



Barriers Faced by e-Mobility in Developing Countries

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Upscaling E-Mobility in Developing Countries for Climate Mitigation
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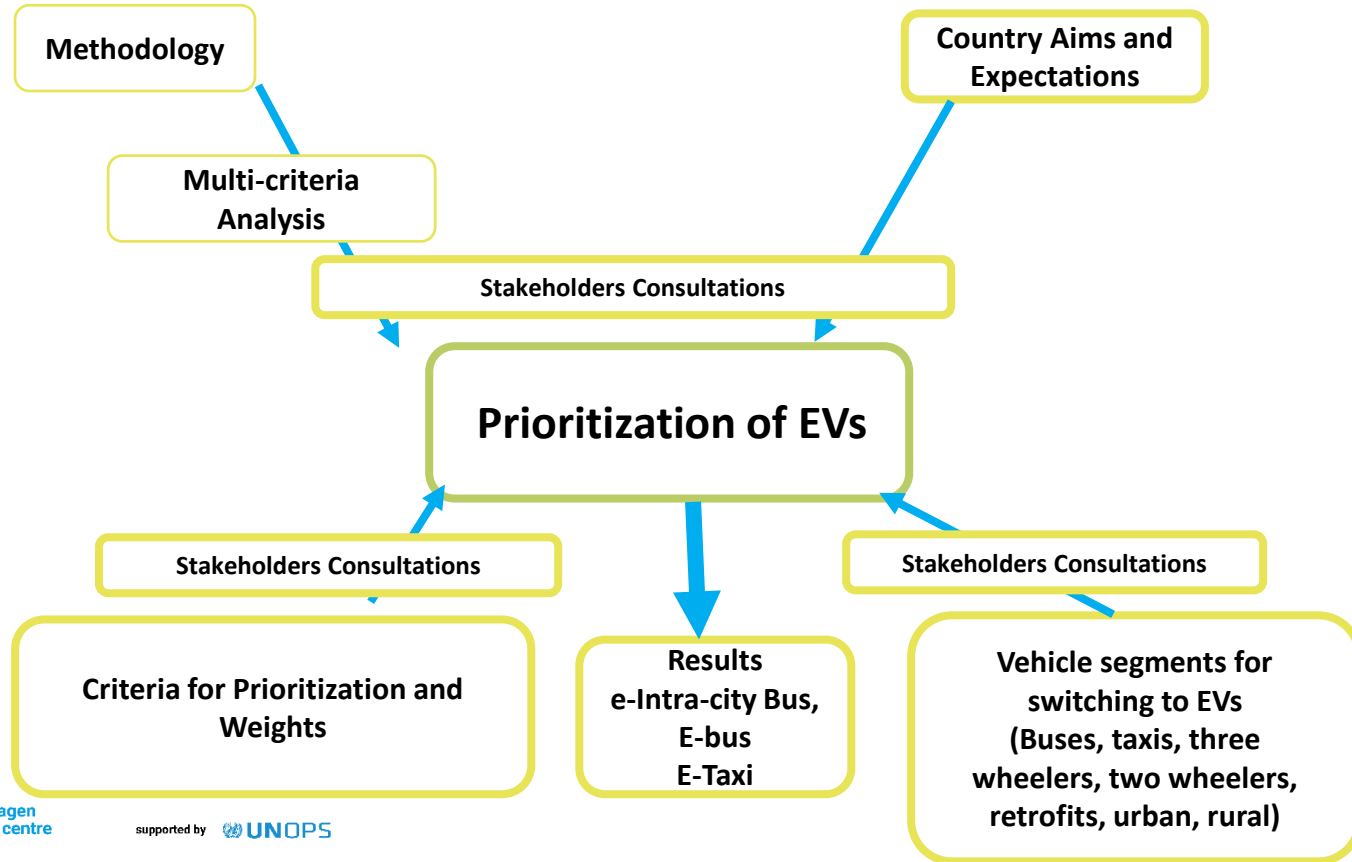
Barriers for Which E-Vehicle?

