

KEYNOTE ADDRESS 1:

MALAYSIA'S JOURNEY TOWARDS A CIRCULAR ECONOMY: TURNING END-OF-LIFE VEHICLES AND BATTERIES INTO CIRCULAR OPPORTUNITIES



Ts. Dr. Abdul Hakim Bin Ab Rahim
Manager, Sector Decarbonisation, Climate Action Division
MGTC

Organised by:



Co-organised by:



In collaboration with:



Energised by:



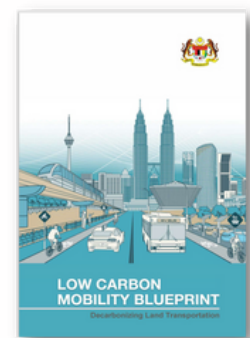
NEW ENERGY ASIA

In conjunction with:



MGTC drives Malaysia's Green Growth and Climate Action Agenda

- Registered under the Companies Act 1965, as a company limited by guarantee and not having a share capital
- We are the Lead Implementing Agency under the purview of the Ministry of Natural Resources and Environment Sustainability (NRES) to drive Malaysia on:
 - Green Growth
 - Climate Change Mitigation
 - Climate Resilience & Adaptation



GREEN INVESTMENT TAX ALLOWANCE (GITA)
GREEN INCOME TAX EXEMPTION (GITE)



GREEN ACADEMY TRAINING

GREEN JOBS MALAYSIA



GOAL

Realizing Low Carbon Mobility
for the Land Transport Sector Through Reducing Greenhouse Gas Emissions and Energy
Consumption by 2030

SIX (6) IMPLEMENTATION FRAMEWORKS

Strengthening institutional framework; Facilitating conducive economic instruments; Government-led initiatives; R&D, technology nurturing and commercialisation, Capacity, skills and knowledge development; Consumer communication, education and public awareness

FOCUS AREAS

A : Improving Vehicle Energy Efficiency



2-Strategies

10-Action Plans

"Emission rating for VTA, Vehicle end-of-life, eco driving, CAFE & CEVS, green logistics"

B: Electric Mobility Adoption



1-Strategies

13-Action Plans

"Electric vehicles, electric buses & electric motorcycles"

C: Alternative Fuel Adoption



2-Strategies

5-Action Plans

"Biodiesel & Industrial Ecosystem Growth"

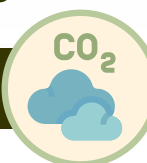
D : Mode Shift



5-Strategies

17-Action Plans

"Public Transport, TOD, Traffic Flow, Active and Micro Mobility & Rail for Freight Transport"



Estimated GHG Emission Reduction (million tonnes CO2 eq)

↓ 77

↓ 17

↓ 27

↓ 44



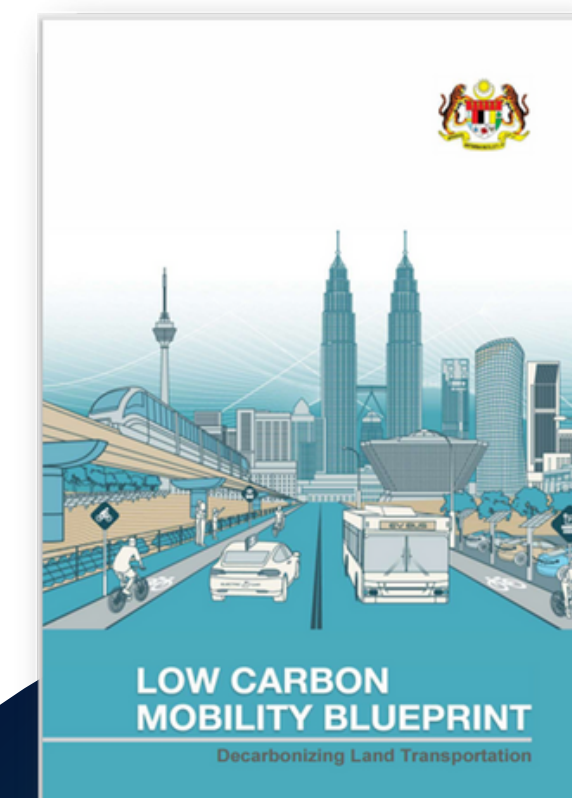
Estimated Energy Consumption Reduction (ktoe)

↓ 24,158

↓ 11,704

↓ 759

↓ 14,691



Low Carbon Mobility Blueprint 2021 - 2030 (LCMB)

Decarbonising Land Transportation

Malaysia's first emission reduction related policy for land transport sector

High Emissions and Energy Demand Make Transport Central to Malaysia's Low-Carbon Transition



Malaysia **ranked 3rd** among ASEAN countries for total CO₂ emissions per capita (2021), after Brunei and Singapore

Source: International Energy Agency CO2 Emissions per capita



Transport sector is **2nd biggest driver of CO₂ emissions (15.12%)** after the energy industries (under sub-category of Energy) (2021)

Source: MALAYSIA FIRST BIENNIAL TRANSPARENCY REPORT (BTR1) (2025)



Road transport is the **largest CO₂ emitter** among all transport subsectors, at 13.6% of all emissions

Source: MALAYSIA FIRST BIENNIAL TRANSPARENCY REPORT (BTR1) (2025)



Transportation contributes to **31.4% of the final energy consumption** in 2021, which is the second largest sector of energy user in Malaysia.

