INDIA'S CRITICAL MINERALS & BATTERY RECYCLING SECTOR

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A $2 billion recycling market by 2034. A 60x capacity gap. Government subsidies live and waiting. Forty percent compound growth in Li-ion recycling. The question is not whether this opportunity is real it is who moves first.

2.37 Mn	60x	~40%
EVs Sold - Last 12 Months	**Recycling Capacity Gap**	**India Li-ion Recycling CAGR**
Mar 2025–Feb 2026 | +38% YoY | All-time record	*2 GWh today vs 128 GWh needed by 2030 | NITI Aayog*	*2025–2032 | Grand View Research & GMI Research*

1. India Is Not Emerging - It Has Already Arrived

India is the **world's third-largest automobile market** and one of its fastest-growing economies. The automotive sector contributes over 7% to GDP, with government projections targeting **USD 300 billion by 2030**. Electric vehicles have shifted from policy ambition to mainstream industrial reality faster than most analysts predicted.

EV sales crossed **2.37 million units in the 12 months to February 2026** - a 38% year-on-year surge and India's highest-ever rolling annual EV total. Electric two-wheelers grew 45.6% YoY. Electric passenger vehicles grew 44% YoY. Government projections put annual EV sales at **17 million units by 2030**.

The scale of individual OEM moves tells the story better than any aggregate:

- **Mahindra & Mahindra:** 473% YoY growth in electric PV sales in February 2026 alone
- **Hero MotoCorp:** 44% YoY overall growth in February 2026, with VIDA EV arm tripling its market share
- **Tata Motors:** 47% share of India's EV passenger vehicle market multi-model, mass-market presence
- **Global validation:** Tesla, VinFast, and BYD all have active India sales operations in 2026 the market has passed the credibility threshold for global majors

This is not government-subsidy-driven demand. It is **consumer-led structural adoption** across income segments and geographies - driven by competitive pricing, improving range, and a rapidly expanding charging network now covering over 25,000 public points nationwide.

2. The Gigafactory Build-Out - Breaking Developments

The manufacturing infrastructure is being built to match demand - and the pace of announcements in the last 60 days signals that India's battery supply chain is entering its most consequential phase.

BREAKING -FEBRUARY 2026

Waaree Energies has received state government approval to build India's largest integrated lithium-ion battery gigafactory in Andhra Pradesh - a **₹8,175 crore investment with 16 GWh capacity**, covering the full value chain from cell manufacturing to battery packs and grid-scale BESS. 3,000 direct jobs. Operational target 2027.

ChemVolt Global signed an MoU with Andhra Pradesh in January 2026 for a separate **5 GWh LFP battery gigafactory** - ₹2,500 crore investment.

Both projects are operational in the exact window when formal EPR compliance enforcement intensifies and recycled content mandates take effect.

Beyond these two, **Reliance, Tata Group, Ola Electric, Amara Raja, and Exide Industries** all have active gigafactory programmes. Companies have announced an additional **246 GWh of cell manufacturing capacity through 2035**, backed by the government's PLI-ACC scheme (₹18,100 crore). More than **30 manufacturing sites** are expected operational by 2030, targeting **290 GWh of total output**.

Every battery gigafactory built is a future recycling feedstock source. Every GWh of manufacturing capacity added today becomes recyclable material in 7–10 years. India is not just building a battery industry - it is **pre-loading the recycling pipeline** at a scale no other emerging market is matching.

3. The Battery Recycling Market - What the Numbers Say

India's battery recycling market is valued at **USD 532 million in 2026** and projected to reach **USD 2 billion by 2034**. But the headline CAGR figure requires careful interpretation and we want to give you the complete picture.

UNDERSTANDING THE CAGR RANGE - WHICH NUMBER IS DEFENSIBLE

Different research firms report CAGRs ranging from 9% to 66% for India battery recycling. The reason is scope. Firms measuring all battery types (lead-acid dominant by volume today) report 9–10%. Firms measuring **lithium-ion battery recycling specifically**.

- **Grand View Research:** 40.5% CAGR, India EV battery recycling, 2024–2030
- **GMI Research:** 41.1% CAGR, India Li-ion battery recycling, 2025–2032
- **Inkwood Research:** 17.98% CAGR, all India battery recycling, 2026–2034 (market $532M to $2B)
- **Mordor Intelligence:** 9.06% CAGR, all battery types, 2025–2030 (most conservative)

The ~40% CAGR figure is the most defensible for the Li-ion segment specifically -supported by two independent top-tier research houses measuring operational domain.

