ENERGY TRANSITION PARTNERSHIP

Milestone 4

VIETNAM'S BATTERY SUPPLY CHAIN:

Current State Analysis and Investment Opportunities

UNOPS

AFD AGENCE FRANÇAISE DE DEVELOPPEMENT

Federal Ministry for Economic Affairs and Climate Action

Department for Energy Security & Net Zero

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Australian Government
Department of Climate Change, Energy, the Environment and Water

CIFF CHILDREN'S INVESTMENT FUND FOUNDATION

SEQUOIA CLIMATE FOUNDATION

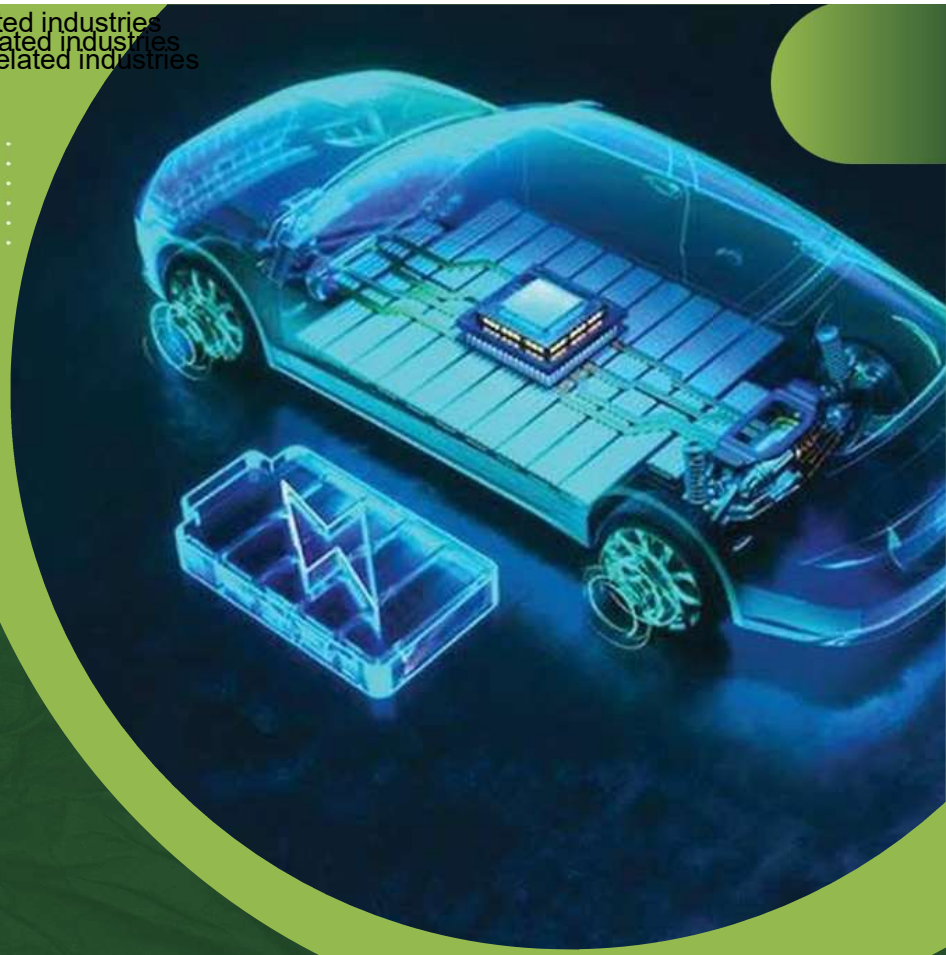
Vietnam's Battery Supply Chain:

Assessing the Current Situation, Identifying Opportunities and Challenges

Report cooperated between Vietnam's
Ministry of Finance and ETP/UNOPS

The Role of Batteries in the Energy Transition

- Promote clean energy
- Strengthen energy security
- Drive economic growth
- The global battery market is projected to reach US$400 billion by 2030, creating jobs and boosting related industries
- Foster technological innovation
- Advance sustainability



Objectives and scopes of the report

A joint initiative between the Ministry of Finance of Vietnam and ETP/UNOPS aims to promote investment, innovation, and policy development to strengthen Vietnam's position in the global battery supply chain. The report provides a comprehensive analysis of Vietnam's battery supply chain, assesses the current landscape, identifies opportunities and challenges, and proposes strategic interventions.

Technology Gap
Assess the capacity for material production, advanced battery technologies, and recycling processes.

Stakeholder Mapping
Identify key actors to foster collaboration and coordination.

Supply Chain Analysis
Examine upstream, midstream, and downstream segments to identify strengths and weaknesses.

Market Opportunities
Analyze domestic and export market potential aligned with green growth strategies.

Policy and Investment Framework
Propose recommendations to enhance production capacity and develop human resources.