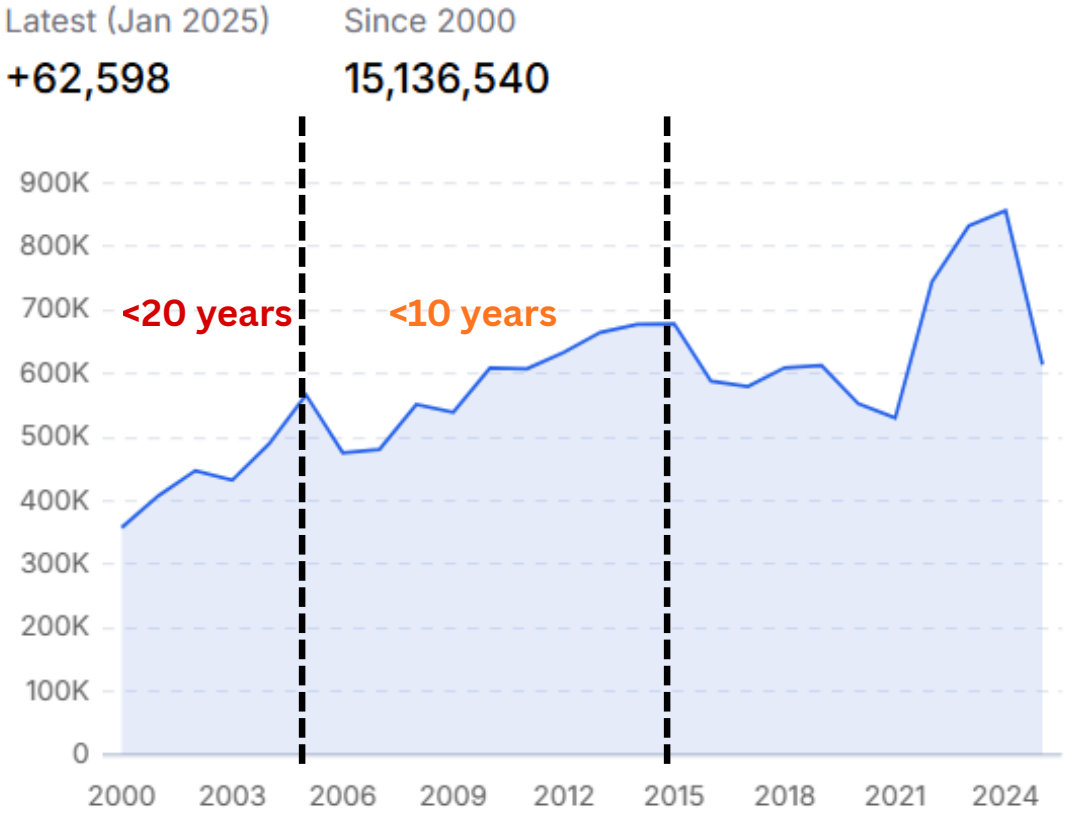
Sumber: National Energy Balance (2021)

The Low Carbon Mobility Blueprint (LCMB) 2021 - 2030 document led by the Ministry of Natural Resources and Environment Sustainability (NRES) outlines strategies and actions required to reduce energy consumption and greenhouse gas (GHG) emissions

Malaysia's Growing Vehicle Population: High Ownership, Growing EV market, but Aging Fleet



Cars (including MPVs, Jeeps, and Trucks)



Quick Statistics, Malaysia

24 MILLION active vehicles

Source: MOT (via News articles) ~10mil >10 years old



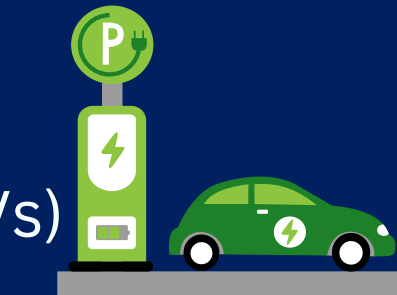
816,747 cars registered in 2024 (PV and CV)

Source: MAA



65,726 Battery Electric Vehicle (BEVs) (Sept 2025)

Source: data.gov.my)



~300% BEV sales growth in 2023 in comparison to 2022

Figures based on vehicle registration in a country, both passenger and commercial vehicles in 2020. Figure is taken from Visual Capitalist Infographics based from International Organization of Motor Vehicle Manufacturers (OICA) data.

Current Vehicle Inspection and End-of-Life Vehicle (ELV) Ecosystem in Malaysia



Vehicle Inspection

- Commercial vehicles are subject to **mandatory periodic inspections** under the Road Transport Ordinance 1959 to ensure compliance with safety and emission standards.
 - ~9% of Malaysia's total registered vehicles.
- Private vehicles are not required to undergo regular inspections.
 - only inspected during ownership transfers or after major modifications (e.g., engine change, structural alteration).
- The inspection system is regulated by the **Ministry of Transport (MOT) and Road Transport Department (JPJ)**.
- PUSPAKOM**, whose exclusive concession ended in August 2024, now operates as the first licensed inspection company under a liberalised vehicle inspection regime.

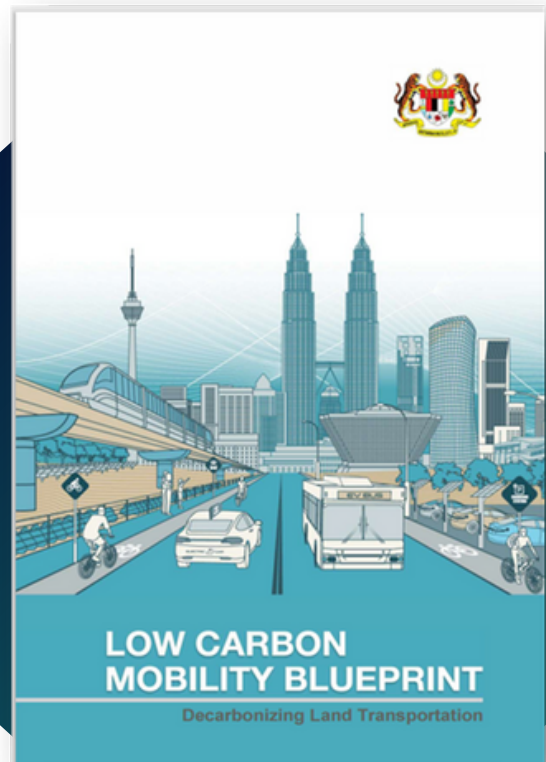


ELV Management

- Malaysia currently has **no mandatory ELV or vehicle scrappage policy**, but voluntary recycling and reuse initiatives are guided by MS 2697:2018 (4R2S standard).
- The National Automotive Policy (NAP 2020) supports sustainable automotive practices, and the mid-term review (due end-2025) may strengthen ELV management frameworks.
 - Target: 70% recyclability rate
- Authorised Automotive Treatment Facility (AATF)
- BUDGET 2026: Government allocating Grant RM4,000 for ELV of >20 years vehicles



