

TRANSPORTATION SYSTEM & x-EV TECHNOLOGY IMPLEMENTATION



Badan Pengkajian dan Penerapan Teknologi

Rizqon Fajar

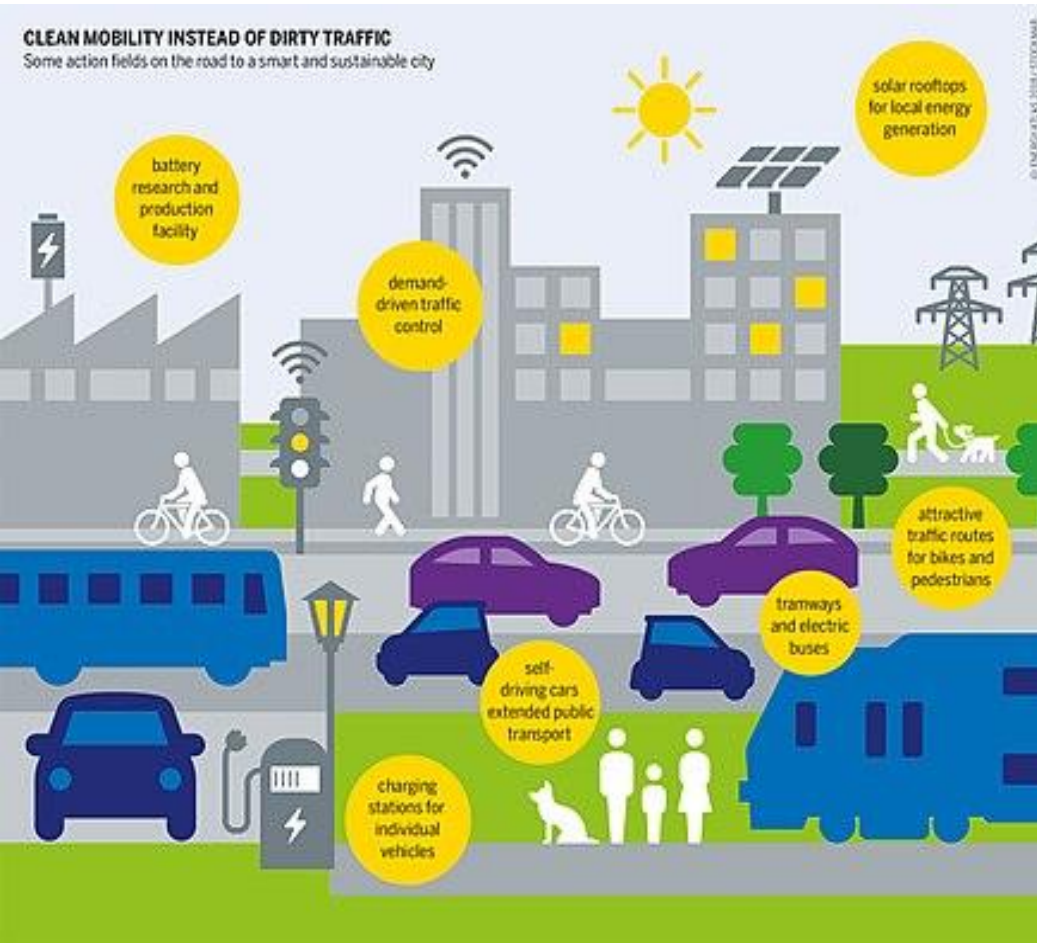
**Pusat Teknologi Sistem & Prasarana Transportasi
BPP TEKNOLOGI**

Seminar Gaikindo 24 July 2019

Outline

- A. Transportation System: Sustainable and Integrated for Electric Based
- B. Clearing Technology for Implementation of x-Electric Vehicle (EV)
 - 1. Vehicle Characteristics and Fuels
 - 2. Effect of Traffic Condition on x-EV Performance
 - 3. Effect of Topography on x-EV Performance
 - 4. Disaster (Flood)
 - 5. Culture
- C. Implementation of x-EV in Indonesia (road map Ministry of Industry)
- D. Recommendation

A. Transportation System: *Sustainable & Integrated*



Source: https://en.wikipedia.org/wiki/Sustainable_transport

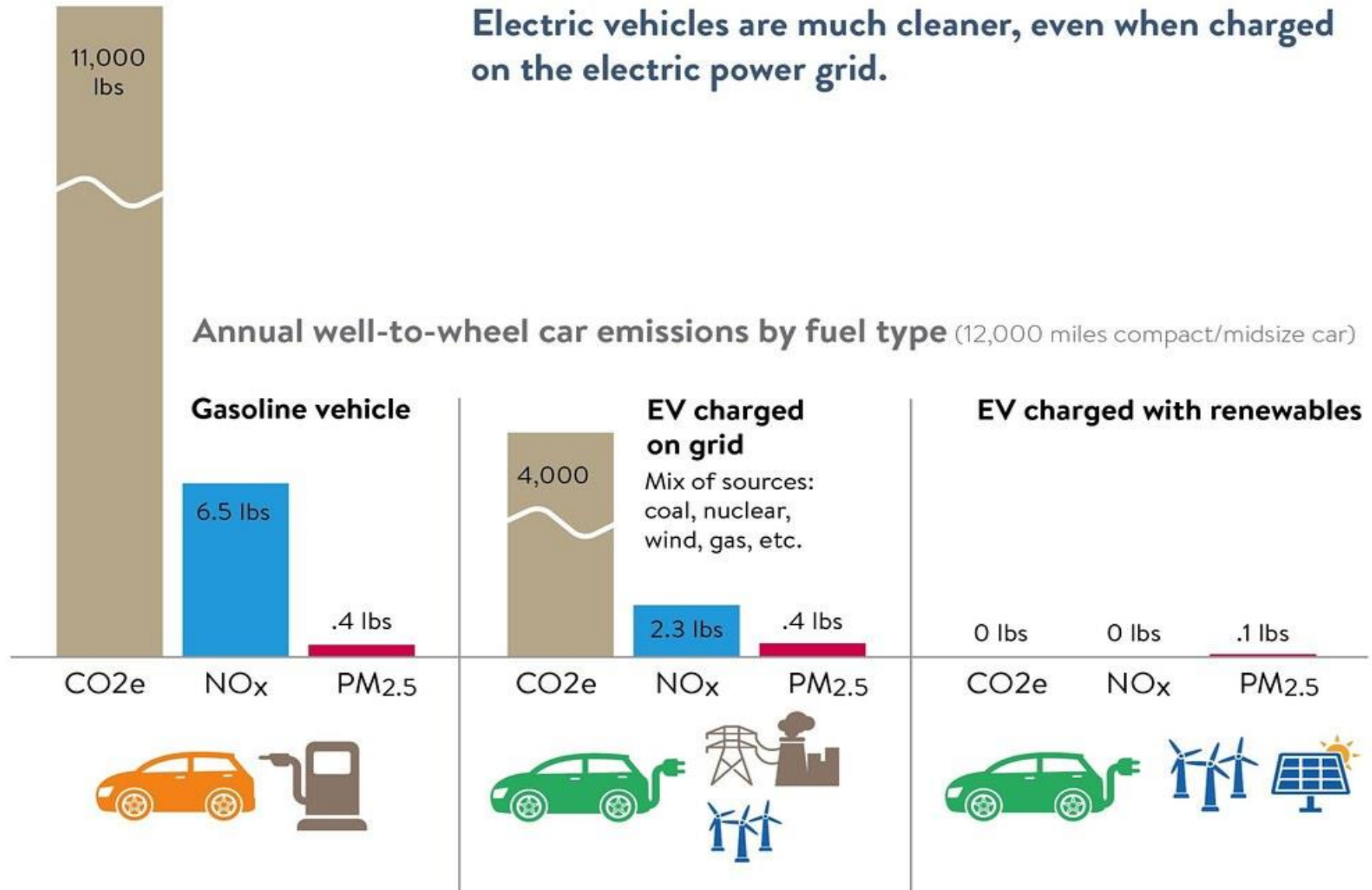
Sustainable

- Effectiveness & Efficiency
(road network, time, fuel/energy etc)
- Environmental & Climate Impact
(emission, recycle, reuse etc)

Activities

- Optimization of road network & traffic
- Improvement of fuel efficiency
- Vehicle emission control
- Migrating from fossil-based to renewable energy

Electric vehicles are much cleaner, even when charged on the electric power grid.

