With support from

# Mimpi Produksi Kendaraan Listrik Nasional


- Ahmad Safrudin - KPBB


Diskusi – Lanjut Ngopi Thamrin School, 2 Maret 2022

# Outline

- Beban Pasokan Energi dan Emisi Kendaraan
- Strategi Pengendalain Emisi Kendaraan
- Biaya dan Manfaat Kendaraan Berkarbon Rendah
- Kebijakan Pemantik Percepatan Kendaraan Berkarbon Rendah
- Kesimpulan dan Rekomendasi.

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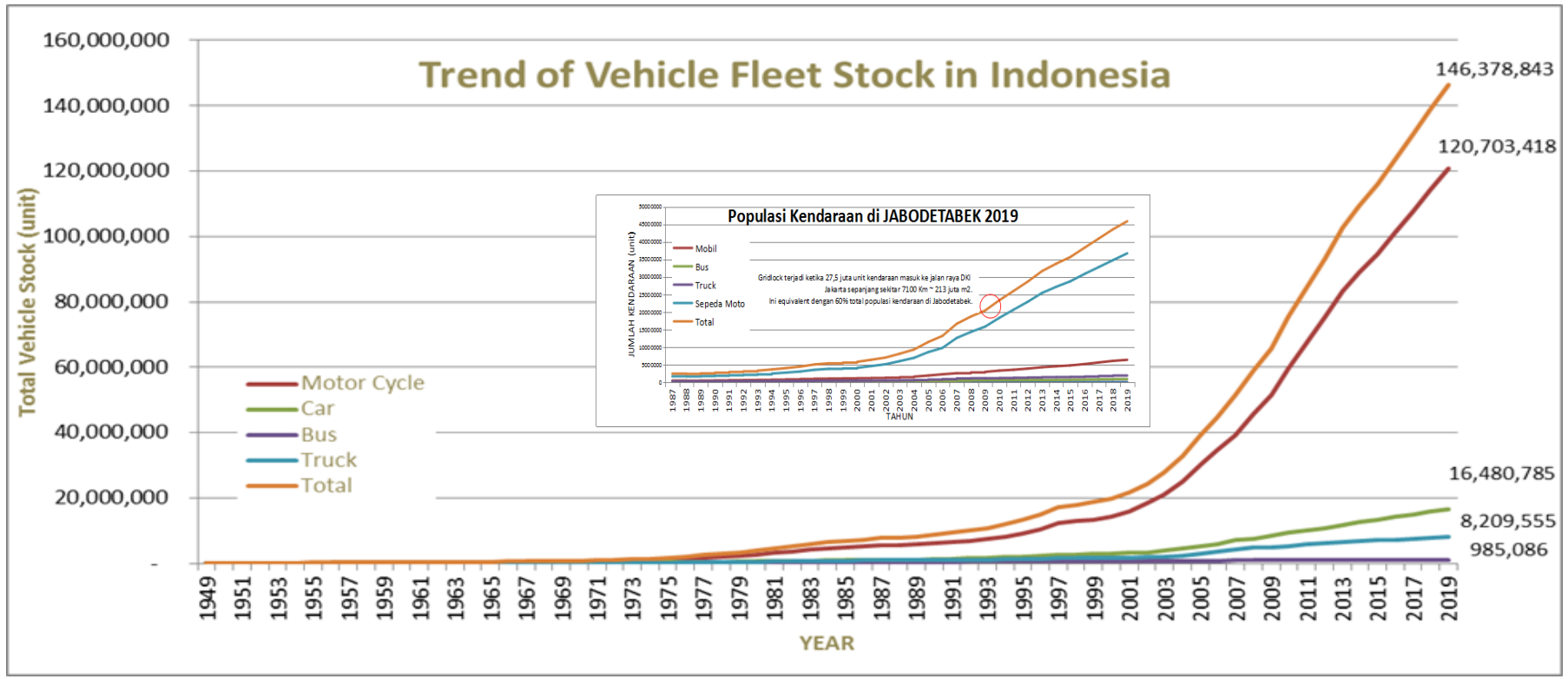
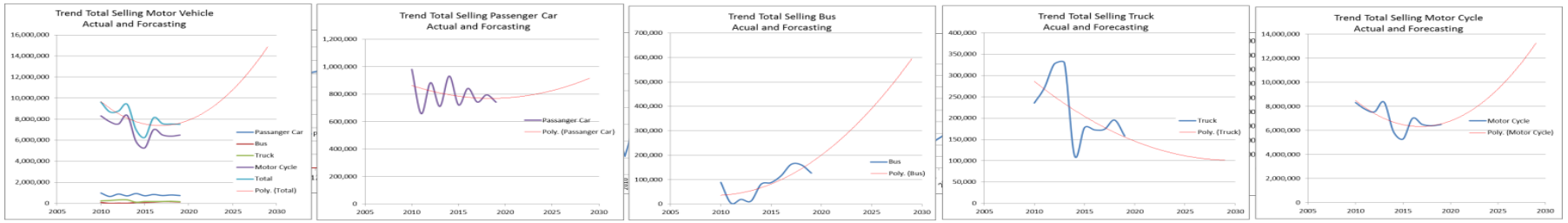
# Beban Pasokan Energi dan Emisi Kendaraan

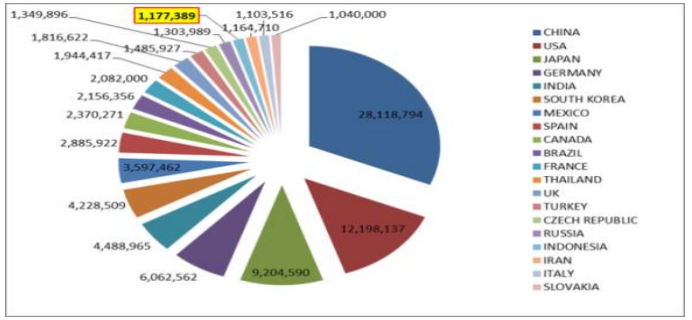
# Vehicle Fleet Statistic




Source: BPS, SAMSAT, GAIKINDO, AISI, 2019; processed by KPBB

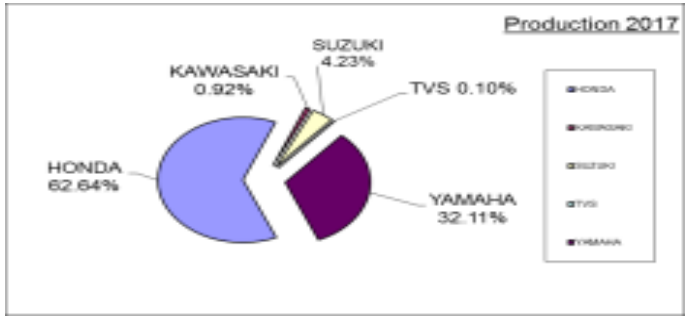



Total sales of motor cycle, passenger car, bus, and truck




Global Vehicle Sales (Source ICCT)

