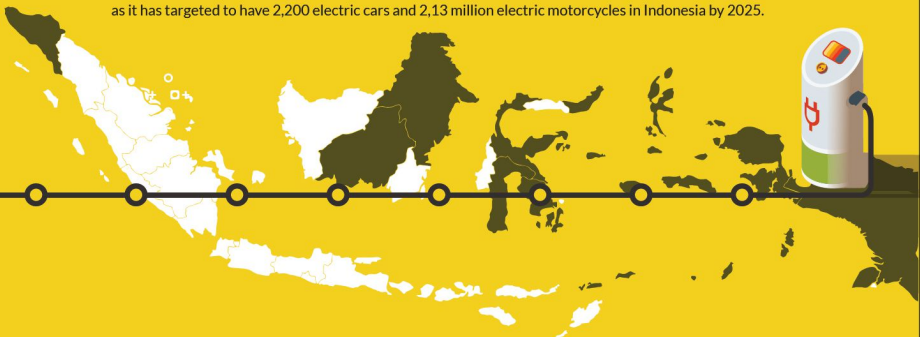
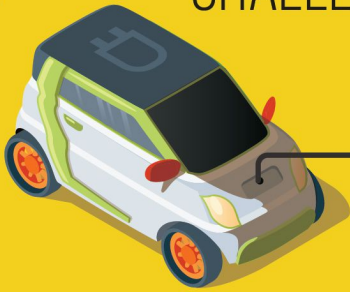


INDONESIA'S EV DEVELOPMENT: OPPORTUNITIES & CHALLENGES



INTRODUCTION

Energy transition in the transportation sector is indicated by the gradual shifting from the use of internal combustion engine (ICE) vehicles to electric vehicles (EVs) globally. The transportation sector consumed 43% of total energy and emitted 16.2% of total global emissions in 2020 (IEA 2020). In 2020, battery electric vehicles (BEV) dominated the global EV stock, which accounted for 67.0%, followed by plug-in hybrid electric vehicles (PHEV) for the other 32.7%. Indonesia is preparing a Roadmap for the National Electric Vehicle Acceleration as one of the implementation strategies of the Paris Agreement ratification to control greenhouse gas emissions in the transportation sector. The Indonesian government has set up The National Energy Plan of Indonesia (RUEN, 2017), as it has targeted to have 2,200 electric cars and 2.13 million electric motorcycles in Indonesia by 2025.

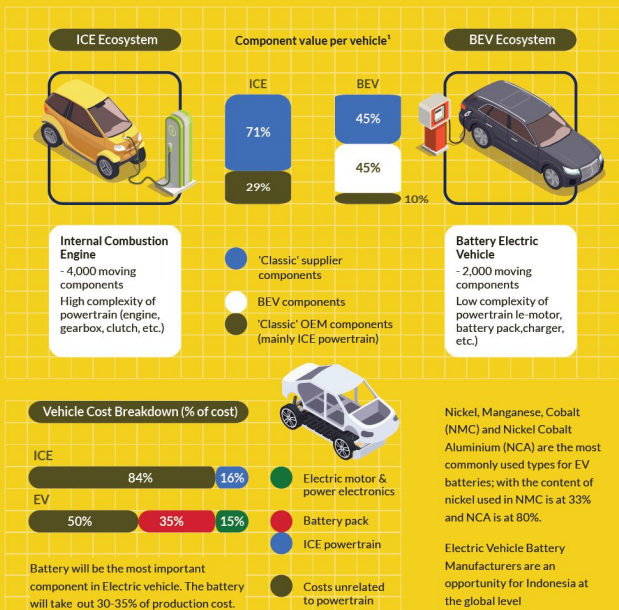
LESSON LEARNED: EV Regulations in the world



Source: International Energy Agency, 2021

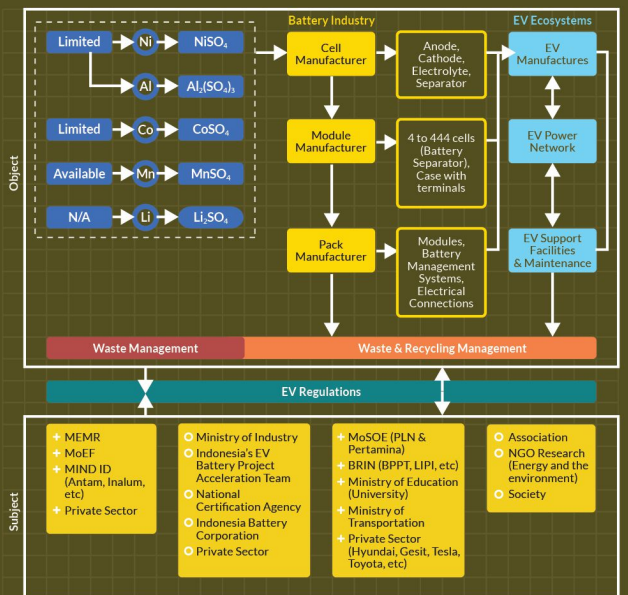
Indonesia's vehicle growth averages at 6% (2015 - 2019) (BPS, 2020). Indonesia has the largest global nickel reserves and the largest automotive sales & production market among all countries in Southeast Asia. Indonesia has the opportunity in Southeast Asia to develop Battery & EV Ecosystem.