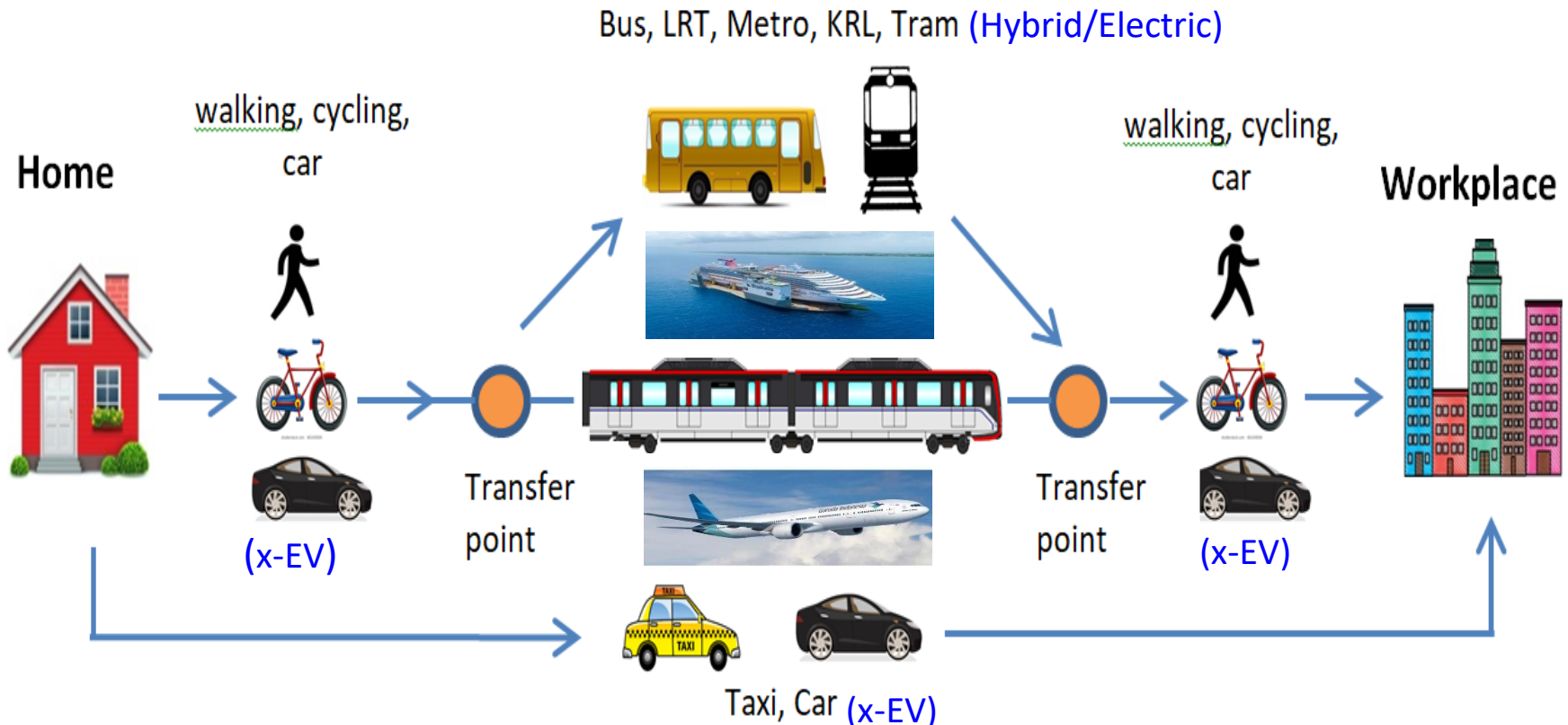


A. Transportation System: ***Sustainable & Integrated***

Integrated: *Different modes of transport are linked with each other*

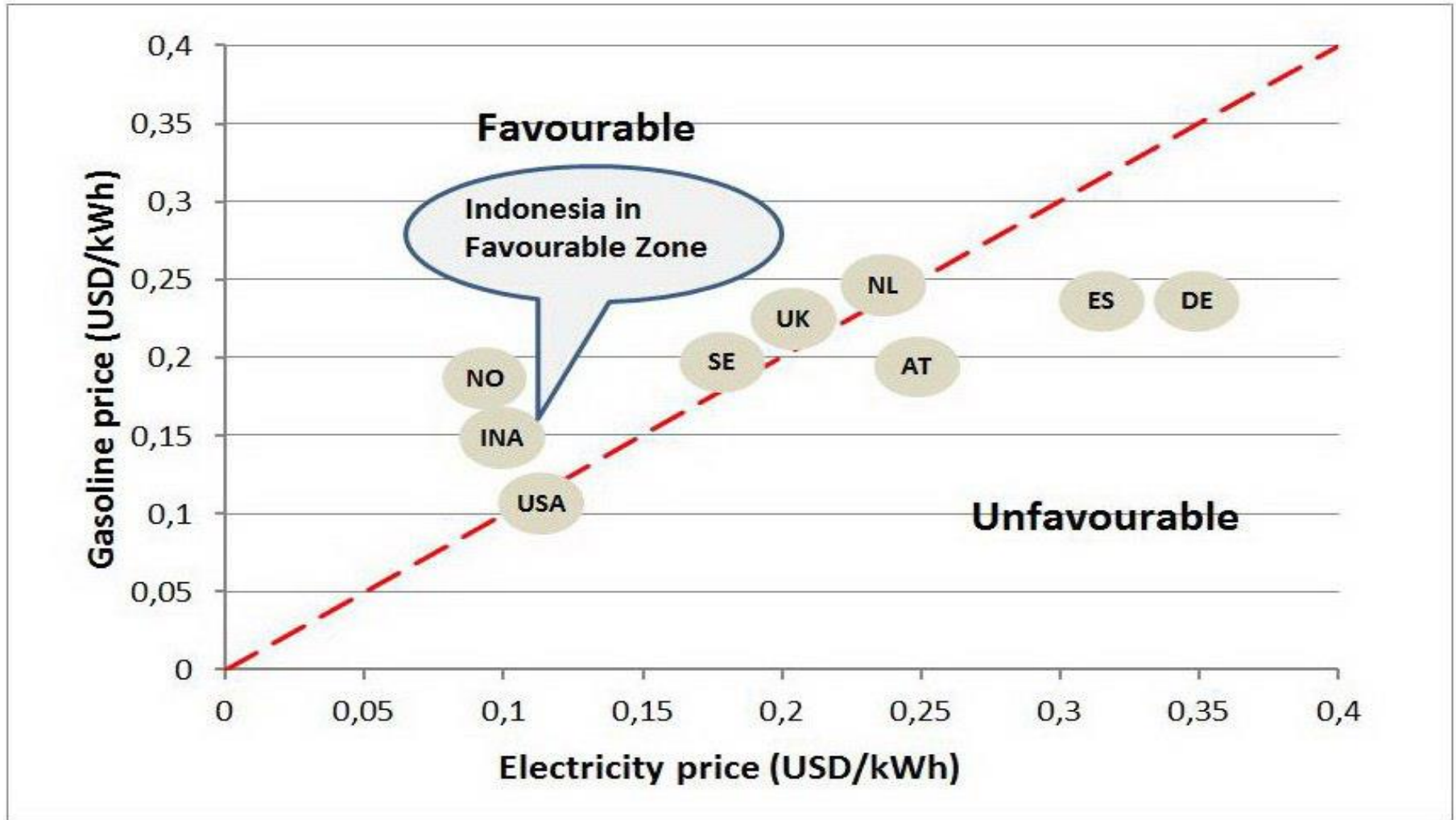
#Travel Easier #Reduce Cost #Boost Revenue

