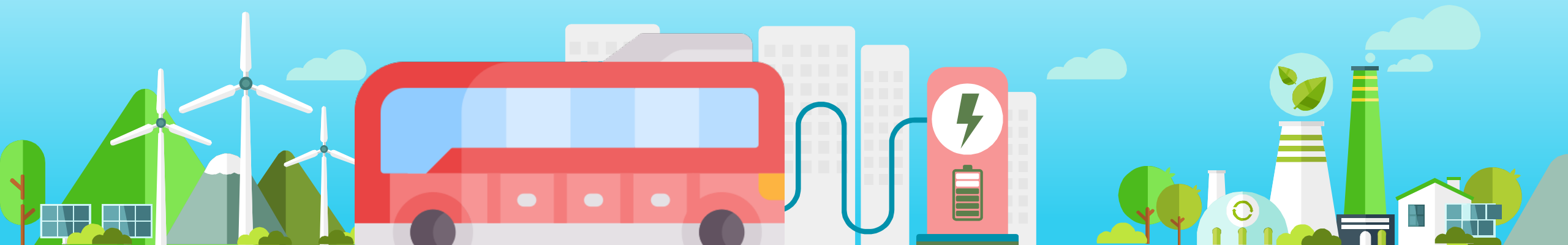


Business and Financing Models for Transitioning to Electric Buses

Jack Crawford

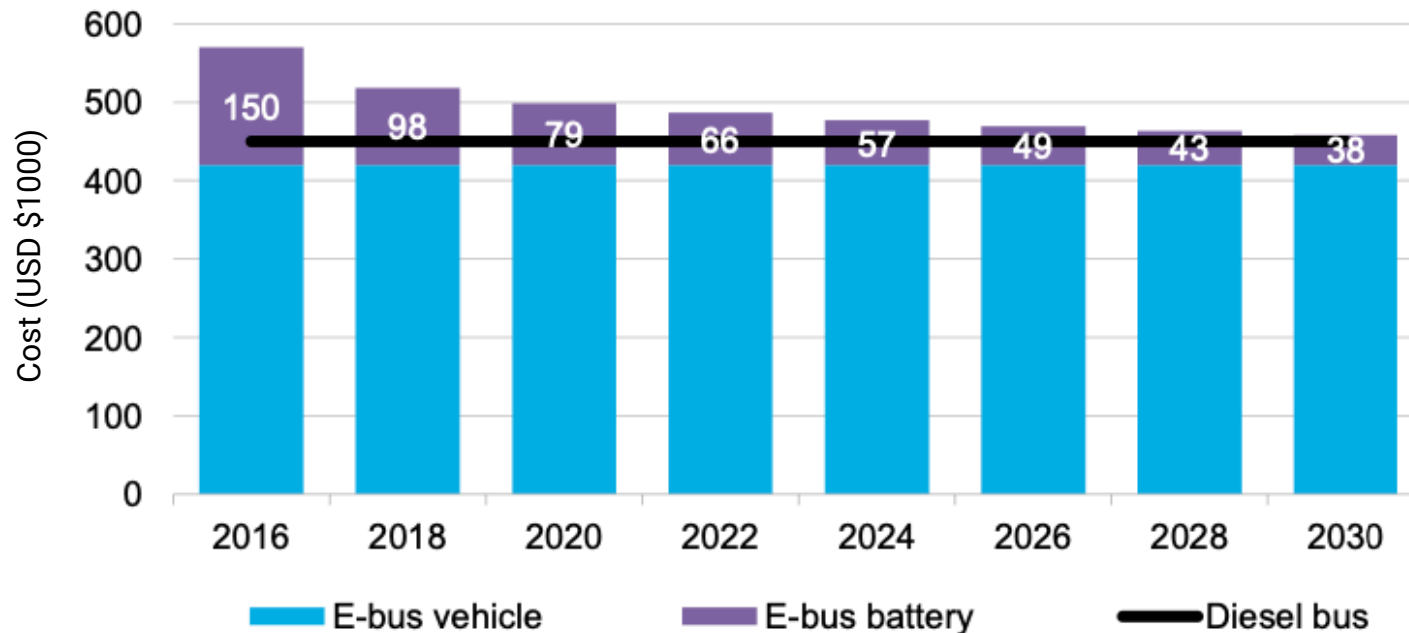
Graduate School of Economics at Kyoto University and Contractor at United Nations ESCAP

