October 2021 – EIC presentation

# A commodity transition from Oil to Metals

*The Metallic pillars of the Energy Transition*

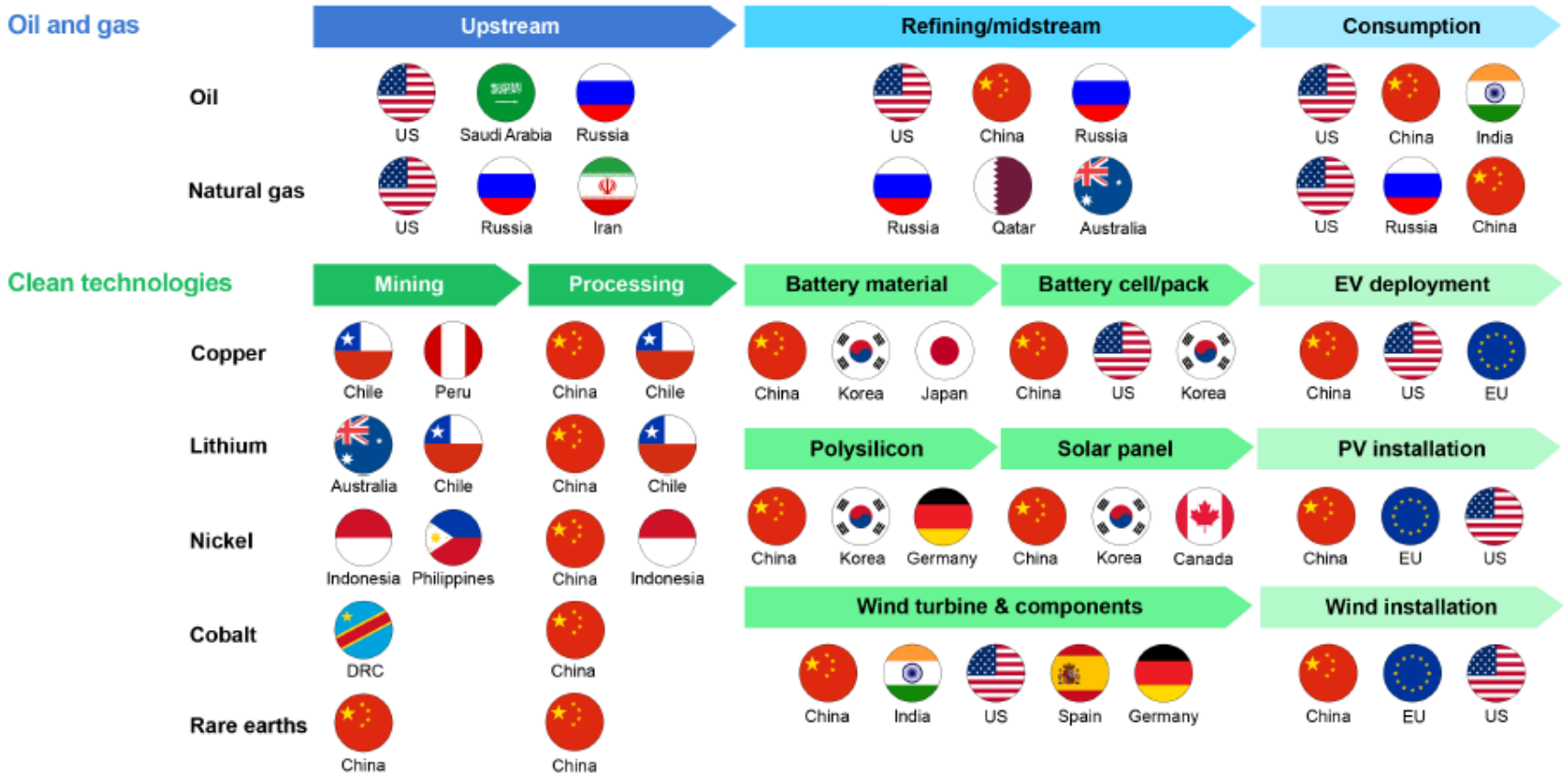
**SOURCES :**

- **IFPEN website**
- **IEA report : the role of critical minerals in clean energy transition**
- **AVICENNE**
- **ORANO**
- **World Bank**

