



Africa Renewable Energy Manufacturing Initiative  
South-South Virtual Policy Dialogue Series  
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## #2 How trade policies can shape regional renewable energy supply chains and catalyze domestic manufacturing in Africa



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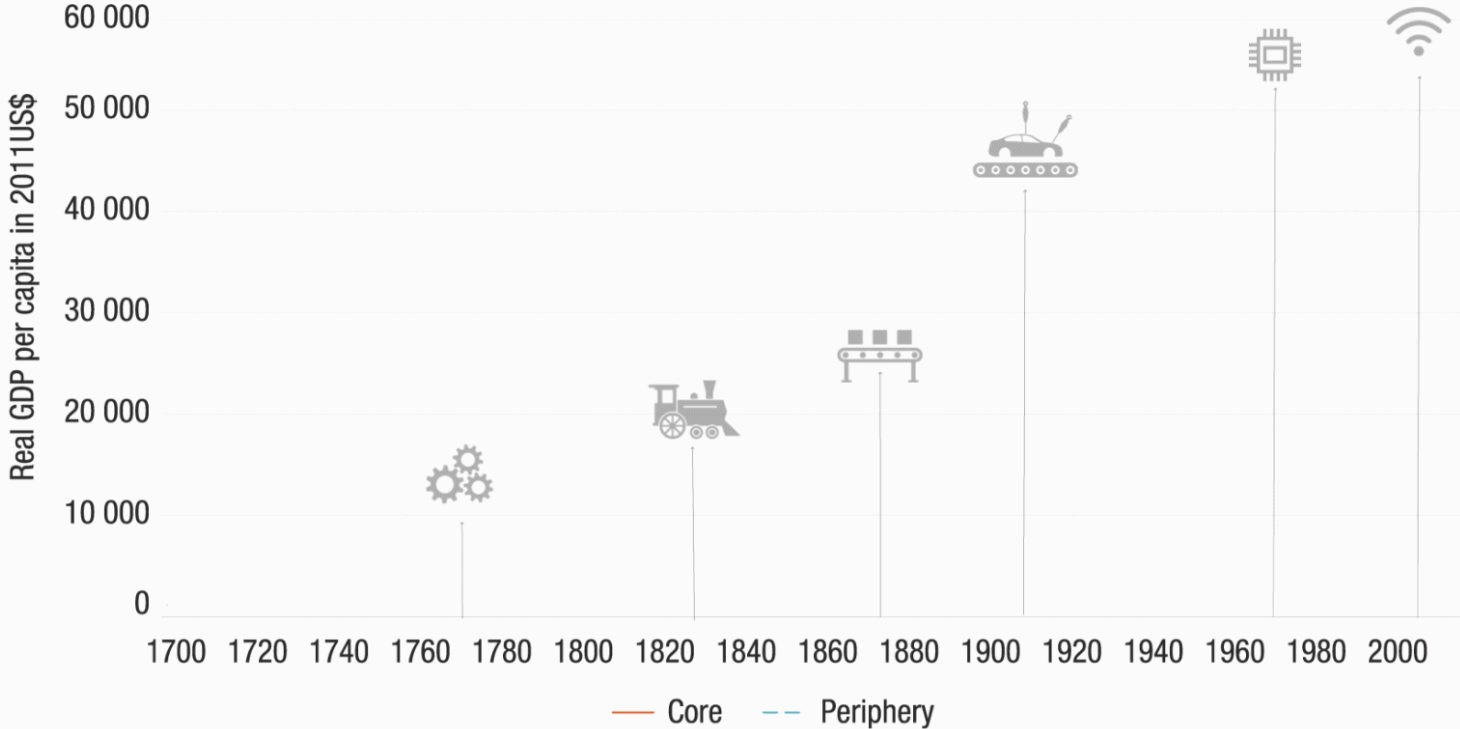