Agenda

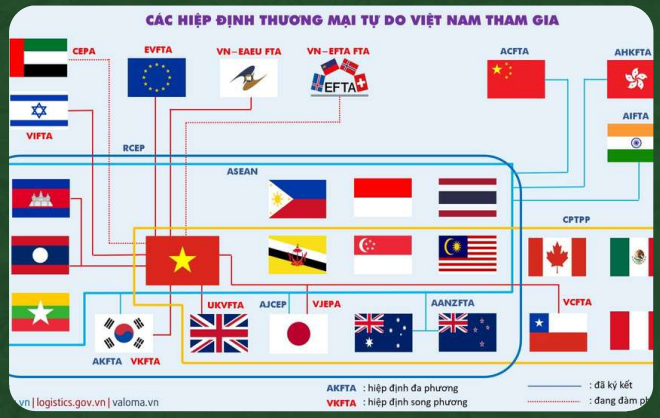
1. Introduction
2. Global Battery Market Drivers
3. Battery Supply Chain Stages in Vietnam
4. Legal and Institutional Framework
5. Financial Landscape and Justification for Investing in Vietnam
6. Investment Foundations and Strategic Partnerships

Vietnam's Strategic Position in the Global Supply Chain

- Global Battery Market Forecast: 3,500 GWh by 2030

- Low labor costs ($296.5/month) and competitive electricity prices ($0.085/kWh)

- Significant mineral resource advantages



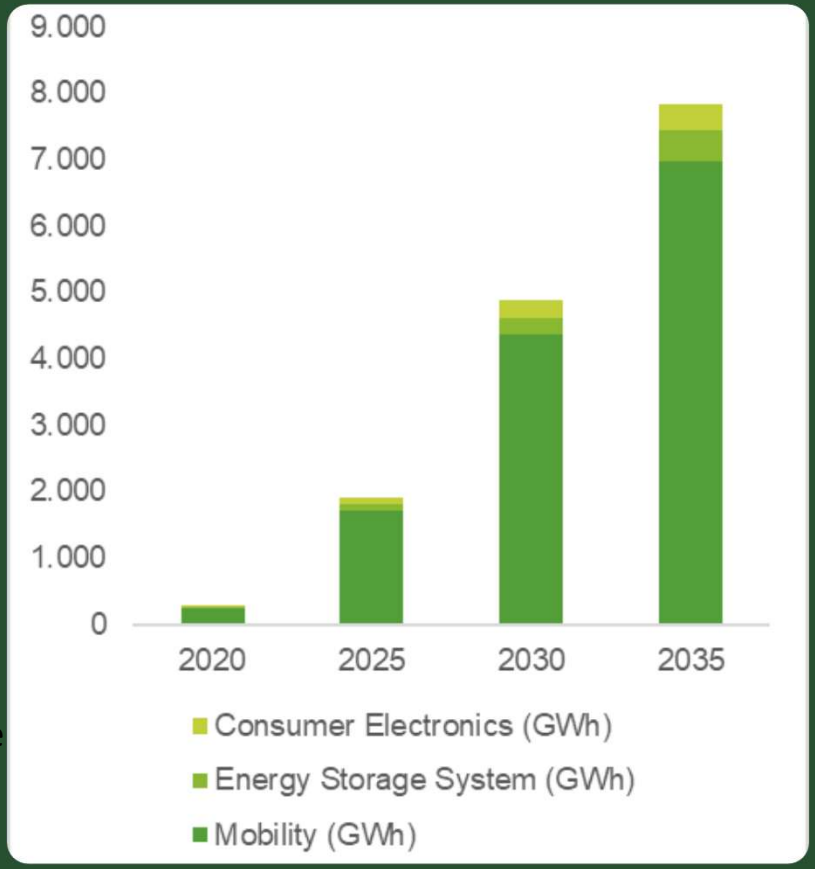
- Extensive FTA network: EVFTA, CPTPP, RCEP

MINERAL RESOURCES – UPSTREAM BASE

Nickel	**3.7 million tons** in Son La, with potential for processing into nickel sulfate for battery production.
Graphite	Untapped mines in Yen Bai and Tuyen Quang hold important cathode materials.
Mangan	**10.77 million tons** available to support anode production for batteries.
Đất hiếm	Significant untapped potential to support next-generation battery types.

2. Global Battery Market Drivers

Strong Demand Growth	Global battery demand is projected to grow from 750 GWh in 2022 to 3,500 GWh by 2030, driven primarily by electric vehicles (EVs) and battery energy storage systems (BESS).
High Concentration and Geopolitical Risks	China accounts for approximately 60% of global battery production. Congo supplies 65% of cobalt, and Australia provides 50% of lithium, creating bottlenecks in the supply chain.
Policy Push and Foreign Direct Investment (FDI)	China has tightened battery quality standards starting from June 2024. This shift presents significant FDI opportunities for Vietnam, including Gotion's 5 GWh project and LG/Samsung SDI's 5 GWh facility in Bac Ninh.
Regional Supply–Demand Balancing	An oversupply of approximately 1.4 TWh is forecasted in China by 2035, while the rest of the world is expected to face a shortage of around 70%, driving the development of regional supply chains and battery recycling.