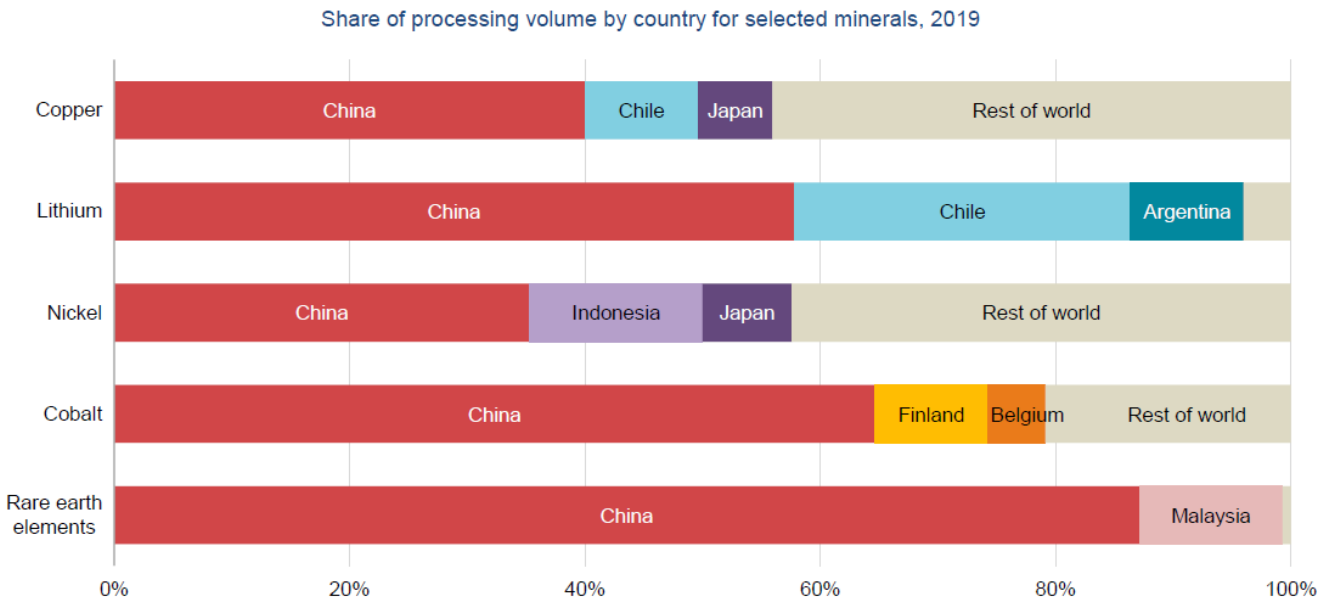
# Overall, will the energy transition substitute the dependance over some fossile ressources toward some other fossile ressources ?

# The transition to a clean energy system brings new energy trade patterns, countries and geopolitical considerations into play

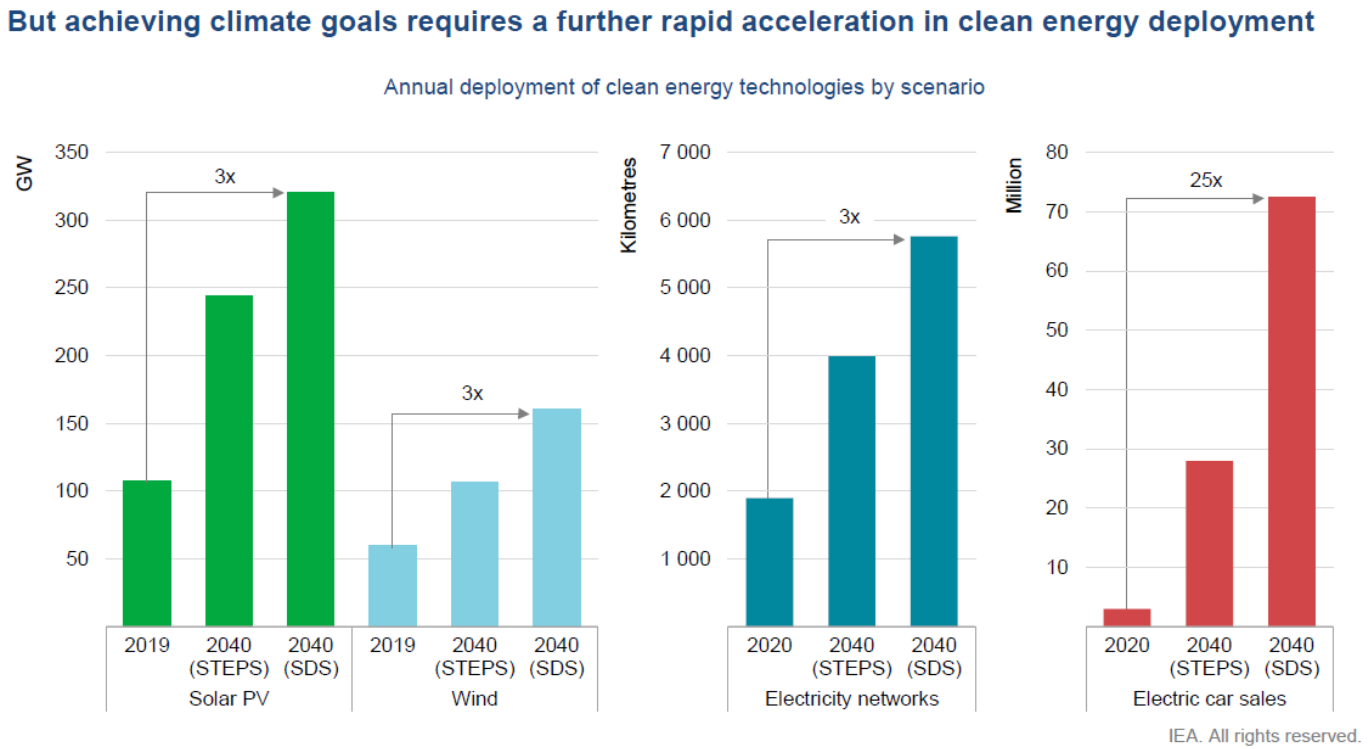
Indicative supply chains of oil and gas and selected clean energy technologies