Backbone of Mass Transportation: Train, Airplane & Ship



X-Electric Vehicle is OK, but X-Electric Public Transport is Better

Opportunity for x-EV application



Assumption:

PLN electric price 6,6-200kVa: Rp 1467/kWh

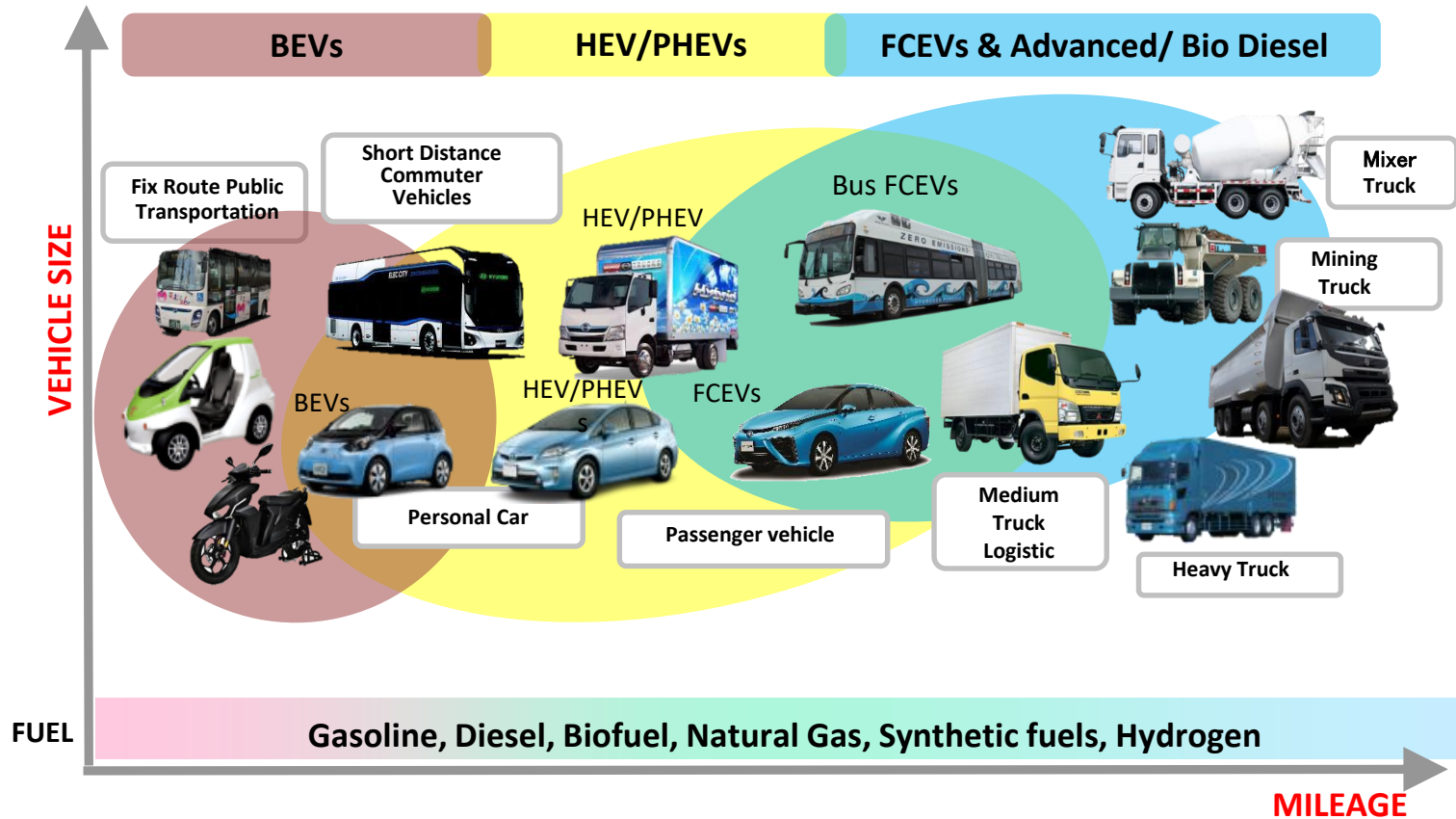
Pertamax price: Rp 10100/Liter

EV application more advantageous for public transport

B. Clearing Technology

Government conducting Clearance test to state that a technology is feasible or not to be applied

1. Vehicle Characteristics & Fuels



Electric Vehicle technology must be adjusted to the characteristics of mileage, vehicle size and fuel

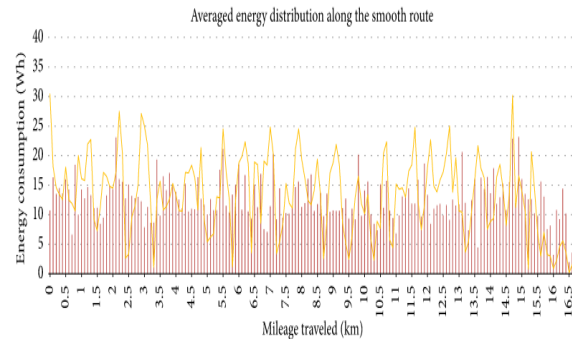
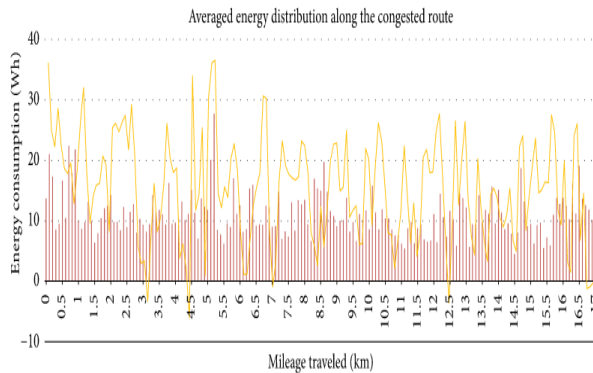
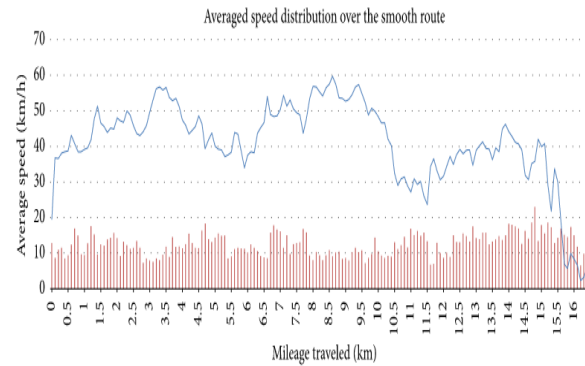
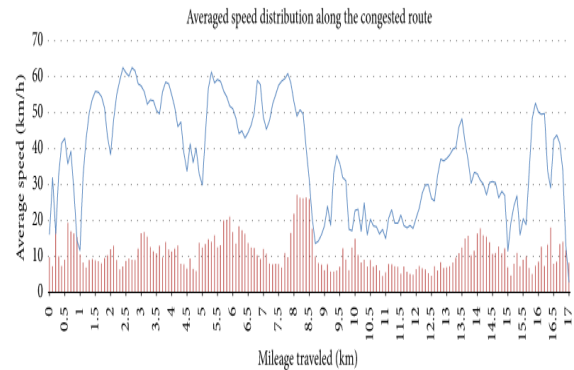
2. Traffic Condition Influence On x-EV



