

Lithium-ion Battery Precursors

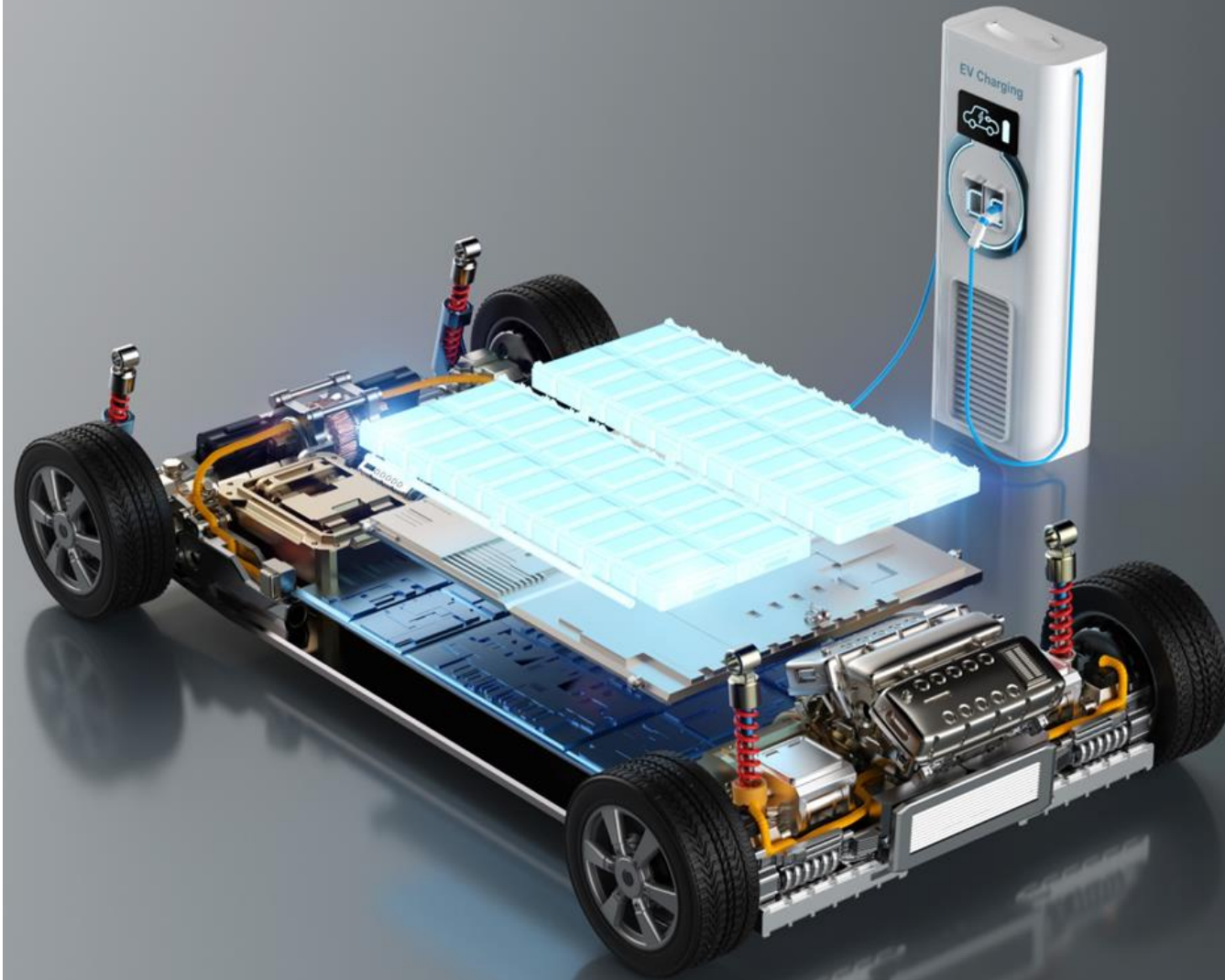
Exploring opportunities for Rwanda in the Lithium-ion Battery Precursor supply chain