# China on the way to control all major substances

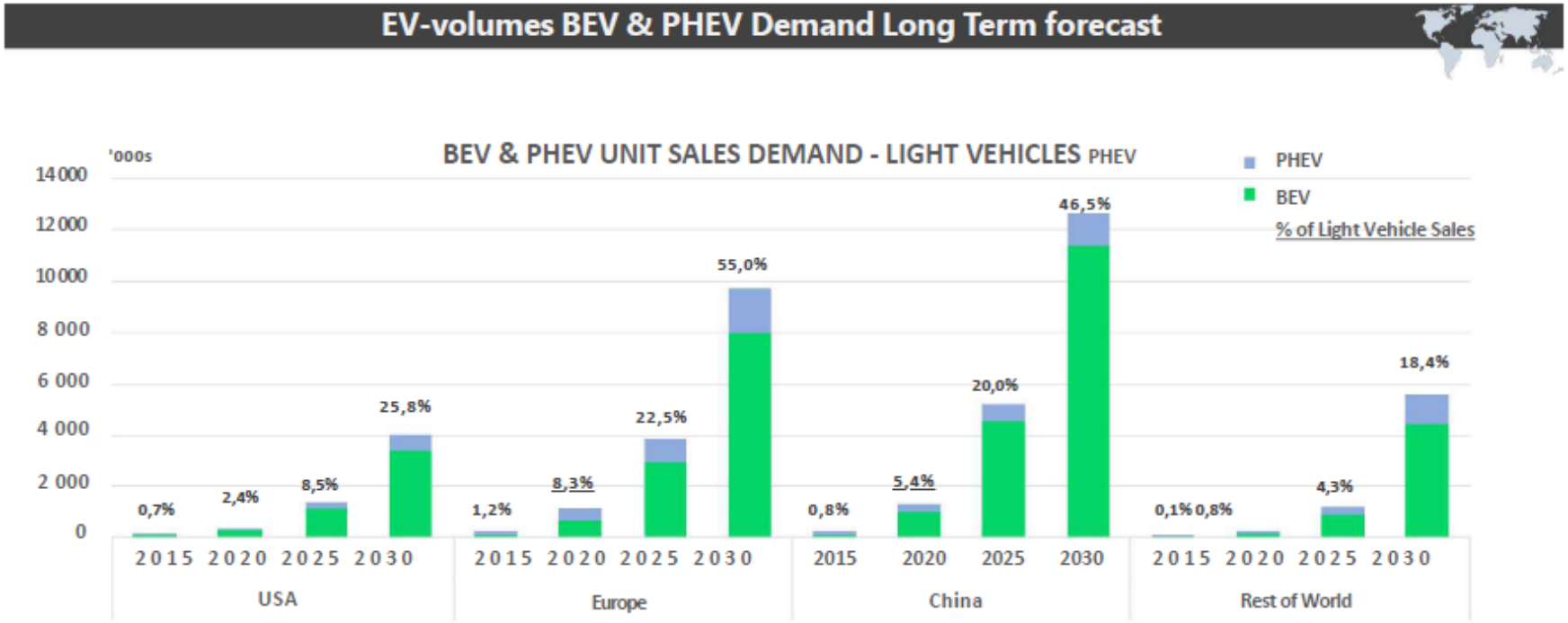


# MAIN APPLICATIONS




Notes: PV = Photovoltaic; STEPS = Stated Policies Scenario; SDS = Sustainable Development Scenario.
Sources: IEA (2021a); IEA (2020a).

# EV APPLICATIONS




Free Demand – Not Capacity Constrained

Data is built bottom up, by brand, model by market

It is based on actual registration data up to 2020

# What is a critical or strategical metal ?

**UN METAL IS STRATEGICAL WHEN:**

- Used in numerous & diversified applications in the industry ;
- Can hardly be substituted ;
- Bears a significant economical value.
- Its geological reserves and/or production are geographically concentrated.