8th May 2024, M2G-ITS Lab Workshop 2024 at Kyoto University



Total Cost of Ownership: Electric vs Diesel

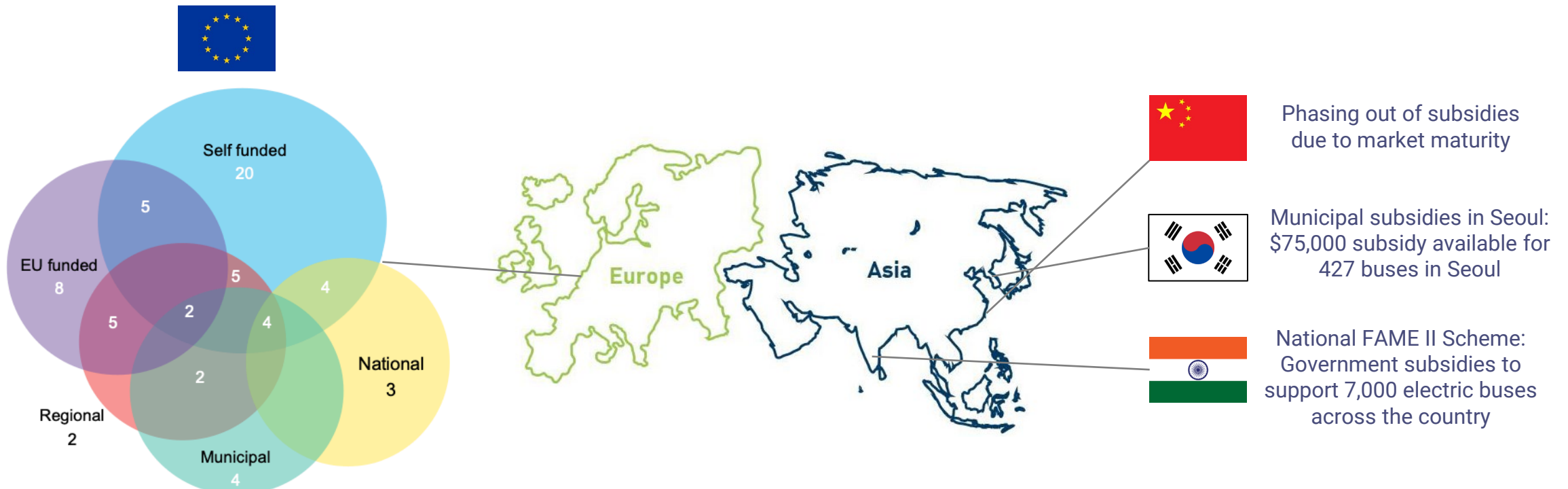
- The biggest challenge for electric buses is their high upfront cost compared to ICE buses
- Mainly influenced by battery costs, prices of which have fallen 24% since 2016 and 79% since 2010
 - Electric buses to reach cost parity with ICE counterparts in 2030 without subsidies



Source: Bloomberg (2018)