January 2024



This document has been funded by UK aid from the UK Government; however, the views expressed do not necessarily reflect the UK government's official policies

www.manufacturingafrica.org

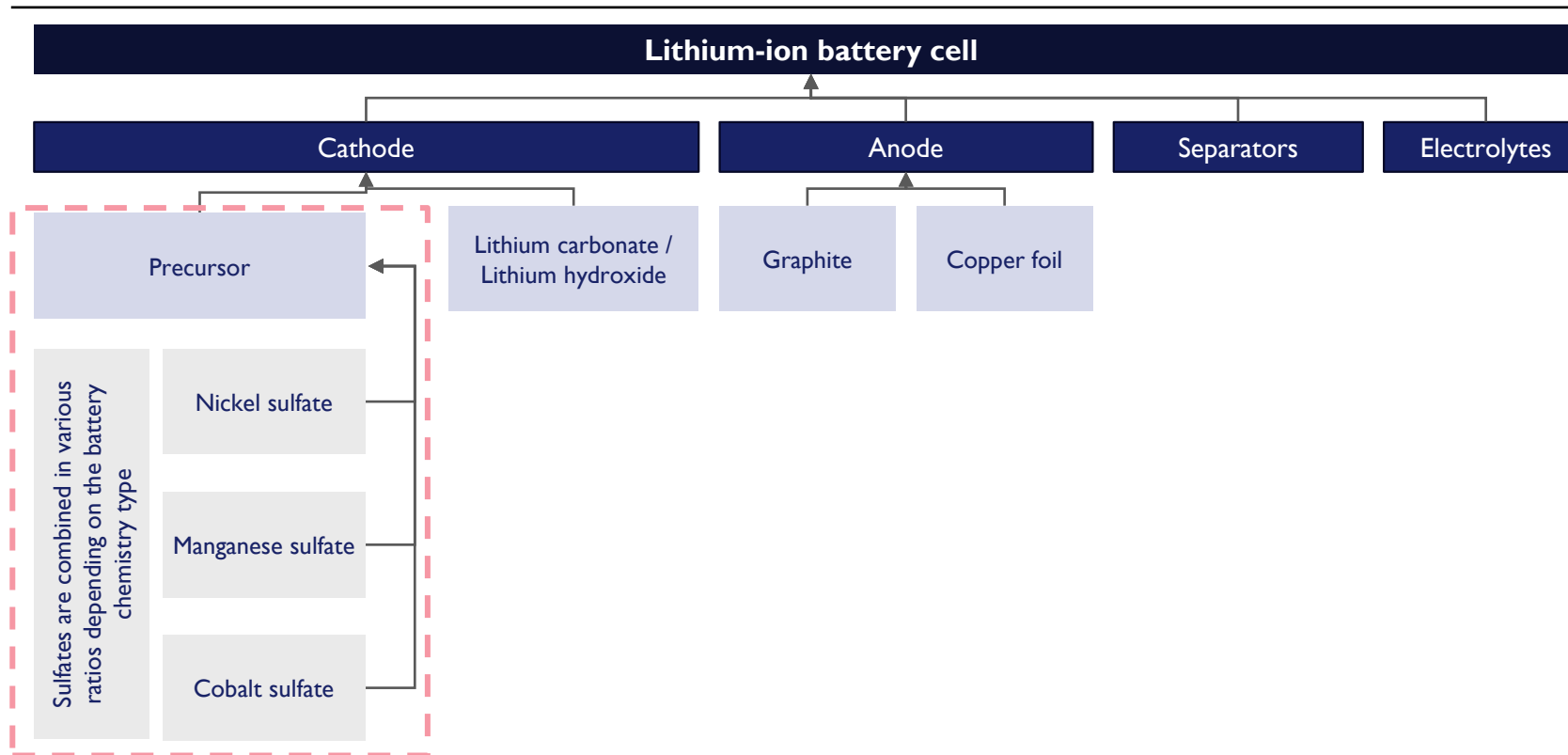


Overview of LIB Precursors (I/2)

 Scope of this report

Precursors are chemical compounds used in the production of cathodes. Cathodes are one of the main components used in the production of lithium-ion batteries, and determine the capacity and performance of the battery