**Trois types of criticity :**

- **géological** : the multitude of applications of critical materials **generates a risk of shortage** ;
- **economical** : Few large producers controls the market
- **environnemental** : Polluting Emissions, **consumption of energie and water** for the production

# Which metals raises the main issues ?

**Copper :** The metal under the strongest pressure from Energy Transition needs. : Close to 90 % of known ressources in copper shall be extracted in 2050 in a scénario of +2°C warming .
This raises the need to developp secondary production secondaire from recycling ( urban mine ).

**Cobalt : Mostly a geopolitical risk,**, as its mining production is concentrated in Dem Rep of Congo, a very unstable regime .

**Lithium : Its economical criticity** is the main issue : 5 producers controls 90 % of the production

**Nickel** : A medium geological criticity with about **41 to 39 % of ressources** still available in 2050 in a +2°C scenario.

All Metals are consumming water in competition with other usages ( agriculture, municipal potable water, ..). **The environnemental criticity is strong on this ressource** for all main metals .

# Main Commodities impacted

## Mineral needs vary widely across clean energy technologies

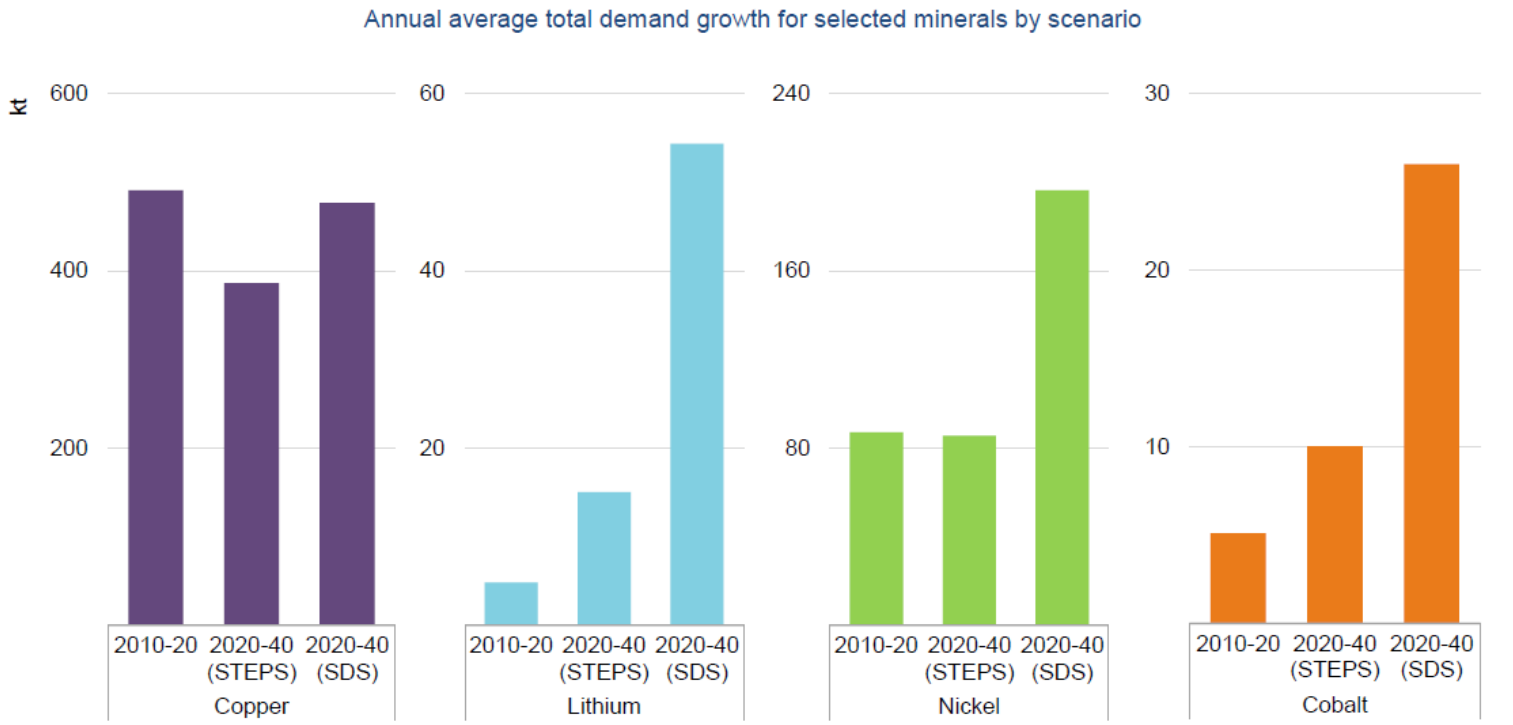
Critical mineral needs for clean energy technologies