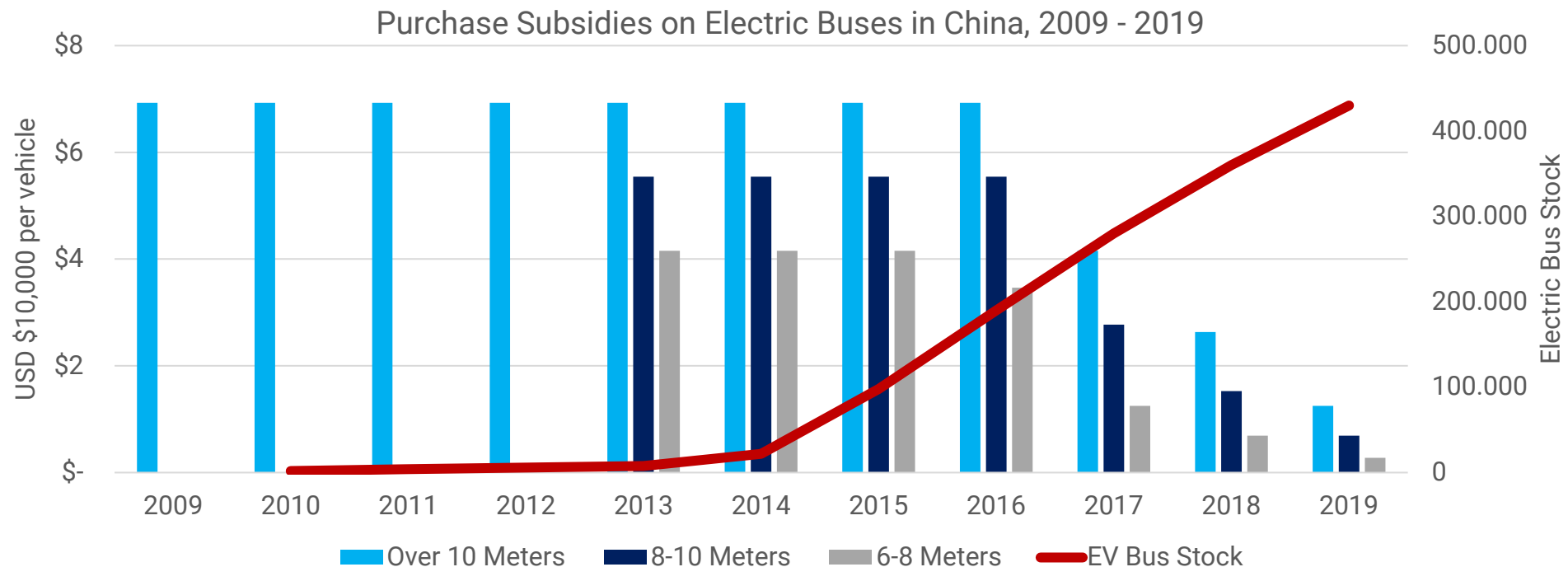
Financing Landscape

- Self-funding with various levels of subsidies most popular
- Can lead to complex funding structures with different agencies