| RANK | NEGARA | Pasar Domestik | Produksi | Potensi Ekspor |
|---|---|---|---|---|
| | | | | (dalam ribu unit) |
| **A. Global** | | | | |
| #1 | China | 29.122 | 29.015 | - |
| #2 | US | 17.583 | 11.189 | - |
| #3 | Jepang | 5.238 | 9.693 | 4.455 |
| #4 | Jerman | 3.811 | 5.645 | 1.834 |
| **B. ASEAN** | | | | |
| #1 | Indonesia | 1.060 | 1.216 | 156 |
| #2 | Thailand | 873 | 1.988 | 1.115 |
| #3 | Malaysia | 591 | 460 | - |




Total sales (2019): 1,02 million units car and 6.48 million units motor cycle p.a.

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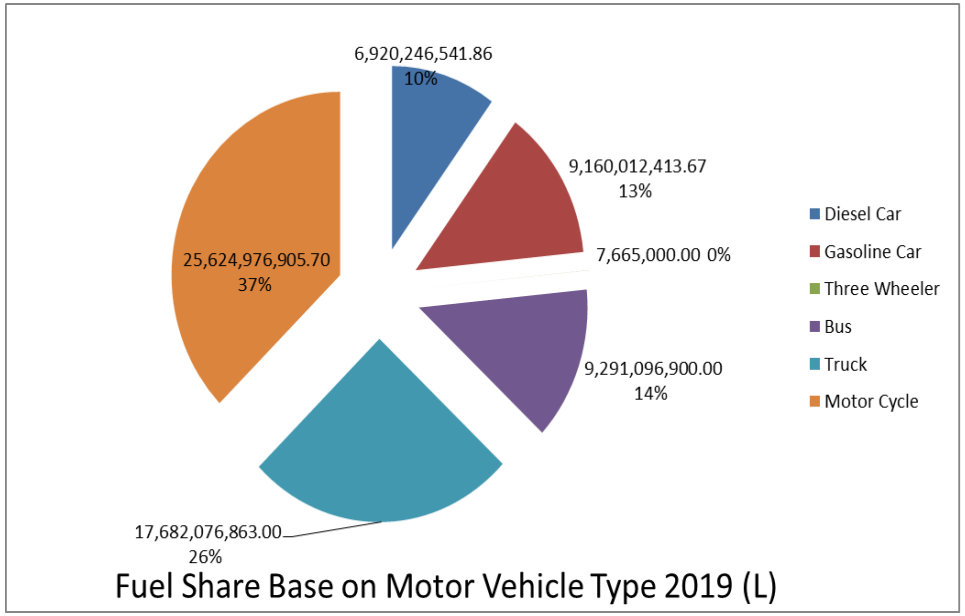
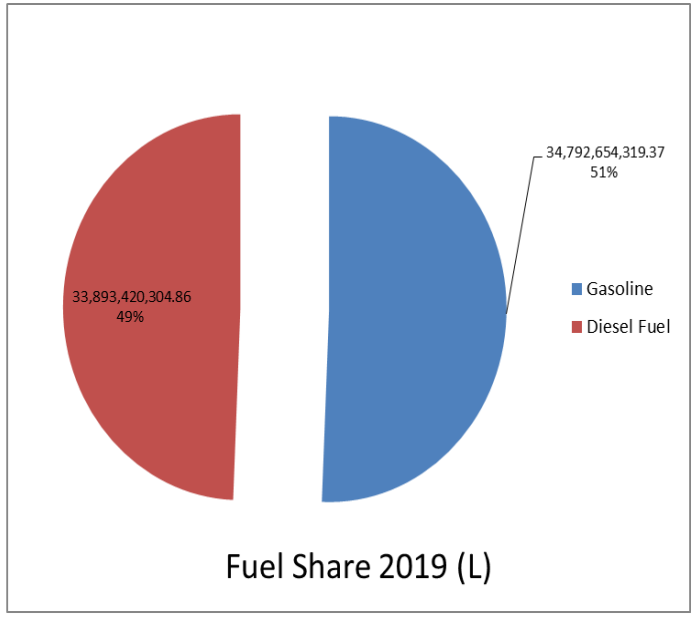
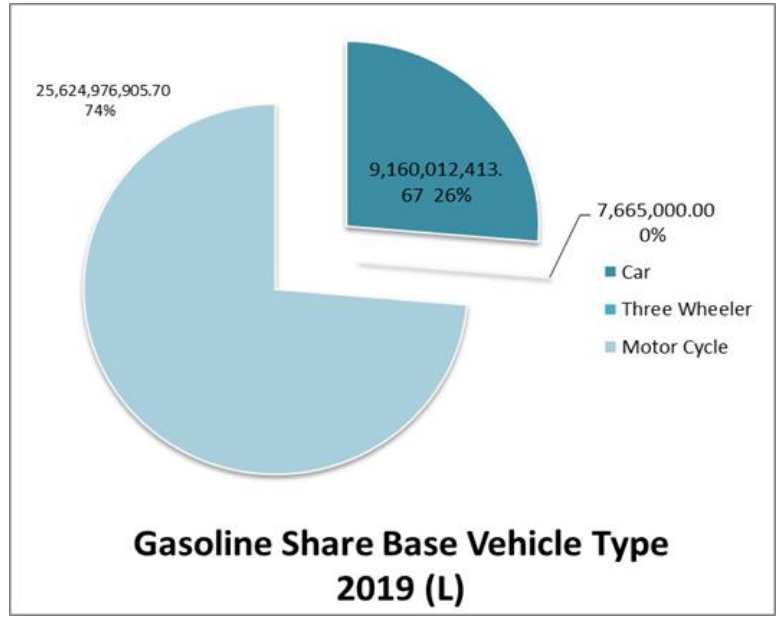


Fuel Share Base on Motor Vehicle Type 2019 (L)