| | Copper | Cobalt | Nickel | Lithium | REEs | Chromium | Zinc | PGMs | Aluminium* |
|---|---|---|---|---|---|---|---|---|---|
| Solar PV | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| Wind | ● | ○ | ◉ | ○ | ● | ◉ | ● | ○ | ◉ |
| Hydro | ◉ | ○ | ○ | ○ | ○ | ◉ | ◉ | ○ | ◉ |
| CSP | ◉ | ○ | ◉ | ○ | ○ | ● | ◉ | ○ | ● |
| Bioenergy | ● | ○ | ○ | ○ | ○ | ○ | ◉ | ○ | ◉ |
| Geothermal | ○ | ○ | ● | ○ | ○ | ● | ○ | ○ | ○ |
| Nuclear | ◉ | ○ | ◉ | ○ | ○ | ◉ | ○ | ○ | ○ |
| Electricity networks | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ● |
| EVs and battery storage | ● | ● | ● | ● | ● | ○ | ○ | ○ | ● |
| Hydrogen | ○ | ○ | ● | ○ | ◉ | ○ | ○ | ● | ◉ |

# Evolutions of needs on a STEPS vs +2°C scenario



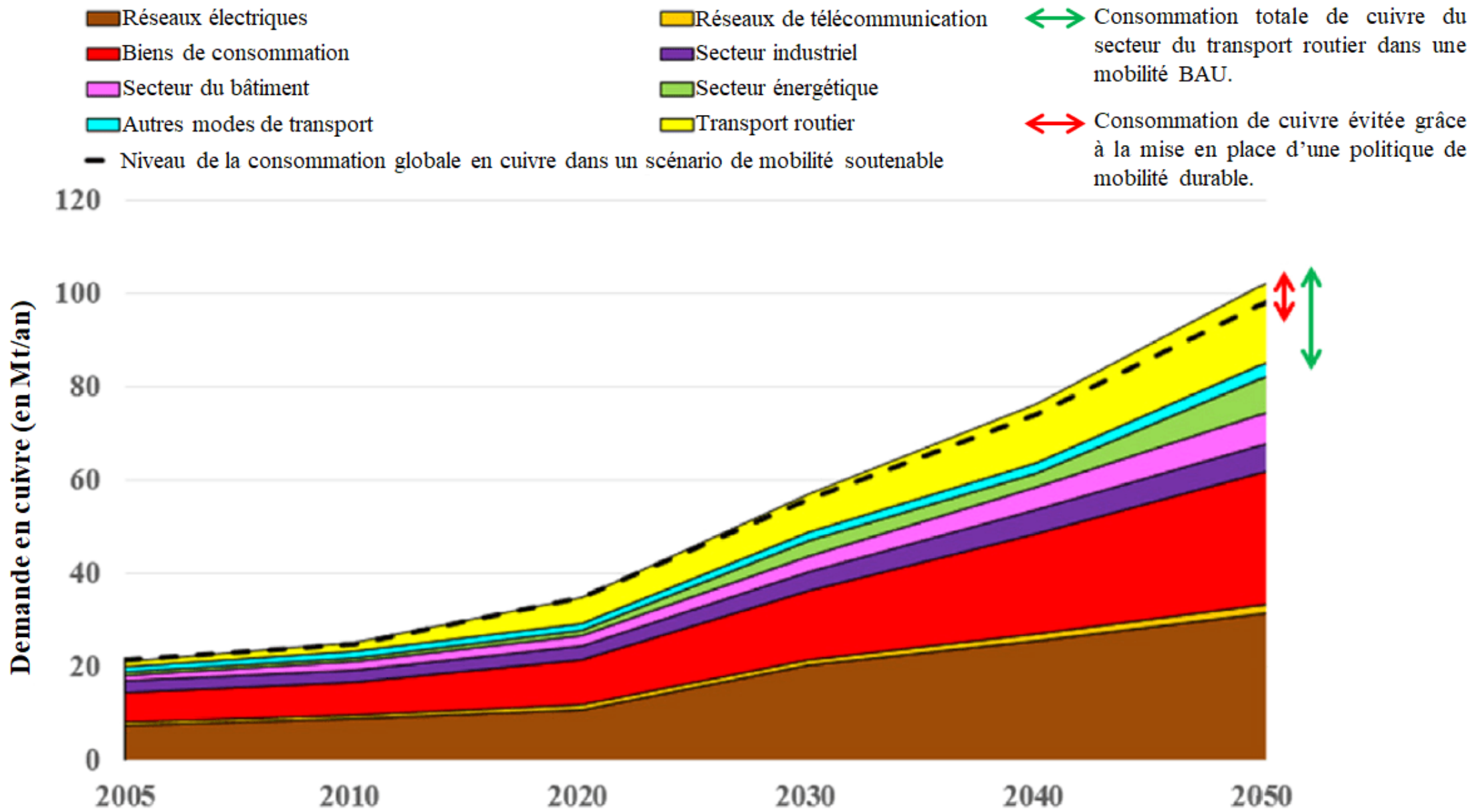
**In the SDS, the required level of supply growth for most minerals is well above the levels seen in the past decade**





