

# *ROAD MAP* PENGEMBANGAN INFRASTRUKTUR KENDARAAN LISTRIK 2020 - 2024

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**TIM PENGEMBANGAN INFRASTRUKTUR  
KENDARAAN LISTRIK**

Jakarta, 1 September 2020

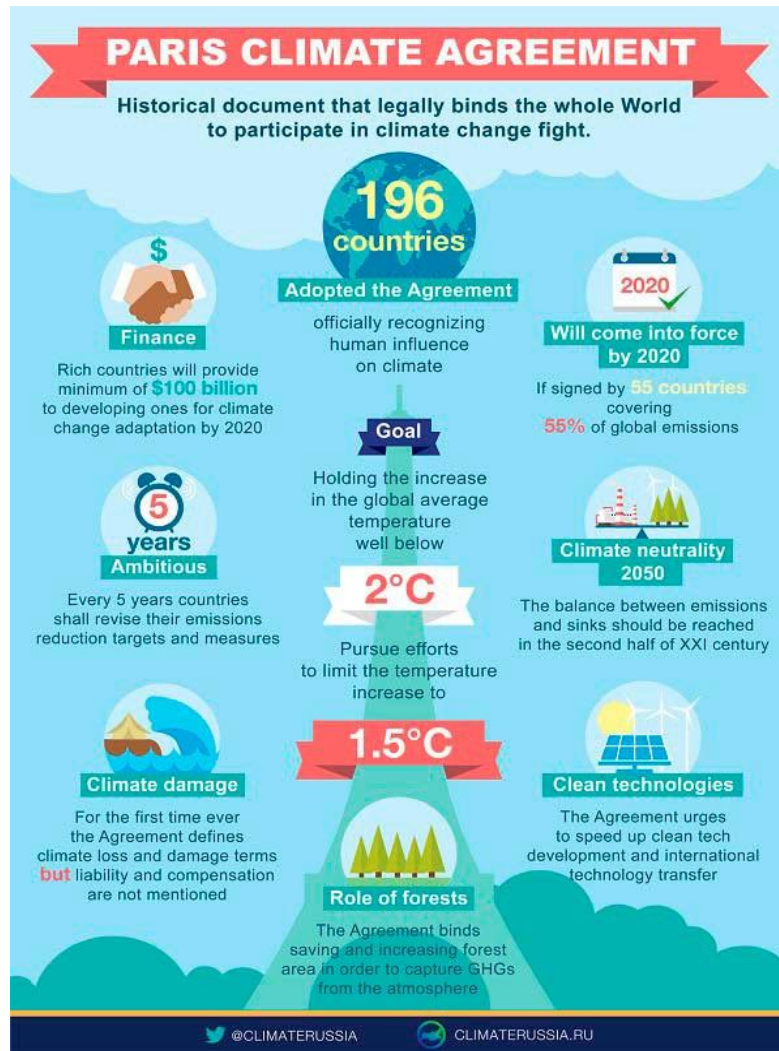


# Outline

1. Latar Belakang
2. Metodologi
3. *Trend* Pertumbuhan *Electric Vehicles* (EV)
4. Proyeksi Kebutuhan Stasiun Pengisian Kendaraan Listrik Umum (SPKLU)
5. Rekomendasi Lokasi Potensial SPKLU
6. Analisa Kelayakan Teknis
7. Analisa Kelayakan Finansial
8. Analisa Risiko .
9. Faktor – Faktor Pendukung
10. Faktor – Faktor Penghambat
11. *Timeline* Pengembangan Infrastruktur SPKLU PLN
12. Strategi Pengembangan



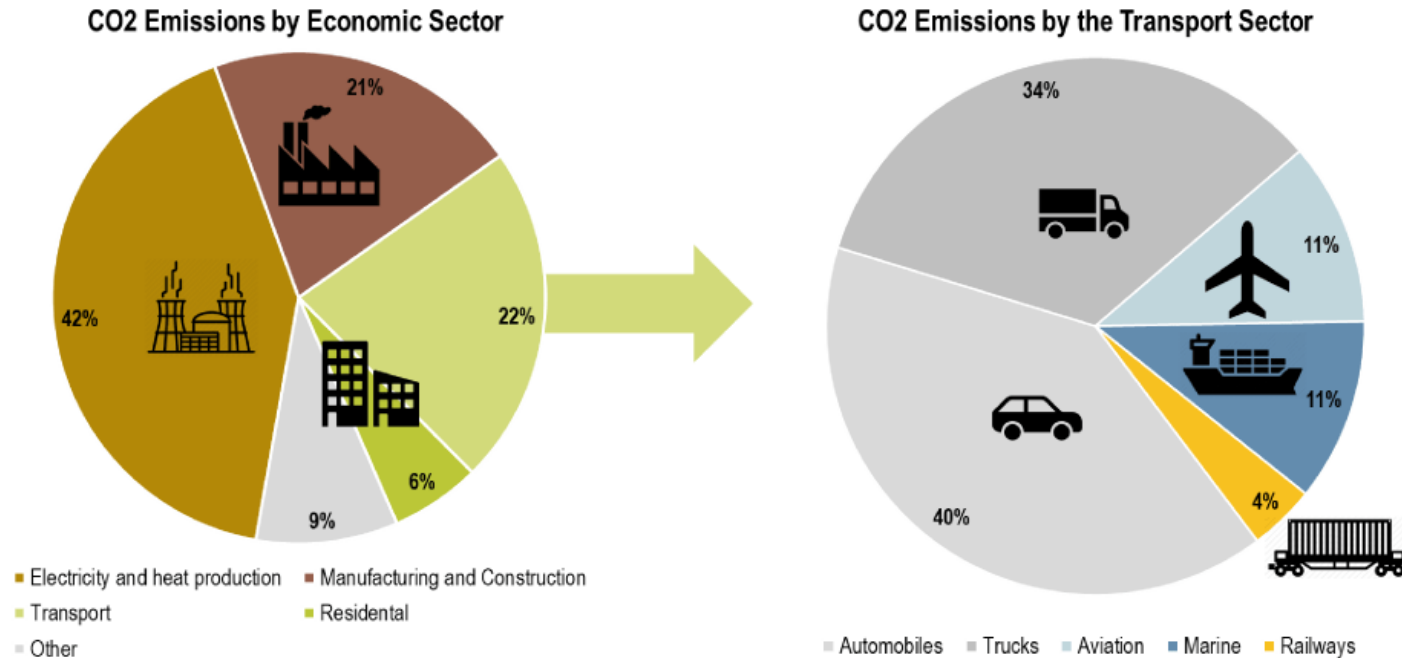
# BACKGROUND (1) : PARIS AGREEMENT



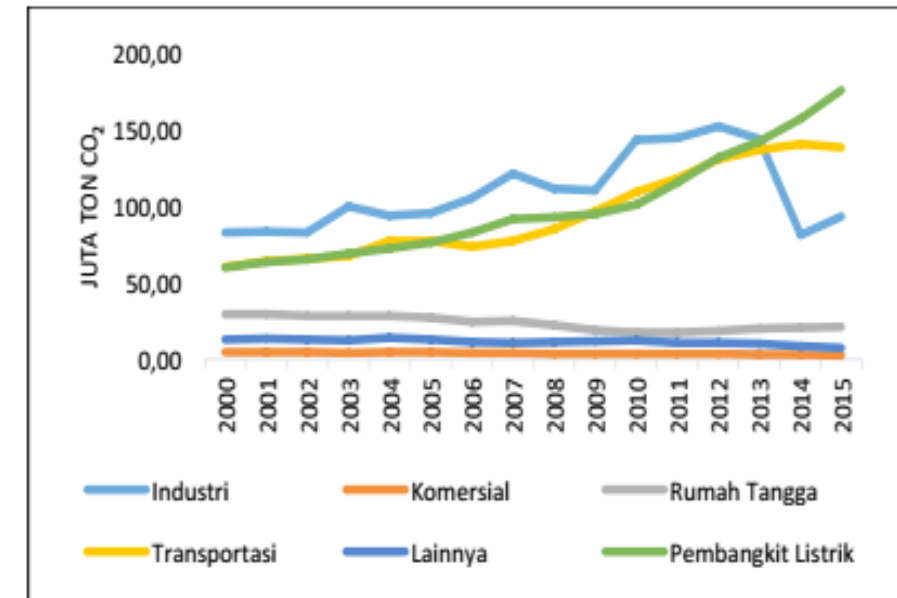
## BACKGROUND (2) : EMISI CO<sub>2</sub> SEKTOR TRANSPORTASI



