What are the Opportunities for Industrialization & Revenue Mobilization in Ghana's Energy Transition Plan?

Tang Palace Hotel, Roman Ridge

17th April 2024

IMANI
Center for Policy & Education

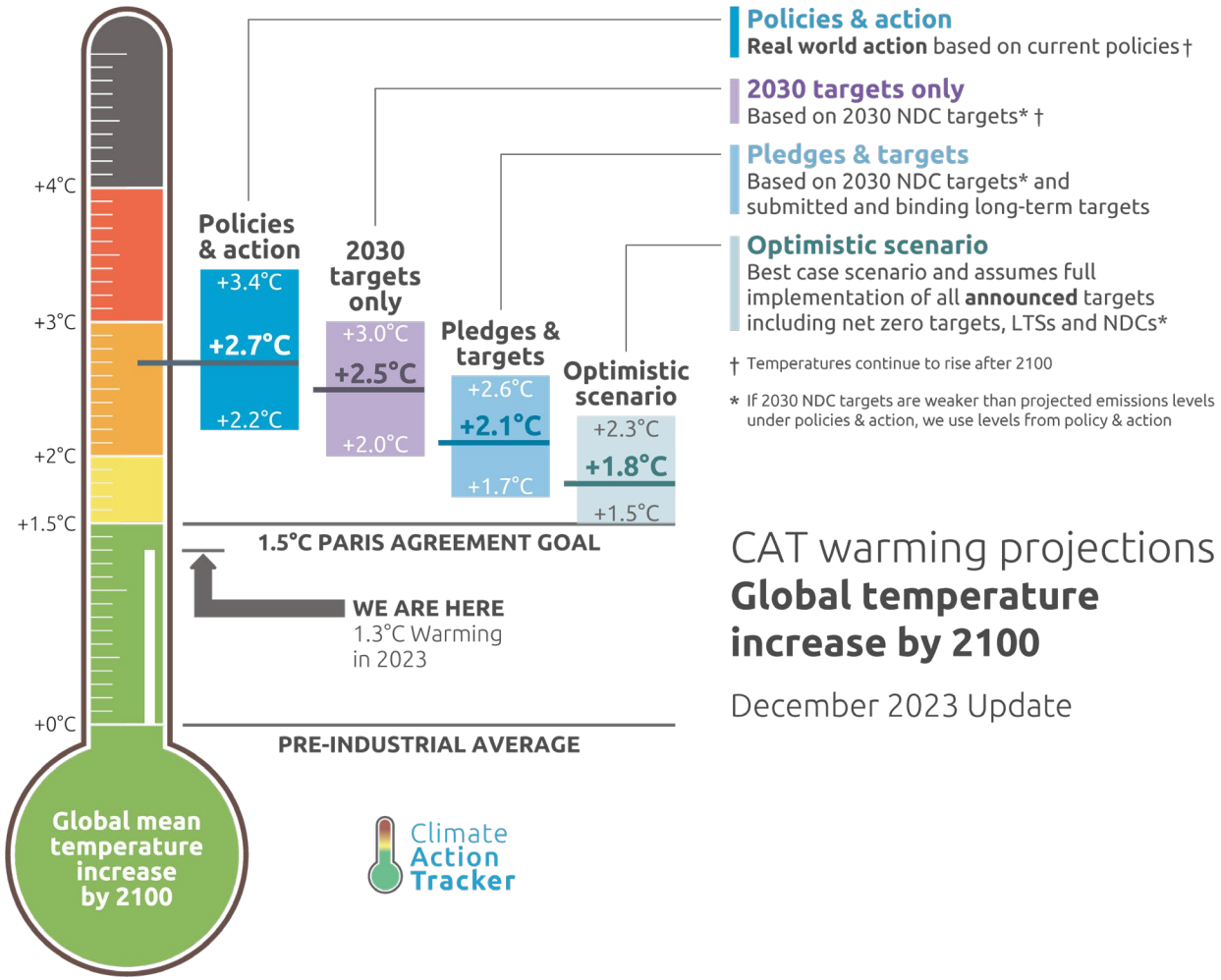
Natural Resource Governance Institute



Outline

- Context – Energy Transition, Industrialization and Revenue Mobilization
- Objectives of the Paper
- Approach
- Ghana's Economy in Perspective – Implications for the Energy Transition
- Ghana's Energy Transition Plan & Low-Carbon Industrialization
- Opportunities & Constraints for Low-Carbon Industrialization through the Energy Transition
- Domestic Revenue Mobilization through the Energy Transition
- Conclusions & Way Forward

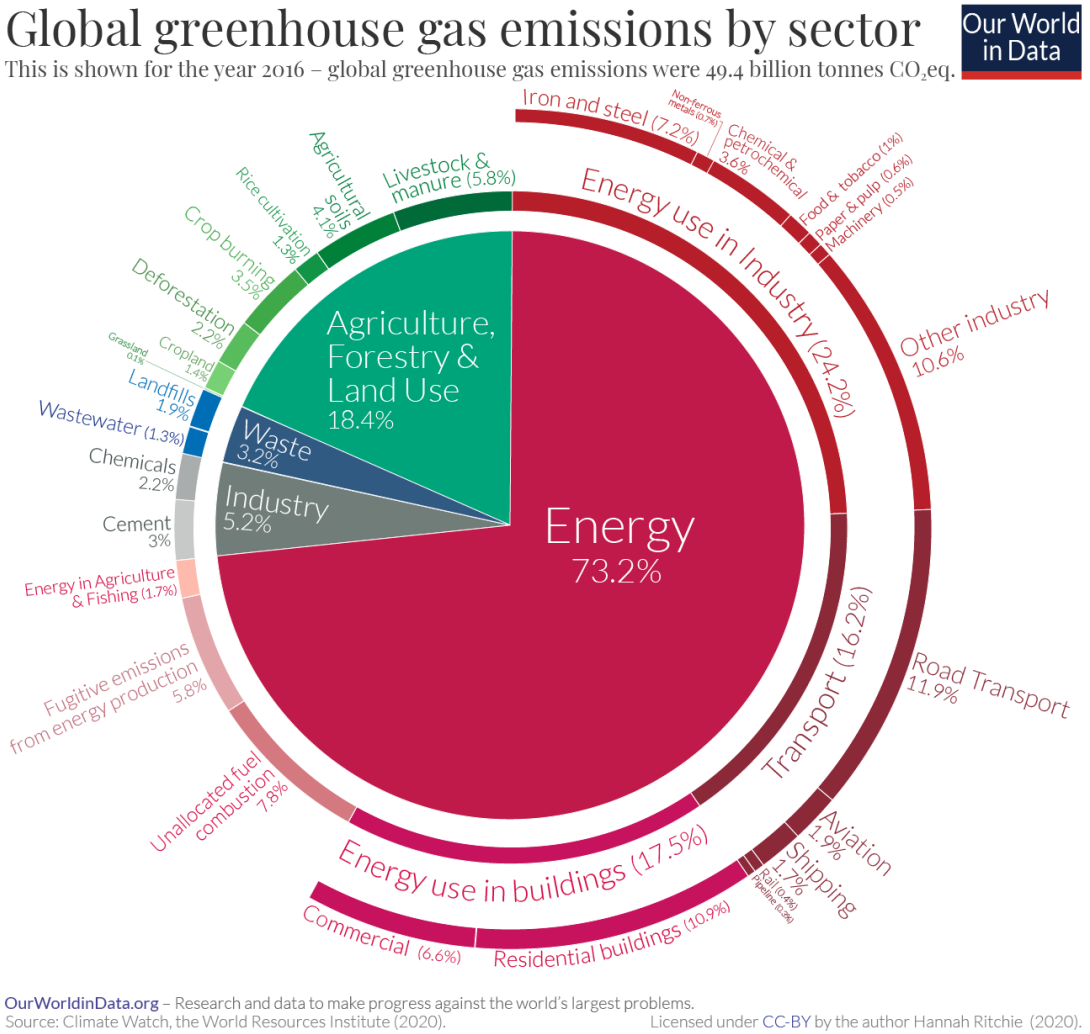
Global GHG missions continue to rise when they need to be falling



CAT warming projections
Global temperature increase by 2100

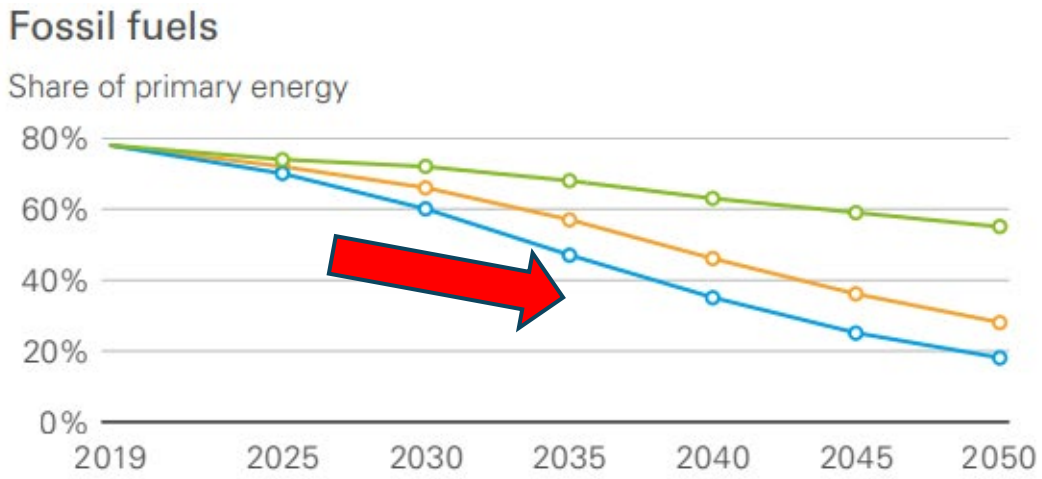
December 2023 Update

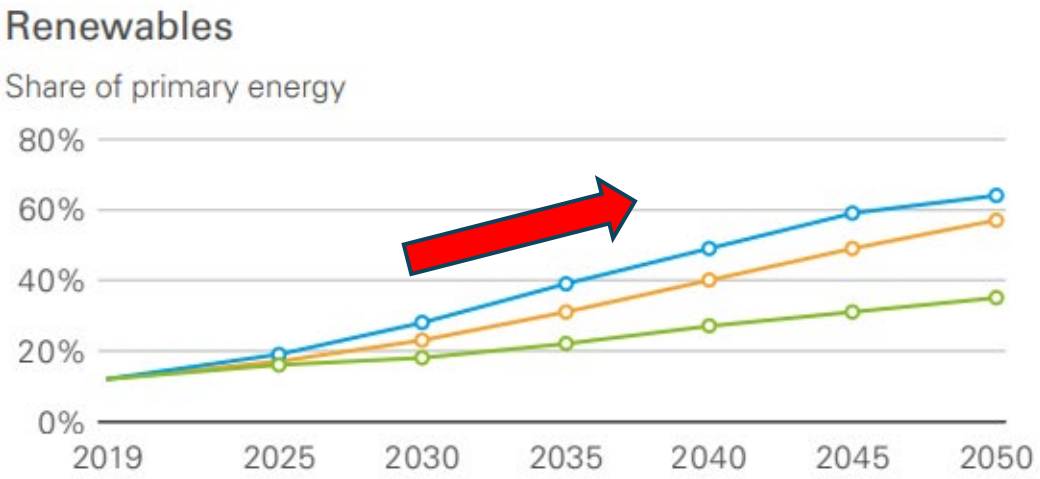
https://climateactiontracker.org/global/cat-thermometer

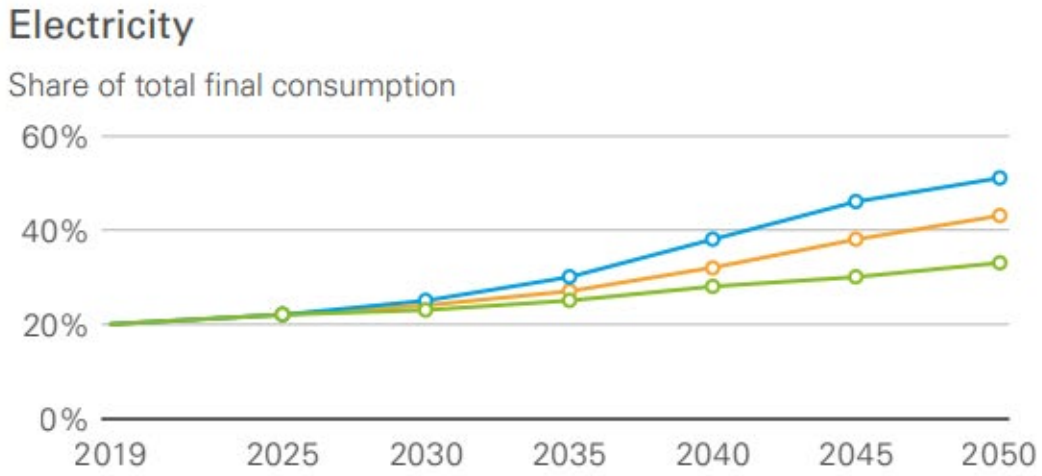


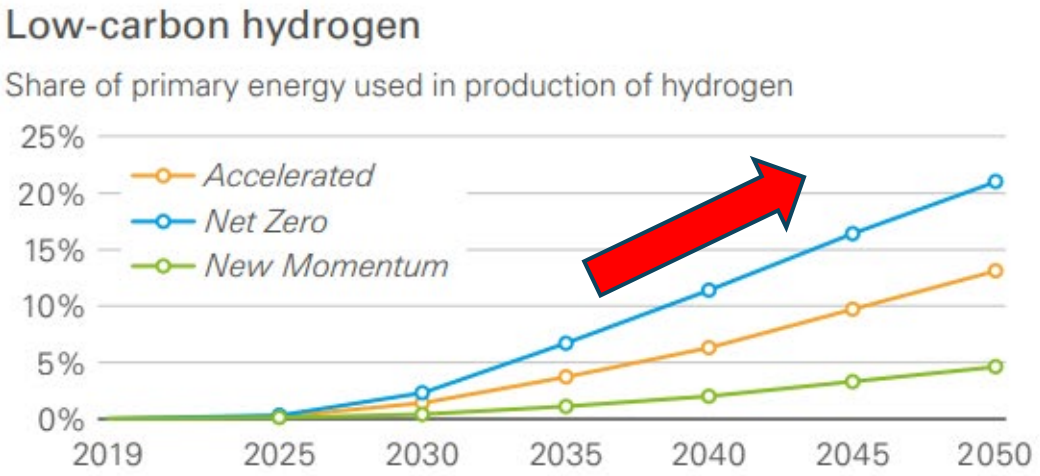
https://ourworldindata.org/ghg-emissions-by-sector