Source: Insidejakarta.com



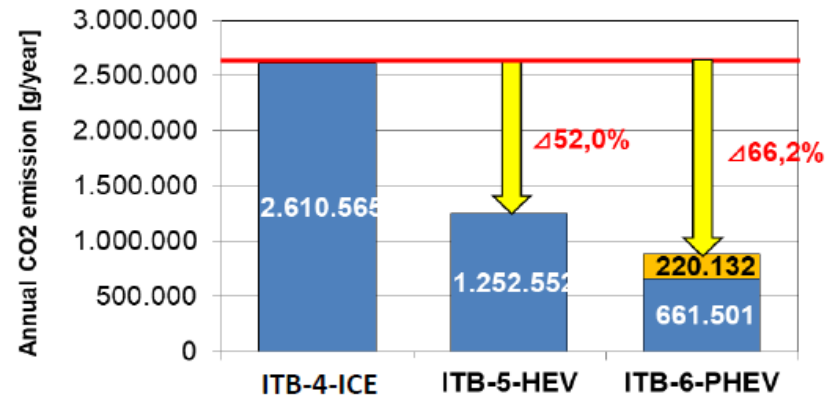
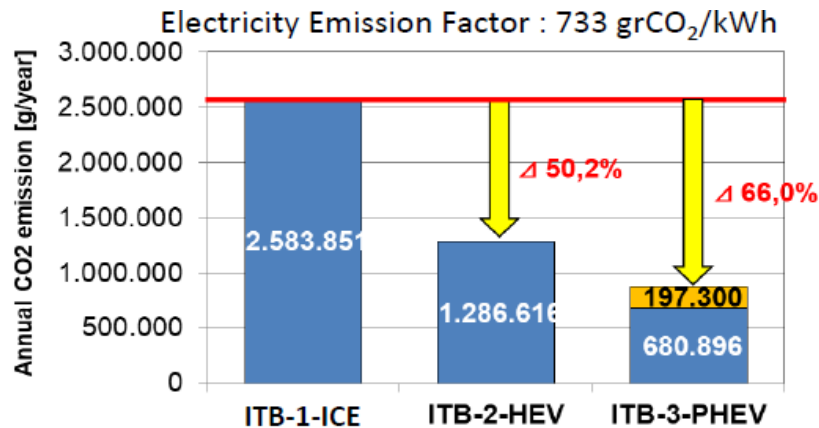
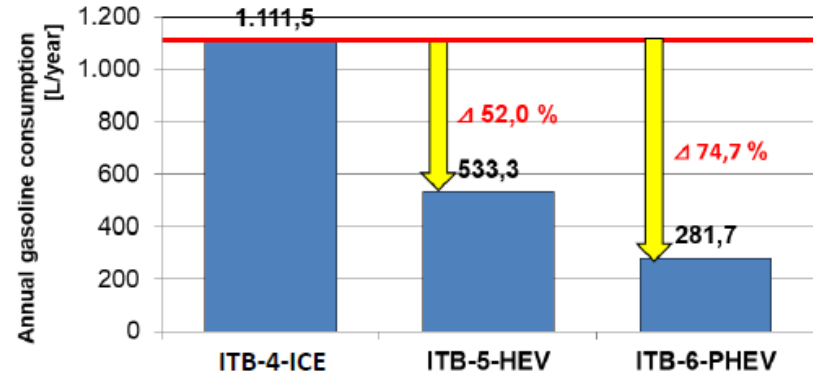
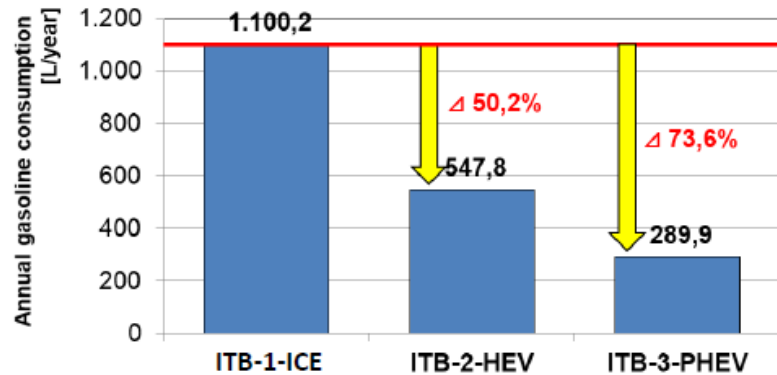
- Traffic Condition greatly affect the energy consumption
- Traffic condition will also influence to driving behavior
- Traffic jam will make it impossible to run Eco drive: x-EV energy consumption increase significantly



Standard deviation

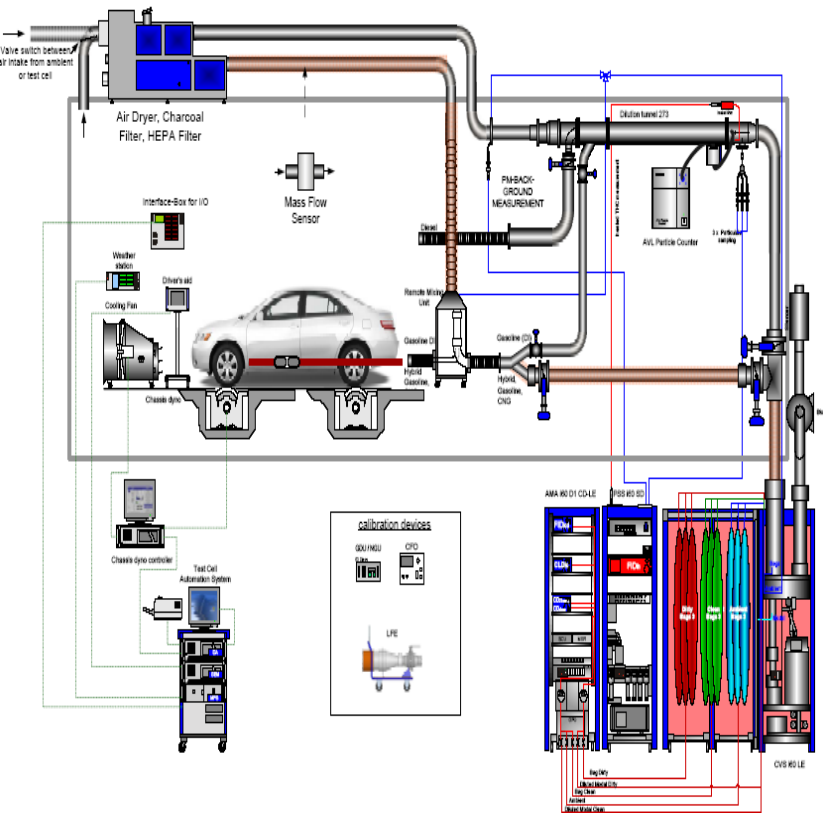
Source: Differences in Energy Consumption in Electric Vehicles: An Exploratory Real-World Study in Beijing
[Kezhen Hu](#), [Jianping Wu](#), and [Tim Schwanen](#)