### GLOBAL



### DOMESTIC

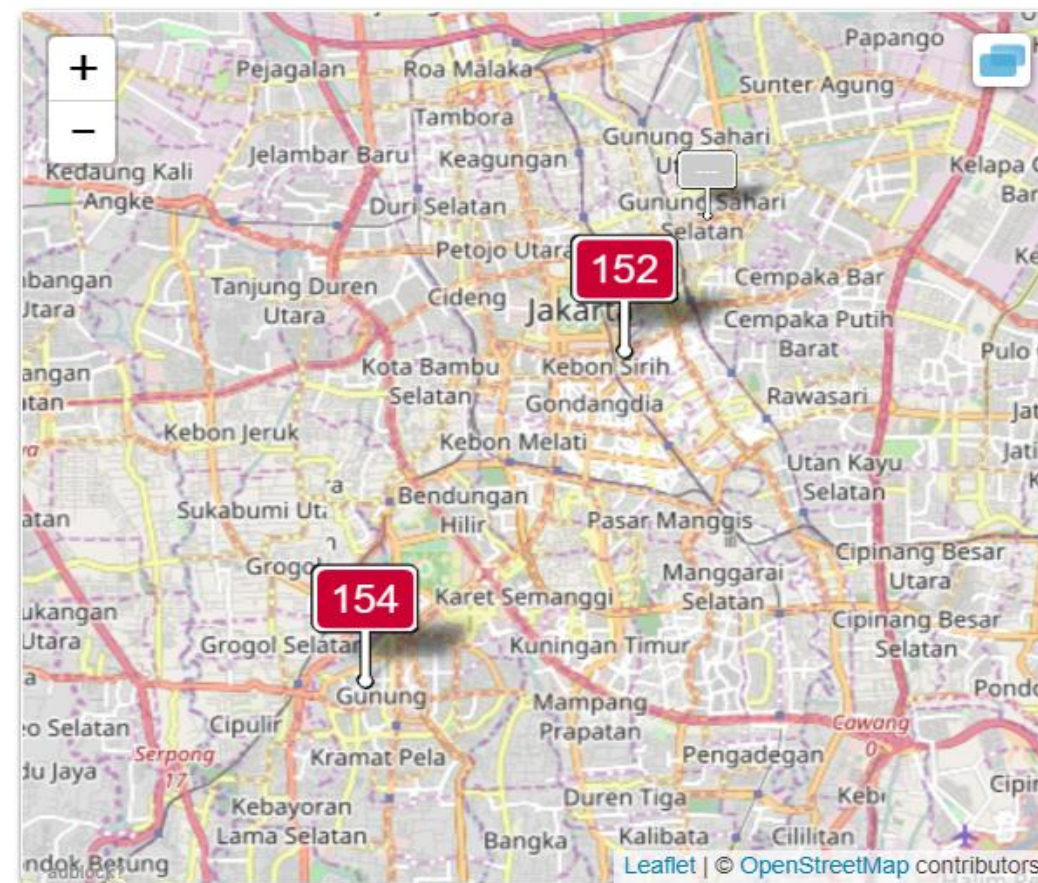
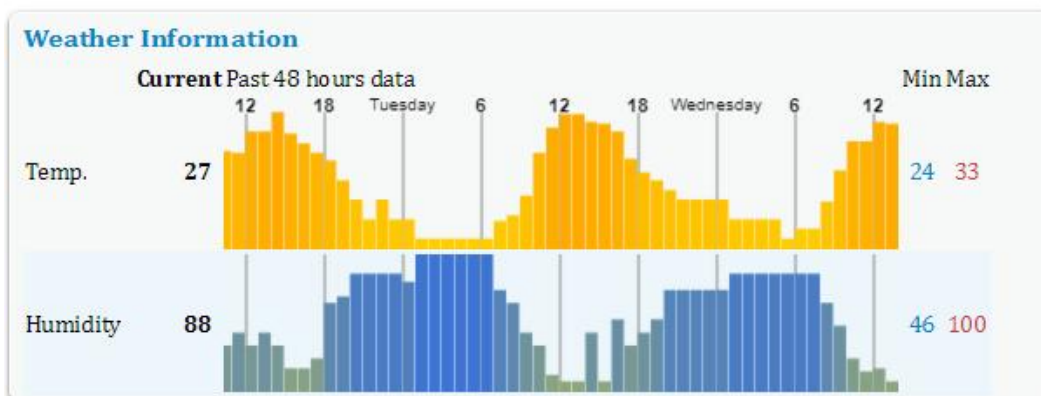


- Globally, transportation is the second largest contributor for CO<sub>2</sub> emission after power generation
- Road transportation is the dominant contributor to CO<sub>2</sub> emissions both globally and domestically for urban areas, accounting for 78% of emissions in Jakarta

