Electric Mobility

# E-mobility Planning and Implementation

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# E-mobility in various forms

## Potential to address growing mobility needs

E-cargo bike in Montevideo @SOLUTIONSplus

E-there wheeler in India

Image: WRI India

BVG/Oliver Lang


E-moto taxi in Kigali @Ampersand/SOLUTIONSplus


E-kick scooter in Hamburg @SOLUTIONSplus


E-cargo 3W in Kathmandu @SOLUTIONSplus

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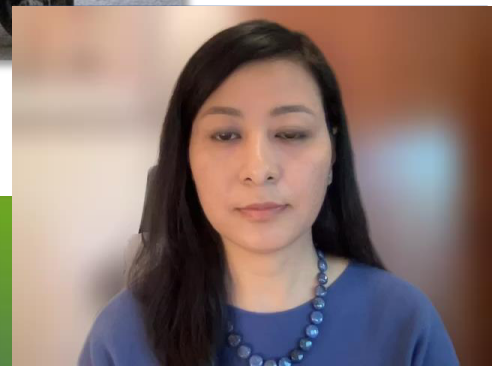


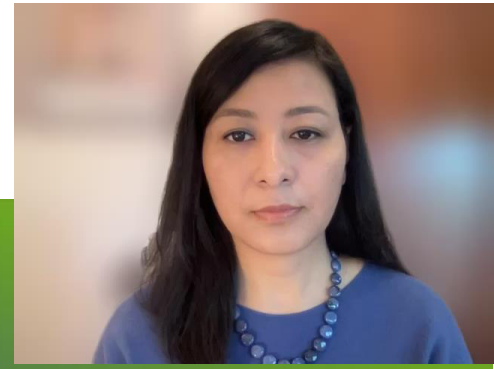
# Why E-mobility?

## E-mobility and SDGs


## Co-benefits of E-mobility

- Reduce carbon emissions and improve air quality
- Reduce dependence on imported petrol/diesel
- Use and incentivise clean energy sources /renewable energy
- Socio-economic potential
  - Improve trade balance
  - Green jobs (industry, vehicle manufacture/assembly)
  - Improve mobility services with ICT integration

Moving away from fossil fuels
+
Switch to e-mobility
+
Powered by renewable energy
=
**A Sustainable Future**