Example from China: Role of Subsidies

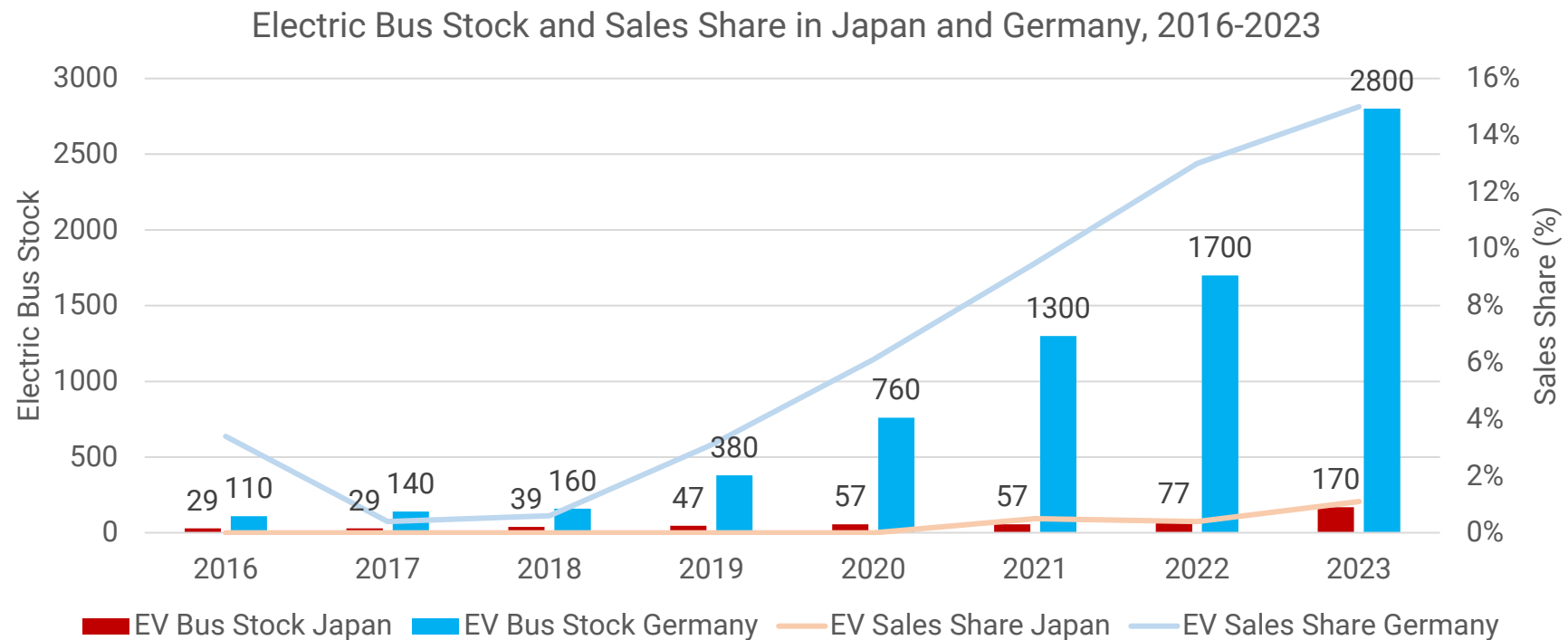
- Subsidies necessary for early stages of e-bus adoption. However, they aren't sustainable, especially for developing countries
- China: phase-out of subsidies coincides with e-bus maturation, decreasing 20% from 2016-2018, and 40% from 2018-2020



Source: ESCAP (2024); IEA (2024)

Shifting Pressure to the Operator

- Removal of subsidies shifts pressure to meet emissions targets onto transport providers, often self-financing
 - Germany began this process in February 2024, while Japan is still in an early adoption phase