Fuel Share 2019 (L)



**Gasoline Share Base Vehicle Type 2019 (L)**

*Table.* Estimation Vehicular Fuel Consumption in Indonesia 2019 (L)

| Fuel Consumption | Per Annum | Percentage |
|---|---|---|
| Diesel Car | 6,920,246,541.86 | 10.08% |
| Gasoline Car | 9,160,012,413.67 | 13.34% |
| 3-Wheelers | 7,665,000.00 | 0.01% |
| Bus | 9,291,096,900.00 | 13.53% |
| Truck | 17,682,076,863.00 | 25.74% |
| Motor Cycle | 25,624,976,905.70 | 37.31% |
| Total | 68,686,074,624.23 | |

| Jenis BBM | Total Demand KL | Prosentase |
|---|---|---|
| Premium88 | 16,146,642,866 | 23.51% |
| Pertalite90 | 16,693,758,624 | 24.30% |
| Pertamax | 12,470,002,068 | 18.16% |
| Pertamax Turbo | 230,470,008 | 0.34% |
| Solar48 | 22,376,490,533 | 32.58% |
| Dexlite51 | 468,097,470 | 0.68% |
| Perta-DEX | 300,613,054 | 0.44% |
| Perta-DEX HQ | - | 0.00% |
| JUMLAH | 68,686,074,622 | 100% |

# Fuel Supply Burden

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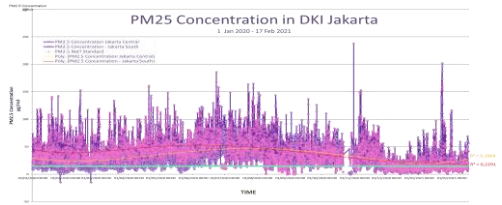


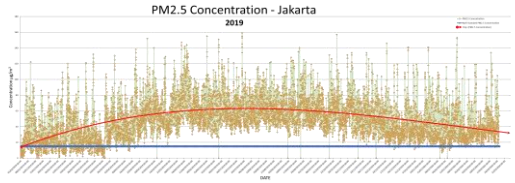



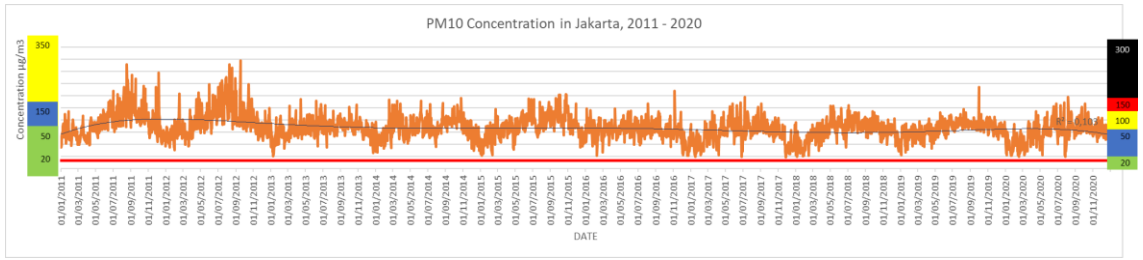


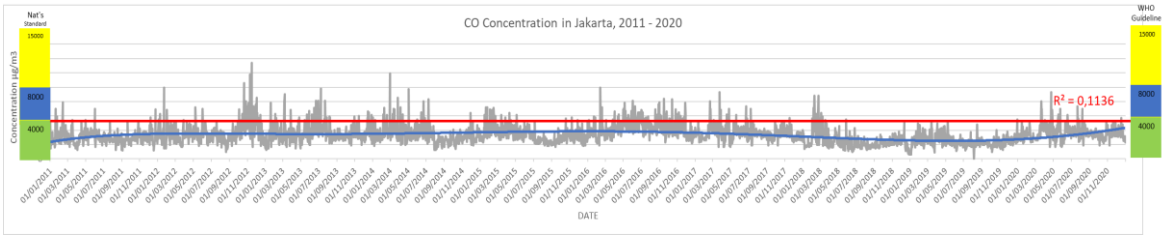



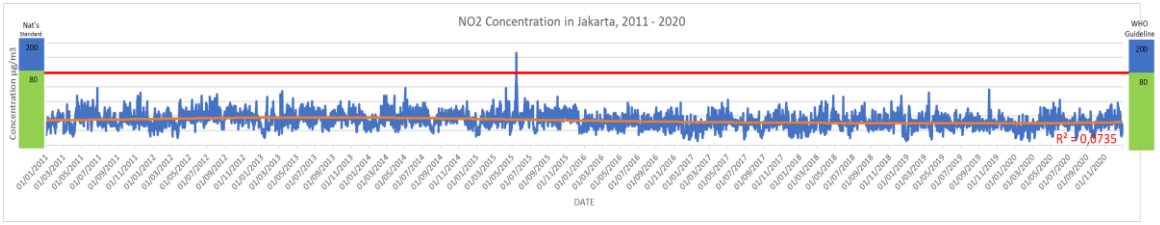


- Jakarta has air quality concentration with PM10, PM2.5, O3, SOx as dominant parameters. Annual mean of PM2.5, PM10, and SO2 concentration are 46.1 µg/m3, 59.03 µg/m3, and 42.76 µg/m3 respectively (2020).
- Annual mean of O3, and NO2 concentration are 83.3 µg/m3, and 14.92 µg/m3 respectively, while the trend of 8hrs mean of CO concentration is 3610 µg/m3 (2020)

# Air Quality Status in Jakarta 2011 - 2020

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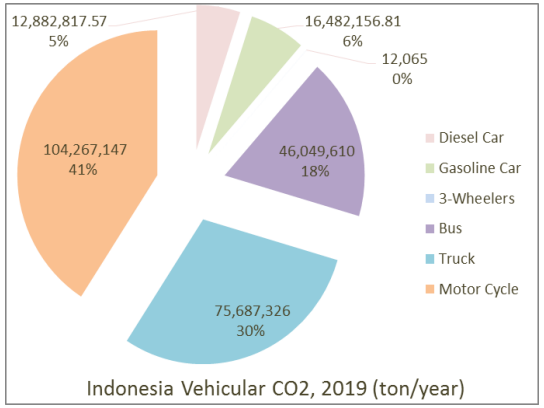
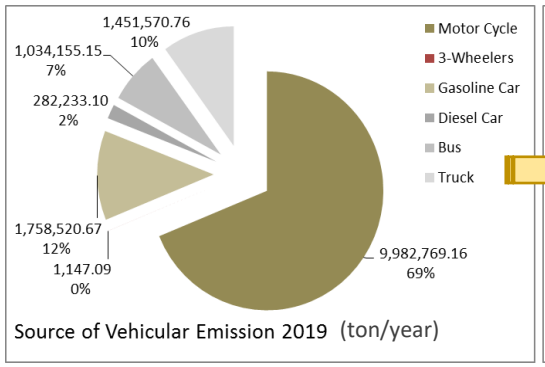
# Emission Load