Future global energy will be dominated by four trends: declining hydrocarbons, rapid expansion in RE, increasing electrification, and growing use of hydrogen



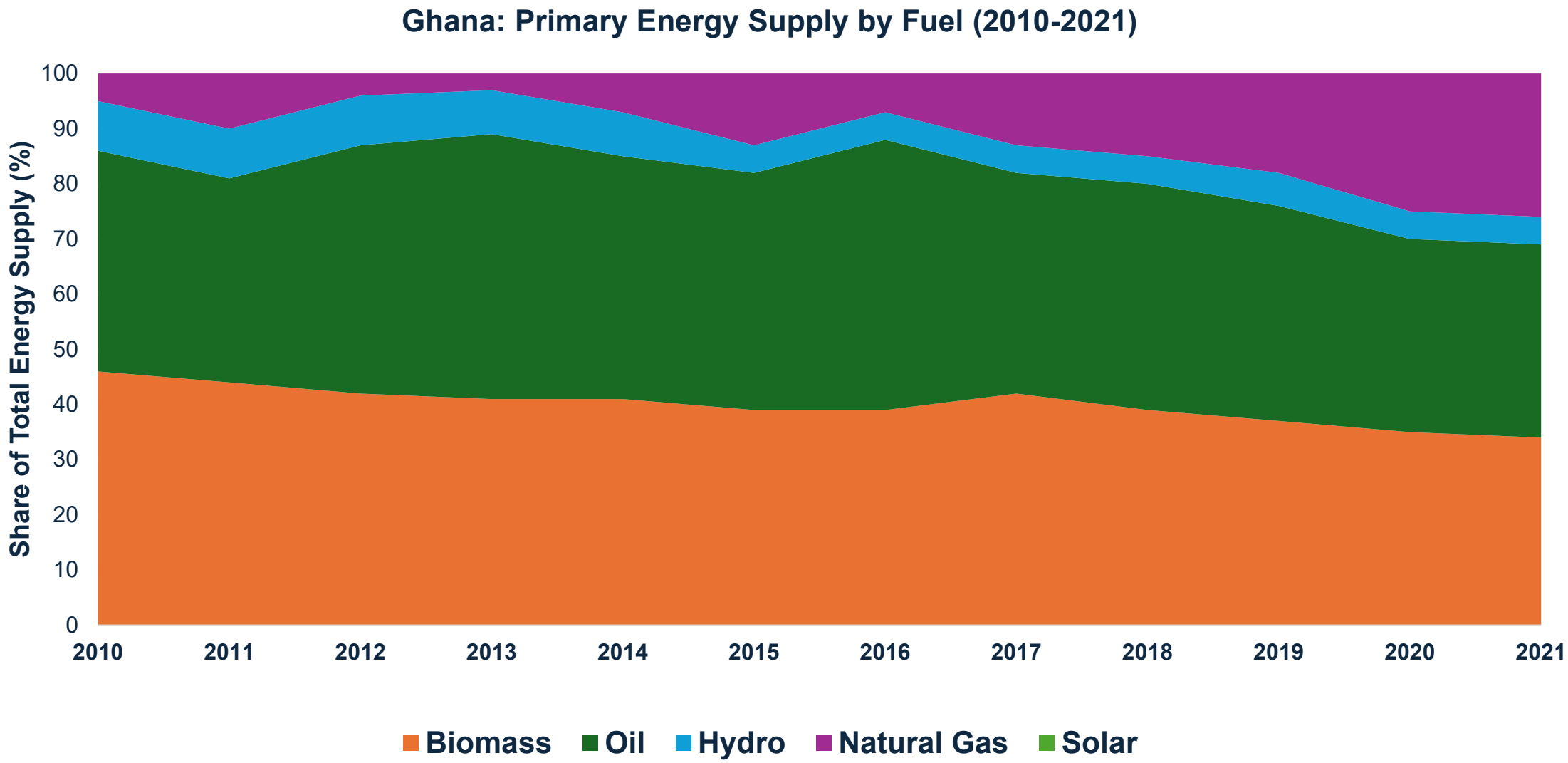




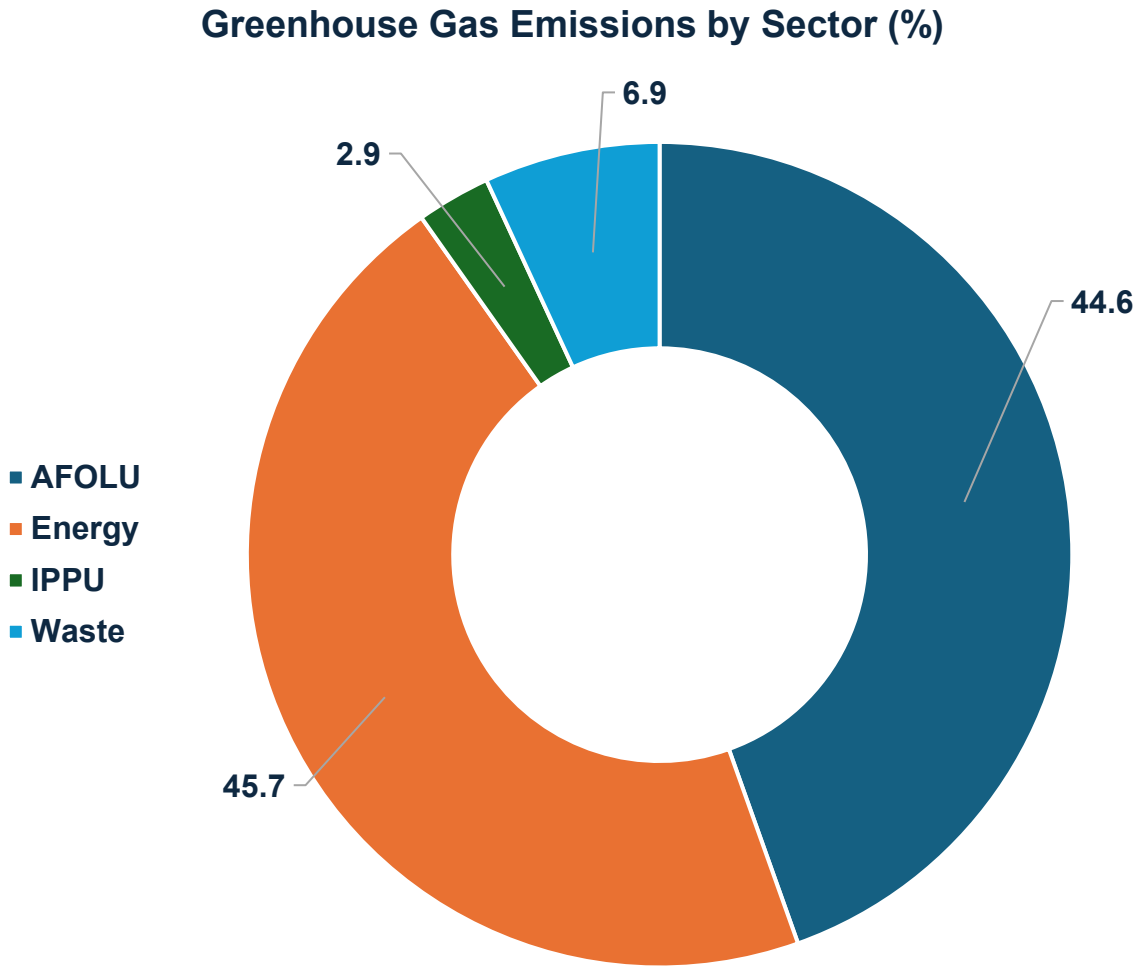


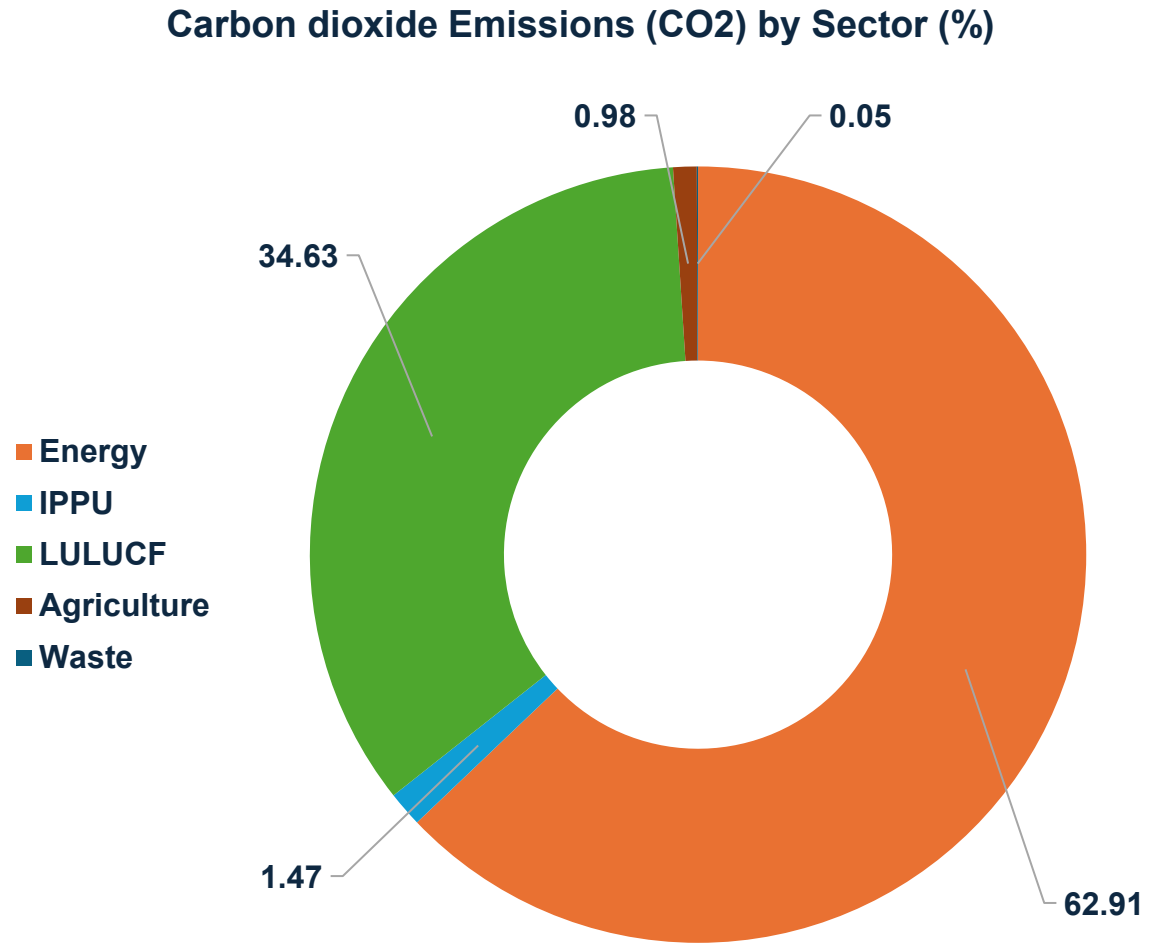
Source: BP Energy Outlook 2023

Context: Current energy supply sources not sufficient to address the energy triple challenge of affordable & reliable supply, environmental sustainability, and economic development



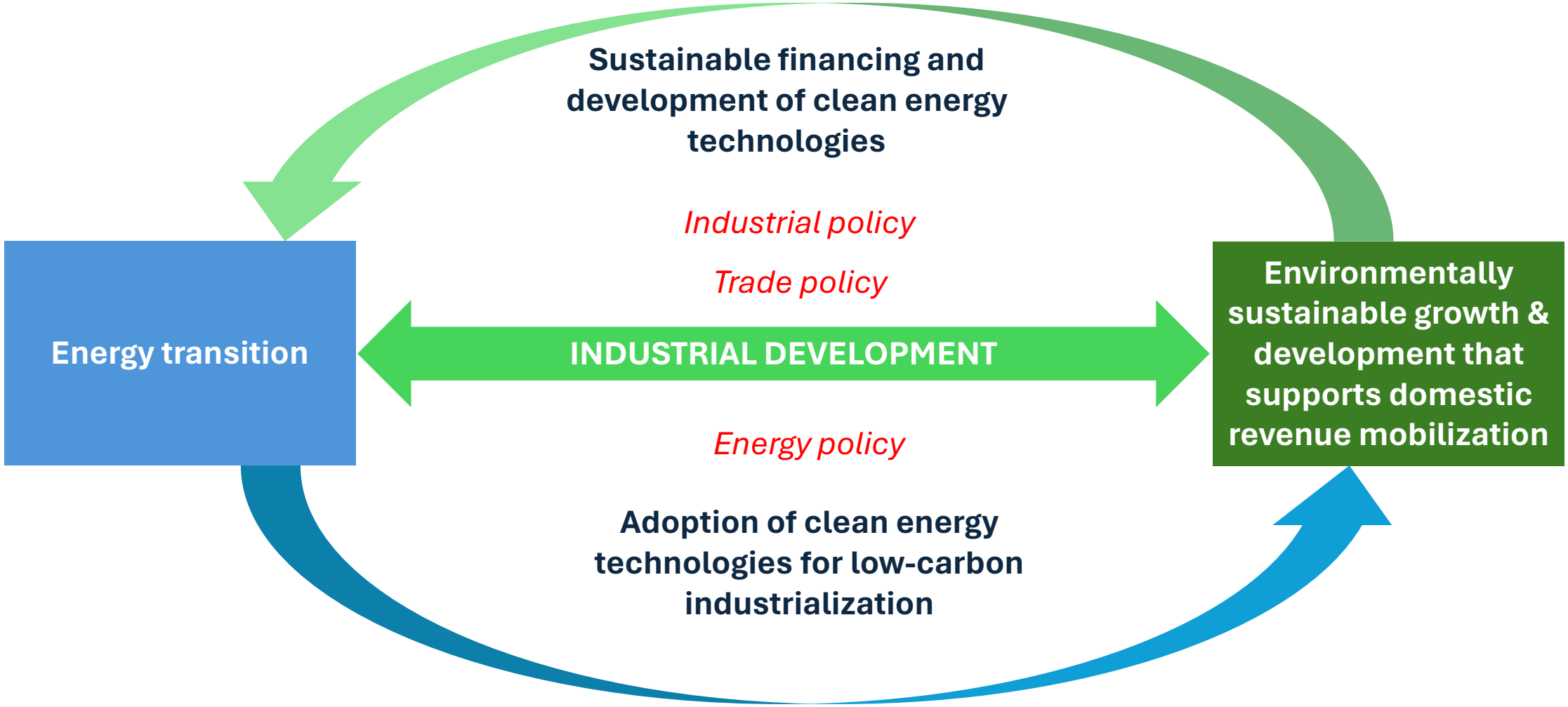
The energy transition is critical to addressing Ghana's climate concerns, particularly the issues of decarbonising industry





EPA (2022)- 5th GHG Inventory Report

The energy transition will be transformative if linked with industrial development



Purpose of the Project



Examine Ghana's Energy Transition Plan (ETP) in the context of low-carbon industrialisation.