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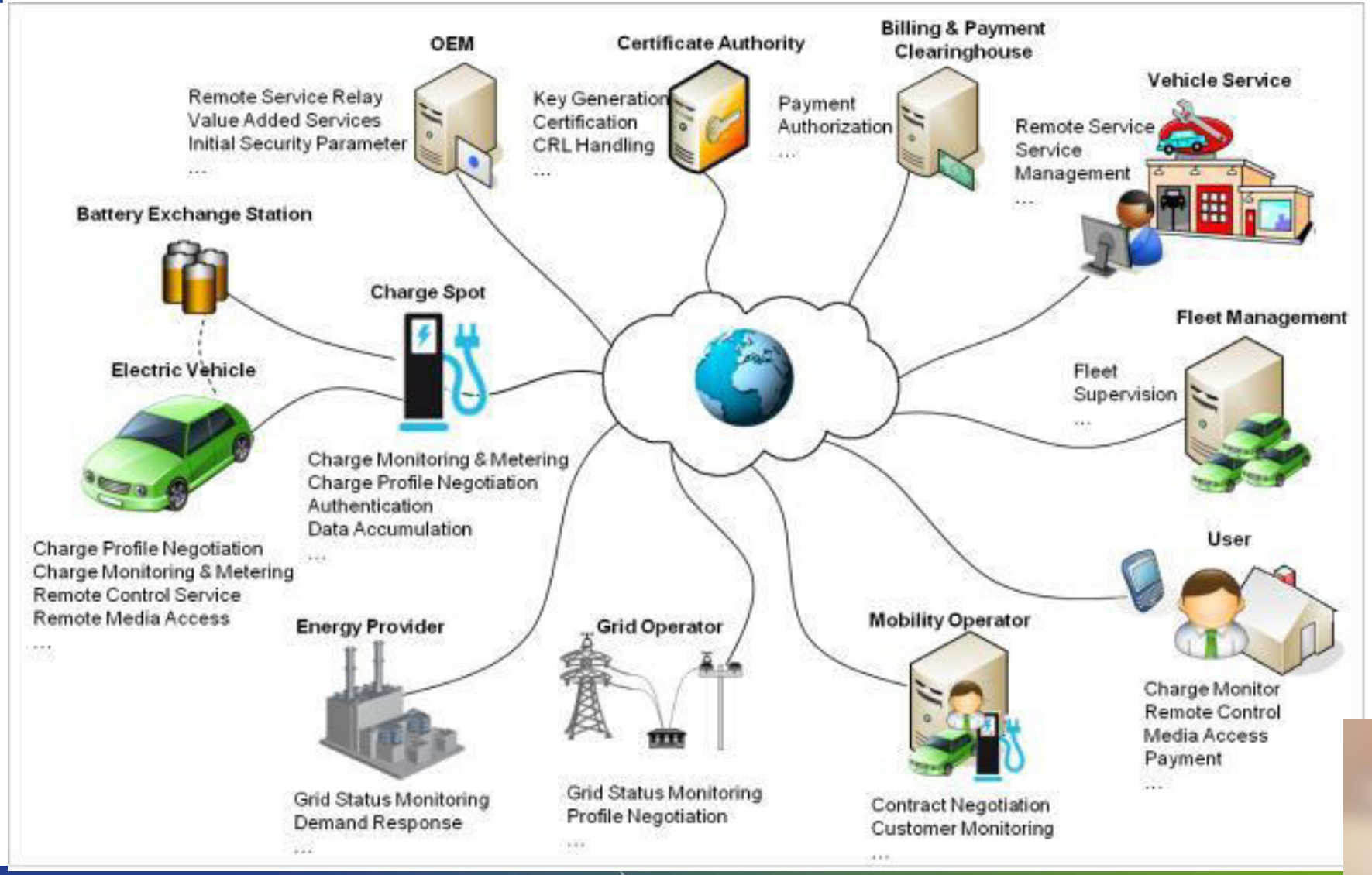
# EV implementation is more than vehicles




Source: Falk and Fries, 2012

# Barriers to e-mobility adoption

## Technical barriers

- Lack of charging infrastructure
- Charger standards and protocol issues
- Grid stability issues
- Battery performance and battery waste/disposal
- Lack of repair and maintenance workshops
- Limited local manufacturers

## Regulations

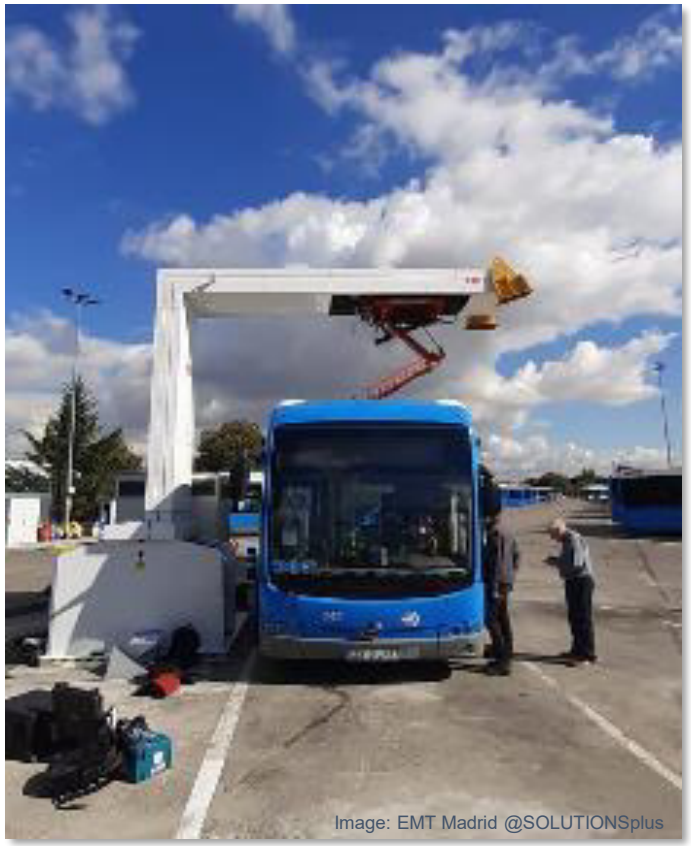
- Lack of standards for chargers/ EV standards
- Inadequate financial/fiscal incentives
- Lack of long term policy planning

