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For EV Batteries

Tracking and Traceability of EV Batteries in Jordan:

A Strategic Brief for Private Sector and Policy Leaders

GJU
الجامعة الألمانية الأردنية
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Contents

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Published by:

German Jordanian University, C-HUB

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Executive Summary

Jordan's electric vehicle (EV) fleet is growing rapidly, with imports exceeding 60,000 in 2024 and projected to surpass 150,000 by 2025. It creates mounting risks from end-of-life (EoL) EV batteries, many of which are currently repaired informally, dismantled without oversight, or disposed of at unauthorized disposal sites. Limited enforcement, fragmented data, and the lack of collection, repurposing, or recycling facilities increase environmental and safety concerns.

A national tracking and traceability system is needed to manage this challenge. Tracking shows where a battery is and its condition, while traceability documents its full lifecycle. Combined, they provide a secure digital record that supports compliance, safety, and circular economy opportunities. International examples from the EU, China, and the USA show this approach is becoming a global requirement.

For Jordan, success depends on four pillars: a unified registry, unique identifiers (QR/RFID), strong stakeholder coordination, and capacity building. A public–private partnership model offers balanced governance, combining oversight with innovation.

Policy priorities include a dedicated EV battery regulation, a pilot registry in Amman, financial incentives such as customs rebates and concessional loans, and a refundable deposit scheme.

Implemented in phases, this system can turn EV battery waste into an economic opportunity while aligning with Jordan's Economic Modernization Vision for sustainability and growth.

Status Quo: EV Battery Market and Waste Management in Jordan

Electric vehicle (EV) adoption in Jordan has risen quickly. Jordan Customs data shows EV imports growing from 4,015 in 2019 to 60,736 in 2024, while gasoline cars dropped to 8,504 and hybrids stabilized at 16,564. By 2025, Jordan's EV fleet is estimated at more than 150,000 vehicles, with battery electrics taking about half of all imports.

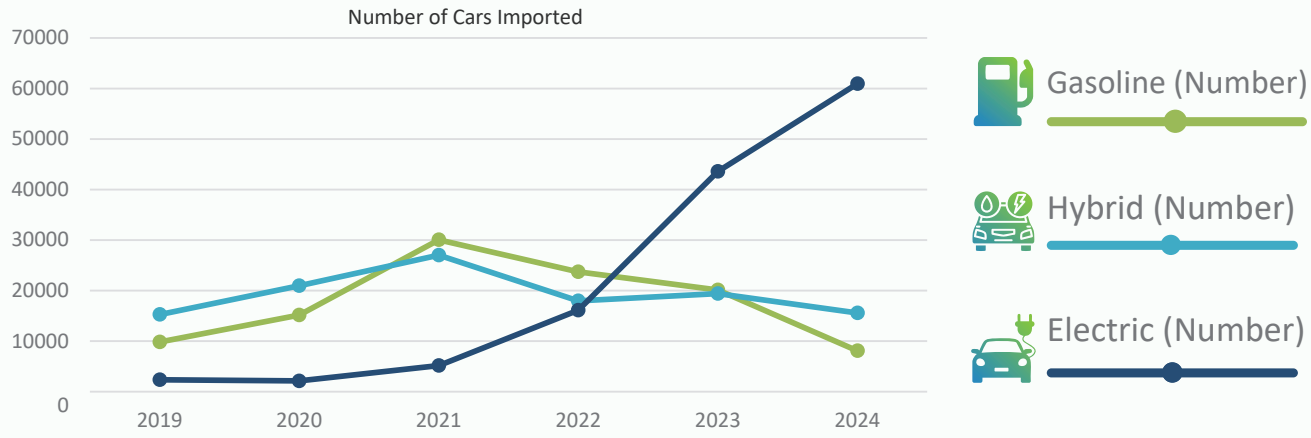


Figure *1* Number of Cars Imported between 2019-2024

Most EV batteries are imported with vehicles and, once they reach end-of-life, many are repaired or reconditioned by local mechanics, exported in small volumes, or dismantled informally. The Swaqa hazardous waste landfill is designated for disposal, but weak enforcement means many batteries end up in regular landfills or are incinerated. Pilot projects explore reuse in stationary energy storage, but there are no large-scale recycling or repurposing facilities.

Jordan classifies EV batteries as hazardous under environmental protection law no. 6 of 2017, and battery disposal legal instructions introduced in 2023 require licensed handlers, prohibit unapproved exports, and mandate safe storage and treatment is still not fully implemented instead.

Challenges include fragmented data, with no detailed records on battery types or age, limited enforcement against informal workshops, and environmental and safety risks from poor handling.

Without comprehensive and structured adaptation of circular economy approaches such as repurposing and recycling, Jordan risks a growing stream of hazardous waste. At the same time, green investment opportunities and related job creation through the establishment and running of collection centres, repurposing, and recycling could. capture economic value and support a sustainable EV transition.

Understanding Tracking and Traceability Systems for EV Batteries

Tracking and traceability are often used interchangeably, but they mean different things.

Tracking is about knowing where a product is at any given time. It focuses on the present where the battery is, who owns it, and what its condition is.