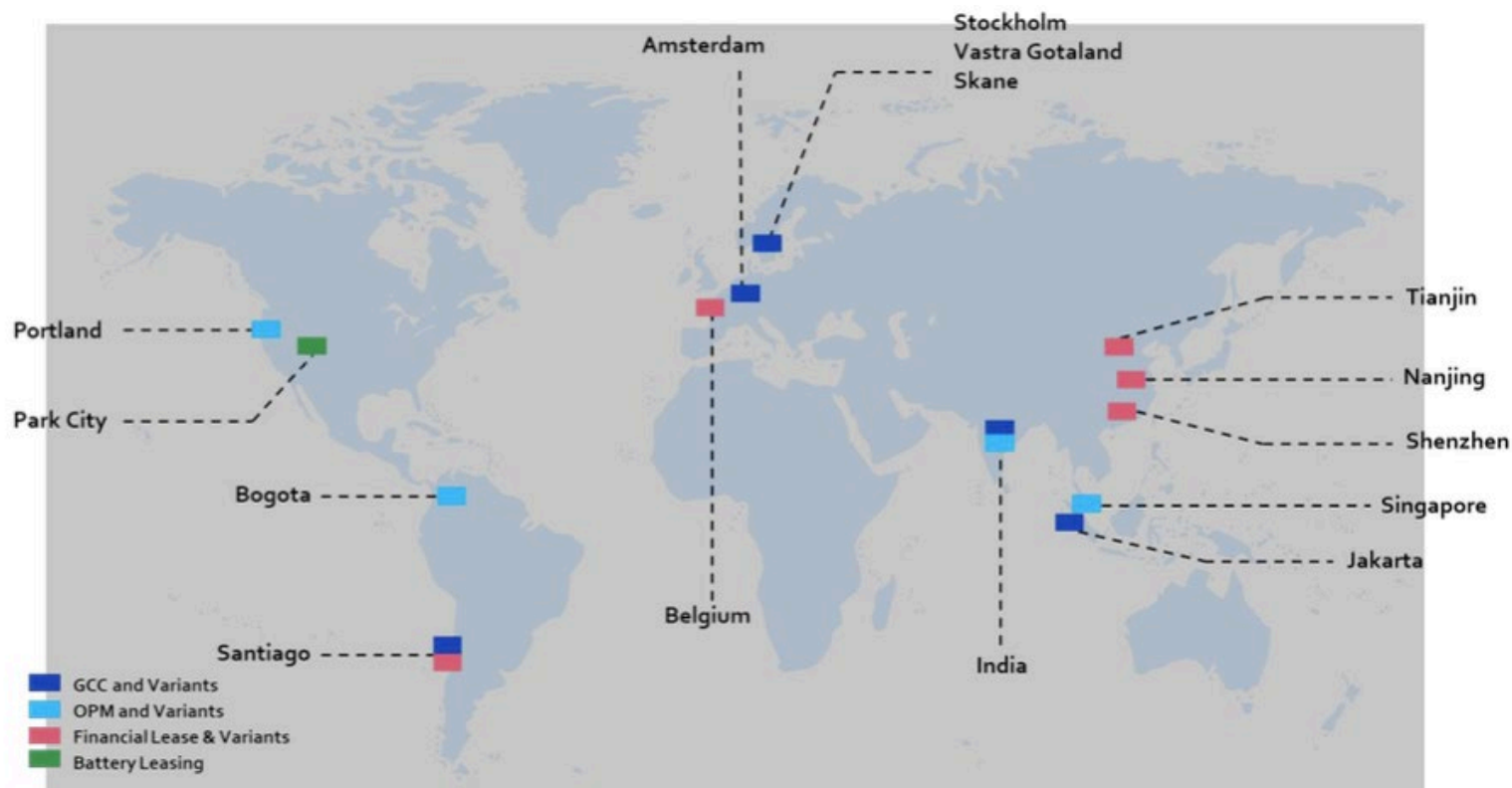


Source: IEA (2024)