## Social barriers

- Lack of awareness on E-mobility and environment
- Range anxiety

## Economic barriers

- High upfront cost/ battery cost
- Lack of proper market availability/ business models

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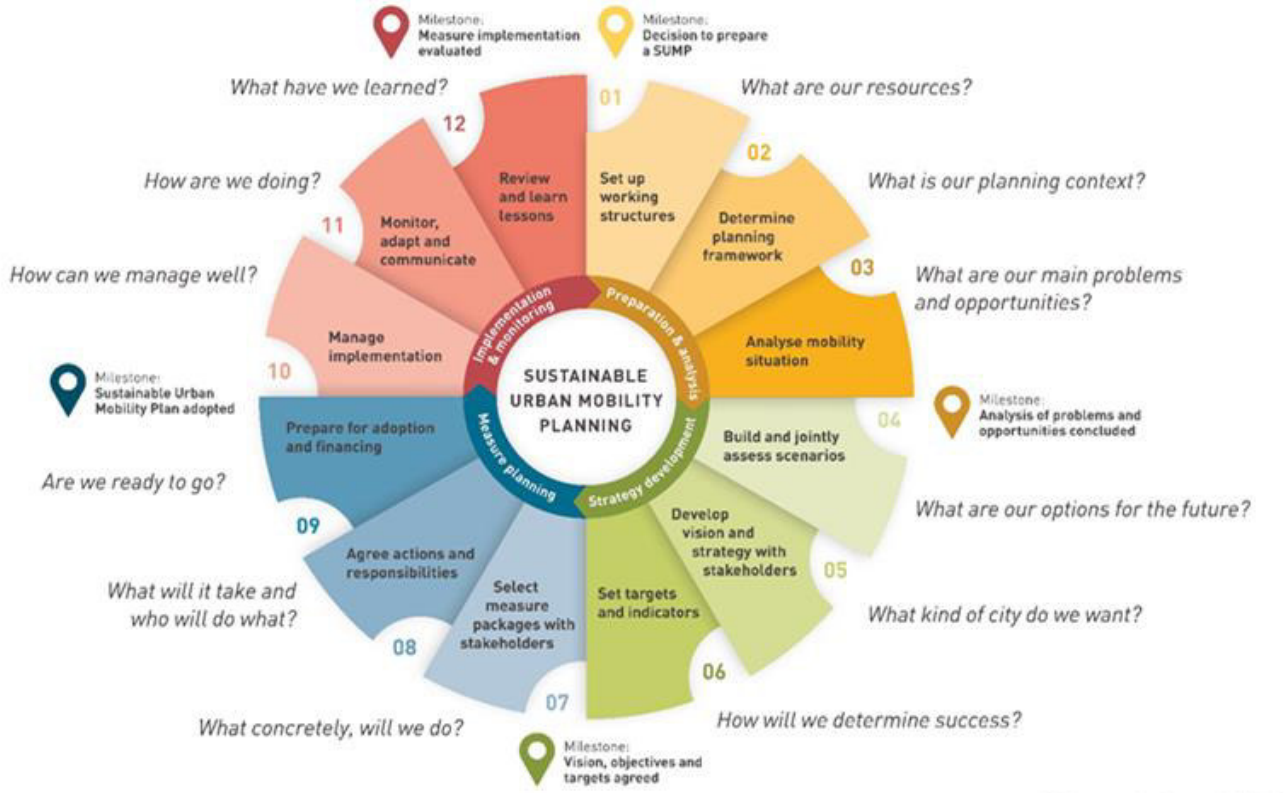
# Key consideration for planning and implementation of EV

## National and local government support

- Policies and regulatory reform: Standards and guidelines for EV operation/ interoperability
- Financial incentives (such as FAME India, EV tax holidays in Bangladesh)
- E-mobility integrated into mobility plans