LCMB quick wins place bold and transformative course of actions to mainstream low carbon mobility agenda under RMK-12



4 FOCUS AREAS

10 STRATEGIES

45 ACTION PLANS



Vehicle exhaust emission rating as part of VTA requirements & Fuel Emission labelling at point of sales



Eco Driving Modules & Programmes



Government Fleet Transition to EV



Corporate Average Fuel Economy & Carbon Emission Vehicle Scheme



Fuel Economy Baseline for Heavy Duty Vehicles



Study on Implementation of Vehicle Inspection and ELV Ecosystem in Malaysia



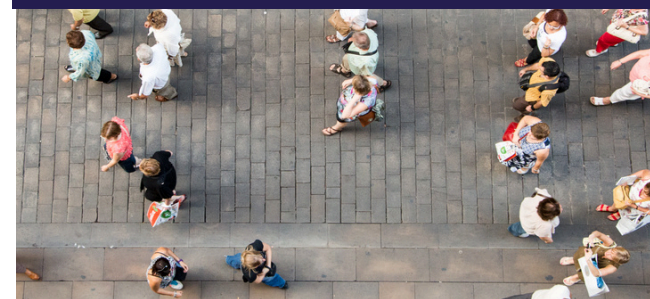
National Green Logistics Programme



Congestion Charges Feasibility Study



First-and-Last Mile Connectivity Guideline



Personal Mobility Device and Bicycles Usage on the Road



xEV Battery Afterlife Management Guideline



GEF7-UNIDO Accelerating the Adoption and Scale up of Climate Smart Transport in Malaysia (AASCT)



Component 1 Strengthening national policy and institutional frameworks

1



MARi
INSTITUT AUTOMOTIF, ROBOTIK & IoT MALAYSIA
MALAYSIA AUTOMOTIVE, ROBOTICS & IoT INSTITUTE

Developing National Reference and Recommendation for Renewable Energy-based Smart Charging and Harmonization of Electric Vehicle Supply Equipment

2





Study on Freight Mode Shift from Road to Rail for Malaysia

3



MARi
INSTITUT AUTOMOTIF, ROBOTIK & IoT MALAYSIA
MALAYSIA AUTOMOTIVE, ROBOTICS & IoT INSTITUTE

Electric Vehicle and Sustainable Battery Ecosystem and Value Chain Roadmap

International Partners



Lead Ministry



Executing Entity



Component 2 Investment and commercialization of electric mobility technologies


4




MARi
INSTITUT AUTOMOTIF, ROBOTIK & IoT MALAYSIA
MALAYSIA AUTOMOTIVE, ROBOTICS & IoT INSTITUTE

Proof of Value for EV Inter-operability Center (EVIC): Vehicle to Infrastructure (V2I) in Cyberjaya


5





Rapid Penang Solar Smart Electric Bus Charging Demonstration


6



HENZ

Kuching Metro Solar Smart Electric Bus Charging Demonstration

7



MARi
INSTITUT AUTOMOTIF, ROBOTIK & IoT MALAYSIA
MALAYSIA AUTOMOTIVE, ROBOTICS & IoT INSTITUTE

EV Battery Second Life Application Value-Chain: Demonstration on Remanufactured Electric Vehicle Battery

8





Electric Motorcycle Battery Swapping Technology Demonstrations

Component 3 Capacity building and scale-up



Training, Preparation and dissemination of knowledge products for specific target groups



Training on EV, sustainable battery ecosystem and value chain with a focus on women



Knowledge exchange and scale-up through participation in regional and international platforms