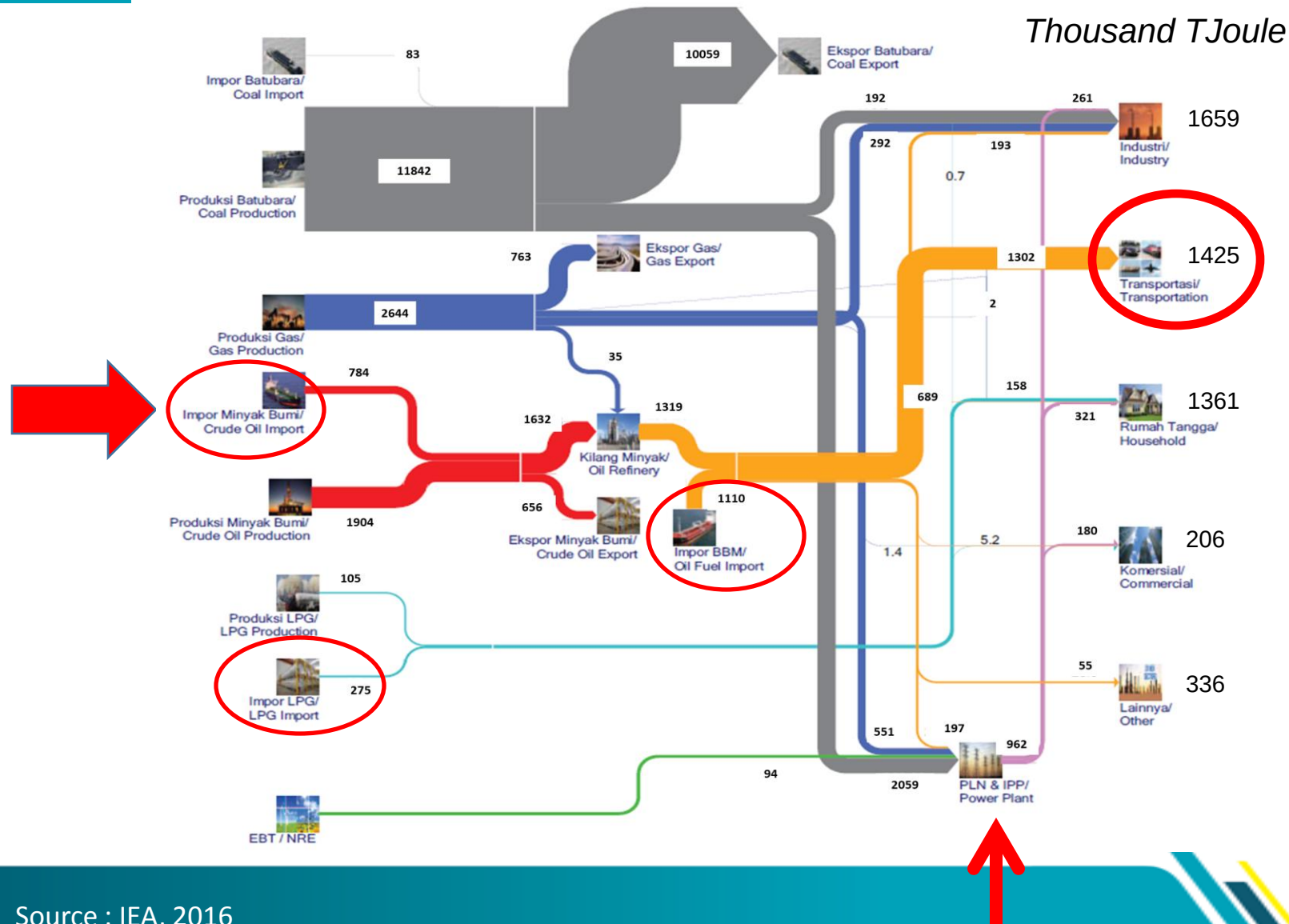


# BACKGROUND (2) : EMISI CO<sub>2</sub> SEKTOR TRANSPORTASI

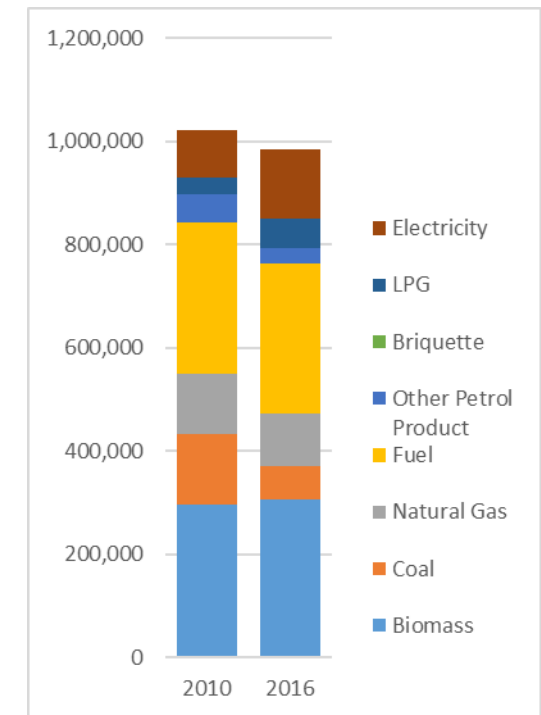
Status Indeks Kualitas Udara DKI Jakarta *“tidak sehat”*



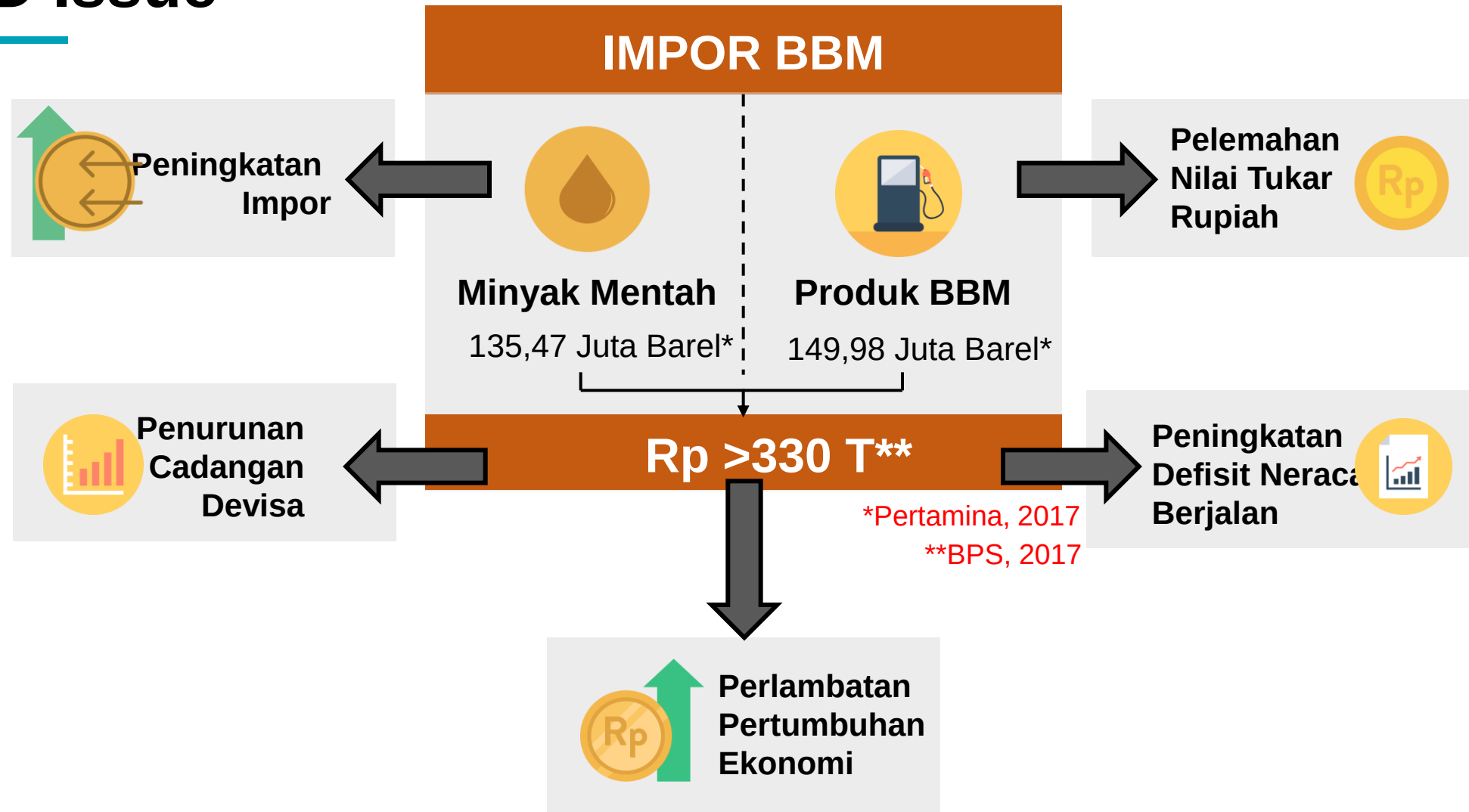
# Indonesia Energy Resilience



- Power electricity = 13,2% of Indonesia total energy consumption



# CAD Issue



# PLN kWh sales below target

## Penjualan Listrik PLN Hanya Tumbuh 5,15 Persen pada 2018

[Pebrianto Eko Wicaksono](#)

29 Jan 2019, 20:33 WIB

<https://www.liputan6.com/bisnis/read/3882752/penjualan-listrik-pln-hanya-tumbuh-515-persen-pada-2018>

**Liputan6.com, Jakarta** - PT [PLN](#) (Persero) mencatat realisasi penjualan listrik sepanjang 2018 sebesar 5,15 persen lebih rendah dari target sebesar 7 persen. Sedangkan jumlah pelanggan 71,9 juta.

Direktur Pengadaan Strategis PLN, Supangkat Iwan Santoso mengatakan, realisasi [penjualan listrik](#) sepanjang 2018 mencapai 232 tWh, tumbuh 5,15 persen dari penjualan 2017. Namun, pertumbuhan tersebut tidak sesuai yang diharapkan sebesar 7 persen.