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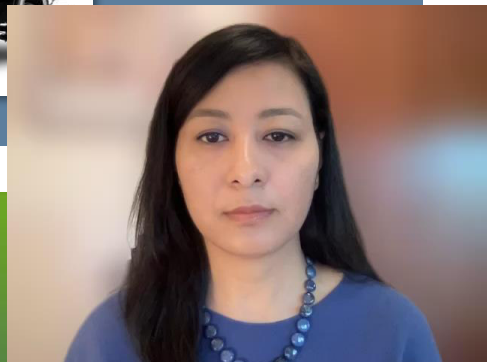
Sustainable urban mobility planning (SUMP) for the electrification of transport

### FAME India

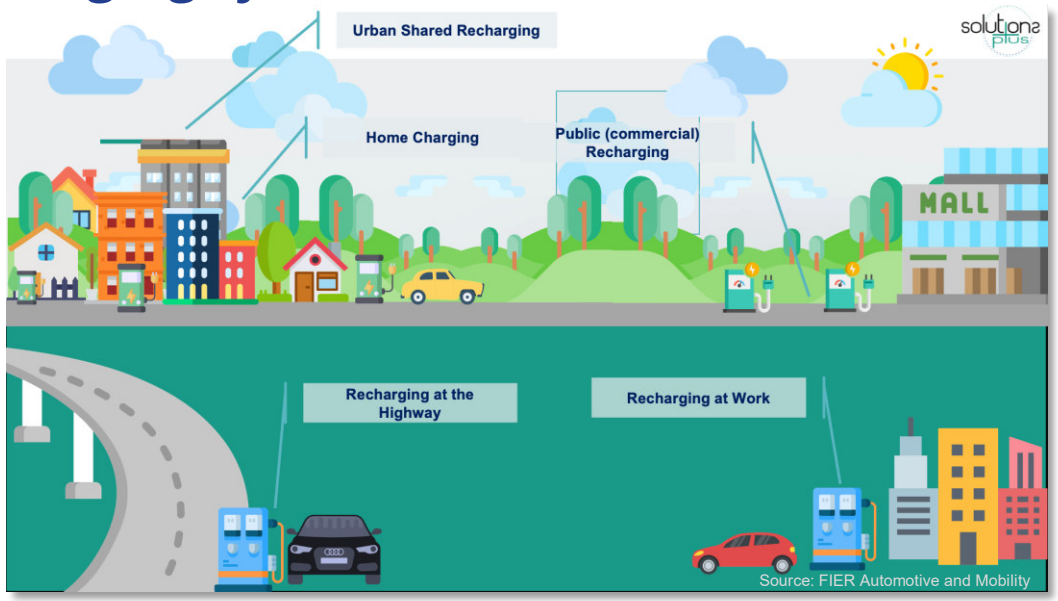
*"Government of India, through its Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles (FAME-II) scheme has provided total incentive support of almost €300m. The funding aims at the electrification of public and shared transportation: around 7,000 electric and hybrid buses, 500,000 electric three wheelers, 55,000 electric four wheeler passenger cars, and 1 million electric two wheelers. The scheme is proposed to be implemented through demand incentives and the establishment of infrastructure facilities such as a network of charging stations."*

Electric three wheelers in Kochi, India



# Key consideration for planning and implementation of EV

## Charging system





## Charging facilities

### Battery swapping

- Involves standardized removable battery packs; reduces bike/scooter downtime due to charging; requires spare batteries to enable circulation

- Operators can use connected information and communications systems that enables the control centre know the battery levels of the e2W/e3W, and where they are located



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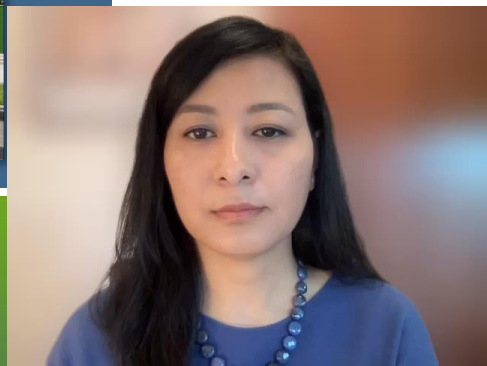
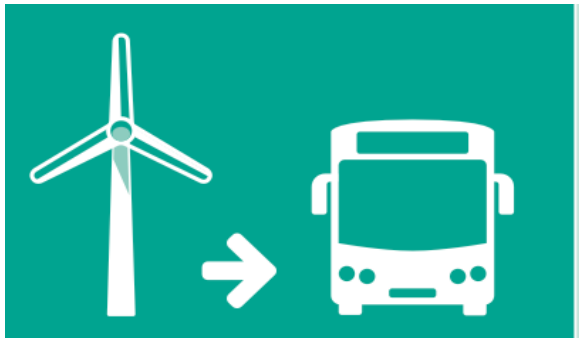