Typical components of a lithium-ion battery cell

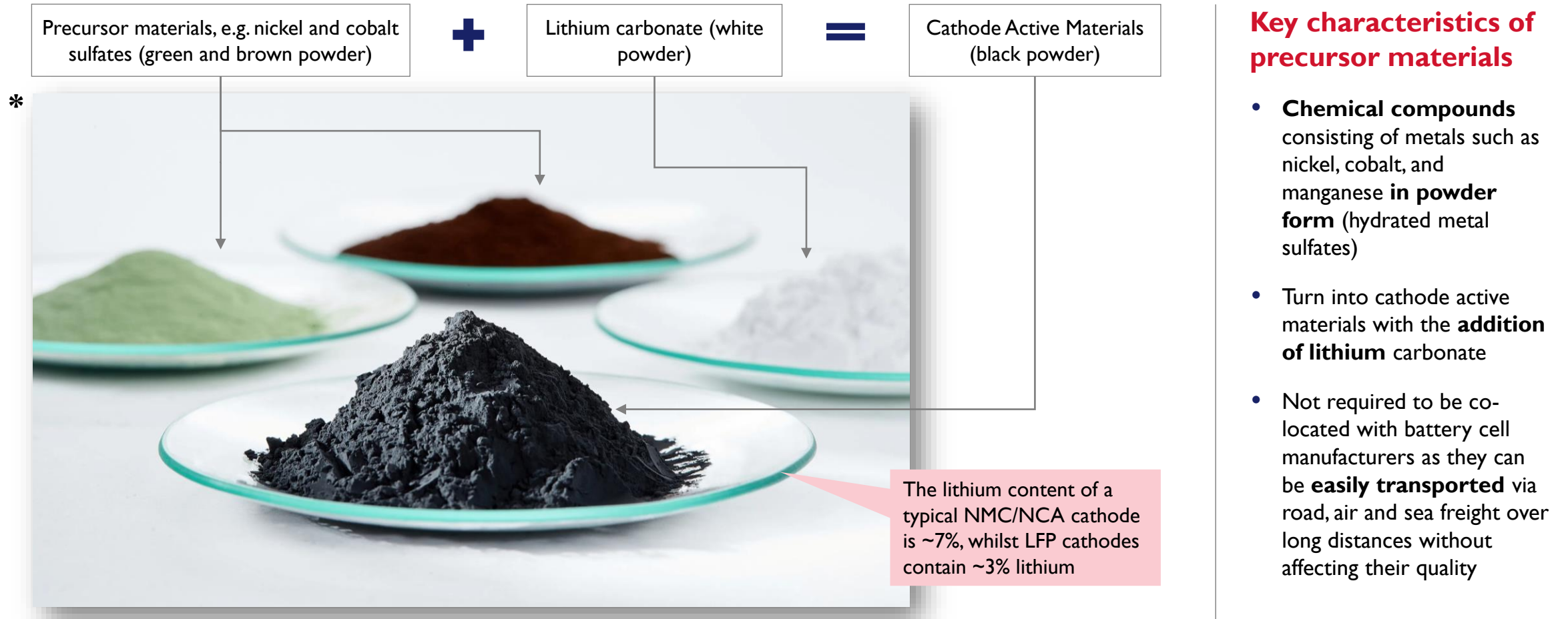


Overview

- Lithium-ion battery cells are made up of four main components: **Cathode, Anode, Separator, and Electrolyte**. These are all packaged into an aluminium case
- Precursors are **chemical compounds** made from **different combinations of key metals** including sulfates of nickel, manganese and cobalt
- Precursors are **key ingredients in the production of cathodes**; Precursors are converted into cathode active materials (CAMs) when refined lithium is added to them. The cathodes are then used in the production of battery cells
- The capacity and performance of a battery is determined by the **combination of metal compounds (chemistries)** used in the production of its precursors
- Precursors are a key component in LIB manufacturing, making up **~70% of cathode material costs**, and **~40% of the overall cost of an LIB**

Overview of LIB Precursors (2/2)