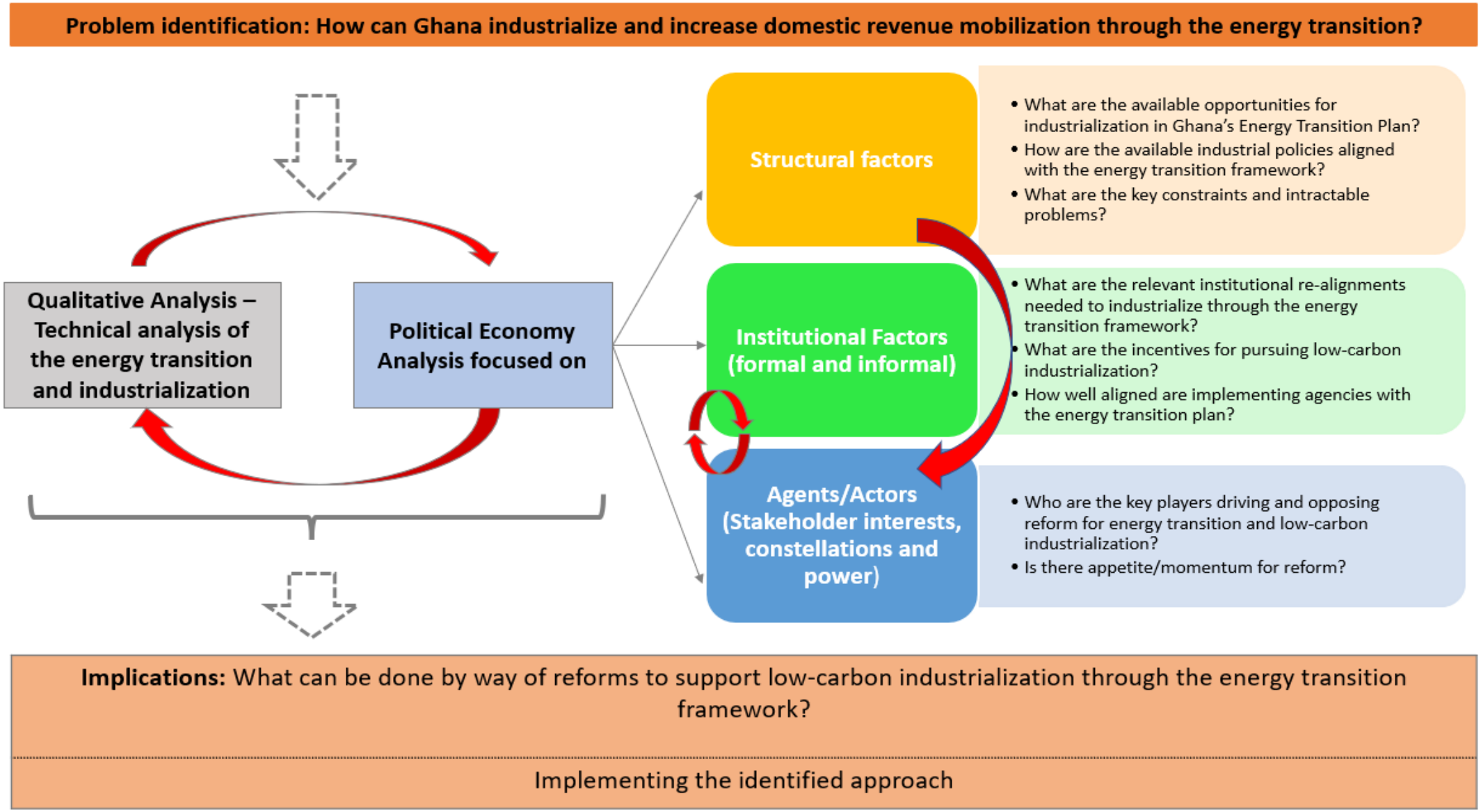


Identify the existing policy and institutional challenges to achieving low-carbon industrialisation through the energy transition.

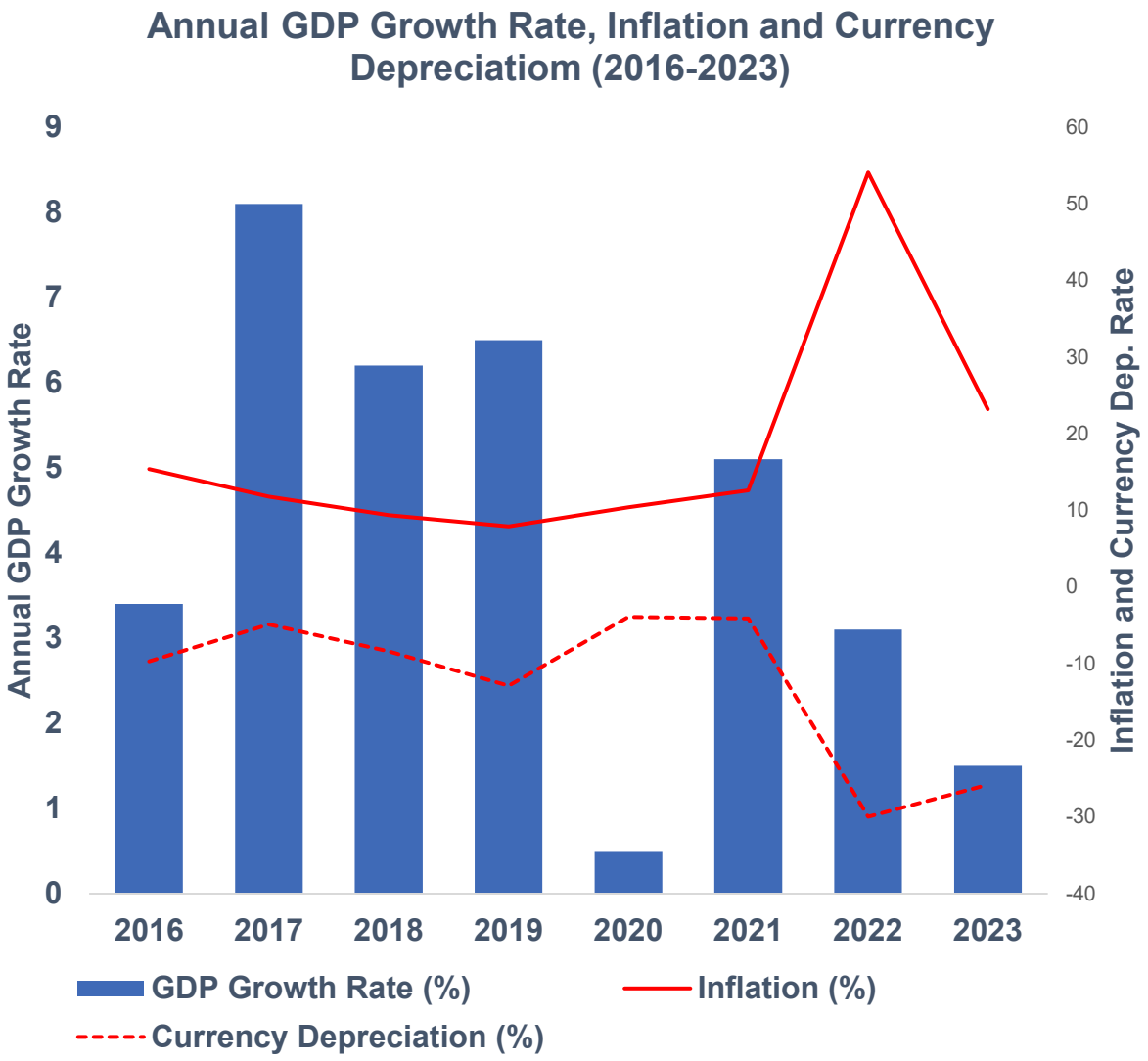


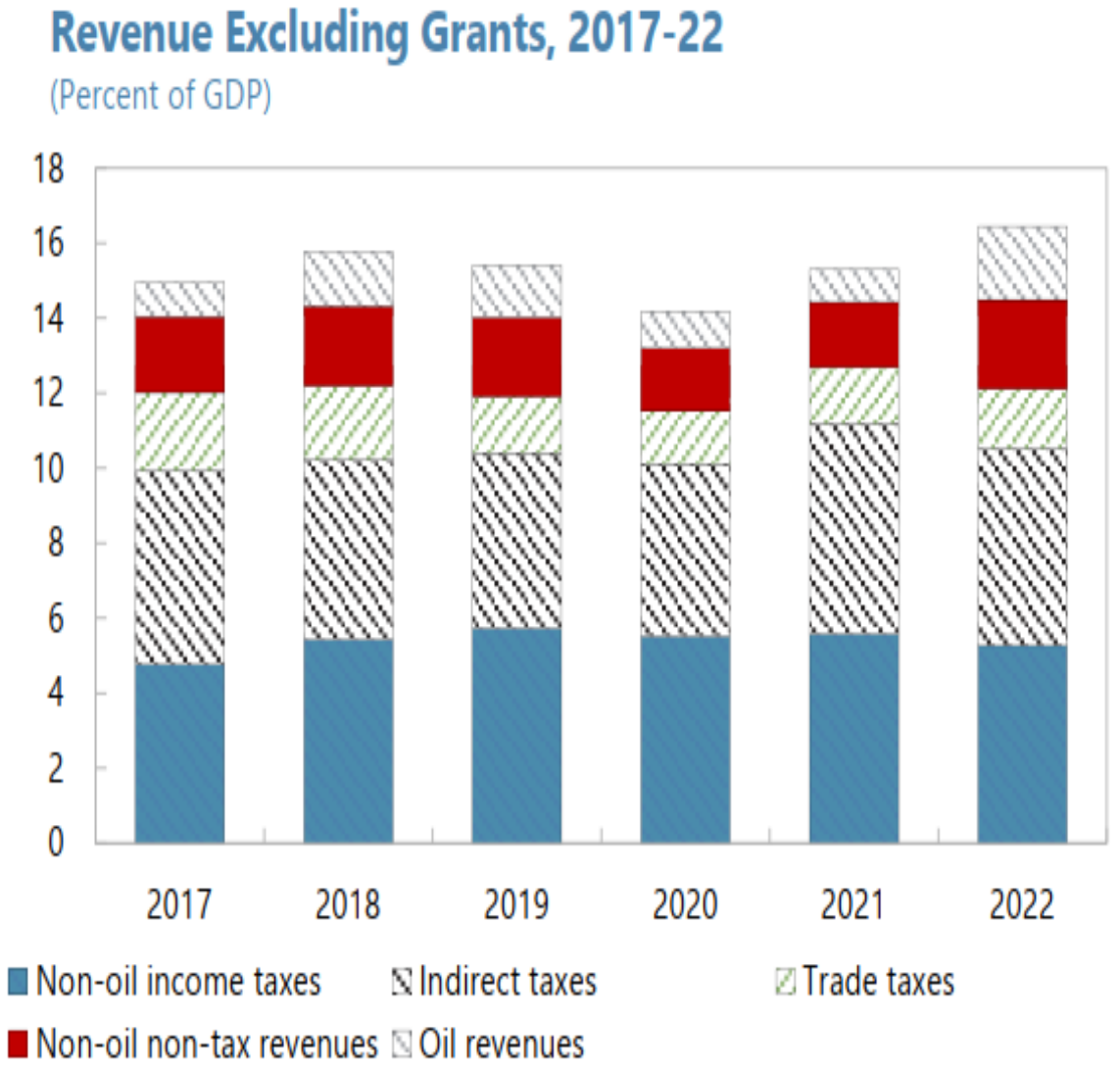
Identify the feasible policy approaches to deepen the linkages between the energy transition plan and industrialisation, and the opportunities for domestic revenue mobilisation.