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**trade**  
& development

 UNCTAD

# Developing countries must catch the green technological revolution early

## Technological change and inequality through the ages

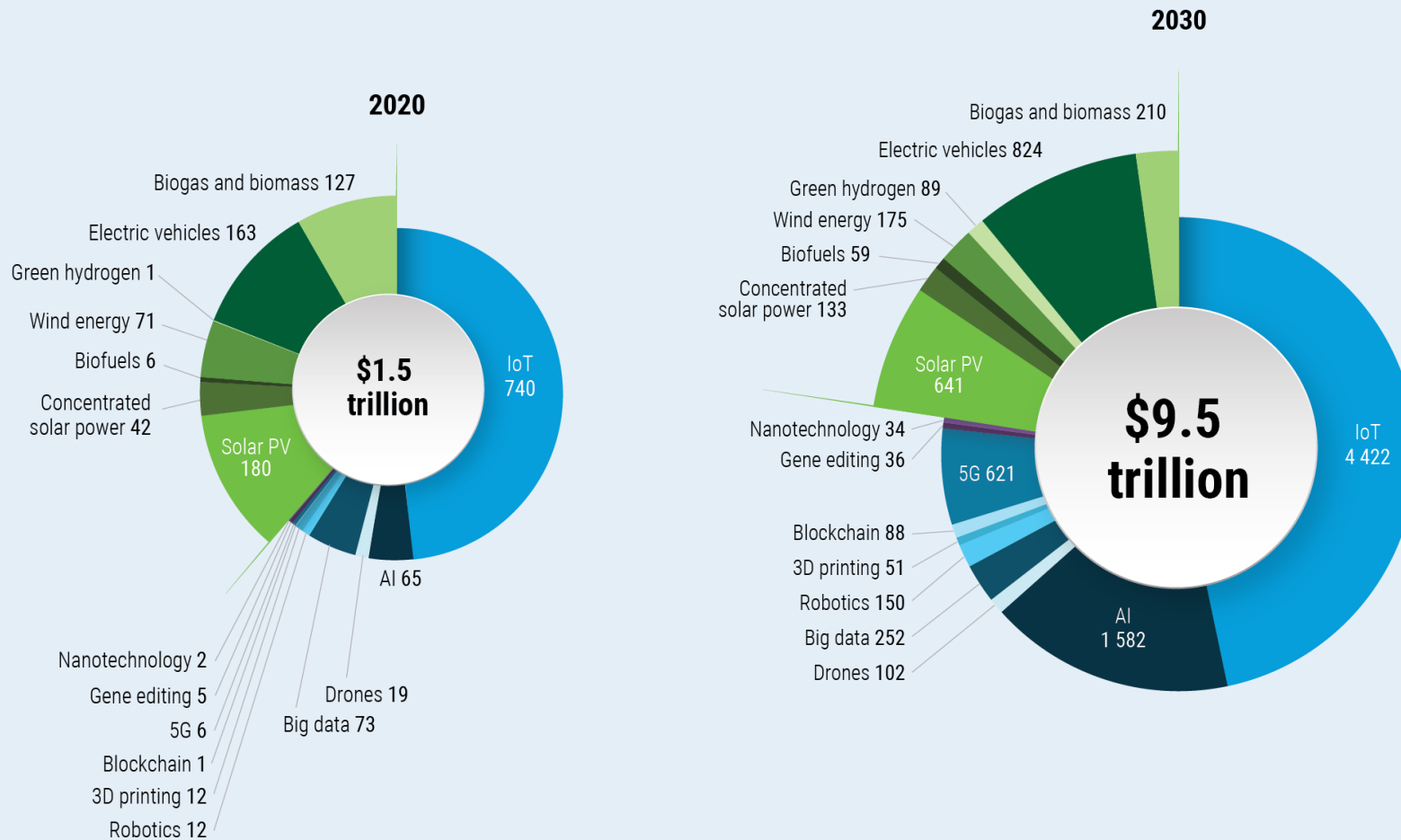


Source: UNCTAD's Technology and Innovation Report 2021



# There are enormous opportunities in the development of green frontier technologies

Market size estimates of frontier technologies, \$ billion



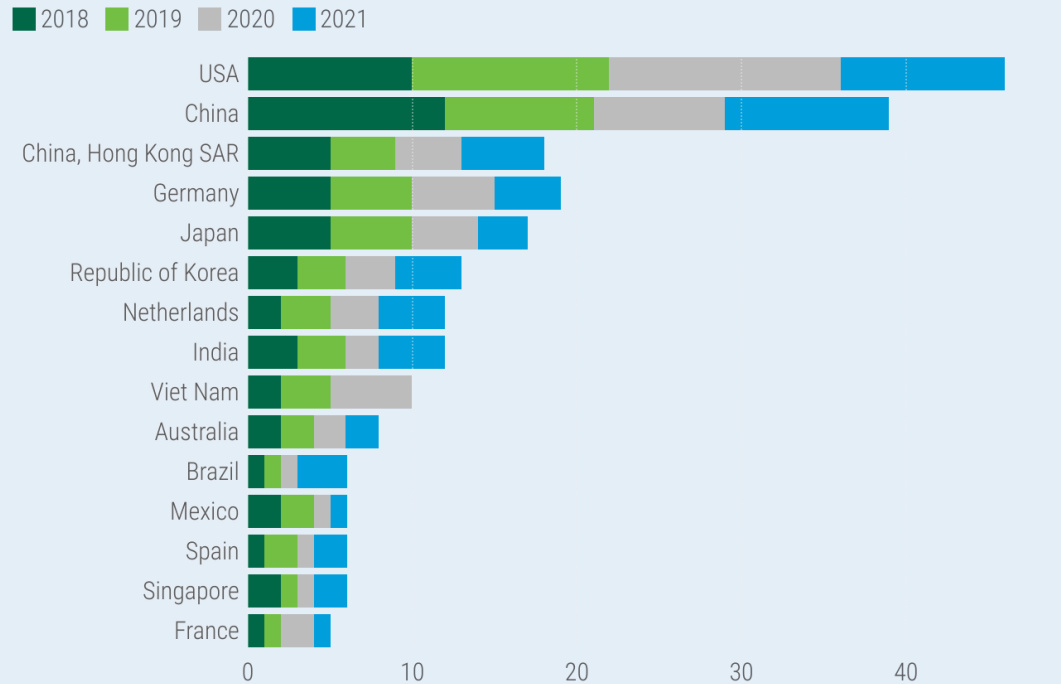
Source: UNCTAD based on various estimates.



# The trade of green technologies has expanded significantly in the last few years

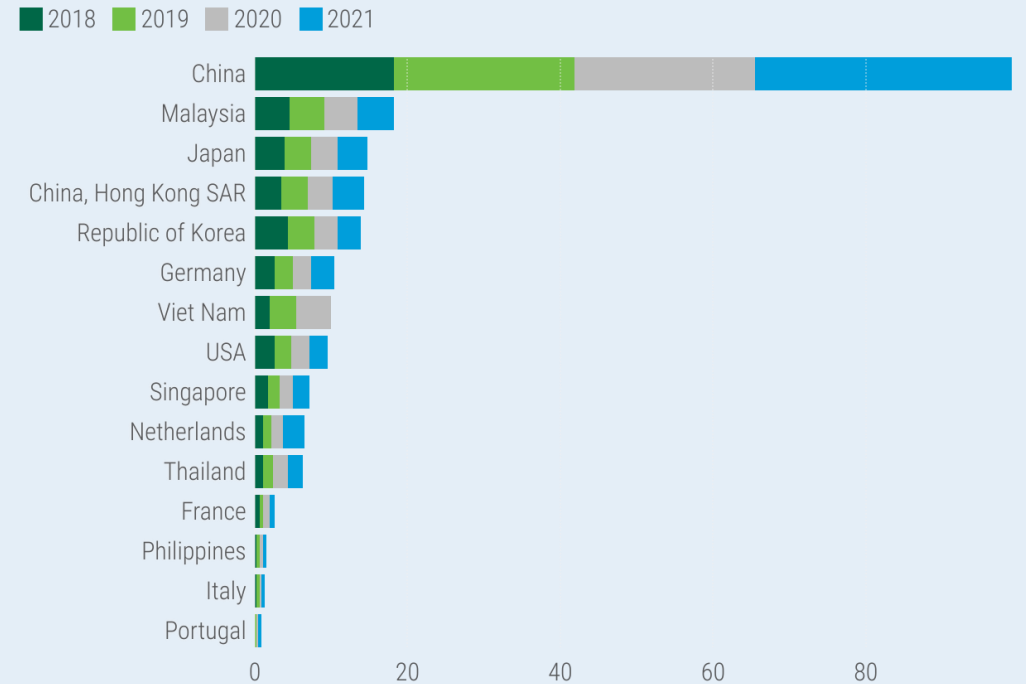
Solar PV imports and exports by top countries, 2018-2021 (USD billions)