The capacity gap is unambiguous. NITI Aayog projects **128 GWh of recyclable batteries available by 2030**. India's current formal recycling capacity stands at **approximately 2 GWh** - a 60-fold shortfall confirmed independently by Mordor Intelligence. India already processes approximately **60,000**

tonnes of battery material annually through informal channels, producing around 3,000 tonnes of lithium carbonate. The formal, technology-led sector barely exists - which means this market has essentially no incumbent to displace.

4. The Policy Commitment - National Priority, Not Departmental Ambition

India's approach is anchored in the Atmanirbhar Bharat framework- a **national-level industrial commitment**, not a ministry initiative. The policy stack is unusually complete:

Policy / Scheme	What It Means for Investors
National Critical Minerals Mission	₹34,300 crore | 7-year | Full value chain: exploration → mining → processing → recycling | Announced Jan 2025 | One of India's largest focused industrial commitments
Critical Minerals Recycling Scheme	₹1,500 crore | Sept 2025 | Up to 20% capex subsidy on new plants | 40–60% opex incentives on incremental sales for 5 years | Targets 270 kt/yr capacity | ₹8,000 crore private investment to be catalysed
PLI -Advanced Chemistry Cell	₹18,100 crore | 50 GWh domestic cell manufacturing capacity | Creates direct, commercial demand for recycled battery-grade inputs from domestic OEMs
PM E-DRIVE Scheme	Replaced FAME subsidy | 114% budget increase in 2025 | 800,000 diesel buses to be converted to electric -generating large, predictable battery volumes for recycling from 2030
State-Level Programmes	Tamil Nadu, Gujarat, Karnataka, Andhra Pradesh: dedicated battery parks, gigafactory zones, and additional recycler incentive schemes running in parallel to national policy

5. EPR Framework - The Full Picture

The EPR (Extended Producer Responsibility) framework is the regulatory backbone of India's battery recycling ecosystem. It is ambitious, legally binding - and like any newly enforced industrial policy, it has real implementation challenges.

What Is Legally Settled and Enforceable

Battery Waste Management Rules 2022 - notified by MoEFCC are law, covering all battery types. The 2024 and 2025 amendments have strengthened enforcement. These provisions are binding:

Provision	Requirement & Timeline
EPR Obligation	Every OEM, importer and seller must ensure batteries are collected and recycled. Cannot be fulfilled through informal operators. Mandatory registration on CPCB portal.
Material Recovery Targets	Li-ion recyclers: 70% recovery in 2024–25 | 80% in 2025–26 | 90% from 2026–27 onwards. Non-compliance triggers

	Environmental Compensation levy under the Environment Protection Act.
EV Battery Collection	70% of EV batteries placed on market must be formally collected by 2027–28. Targets escalate annually, tracked separately by vehicle category (2W, 3W, 4W).
Recycled Content Mandate	From FY 2027–28: minimum % of domestically recycled materials required in all new batteries. Starts at 5%, rising to 20% by 2030–31. Must be Indian-origin -imported recycled content does not qualify.
EPR Certificate Market	Registered recyclers earn tradeable EPR certificates on the CPCB portal upon verified material recovery. Producers purchase certificates to demonstrate compliance. Structured commercial revenue stream for certified recyclers.
2025 Amendments	Mandatory QR codes on all batteries for digital traceability. Fully online CPCB portal -no paper filings. Strengthened audit and third-party verification mechanisms.

The Real Implementation Challenges - Acknowledged Directly

The EPR framework is strong in design but faces documented execution gaps. These are not reasons to avoid the market - they are precisely **why a technology-credible partner holds a structural advantage** over informal operators who cannot meet compliance standards.

- **EPR certificate floor price too low:** Current pricing makes formal Li-ion recycling economically marginal for most operators - the single most cited systemic challenge. Some producers are sourcing certificates from non-compliant routes, mirroring early failures in India's plastic EPR system. Government review is expected but not yet implemented.
- **Only ~1% formally recycled today:** Despite the legal framework, India's formal collection and recycling rate for Li-ion batteries remains critically low. The majority still enters informal, unsafe, non-compliant channels.
- **Self-declared data inconsistency:** The CPCB portal relies on producer self-reporting. Independent audits have found significant mismatches between declared and actual volumes. Third-party audit modules are not yet fully operational.
- **Fragmented reverse logistics:** No standardised national collection infrastructure exists yet. Used batteries are mixed with general e-waste or held by informal aggregators, making consistent, certified feedstock supply a challenge.
- **OEM legal resistance:** In April 2025, multinationals including Daikin, Hitachi, and Samsung filed legal challenges against India's e-waste EPR policies - signalling that large producers are not passively accepting compliance costs. Enforcement consistency remains a risk in the near term.