Fuel Consumption & CO2 emission for ICE, HEV & PHEV (ITB Study)

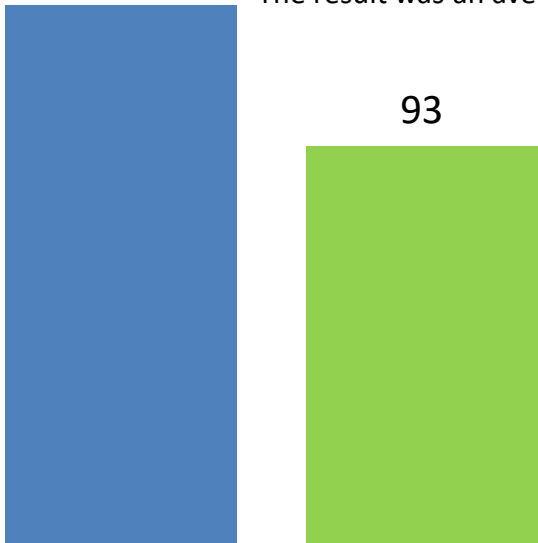
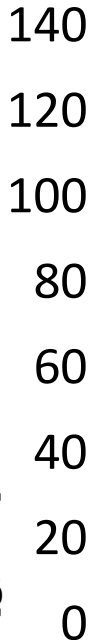


Result of Real driving cycle around Bandung

ICE Vs x-EV at Laboratory



Well to Wheel CO2 Emission
[g/km]



Conventional Vehicle
[1.3L]

Electric Vehicle

Ref. Mitsuo Hitomi, Mazda Motor Japan

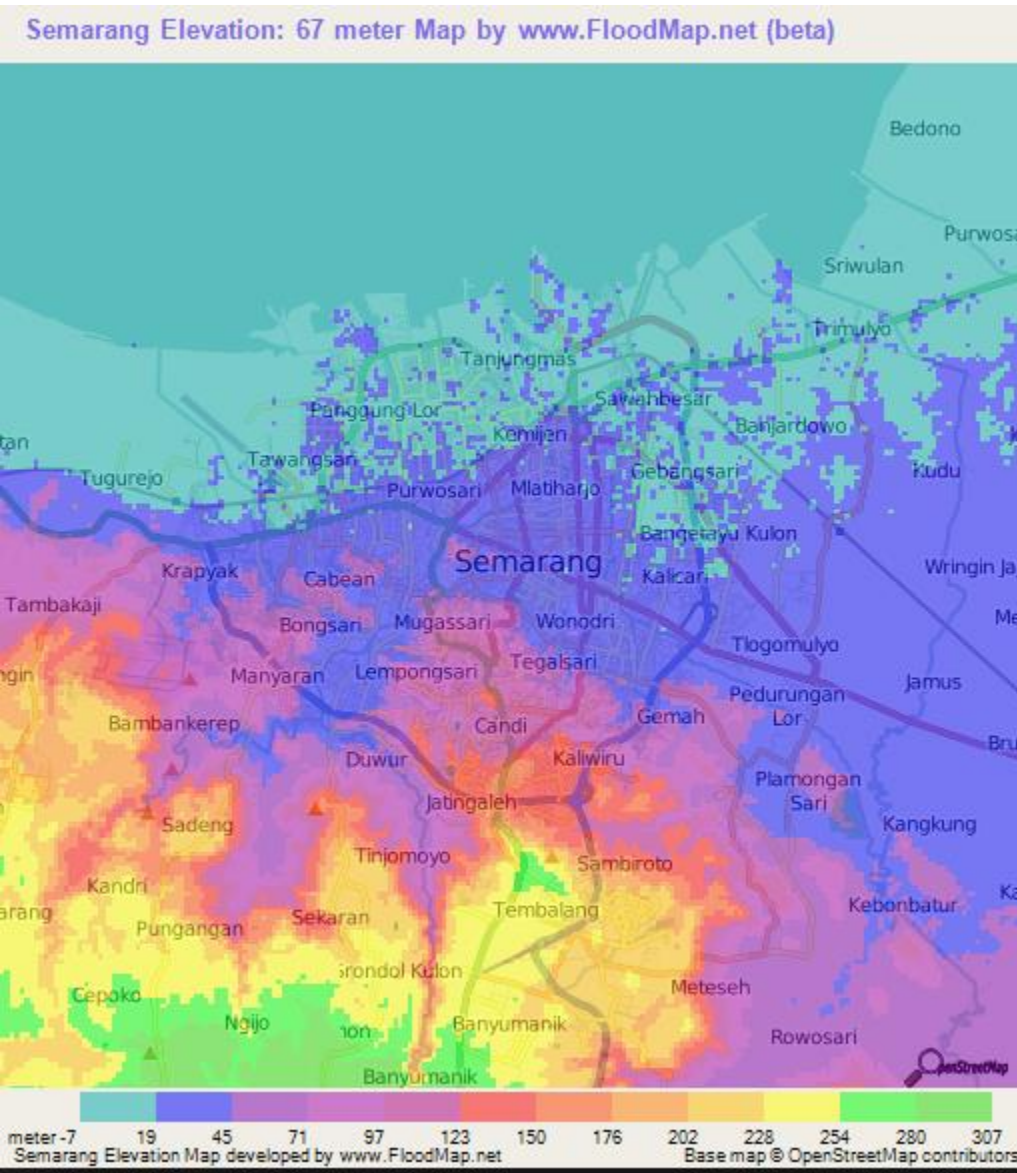
- Test Method:
- JC08 at temperature of 25, 37 and -7 degC
 - AC was set at 25 (Auto)
 - The result was an average

Ina Lab has no experience for EV test

At BT2MP-BPPT for CO2 of HEV using R-101

HEV	Conventional (typical number for current vehicle)
91.7 g/km	120 – 135 g/km

3. Effect of Topography on x-EV Performance



Source: greencarsreport.com

- Higher road slope leads to Higher energy consumption
- City with mostly flat topography might be the right choice for x-EV

x-EV During natural disaster

Japanese ministry of Transportation called for special attention when sudden flooding happened

The screenshot shows the official website of the Japanese Ministry of Transportation (国土交通省). The page is in Japanese and features a navigation bar with links to home, about, news, policy, open data, and contact. Below the navigation bar, there is a section titled '自動車' (Automobile). Under this section, there is a link to '浸水・冠水被害を受けた車両のユーザーの方へ' (For users of vehicles affected by flooding). The main content area contains a warning in Japanese about the dangers of using vehicles after flooding, specifically mentioning the risk of electrical fires due to short circuits. It provides three instructions: 1. Do not start the engine. 2. If you want to use the vehicle, contact the nearest repair shop. 3. Disconnect the negative terminal of the battery. An illustration shows a car battery with a disconnected negative terminal. The website's URL is visible at the bottom: http://www.mlit.go.jp/jidosha/jidosha_fr09_000100.html.