## Solar PV: Top Importers



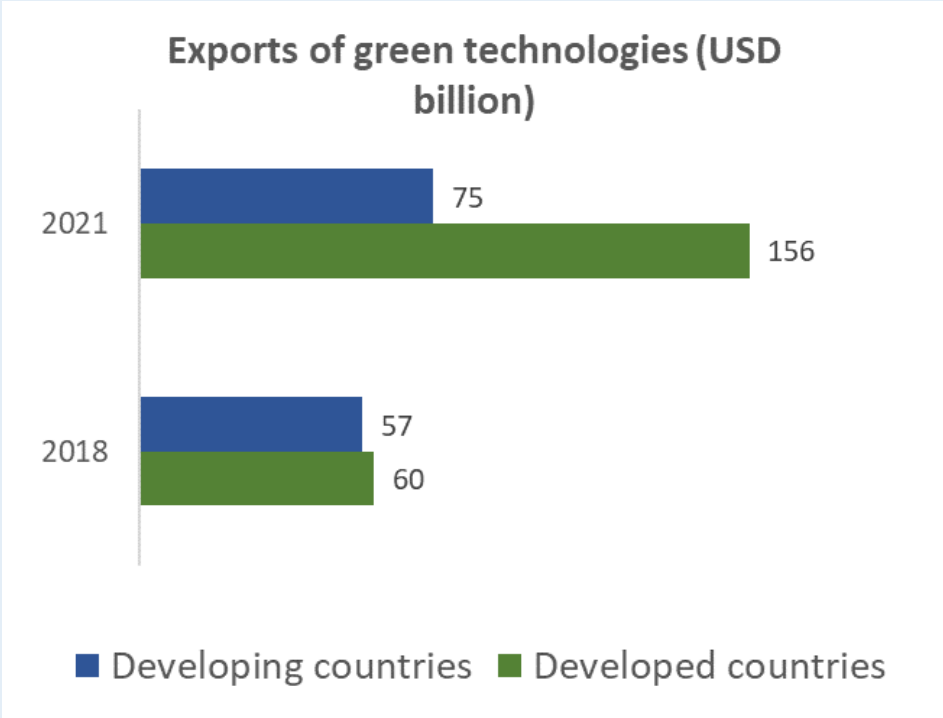
Source: UNCTAD

## Solar PV: Top Exporters

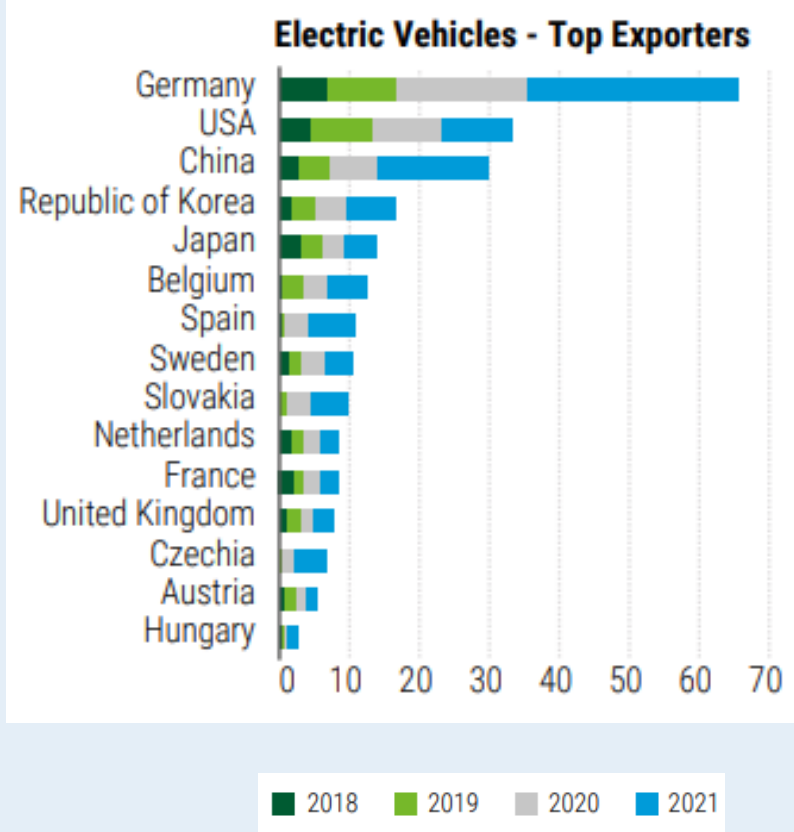


Source: UNCTAD

# But so far, developed economies are seizing most of the opportunities



Technology imports and exports by top countries, 2018-2021 (USD billions)