ECONOMIES OF SCALE IN THE SUPPLY CHAIN

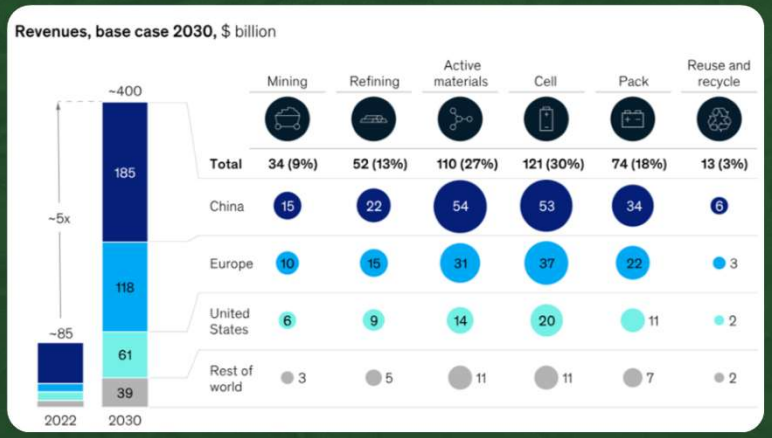
Component Market Size

The component market (including cathodes and anodes) is projected to reach US$250 billion by 2030, with more than 200 gigafactories planned.

Significant Cost Reduction Driven by Scale and Technology

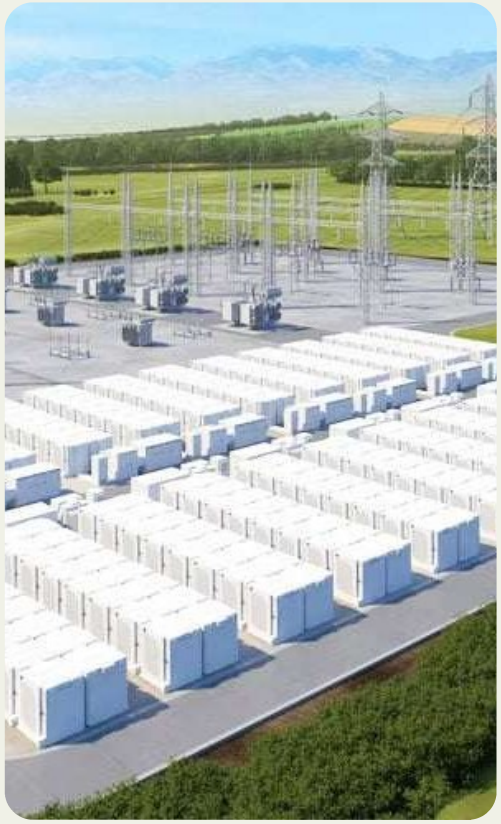
Global LIB prices dropped from US$140 per kWh in 2023 to US$112 per kWh in 2024, with the lowest price recorded in China at US$80 per kWh.

Prices of Selected Battery Metals and LIB Packs (2015–2025)



Revenue at Each Stage of the Battery Supply Chain

CONSTRAINTS ON RAW MATERIAL SUPPLY



Exploding demand for raw materials

Nickel, graphite, and lithium demand projected to increase 14–20 times by 2040 compared to 2020; lithium demand expected to grow 5 times by 2030.

Monopoly and bottlenecks

China controls 60% of battery raw materials. Indonesia, Congo, and Australia face port congestion and political instability.