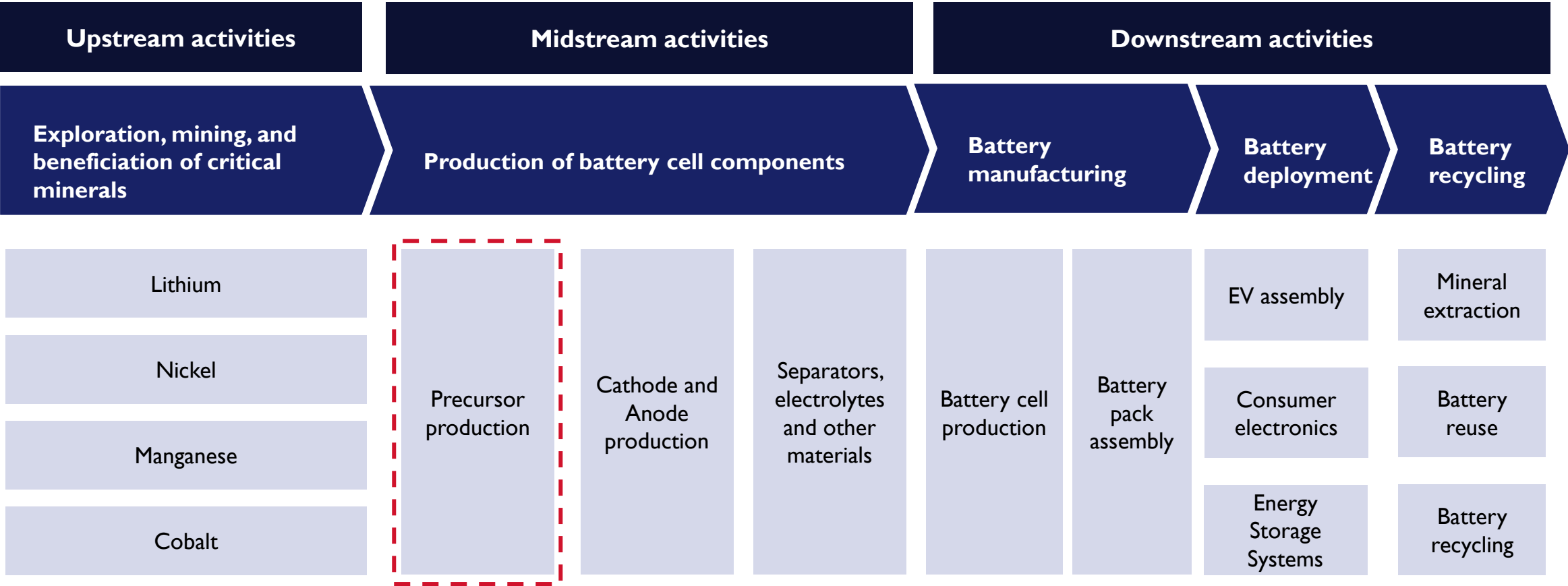
Precursor materials exist in powder form and can be transported via road, air and sea freight over long distances without affecting their quality



Precursors in the overall LIB supply chain

Precursors are part of the midstream activities of the overall LIB supply chain and are key in the production of battery cell components. They are chemical compounds used in the production of cathodes, and determine the capacity and performance of LIBs

