HOW THE GROWING GLOBAL SUPPLY OF LITHIUM-ION BATTERIES AFFECTS RECYCLING ECONOMICS IN EAST AFRICA

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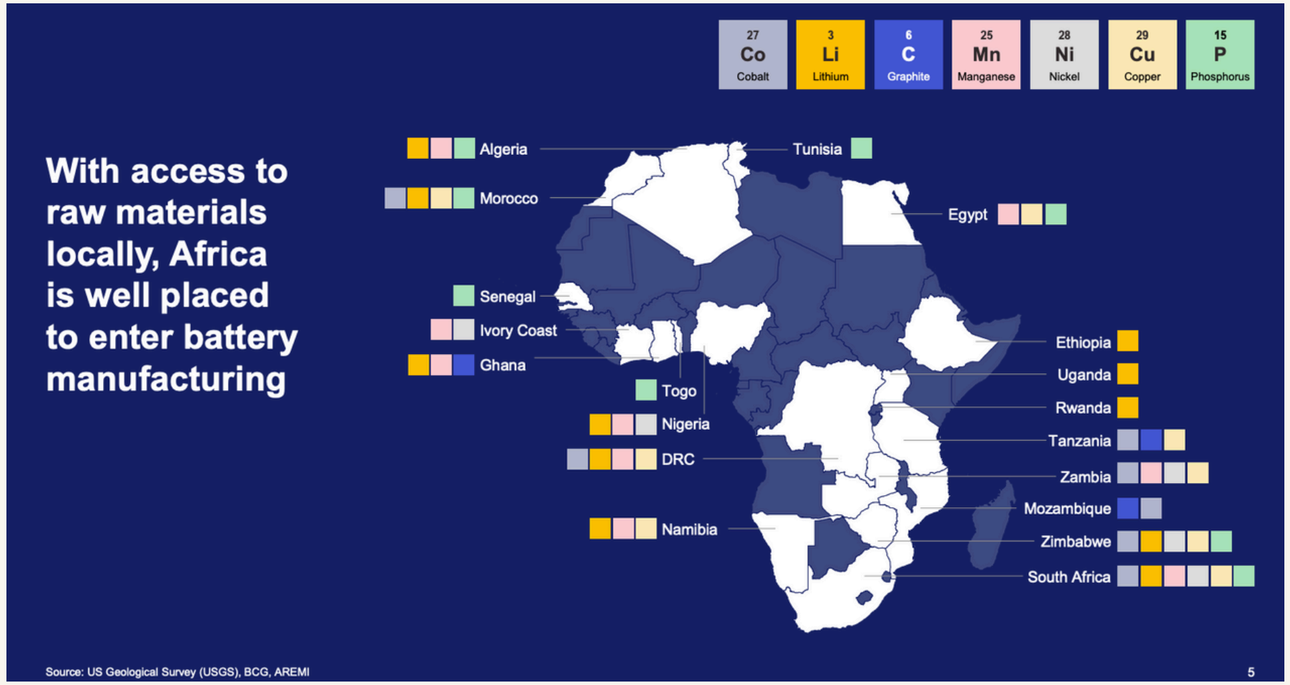
INTRODUCTION

East/Sub-Saharan Africa Battery Market

- Battery use is growing to address power outages and infrastructure gaps
- Market expected to grow **6.6% from 2026 to 2032**
- Key applications: renewable energy integration, off-grid electrification
- **Challenge:** Lack of local battery manufacturing
- **Opportunity:** Battery reuse & recycling as a cost-effective alternative