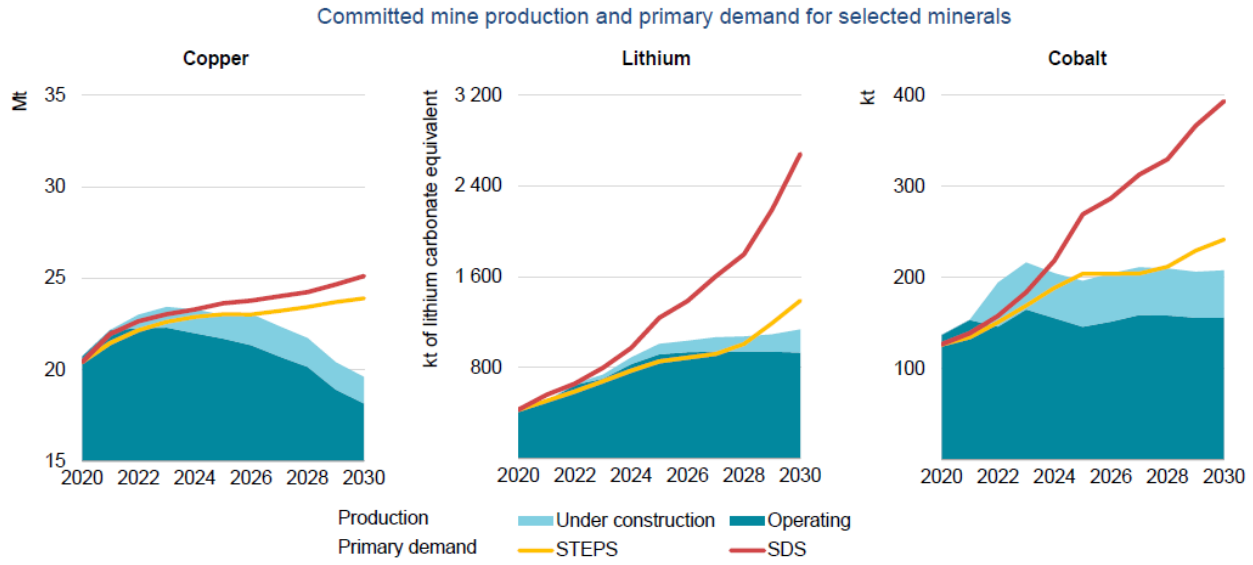

Notes: Total demand includes both demand from clean energy technologies and other consuming sectors. kt = thousand tonnes; STEPS = Stated Policies Scenario; SDS = Sustainable Development Scenario.