# Critical energy transition minerals (CETMs)

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

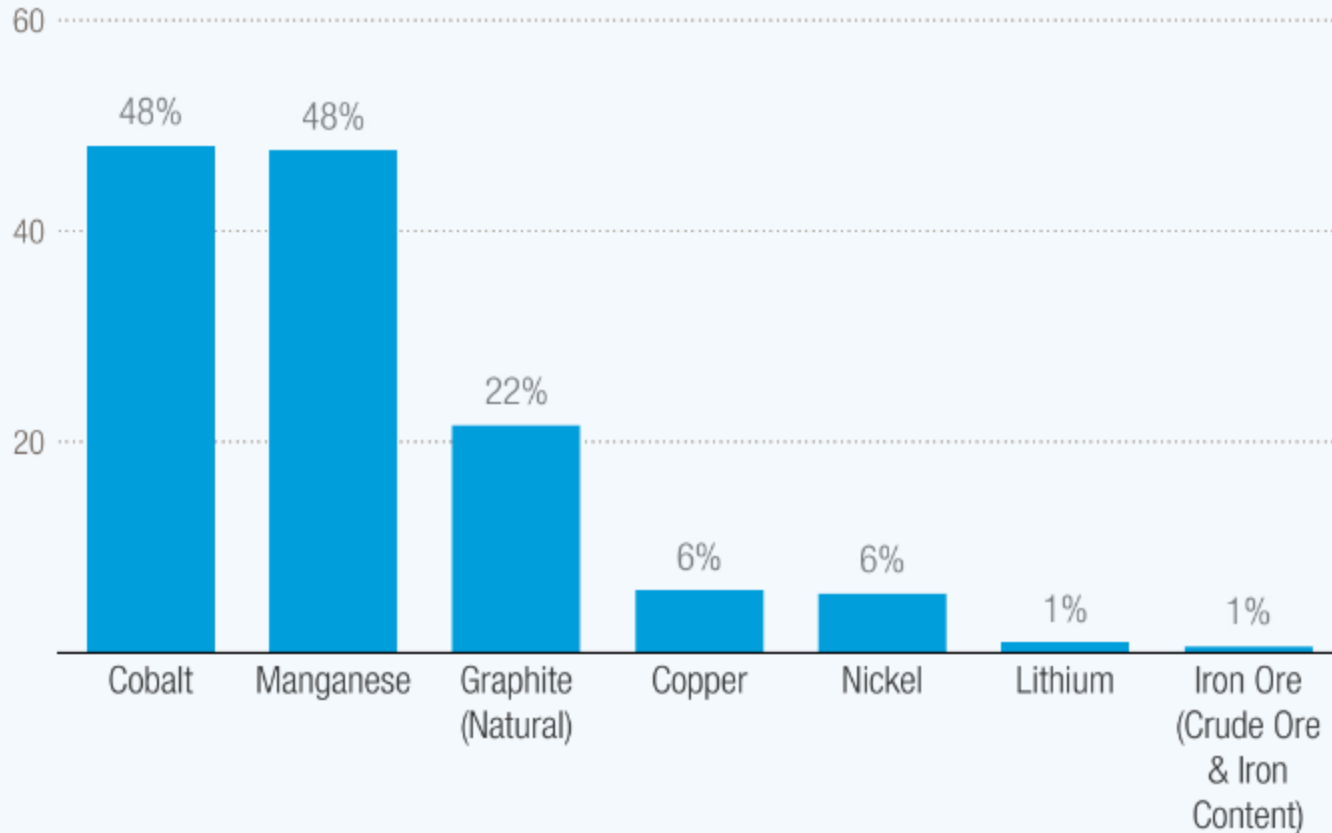
Source: IEA.

Notes: Shading indicates the relative importance of minerals for a particular clean energy technology (● = high; ● = moderate; ○ = low). CSP = concentrating solar power; PGM = platinum group metals.

\* Aluminum demand is assessed for electricity networks only and is not included in the aggregate demand projections.

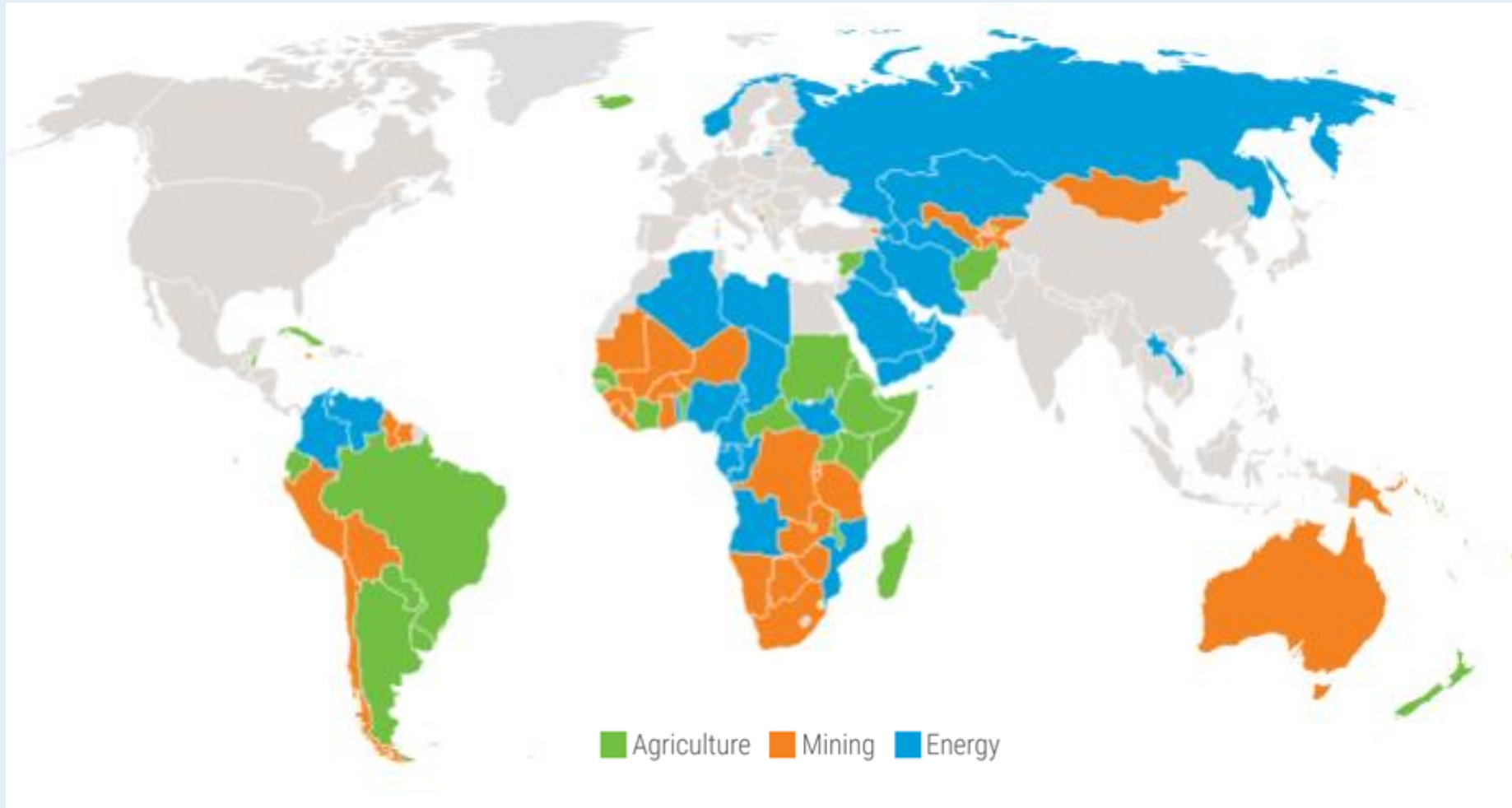
## Critical minerals: Africa has an abundance of metals needed for electric vehicles