- Which vehicle segment?



- How to select?

Barriers for which Electric Vehicle?



Priorities for EVs

- Which vehicle segment?

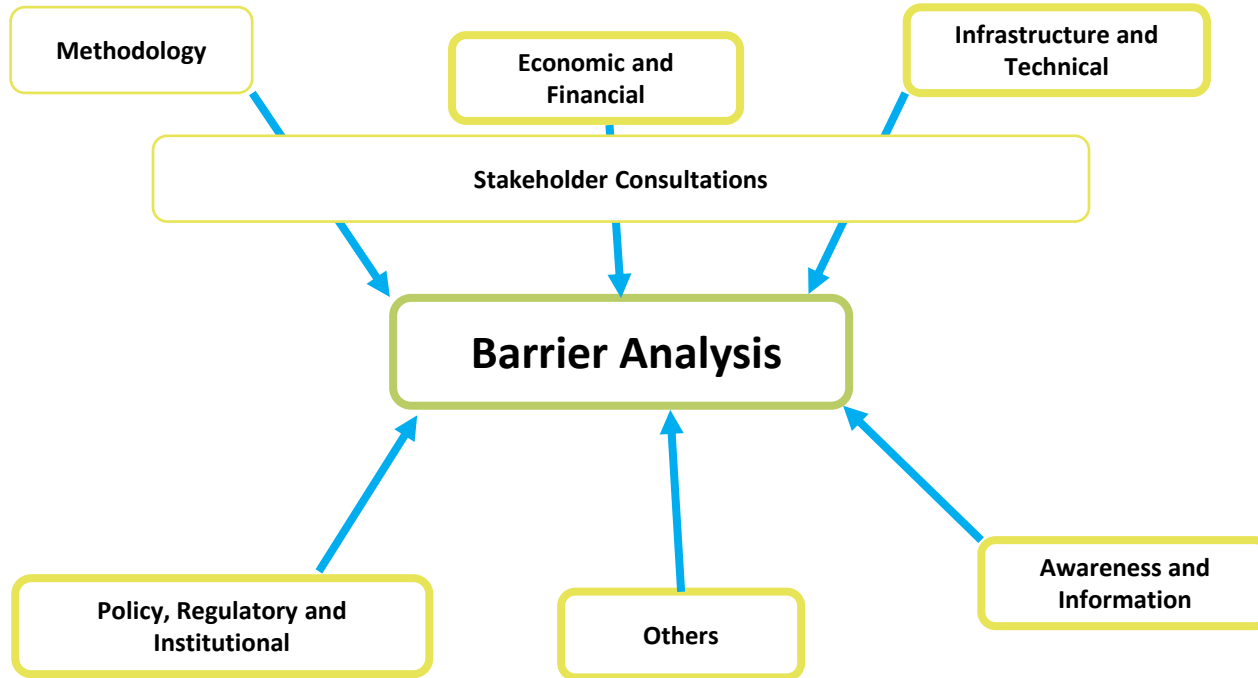


- Criteria for prioritization and weights
 - **Costs**- capital & operational
 - **Benefits**-economic, social, air pollution, climate
 - **Local context**- Government preference, user characteristics, supporting ecosystem