# ÉVOLUTION DE LA CONSOMMATION EN CUIVRE DANS UN SCÉNARIO 2°C: IMPACT DU CHOIX DE POLITIQUE DE MOBILITÉ

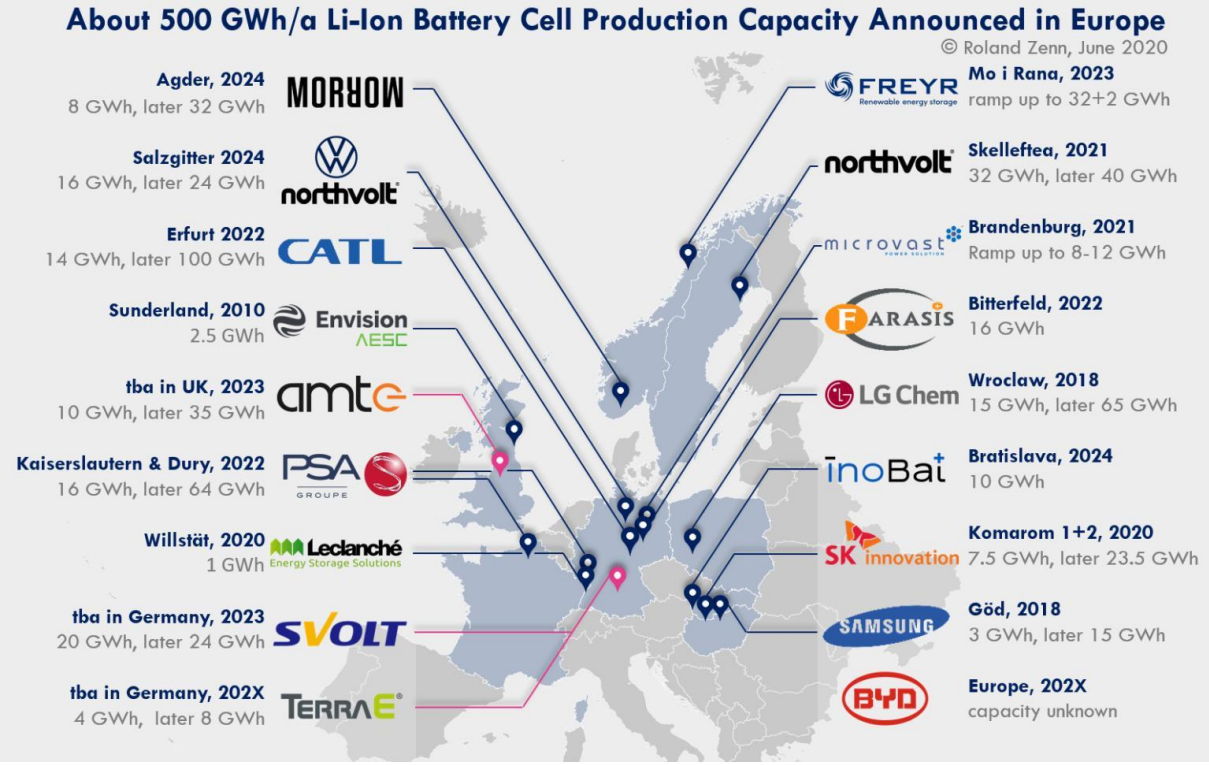


# Raising gaps of Offer vs Demand

**Meeting primary demand in the SDS requires strong growth in investment to bring forward new supply sources over the next decade**



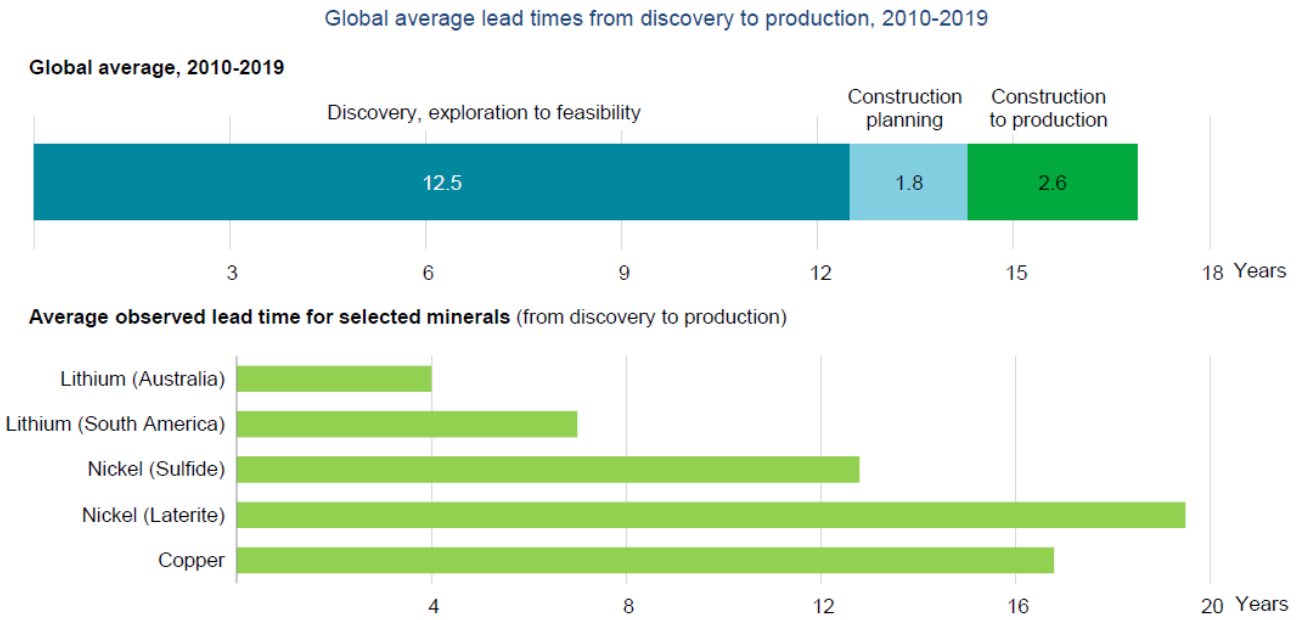
# Multiplication of fast track EV projects : batteries



