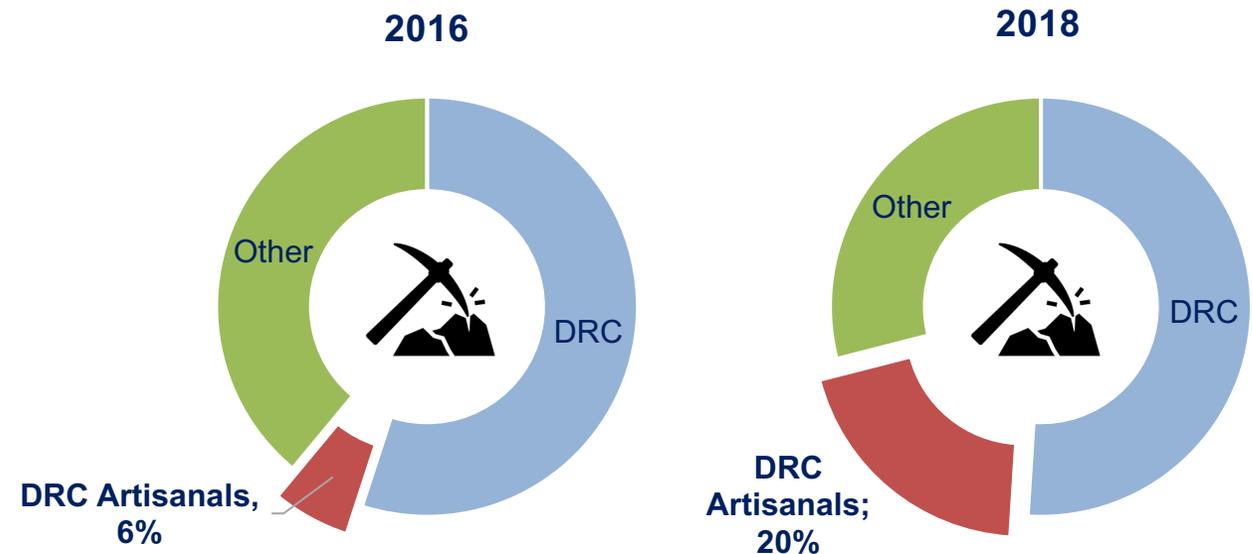
DISTINCTION BETWEEN ARTISANAL AND INDUSTRIAL MINING

- Artisanal mining, also called **small-scale mining (ASM)**, has increased dramatically between 2016 and 2018, on the back of strong demand growth and rising prices, and has been key in satisfying skyrocketing cobalt demand.
- The majority of Congolese cobalt is mined by industrial operations or **large-scale mining (LSM)**. However, **most cobalt miners and their families rely on artisanal, not industrial, mining as a source of income.**

DISTRIBUTION OF MINERS BETWEEN ASM AND LSM IN DR CONGO



COBALT MINED SUPPLY BREAKDOWN, WORLDWIDE



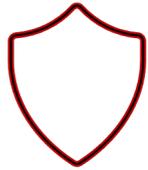
THE INTERCONNECTED RELATIONSHIP BETWEEN ARTISANAL AND INDUSTRIAL MINING

DISTRIBUTION OF MINERS BETWEEN ASM AND LSM IN DR CONGO



- It is estimated that this informal sector provide employment to at least **100.000 miners**, **Children make up about 13% of the labor force**, half of which under 14 years old.
- Most children indicated that they earned between 1,000-2,000 Congolese Francs per day (**US\$1-2**).
- Artisanal miners living in the mining communities of the copper cobalt belt **capture a relatively small share of the price** (as low as 6%) paid for their output downstream.
- Corruption manifests in different ways in large-scale mining and ASM, but the two sectors are also **intricately intertwined**.

MAIN ISSUES EMERGING FROM COBALT MINING IN DR CONGO



SECURITY OF SUPPLY

Global concerns: concentration of cobalt production and refining in two single countries, DRC and China. This implies that a huge chunk of the cobalt supply chain is **vulnerable to disruption**.