Recycling – a long-term solution

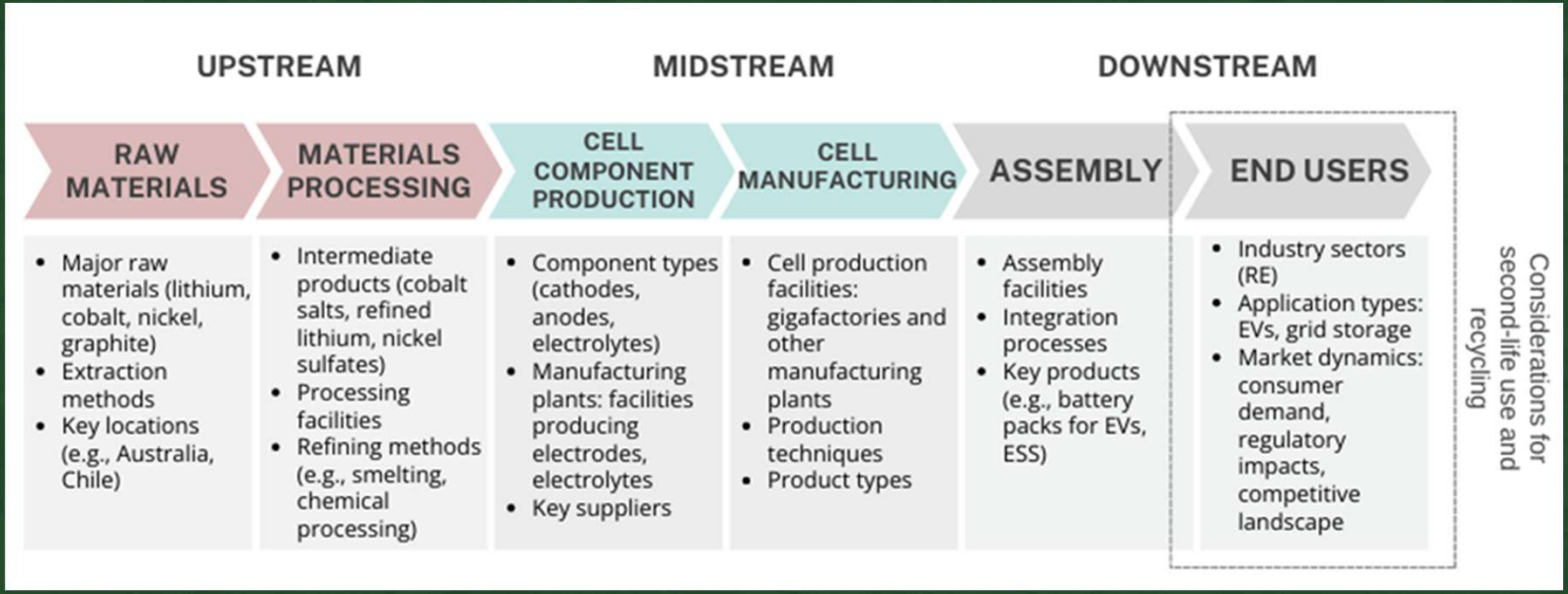
Currently, only 5% of lithium-ion batteries are recycled. The EU has set ambitious targets, while Vietnam is still in the early stages.

Summary Table of Trends

Category	Global	Vietnam
Demand	Battery demand is projected to reach 4.9 TWh by 2035, with 90% driven by electric vehicles (EVs); battery energy storage systems (BESS) are expected to reach 200 GWh by 2030, with LFP and NMC chemistries accounting for 80%.	Electric two-wheelers (EV-2W) are growing at a 13.4% compound annual growth rate (CAGR); electric cars are expected to reach 90,000 units in 2024; battery energy storage systems (BESS) are projected to reach 10–16 GW by 2030.
Supply	A supply-demand balance is expected by 2035, but distribution remains uneven: China is projected to have a surplus of 1.4 TWh, while the rest of the world (RoW) faces a 70% shortfall. China is expected to account for 60% of global battery production.	Vietnam imports 80% of its lithium and 100% of its cathodes, with limited domestic production. Foreign direct investment from companies like LG Chem and Samsung SDI provides crucial support.
Chain value	Refining is projected to reach US$114 billion, cell manufacturing US$119 billion, and recycling US$12 billion by 2030.	Nickel and lithium refining holds significant potential. Cell manufacturing is advancing with key players such as VinFast and LG Chem. Currently, only 10% of batteries are recycled, but this is expected to rise to 35% by 2030.
Opportunity	Diversify sources toward the Rest of the World (RoW); shift cell production closer to EU and North American markets; export raw materials.	Export refined materials through CPTPP and EVFTA; develop battery energy storage systems (BESS) and recycling; leverage nickel and graphite reserves; invest in R&D for LFP batteries.

3. STAGES OF THE BATTERY SUPPLY CHAIN IN VIETNAM

Battery Supply Chain and Key Indicators



Vietnam's battery supply chain, which plays a crucial role in supporting the country's electric vehicle (EV) and renewable energy targets, comprises five interconnected stages: (1) raw material extraction, (2) battery material production, (3) battery assembly, (4) product distribution, and (5) end-use and recycling. Each stage shapes the nation's capacity to reduce reliance on imports and meet its EV and battery energy storage system (BESS) goals.

RAW MATERIAL EXTRACTION & PROCESSING (UPSTREAM)

1. **Lithium:** Modest reserves, not yet commercially exploited.
2. Nickel: Estimated reserves of 4.1 million tons with high grade, suitable for NMC. Blackstone Minerals is investing in the Ban Phuc project.
3. **Cobalt:** 280,000 tons, with stable geopolitical conditions. Mainly exported in raw form.
4. **Manganese:** 10.77 million tons in reserves, with 362,000 tons produced in 2022. Limited processing for battery applications.
5. **Graphite:** 33.24 million tons in reserves, but refined graphite is still imported.

Battery Material Production (Midstream)

An Emerging Industry
This stage involves converting raw minerals into battery-grade materials, accounting for 35–50% of total battery costs. Vietnam remains heavily dependent on imports, with 70% of materials sourced from China.

- **Low Efficiency**
The mineral recovery rate in Vietnam ranges from 60% to 70%, significantly below the global benchmark of 90%.

- **Lack of Advanced Processing Facilities**
Vietnam currently lacks deep processing facilities for nickel sulfate, cobalt sulfate, and lithium hydroxide. The production of cathode and anode materials remains limited.

- **Policy Recommendations**
Promote technology transfer, provide investment incentives, and support the development of industrial clusters and domestic research and development.