# Key consideration for planning and implementation of EV

## Charging system

### EV charging with renewable electricity



**Large bus fleets can be integrated into renewable electricity planning**

- Buses charged at night to store renewable energy generated at low-demand times of day
- Bus batteries help balance the grid by charging at times when renewable capacity is high but demand is low
- Close integration is needed with grid operators to plan incremental power upgrades
- Power tariffs may be pre-planned to incentivise bus charging at times of low general demand (overnight, for instance)
- Large bus fleets may require incremental renewable generation capacity

Image: EVgo

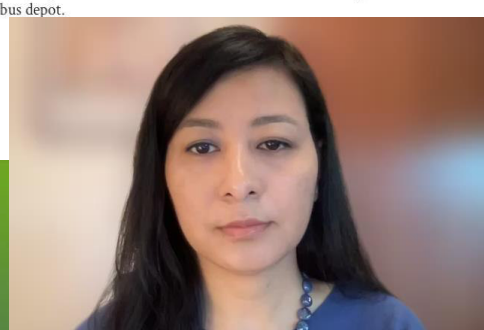
Germany

Image: Chargercube

Source: EBRD 2021

The installed rooftop PV system can recharge 6 of the 70 electric buses at the same time and provide electricity for other purposes at the bus depot.

Shanghai, China



# Key consideration for planning and implementation of EV

## Investment opportunities

### Business model

- Provide value to the customer that is higher than the costs for providing it, and then capture the difference.
- Unleash technologies' inherent value with different degrees of efficiency and with different characteristics

Need to take different concerns/stakeholders into account

**Auto Industry**
- Coherent and accessible charging network
- New routes to market/use models
- Clarity on energy infrastructure capabilities

**Energy System**
- Better optimization of intermittent generation and EV charging
- Tariffs to reward flexibility and response and new aggregator businesses
- Ability to anticipate and respond to network stress

**City governments**
- Coherent and accessible charge network
- Better partnerships with energy stakeholders
- Integrated service approaches to mobility

**Transport Industry**
- Improvement of cost efficiency in delivering expected service quality levels
- Reliability
- Risk management

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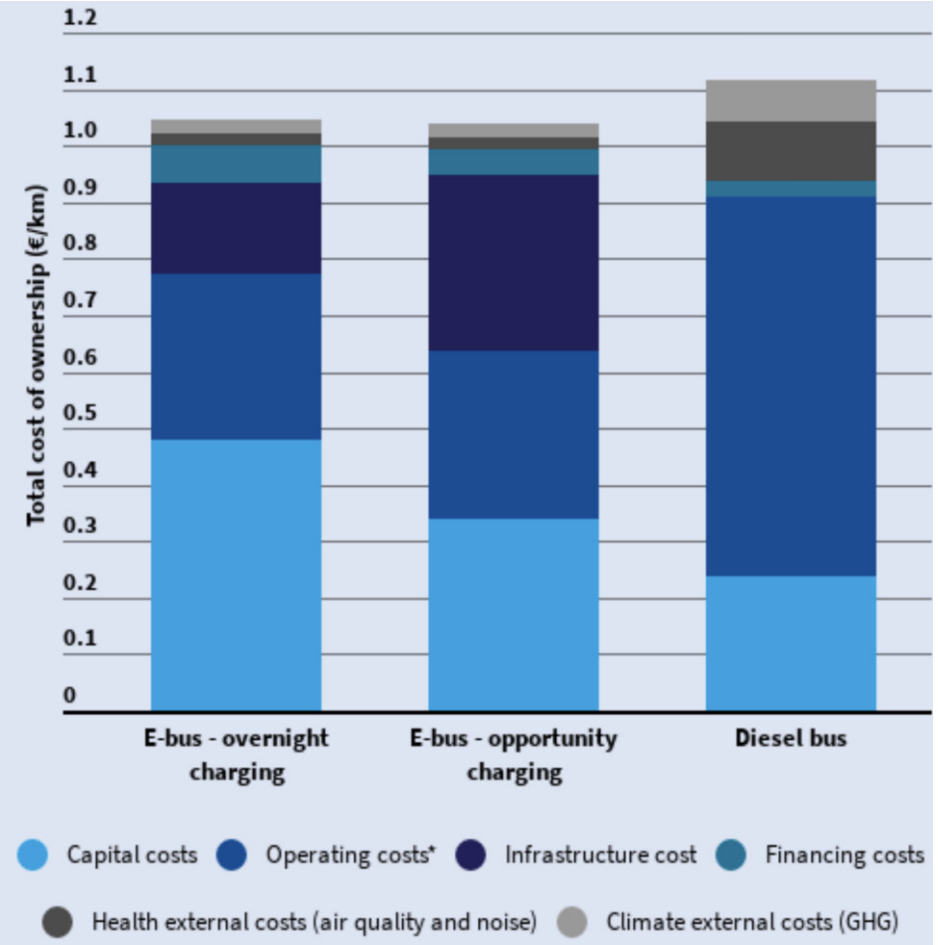
# Key consideration for planning and implementation of EV