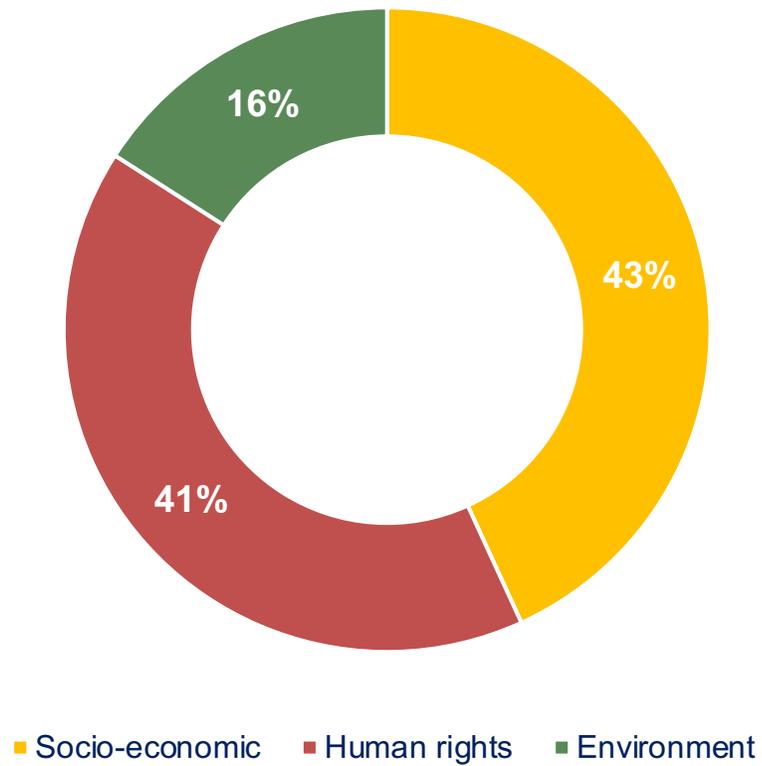
SUSTAINABILITY CONCERNS

Local concerns particularly affecting **cobalt supply chain** and its traceability, especially regarding artisanal mining, highlighting severe ethic concerns for companies using lithium-ion batteries for their products.

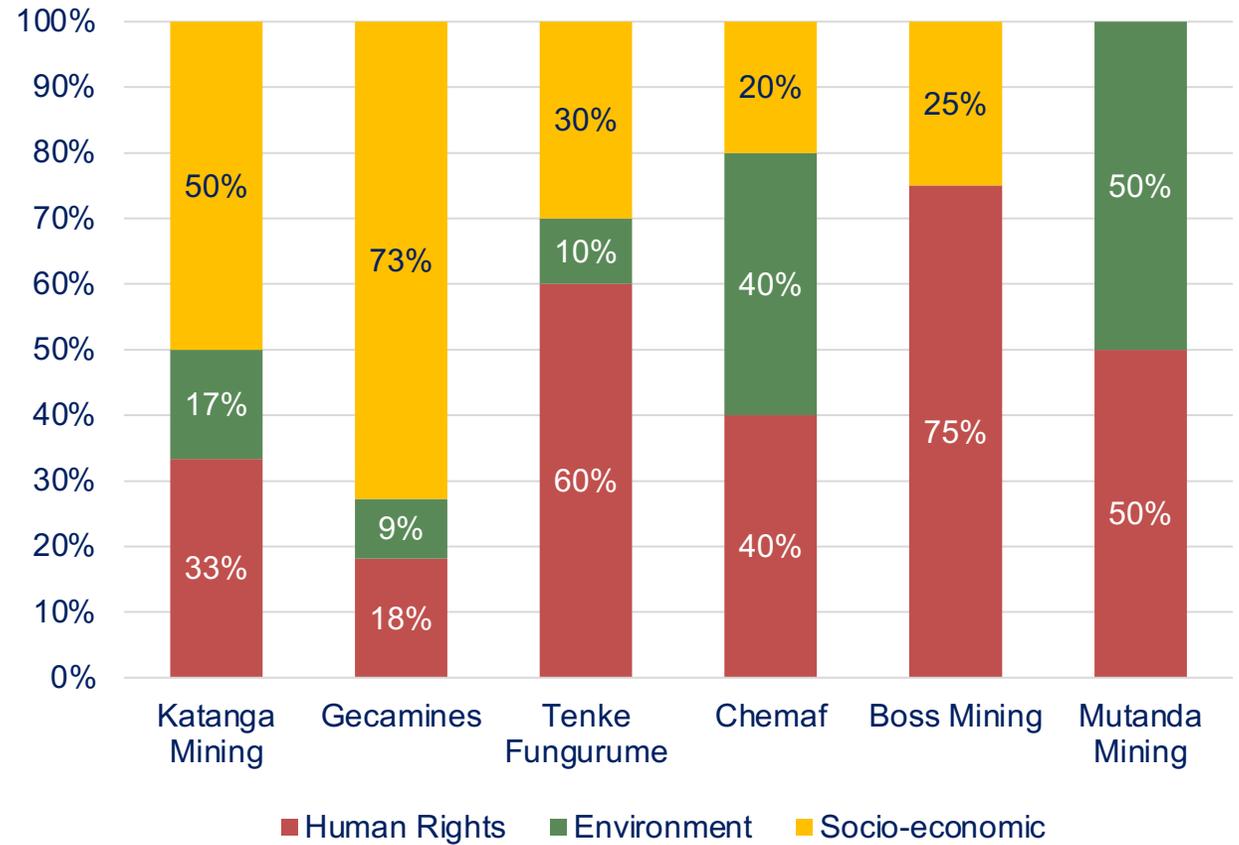
- Data have been collected through the Transition Minerals Tracker developed from the Business & Human Rights Resource Centre. The Tracker includes company policies and allegations, collected in the first half of 2019.
- Analysis of the allegations reported by the Tracker, categorizing them into three groups according to their nature: **human rights, environmental and socio-economic allegations.**