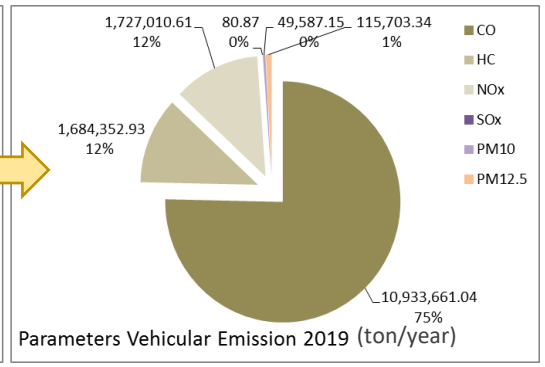
## National-wide



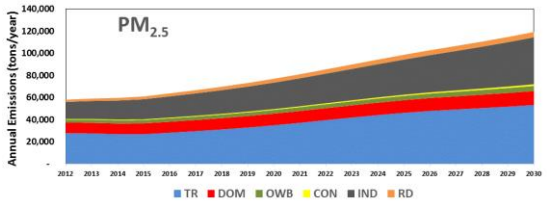

- Emissions load at national-wide is estimated 39,754.51 ton/day (2019), with motor cycle as the largest polluter with 68.80% then is followed by gasoline car, truck, bus, diesel car and three wheelers.
- Meanwhile for CO2 vehicular emission loads at national-wide is estimated 699,674.31 ton/day (2019), again motor cycle as largest polluter with 40.83% or 285,663.42 ton/day then it is followed by truck, bus, gasoline car, diesel car and three wheelers.

## GHGs Emission Load



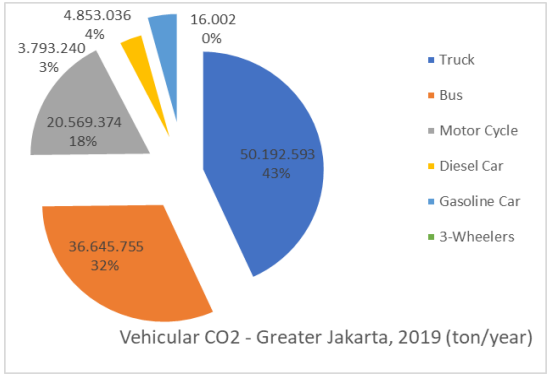




## Local Air Pollution - Emission Load



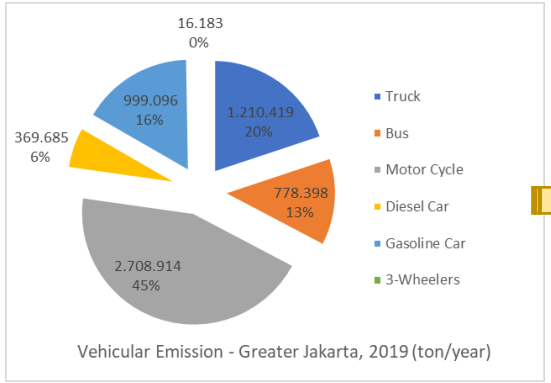

Estimation Emission in Jakarta

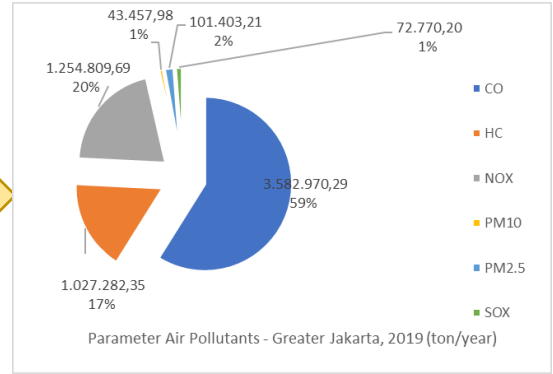
## Greater Jakarta




- Emissions –air pollutant – load in the Greater Jakarta is estimated 19,165 ton/day, which sourced by motor cycle (45%), truck (20%), bus (13%), diesel car (6%), gasoline car (16%), and three wheeler (.23%).
- CO2e loads in the Greater Jakarta is estimated 318,840 ton/day which sourced by truck (43%), bus (32%), motor cycle (18%), gasoline car (4%), diesel car (3%), and three-wheeler (.01%).
- Emission load in Greater Jakarta is estimated would be increase 1.8 – 3.5 times in 2030 (BAU, baseline 2012)