Africa's share of global reserves, percentage



Source: UNCTAD calculations, based on data from the Knoema database, 2023

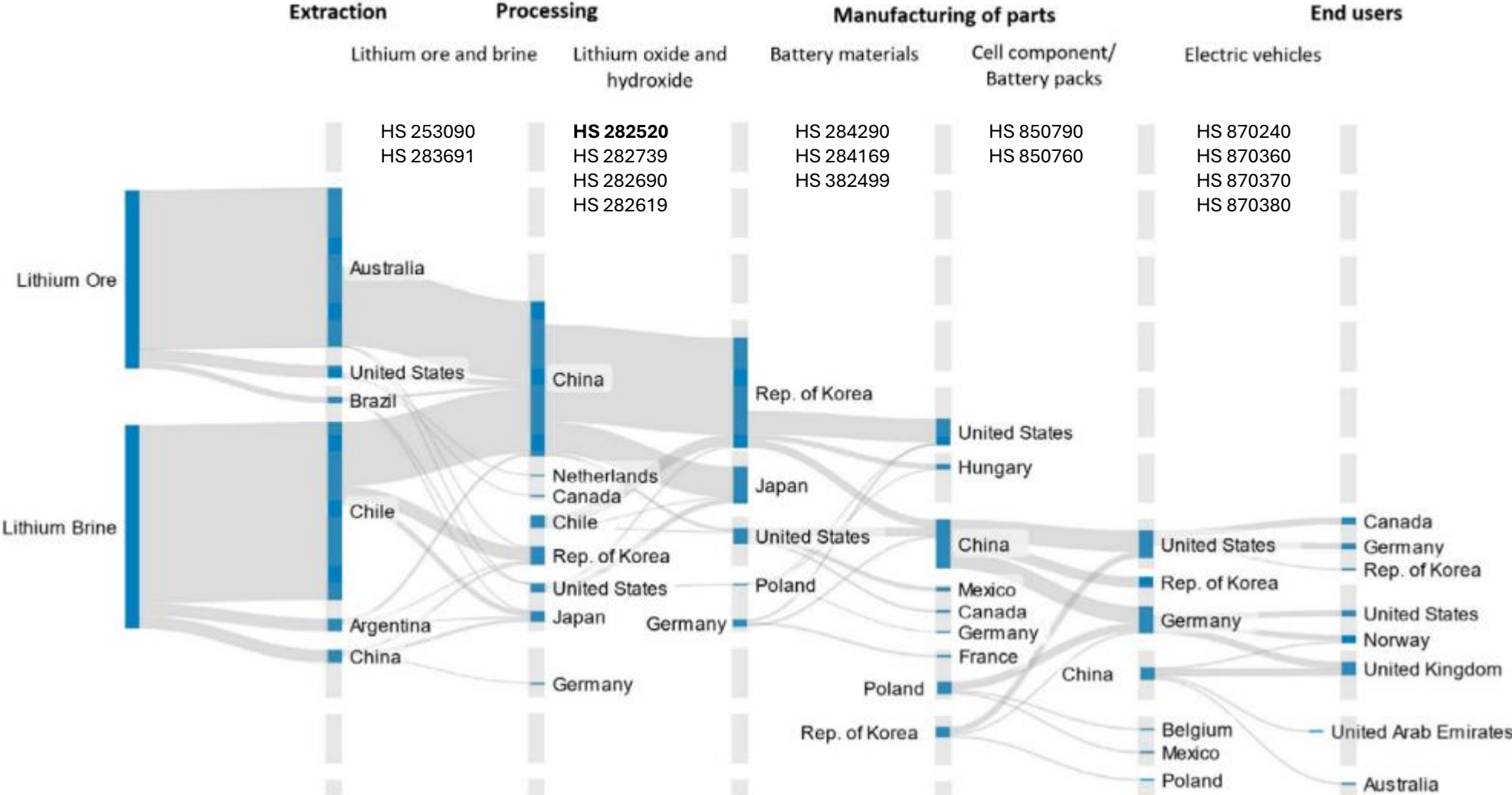
# Commodity dependence remains a critical issue for developing countries