INTRODUCTION

Battery Types

Ni-Cd
durable but toxic

Ni-MH
more storage, quicker discharge

Li-ion
widely used, high efficiency, expensive

Recycling Methods

Pyrometallurgical
high energy, high emissions

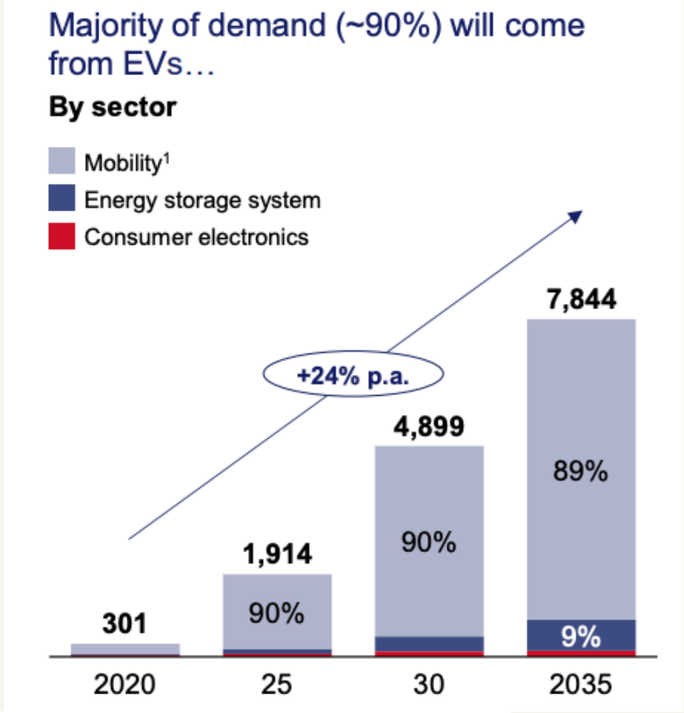
Hydrometallurgical
selective, less emissions

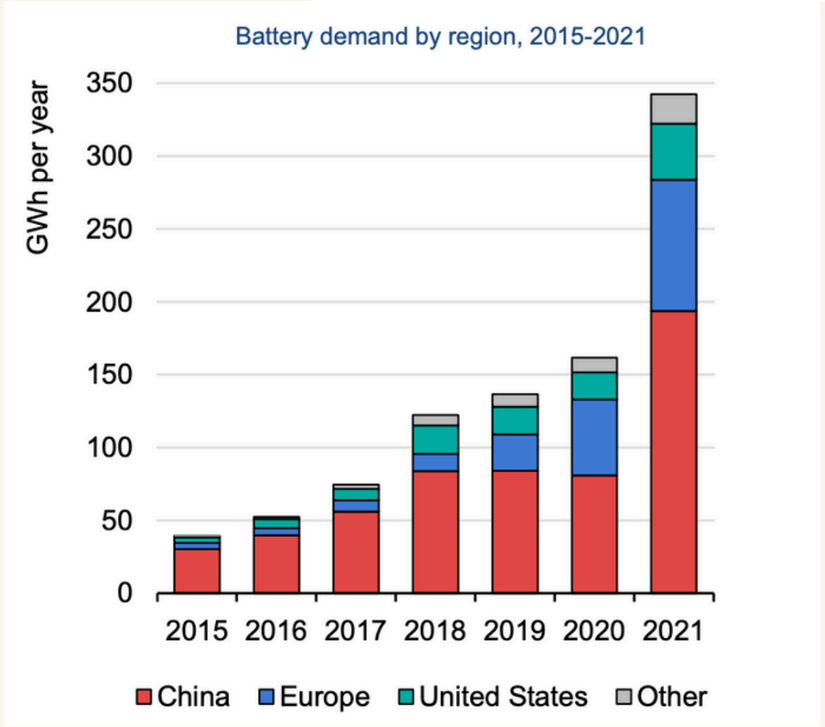
Direct Recycling
cost-effective, preserves materials

THE FUTURE OF THE BATTERY MARKET

Global Battery Market Trends

- **Global battery demand** projected to hit **7.8 TWh by 2035**
- **EVs will drive ~90%** of total demand growth
- **Li-ion batteries** expected to dominate at **~80%** market share
- **China leads** global battery production; **oversupply** forecasted
- US, EU, and others may face **undersupply** → Africa can fill the gap
- **Africa's opportunity:** export refined materials to diversify global supply
- Projected cost of LFP batteries in Africa: $68–$72/kWh by 2030
- **35–40% cost savings** on lithium refining due to raw material access & labor