国土交通省

YouTube Twitter 本文へ 文字サイズ変更 標準 拡大 音声読み上げ・ルビ振り English

Google カスタム検索 検索 検索方法 サイトマップ

ホーム 国土交通省について 報道・広報 政策・法令・予算 オープンデータ お問い合わせ・申請

自動車

組織 予算 税制・財投 統計データ パブリックコメント 報道発表 関連リンク集

ホーム 政策・仕事 自動車 浸水・冠水被害を受けた車両のユーザーの方へ

浸水・冠水被害を受けた車両のユーザーの方へ

水に浸った車両は、外観上問題がなさそうな状態でも、感電事故や、電気系統のショート等による車両火災が発生するおそれがありますので、以下のように対処して下さい。

1. 自分でエンジンをかけない。
2. 使用したい場合には、お買い求めの販売店もしくは、最寄りの整備工場にご相談下さい。特に、ハイブリッド車(HV)や電気自動車(EV)は、高電圧のバッテリーを搭載していますので、むやみに触らないで下さい。
3. なお、使用するまでの間、発火するおそれがありますので、バッテリーのマイナス側のターミナルを外して下さい。

23:24 2018/08/04

http://www.mlit.go.jp/jidosha/jidosha_fr09_000100.html

In case of sudden natural disaster (flooding), Special care is required for vehicle with have Electric Power



- Standard operating Procedure must be fully understood by user
- Vehicle safety regulation must be strict and covered this kind of natural disaster with commonly happen in Indonesia

5. Culture

- a. **Mudik Lebaran (Homecoming in the last month of Ramadhan)**
 - ✓ Long distance travel with heavy traffic jam
- b. **Driving Behavior**
 - ✓ Aggressive, over load & over speed are typical of Indonesia drivers
- c. **Lack of care for vehicle periodic checking**
 - ✓ After sales of x-EV
 - most Indonesian will think about the selling price when purchasing new vehicle
- d. **Vehicle is still become 'status' for Indonesian**
- e. **Etc.....**



Gradual changing is required

Direct Changing for conventional to EV might be difficult

Transport System at Semarang City (BPPT study)



Desired Lines of private car year 2018 (people/day)



Desired Lines of public transportation year 2018 (people/day)

TRAYEK	LOAD FACTOR AVERAGE
BRT 1	46,17%
BRT 2	32,69%
BRT 3	11,74%
BRT 4	26,56%
BRT 5	21,03%
BRT 6	24,80%

- People mostly using private car
- Load Factor average for public transportation (BRT) is less than 50%

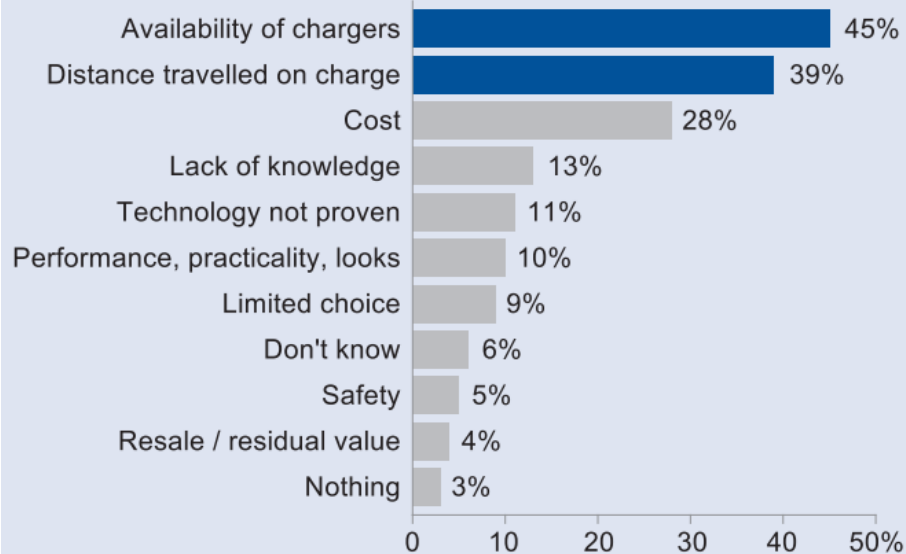


X-EV is preferred to be implemented on public transportation to achieve environmentally friendly and integrated transportation

Restriction for EV Implementation: Charging Station

Figure 5: Lack of charger availability is the main barrier to EV adoption

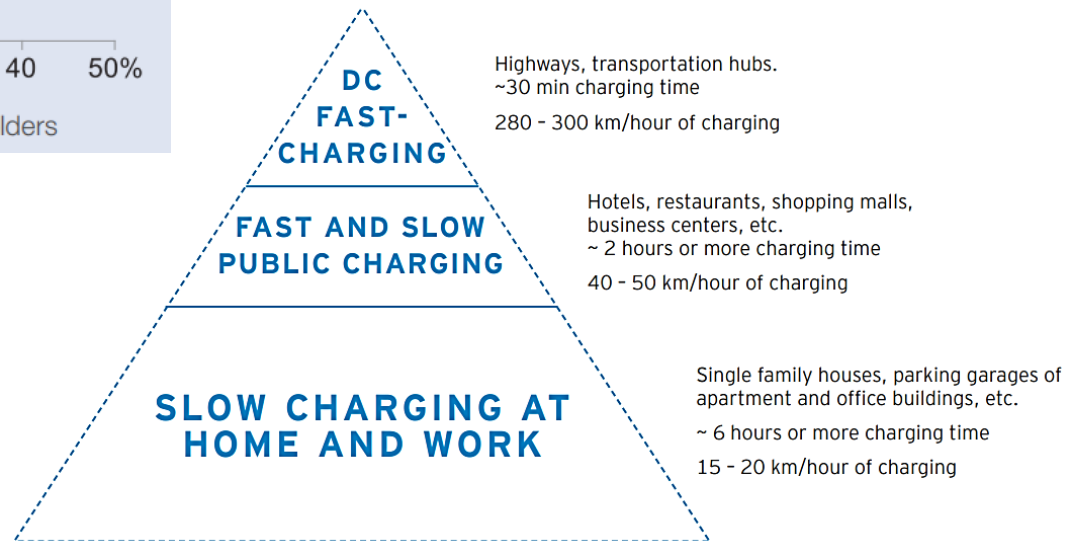
Reason for not purchasing an EV (multiple selections possible)