Traceability goes backward, reconstructing the full history of a product. For EV batteries, this means recording where raw materials came from, how the battery was produced, how it was used, and how it was handled at the end of life.

Figure 2 Tracking and Traceability

A Tracking and Traceability System combines both, creating a digital record of the battery that captures its identity, ownership, materials, health, and environmental footprint.

Best Practices and Lessons Learned

Global best practices show how major economies are making EV batteries traceable across their lifecycle. The EU will require a digital Battery Passport for all EV batteries above 2 kWh by 2027, capturing chemistry, performance, and carbon footprint data. China already mandates unique IDs for batteries produced after 2018, while the USA makes EV tax credits under the Inflation Reduction Act conditional on proof of where critical minerals are sourced.

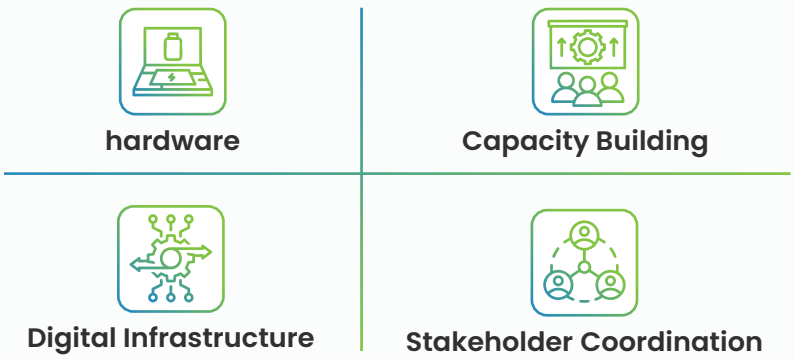
In the Middle East, the UAE tracks hazardous waste from collection to disposal, including EV batteries?. Saudi Arabia has e-waste rules requiring producers and recyclers to register and report flows. Though not battery-specific, these systems provide practical approaches to waste traceability.

While Jordan does not yet operate a battery tracking system, the Sanad JO digital identity platform demonstrates the country's ability to design, and scale centralized digital services. Similar approaches could be adapted for EV batteries, linking customs, importers, and repurposing facilities through a unified registry.

Digital tracking of batteries is no longer optional; it is becoming mandatory worldwide and will shape trade and compliance. Building a system does not require starting with full digital passports: a stepwise approach, beginning with customs registration and linking to disposal records, is achievable in the short term. Multi-stakeholder participation is essential. Integrating informal repair shops into the formal system is another priority, since they currently handle large volumes of batteries without oversight. By starting small and scaling over time, Jordan can build a battery tracking framework that reduces risks, captures economic value, and supports its fast-growing EV market.

System Requirements and Infrastructure for Jordan

In Jordan, EV batteries enter the market already installed in imported vehicles, as the country does not have mining, cell manufacturing, or battery pack assembly. A traceability and trackability system must therefore focus on inspection, repair and replacement, and End-of-Life (EoL) handling. To achieve this, four main pillars are required:



Digital Infrastructure

A unified national battery registry is essential to consolidate data into one secure platform. This registry should support extended producer responsibility (EPR), be interoperable with customs and other authorities, and connect through standardized APIs with systems such as Product Lifecycle Management (PLM), Enterprise Resource Planning (ERP), and Battery Management Systems (BMS). Data must be interoperable, machine-readable, and updated by all relevant stakeholders, including workshops and repurposing facilities.

Hardware

Each battery must carry a unique identifier, ideally a QR code or RFID tag, engraved or printed visibly and indelibly. QR codes are accessible and affordable, while RFID adds advanced tracking capabilities. Supporting infrastructure such as servers, routers, firewalls, and storage systems is required, alongside test stands for internal data collection. Integration of physical identifiers with digital platforms ensures accuracy and transparency.

Stakeholder Coordination

Effective implementation requires collaboration across regulators (e.g., MoE, Ministry of Energy, JSMO, Jordan Customs, EMRC, GAM), importers and dealers (e.g., Gargour, Abukhader Group, Markazia, National Arab Motors), and waste management operators (e.g., Safe & Clean, ExelX, Tafkek). Research institutions (GJU, UJ, RSS, JUST) and international partners (e.g., GIZ, UNDP, EU, USAID, World Bank) provide technical expertise and funding (e.g., donor grants, public budget, small per-battery fees, eco-modulated charges) while advocacy groups, media, and consumers ensure awareness and participation in proper EoL handling.

Capacity Building

Jordan faces gaps in skills and resources to operate such a system. Training programs are needed for operators, collectors, repurposing facilities, and repairers, alongside awareness campaigns for businesses and consumers. Specialized expertise in software development, data management, and system testing is required. Empowering independent operators with training and ensuring long-term institutional capacity are crucial for sustainability.

Governance of Tracking and Traceability Systems

Building a national tracking and traceability system for EV batteries in Jordan requires clear governance to ensure accuracy, transparency, and compliance. Three governance models are possible: government-led, private sector-led, or a public-private partnership (PPP).