Approach


Problem identification: How can Ghana industrialize and increase domestic revenue mobilization through the energy transition?
Qualitative Analysis – Technical analysis of the energy transition and industrialization
Political Economy Analysis focused on
Structural factors
Institutional Factors (formal and informal)
Agents/Actors (Stakeholder interests, constellations and power)
• What are the available opportunities for industrialization in Ghana's Energy Transition Plan?
• How are the available industrial policies aligned with the energy transition framework?
• What are the key constraints and intractable problems?
• What are the relevant institutional re-alignments needed to industrialize through the energy transition framework?
• What are the incentives for pursuing low-carbon industrialization?
• How well aligned are implementing agencies with the energy transition plan?
• Who are the key players driving and opposing reform for energy transition and low-carbon industrialization?
• Is there appetite/momentum for reform?
Implications: What can be done by way of reforms to support low-carbon industrialization through the energy transition framework?
Implementing the identified approach

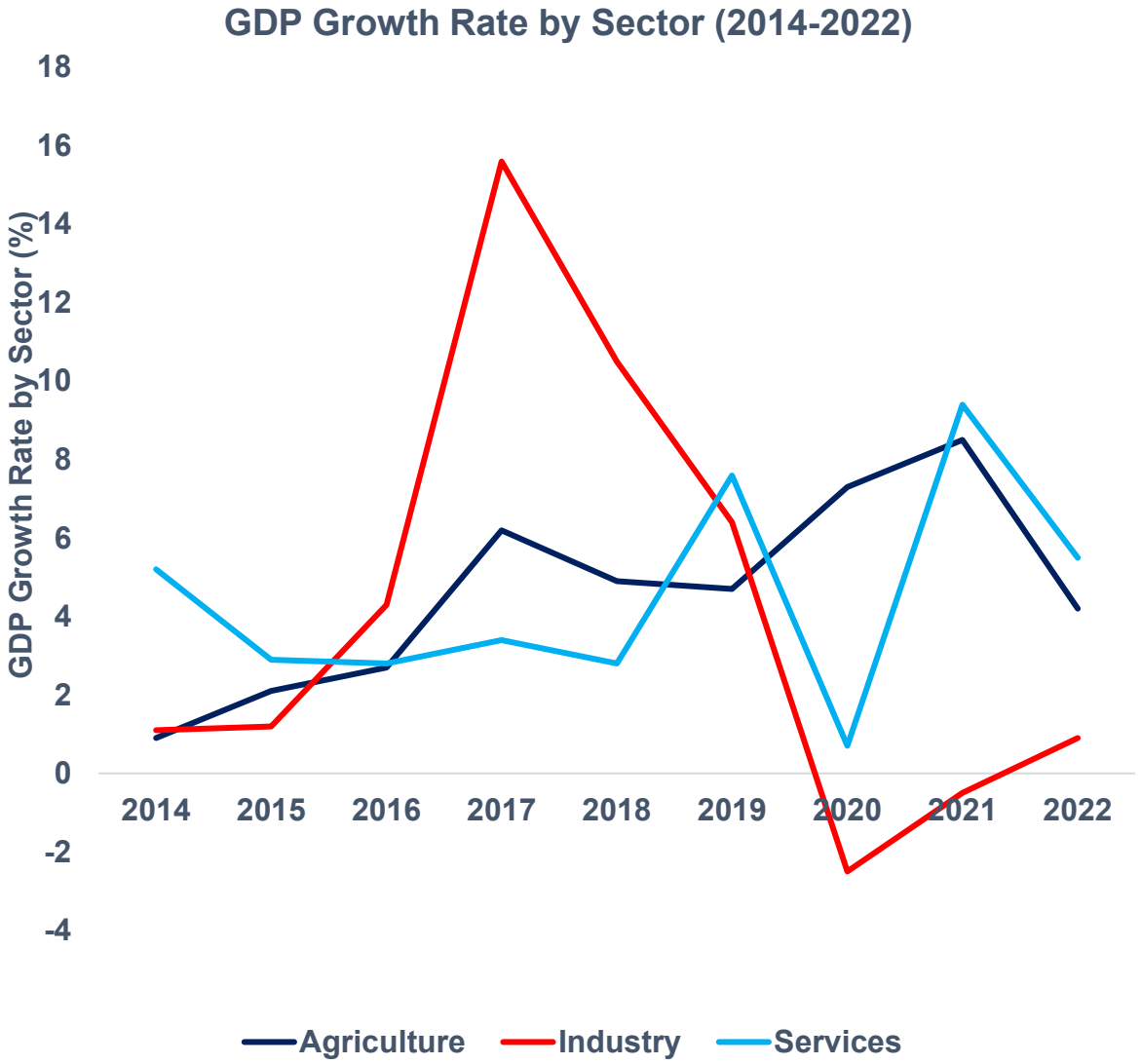
Ghana's Economy in Perspective – Implications for the Energy Transition

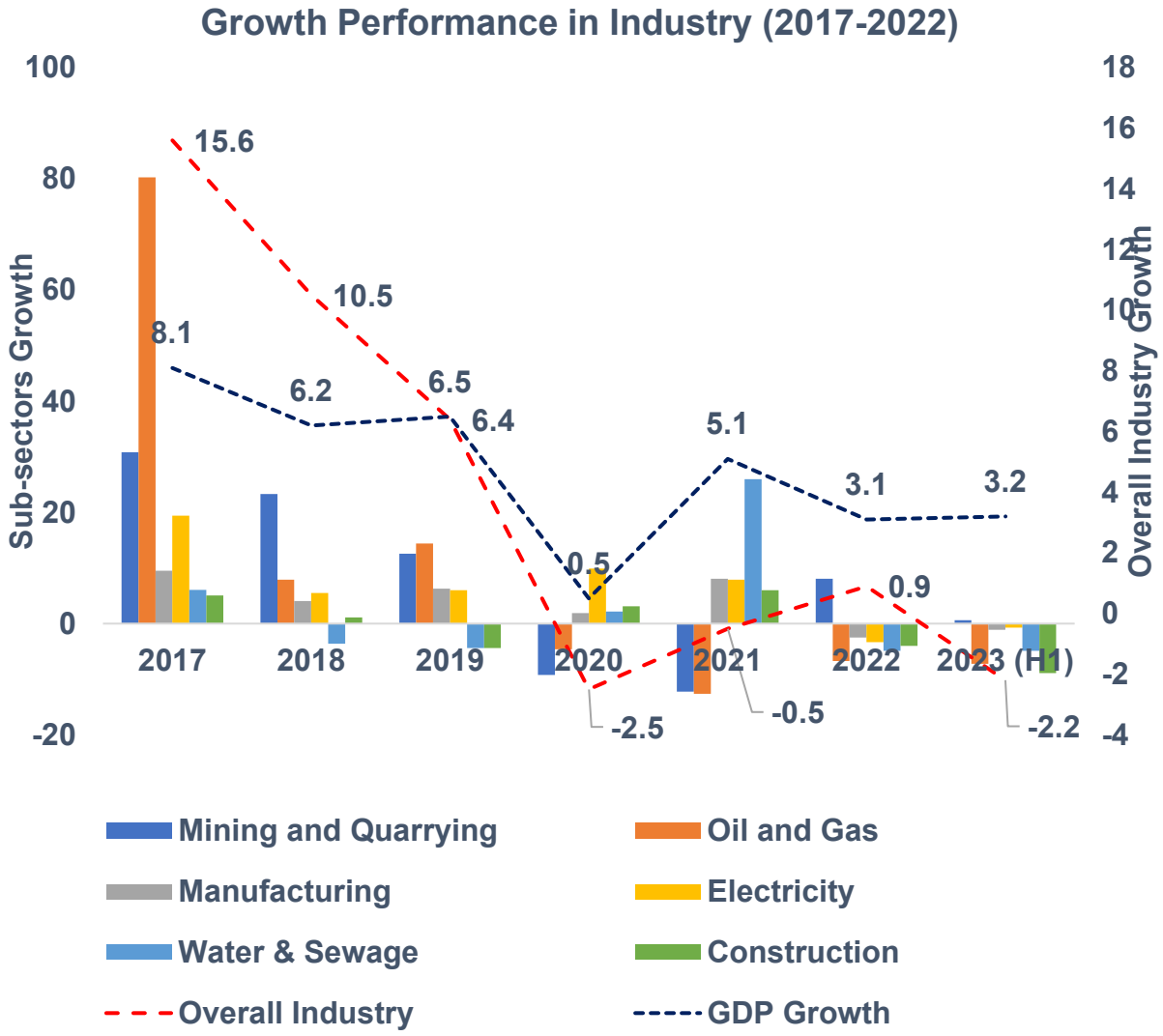




Source: IMF, MOFEP

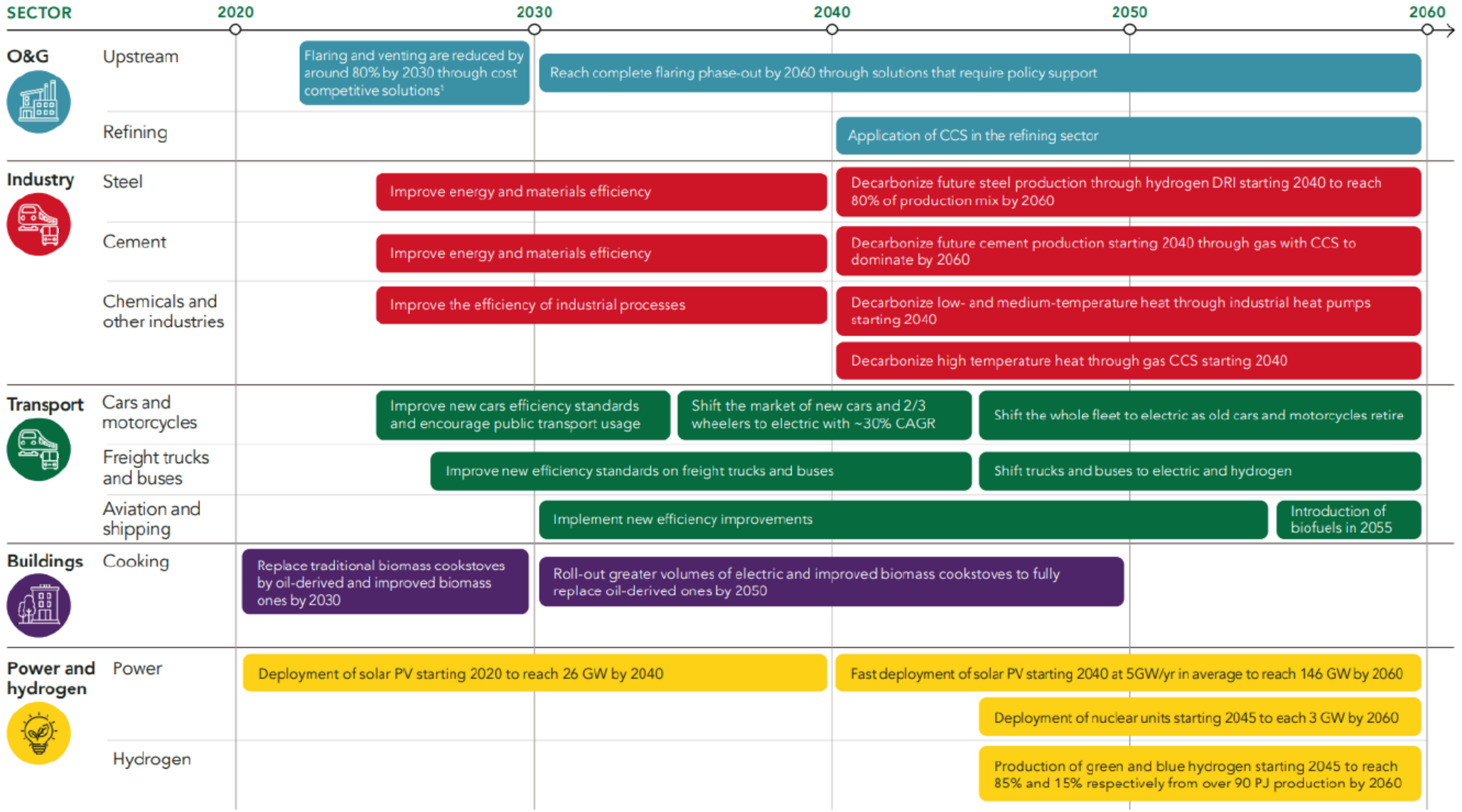
An unstable macroeconomic environment affects the opportunities for industrial development; however, the energy transition can support industrialization & growth.





Source: MOFEP

Roadmap of Ghana's energy transition – achieving net zero by 2060



Source: Ghana Energy Transition Plan and Investment Framework

Ghana's Energy Transition Plan & Anchor Technologies

Electrification & Renewables

- Replace fossil fuels through electrification.
- Contribute to CO_2 abatement by 26%



Carbon Capture & Storage

- Cature CO_2 emissions and high-temperature heat processes.
- Contribute to CO_2 abatement by 5%.



Low-Carbon Hydrogen

- Alternative fuel for heating & feedstock for industry.
- Contribute to CO_2 abatement by 12%.



Battery Electric

- Replace fossil fuels in combustion engines - passenger vehicles, wheelers & light trucks.
- Contribute to CO_2 abatement by 40%.



Clean Cooking Stoves

- Replace traditional biomass and LPG with improved biomass & electricity.
- Contribute to CO_2 abatement by 16%

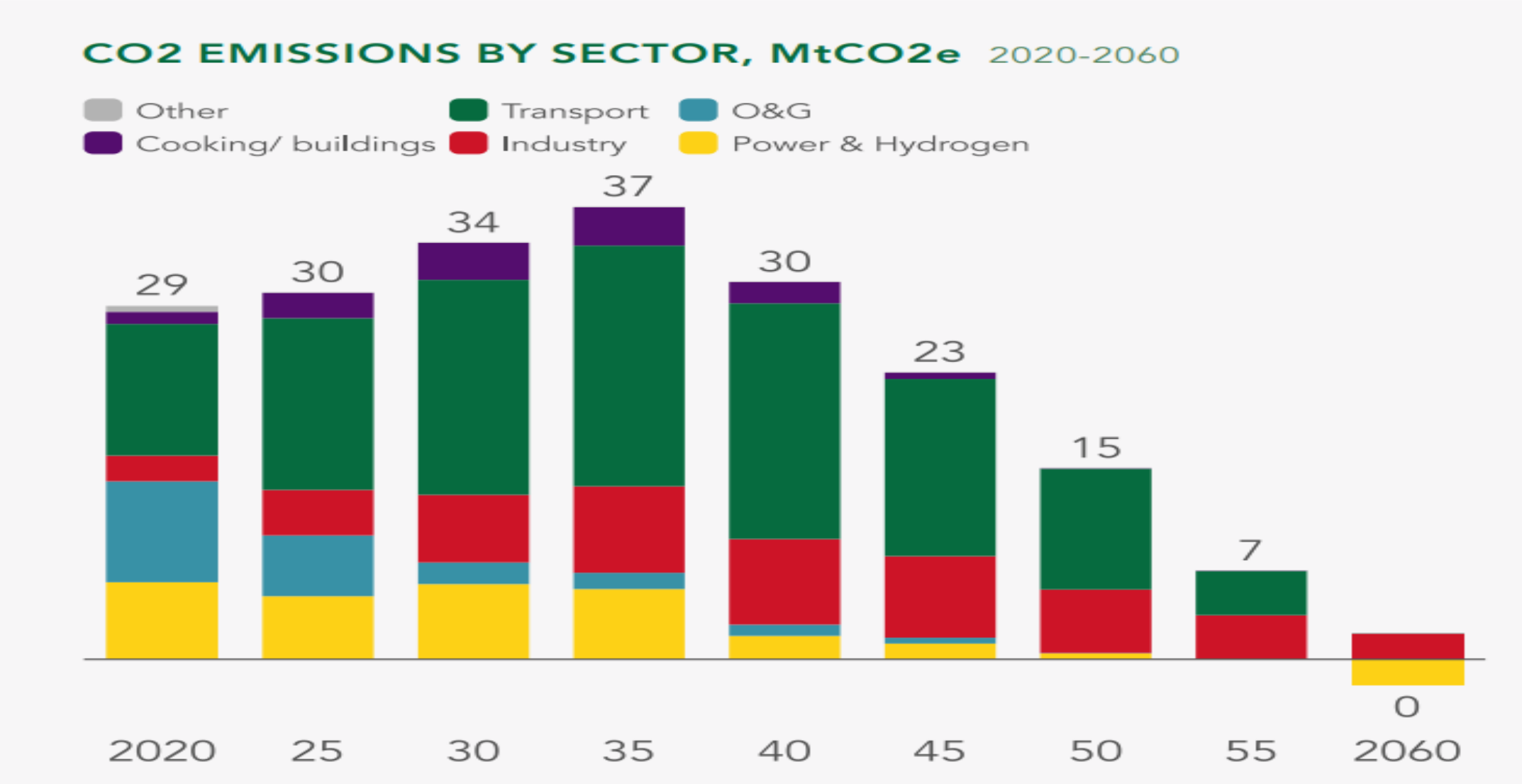


Negative Emission Tech.