Source: PYC, 2021



Source: BCG, IEA, 2020

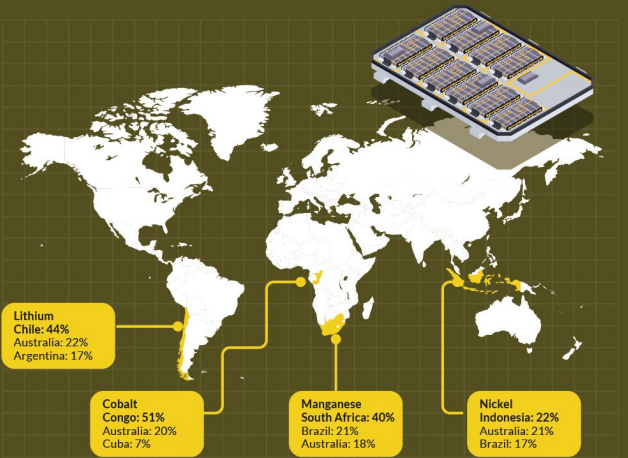
INDONESIAN EV SUPPLY CHAIN



Source: PYC, 2021

OPPORTUNITIES: Countries with Abundant EV Battery Raw Materials

Nickel is one of the essential minerals in the development of EV batteries. Having 22% of the global nickel reserves, Indonesia has an excellent opportunity to become one of the main players in the global EV supply chain.

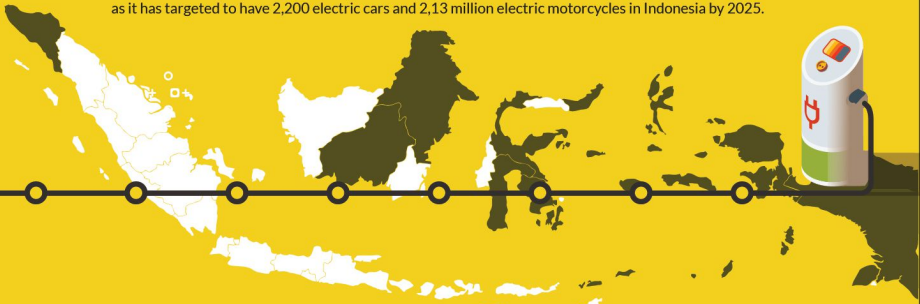


Source: USGS, 2021

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INTRODUCTION

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MAP OF NICKEL RESOURCES AND RESERVES



01. Southeast Sulawesi			05. Special Region of Papua			09. Central Kalimantan		
Total Location (Unit)	161		Total Location (Unit)	7		Total Location (Unit)	1	
Total Resources (Ton)	Ore	4,716,250,791	Total Resources (Ton)	Ore	425,120,000	Total Resources (Ton)	Ore	21,730,643
	Metal	72,487,033		Metal	5,483,218		Metal	393,325
Total Reserve (Ton)	Ore	1,720,024,297	Total Reserve (Ton)	Ore	-	Total Reserve (Ton)	Ore	9,780,719
	Metal	26,216,067		Metal	-		Metal	167,250

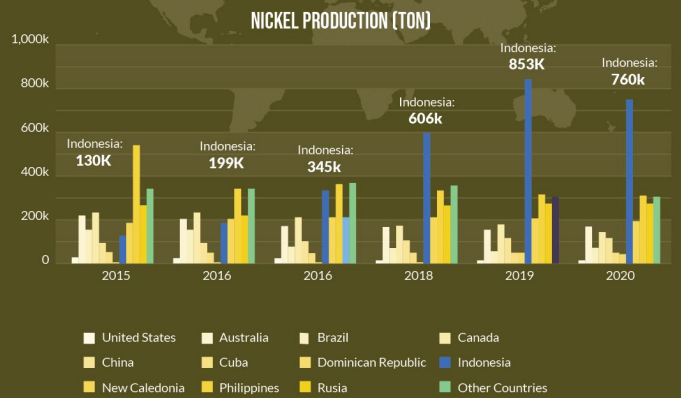
02. North Maluku			06. South Sulawesi			10. Special Region of Aceh		
Total Location (Unit)	68		Total Location (Unit)	10		Total Location (Unit)	1	
Total Resources (Ton)	Ore	3,382,794,673	Total Resources (Ton)	Ore	343,884,604	Total Resources (Ton)	Ore	8,295,040
	Metal	47,930,687		Metal	4,373,621		Metal	85,340
Total Reserve (Ton)	Ore	1,318,171,677	Total Reserve (Ton)	Ore	120,017,074	Total Reserve (Ton)	Ore	-
	Metal	20,219,150		Metal	2,081,593		Metal	-