## GHGs Emission Load



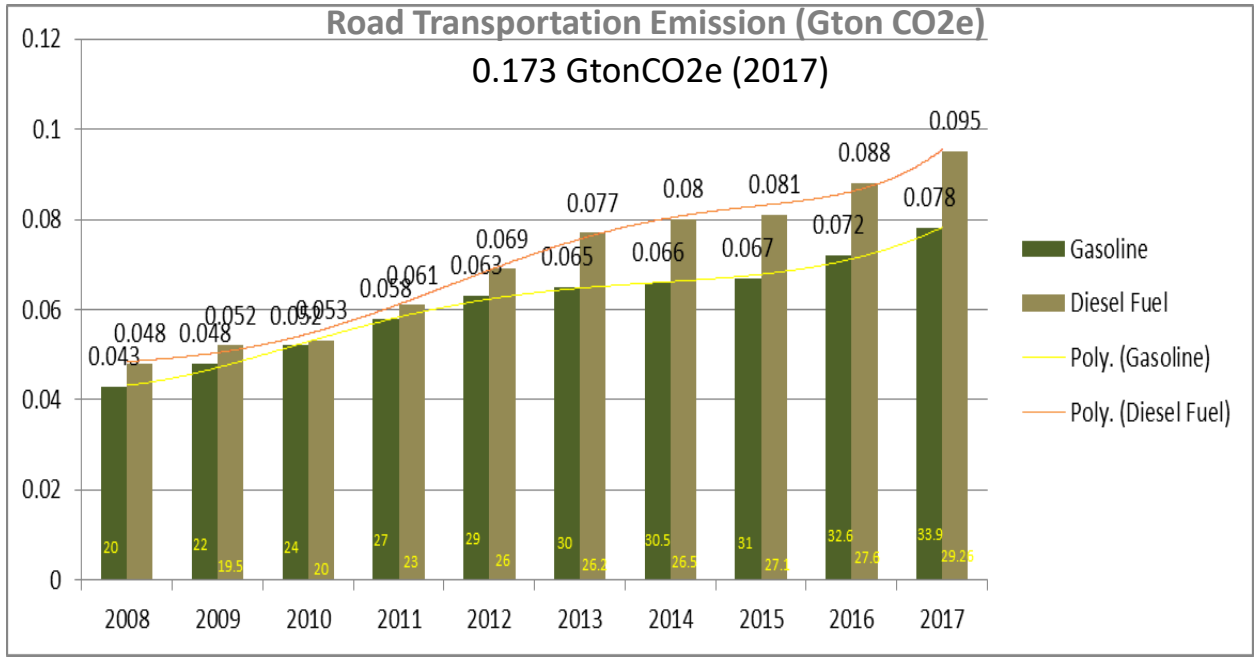




## Local Air Pollution - Emission Load

# NDC - Indonesia

Nationally Determined Contributions
2020 – 2030
Based on Paris Agreement Dec 2015

- Indonesia commitment on COP 21 - UNFCCC => NDC
- GHG reduction by 29% (unconditional) to 41% (conditional)
- GHG BAU in 2030 ~2.82 GtonCO2e.
- Sector: Energy, (inc.transportation); LULUCF, IPPU, Agriculture, and Waste.




Road transportation consumed 63,1 million KL of fuels and emitted 173 MtonCO2e (2017), 255 MtonCO2e (2019), and tend to increase to be 470 Mton$CO_2$e BAU (2030) (16.66% Nat'l GHG BAU).

# Strategi Pengendalian Emisi Kendaraan

# Komitmen Mitigasi Emisi

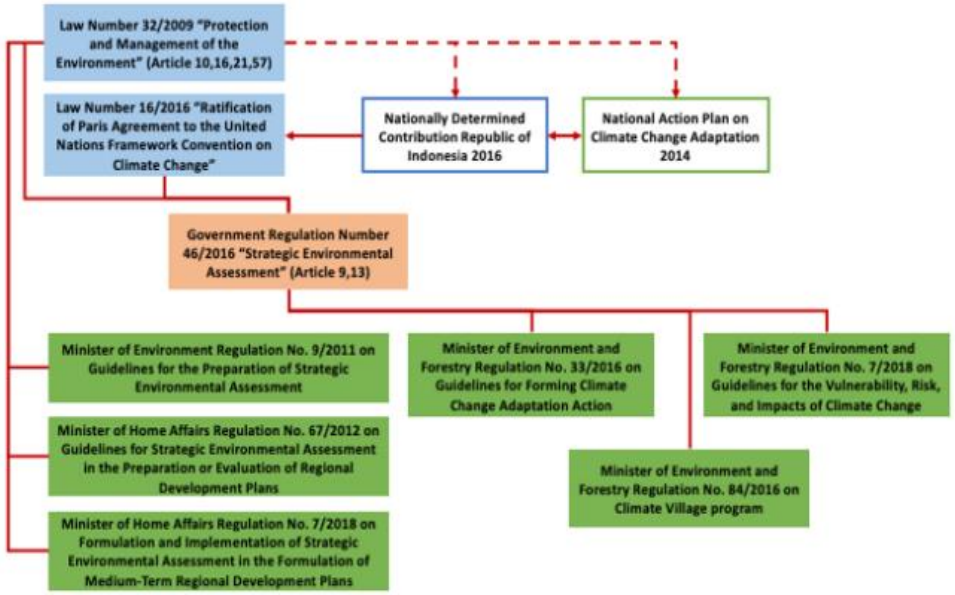



Figure 1. National policy and regulatory framework supporting climate change mitigation

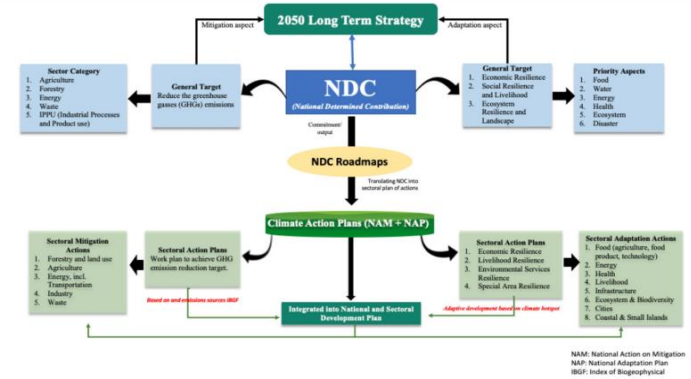



Figure 2. Connectivity between mitigation and adaptation in LTS, NDC, Climate Action Plans, and their integration to National and Sectoral Development Plans