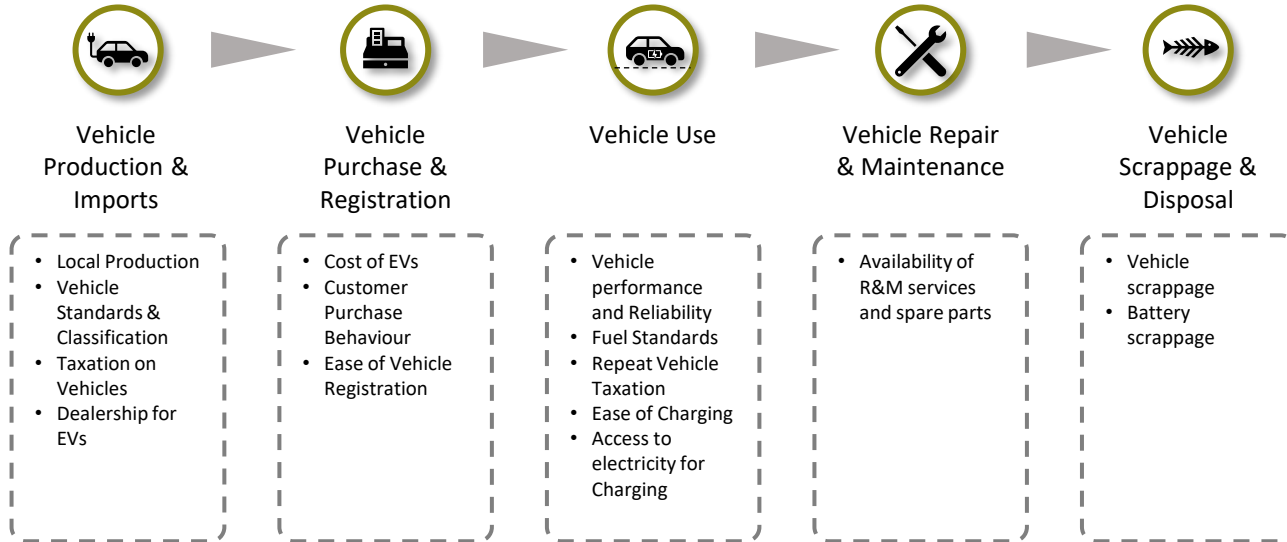


| Prioritization matrix for EVs adoption in Zimbabwe | | | | | | | | Weighted Score | | | | | | | |
|--|--------------------------------|-------------------------|--|-----------|-----------------------|----------------------------|-------|--------------------|----|--------------|---------|-------------------|--------------------------|--|--|
| Criteria No | Criteria | | | Weightage | | | | 2W- Personal | 3W | 4W- Personal | 4W-Taxi | Buses (Intercity) | Kombis/Buses (Intracity) | | |
| | Level 1 (L1) | Level 2 (L2) | Level 3 (L3) | L1 | L2 | L3 | Final | | | | | | | | |
| C-1 | Cost | CAPEX | EVs investment requirement | 30% | 70% | 70% | 15% | | | | | | | | |
| C-2 | | | Charging infrastructure investment requirement | | | 30% | 6% | | | | | | | | |
| C-3 | | OPEX | Electricity consumption | | 30% | 100% | 9% | | | | | | | | |
| C-4 | Benefits | Economic | Total cost of Ownership | 40% | 30% | 30% | 4% | | | | | | | | |
| C-5 | | | Retrofit potential | | | 20% | 2% | | | | | | | | |
| C-6 | | | Fuel Saving | | | 50% | 6% | | | | | | | | |
| C-7 | | | Job creation | | | 33% | 3% | | | | | | | | |
| C-8 | | | Social | | | Quality of life and equity | 33% | 3% | | | | | | | |
| C-9 | | Gender Equality | | | 33% | 3% | | | | | | | | | |
| C-10 | | Environmental | Air pollution reduction potential | | 15% | 100% | 6% | | | | | | | | |
| C-11 | | Climate | GHG reduction potential | | 35% | 100% | 14% | | | | | | | | |
| C-12 | | Local Context | Usage Characteristics | | On Road vehicle stock | 30% | 30% | 25% | 2% | | | | | | |
| C-13 | | | | | Vehicle trip length | | | 25% | 2% | | | | | | |
| C-14 | Fuel eff. /pax-km | | | 25% | 2% | | | | | | | | | | |
| C-15 | Easiness of EV Charging | | | 25% | 2% | | | | | | | | | | |
| C-16 | Supporting Ecosystem | | Local availability of EV models | 15% | 1% | | | | | | | | | | |
| C-17 | | | Local post sales services & spare parts availability | 20% | 2% | | | | | | | | | | |
| C-18 | | | Local assembly of EV models & components | 25% | 2% | | | | | | | | | | |
| C-19 | | | EVs R&D and Technical skills | 25% | 2% | | | | | | | | | | |
| C-20 | Local stakeholders' acceptance | Government's preference | Quality of road and accessibility | 15% | 1% | | | | | | | | | | |
| C-21 | | | 70% | 9% | | | | | | | | | | | |
| C-22 | 45% | 30% | 4% | | | | | | | | | | | | |
| Overall Score | | | | | | | | 48 | 48 | 39 | 55 | 59 | 62 | | |
| Low Weightage | | | | | | | | Moderate Weightage | | | | High Weightage | | | |