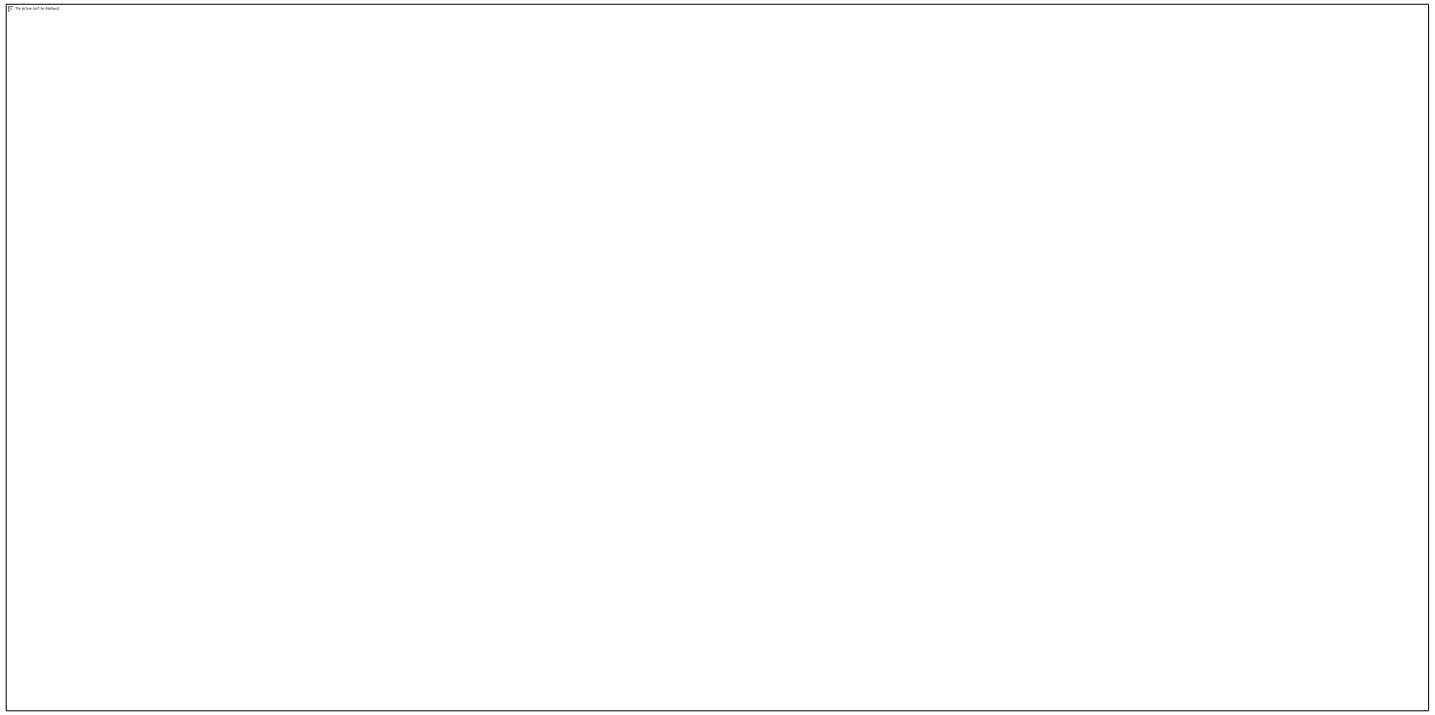
## Investment opportunities

### Total cost of ownership



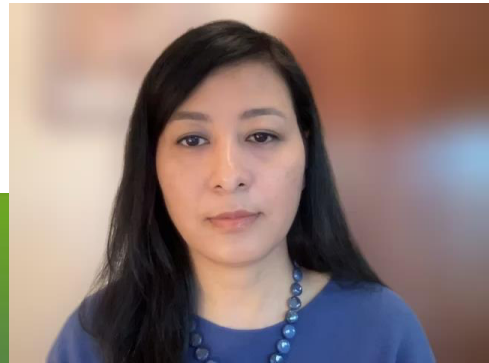

8-year TCO calculation, daily distance travelled of 250km, excluding driver costs, in 2018, in Europe (€/km)

Total cost of ownership (TCO) comparison of e-buses and diesel buses (source: Transport & Environment 2018)



Comparison of TCO per km of e-rickshaw (without subsidy) and e-auto (without subsidy) with CNG-3W, Petrol-3W and Diesel-3W at average daily travel distance of 100km