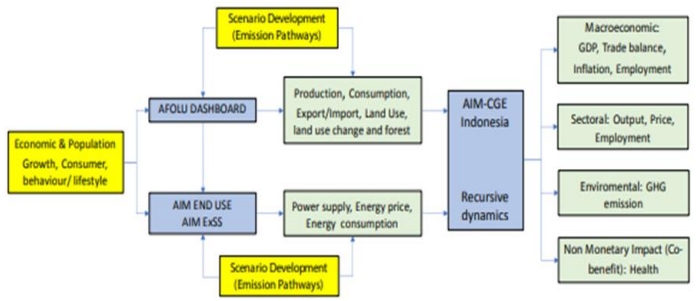



Figure 3. Models for developing emission pathways in Indonesia

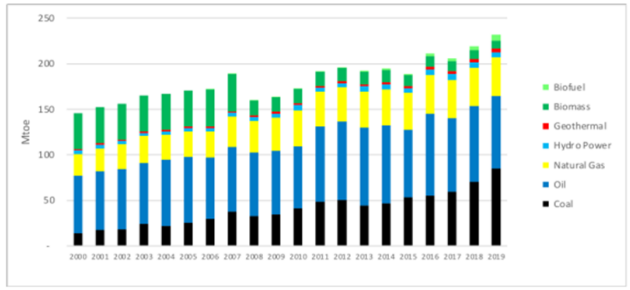



Figure 4. Development of primary energy supply

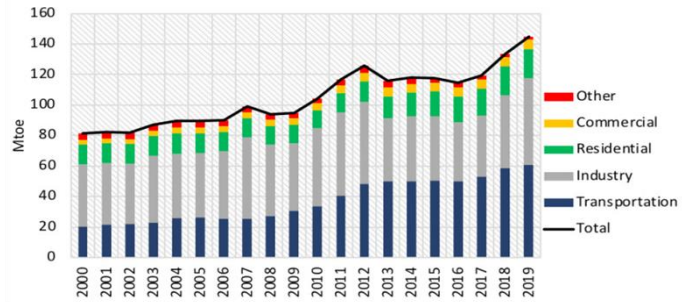



Figure 5. Development of final energy consumption by consuming sectors

Sumber: LTS-LCCR 2050

*Fakta empiris tidak pernah menunjukkan keseriusan untuk pengendalian emisi (energy consumption) sector transportasi.*

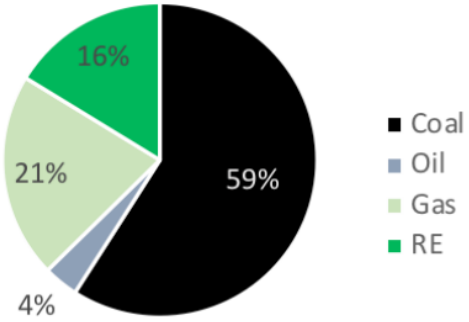



**Figure 6.** Electricity generation mix 2019

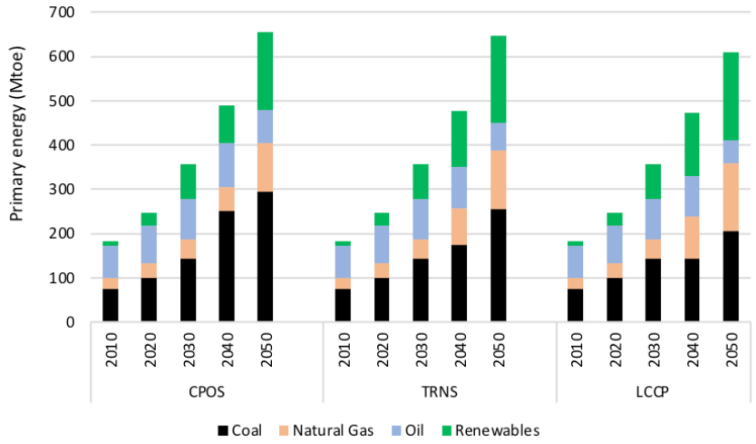



**Figure 8.** Projection of primary energy supply under CPOS, TRNS and LCCP

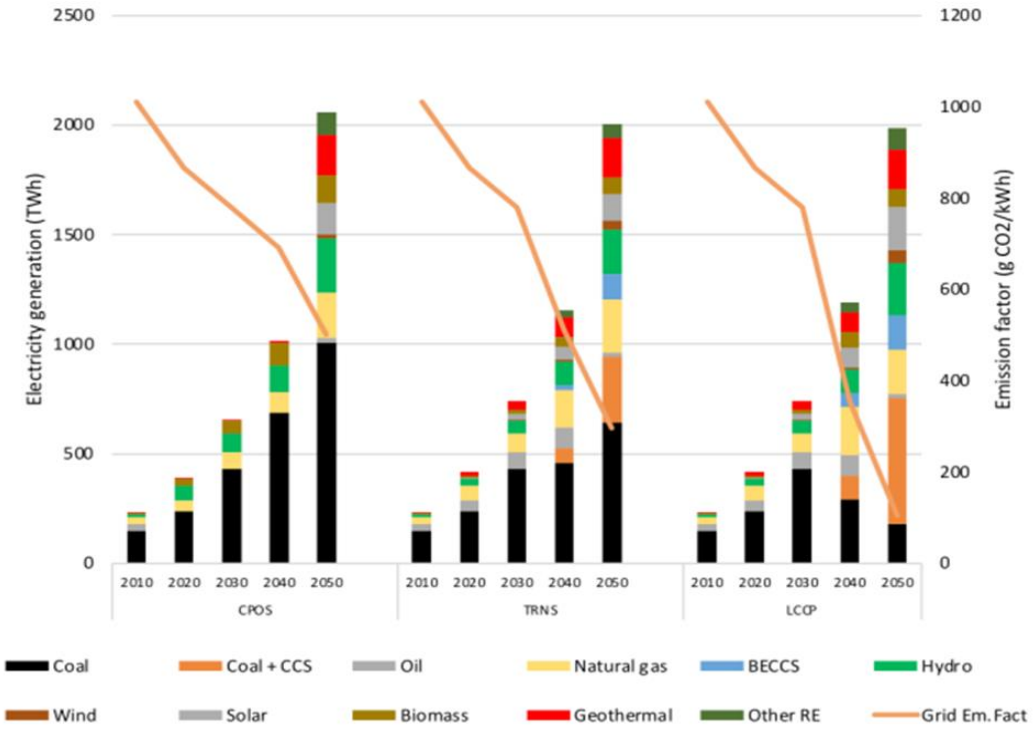



**Figure 7.** Projection of power generation mix and grid emission factor under CPOS, TRNS and LCCP

Sumber: LTS-LCCR 2050

Belum ada langkah konkrit untuk membumikan LCCP di sub-sector transportasi.