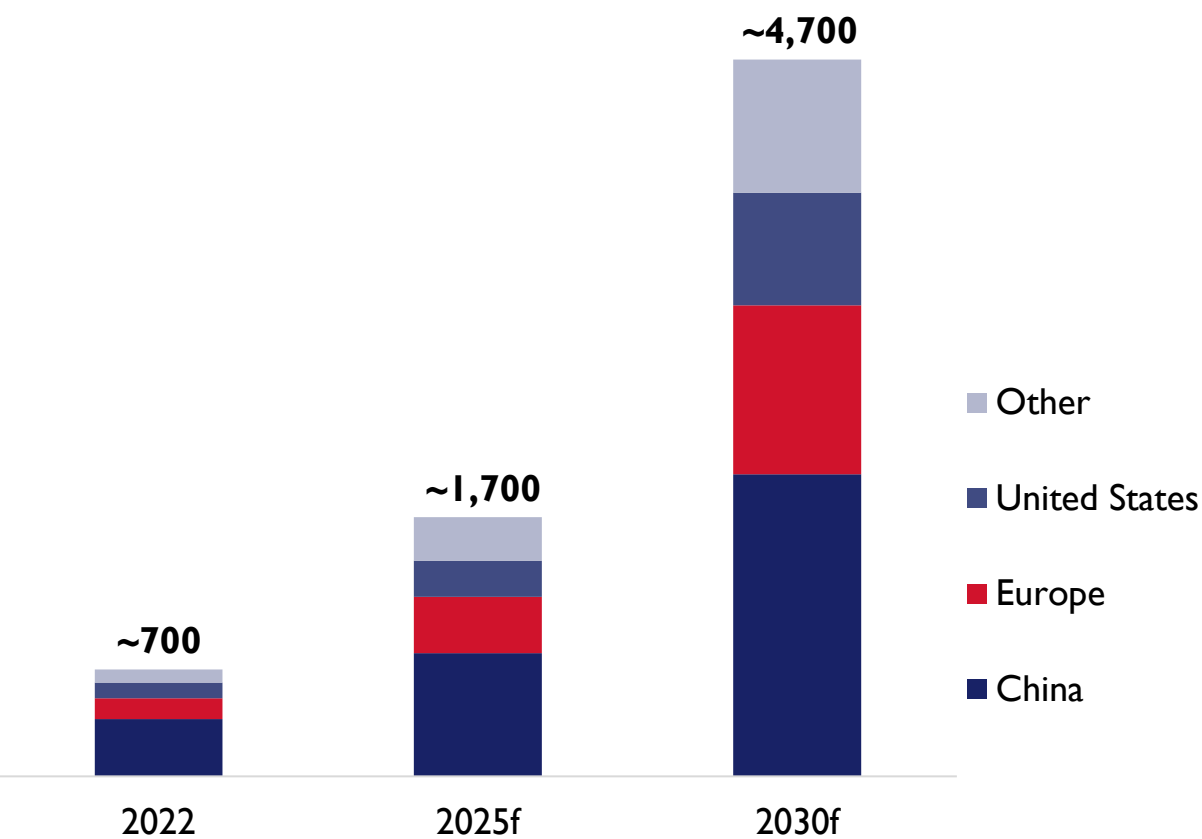
Precursors in the overall LIB supply chain



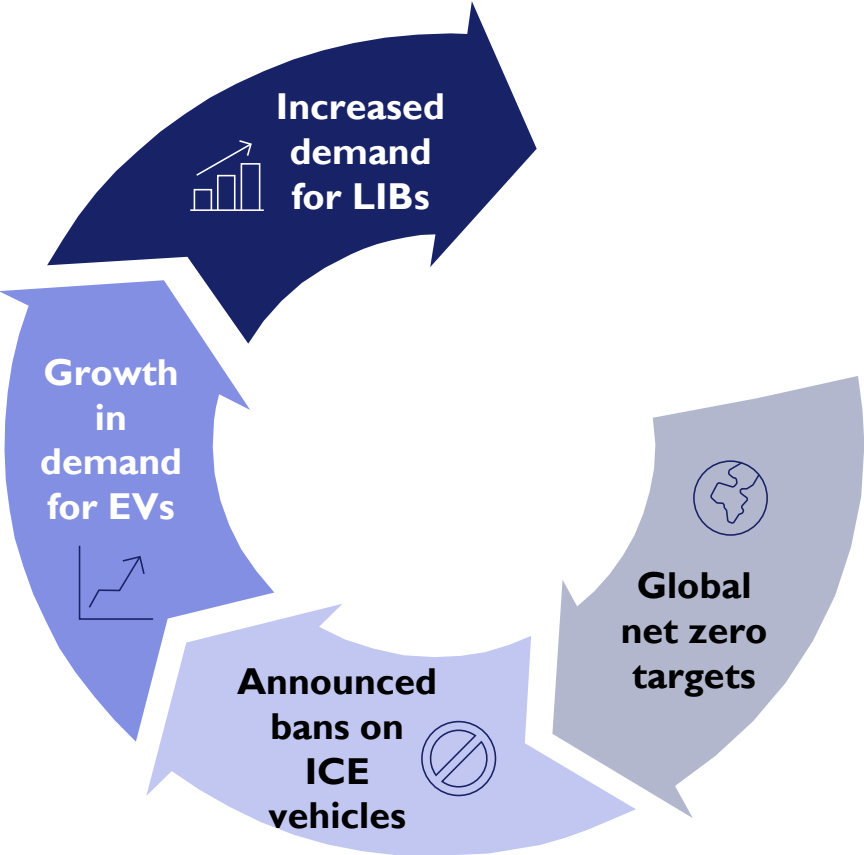
Market size and drivers of growth

Strong market fundamentals support a high global demand outlook for LIBs

Global LIB demand, GWh



Drivers of growth



Overview of key demand-side trends

Key trends

Global net-zero targets

01

- Global net-zero targets are driving electrification and subsequent demand for LIBs for both EVs and ESS