# When Metal project dev needs time …



## Project development lead times: Market tightness can appear much more quickly than new projects

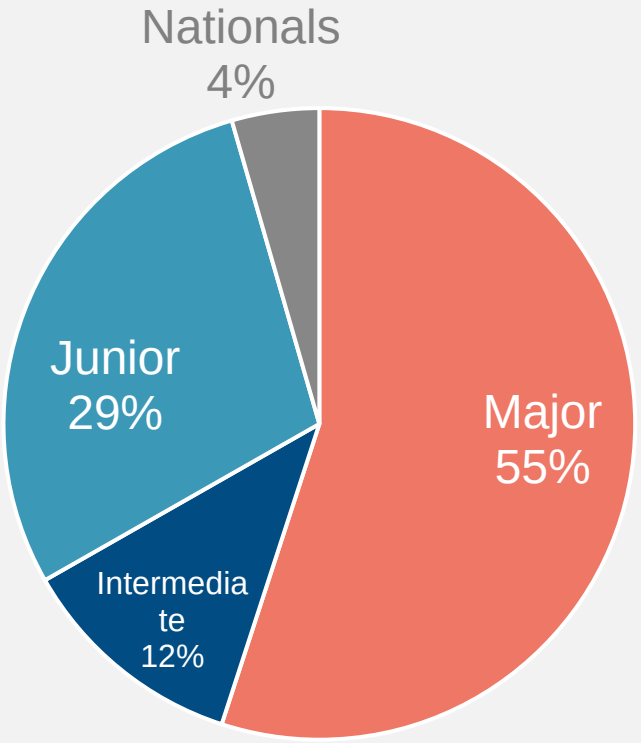





Note: Global average values are based on the top 35 mining projects that came online between 2010 and 2019.
Source: IEA analysis based on S&P Global (2020), S&P Global (2019a) and Schodde (2017).

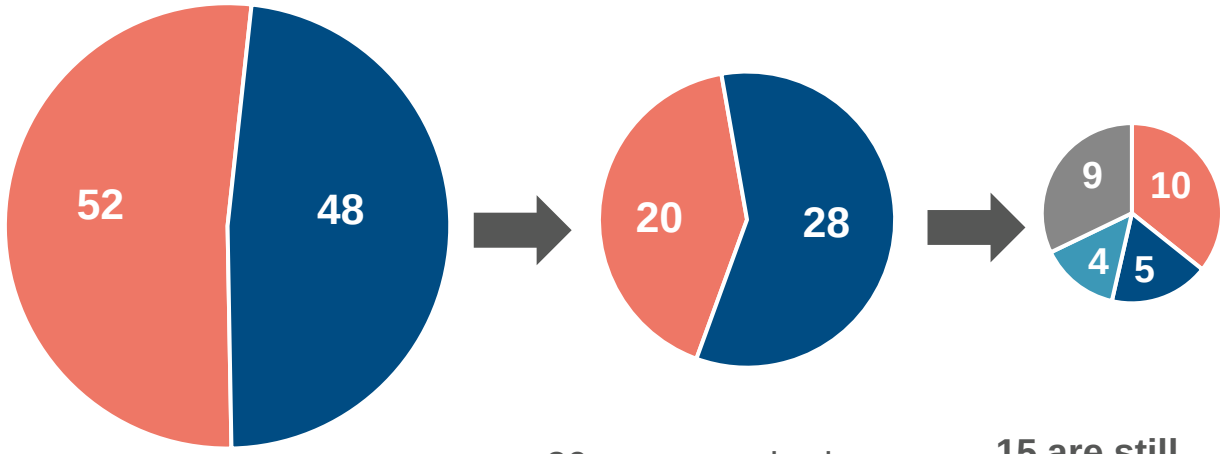
# 3 MAIN ACTORS developing the offer

## 2017 exploration budget repartition ($7.95B)




Article for AUS Bulletin (2015) – McCarthy (2003), Bullock (2011)

## 100 Juniors were followed between 2004 and 2014




52 are in stand by; **48 evolved**

20 were acquired, went bankrupt or changed their activity; **28 became producers**

**15 are still operating** (10 under their name, 5 were bought), 4 stopped mining, 9 went bankrupt

Juniors tend to surf the speculation wave but, yet, are responsible for 60% of discoveries. Majors are more keen on production and thus invest more on expansion.

# New Opportunities


## Non Mining Metal Resource : Recycling

- **Recycled steel** contributes to 16% of global supply,
- **Recycled copper** contributes to 50% of EU supply
- **E-wastes industry** in development
  - Processes applied : hydrometallurgy (68%) and pyrometallurgy (13%).
  - Abundant resource present in Europe: Future local M& industry in developed/wealthy countries, affording to treat/recycle their wastes

## New resources accessible

- **Due to climate change:** Greenland, Arctic
- **Subsea Mining, not yet mature :** Environmental solutions & Financial model still to be clarified (can we do something acceptable and profitable?)