Electric Vehicle- Barrier Analysis





Barrier Analysis Framework



Technical Barrier- Charging; an example

Which standard- for basic charging, connectors, wireless charging, AC and others

- **CCS, in the European Union (EU) and the U.S.:** Relatively open protocol.
- **CHAdeMO, in Japan:** "CHArge de MOve", closed charging protocol. But special adaptors available.
- **GBT, in China**
- **ChaoJi, in China and Japan:** China Electricity Council and the CHAdeMO association collaboration 2020. Aim: faster, safer, and compatible with all other protocol. Target: 2035- International standard.
- **India:** Battery swapping and others under development.

| | N. America | Japan | EU and the rest of markets | China | All Markets except EU |
|----|--|--|---|---|---|
| AC |  J1772 (TYPE 1) |  J1772 (TYPE 1) |  Mennekes (TYPE 2) |  GBT |  Tesla |
| DC |  CCS1 |  CHAdeMO |  CCS2 |  GBT | |

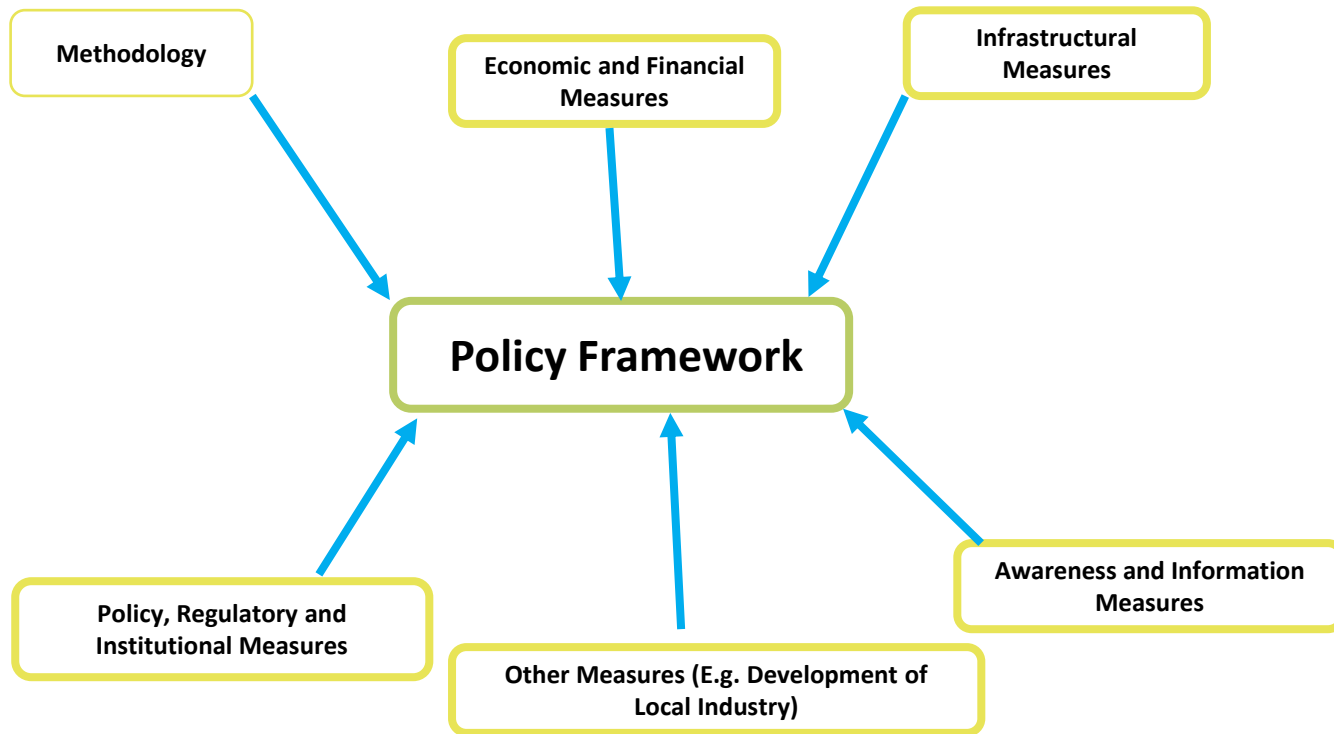
Economic / Financial Barriers- Charging; an example