Source: UK Department for Transport (2016), N=649 licence holders

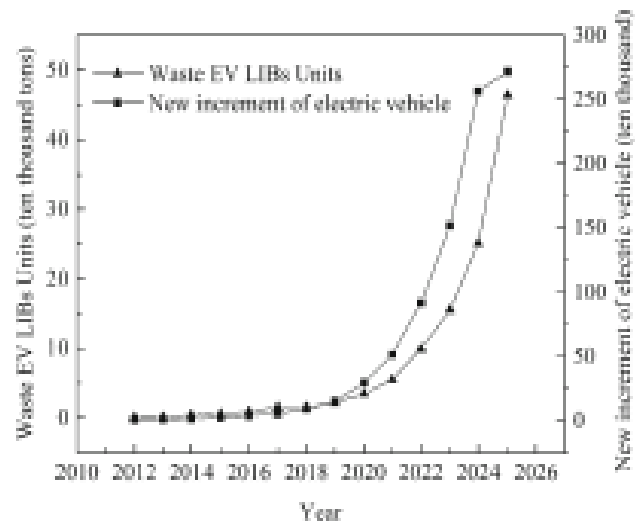


CHARGING INFRASTRUCTURE MIX

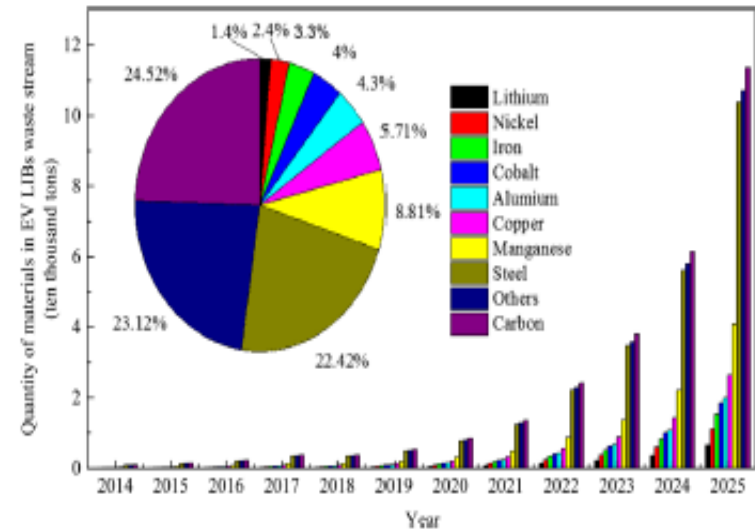


Source : World Economic Forum

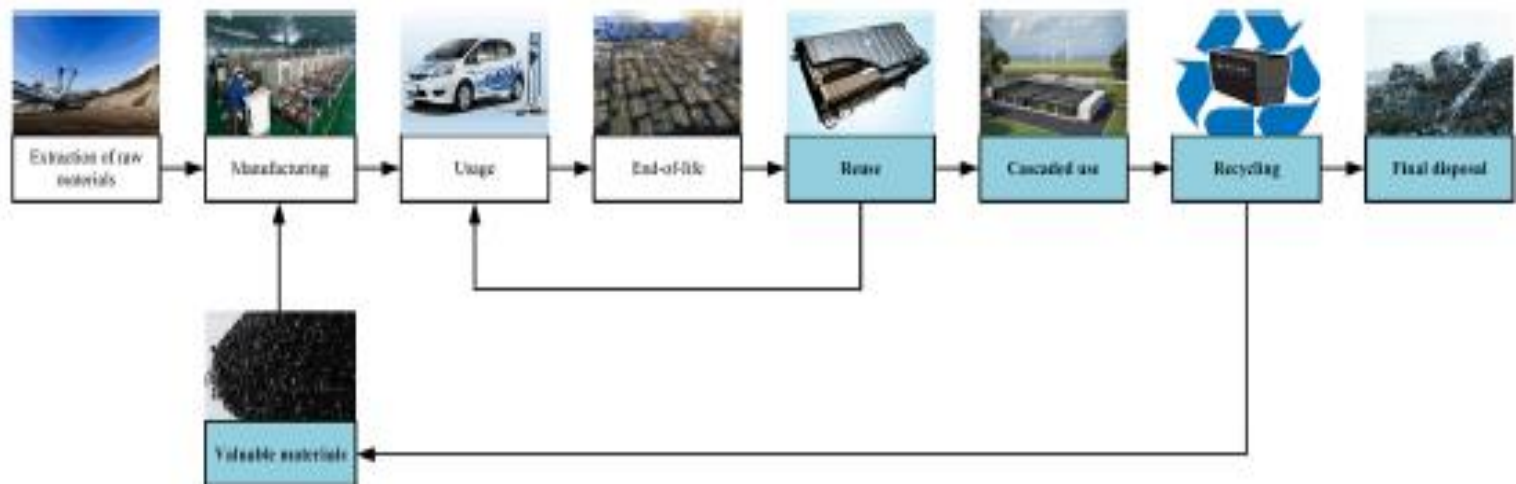
Environment Issue: Battery Disposal & Re-cycle



