



**Dissemination Webinar on  
Indonesia's Transportation Decarbonisation Roadmap**

# **Emission Reduction Projection and Policy Intervention in Modal Share and Electric Vehicles**

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**Zoom. Meeting. Tuesday. December 5, 2023. 08.30-12.00 wib.**



# BACKGROUND AND ASPECTS

## Background

- In supporting the commitment to reduce emissions, the Indonesian Government has implemented several initiatives and policies in the transportation sector to reduce emissions, such as the use of biofuels, public transportation (modal shift), and most recently shifting to electric vehicles.
- These policies have not yet been used as a planning reference due to the absence of a roadmap.
- IESR has carried out roadmap modeling to guide what aspects or strategies need to be prioritized to effectively reduce emissions in the transportation sector.

## Decarbonization in Transportation Sector

- efforts to reduce or eliminate carbon dioxide (CO<sub>2</sub>) emissions and other greenhouse gases produced by vehicles and transportation infrastructure.
- to overcome climate change and create a more sustainable transportation system.

## TWO ASPECTS TO BE DISCUSSED:

### (1) Modal Share

- is the percentage of travelers using a particular type of transportation or number of trips using vehicle types.
- is an important component in developing sustainable transport within a city or region.
- sustainable modal share contribute to better environment impact

### (2) Electric Vehicles

- a set of initiatives, policies, and actions put in place by governments, organizations, or companies to promote the development, adoption, and integration of electric vehicles (EVs) into the transportation sector.
- designed to address various aspects of the electric vehicle ecosystem (not just the vehicles), including manufacturing, infrastructure, consumer incentives, and research and development.

# CHALLENGE IN DECARBONIZATION IMPLEMENTATION



## RESISTANCE TO CHANGE

- Employees and stakeholders may resist changes outlined in the roadmap. Resistance can stem from concerns about job security, unfamiliarity with new processes, or a general aversion to change. Overcoming resistance and gaining buy-in from key stakeholders is crucial for successful implementation.

## RESOURCE CONSTRAINTS

- Inadequate resources, including financial, human, and technological resources, can impede the smooth implementation of a roadmap. Limited budgets, insufficient skilled personnel, or a lack of necessary technology can slow down progress and hinder the achievement of milestones.

## LACK OF CLEAR COMMUNICATION

- Ineffective communication about the roadmap's goals, objectives, and the rationale behind the changes can lead to confusion and misunderstanding among team members. Clear, transparent, and consistent communication is essential for alignment and understanding across the organization.

## UNREALISTIC TIMELINES

- Setting unrealistic timelines for the implementation of certain milestones can lead to frustration and burnout among team members. It's important to balance the ambition of the roadmap with a realistic assessment of the time and effort required for successful implementation.

## INADEQUATE PLANNING

- Poorly defined goals, unclear strategies, and inadequate planning can result in roadblocks during implementation. A comprehensive and well-thought-out plan that considers potential challenges and contingencies is essential for successful roadmap execution.

## COMPLEXITY AND INTERDEPENDENCIES

- Many roadmaps involve complex projects with interdependencies between various tasks and teams. Managing these interdependencies can be challenging, and delays or issues in one area may have cascading effects on other aspects of the roadmap.

## TECHNOLOGY INTEGRATION

- Implementing new technologies often comes with integration challenges. Compatibility issues, data migration problems, or difficulties in aligning new technologies with existing systems can hinder the successful implementation of a roadmap.

## CULTURAL RESISTANCE

- Organizational culture can be a significant barrier to roadmap implementation. If the new initiatives conflict with existing cultural norms or values, overcoming cultural resistance becomes crucial for success.

# HOW MODAL SHARE CONTRIBUTES TO DECARBONIZATION



## REDUCTION IN INDIVIDUAL VEHICLE USE

- Increasing the modal share of sustainable transportation modes, such as public transit, cycling, and walking, helps reduce the reliance on individual motorized vehicles. Private cars, especially those powered by fossil fuels, contribute significantly to carbon emissions. A higher modal share for alternative modes can lead to fewer emissions per passenger-mile.