- Provide addition greenhouse gas removal.
- Contribute to CO_2 abatement by 2%.

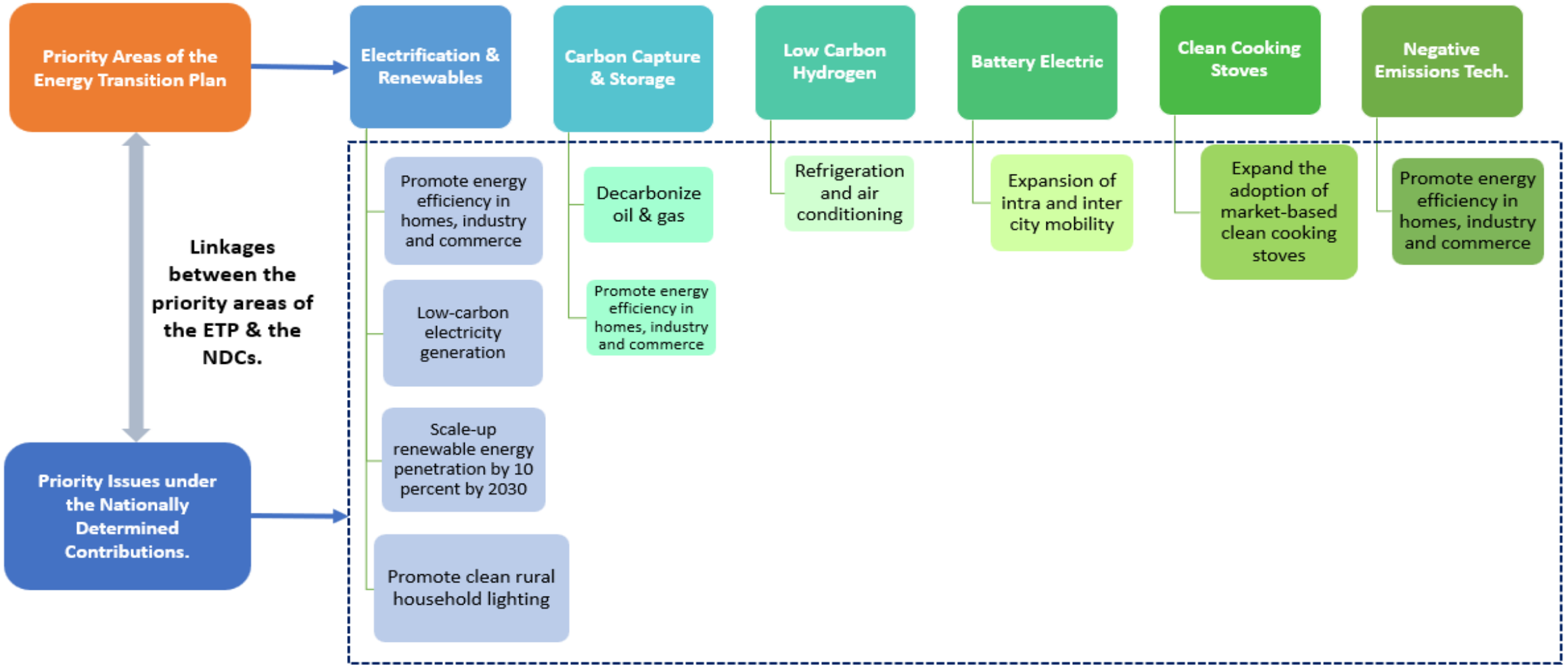


Potential Outcome: Emissions reduction trajectory by 2060

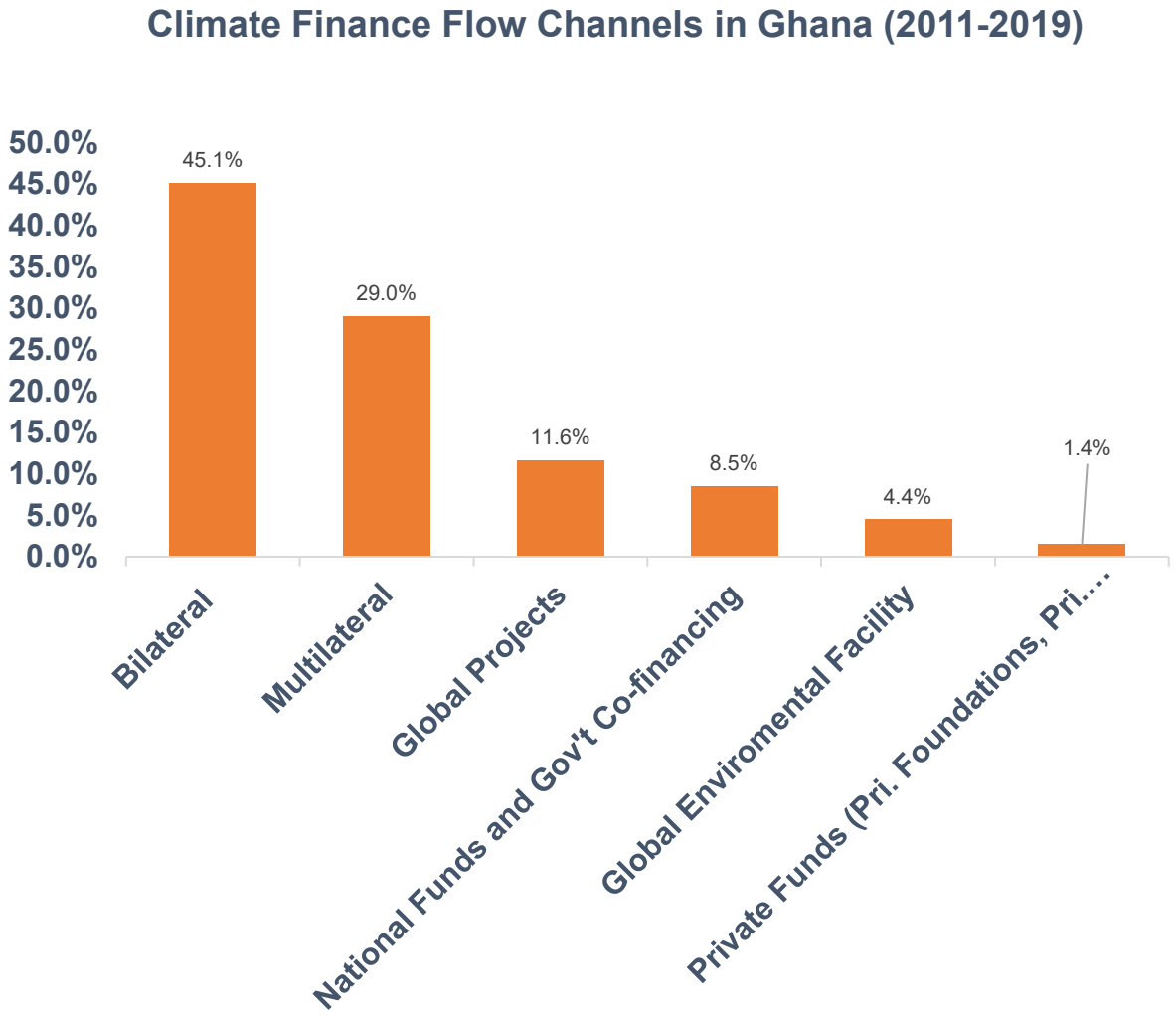


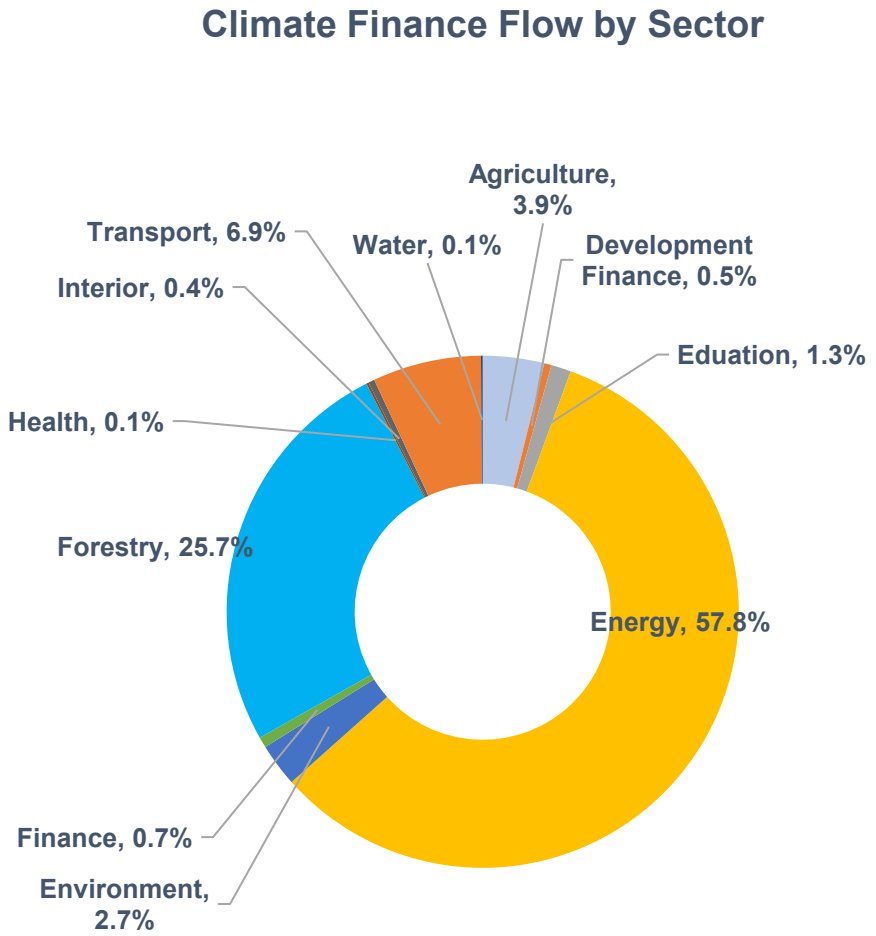
Source: Ghana Energy Transition Plan

Energy Transition Plan and the Nationally Determined Contributions

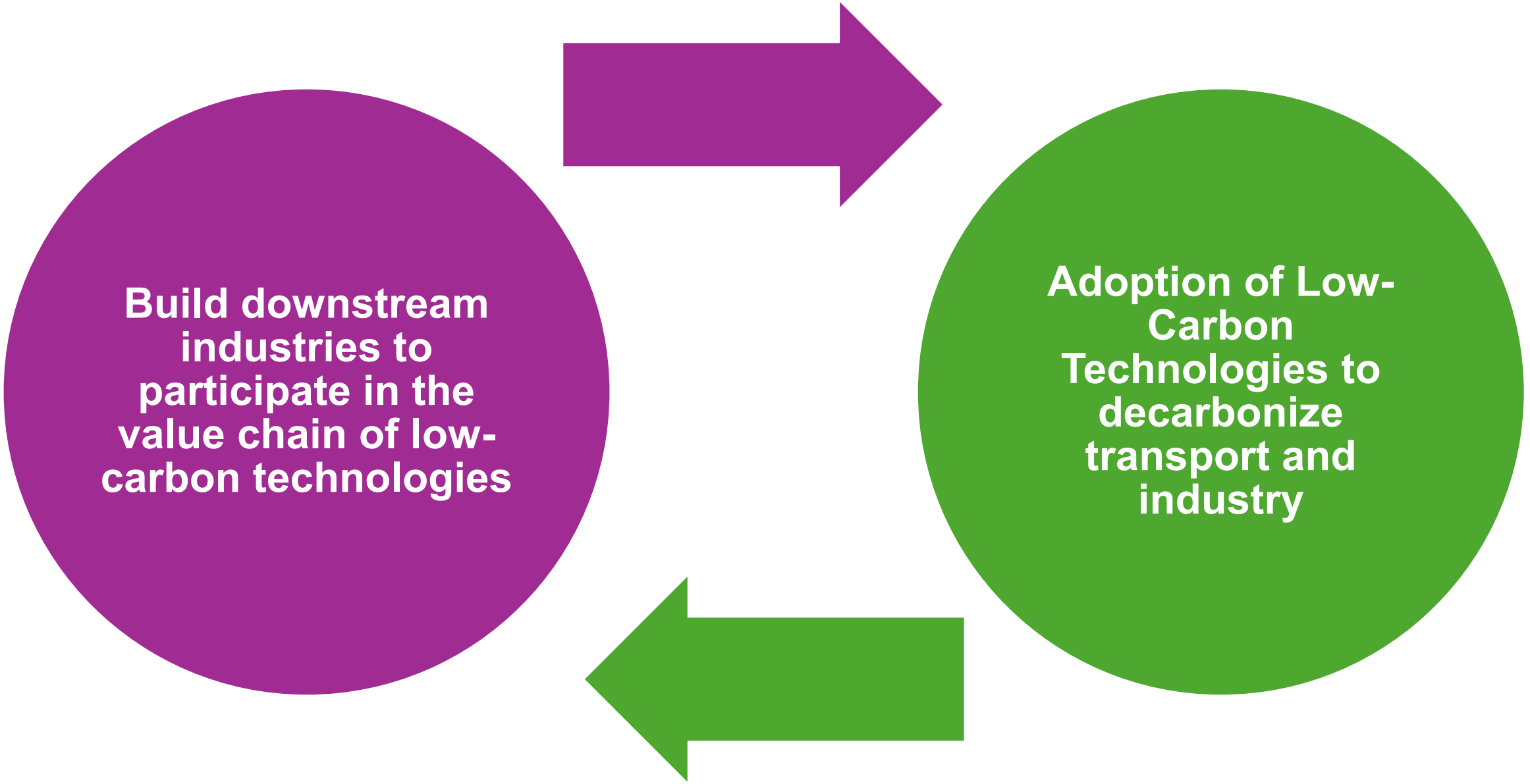


There are significant challenges with financing the Energy Transition and the Nationally Determined Contributions.