Source: WRI India



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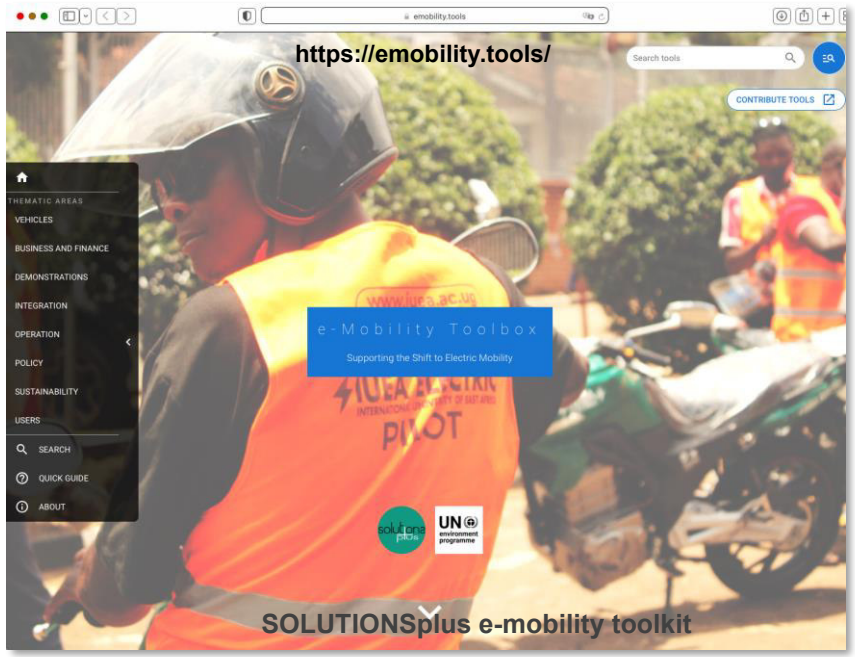
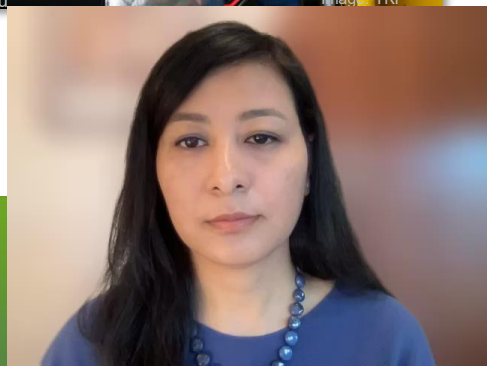
# Key consideration for planning and implementation of EV

## Local capacity development

- Technical capacity for EV operation, maintenance and local manufacture
- Promotion and awareness raising



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