RMK-12 LCMB Study Findings: Emissions Testings and Recyclability Rate



Emission Testing at National Emission Testing Centre



Model A (5) **Model B (5)**

Year: 2011 to 2014



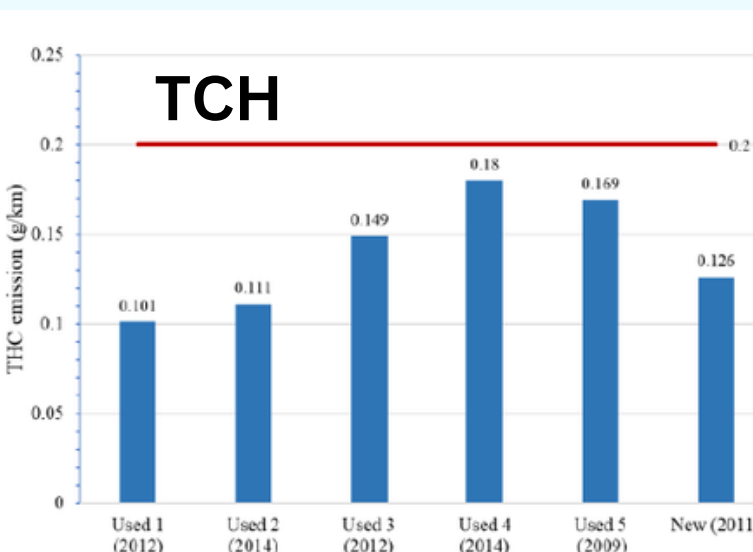
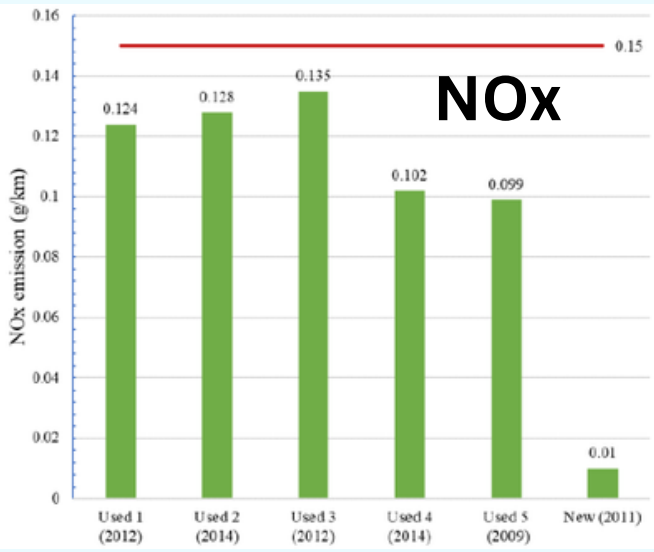
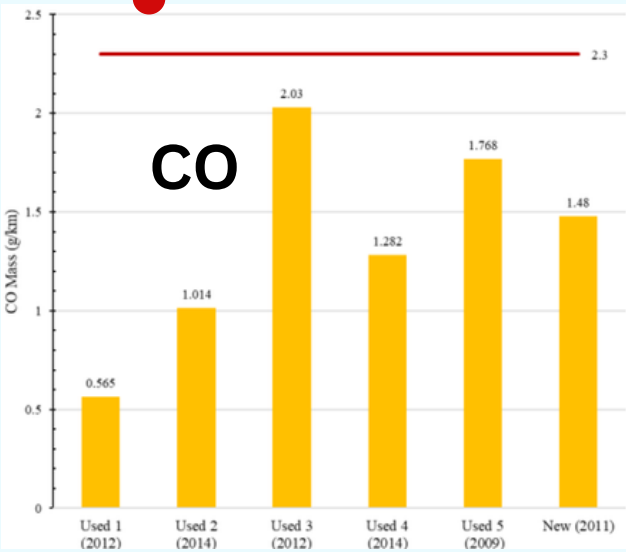
Average
odometer:
176,000km



Average
odometer:
205,000km

The testing is aimed to measure pollutant emissions of local passenger vehicles by evaluating exhaust emissions (CO, NOx, and THC) of the heavily used cars.

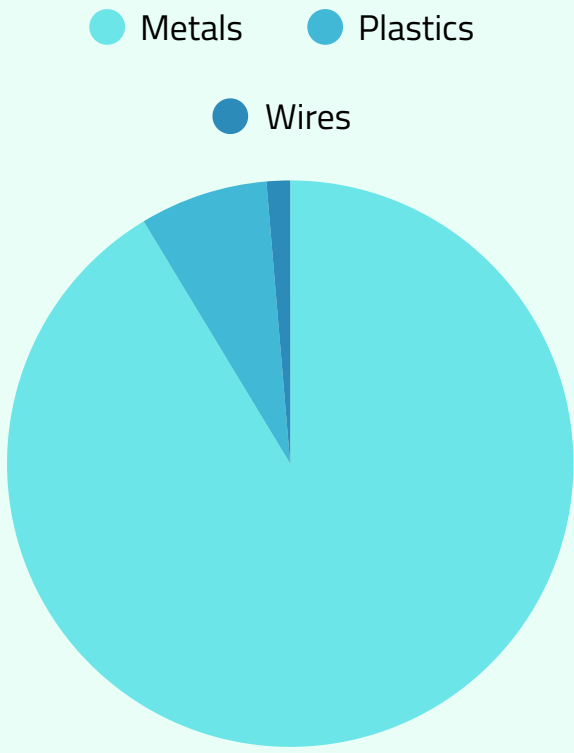
! Result: No exhaust product exceeds the pollutant (CO, THC and NOx) limit of DOE Act