BATTERY ASSEMBLY (DOWNSTREAM)

Situation in Vietnam

- The battery assembly sector in Vietnam is emerging, with a focus on lithium-ion batteries for electric vehicles, electronics, and energy storage systems.
- VinES and LG Chem lead in assembly capacity, which is estimated to reach 5–7 GWh by 2024.
- Automation is being introduced (e.g., ABB robots), but large-scale adoption remains limited.
- Production efficiency stands at 80–85%, which is lower than that of leading countries (95%).

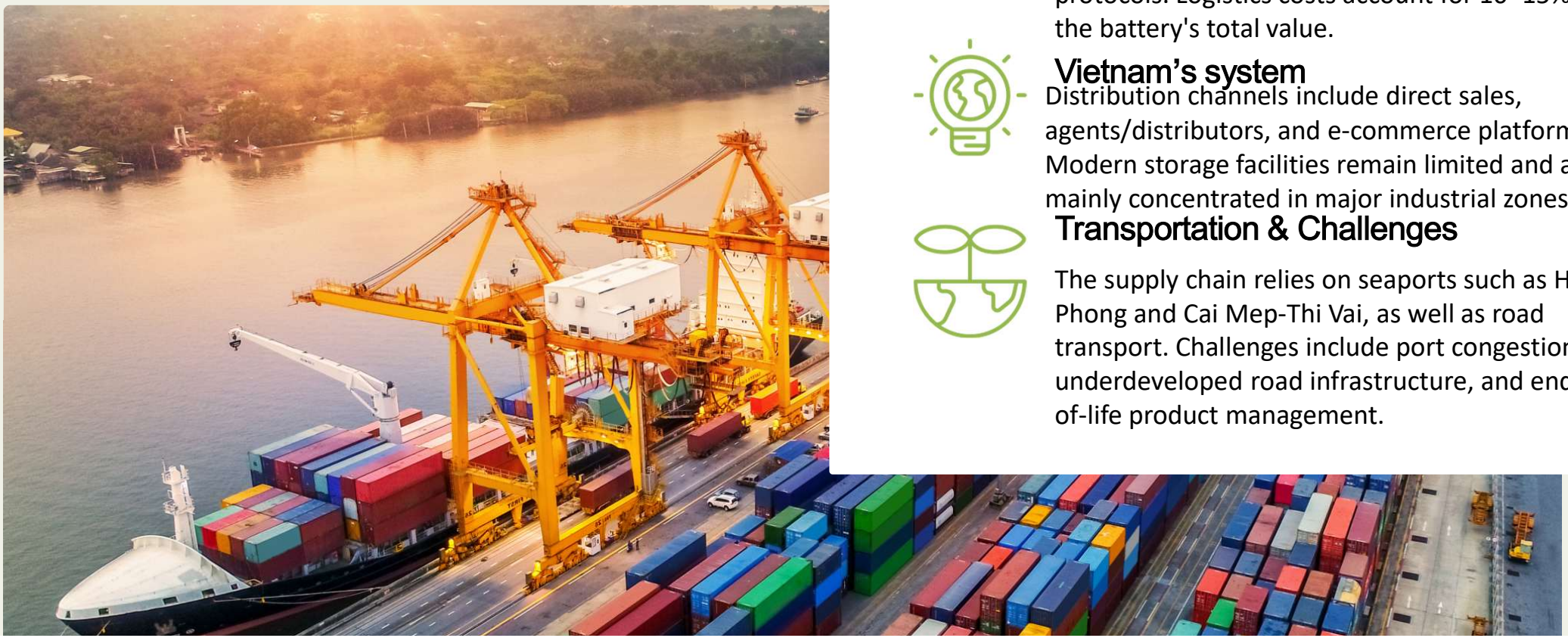
Added value

This stage involves integrating components into functional battery cells, which determines the battery's performance, safety, and lifespan

Dependence on import

70% of key materials are imported from China and South Korea, increasing production costs by 20%.

PRODUCTS DISTRIBUTION



Modern logistics

Distributing lithium-ion batteries requires modern logistics systems and strict safety protocols. Logistics costs account for 10–15% of the battery's total value.

Vietnam’s system

Distribution channels include direct sales, agents/distributors, and e-commerce platforms. Modern storage facilities remain limited and are mainly concentrated in major industrial zones.

Transportation & Challenges

The supply chain relies on seaports such as Hai Phong and Cai Mep-Thi Vai, as well as road transport. Challenges include port congestion, underdeveloped road infrastructure, and end-of-life product management.

END-OF-LIFE & RECYCLING

Significance

Crucial for sustainability, end-of-life battery recycling helps reduce environmental risks and promotes a circular economy. Recycling enables the recovery of valuable materials, reduces reliance on raw material extraction, and can lower costs by 20–30%.