# Perpres No. 55 Tahun 2019

## BAB IV

### PENYEDIAAN INFRASTRUKTUR PENGISIAN LISTRIK DAN PENGATURAN TARIF TENAGA LISTRIK UNTUK KENDARAAN BERMOTOR LISTRIK BERBASIS BATERAI

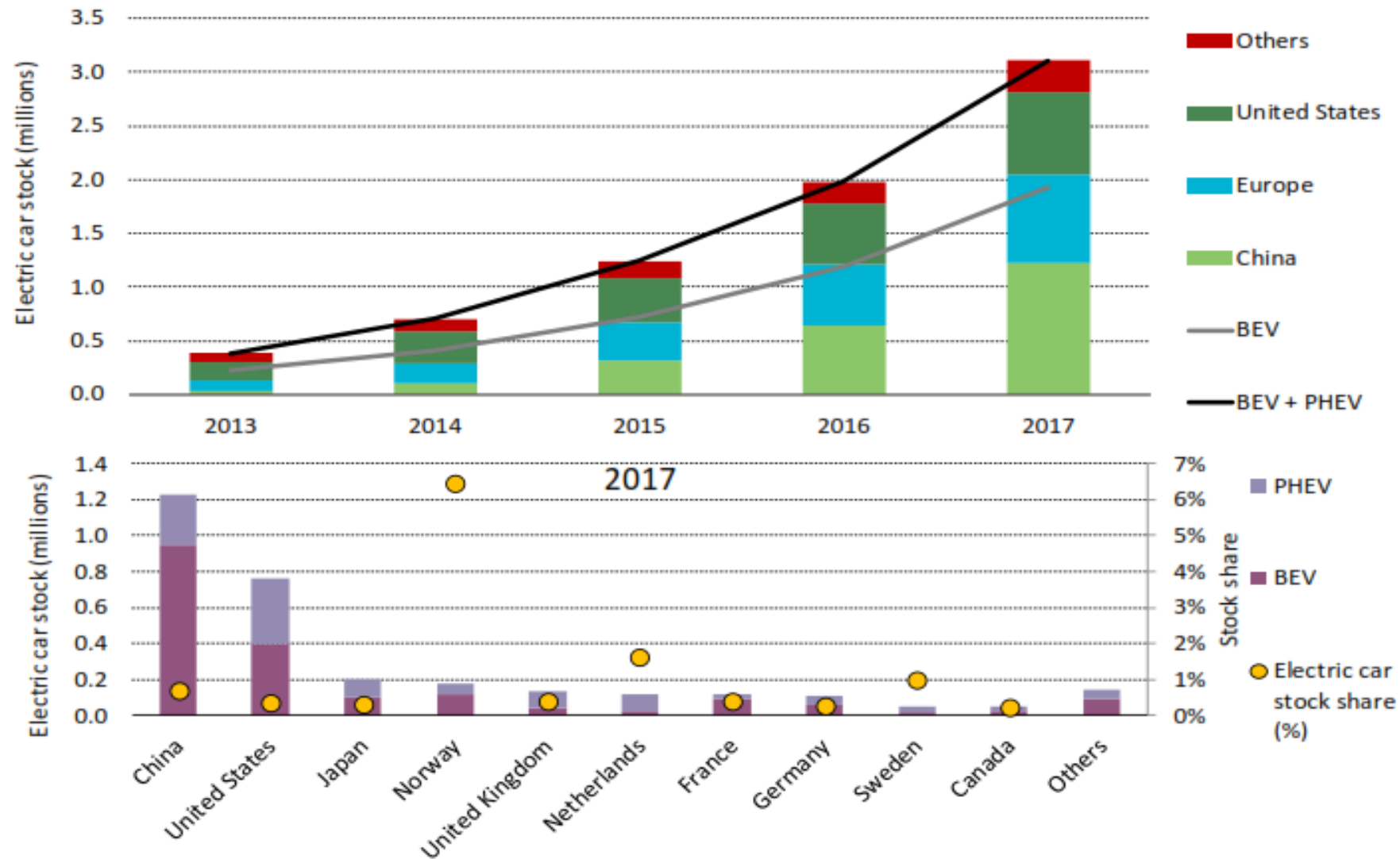
#### Pasal 23

- (1) Penyediaan infrastruktur pengisian listrik untuk KBL Berbasis Baterai sebagaimana dimaksud dalam Pasal 22 ayat (1) dapat dilaksanakan oleh Badan Usaha Milik Negara bidang energi dan/atau badan usaha lainnya.
- ➔ (2) Untuk pertama kali, penyediaan infrastruktur pengisian listrik untuk KBL Berbasis Baterai sebagaimana dimaksud pada ayat (1) dilaksanakan melalui penugasan kepada PT PLN (Persero).
- (3) Dalam melakukan penugasan sebagaimana dimaksud pada ayat (2) PT PLN (Persero) dapat bekerja sama dengan Badan Usaha Milik Negara dan/atau badan usaha lainnya sesuai dengan ketentuan peraturan perundang-undangan.

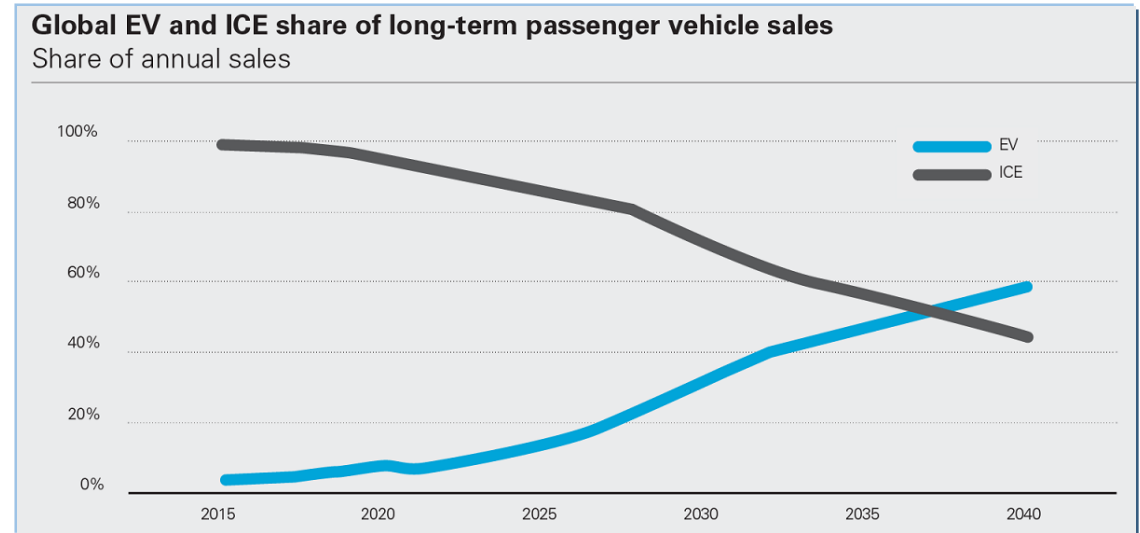
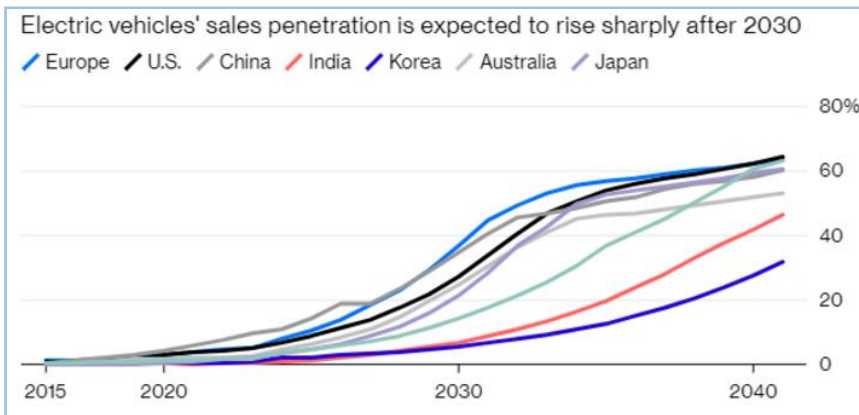
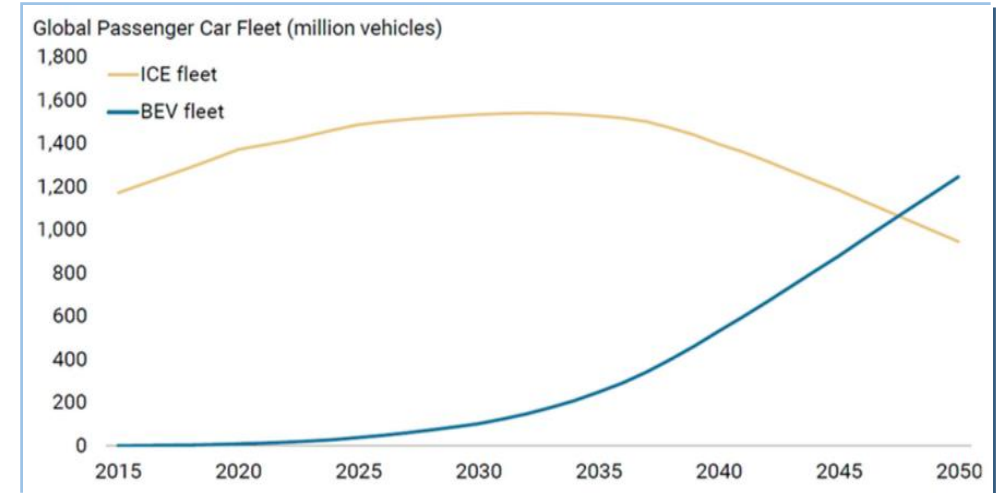
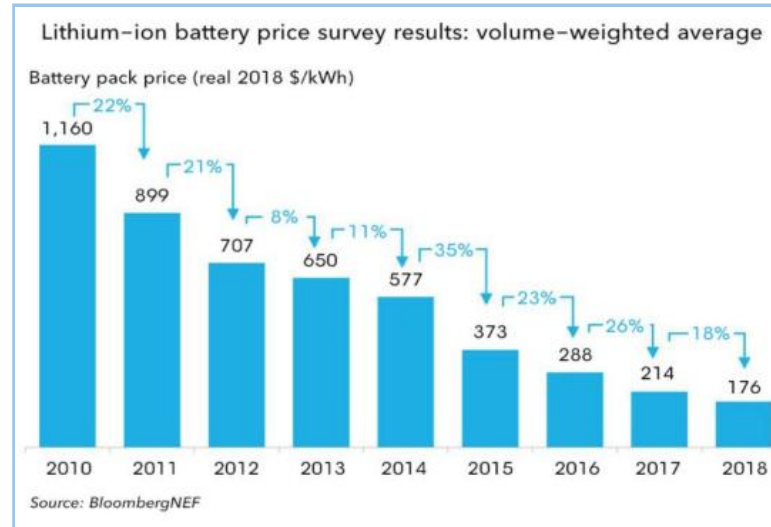
# METHODOLOGY