Company	Subsidiary	Number of allegations	Human Rights policy
Glencore	Katanga Mining	12	x
Gécamines	Gécamines	11	
China Molybdenum	Tenke Fungurume	10	x
Shalina Resources	Chemaf	5	
Eurasian Resources Group	Boss Mining	4	x
Glencore	Mutanda Mining	2	x

COBALT RELATED ALLEGATIONS



COBALT RELATED ALLEGATIONS BY COMPANY



SUSTAINABILITY CONCERNS RELATED TO COBALT MINING IN DR CONGO

Human rights violations

- **Child labour**, beating and violence, and sexual abuses.
- **Hazardous working conditions** often leading to fatal accidents.
- Serious **health issues** related to miners' continuous exposure to cobalt dust without adequate protective equipment
- Severe impact on **local populations** living near mining concessions, that have been forced to abandon their homes and expropriated of their properties.

Environmental impact

- **Toxic waste waters** released into the local environment
- **Air pollution**, especially due to dust resulting from drilling and blasting.
- **Environmental degradation** that results in the destruction of the fauna, flora, as well as human settlements.

Socio-economic impact

- Corruption, lost mining revenues, lack of transparency of public finance and fraudulent tax systems meaning that **wealth escapes from the country** and cannot benefit communities.

MAIN RESPONSES TO FACE SUSTAINABILITY ISSUES RELATED TO COBALT EXTRACTION

#1: SHIFT TO OTHER ALTERNATIVES

- A lot of companies, including Tesla, are interested in making a **zero-cobalt battery** in order to replace cobalt.
- Sodium-ion batteries have been identified as appealing alternatives to lithium-ion batteries because they are made from raw materials that are less expensive, more abundant and less toxic.

#2: CONGOLESE GOVERNMENT ACTION

- The Democratic Republic of Congo, after having declared cobalt a «**strategic**» **substance** and **increased royalties to 10%**, recently created a **state-owned company to buy all the cobalt mined by hand in the country**, in an effort to support the price of the key battery material used in electric cars.

#3: ADDRESSING SUSTAINABILITY ISSUES WITHIN THE SUPPLY CHAIN

- An increasingly number of companies (e.g. Tesla, Volvo, Apple) is implementing **rigorous systems for monitoring and addressing sustainability concerns throughout their supply chains, stopping to buy cobalt coming from artisanal miners.**

THE ERADICATION OF THE ASM CAN TURN TO BE THE WRONG WAY

- Disengaging from artisanal mining can have **detrimental effects for a large number of households** living in the DRC copper cobalt belt
- Boycotting sourcing from certain areas or sectors can lead to **devastating job loss** for many legitimate miners, and can stimulate **black-market growth**.
- Sourcing exclusively from LSM does not eliminate the risk of child labour being present in a company's supply chain given the **overlap that occurs between ASM and LSM mining activities**.



Recently the commodity trader **Trafigura** signed a cobalt deal with DRC to help **improving conditions at informal mining sites** in return for supplies of the battery metal cobalt. However, some carmakers are still reluctant to source from the DRC's informal mining sector: **Volkswagen recently said that it did not accept cobalt from artisanal mining**

PROMOTING A SOUND MINING SECTOR GOVERNANCE: THE CASE OF ERGI

- A possible response could be the **strengthening** instead of the eradication of **informal cobalt extraction**.



ERGI.

- A successful and replicable example is that of the **Energy Resource Governance Initiative (ERGI)**¹, an initiative founded by the governments of Canada, Botswana, Perú, Australia and the USA in order to promote solid governance and efficient management of energy supply chain in the mining sector.
- The necessary standards to operate in this sector could be ensured through the **spread of best practices** contributing to the development of clean energy demand

¹ Source: <https://ergi.tools>

- While cobalt is an essential element in advancing the energy transition, it is strongly linked to **controversial damaging mining practices** that in the future could lead its largest consumers to seek a substitute for it.
- In light of the risks related to its extraction, the actors involved in this scenario are starting to take some steps with the clear aim of protecting themselves and **promoting more ethical and transparent practices**.
- On the other hand, if the objective remains only that of **extricating themselves from the informal sector** to clean up their supply chain, such actions may prove inadequate.
- The artisanal extraction should not be demonized but **strengthened and regulated**, as it reflects a concrete opportunity to create a **diversified and inclusive mining sector**.



THANK YOU FOR YOUR ATTENTION!