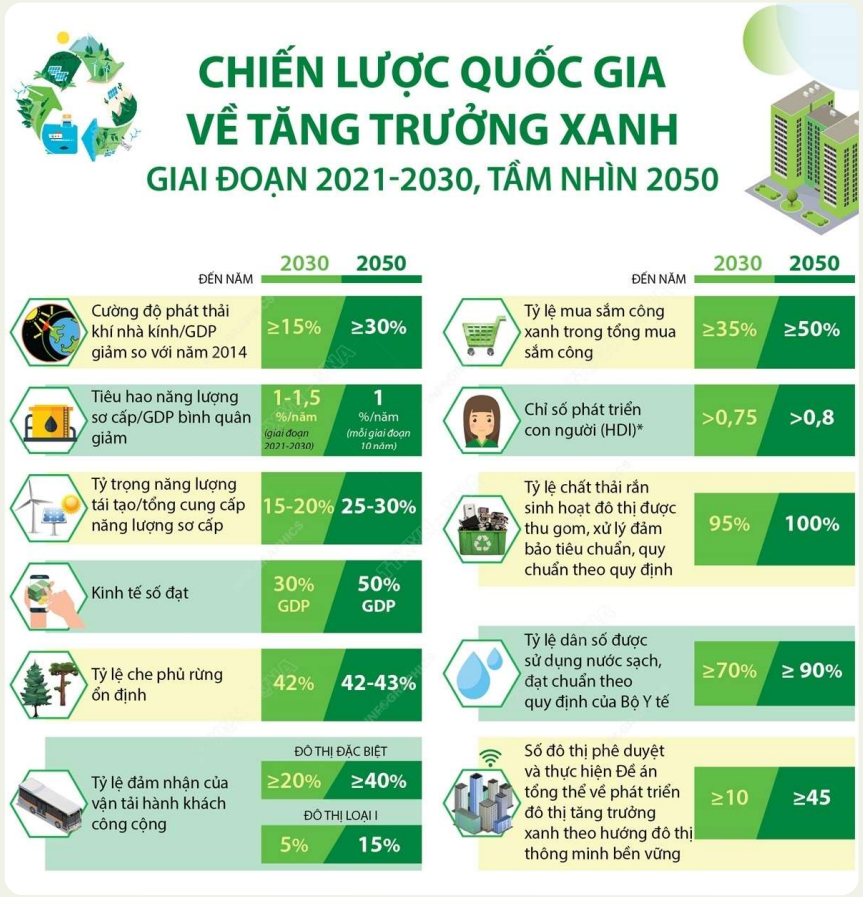
Vietnam's situation

- The recycling industry is still in its early stages, collecting only 500 tons of used batteries in 2023—just 0.5% of its potential. Only 10% of collected batteries are recycled, with a material recovery rate below 20%, compared to 80% in the EU. About 90% of discarded batteries are either landfilled or incinerated, contributing to pollution. Recycling technologies remain outdated and inefficient.

Potentials

The industry's estimated value is projected to reach US$100–200 million per year by 2030. Expanding recycling efforts could reduce the need for new raw material extraction by 25–40% by 2050.

4. Legal and Institutional Framework



Policies Supporting the Development of the Battery Supply Chain

- National Green Growth Strategy (2012, updated in 2021)

- **Investment Law 2020** and **Geology and Mineral Resources Law 2024**.

- **Decision No. 866/QD-TTg (2021)** promotes the development of green energy and the sustainable exploitation of mineral resources.

- **Import tax incentives for electric vehicle components and exemption from electric vehicle registration fees.**

POLICIES AND IMPACTS: UPSTREAM (RAW MATERIALS)

Geology and Mineral Law

- *It provides a comprehensive regulatory framework for the management of strategic minerals such as nickel, cobalt, lithium, and graphite, and takes effect from July 2025. However, the current prioritization of raw ore exports over domestic processing presents a significant policy gap.*

High Export Tariff

- *High export taxes (up to 40% on raw nickel) are intended to curb raw material exports, but their effectiveness is limited due to a lack of refining capacity.There is also a lack of a cross-ministerial mineral strategy for the battery supply chain*

POLICY AND IMPACT:MIDSTREAM (BATTERY MANUFACTURING)

General Incentives

There are no specific incentives for battery manufacturing; only general high-tech manufacturing policies are applied.

Lack of Domestic Support

EV batteries and BESS are not classified as domestically manufactured goods, limiting support for local production.

Technical specifications

There are existing technical standards, but no specific Vietnamese standards (TCVN) for BESS, requiring reliance on international standards.

POLICY AND IMPACT:DOWNSTREAM (EV AND BESS DEPLOYMENT)

EV Policies

- Decision 876/QĐ-TTg sets a target of net-zero emissions in the transport sector by 2050.100% registration fee exemption is granted for BEVs until February 2027, along with preferential special consumption tax rates (1–3%).

BESS Policies

- The Power Development Plan VIII sets a target to deploy a significant amount of BESS: 10,000–16,300 MW by 2030.
  Decision 988/QD-BCT introduces higher electricity prices for solar power projects integrated with BESS.