- Cost of charging stations
 - Level 1 charger: \$813 per charger (1.2-1.4 kW)
 - Level 2 3.3-6.6 kW \$938- 2793 per charger
 - DC Fast (Level 4- 350kW)- \$140000 per charger
- Need and uncertainty of demand

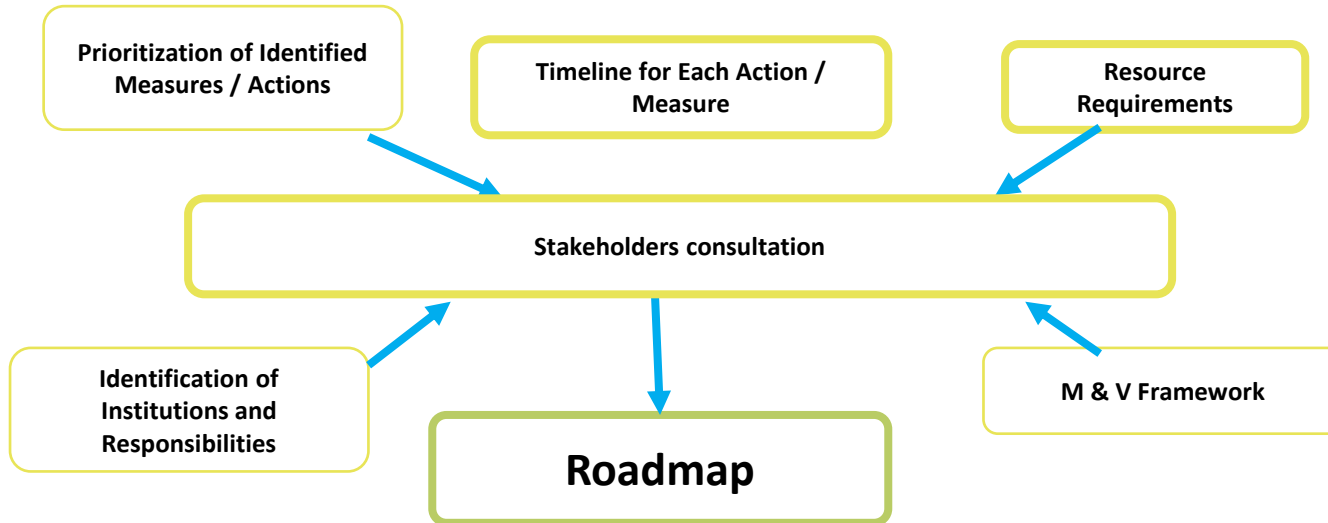


Source: Ultra fast chargers; thedriven.io

Electric Vehicle Policy Framework



Electric Vehicle Policy Roadmap



Thank you very much for your attention