*Sekadar manaruh angka?*

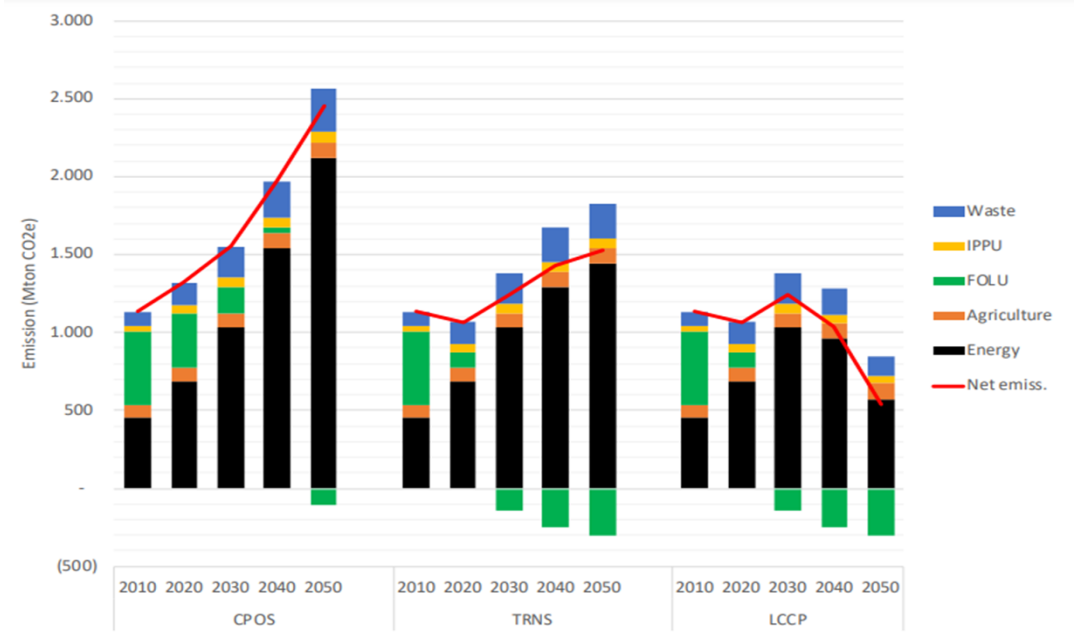



**Figure 9.** Projection of emission under the CPOS, TRNS and LCCP

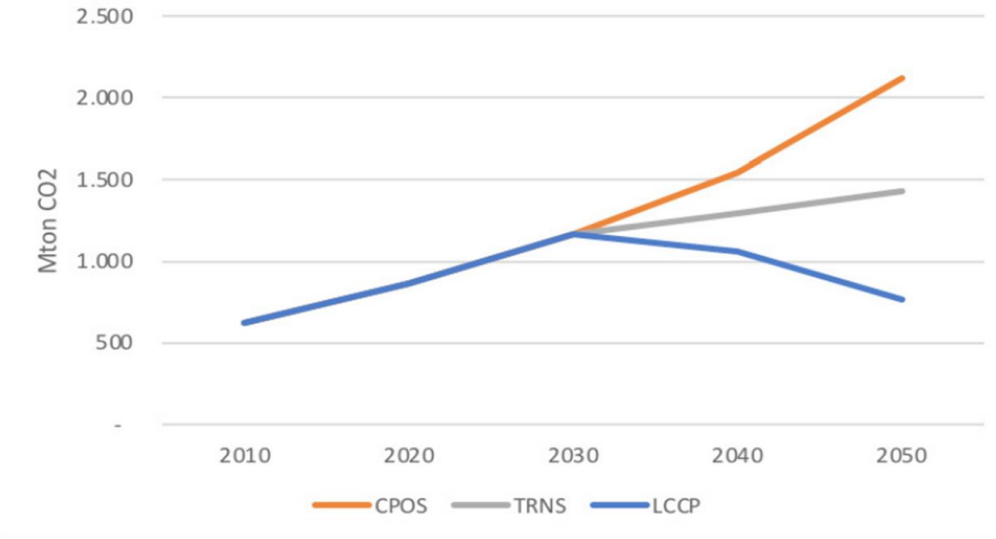



**Figure 10.** Projection of energy sector total emissions under CPOS, TRNS and LCCP

Sumber: LTS-LCCR 2050

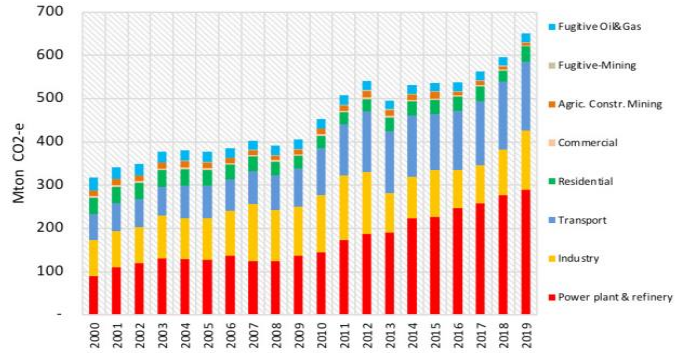



**Figure 11.** Estimation of GHG emission in energy sector by sources

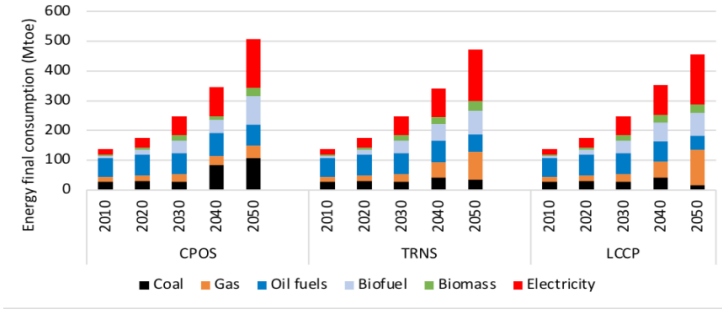



**Figure 12.** Projection of final energy demand by fuel type under CPOS, TRNS and LCCP

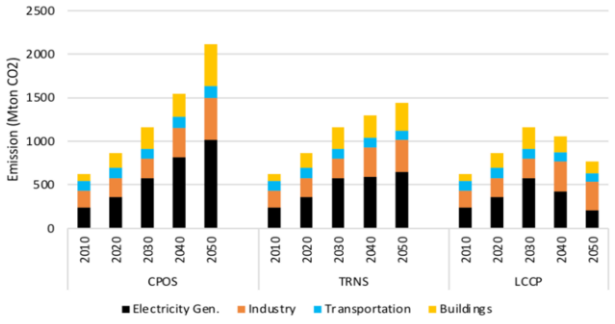



**Figure 14.** Projection of energy sector emissions by emitting sector under CPOS, TRNS and LCCP

Jika sekadar manaruh angka, *gimana* merealisasikan target seperti ini?