WHY THESE CHALLENGES FAVOUR THE SERIOUS PARTNER

Every challenge above represents a gap that **technology-led, audit-ready operators** are uniquely positioned to fill. The domestic recycled content mandate from FY 2027–28 means OEMs will actively compete to secure certified, high-purity recycled material supply and there are currently nowhere near enough qualified suppliers to meet that demand.

- **90% recovery mandate:** Only operators with proven hydrometallurgical technology can consistently hit this - eliminating informal competition
- **QR traceability mandate:** Digital chain-of-custody integration positions compliant recyclers as the preferred partner for OEMs facing audit pressure
- **Recycled content mandate:** Creates a captive, regulated, growing demand pool that does not yet have enough certified suppliers - first-movers own this market

The EPR gap is not a reason to hesitate. It is the reason this market needs exactly the kind of partner this briefing is discussing.

6. Global Context – Why Global Companies are well positioned

India's strategy is part of a converging global shift. Several factors amplify its significance specifically for Korean industry:

- **Korea chairs FORGE (February 2026):** Korea is now chair of FORGE - the Forum on Resource Geostrategic Engagement successor to the Minerals Security Partnership. Korean companies entering India's critical minerals space do so with explicit geopolitical alignment and bilateral strategic positioning, not against it.
- **EU Critical Raw Materials Act (2023):** 15% recycling of strategic minerals mandated by 2030. Indian manufacturers exporting to Europe must meet this - creating direct, commercial demand for certified recycled inputs that only advanced technology partners can supply.
- **China's WTO Challenge (2025):** China formally challenged India's PLI battery and EV schemes at the WTO - perhaps the clearest external signal that India's industrial strategy is working and is being taken seriously as a competitive force.
- **IEA 2024 Data:** Global nickel and cobalt recycling rates have reached 40–50%. Lithium is at ~20% - the largest remaining growth opportunity, and the segment where India's policy incentives are most heavily concentrated.
- **US Critical Minerals Strategy:** $12 billion proposed strategic stockpile. Over 30 new recycling measures introduced globally since 2022. Supply security is now geopolitical strategy, and India–Korea bilateral supply chains offer a compelling alternative to China-dependent routes.
- **Global Market:** Battery recycling grows ~10x - from $13 billion in 2025 to $115 billion by 2035. India's share of this growth, with its combination of market size, policy support, and current capacity gap, is disproportionately large.

7. On Raw Material Supply - An Honest Assessment

End-of-life EV battery volumes in India are building not yet at peak, but on a clearly quantified trajectory. With battery lifespans of 6–10 years, **high-volume EV battery scrap materialises from 2028–2030** and accelerates strongly into the mid-2030s.

- **E-waste bridges the gap today:** India is the world's third-largest e-waste generator - cobalt, copper, gold, and rare earths are available as feedstock now, not in 2030. Multiple Indian recyclers already operate commercially on this basis.
- **Infrastructure must precede volume:** Recycling plants require 2–3 years from investment decision to full commissioning. Decisions made in 2026 translate to operational capacity in

2028–2029 - precisely when EV battery scrap begins its structural ramp. Waiting means arriving late.

- **The capacity gap is enormous:** Announced recycling capacity covers only 10% of projected feedstock volumes by 2040. This is not a crowded space. There is significant open ground for partners who move with conviction.
- **Capital is now flowing:** As of early 2026, Indian financial institutions and growth-stage investors are actively funding battery recycling ventures. The sector has crossed from speculative to bankable - with performance data and secondary market comps now available.
- **Second-life extends revenue:** Studies confirm 15–20% of cells in end-of-life EV batteries remain viable for secondary applications including grid storage and industrial use. This secondary revenue stream materially improves the unit economics of primary material recovery.

The raw material ramp is real, predictable, and already quantified. This is a **known timeline** not an unknown risk. And it is a timeline that decisively favours those who build now over those who wait.

8. Partnership Structures - Flexible and Incentive-Backed

Indian entities across the ecosystem established industrial players, emerging battery recyclers, state-backed institutions, and major OEMs are actively seeking technology partners and JV co-investors with proven capabilities in hydrometallurgical processing, black mass refining, and high-purity material recovery.