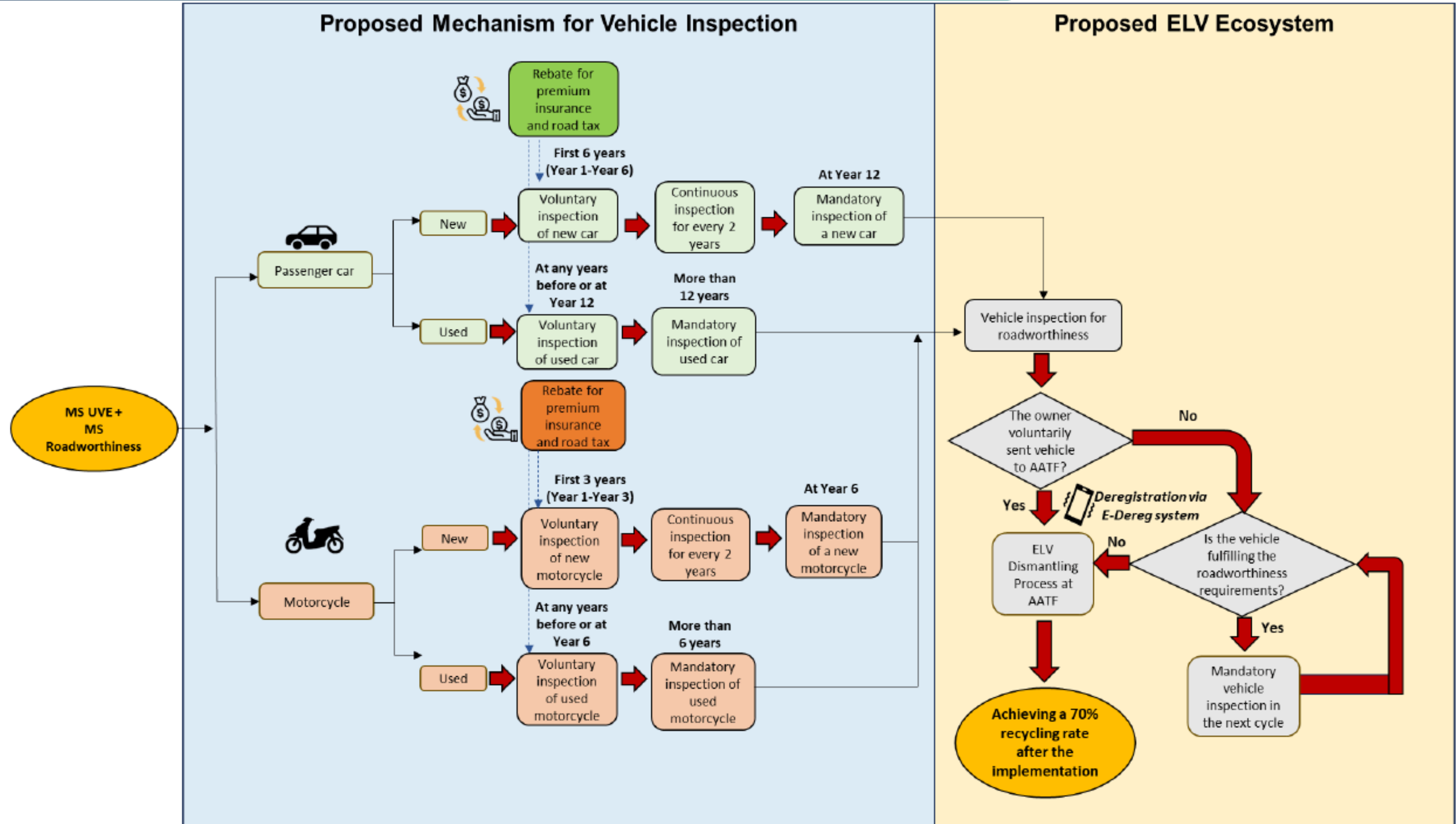
Recyclability Rate Study @ Car Medic

1 unit of each Model A and B underwent disassembly, segregation, weighing and analyzed to record the recyclable components and materials from Metals, Plastics and wires. The components can be reuse and remanufacture for secondary market.

! Result: Around 80% of material recovered susccesfully, exceed the 70% target in NAP 2020



Proposed Vehicle Inspection and ELV mechanism



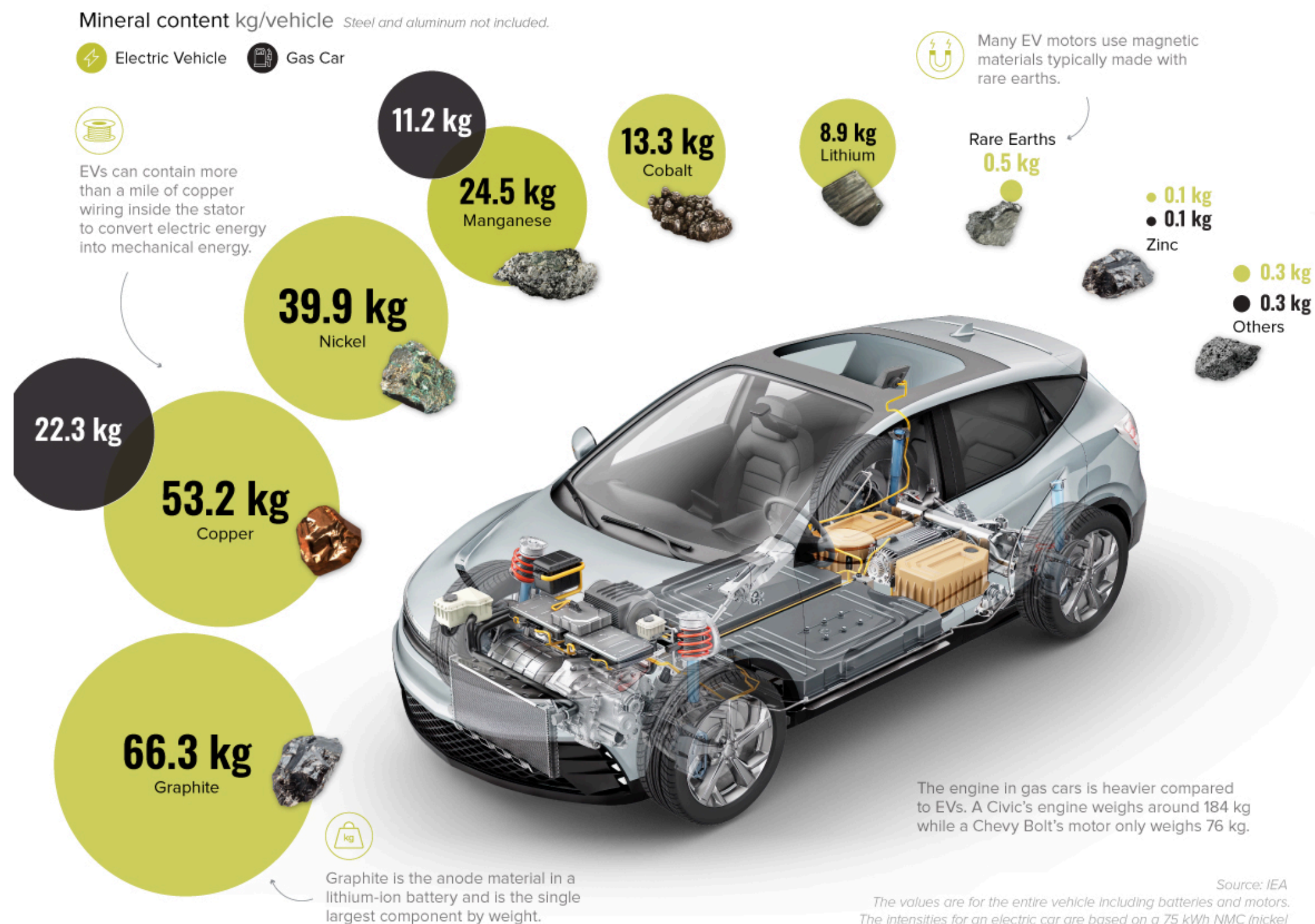
Evolution of Vehicle Disposal to Resource Recovery in the xEV Era