# Trade is concentrated upstream in the value chain

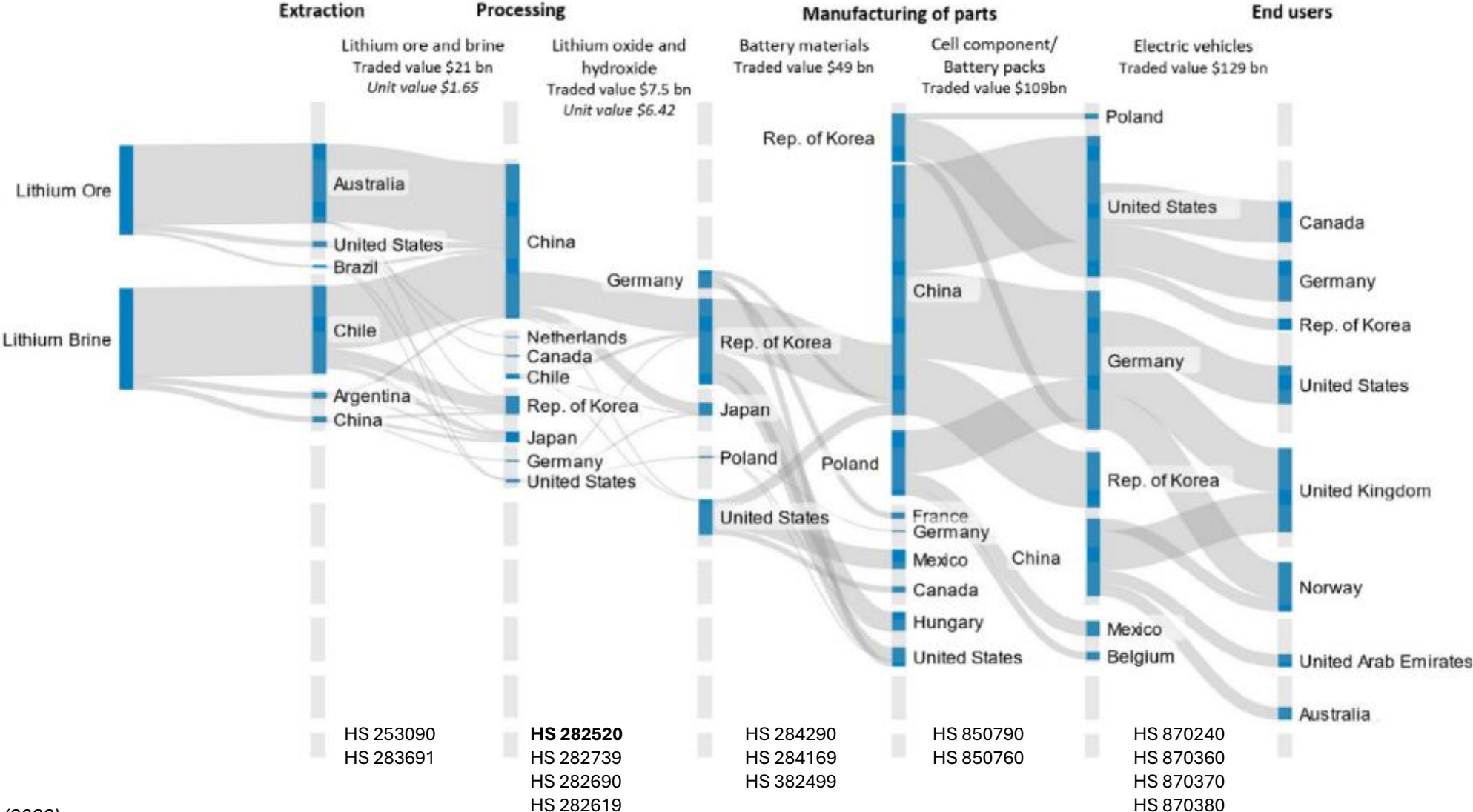
Lithium trade flows along the EV value chain, 2022 (percentage of total exports)



Note: export value (2022)  
 Source: UNCTAD Secretariat based on calculations from UN Comtrade.

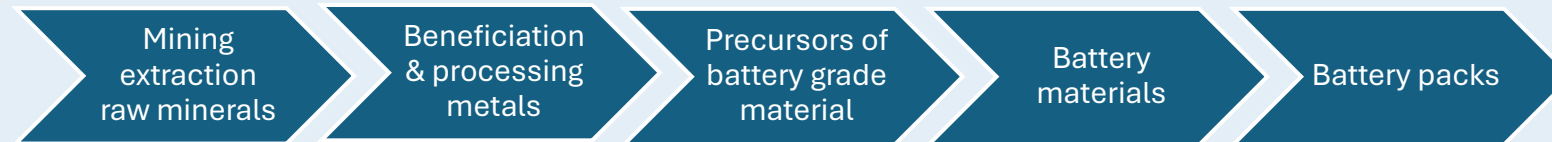
# Trade values increase downstream in the value chain

Lithium trade flows along the EV value chain, 2022 (USD)