The Operator's Perspective: No One-Size Fits All Approach

Business Models for Electric Buses in Different Parts of the World

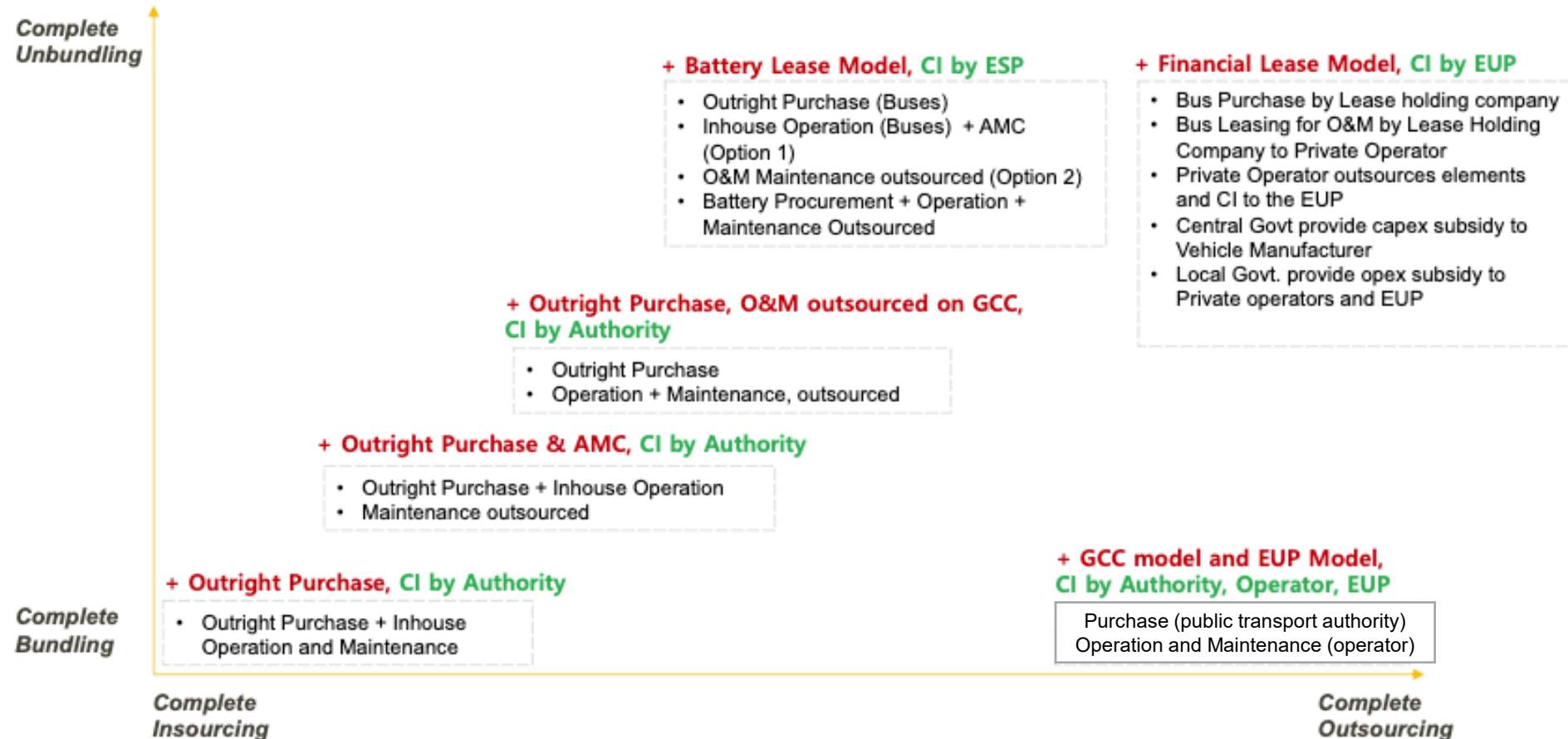


Source: ESCAP (2023)