Major stakeholders

Government agencies

Ministry of Finance, Ministry of Industry and Trade, Ministry of Construction, Ministry of Agriculture and Environment, Ministry of Science and Technology, Ministry of Home Affairs, State Bank of Vietnam.

SOEs

Vinacomin (TKV), Vietnam Electricity (EVN), and Petrovietnam (PVN) play important roles in infrastructure and energy.

Key players

Blackstone Minerals, Tân Phát Minerals, POSCO, VinES, Gotion High-Tech, Samsung SDI, and LG Chem are key players in the battery supply chain.

Market opportunities

Domestic demands

46,9 GWh

For electric motorbikes, electric cars, and energy storage.

Export opportunities

ASEAN, EU, US

Benefit from the IRA and the Green Deal

FDI inflows

2–3 billion USD

Total investment for gigafactory projects

Socio-economic impacts

Total investment

3.3–5.4 billion USD in the period up to 2030

GDP growth

0.3–0.5 percentage points per year

Job creation

Create 28,750–35,000 high-tech and manufacturing jobs

Labor restructuring

25% of the workforce trained in specialized fields

Industrial development

Local support

5.FINANCIAL SITUATION AND KEY REASONS TO INVEST IN VIETNAM

Projected battery demand up to 2030

Total battery demand	**~46,9 GWh (~1,3% globally).**
Allocation by segment	•**BESS:** 64% (~30 GWh) •**PEV:** 24% (~11,5 GWh) •**E-2W:** 12% (~5,4 GWh)
Forecasted growth	•**E-2W:** CAGR 16%, đạt 1,55 million units •**PEV:** CAGR 15%, đạt 171.000 units.

BATTERY COSTS AND TOTAL REQUIRED INVESTMENT

Forecasted battery prices up to 2030:

- *Conservative: 115 USD/kWh → Total investment ~5.4 billion USD.*
- *Average: 90 USD/kWh → ~4.2 billion USD.*
- *Optimistic: 70 USD/kWh → ~3.28 billion USD.*

- BESS accounts for approximately 60–65% of total investment due to its large capacity.
- There is a potential savings of 2.1 billion USD if production is localized.

VIETNAM'S COST COMPETITIVENESS

Estimated battery "cost floor"

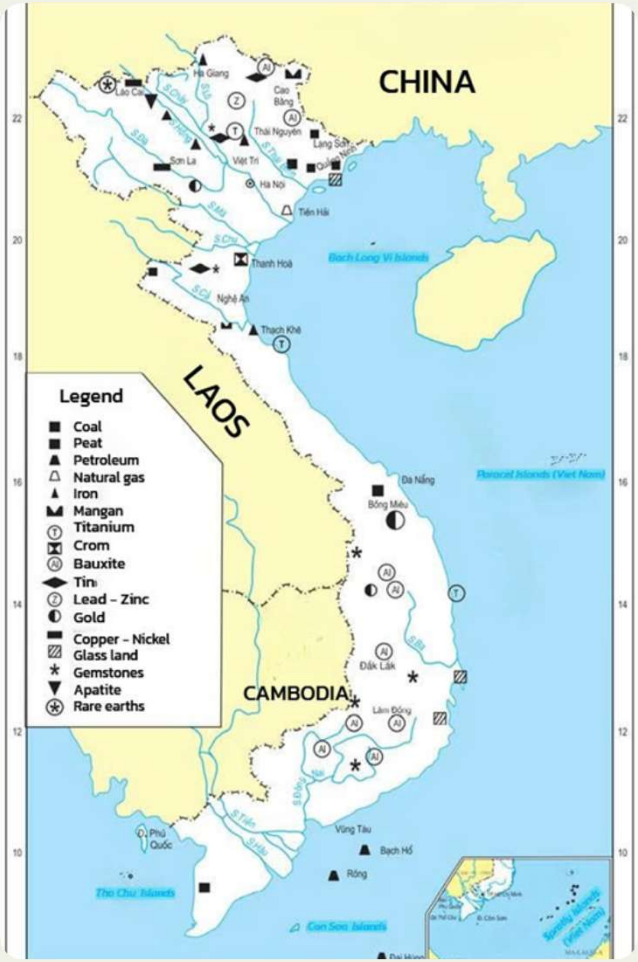
- ASEAN: 84,9 USD/kWh
- EU: 85,3 USD/kWh
- US: 86,1 USD/kWh

Vietnam's advantages

- Low labor and electricity costs
- Proximity to raw materials (nickel, graphite)
- Strategic seaports (Hai Phong, Ho Chi Minh City)
- Policy support (Investment Law, Geology & Minerals Law)

Challenges

Dependence on foreign technology and limited refining capacity.



STRATEGIC BENEFITS OF DEVELOPING THE BATTERY SUPPLY CHAIN

- Economic: Increase value-added and support the high-tech industry.
- Environmental: Contribute to CO_2 emission reduction, support BESS, and battery recycling.
- Industrial: Promote FDI and enhance export capacity (2 billion USD by 2032).
- Energy security: Reduce dependence on fossil fuels and imported batteries.