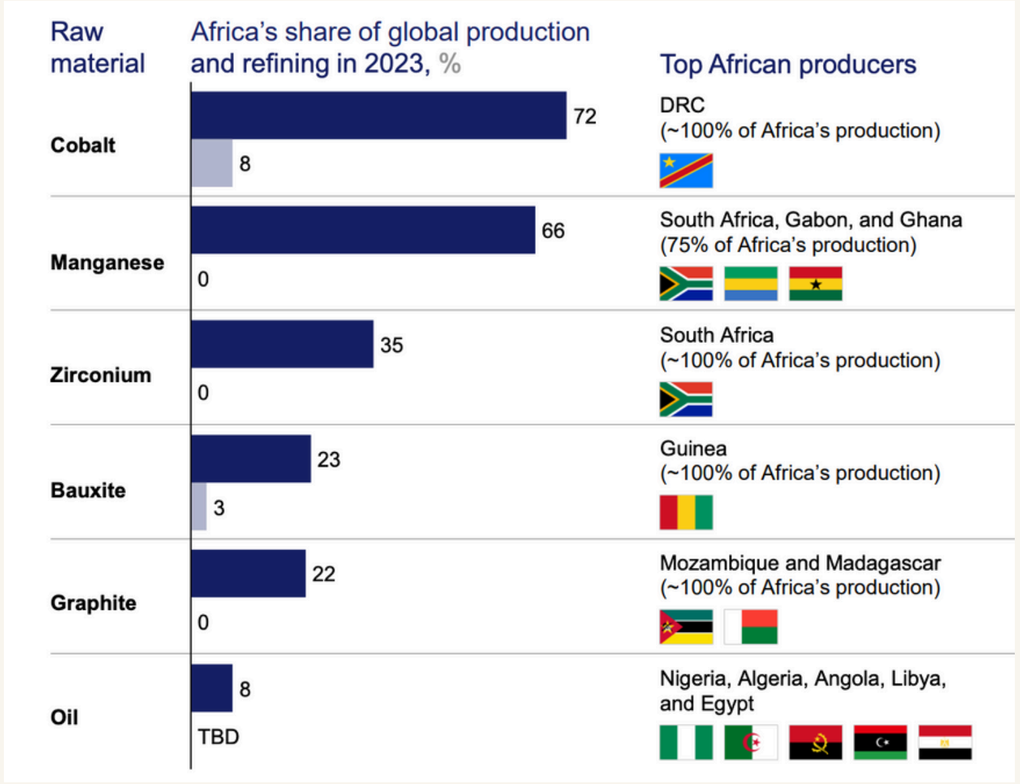




THE FUTURE OF THE BATTERY MARKET

Local Battery Supply & Demand

- **Africa's battery demand:** projected at **7 GWh by 2030** (~0.1% of global demand)
- Driven by **BESS** and affordable **2- & 3-wheel EVs**
- Rich in raw materials: **cobalt, lithium, nickel**
- **Most raw materials are exported** for refining abroad (mainly China)
- **Refining capacity is limited** but investment is growing
- **Refining lithium in Africa is 35–40% cheaper** than global averages
- Potential to **become a global refining hub** with local infrastructure development



THE FUTURE OF THE BATTERY MARKET

Second-Hand vs New Batteries

Cost Comparison

- New battery ≈ 10,000 KES (~$77 USD)
- Used battery ≈ 4,500 KES (~$35 USD)
- Per watt-hour, new batteries may be cheaper due to longer life

Lifespan & Performance

- Second-hand batteries: unknown capacity, reduced lifespan
- New batteries: longer lifetime, consistent performance

Trust & Risk

- Second-hand: often purchased from less reputable sellers
- New batteries: lower risk of scams or defects

Market Trends

- Unclear if new batteries will ever be cheaper outright
- As income rises, convenience > cost savings, favoring new batteries

THE FUTURE OF THE BATTERY MARKET

Policy & Import Tariffs

East African Community (EAC) Tariff Policy

- Includes DRC, Rwanda, Burundi, Uganda, South Sudan, Kenya, Somalia, Tanzania
- **35% import tariff** on finished batteries
- **0% tariff** on battery parts → incentive for local assembly/repair

Local Industry Encouragement

- Policy pushes for manufacturing and refurbishment within EAC
- Reduced reliance on expensive imports

Zimbabwe’s Lithium Export Ban

- Ban on raw lithium exports to retain economic value
- Goal: Boost local refining jobs and industrial revenue
- Too recent to judge impact, but signals shift toward value retention

ECONOMICS OF RECYCLING

LIB Recycling

Recycling Methods & Innovation

- Pyrometallurgical: widely used, high-temp, energy intensive (e.g., Umicore, Glencore)
- Hydrometallurgical: cleaner, lower temp, rising in popularity (e.g., Li-Cycle, ABTC)
- Mechanical: low-cost, ideal for early-stage or small-scale efforts
- Spoke & Hub model: modular pre-processing + centralized refinement (Li-Cycle, Redwood)

Global Growth of Facilities

- Over 150 facilities worldwide projected by 2025
- China leads in recycling centers (GEM Co., Brunp), backed by government policy
- EU's Circular Economy Plan driving new hydromet plants (Umicore, Redcar)
- U.S. slower, but expanding eco-friendly facilities (Li-Cycle, Redwood Materials)