Pathways for Industrialization through the Energy Transition



The existing legal frameworks may not support industrialization and the energy transition.

Policy/Law	Purpose & Recognition of Low-Carbon Industrialisation
Renewable Energy Master Plan	The REMP is the main strategy for accelerating the adoption of renewable energy technology in Ghana. It is expected to accelerate clean energy investments towards achieving 10% renewable energy in the energy mix. It promotes domestic manufacturing of clean energy technologies. ***Comment: It explicitly has provisions for low-carbon industrialisation.***
Ghana Industrial Policy	The Ghana Industrial Policy is the main industrial policy strategy for promoting productivity and job creation through industrialisation. ***Comment: It does not explicitly provide for low-carbon industrialisation.***
Renewable Energy Act 2011 (Act 832)	The Renewable Energy Act 2011 (Act 832) is the main law governing the development and utilisation of renewable energy technologies in Ghana. ***Comment: It explicitly has provisions for low-carbon industrialisation.***
National Climate Change Policy	The NCCP is the main policy framework governing climate change mitigation and adaptation. ***Comment: It does not explicitly provide for low-carbon industrialisation.***

Global Energy Transition & Critical Minerals

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

Suites of policies have been released in major markets



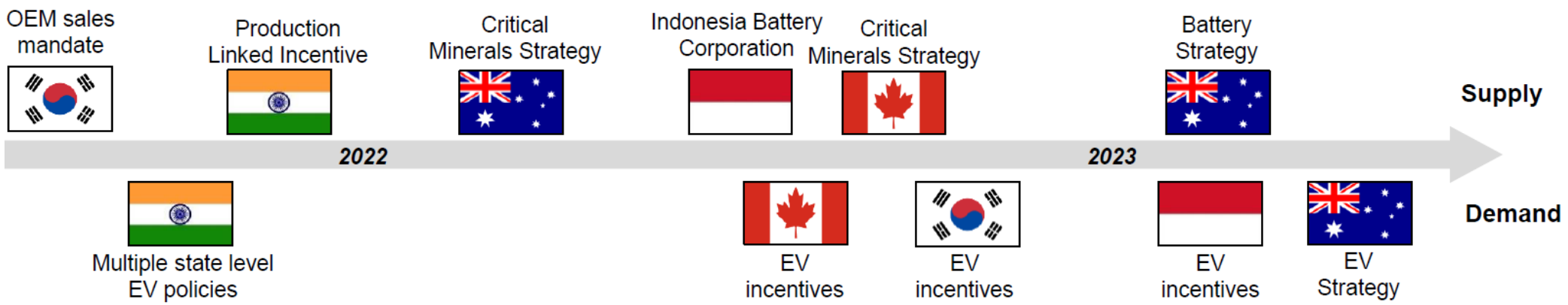
Inflation Reduction Act
- Clean Vehicle Tax Credit
- Clean Heavy-Duty Vehicle Program
- Commercial Clean Vehicle Credit
- And others..



Green Deal Industrial Plan
- Net Zero Industry Act
- Critical Mineral Act
- EU Battery Directive

- Plus revised CO_2 standards, Euro 7 regulations, and the Alternative Fuel Infrastructure Directive

Examples of key EV related policies



Source: IEA Global EV Outlook 2023, p.27

Key Critical Minerals in Ghana



Bauxite

- About 900 million tones of proven reserves.
- Annual production of 1 million tonnes.



Manganese

- Managenese mine size of about 170 sq. km.
- Average annual production of about 1.93 million tonnes.



Lithium

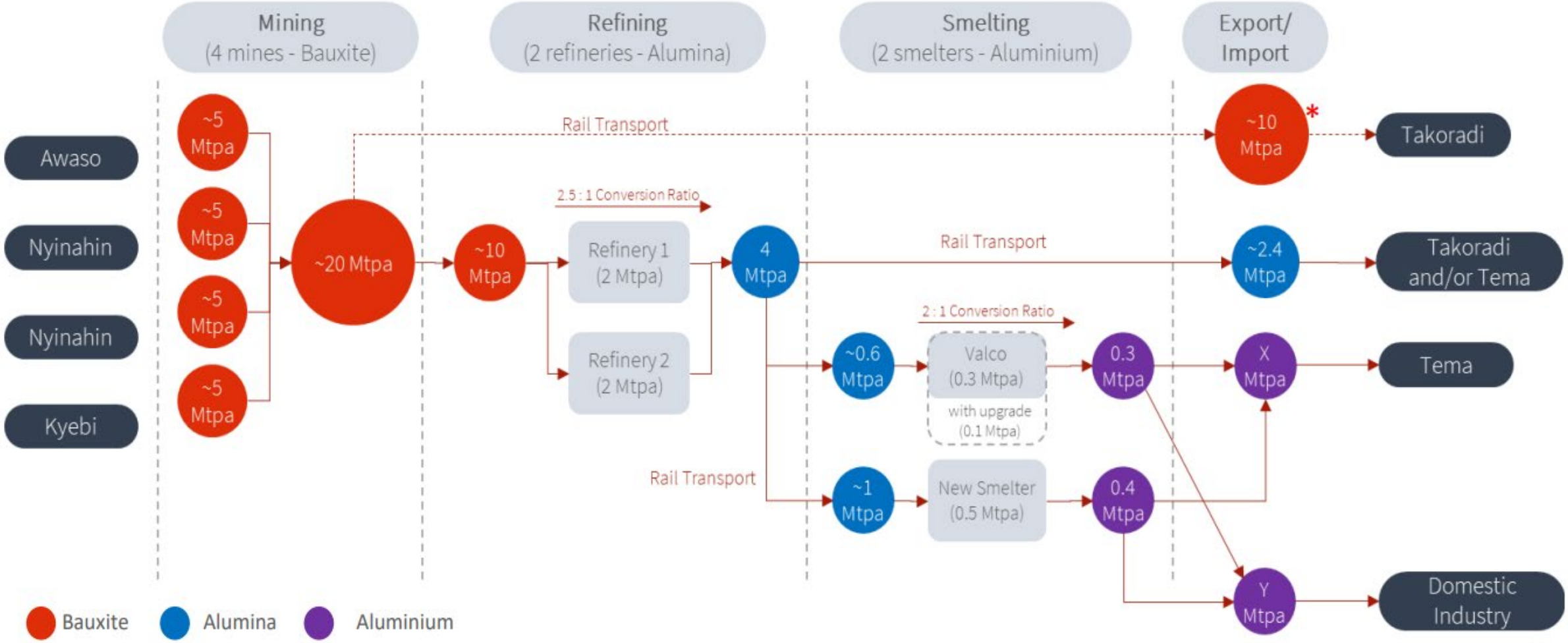
- Mineral estimated reserve of 35.3 million tonnes at 1.25 Li_2O spodumen concentrate.
- Atlantic Lithium lease is estimated to produce 350,000 t/pa.



Graphite

- Mineral reserve estimate of about 22.1 million tonnes at 8.6% TGC.
- The Castle Kambale Project is the main graphite mine in Ghana.

Existing Strategies for Creating Downstream Industrial Value Chain from Critical Minerals

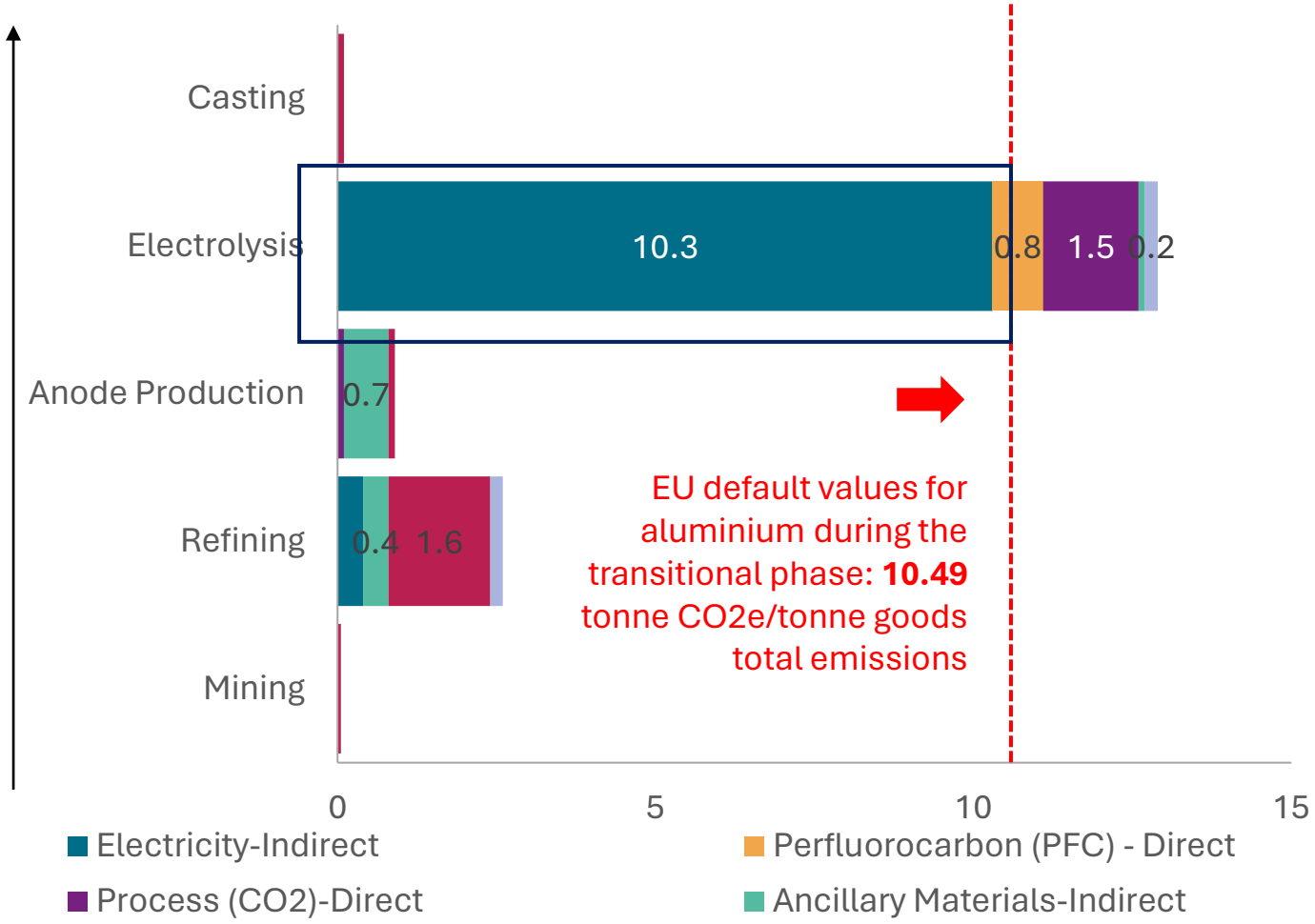


Source: GIADEC

CBAM and Ghana's aluminium industry



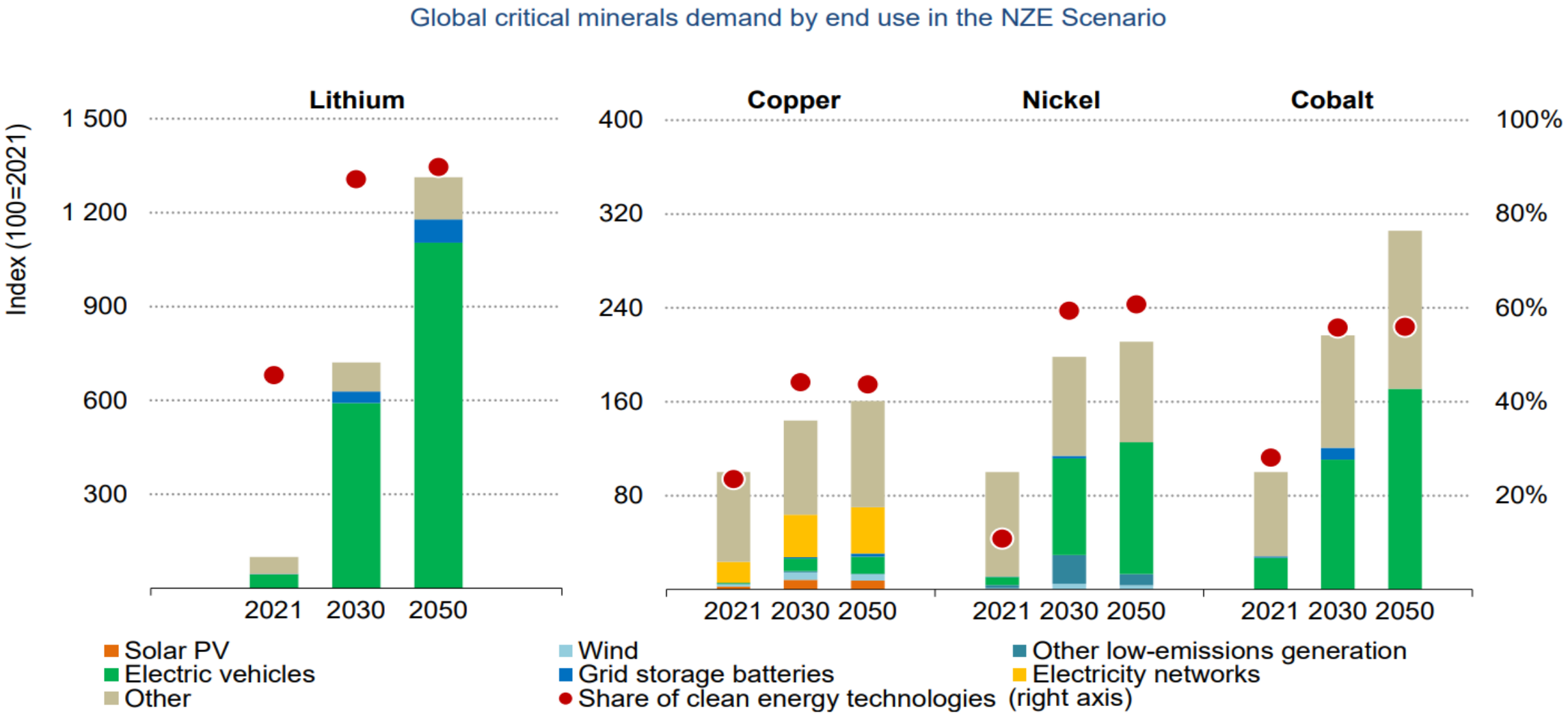
Full life cycle (cradle-to-gate) greenhouse gas emission of aluminium value chain (tonnes of CO2e per tonne of primary



Data Source: International Aluminium Organisation (2021)

- About 80% of VALCO's aluminium ends up in Europe
- VALCO sources power directly from VRA [hydropower from Akosombo Dam]
- Ghana could benefit from CBAM; But VALCO has future expansion plans for its plant and also a new one under the IAI master plan
- New plants will have to incorporate latest technologies: e.g. using CCUS, hydrogen, etc.