- Electric vehicles (xEVs) contain **6× more minerals** than conventional gas cars — including lithium, nickel, cobalt, manganese, and graphite- in its battery
- As xEV adoption grows, recycling these critical minerals is essential to **reduce resource dependency, lower emissions, and support circular economy goals.**
- Malaysia's pathway towards greener mobility under the National Automotive Policy (NAP 2020) and upcoming ELV framework must integrate battery **recovery, remanufacture, repurpose, and recycling** infrastructure.
- Developing a local xEV recycling ecosystem will **strengthen supply-chain resilience** and support ASEAN's sustainable automotive leadership.

Minerals in ELECTRIC VEHICLES VS GAS CARS

Electric vehicles require a wider range of minerals for their motors and batteries compared to gas cars.

In fact, an EV can have 6 times more minerals than a gas car and be on average 340 kg heavier.



xEV Battery Related Development in Malaysia (Agency-level)



Battery Passport Initiative introduced by MARii

Electric Vehicle and Sustainable Battery Ecosystem and Value Chain Roadmap



MGTC-MARii: Global Environment Facility Project - AASCT

EV Battery Second Life Application Value-Chain: Demonstration on Remanufactured Electric Vehicle Battery



The National Rechargeable Battery Testing Centre (NRBTC) by SIRIM



NanoMalaysia Subsidiary Signs MoU With Singapore Thailand On Battery Technology



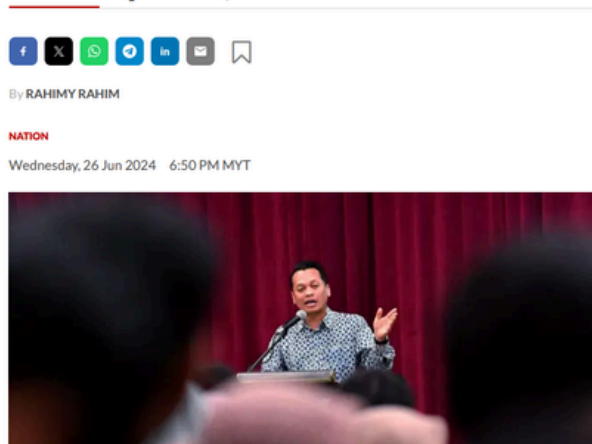
Hydrogen-Electric Vehicle-Battery (HEBATT) by NanoMalaysia Berhad is a local pilot plant to produce Pouch Cell Graphene-based (alternative to cylindrical batteries) composite batteries for EV applications

GigaFactoryMalaysia Sdn Bhd (GMSB), subsidiary of NMB **collaborated with NEU (Singapore) and Thailand** on battery technology. NEU specialises in lithium iron phosphate battery recycling



MIDA is actively promoting EV battery investments in Malaysia, such as EVE Energy Malaysia's \$422.3 million lithium-ion battery plant.

Govt drawing up guidelines for disposal of solar panels, EV batteries



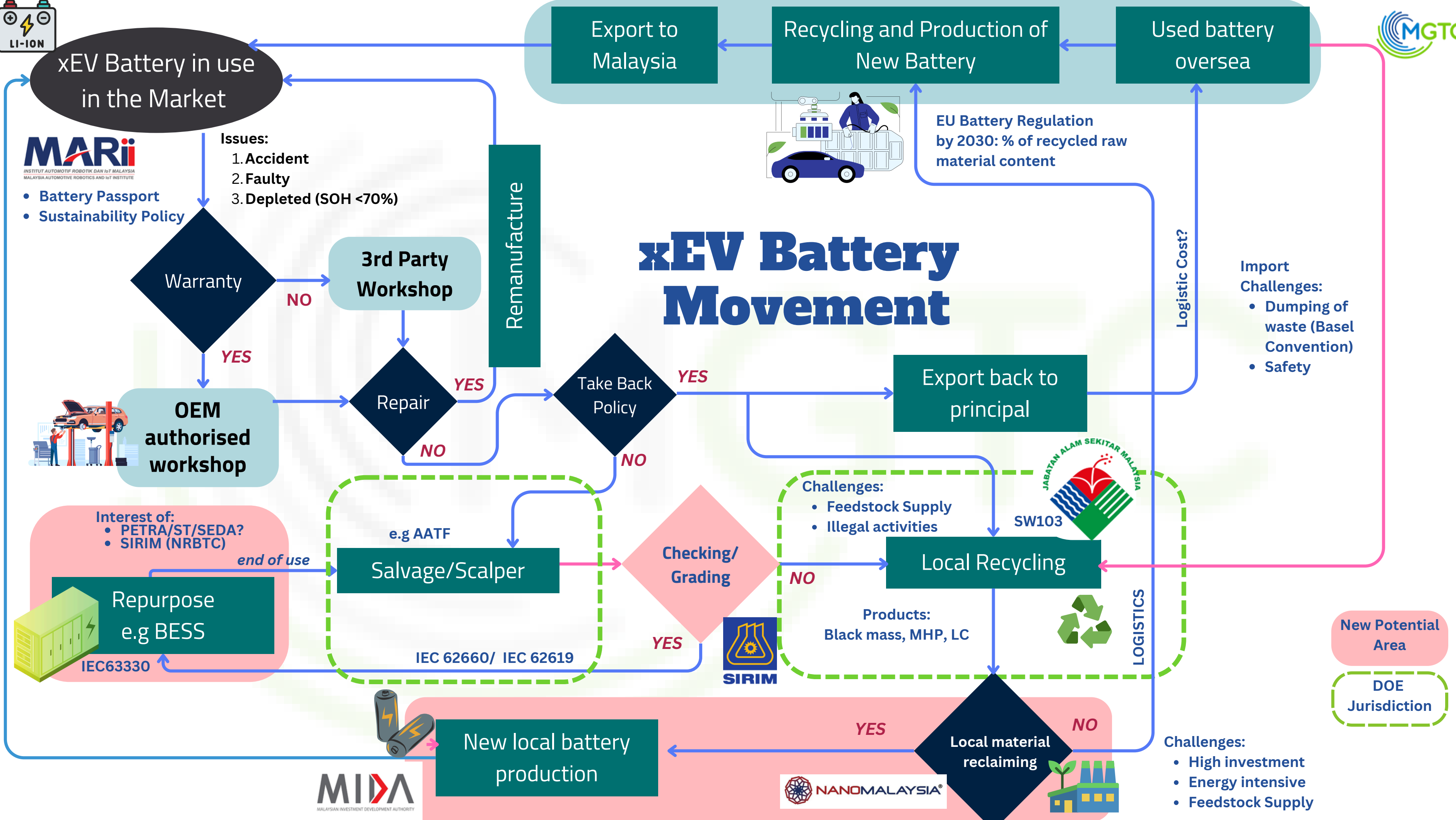
EV and Battery Management (EVBM) Guideline, which outlines port handling to disposal, was launched at IGEM 2024