Africa's Current & Emerging Landscape

- No full LIB recycling centers yet
- Enviroserve: collects LIBs, ships to UAE; stockpiled 20 tons in Kenya
- Plan to establish local "black mass" pre-processing to reduce costs
- Challenges: high startup costs, limited infrastructure
- Progress: efforts from eWASA, rising EV demand, growing awareness & investment

ECONOMICS OF RECYCLING

Transportation Challenges

High Shipping Costs in Sub-Saharan Africa

- Logistics = 12–15% of GDP (vs. 6–9% in Asia/Europe)
- Lack of infrastructure + inefficiencies = high overhead

Hazardous Material Regulations

- LIBs must meet strict packaging/fire safety rules (IATA, DOT)
- Air freight for LIBs: $5–$10/kg (vs. $1.50–$3/kg standard)
- Sea freight: $1,500–$7,000 per container with hazmat fees

“Black Mass” as a Workaround

- Lower shipping risk/cost: $2,000–$4,000 per container
- Still needs special handling + facilities to process on arrival

Bottom Line

- Lack of local processing centers = long-term cost barrier
- Investment in modular local infrastructure is critical

ECONOMICS OF RECYCLING

Building Recycling Centers

High Capital Requirements

- Modular black mass facilities: $5M–$15M
- Full recycling plants: $50M–$100M

The Modular Advantage

- Focuses only on initial processing (black mass)
- Cuts transportation costs by avoiding full battery shipment
- Aligns with Li-Cycle’s “Spoke & Hub” model

Realistic Path for Africa

- Modular plants = scalable, lower startup costs
- Enables gradual growth as battery demand rises
- Paves the way for full-scale plants in the future

Long-Term Benefits

- Boosts sustainability
- Encourages local economic development
- Builds self-sufficiency in battery value chain

ECONOMICS OF RECYCLING

Value of Extracted Materials

Growing Demand = Rising Material Value

- Demand for Li-ion batteries increases → lithium, nickel, cobalt, manganese more valuable
- Recycling = less reliance on mining, better resource circularity

Economic Opportunity

- Estimated economic value of LIB waste: ~€6,500/ton
- Market prices of raw materials: $10–$26.50/kg

Profitability Threshold

- To be profitable, recycled materials must yield $2–6/kg
- Efficient refining & purification is critical to economic viability

Resource Types

- Recovered from:
  - Spent batteries
  - Manufacturing scraps

ECONOMICS OF RECYCLING

Environmental Impact

- Battery recycling offers critical environmental benefits beyond just cost savings
- Reduces dependency on newly mined materials like lithium, cobalt, and nickel
- Recycling significantly lowers emissions, water use, and energy demand
- Facility location plays a big role in overall environmental impact
- With proper infrastructure, recycling supports a more sustainable battery supply chain

Metric	Mining	Recycling	% Savings
CO_2 Emissions	High	Low	81–85% ↓
Water Usage	High	Lower	72–88% ↓
Energy consumption	High	Efficient	77–89% ↓

SLBS VS NEW BATTERIES

SLBs

- Cost about $1,500 in Kenya vs. $10,000 for new batteries
- Retain 70–80% of original capacity
- Sourced from retired EV batteries
- Ideal for off-grid and rural energy storage
- Reduces e-waste and delays need for recycling
- Downsides: shorter lifespan, inconsistent performance, potential safety risks

SLBS VS NEW BATTERIES

New Batteries

- Offer higher efficiency, longer lifespan, and advanced tech
- Still costly and resource-intensive to produce
- Provide a reliable long-term solution
- Cost expected to drop to $68–$72/kWh by 2030
- Better for scaling national grid solutions and energy infrastructure
- SLBs + new = a hybrid model for sustainable energy growthout $1,500 in Kenya vs. $10,000 for new batteries

Conclusion

"Recycling isn’t just a solution — it’s a strategy for long-term sustainability."

- Battery recycling is **crucial for East Africa’s sustainable growth**
- Offers **significant economic and environmental benefits**
- **Falling new battery prices** may challenge recycling’s cost advantage
- **Policy support** will be key to making recycling more viable
- **Second-life batteries** are valuable but not a one-size-fits-all solution
- A balanced, strategic approach can help East Africa build a cleaner, more resilient energy future

Thank you!
Q/A