Lithium – There is a high global demand for lithium-based clean energy technologies has created a high demand for lithium.

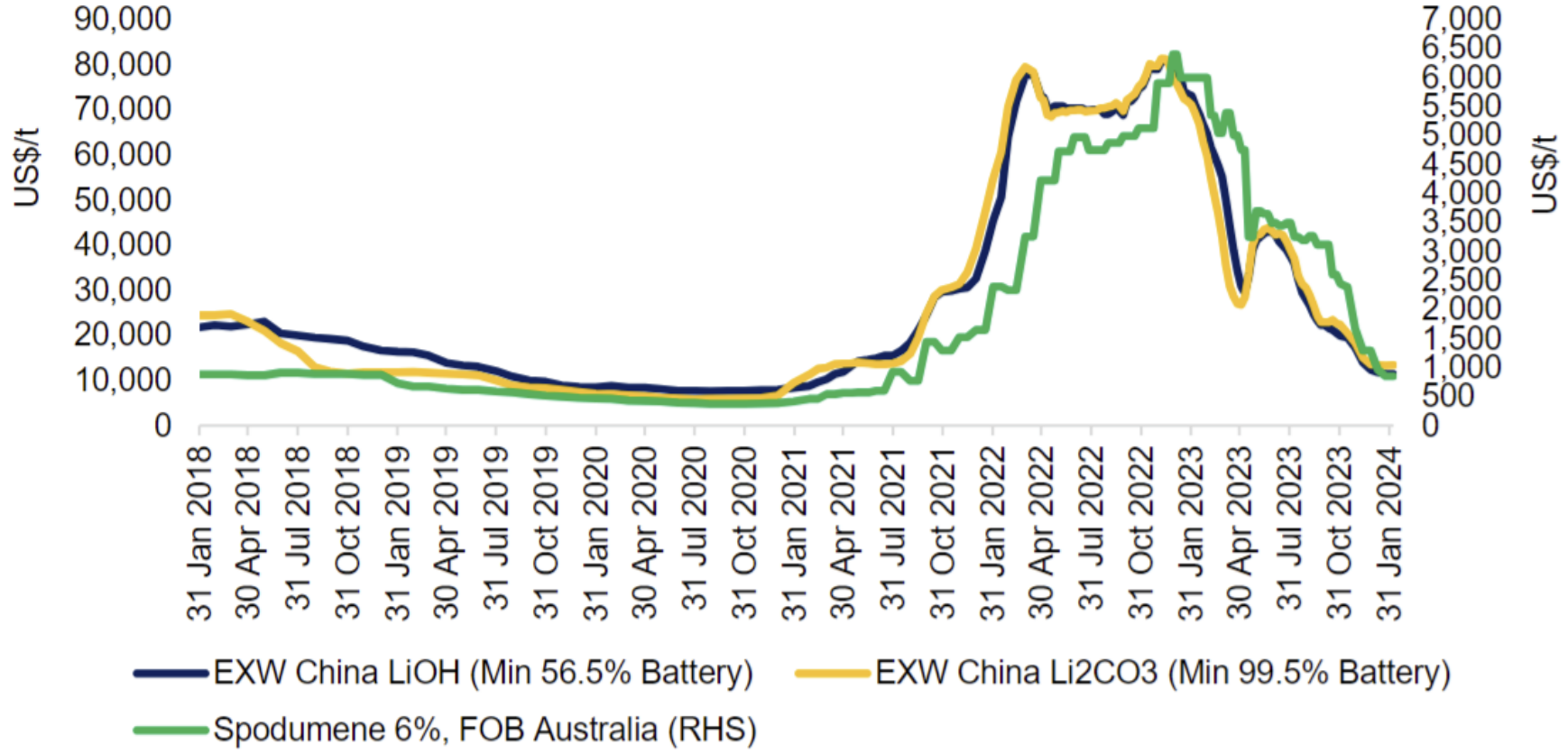


Source: International Energy Agency

But price volatility is a major concern

The spodumene price has fallen more than 84% since March 2023; subdued outlook on near-term electric vehicle (EV) demand.

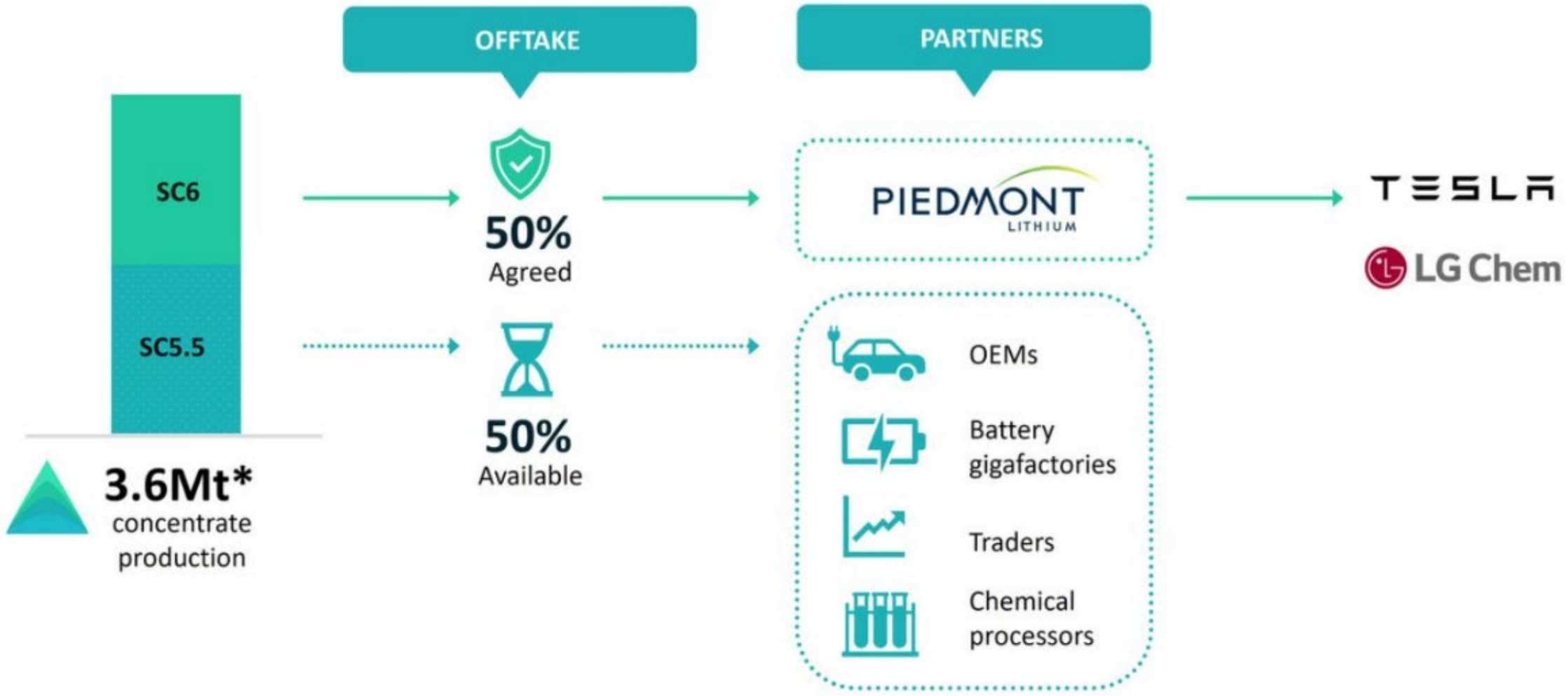
Figure 1: Lithium chemical spot prices (LHS) and spodumene concentrate (RHS), US$/t



Source: Benchmark Minerals

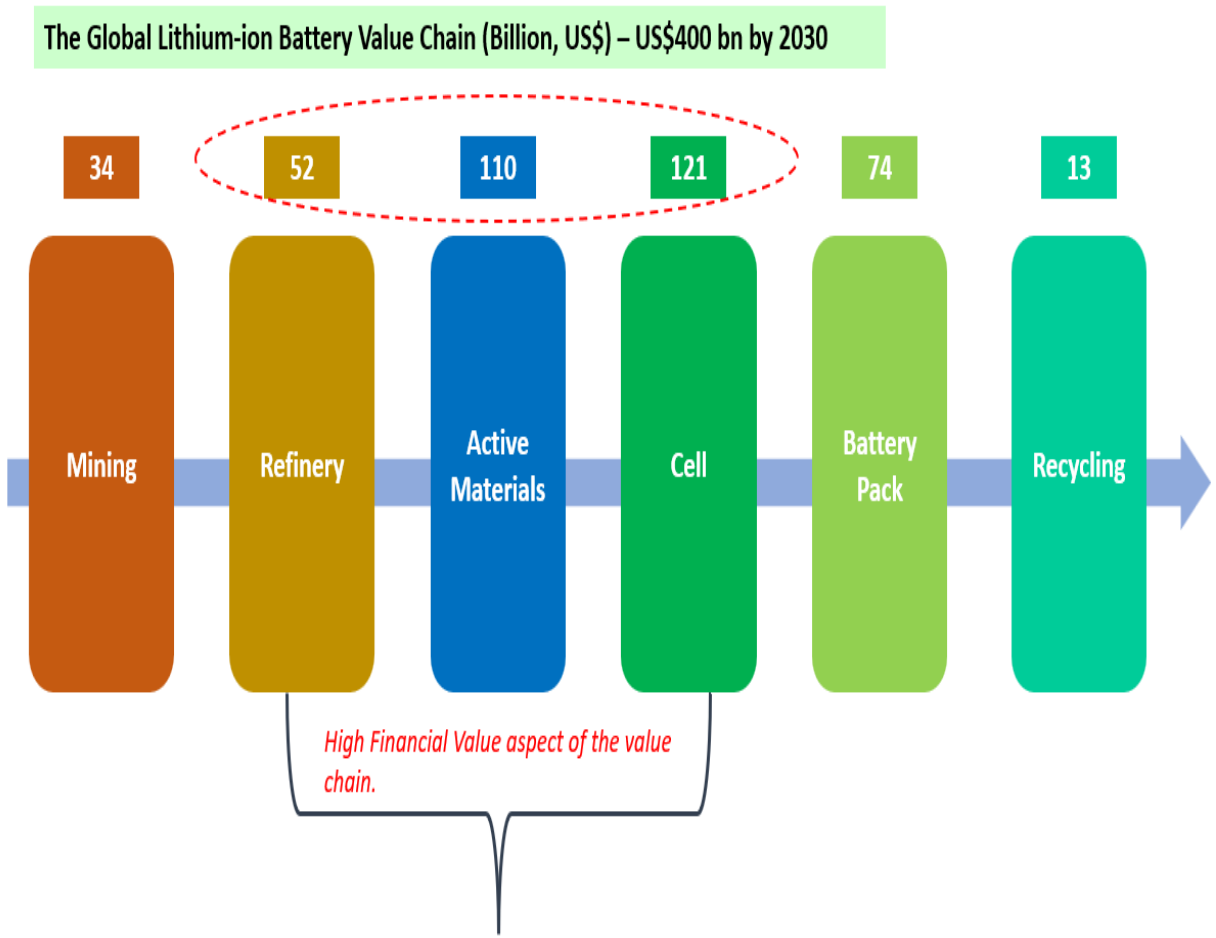
Note: EXW = Ex Works, LiOH = Battery-grade Lithium Hydroxide, Li2CO3 = Battery-grade Lithium Carbonate