## PROMOTION OF PUBLIC TRANSIT

- Modal share strategies often aim to increase the use of public transportation. Public transit options, such as buses and trains, can be more energy-efficient and have a lower carbon footprint per passenger compared to private vehicles, especially when electrified or powered by renewable energy sources.

## ENCOURAGEMENT OF ACTIVE TRANSPORT

- Modal share initiatives that promote walking and cycling contribute to decarbonization by encouraging zero-emission and low-impact modes of transport. These modes are not only environmentally friendly but also contribute to improved public health and reduced air pollution.

## OPTIMIZATION OF VEHICLE OCCUPANCY

- Modal share efforts can focus on optimizing vehicle occupancy, particularly through initiatives like carpooling and ride-sharing. Increasing the number of passengers per vehicle reduces the overall emissions per person, leading to more efficient use of transportation resources.

## SHIFT TO LOW-EMISSION VEHICLES

- Modal share initiatives may involve promoting the use of low-emission and zero-emission vehicles. This includes electric vehicles (EVs) for private cars, electric buses for public transit, and other clean transportation options.

## INTEGRATION OF SUSTAINABLE MODES

- Encouraging the integration of different sustainable transportation modes within a comprehensive transportation system can provide people with more choices. For example, well-planned transit-oriented development can make it easier for individuals to switch between walking, cycling, and public transit.

## REDUCTION IN TRAFFIC CONGESTION

- A shift in modal share away from private vehicles can help alleviate traffic congestion. Congestion contributes to increased fuel consumption and emissions per mile traveled. By promoting alternative modes and improving public transit, modal share strategies can contribute to smoother traffic flow.

## REDUCED RELIANCE ON FOSSIL FUELS

- Shifting modal share away from high-emission modes, such as private gasoline-powered vehicles, reduces the overall demand for fossil fuels in the transportation sector. This is a fundamental aspect of decarbonization, as the energy sources used for transportation play a significant role in determining carbon emissions.

# THE CHOICE OF PUBLIC TRANSPORTATION SYSTEMS AND ITS CHARACTERISTIC



Type of Public Transportation System		Investment	Capacity	Construction Duration	Level of Adaptabilities	Energy consumption (per pax – km)	Environmental-Friendly	
Light railway/LRT		High	Large (Mass)	Long	Low	Low	Yes	
Maglev Rail Transit		High	Relatively Large	Relatively long	Low	Low	Yes	
Medium capacity of Public transport system	Straddle-type monorail	Relatively high	Relatively Large	Relatively long	Low	Relatively low	Yes	
	Suspended monorail	Relatively high	Medium	Relatively long	Low	Relatively low	Yes	
	Modern Trem	Trem	Medium	Medium	Relatively long	Medium	Relatively low	Yes
		Autonomous Rail Transit	Relatively Low	Medium	Relatively short	Relatively high	Relatively low	Yes
Bus Rapid Transit System		Low	Relatively Low	Short	Relatively high	Medium	May be Yes/ May be No	
Conventional bus system		Low	Low	Short	High	High	May be Yes/ May be No	

**In the context of decarbonization and the effective-efficient public transportation, the transportation mode with large capacity and low energy consumption is the most ideal choice.**



# ELECTRIC VEHICLES IN PUBLIC TRANSPORTATION

- **Electric Vehicle (EV) is the main priority** for decarbonizing the sector in the future, especially for 2-wheels, 3-wheels and light-duty vehicles.
- The barriers / challenges to develop the EV in Indonesia are: **high upfront cost, inadequate charging infrastructure, limited government incentives, and lack of consumer knowledge and awareness.**