Generation of waste EV LIBs and new increment of EVs per year in China

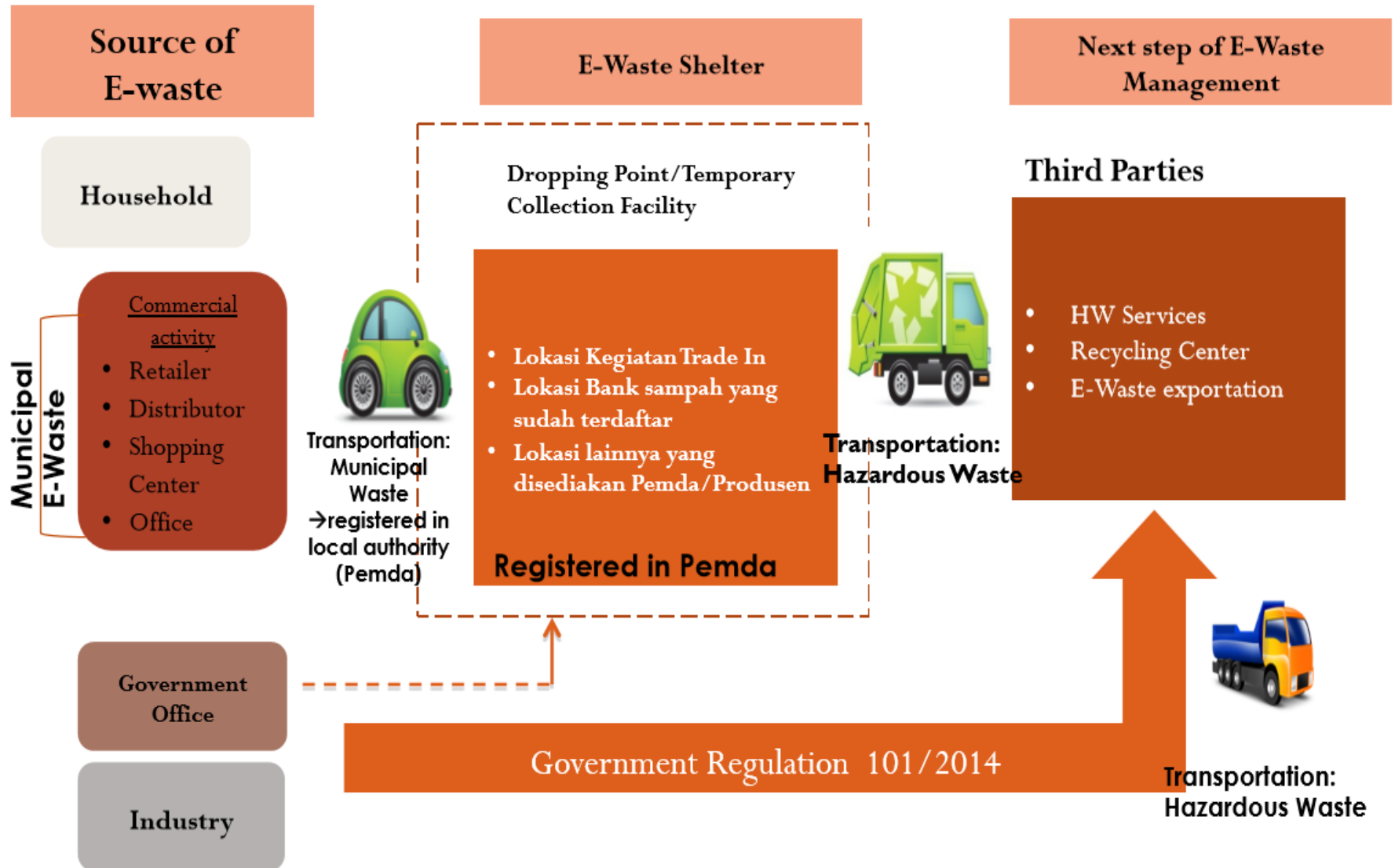


Quantity of materials in EV LIBs waste stream in China



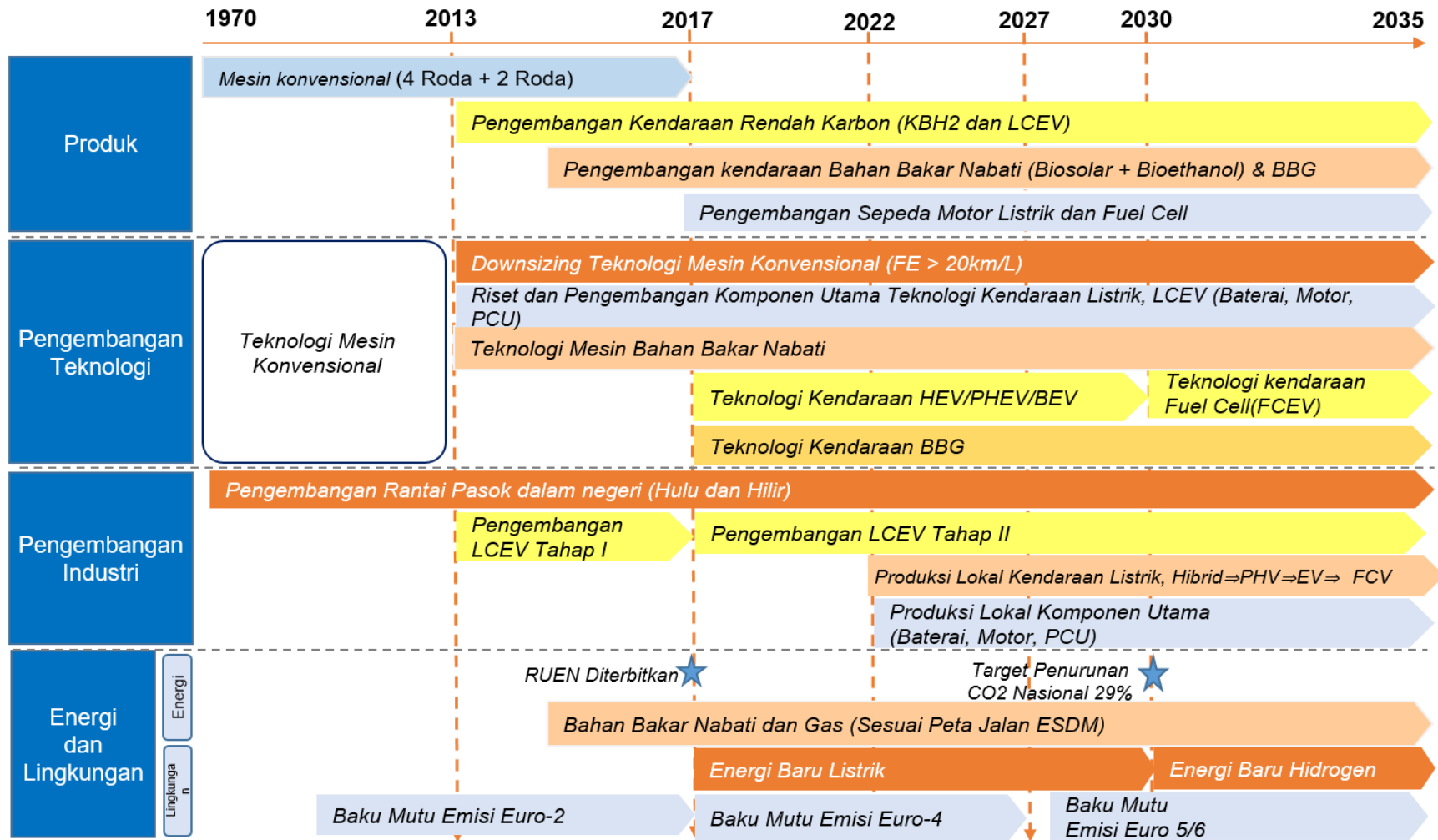
Strategy of waste EV LIBs treatment

Environment Issue: Battery Disposal & Re-cycle



Source: ministry of environment

Roadmap of National Automotive Industry



Note :

1. Road map based on Government Regulation 14/2015 regarding to RIPIN
2. It also related to commitment at COP21 to reduce **29% CO2 emission w/o international support, and reduce 41% CO2 emission with international support until 2030**

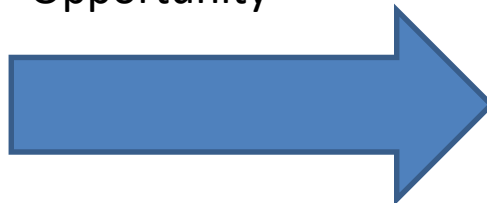
BPPT Role in The Implementation of Electric Vehicle

- Providing Laboratory for assessment of x-EV
- Development of Charging Stations
- Li Battery Testing Laboratory
- Clearing Technology for Transportation system to evaluate suitable implementation of x-EV in Indonesia

Program BPPT:

- Charging Station
- Electric Bus (Trolley)
- Electric Train (KRL & LRT)
- Electric Bicycle
- Electric Motorcycle
- Electric Car

Collaboration
Opportunity



BPPT

PT. INKA

PT. PLN

**Automotive
Industry**

University

Issues for Effective & Efficient Implementation x-EV

MACRO

- ❖ Network Capacity
- ❖ Travel demand distribution
- ❖ Topography
- ❖ Climate
- ❖ etc



MIDDLE

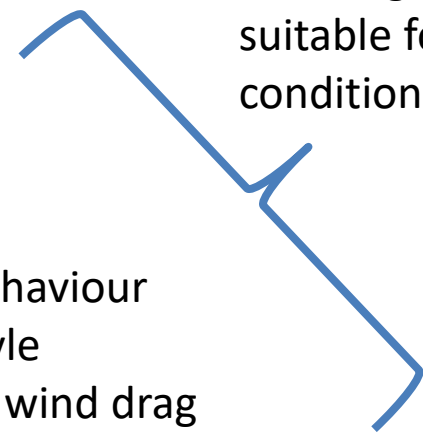
- ❖ Infrastructure Design
- ❖ Traffic Signal Timing
- ❖ Route Selection
- ❖ etc



MICRO

- ❖ Driving Behaviour
- ❖ Driving style
- ❖ Slope and wind drag
- ❖ Traffic Condition
- ❖ etc

Must carefully choose the right propulsion system, x-EV might be suitable for some condition



Regulations???

RECOMMENDATION

- At some environmental condition, an implementation of x-EV as Sustainable and Integrated transportation is preferable
- An Application of x-EV should be starting from public transportation
- An Implementation of x-EV on private vehicle will help to boost the decrease on emission gas pollutant but it would be much greater for public transport application
- Several issue related to Govt regulation, environmental and culture should be solved before the implementation of x-EV



THANK YOU