- [1] Studi literatur
- [2] *Survey* lapangan
- [3] *Market survey*
- [4] *Focus Group Discussion* (FGD)

**Figure 2.1 • Passenger electric car stock in major regions and the top-ten EVI countries**



# ICE vs BEV Global



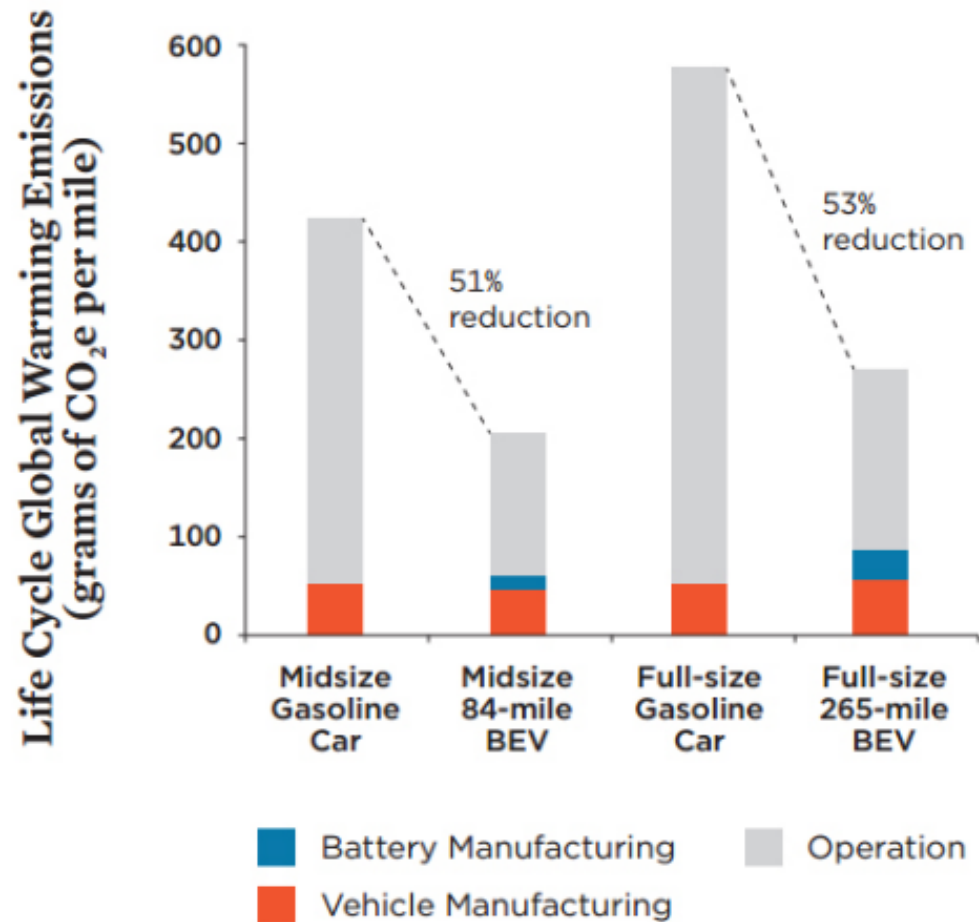


# EV Benefits – 1/2

The IEA (2017a) observed that in 2015 electric cars in **Europe**, on a **well-to-wheel (WTW)** basis, emitted about:

- 1) 50% less CO<sub>2</sub> than gasoline cars
- 2) 40% less than diesel cars.

Life Cycle Global Warming Emissions  
from the Manufacturing and Operation of Gasoline and  
Battery-Electric Vehicles



# EV Benefits – 2/2

1. EVs provide fuel efficiencies (in final energy terms) that are **two-to-four-times higher** than ICE.
2. It is estimated that EVs operating worldwide in 2017 displaced 0.74 exa joules (EJ) (17.5 million tonnes of oil equivalent [Mtoe], 0.38 million barrels per day [mb/d]) of diesel and gasoline demand.