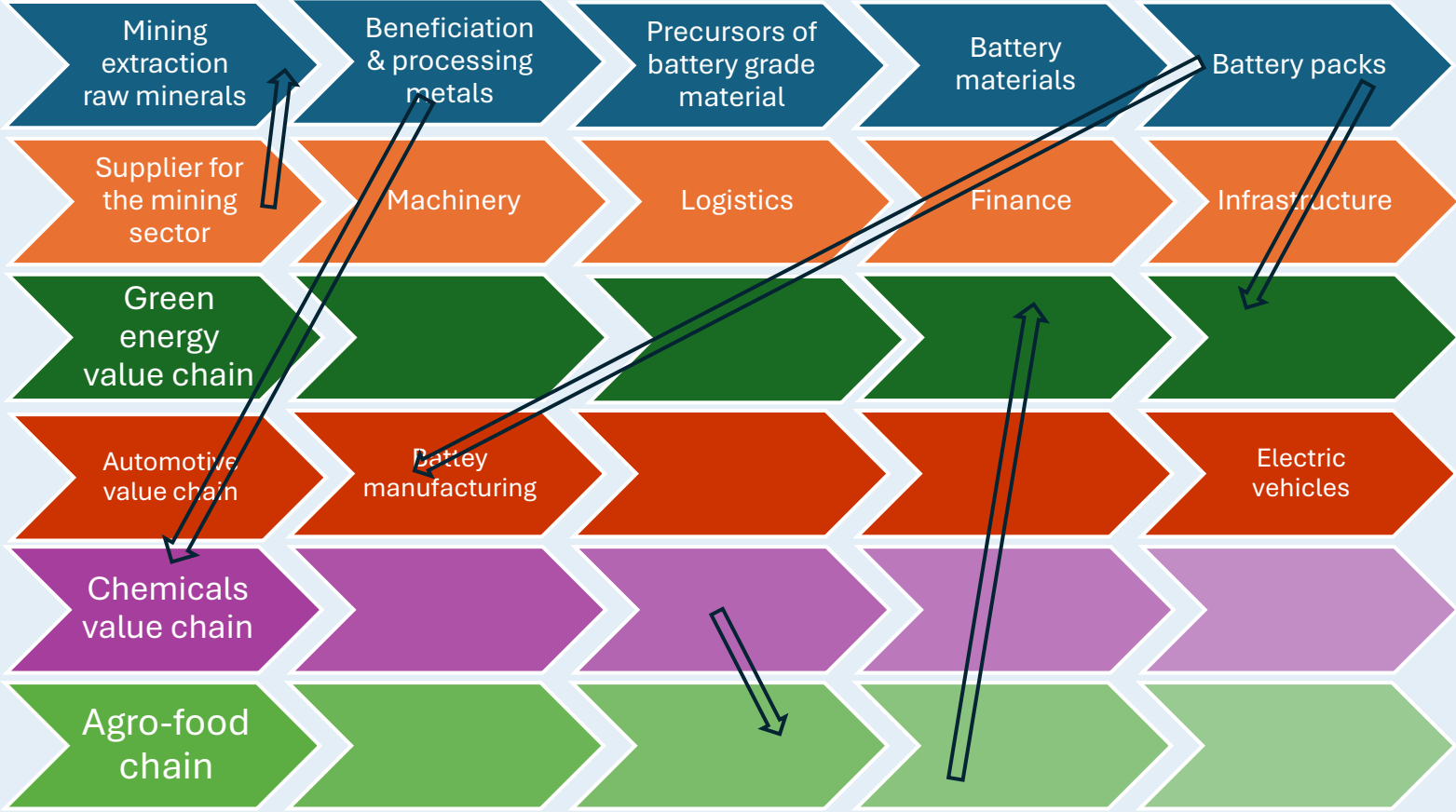


Note: export value (2022)  
 Source: UNCTAD Secretariat based on calculations from UN Comtrade.

# Value addition and diversification: Structural transformation perspective

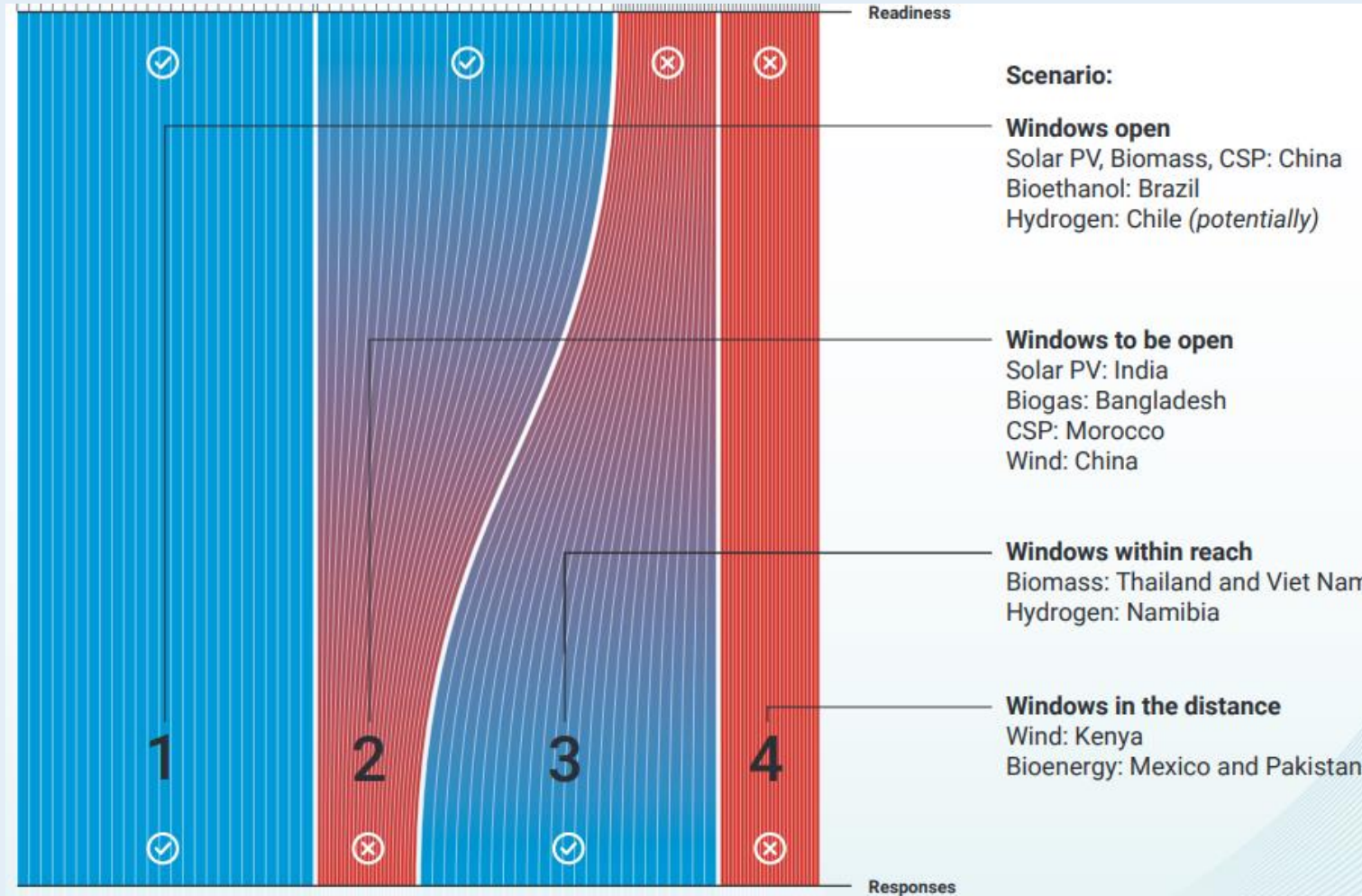


# Value addition and diversification: Structural transformation perspective



Source: UNCTAD based on Andreoni A and Avenyo E (2023). Critical Minerals and Routes to Diversification in Africa: Linkages, Pulling Dynamics and Opportunities in Medium-High Tech Supply Chains. Background paper commissioned by the UNCTAD secretariat for the 2023 edition of the Economic Development in Africa Report. [https://unctad.org/system/files/non-official-document/edar2023\\_BP1\\_en.pdf](https://unctad.org/system/files/non-official-document/edar2023_BP1_en.pdf)