FIRST SCHEDULE (REGULATION 2)	
Code	Description
SW101	Waste containing arsenic or its compound
SW102	Waste of lead acid batteries in whole or crushed form containing cadmium and nickel or mercury or lithium



SW103 (Scheduled Waste 103): under JAS includes waste batteries containing hazardous materials like cadmium, nickel, mercury, or lithium.



Battery Repurposing Presents a Strategic Opportunity to Extend Value and Reduce Waste



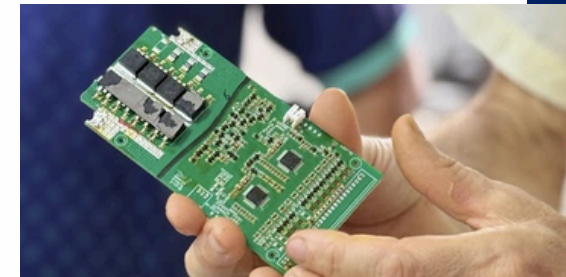
The application of second-life xEV batteries is still limited, highlighting the need for further feasibility evaluation



micro/ off-grids



Small appliances



Battery management systems (BMS)

CHALLENGES AHEAD

Challenges & Opportunities

- **Screening & Sorting:** Cells and modules from different sources must undergo strict screening due to performance degradation and inconsistent history.
- **BMS Adaptation:** Second-life batteries require customised BMS to handle diverse cell aging, ensure accurate SOC/SOH estimates, and maintain cell balance. The application depends on battery condition, expected cycle life, and system integration.
- **Safety Risks:** Risks like thermal runaway and fire
- **Techno-Economic Viability:** Key cost factors include dismantling, transport, storage, and reduced performance compared to new batteries.



Opportunities to support rural electrification and microgrids in Malaysia, Low to Medium Power Needs - Stall power (small cooking equipment)



Mobile Charger from used xEV batteries

Malaysia's Battery Recycling Ecosystem Is Emerging, with Room to Grow



In Malaysia, the regulatory framework for battery recycling, particularly for EV and hybrid batteries, is still in its early stages but is progressively evolving.

Key Regulatory Components

SW103: Waste Batteries containing cadmium, nickel, mercury, or lithium are designated as SW103 under the Environmental Quality (Scheduled Wastes) Regulations 2005.

>This classification mandates strict handling, storage, transportation, and disposal protocols to mitigate environmental risks.

Licensed Treatment Facilities:

Currently, Malaysia has a limited number of licensed facilities for handling SW103 waste - four scheduled waste recycling facilities approved by the DoE.

- License Category:
 - Pemerolehan Kembali luar tapak;Penstoran luar tapak,
 - Waste Generator > Waste Transporter > Waste Receiver

Monitoring and Compliance: The DoE utilizes the Electronic Scheduled Waste Information System (eSWIS) to track the movement of scheduled wastes, ensuring transparency and compliance across the waste management chain.

SW103

4

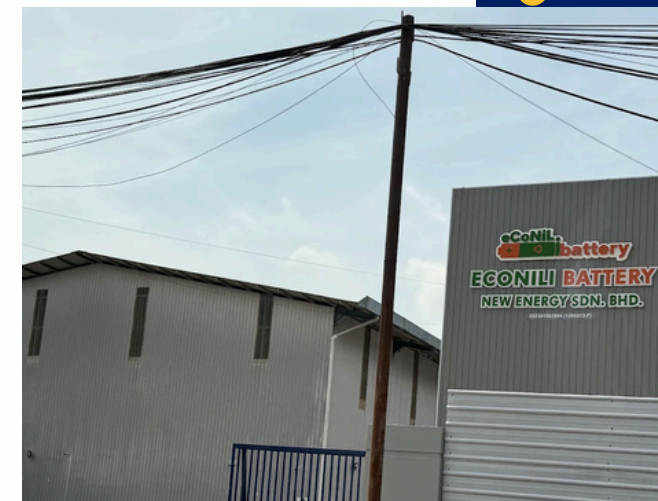
licensed
recycling
facilities



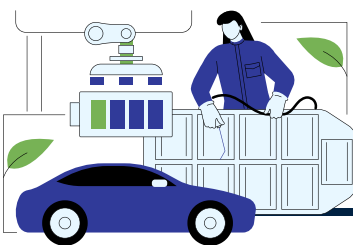
CHALLENGES
AHEAD

Challenges & Opportunities

- **Limited feedstock supply:** low local adoption and importation restrictions under Basel Convention
- **Evolving & diverse battery chemistries:** New chemistries like LFP, NMC, NCA, and emerging sodium-ion need different processing, complicating recovery lines and technical protocols.
- **Complex and Labour-Intensive Battery Disassembly:** Diverse formats and safety risks make manual disassembly slow, hazardous, and expensive.
- **Energy-Intensive and Costly Material Reclaiming**
- **Illegal activities**



Malaysia could become a recycling and second-life processing hub for ASEAN, leveraging its manufacturing base and logistics network.