GCC: Gross Cost Contract, OPM: Outright Purchase Model

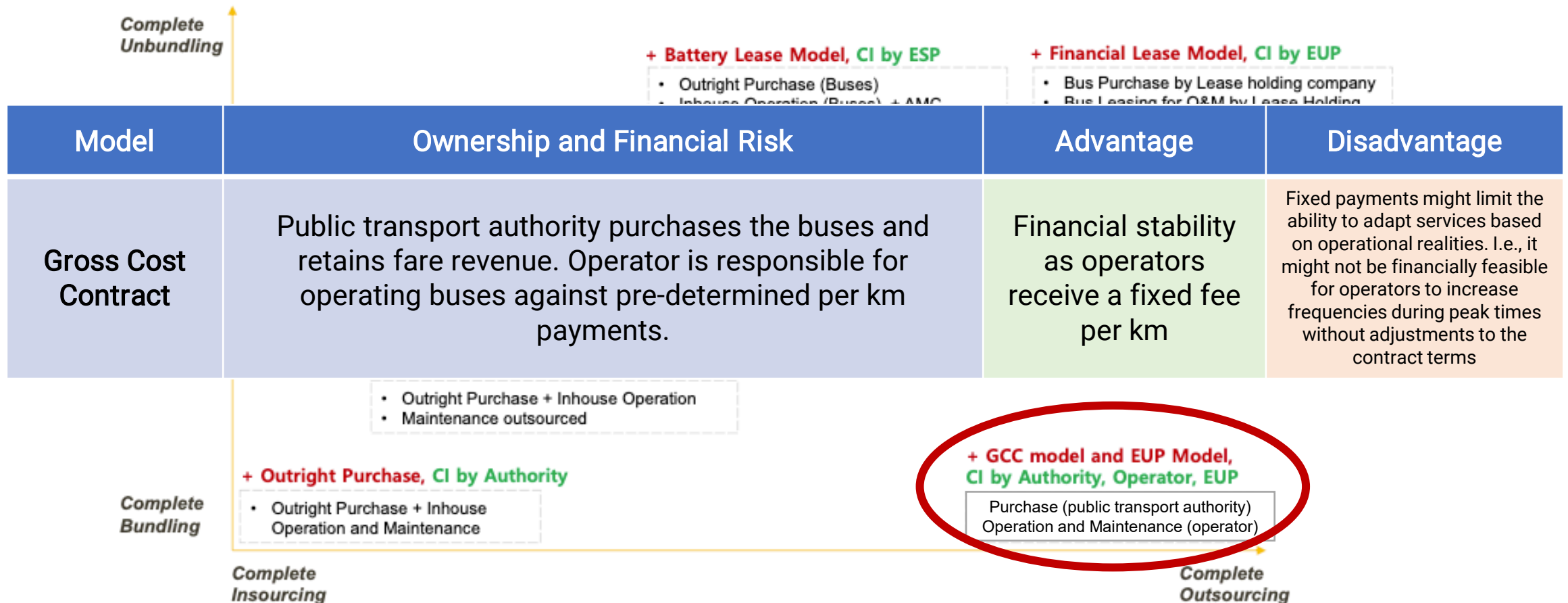


Types of Business Models for Electric Buses in Public Transport



CI = Charging Infrastructure, EUP: Energy Utility Provider, AMC: Annual Maintenance Contract, O&M: Operation and Maintenance

Types of Business Models for Electric Buses in Public Transport



Types of Business Models for Electric Buses in Public Transport

Complete
Unbundling

+ Battery Lease Model, CI by ESP

- Outright Purchase (Buses)
- Inhouse Operation (Buses) + AMC (Option 1)
- O&M Maintenance outsourced (Option 2)
- Battery Procurement + Operation + Maintenance Outsourced

+ Financial Lease Model, CI by EUP

- Bus Purchase by Lease holding company
- Bus Leasing for O&M by Lease Holding Company to Private Operator
- Private Operator outsources elements and CI to the EUP
- Central Govt provide capex subsidy to Vehicle Manufacturer
- Local Govt. provide opex subsidy to Private operators and EUP

+ Outright Purchase, O&M outsourced on GCC,

Model	Ownership and Financial Risk	Advantage	Disadvantage
Battery Lease	Operator owns the bus but leases the battery from a specialized provider, reducing the upfront purchase price of the bus and removing the operator from risks associated with battery life and technology upgrades.	Lowers initial costs and aligns expenses with battery life cycles	Dependent on battery provider for critical operational components