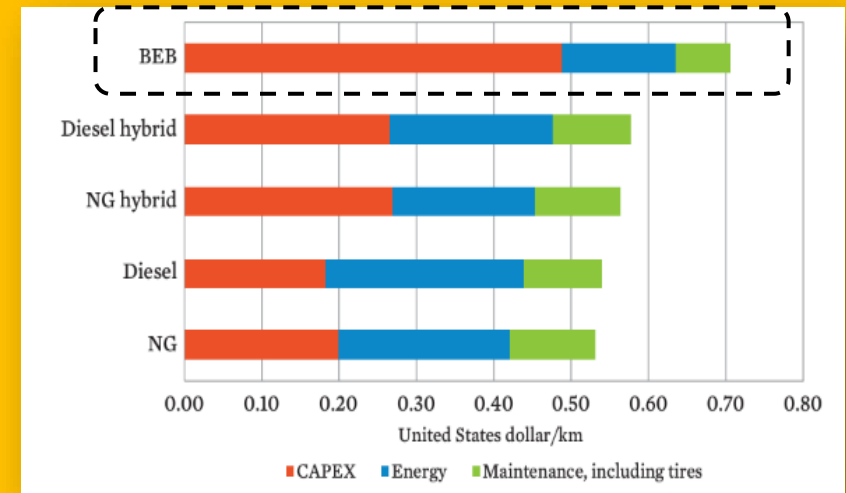
- Jakarta has implemented **EV for Bus Rapid Transit** (TransJakarta) in since 2019.
- **Lesson learned from China** : the procurement cost (Capex) for Battery Electrical Bus is **the most expensive** compared to other types of buses, while the energy usage and maintenance costs are **the cheapest.**



## The comparison of bus fleet procurement (in US\$)

Bus Fuel Technology	Fleet Length	
	8 mtr	12 mtr
Diesel	59,000	94,000
Gasoline	63,000	102,000
Diesel plug-in hybrid	-	136,000
Gasoline plug-in hybrid	-	138,000
<b>Battery electrical bus</b>	<b>114,000</b>	<b>250,000</b>

## The comparison of energy use and maintenance cost (in US \$ per-km)



Source: Sustainable Transport Solution; Low-Carbon Buses in the People's Republic of China – Asian Development Bank (2018)



# HOW ELECTRIC VEHICLES CONTRIBUTED TO DECARBONIZATION



## ZERO VEHICLE EMISSIONS

- One of the primary benefits of electric vehicles is that they produce zero tailpipe emissions. Unlike traditional internal combustion engine vehicles that burn fossil fuels, EVs use electric power stored in batteries, resulting in no direct emissions of pollutants such as carbon dioxide (CO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), and particulate matter during operation.

## SHIFT IN CONSUMER PREFERENCES

- Increasing awareness of environmental issues and a growing interest in sustainable living have led to a shift in consumer preferences. More individuals are choosing electric vehicles due to their lower environmental impact, contributing to the overall reduction of GHG emissions from the transportation sector.

## DECARBONIZATION OF THE ENERGY GRID

- The overall impact of EVs on GHG emissions depends on the source of the electricity used to charge them. As the energy grid shifts toward cleaner and more renewable sources, the carbon footprint of charging electric vehicles decreases. In regions where a significant portion of electricity comes from renewable sources like wind, solar, or hydropower, the environmental benefits of EVs are even more pronounced.

## TECHNOLOGICAL INNOVATION

- Continued research and development in electric vehicle technology contribute to the production of more efficient and cost-effective EVs. This innovation helps overcome barriers to adoption and makes electric vehicles more accessible to a wider range of consumers.

## ENERGY EFFICIENCY

- Electric vehicles are generally more energy-efficient than traditional internal combustion engine vehicles. They convert a higher percentage of the electrical energy from the grid to power at the wheels, resulting in less energy waste and lower overall energy consumption per mile or kilometer traveled.

## INCENTIVES AND POLICIES

- Many governments around the world have implemented incentives and policies to promote the adoption of electric vehicles. These measures include tax credits, rebates, and regulations that encourage consumers and businesses to choose electric vehicles over traditional vehicles, fostering a faster transition to a low-carbon transportation system.

## LIFECYCLE EMISSIONS

- When considering the entire lifecycle of a vehicle, including manufacturing, operation, and disposal, studies have shown that electric vehicles can have lower lifecycle emissions compared to traditional vehicles, particularly as the electricity grid becomes cleaner and the production of batteries becomes more sustainable.