Government-Led Ownership: A national authority would design and oversee the system. Participation by importers, repurposing facilities, and resellers would be mandatory, with data integrated into customs and environmental monitoring systems. This model ensures data sovereignty, standardisation, and regulatory alignment, while strengthening public trust. However, it requires substantial investment and institutional capacity and may advance more slowly than private initiatives.

Private Sector-Led: Private technology providers or logistics firms could develop and operate the system, offering access to stakeholders on a subscription or licensing basis. This approach encourages innovation, user-friendly solutions, and reduced financial burden on the government, while enabling the industry to develop new services based on data insights. Risks include fragmentation, limited regulatory oversight, and reduced transparency if standards are not enforced.

Public-Private Partnership (PPP): A PPP model allows regulators and industry to share responsibility for system design, financing, and governance. A neutral technology partner could manage operations, while the government ensures compliance and transparency. This model provides balanced incentives, shared costs, and flexibility, and is especially suitable for Jordan, where institutional capacity is developing alongside a dynamic private sector. Key challenges are the need for clear rules on data access and ownership and effective interagency coordination.

Investment Potential & Revenue Streams from having tracking and traceability

A robust tracking and traceability system for EV batteries presents significant investment opportunities in Jordan. Beyond compliance and environmental protection, such a system can unlock private sector innovation, green jobs creation, and generate new sustainable revenue streams.

Private Sector Opportunity:

Tracking and traceability enable businesses to capture value from the battery lifecycle. Spent batteries can be repurposed for stationary energy storage, supporting renewable integration and backup power systems. At the same time, effective tracking ensures that valuable raw materials such as lithium, cobalt, and nickel can be recovered and resold, reducing dependence on imports and creating new supply chains for local and regional markets.

Cost-Benefit Analysis:

The establishment of a national tracking system involves upfront costs for digital infrastructure, hardware, and training, as well as ongoing maintenance. However, these investments are offset by long-term savings through standardized compliance, reduced environmental liabilities, and more efficient waste handling. Over time, the ability to capture materials and reuse batteries can generate revenue that outweighs initial expenditures.

Revenue Streams:

- A traceability framework creates multiple revenue channels. These include:
- Battery buyback and resale markets, where consumers or dealers exchange old packs for value.
- Second-life applications, converting EV batteries into stationary storage for households, businesses, and renewable energy projects.
- Export of recovered materials, enabling Jordan to integrate into global supply chains and benefit from rising demand for critical minerals.

Implementation Pathway and Future Outlook

Jordan's adoption of tracking and traceability systems for EV batteries could be structured into three phases. In the short term (1–2 years), efforts should focus on feasibility studies, pilot projects, and establishing the legal and institutional foundation. The medium term (3–5 years) should prioritize scaling up the system, national rollout, and broad public awareness campaigns to ensure participation from importers, repurposing facilities, and consumers. In the long term (>5 years), Jordan can position itself as a regional leader in battery lifecycle management, with integration into carbon markets and extended producer responsibility (EPR) schemes.

Short term (1–2 years)	Medium term (3–5 years)	Long term (>5 years)
• Conduct feasibility studies and pilot projects • Draft regulatory framework	• Scale up system and roll out nationally • Launch public awareness and training programs	• Achieve regional leadership in EV battery lifecycle management • Integrate with carbon markets and EPR schemes

Key Challenges	
Limited data availability and quality	IT adaptation and interoperability gaps
Continuous updates for dynamic battery data	Cost and complexity for smaller suppliers
Global coordination and standard alignment	

Policy Recommendations

National Policy Guidelines

- Enact a dedicated EV Battery Management Regulation under the Environmental Protection Law.
- Mandate unique identifiers (QR codes or RFID) for every imported EV battery, linked to a national registry.
- Define clear responsibilities for importers, workshops, collectors, repurposing facilities, and consumers in reporting and updating battery status.
- Require formal registration of all repairs, reconditioning, and collectors, repurposing entities.

Pilot Implementation

- Launch a pilot registry covering selected importers, repurposing facilities, and workshops in Amman.
- Use a QR-based system as a low-cost entry point, with RFID integration planned later.
- Test integration with Customs data and evaluate performance before national rollout.

Stakeholder Engagement Strategy

- Establish a multi-stakeholder steering committee led by the Ministry of Environment and including C-Hub, Customs, JSMO, EMRC, importers, collectors, repurposing facilities, and consumer representatives.
- Involve universities and research institutions in data verification and technical support.
- Conduct awareness campaigns for EV owners on safe battery disposal and system benefits.

Financial Incentives

- Provide customs fee rebates for importers who demonstrate full compliance with registry requirements.
- Offer VAT reductions or operational subsidies for certified workshops, collectors, and repurposing facilities investing in proper EoL handling.
- Support collectors and repurposing facilities, with concessional loans or grants to establish testing and repurposing facilities.

Refundable Deposit Scheme

- Introduce a deposit-return system where importers pay a fixed deposit per battery into the registry.
- Refund the deposit when the battery is returned to a licensed repurposing or collection center.
- Ensure transparency by linking refunds to confirmed scan events in the national registry.

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