03. Central Sulawesi			07. North Sulawesi			11. Maluku		
Total Location (Unit)	62		Total Location (Unit)	1		Total Location (Unit)	1	
Total Resources (Ton)	Ore	2,471,173,511	Total Resources (Ton)	Ore	42,464,772	Total Resources (Ton)	Ore	3,012,295
	Metal	36,290,321		Metal	727,790		Metal	42,172
Total Reserve (Ton)	Ore	1,082,908,077	Total Reserve (Ton)	Ore	20,557,641	Total Reserve (Ton)	Ore	-
	Metal	17,711,383		Metal	355,539		Metal	-

04. Special Region of West Papua			08. East Kalimantan		
Total Location (Unit)	14		Total Location (Unit)	2	
Total Resources (Ton)	Ore	438,235,200	Total Resources (Ton)	Ore	36,000,000
	Metal	6,257,039		Metal	608,400
Total Reserve (Ton)	Ore	72,920,000	Total Reserve (Ton)	Ore	1,202,428
	Metal	1,214,967		Metal	16,834

Source: PYC Data Center, 2021

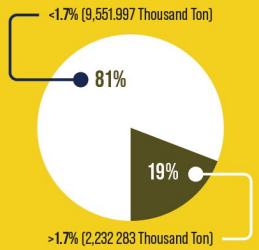
WORLD NICKEL PRODUCTION



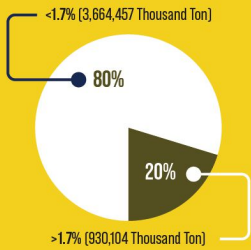
Source: PYC Data Center, 2021

RESOURCES AND RESERVES

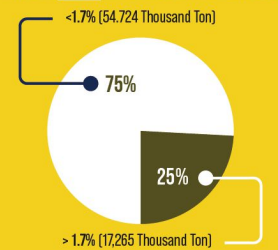
NICKEL ORE RESOURCE BY THE GRADE



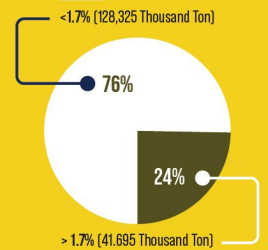
NICKEL ORE RESERVE BY THE GRADE



NICKEL METAL RESOURCE BY THE GRADE



NICKEL METAL RESERVE BY THE GRADE



Source: PYC Data Center, 2021

CHALLENGES

- The implementation and adoption of Indonesian EV are still far off from the target set by the government.
- The infrastructure for nickel processing (Smelter) HPAL for batteries is still lacking.
- Ministry of Transportation data showed that there were only 2,278 EVs (car and motorcycle) and 122 public charging infrastructures in Indonesia in 2020.
- Differences in perception between government and industry for local content regulations for battery and electric vehicle manufacturing.
- The price of electric vehicles is still expensive compared to the price of vehicles based on combustion engines.
- There are no sufficient domestic industries and technologies as well as in policies that comprehensively cover the customers and producers directly to support EV development and utilization in Indonesia.
- Less incentives for the electric vehicle industry and consumers.

ABBREVIATIONS:

- BEV : Battery Electric Vehicle
- BRIN : Indonesian Research Agency
- EV : Electric Vehicle
- HPAL : High Pressure Acid Leach
- ICE : Internal Combustion Engine
- JVCo : Joint Venture Company
- LCEV : Low Carbon Emission Vehicle
- LDV : Light Duty Vehicle
- LIPI : Indonesian Institute of Sciences
- MEMR : Ministry of Energy and Mineral Resources
- MoEF : Ministry of Environment and Forestry
- MoSOE : Ministry of State-Owned Enterprises
- NGO : Non-Governmental Organization
- OEM : Original Equipment Manufacturer
- PHEV : Plug-In Hybrid Electric Vehicle
- RUEN : National Energy General Plan of Indonesia
- USGS : United States Geological Survey
- ZEV : Zero Emission Vehicle