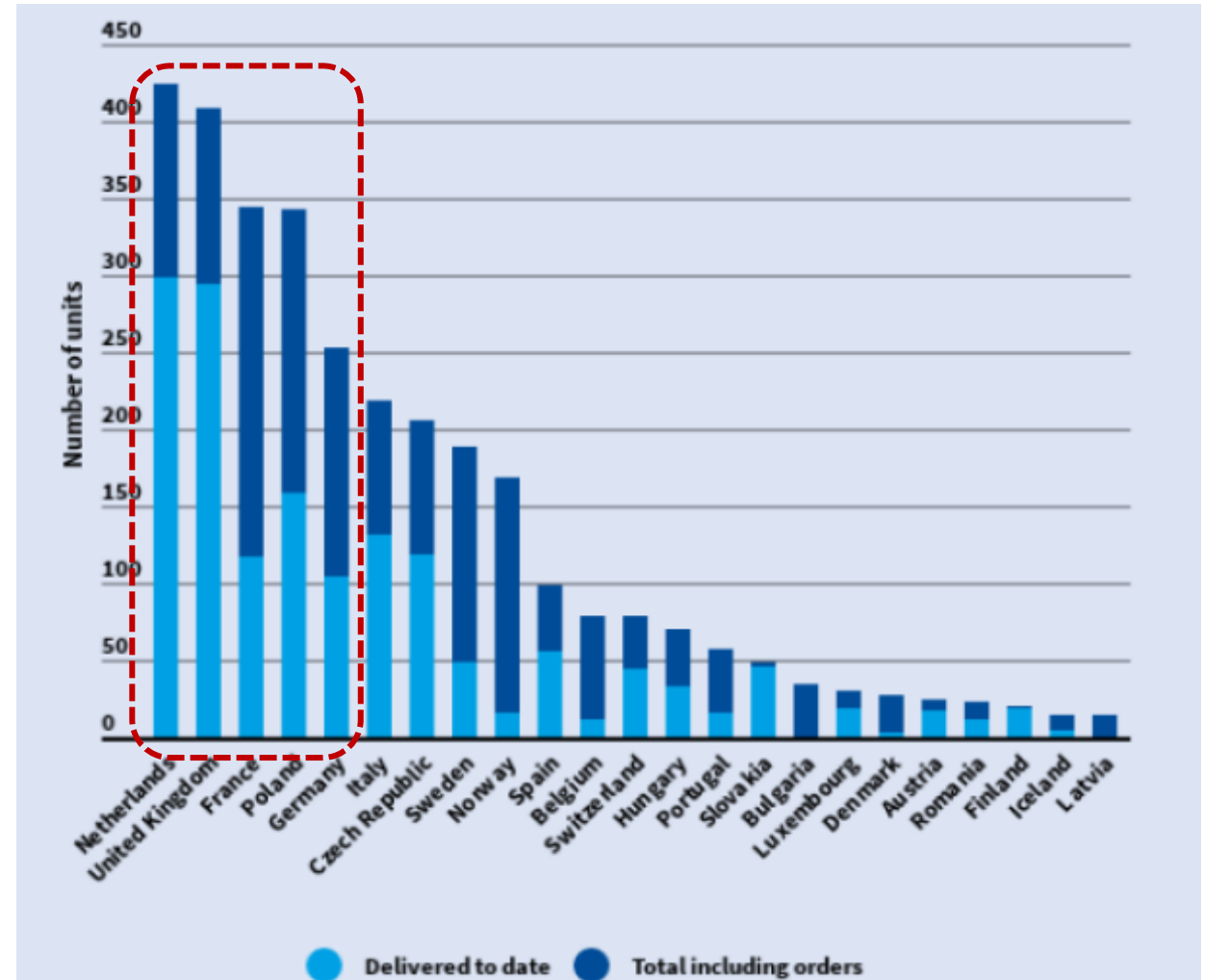
## ADVANCEMENTS IN BATTERY TECHNOLOGY

- Ongoing advancements in battery technology are leading to improvements in energy density, cost, and environmental impact. Sustainable battery technologies, recycling initiatives, and a shift toward less resource-intensive materials contribute to reducing the environmental footprint of electric vehicles.

# EV implementation for Public Bus Transportation in EUROPE



- Public bus transportation operations in Europe are half developed **in 5 countries:** Netherlands, England, France, Poland, Germany.
- European countries are targeting the use of buses with electric technology to **reach 100% by 2030 to support the "Zero Emission Buses" program.**



source: Transport & Environment, 2018



**Thank You**