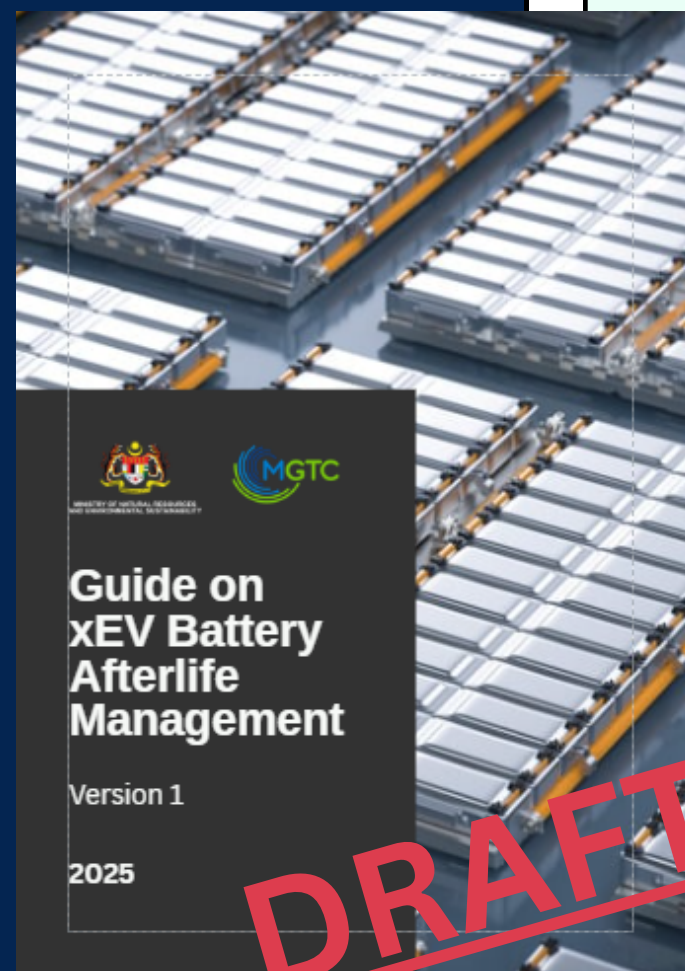


DRAFT - DEVELOPMENT OF xEV BATTERY AFTERLIFE MANAGEMENT GUIDELINE FOR THE INDUSTRY (SCOPE 1)



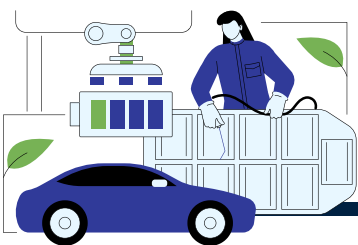
The Guideline will cover the following chapters (DRAFT):

- 1.0 Introduction**
- 2.0 Principles and Objectives**
- 3.0 Scope**
- 4.0 Key Stakeholders**
- 5.0 Definition and Interpretation**
 - 5.1 Classification of Used vs Waste
- 6.0 Statutory Requirements**
- 7.0 Flow of Procedures & Requirements**
 - 7.1 - End of Usage
 - 7.2 - Logistics: Collection, Storage & Transport
 - 7.3 - Assessment and Grading
 - 7.4 - Repurposing
 - 7.5 - Recycling
 - 7.6- Disposal
 - 7.7 - Transboundary Movement
- 8.0 Financing**
- 9.0 Penalties**
- 10.0 Annex - List of Standards**



Intended Users of the Guideline include:

- 1. xEV Battery Manufacturers**
- 2. OEM Vehicle Producers**
- 3. xEV battery Recylers**
- 4. Battery logistics provider**
- 5. Repurposers**
- 6. Importers and Distributors of xEV Batteries or Vehicles**
- 7. Consumers and Fleet Operators**
- 8. Testing and Certification Body**



Challenges & Opportunities in Malaysia



Challenges

- Lack of **legislative mandate and long-term strategic direction** for end-to-end strategy for the ELV of vehicles and batteries
- Lacks a dedicated **regulatory framework to support battery circularity**
 - E.g. clear provisions for battery grading, second-life applications, and resource classification
- Underdeveloped **domestic ecosystem** for second-life and recycling applications
 - Economic of scale, limited infrastructure, technical capability, and investment in repurposing and recycling facilities in Malaysia

Opportunities

- The presence of Automotive manufacturing, AATF as well as emerging battery manufacturing and recyclers in Malaysia
 - Opportunity to **build a closed-loop ecosystem** — from manufacturing to collection and resource recovery — within Malaysia's borders.
- Malaysia's aim for 70% RE Capacity by 2050 with BESS investment and deployment expected reaching MYR 80bil by 2050 -NETR
 - Opportunity for a **second-life BESS industry**
- Offering **centralised, specialised battery testing and grading services**, supporting decisions on repurpose, recycling, or re-export across the region.





MINISTRY OF NATURAL RESOURCES
AND ENVIRONMENTAL SUSTAINABILITY

Thank you

MALAYSIAN GREEN TECHNOLOGY AND CLIMATE CHANGE CORPORATION

No.2, Jalan 9/10, Persiaran Usahawan, Seksyen 9,
43650 Bandar Baru Bangi, Selangor Darul Ehsan, Malaysia.

Tel no: +603 - 8921 0800

Fax: +603-8921 0801/0802

Email: info@mgtc.gov.my

Website: www.mgtc.gov.my