**Energy Cost Saving: 35 to 80%**

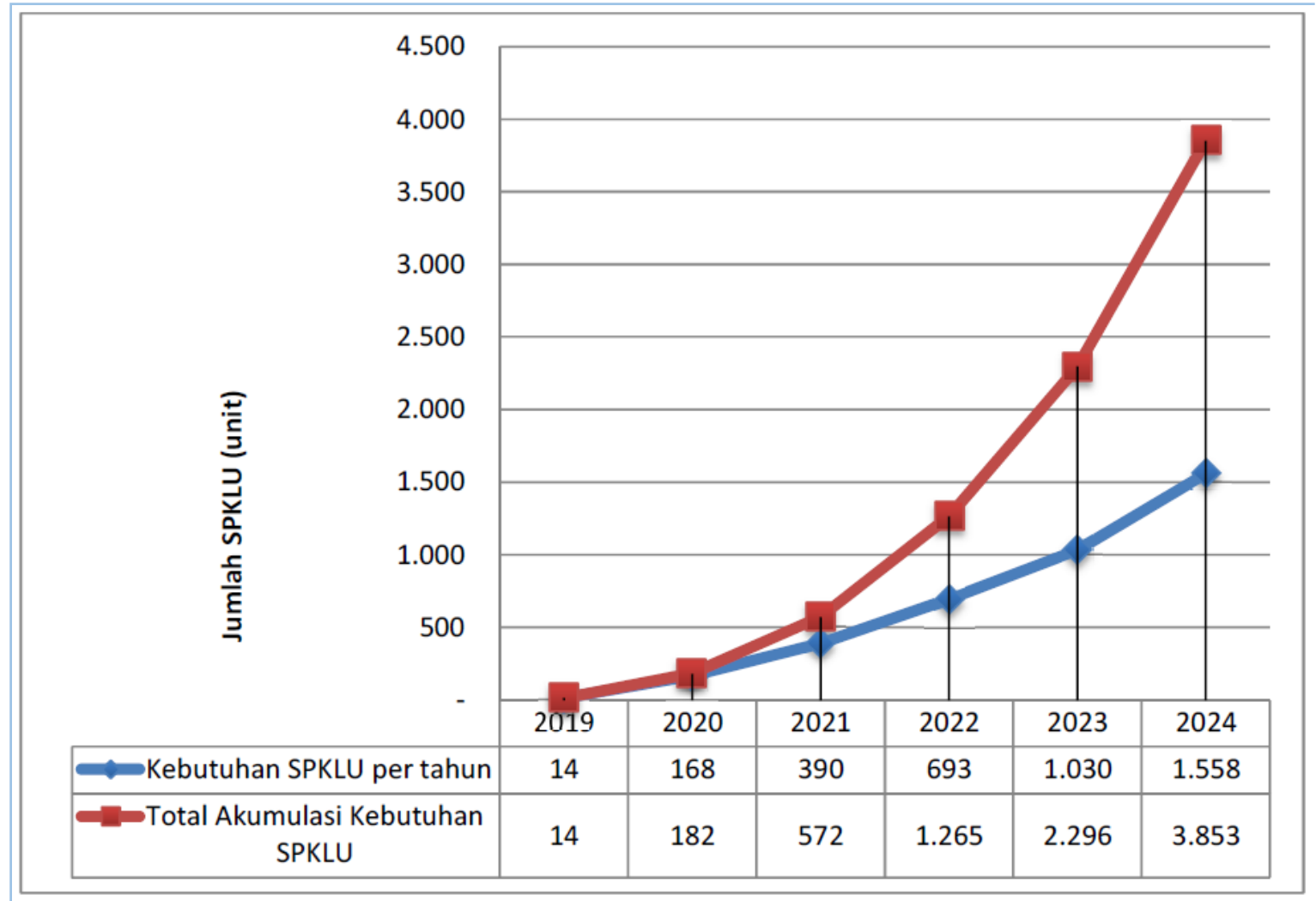
# EV Growth Estimated

| Description                        | 2020      | 2021      | 2022      | 2023      | 2024      | 2025      |
|------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Tot. produksi                      | 1.500.000 | 1.600.000 | 1.700.000 | 1.800.000 | 1.900.000 | 2.000.000 |
| Total Sales                        | 1.250.000 | 1.338.000 | 1.426.000 | 1.514.000 | 1.602.000 | 1.690.000 |
| Pertumbuhan sales/thn              | 5%        | 7%        | 7%        | 6%        | 6%        | 5%        |
| % Mobil penumpang [dr total sales] | 79%       | 79%       | 79%       | 79%       | 79%       | 79%       |
| Total Mobil Penumpang              | 986.124   | 1.055.547 | 1.124.971 | 1.194.394 | 1.263.817 | 1.333.240 |
| Sub Total Sedan dan Non Sedan      | 674.077   | 734.257   | 790.684   | 846.230   | 900.896   | 952.992   |
| % KBH2                             | 25%       | 24%       | 23%       | 22%       | 21%       | 20%       |
| Energy saving cars 4x2 [KBH2]      | 310.423   | 315.938   | 321.453   | 326.968   | 332.483   | 337.998   |
| % FCEV, HEV                        | 0,07%     | 0,10%     | 0,40%     | 0,70%     | 0,90%     | 1,00%     |
| % PHEV, BEV                        | 0,06%     | 0,30%     | 0,50%     | 0,70%     | 1,00%     | 1,50%     |
| FCEV, HEV                          | 935       | 1.338     | 5.704     | 10.598    | 14.418    | 16.900    |
| PHEV, BEV                          | 689       | 4.014     | 7.130     | 10.598    | 16.020    | 25.350    |
| Total Kendaraan Listrik            | 1.624     | 5.352     | 12.834    | 21.196    | 30.438    | 42.250    |
| Akumulasi Total Kendaraan Listrik  | 2.453     | 7.805     | 20.639    | 41.835    | 72.273    | 114.523   |
| #EVCU                              | 168       | 390       | 693       | 1.030     | 1.558     | 2.465     |
| Total Akumulasi #EVCU              | 182       | 572       | 1.265     | 2.296     | 3.853     | 6.318     |

## Asumsi Perhitungan #EVCU :

- Pengisi ulang mobil dalam seminggu : 1 kali
- Rata-rata durasi charging : 2 jam
- Shelter site terdapat min 1 unit EVCU : 2 port
- Waktu efektif di shelter [8.00-22.00] : 12 jam