Structure	What the Partner Brings	Revenue & Return
Technology Licensing	Proprietary processing IP, technical advisory, process validation, yield guarantee	Royalty stream + long-term technical service fees. Immediate revenue, limited capital commitment.
Greenfield JV	Technology + co-investment in new Indian recycling facility. Capex subsidy (up to 20%) directly de-risks greenfield investment.	Opex subsidy (40% disbursed in Year 2, balance 60% in Year 5) on incremental sales over 5 years
Brownfield Upgrade	Partner with an existing Indian recycler -upgrade technology, expand capacity. Faster to market with established feedstock relationships.	Technology transfer fees + revenue share + accelerated market entry with existing EPR compliance contracts
Offtake Partnership	Committed offtake for battery-grade recovered Li, Co, Ni, Mn from Indian operations	Secured, price-stable critical mineral supply for Korean manufacturing -reducing spot market volatility exposure

All structures establishing or expanding recycling capacity in India are eligible for government capex and opex incentives under the Incentive Scheme for Promotion of Critical Minerals Recycling (under the National Critical Mineral Mission)

Note: Incentive caps apply - ₹50 crore for large entities, ₹25 crore for MSMEs. Facilities engaged solely in black mass production are explicitly excluded from eligibility; end-to-end recovery

9. EPR Eligibility for an End-to-End Recycler

This section answers one specific question precisely: **if a company wants to set up a full end-to-end recycling operation in India, what exactly must it extract, in what quantities, and from which battery types - to qualify for EPR certificates and generate revenue from the certificate market?**

Step 1 - Who Qualifies as an EPR-Eligible Recycler

To generate EPR certificates and participate in the certificate market, a recycler must:

- **Register on the CPCB centralized EPR portal** at eprbattery.cpcb.gov.in - mandatory before any certificate can be generated
- **Obtain authorization from the concerned SPCB** (State Pollution Control Board) of the state where the facility is located - dual registration, both CPCB and SPCB
- **Operate an authorized recycling facility** - must be a formal, registered plant. Informal or backyard operations are explicitly excluded
- **Submit quarterly returns to CPCB** - detailing quantity of battery collected, processed, materials recovered, and hazardous waste generated
- **Upload procurement data per batch** - source, quantity, date of procurement for every lot of waste battery received

Important : A foreign company cannot register directly as a recycler on the CPCB portal. The Rules require an Indian legal entity either an Indian subsidiary, a joint venture company registered in India, or a local partner as the registered operator. This is one of the key structural reasons why a JV or Indian subsidiary is the recommended entry model.

Step 2 - Which Battery Types Generate EPR Certificates

The Battery Waste Management Rules 2022 cover all battery types. EPR certificates are generated separately for each category:

Battery Category	EPR Code	Metals That Generate Certificates	Relevance
EV Batteries (Li-ion)	BAT-LI (EV)	Lithium, Cobalt, Nickel, Manganese, Copper, Graphite, Aluminium	**PRIMARY TARGET - highest value, fastest growing feedstock**
Portable Batteries (Li-ion)	BAT-LI (Portable)	Lithium, Cobalt, Nickel, Copper, Graphite	Excellent bridge feedstock -available immediately from e-waste stream
Industrial Batteries (Li-ion)	BAT-LI (Industrial)	Lithium, Cobalt, Nickel, Copper, Graphite	UPS, solar grid, data centre batteries - significant existing volume

Lead-Acid Batteries	BAT-LA	Lead (95%+ recovery required), Plastic casings	Largest volume today -high EPR certificate supply already established
Nickel-Cadmium Batteries	BAT-NiCd	Nickel (80%+ recovery), Cadmium (must be isolated separately)	Power tools, industrial -niche but available

Step 3 - Exactly What Must Be Extracted and in What Quantities

EPR Certificate Generation Formula for Li-ion Recyclers (per CPCB portal and Battery Waste Management Rules 2022)

EPR Certificates (in kg) = Weight of the identified key battery metal produced AND SOLD after recovery from recycling

For a Li-ion battery recycler, certificates are generated separately for each of the following metals:

- **Lithium (Li):** EPR certificates = weight of Lithium sold after recovery. Example: 50 kg Lithium recovered and sold = 50 EPR-Li certificates
- **Cobalt (Co):** EPR certificates = weight of Cobalt sold after recovery. Example: 200 kg Cobalt recovered and sold = 200 EPR-Co certificates
- **Nickel (Ni):** EPR certificates = weight of Nickel sold after recovery. Example: 100 kg Nickel recovered and sold = 100 EPR-Ni certificates
- **Manganese (Mn):** EPR certificates = weight of Manganese sold after recovery. Example: 100 kg Manganese recovered and sold = 100 EPR-Mn certificates
- **Aluminium (Al):** EPR certificates = weight of Aluminium sold after recovery. Example: 100 kg Aluminium recovered and sold = 100 EPR-Al certificates
- **Copper (Cu):** EPR certificates = weight of Copper sold after recovery
- **Graphite:** EPR certificates = weight of Graphite recovered and sold

Critical rule: Only materials that are SOLD after recovery qualify for certificate generation -not just processed. The recycler must have an actual sale transaction on record. This is why having downstream offtake agreements or your own refining-to-sale capability (end-to-end) significantly strengthens EPR certificate generation.