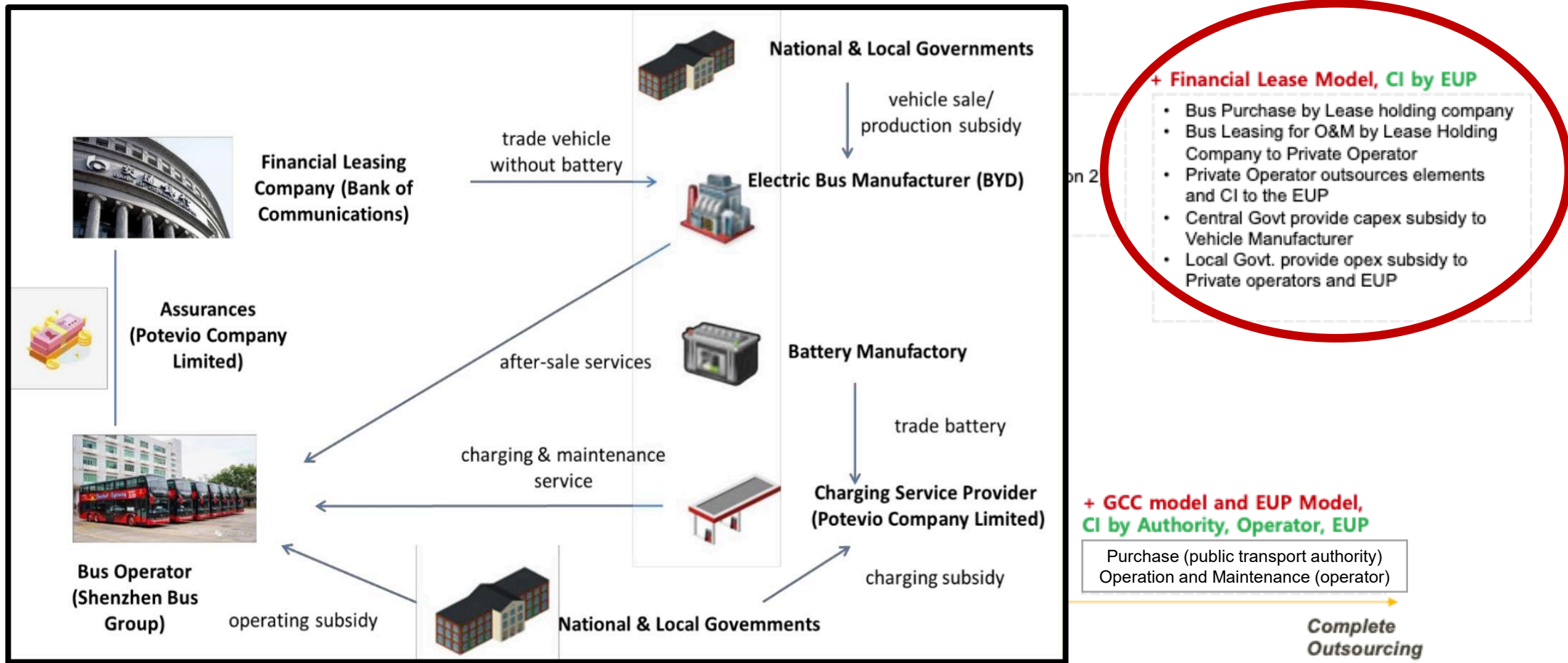
Complete
Insourcing

Complete
Outsourcing

Source: ESCAP (2023)

CI = Charging Infrastructure, EUP: Energy Utility Provider, AMC: Annual Maintenance Contract, O&M: Operation and Maintenance

Types of Business Models for Electric Buses in Public Transport



Source: ESCAP (2023); World Bank (2021) CI = Charging Infrastructure, EUP: Energy Utility Provider, AMC: Annual Maintenance Contract, O&M: Operation and Maintenance

Evaluating Alternative Business Models



Source: ESCAP (2023)

Thank you!

POLICY BRIEF


Accelerating Electric Mobility in Public Transport

How Asia and the Pacific Could Unlock Financing for Electric Buses



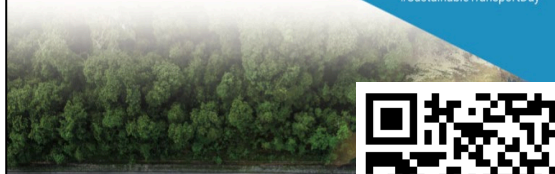
 TRANSPORT



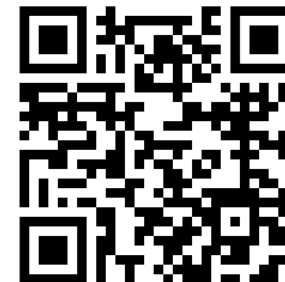
 ESCAP
Economic and Social Commission for Asia and the Pacific

WORLD SUSTAINABLE TRANSPORT DAY

MONOGRAPH SERIES ON
TRANSITIONING TO
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ACCELERATING THE TRANSITION
OF PUBLIC TRANSPORT FLEETS
#SustainableTransportDay



Transport Research and Education Network



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