# Combining strong initial conditions and strong responses make up the best scenario to seize GWOs but weak conditions can be compensated by strong efforts





| Dimensions of tradability | Capital equipment and inputs                              | Energy generation technology                        | Green energy outputs           |
|---------------------------|---|---|--------------------------------|
| <b>Bioethanol</b>         | <i>Medium</i><br>(Distillery equipment)                   | <i>Low</i><br>(Ethanol distillery)                  | <i>High</i><br>(Ethanol)       |
| <b>Biogas (a)</b>         | <i>Low</i><br>(Heavy-duty machinery)                      | <i>Low</i><br>(Biogas plant, e.g., waste to energy) | <i>High</i><br>(Gas)           |
| <b>Biogas (b)</b>         | <i>High</i><br>(Anaerobic digestion equipment)            | <i>Low</i><br>(Biogas digester)                     | <i>High</i><br>(Gas)           |
| <b>Biomass</b>            | <i>Low</i><br>(Equipment)                                 | <i>Low</i><br>(Direct-fired biomass plant)          | <i>Medium</i><br>(Electricity) |
| <b>Solar PV</b>           | <i>High</i><br>(Industrial robots, assembly line designs) | <i>High</i><br>(Solar PV Panels)                    | <i>Medium</i><br>(Electricity) |
| <b>CSP</b>                | <i>Low</i><br>(Heavy duty machinery)                      | <i>Low</i><br>(Solar farm)                          | <i>Medium</i><br>(Electricity) |
| <b>Wind power</b>         | <i>Low</i><br>(Heavy duty machinery, steel)               | <i>Medium</i><br>(Wind turbines)                    | <i>Medium</i><br>(Electricity) |
| <b>Green Hydrogen</b>     | <i>Medium</i><br>(Electrolysis equipment)                 | <i>Low</i><br>(Conversion facility)                 | <i>High</i><br>(Ammonia)       |

The level of tradability influences both competitive dynamics and modes of learning

# Incentive policies to green technologies

Developing and developed countries have implemented a mix of direct and indirect incentive measures to develop green industries

| Support policies               | Examples of implementing countries  |
|--------------------------------|---|
| Local content requirements     | China, South Africa, India, Morocco, Brazil, Canada, Spain                                      |
| Favourable custom duties       | India, South Africa, Thailand, Mexico, Denmark, Germany, Australia, China                       |
| Export credit assistance       | Denmark, Germany  |
| Quality certification          | India, China, Denmark, Germany, USA, Japan  |
| Financial and tax incentives   | India, Kenya, Morocco, Brazil, Thailand, China, Canada, Australia, Spain, USA, Germany, Denmark |
| Research and development       | Morocco, Brazil, Denmark, Germany   |
| Feed-in-tariffs of fixed price | Iran, Kenya, China, Brazil, India, Germany, Denmark, Spain, Netherlands, Japan                  |
| Mandatory RE targets           | Australia, UK   |
| Government tendering           | South Africa, Brazil, India, China, UK, Canada, Japan   |

Source: UNCTAD based on multiple sources

Trade policies have been the part of the incentives to develop green industries

# Burgeoning CETM policy actions with different policy objectives

UNCTAD Database on CETM Agreements: An ongoing work to systematically assess the proliferating state-to-state agreements on CETMs in recent years.

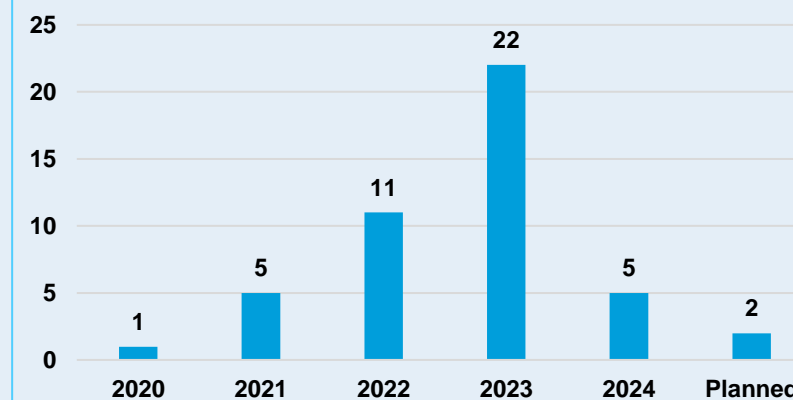
## UNCTAD Database on CETM Agreements

| Typology of agreements (2020-present) in Database | Count     |
|---|-----------|
| Memorandum of Understanding                       | 18        |
| Partnership Agreement                             | 14        |
| Joint Statement                                   | 9         |
| Dialogue or Working Group                         | 6         |
| <b>TOTAL</b>                                      | <b>47</b> |

| Issues covered by agreements  | Count |
|-------------------------------|-------|
| Research cooperation          | 31    |
| Investment and finance        | 26    |
| Environment and social impact | 22    |
| Extraction                    | 18    |
| Exploration                   | 17    |
| Recycling                     | 17    |
| Trade cooperation             | 15    |

| States with agreements                  |
|---|
| Australia                               |
| Canada                                  |
| Chile                                   |
| China                                   |
| Democratic Republic of Congo            |
| European Union / France, Germany, Italy |
| India                                   |
| Japan                                   |
| Kazakhstan                              |
| Namibia                                 |
| Republic of Korea                       |
| United Kingdom                          |
| United States                           |
| Vietnam                                 |
| Zambia                                  |

Number of Agreements on CETMs, 2020-present



## International cooperation

Consistency between international agreements on trade, intellectual property and climate change is critical for green technology revolution

Trade rules should permit developing countries to foster infant green industries, e.g. through tariffs, subsidies and public procurement

Intellectual property should have greater flexibilities for developing countries with regard to green technologies

# Thank you

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