6. INVESTMENT BASE AND STRATEGIC PARTNERSHIPS

Opportunities and Challenges for Vietnam in the Battery (LIB) Industry

Potentials

- Strategic location in Southeast Asia, abundant mineral resources (nickel, graphite), and a developing renewable energy sector.
  The global battery market is projected to reach 3,500 GWh by 2030 (CAGR growth of 21%).
  Goals include attracting FDI and meeting domestic battery demand (46.9 GWh by 2030) for EVs and energy storage..

Challenges

- Dependence on 80% imports of lithium and cathode materials.
- Weak recycling infrastructure (only 10% of batteries are recycled).
- Lack of intermediate processing capacity (e.g., only 15% of mined nickel is processed).
- Low R&D investment (<0.5% of GDP vs. 4.8% in South Korea).

Policy Framework and Limitations

Current policies	Limitations
•Green Growth Strategy (GGS), Net Zero Transport Roadmap, Power Development Plan VIII. Incentives: Import tax exemption for EV components, CIT rate of 15–20%. Strategic Industries List (Decision No. 1131/QĐ-TTg dated 12/6/2025): Energy technology and advanced materials group including lithium-ion batteries, solid-state, fuel cells, and electrolyzers; Rare earth technology group: reserve assessment, mining, mineral processing, extraction, and refining of rare earths.	•EV-2W grows at 13.4% CAGR; electric cars: 90k units (2024); BESS: 10–16 GW (2030) Lack of targeted subsidies for battery manufacturing (unlike the US, China, India). High export tax (30% on raw nickel ore) increases processing costs. Absence of a national battery roadmap and mandatory recycling standards. Competitive risks: FDI shifts to Indonesia (0% EV tax), Thailand, and Poland due to less attractive incentives.

Strategic Partnership

Key FTAs

- EVFTA (EU): Battery market access opened; requires ESG compliance (70% lithium recycling by 2030).
- CPTPP: Solid-state battery R&D cooperation with Japan; lithium sourcing from Australia.
- RCEP: Access to advanced materials (Indonesian nickel, Korean cathodes).

Regional partners

- **Thailand:** Partnership with Energy Absolute (EA) to build a 2 GWh/year battery plant.
- **Indonesia:** Securing supply of 50,000 tons of nickel per year.

Private partners (VinFast)

- Gotion (China): Producing LFP batteries (30 million cells/year).
- ProLogium (Taiwan): Developing solid-state batteries.
- Marubeni (Japan): Recycling EV batteries into BESS.

Supply Chain Optimization Strategy

Battery Ecosystem Development

- **Mining & Processing:** Invest in nickel hydrometallurgical plants and domestic graphite mining.
  Materials Production: Attract gigafactories (CATL, LG Chem) through tax incentives.
  Recycling: Target 70% lithium recovery (in line with EU standards).

Key Solutions

- **Vertical Integration:** Combine mining, production, and recycling to reduce costs.
  Strategic Mineral Reserves: Stockpile key minerals (like China) to mitigate price volatility.
  Supply Chain Digitalization: Use AI and IoT to enhance efficiency.
  Skilled Workforce Development: Train specialists in battery chemistry and recycling

Policy and Impact: Downstream (EV and BESS Utilization)

EV Policies

- Decision 876/QĐ-TTg sets a target of net-zero emissions in transportation by 2050.
- 100% registration fee exemption for BEVs until February 2027 and preferential special consumption tax (1–3%).

BESS Policies

- Power Development Plan VIII sets a significant BESS deployment target: 10,000–16,300 MW by 2030.
- Decision 988/QD-BCT introduces higher electricity tariffs for solar projects integrated with BESS.

Opportunities

- Positioning as the ASEAN battery hub through FTAs and geographic advantage.
- Promoting a circular economy through recycling and BESS.

Battery Value Chain Development Strategy

01 Upstream: Domestic mineral extraction and processing investment.

02 Midstream: Cathode/anode production, technology support, and investment incentives.

03 Downstream: Development of LFP battery plants, charging infrastructure, recycling, and second-life batteries.

Strategic Approach

- Vertical integration, supply chain digitalization, and supply diversification.
- Application of AI and IoT, implementation of “battery passports” in line with EU standards.
- Investment in advanced skills training and development of a high-quality workforce.

Action Roadmap

Shorterm

Announce the national battery roadmap, establish green battery industrial parks, and provide workforce training.

Medium term

Increase production capacity, build raw material linkages, and improve recycling.

Long term

Innovate technologies (solid-state batteries, sodium-ion batteries) and meet global ESG standards.

Policy recommendations

1. Develop a national battery strategy through inter-ministerial coordination
2. Expand domestic production to reduce reliance on imports
3. Strengthen infrastructure for electric vehicles and battery manufacturing
4. Build a skilled workforce through training and investment in research
5. Promote global and regional strategic partnerships to enhance resilience
6. Advance sustainable and equitable battery production and recycling

THANK YOU FOR YOUR ATTENTION