Largest producers of LIBs globally

02

- China is the largest producer and exporter of LIBs globally, and Chinese companies are proactively looking to grow their global footprint

Investment flows

03

- Opportunity for Africa to act as a local nearshoring region to serve the European LIB supply chain

Expansion of battery production capacity in Europe

04

- Poland and Hungary are at the forefront of attracting investments in gigafactories and securing local capacity for LIB production

Emerging battery technologies

05

- The industry is exploring new, more efficient battery technologies with a view to gradually move away from lithium-based batteries in the long term

LIB price trends

06

- Continued fall in the price of LIBs, driven by economies of scale and technological innovation

Greater focus on battery recycling

07

- The industry is moving from a linear to a circular value chain where used materials are repaired, reused, or recycled

Regulatory developments

08

- Complex regulatory landscape with multiple regulatory bodies at global, regional and national levels

Mineral supplies –Top producers of LIB metals in Africa

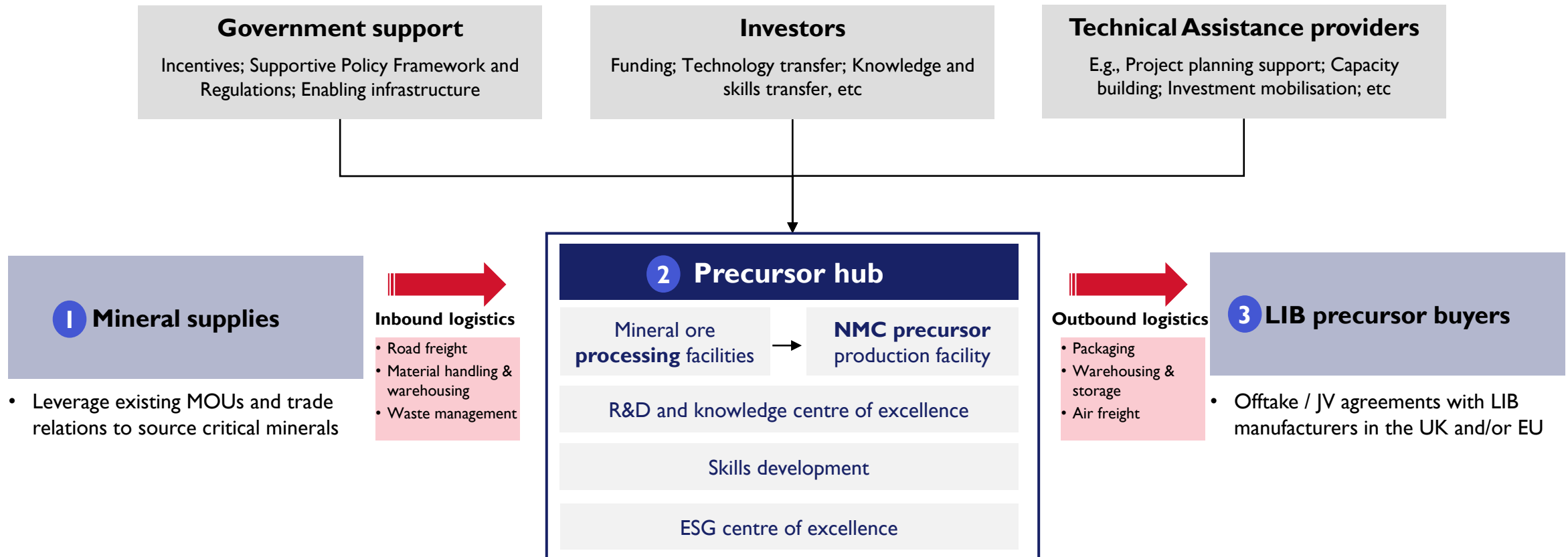
Africa is well endowed with the key resources required for the production of LIBs which presents opportunities for potential collaboration between African countries in the battery value chain