# SPKLU Growth

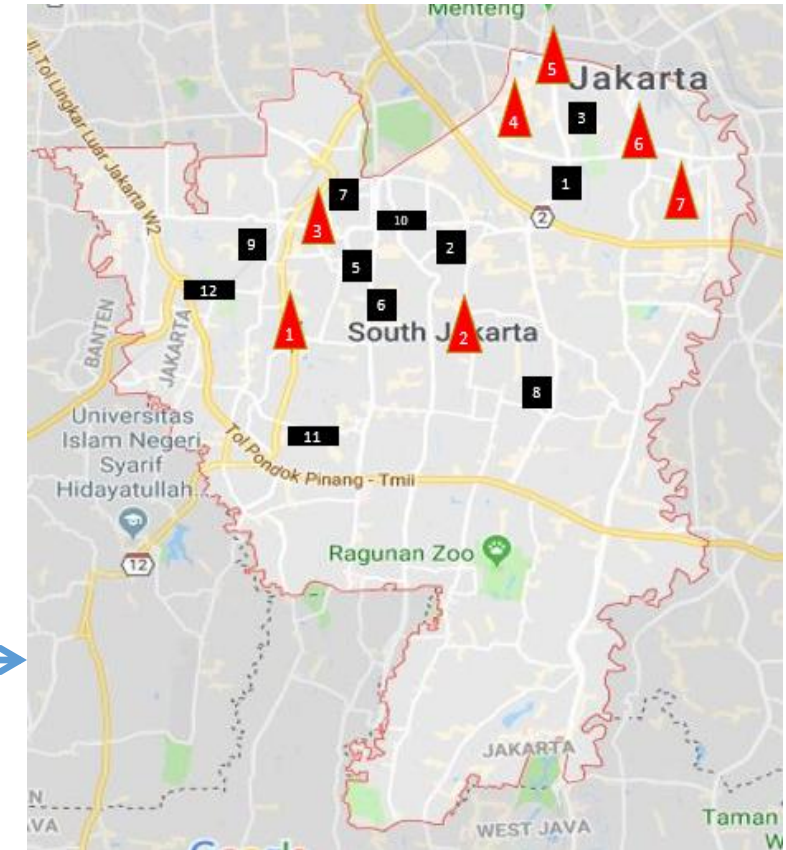




# EVCS Potential Location

| Sebaran Kendaraan    | Percentage | 2018 | 2019 | 2020 |    | 2021  |     | 2022  |     | 2023  |     | 2024   |       | 2025   |       |
|----------------------|------------|------|------|------|----|-------|-----|-------|-----|-------|-----|--------|-------|--------|-------|
|                      |            | EV   | CH   | EV   | CH | EV    | CH  | EV    | CH  | EV    | CH  | EV     | CH    | EV     | CH    |
| DKI Jakarta          | 39%        | 62   | 59   | 695  | 68 | 3,033 | 295 | 6,889 | 670 | 9,737 | 947 | 12,901 | 1,254 | 16,410 | 1,595 |
| BEKASI               | 11%        | 18   | 17   | 197  | 19 | 861   | 84  | 1,957 | 190 | 2,765 | 269 | 3,664  | 356   | 4,661  | 453   |
| BANDUNG              | 10%        | 16   | 15   | 179  | 17 | 781   | 76  | 1,774 | 172 | 2,507 | 244 | 3,321  | 323   | 4,225  | 411   |
| SURABAYA             | 9%         | 14   | 13   | 155  | 15 | 678   | 66  | 1,539 | 150 | 2,175 | 212 | 2,882  | 280   | 3,667  | 356   |
| TANGERANG            | 7%         | 11   | 11   | 127  | 12 | 556   | 54  | 1,262 | 123 | 1,784 | 173 | 2,363  | 230   | 3,006  | 292   |
| BOGOR                | 5%         | 8    | 8    | 90   | 9  | 393   | 38  | 892   | 87  | 1,261 | 123 | 1,671  | 162   | 2,126  | 207   |
| MEDAN KOTAMADYA      | 4%         | 6    | 5    | 65   | 6  | 284   | 28  | 645   | 63  | 912   | 89  | 1,208  | 117   | 1,537  | 149   |
| MAKASSAR             | 3%         | 5    | 5    | 57   | 6  | 247   | 24  | 561   | 55  | 793   | 77  | 1,051  | 102   | 1,337  | 130   |
| SEMARANG             | 4%         | 6    | 5    | 64   | 6  | 278   | 27  | 631   | 61  | 891   | 87  | 1,181  | 115   | 1,502  | 146   |
| PALEMBANG KOTAMADYA  | 3%         | 4    | 4    | 49   | 5  | 214   | 21  | 487   | 47  | 688   | 67  | 912    | 89    | 1,160  | 113   |
| DENPASAR             | 2%         | 3    | 3    | 34   | 3  | 149   | 14  | 338   | 33  | 477   | 46  | 632    | 61    | 804    | 78    |
| BALIKPAPAN KOTAMADYA | 1%         | 1    | 1    | 15   | 1  | 66    | 6   | 151   | 15  | 213   | 21  | 282    | 27    | 359    | 35    |
| YOGYAKARTA KOTA      | 1%         | 1    | 1    | 14   | 1  | 61    | 6   | 139   | 13  | 196   | 19  | 260    | 25    | 331    | 32    |

|            | Tahun  | 2,019 | 2,020 | 2,021 | 2,022 | 2,023 | 2,024 | 2,025 | 2,026 | 2,027 | 2,028 | 2,029 |
|------------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|            | EVCU   | 59    | 68    | 295   | 670   | 947   | 1,254 | 1,595 | 2,255 | 2,988 | 3,800 | 4,700 |
| J. Selatan | 34.50% | 20    | 23    | 102   | 231   | 327   | 433   | 550   | 778   | 1,031 | 1,311 | 1,622 |
| J. Barat   | 32.07% | 19    | 22    | 95    | 215   | 304   | 402   | 511   | 723   | 958   | 1,219 | 1,507 |
| J. Pusat   | 16.82% | 10    | 11    | 50    | 113   | 159   | 211   | 268   | 379   | 503   | 639   | 791   |
| J. Timur   | 8.80%  | 5     | 6     | 26    | 59    | 83    | 110   | 140   | 198   | 263   | 334   | 414   |
| J. Utara   | 7.87%  | 5     | 5     | 23    | 53    | 75    | 99    | 126   | 178   | 235   | 299   | 370   |



# Kelayakan Teknis EVCS

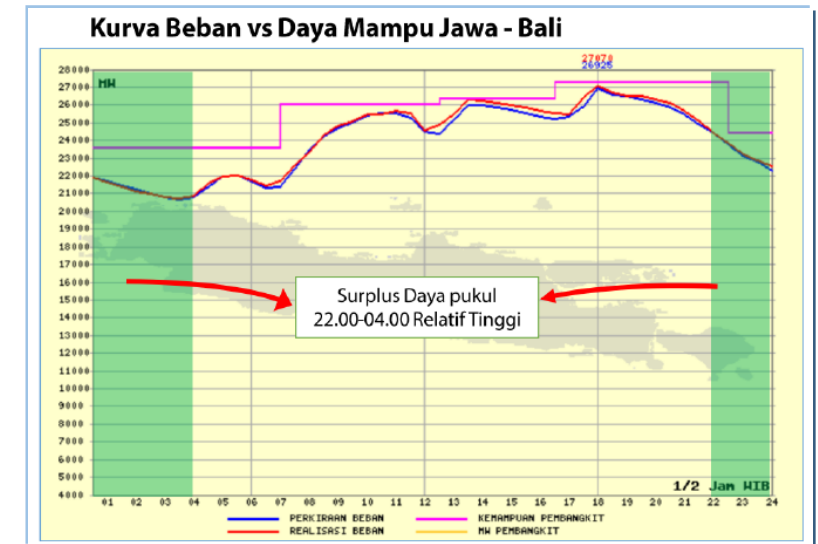
## 2. Power availability

### 1. EVCS Standard

|                                | Level 1                | Level 2                    | Level 3                                                                                                     |                                                       |
|--------------------------------|------------------------|----------------------------|-------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
| Fase                           | Tunggal                | Tunggal atau Tiga          | Tiga                                                                                                        | Tiga                                                  |
| Tegangan masukan (V)           | 230 V <sub>a.b.b</sub> | 230/400 V <sub>a.b.b</sub> | 400 V <sub>a.b.b</sub>                                                                                      | 400 V <sub>a.b.b</sub>                                |
| Tegangan keluaran maksimum (V) | 230 V <sub>a.b.b</sub> | 250/480 V <sub>a.b.b</sub> | 250 V <sub>a.b.b</sub> dan 600 V <sub>a.s</sub> (EE); 480 V <sub>a.b.b</sub> dan 1000 V <sub>a.s</sub> (FF) | 750 V <sub>a.s</sub> (BB) / 600 V <sub>a.s</sub> (AA) |
| Tipe arus keluaran             | a.b.b                  | a.b.b                      | a.b.b / a.s.                                                                                                | a.s.                                                  |
| Arus keluaran maksimum (A)     | 16 a.b.b               | 70/63 a.b.b                | 70 a.b.b dan 200 a.s.(EE); 63 a.b.b dan 250 a.s. (FF)                                                       | 200 a.s. (AA) / 250 a.s. (BB)                         |
| Tipe <i>plug-in</i> konektor   | Tipe 1 (IEC 62916-2)   | Tipe 2 (IEC 62916-2)       | Tipe 3 konfigurasi EE dan FF ( <i>combined charging system</i> ) (IEC 62916-3)                              | Tipe 3 konfigurasi AA dan BB (IEC 62916-3)            |

| Years | Estimated EV* | Mileage (km/year) ** | kWh/year   | MW Estimated *** |          |          |
|-------|---------------|----------------------|------------|------------------|----------|----------|
|       |               |                      |            | 7 Hours          | 12 Hours | 16 Hours |
| 2020  | 150,000       | 8.500                | 900,000    | 129              | 75       | 56       |
|       |               | 18.800               | 1,950,000  | 279              | 163      | 122      |
| 2021  | 400,000       | 8.500                | 2,400,000  | 343              | 200      | 150      |
|       |               | 18.800               | 5,200,000  | 743              | 433      | 325      |
| 2022  | 750,000       | 8.500                | 4,500,000  | 643              | 375      | 281      |
|       |               | 18.800               | 9,750,000  | 1,393            | 813      | 609      |
| 2023  | 1,200,000     | 8.500                | 7,200,000  | 1,029            | 600      | 450      |
|       |               | 18.800               | 15,600,000 | 2,229            | 1,300    | 975      |

### 3. Demand side management → “Overnight charging”



# Kelayakan Finansial SPKLU

## AC Normal Charger Station

| URAIAN                          | NON SHELTER | SHELTER       |
|---------------------------------|-------------|---------------|
| <b>CAPEX:</b>                   |             |               |
| Sewa Lahan (5 thn 35 m2)        | 87,500,000  | 87,500,000    |
| EV Charger Station              | 230,152,000 | 430,152,000   |
| Instalasi Listrik               | 7,500,000   | 7,500,000     |
|                                 | 325,152,000 | 525,152,000   |
| <b>OPEX (THN)</b>               |             |               |
| Biaya Pegawai                   | 46,800,000  | 46,800,000    |
| Biaya Administrasi              | 6,000,000   | 6,000,000     |
| Biaya Keamanan & Ketertiban     | 9,000,000   | 9,000,000     |
| Baya Utilitas                   | 10,800,000  | 10,800,000    |
|                                 | 72,600,000  | 72,600,000    |
| <b>REVENUE (THN)</b>            |             |               |
| Penjualan Listrik (Rp 2476/kWh) | 180,675,000 | 180,675,000   |
| <b>Net Present Value</b>        | 76,852,072  | (104,966,109) |