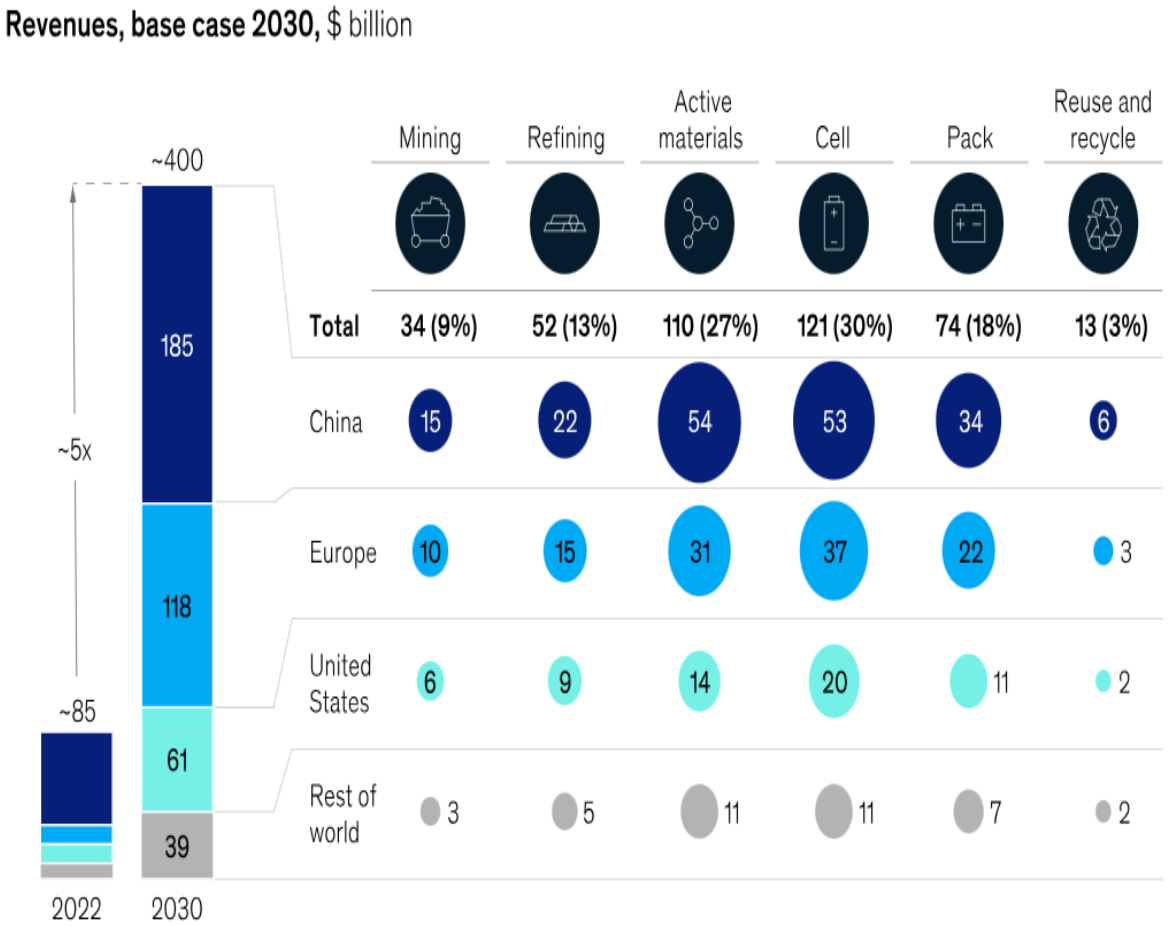
Existing Lithium Arrangement – Ewoyaa Project



Source: Atlantic Lithium

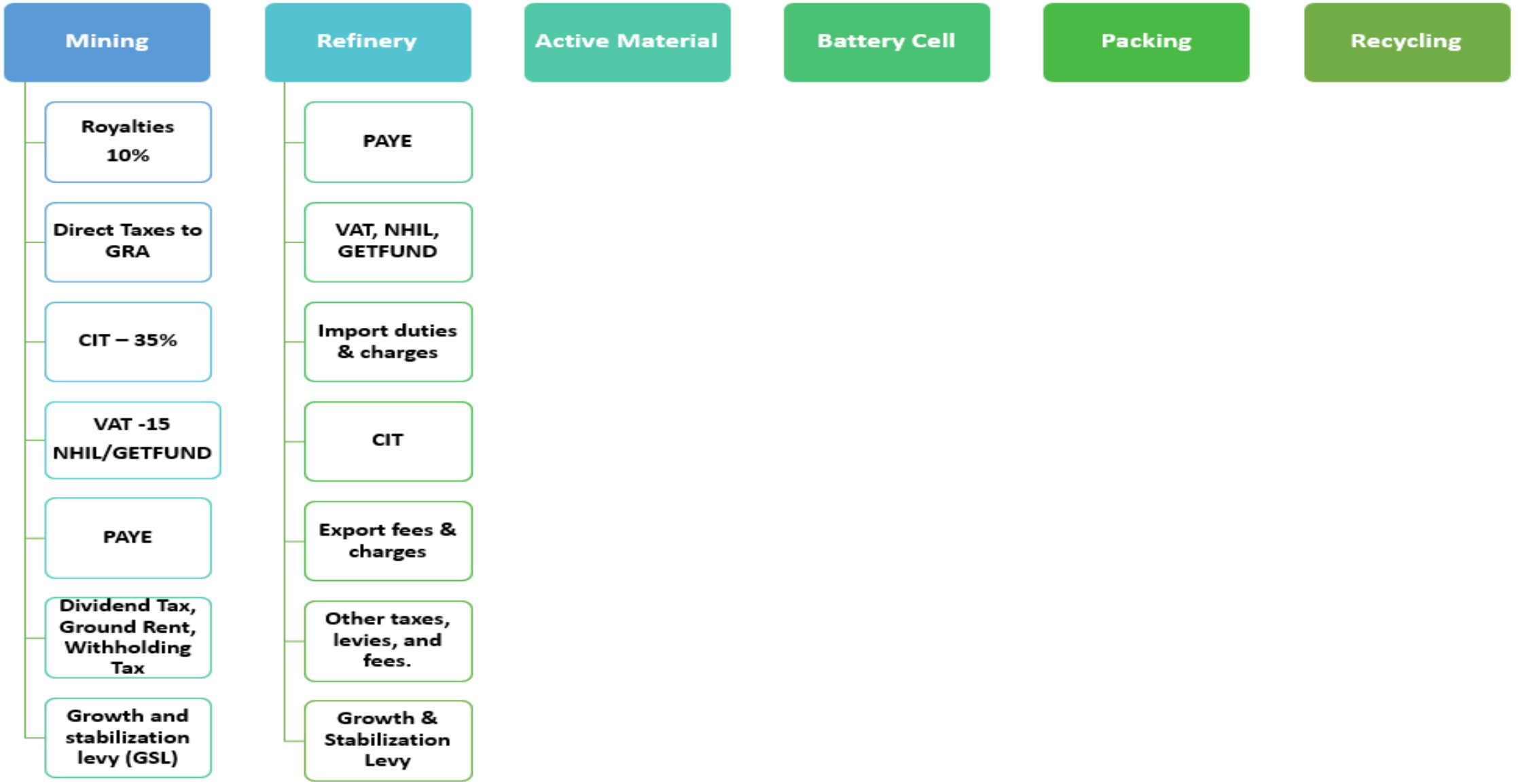
Domestic Revenue Mobilization – Lithium Value Chain



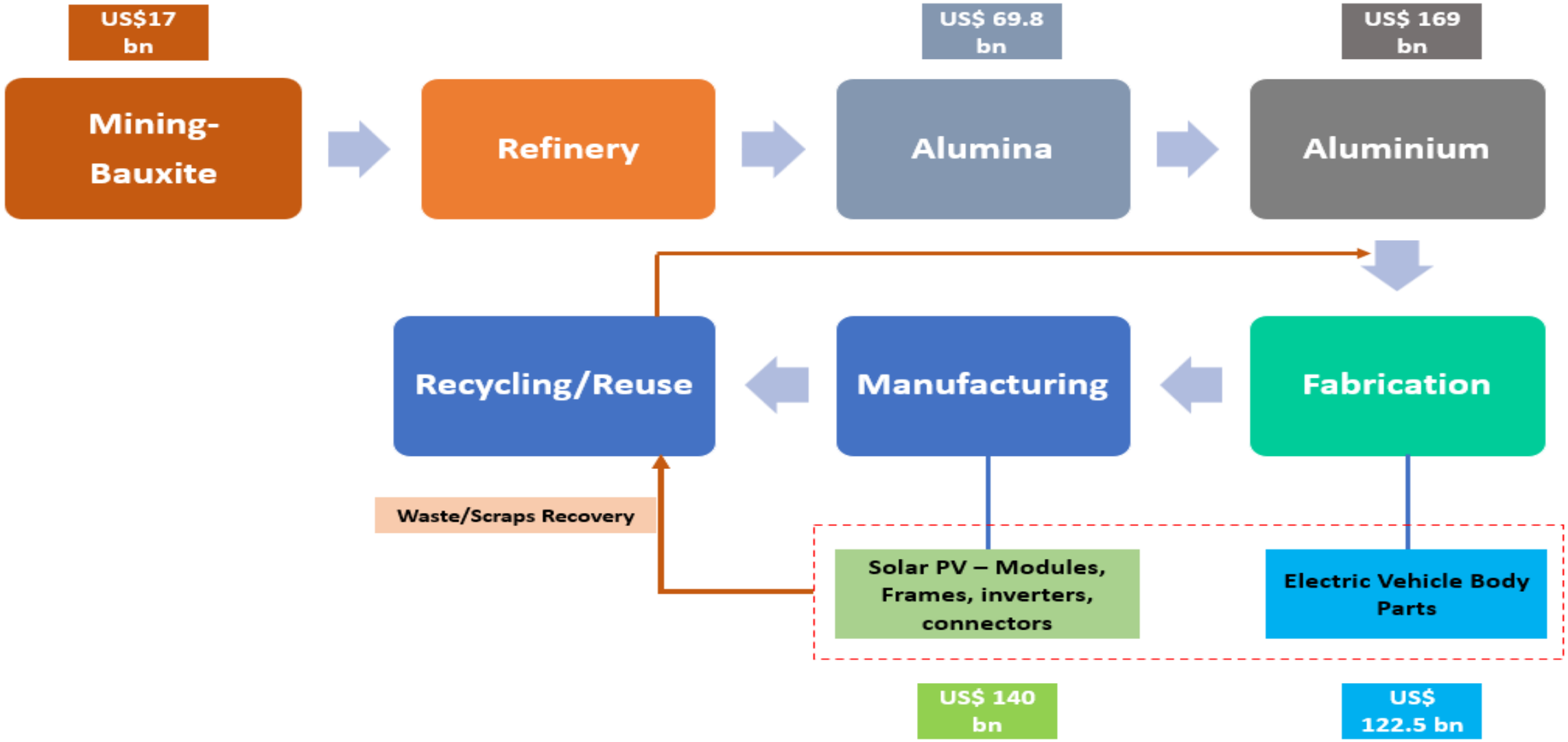


Source: Mckinsey

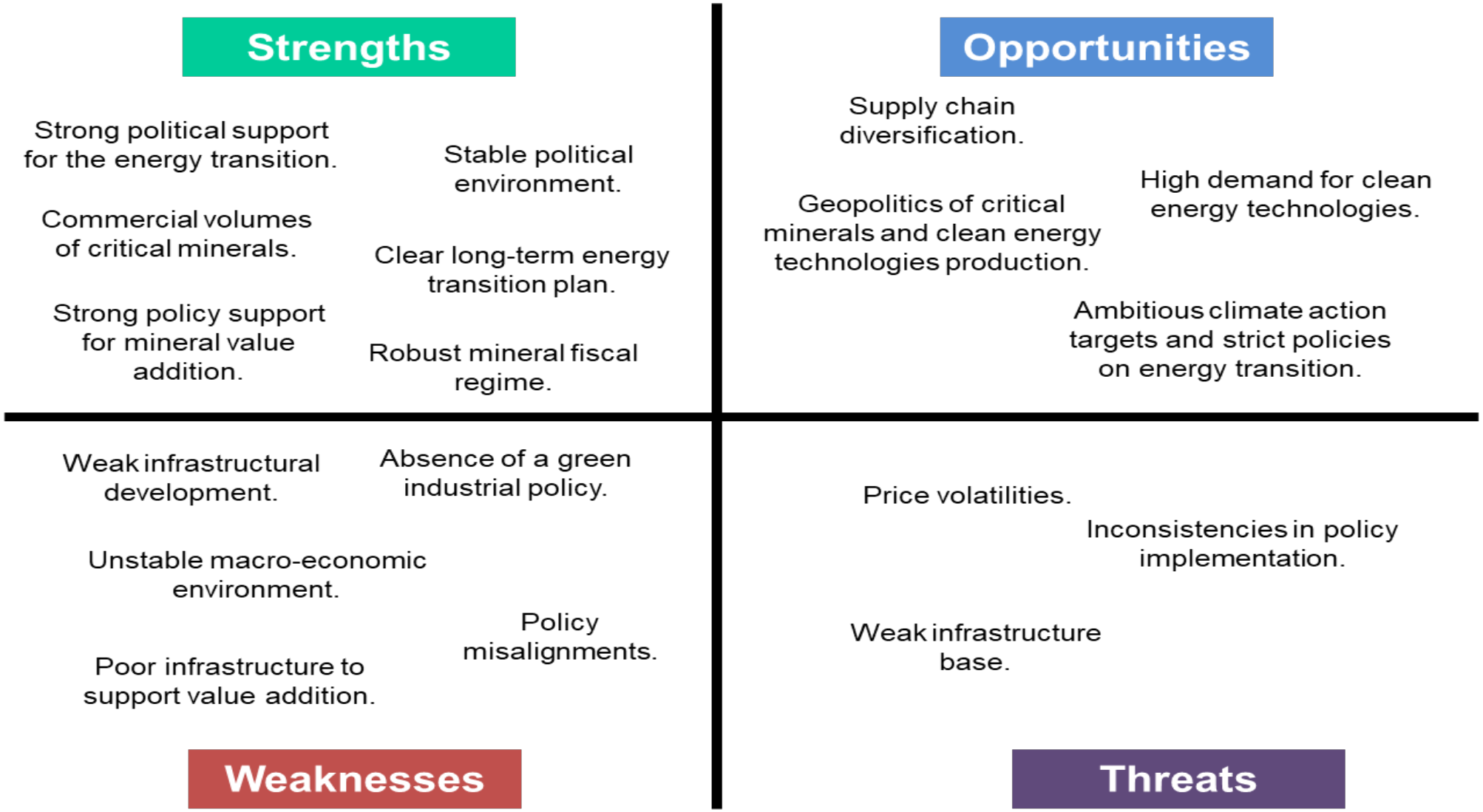
Potential Revenue Sources – Lithium Case Study



Domestic Revenue Mobilization – Bauxite Value Chain



SWOT Analysis – Opportunities for Ghana to industrialize through the energy transition.



Conclusion

Ghana's economic growth and development can go hand-in-hand with the energy transition.

Ghana is endowed with the critical mineral resources required for the development of clean energy solutions needed for the energy transition.

Prioritising the addition of value to the existing critical minerals could open the economy to significant revenues from the clean energy technology value chains.

Way Forward

- Develop and implement a green industrial strategy and action plan.
- Enhance infrastructure development to support the establishment of downstream industrial clusters for critical minerals and developing clean technologies.
- Develop and implement targeted policy support for specific clean energy technologies.
- Align the green minerals policy to the entire value chain of clean energy technologies.
- Deepen research, innovation and development in the manufacturing of clean energy technologies.





Thank you

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