		Cobalt	Copper	Graphite	Lithium	Manganese	Nickel
	Burundi	✓	✓				✓
	DRC	✓	✓		✓	✓	
	Gabon					✓	
	Ghana				✓	✓	
	Ivory Coast					✓	✓
	Madagascar	✓		✓			✓
	Mali				✓	✓	
	Mozambique			✓			
	Namibia		✓	✓	✓	✓	
	Rwanda				✓		
	South Africa	✓	✓		✓	✓	✓
	Tanzania			✓			✓
	Uganda		✓	✓			
	Zambia	✓	✓	✓		✓	✓
	Zimbabwe	✓	✓	✓	✓		✓

Rwanda's potential as a regional precursor hub

Rwanda has potential to become an LIB precursor processing hub in East Africa by positioning itself in the centre of a regional value chain and taking advantage of growing demand in the UK and EU for nearshoring solutions in the LIB supply chain

Potential precursor manufacturing model in Rwanda



Rwanda's competitive advantage

Strength of Rwanda's mining sector

Regulatory and ESG capabilities	• Strong ESG capabilities in line with international requirements • Regulatory frameworks and policies developed, implemented and monitored the Rwanda Environment Management Authority (REMA) and Rwanda Mines, Petroleum and Gas Board (RMB)
Mineral value addition	• Three mineral processing plants for gold, tin and tantalum already in operation, with the establishment of a fourth one for lithium under discussion
Mineral transparency initiatives	• 100% of Rwanda's minerals are traceable from their mine site up to their export point through a digitalized blockchain tagging system which complies with international regulatory requirements

Strength of infrastructure

 Good road network	 Secure borders	 Access to regional ports	 Air transportation
 Reliable utility supplies	 ICT infrastructure	 International financial services	 Access to Special Economic Zones

Presented findings at the UK-Rwanda Business Forum



Forum overview

- Inaugural UK-Rwanda investment forum held in Kigali in Jan 2024
- Brought together UK and Rwandan business leaders, investors and senior government officials to discuss business opportunities
- Provided opportunities for high-level dialogue and networking focused on six priority sectors: manufacturing, agriculture, financial and professional services, the green economy, infrastructure, and critical minerals

Key outcomes

- Presentation well received by participants, with strong interest from private sector players in Rwanda's mining sector
- Strong engagement with the UK's Critical Minerals Association
 - Has around 40 members who are looking to secure alternative critical mineral supply chains.
 - They see an opportunity to collaborate closely with Rwanda on LIBPs from an offtake point of view.
 - Keen to be involved at the next business planning phase

Challenges and lessons learned in delivering the TA

Data availability and gathering

- Challenges in gathering data in a timely manner, despite having named individuals assigned from MINICOM
 - Use of external consultant instead of the main contacts within the ministry departments
 - Helpful that BDO had an advisor embedded within RDB
- Incorporation of off-the-record findings from discussions with subject matter experts and other primary research sources

Stakeholder engagement

- Helpful to have strong and actively engaged government stakeholder on the SteerCo
 - MINICOM's Director General
 - Able and empowered to draw other government departments / ministries as well as non-state actors
- However, some relevant stakeholders only joined the party further down the line
 - Initial scepticism from other ministries but eventually came fully on board with strong and meaningful contributions (eg RMB)
 - Required one-on-one engagement with less engaged stakeholders (eg RDB's skills office; RMB)

Risk of scope creep

- Managing stakeholder expectations on conducting out-of-scope work elements, e.g. building out a business plan / financial feasibility
- Given the complexity of the subject, there were some requests to go an extra mile in the market analysis – eg initially agreed to include two case studies on DRC/Zambia and South Africa, but ended up including additional case studies on China, Poland, and high-level overviews of Zimbabwe and Morocco
- Challenge to conduct a market study in a constantly evolving market
 - Highly dynamic and fast-moving market with pressure to respond to every “breaking story” in the media
 - More focus on evolving longer-term trends than on short-term headline news articles

Next steps

- A more detailed feasibility study to be conducted to evaluate the viability of establishing a production facility for LIB precursors in Rwanda
- This will include an analysis of suitable locations, land and infrastructure requirements, plant and equipment specifications, production capacity planning, and technical feasibility assessments



Key contributor:

Fadzayi Musanhu

fadzayi@marketintelligenceafrica.com

This document has been funded by UK aid from the UK Government; however, the views expressed do not necessarily reflect the UK government's official policies

www.manufacturingafrica.org