2 units charger tipe AC 22 kW  
 20 EV/hari, rata-rata 10 kW  
 Waktu pengisian rata-rata 1 jam

## AC Normal + DC Fast Charger

| URAIAN                          | NON SHELTER   | SHELTER       |
|---------------------------------|---------------|---------------|
| <b>CAPEX:</b>                   |               |               |
| Sewa Lahan (5 thn 56 m2)        | 157,500,000   | 157,500,000   |
| EV Charger Station              | 939,066,000   | 1,159,066,000 |
| Instalasi Listrik               | 35,000,000    | 35,000,000    |
|                                 | 1,131,566,000 | 1,351,566,000 |
| <b>OPEX (THN)</b>               |               |               |
| Biaya Pegawai                   | 46,800,000    | 46,800,000    |
| Biaya Administrasi              | 6,000,000     | 6,000,000     |
| Biaya Keamanan & Ketertiban     | 9,000,000     | 9,000,000     |
| Baya Utiitas                    | 15,120,000    | 15,120,000    |
|                                 | 76,920,000    | 76,920,000    |
| <b>REVENUE (THN)</b>            |               |               |
| Penjualan Listrik (Rp 2476/kWh) | 271,912,000   | 271,912,000   |
| <b>Net Present Value</b>        | (356,720,824) | (556,720,824) |

2 units charger tipe AC 22 kW, pengisian rata-rata 1 jam  
 1 unit charger tipe DC 50 kW, pengisian rata-rata 20 menit  
 30 EV/hari, rata-rata 10 kW

# Analisa Risiko EVCS

Dari 11 item risiko yang teridentifikasi, dipetakan risiko yang perlu ditindak lanjuti (4 risiko kategori ekstrem, 3 risiko kategori tinggi)

| Tahapan     | ID Risk | Risiko                                                                  | Level   |
|-------------|---------|-------------------------------------------------------------------------|---------|
| Perencanaan | 1       | Skema bisnis/ business model tidak tepat                                | Ekstrem |
|             | 2       | Pemilihan teknologi tidak sesuai dengan kebutuhan konsumen              | Tinggi  |
|             | 3       | Ketidaktepatan pemilihan lokasi SPKLU                                   | Ekstrem |
| Pendanaan   | 4       | Dana tidak tersedia/tidak memadai                                       | Tinggi  |
| Operasional | 9       | Keandalan SPKLU rendah                                                  | Ekstrem |
|             | 10      | Tidak tercapainya jumlah minimum layanan charging untuk mencapai profit | Ekstrem |
|             | 11      | Terjadinya kecelakaan pada pelanggan maupun pegawai                     | Tinggi  |

## Faktor Pendukung

- [1] Regulasi Pemerintah terkait Insentif Pengembangan SPKLU
- [2] Standar Nasional (SNI) tentang SPKLU
- [3] Kecukupan Pasokan Energi Listrik
- [4] *Road Map* Pengembangan Industri Kendaraan Listrik
- [5] Kebijakan Pemerintah terkait Pembatasan Kendaraan Bermotor (ICE) dan Pengurangan Emisi Sektor Transportasi



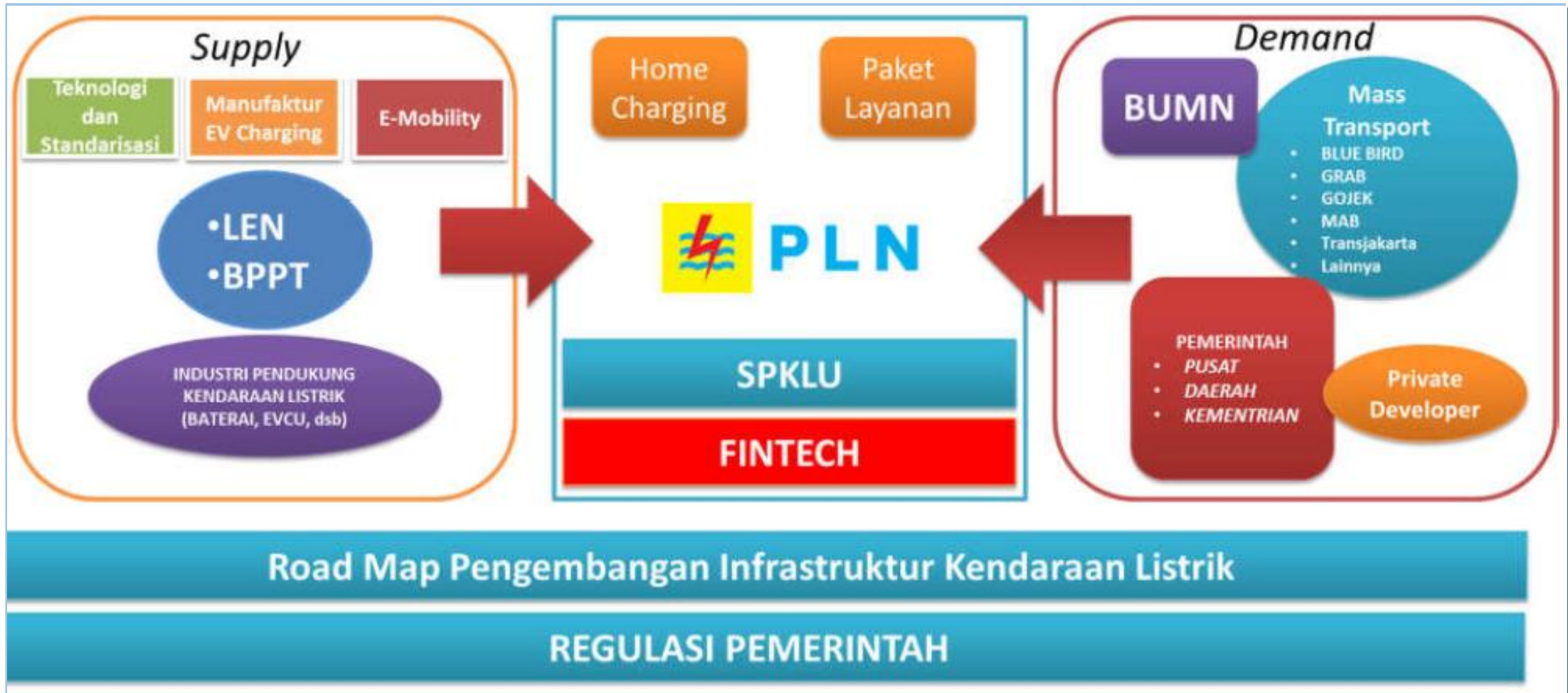
# Faktor Penghambat

- [1] Investasi Pengembangan SPKLU yang masih relatif tinggi khususnya *DC Fast Charger*
- [2] Belum ada regulasi tentang Tata Niaga SPKLU **X**
- [3] Ketersediaan ruang dan lahan yang strategis untuk *SPKLU*
- [4] Harga EV masih relatif mahal
- [5] *Mindset* masyarakat yang keliru tentang EV
- [6] Model bisnis Pengembangan SPKLU yang belum teruji

# Timeline



# Strategi “Network Collaborator”



# Update

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- [1] Adanya pandemik COVID-19 mendorong adanya revisi *timeline* implementasi pengembangan SPKLU (revisi proyeksi kebutuhan)
- [2] Keluarnya Permen ESDM No. 13 bulan Agustus 2020 berimplikasi kepada:
  - 1. Perubahan Skema Model Bisnis
  - 2. Revisi Perhitungan Analisa Kelayakan Finansial SPKLU
  - 3. Revisi Perhitungan Analisa Kelayakan Teknis SPKLU
  - 4. Kebutuhan *Road map* pengembangan SPBKLK paling lambat 6 bulan sejak Permen ditandatangani



PLN

**Terima Kasih**