As per CPCB portal guidance operators should confirm the exact clause applicable to their registration

Step 4 - Minimum Recovery Targets That Must Be Met to Generate Certificates

Certificates are only generated if the recycler meets the minimum material recovery threshold for that year. These targets are legally binding and escalate annually:

Battery Type	FY 2024-25	FY 2025-26	FY 2026-27 onwards	What This Means Practically
EV & Portable Li-ion Batteries	**70%**	**80%**	**90%**	90% of dry weight of battery must be recovered as sellable material. Only hydrometallurgical process reliably achieves this.
Automotive & Industrial Batteries	**50%**	**55%**	**60%**	Lower bar -accessible even with less advanced technology
Lead-Acid Batteries	**95%**	**95%**	**95%**	Lead recovery only.
Nickel-Cadmium Batteries	**70%**	**75%**	**80%**	Cadmium must be separately isolated -not just recovered

Step 5 - Why End-to-End Is the Strongest EPR Position

Does end-to-end make sense from an EPR standpoint - has a clear answer: yes, and here is why:

- **Certificate generation requires actual material sale:** EPR certificates = weight of metal SOLD, not just recovered. An end-to-end operator who refines and sells battery-grade Li, Co, Ni directly generates the maximum number of certificates per tonne of input battery. A recycler who only produces black mass and sells it to a third-party refiner generates zero certificates for the refined output - those go to whoever sells the final metal.
- **90% recovery is only achievable with hydrometallurgy:** The 2026-27 target of 90% dry weight recovery for Li-ion batteries is only consistently achievable through hydrometallurgical processing. Pyrometallurgical-only operators cannot reliably hit this target, giving hydromet operators a structural compliance advantage.
- **Hydromet recovers all 7 certificate-generating materials:** Pyromet typically recovers only Co, Ni, Cu as an alloy losing Li and Mn entirely. Hydrometallurgical processing recovers Lithium, Cobalt, Nickel, Manganese, Copper, Graphite, and Aluminium separately maximising certificate count per batch.
- **Domestic sale is mandatory for recycled content mandate:** From FY 2027-28, OEMs must source domestically recycled Li, Co, Ni for new battery manufacturing. End-to-end operators who produce battery-grade materials domestically are the only qualified suppliers for this mandate creating a captive, growing, regulated demand pool.
- **EPR certificate validity is 7 years:** Certificates generated today remain tradeable for 7 years - giving early-mover recyclers a long commercial runway on certificates generated during the ramp-up phase.

BOTTOM LINE

An end-to-end Li-ion recycling operation in India from collection through black mass production through hydrometallurgical refining to sale of battery-grade Li, Co, Ni, Mn - is the **optimal configuration for EPR certificate generation**. It maximises the number of certificates generated per tonne of input, positions the operator as the highest-compliance partner for OEMs, and directly qualifies for the recycled content mandate demand from FY 2027-28. No other configuration generates as much EPR certificate revenue or as strong an OEM partnership position.

The 90% recovery mandate from FY 2026-27 is the filter that separates serious players from the rest. It is, in effect, a **government-imposed barrier to entry** that eliminates informal and low-technology operators and creates a protected market for those with advanced hydrometallurgical capability.

10. Why the Window Is 2026

India's battery recycling sector sits at a specific and time-limited inflection: past the point of regulatory ambiguity, before the point of market saturation. The incentive schemes are live. The gigafactories are breaking ground. OEMs are selling EVs at record volumes and facing incoming recycled-content mandates they do not yet have supply chains to meet. The government is actively clearing foreign technology partnerships.

There are no dominant international players entrenched in this space. The formal, technology-led recycling sector barely exists -which means this market has essentially **no incumbent to displace**. Companies that establish partnerships and operational presence now will enter the high-volume phase already contracted, already trusted, and already optimised.

India is not looking for any partner. The scale of OEM compliance obligations, the rigour of the recovery mandates, and the quality demands of battery-grade material specifications mean this market will consolidate quickly around a small number of technically credible operators. The informal sector cannot meet those standards.

DATA SOURCES

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