# Integrated Vehicular Emission Reduction

## EMISSIONS

- **PM, HC, CO, NOx, O3, SOx: Local Air Pollution**
- **CO2: Global Green House Gas**

### CLEAN ENERGY

ESDM, MOEF, Pertamina, PGN, PLN, City Government

- ULG
- Low Sulfur Fuels:
  - CNG, LGV
  - Gasoline for Euro 2/II, Euro4/IV Standard
  - Diesel Fuel for Euro 3/III, and 4/IV Standard
  - Fuel with Euro 6 Standard
  - Low Sulfur Industrial Diesel Fuel
  - ***Phase-out Dirty Fuels:***
    - RON 88
    - RON 90
    - CN 48 with S> 2000 ppm
    - CN 51 with S > 500 ppm
- Renewable Fuels –
  - Bio-diesel (B10 in 2006, B2.5 in 2007-2009, B0 in 2009-2015, B15% in 2015-2017, B20 in 2017-2019, B30 in 2019-now).
  - Bioethanol (BE10 in 2006 and disappear since 2007).
- ***Fuel Economy spec (appropriate RON, ect).***
- ***Fuel Handling Evaporated:***
  - Nozzle Evaporated Standard
  - Tank Evaporated Transportation/Storage/Refinery.
- ***Clean and Sustainable Fuel for Electricity Supply:***
  - CNG, LNG, LPG (limited)
  - PV Panel (very limited)
  - Hydro Power (limited)
  - Phase out Diesel Power Plant
  - Phase out Coal Fired Power Plant.
- RE - Electricity for Transportation.

### CLEAN TECHNOLOGY

MOI, MOT, MOEF, AUTO-INDUSTRY, City Government

- ***Lower Emission Vehicle:***
  - Euro Standard (2/II, 3, and 4)
  - NGV (Natural Gas Vehicle)
  - Soot-free Buses
  - Scrapping Car
- ***Low Carbon Emission Vehicle:***
  - Down Sizing
  - EV (e-motorcycle, e-passenger vehicle, e-Bus, e-scooter):
    - Operating EV for taxi
    - e-Bus (trial 2019 and 2020)
    - EV running on the road (success on market penetration)
  - Technology Improvement
    - Alt Low Carbon Tech
    - Eco-mode application
    - Automatic turn-off at the idling (limited)
  - Scrapping Car
- Appropriate Car Fuel Filling System (CNG and electrified urban transport).

Implemented/on progress

Not Implemented yet

Priority program

### LAND USE, INDUSTRY, TRAFFIC AND TRANSPORT MANAGEMENT

MOI, MOT, MOEF, City Government

TRANSPORTATION:

- Mobility Behavior:
  - Driving Habit:
    - Eco-driving/riding (voluntary)
    - Speed management
    - Vehicle utility
  - Voluntary Public Education Reduce Motor Vehicle Dependency by CSO:
    - TDM and TOD
    - e-Mass Public Transport: MRT/LRT/BRT
    - NMT: (limited areas in the whole of cities)
      - Walking
      - Cycling
    - First and last mile e-mobility/NMT
    - Road Pricing (not toll)
    - Parking Management
- ***Infrastructure (limited to support Sustainable Transportation:***
  - TDM and TOD (on progress)
  - Road, rail, ect. (still imbalance)
  - Underpass/fly-over at the railway crossing
  - NMT: (Walkability City, and Cycling)
  - First and last mile e-mobility/NMT
  - Traffic congestion pricing
    - Road Pricing (not toll)
    - Parking Management
  - Mass Public Transport: MRT/LRT/BRT:
    - CNG, LGV
    - MRT/LRT/E-Bus
- ***Green Freight and Logistic:***
  - CNG, LPG, LNG, soot-free Diesel, e-transporter
  - Eco-driving
- Intelligence Traffic System:
  - Traffic Light (integrated system)
  - Toll gate (Gantry and OBU)
  - ERP Gantry
  - Motor Vehicle dBase

### EMISSION STANDARD

MOEF, MOI, MO Energy, City Government

- Ambient Air Quality Monitoring (limited in certain cities):
  - By PEMDA
  - By Industrial Estate
  - By Hazardous Industry
- Ambient Air Quality Standard (need to be tightened)
- ***Low Emission Vehicle Standard (local air pollution)***
- ***Fuel Economy Vehicle Standard/Low Carbon Emission Vehicle Standard***
- ***Stringent Emissions Index of Fuels***
- Low Emission Zone, and zero emission zone.

CARBON DIOXIDE REMOVAL:

- Sustainable urban agriculture and soil carbon
- Restoration of degraded lands and protection of primary urban forests/mangrove/wetland/estuary
- Bio-energy with Carbon capture and storage
- Direct air Carbon capture and storage

### LAW ENFORCEMENT

MOEF, MOT, MO Energy, Traffic Police, City Government

- Incentive/disincentive:
  - ***Fiscal:***
    - Low Emission Vehicle
    - Vehicle Carbon Tax
    - Fuel Carbon Tax
  - Non Fiscal
- ***Market Driven:***
  - Low Emission Disclosure
  - Fuel Economy/Low Carbon Vehicle Disclosure and or Fuel Economy Labeling
- In-used Vehicle:
  - I/M (voluntary)
  - ***Emission Raid.***

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# LEV and LCEV Roadmap

*Uncertainty*

LCEV Technology:
- EV (BEV, FCEV, PEV/trolley bus)
- Hybrid (HEV, PHEV)
- ICE:
  - Tech improvement
  - Flexicar Tech/biofuels
  - CNG/LGV/LNG

| 1970 | 2005 | 2013 | 2017 | 2020 | 2022 | 2025 | 2027 | 2030 | 2035 |
|---|---|---|---|---|---|---|---|---|---|
| ICE CV Based Platform | Euro2/II Standard | Euro3 Standard 2W | Euro4/IV Standard | | | Euro6/IV Standard | | | |
| | 200 gr/km of CO2 | LCGC | LCEV | | | LCEV | | | |
| | | | 118 gr/km of CO2 ~ 20Km/L | | | 85 gr/km of CO2~28Km/L | | | |

Mandates of:
- Government Regulation No 41/1999 jo 22/2021 toward Air Pollution Control
- Government Regulation No. 14/2015 toward Nat'l Industrial Development Master Plan (RIPIN).
- Government Regulation No 73/2019 toward Fiscal Incentive for LCEV.
- Presidential Decree No. 22/2017 toward Nat'l Energy Strategic Plan => Fuel Economy Standard by 2020.
- Presidential Decree No 55/2019 toward BEV.
- Law No 16/2016 toward Ratification on Paris Agreement.
- Minister Decree No 26/2020, and 27/2021 toward Roadmap on Auto-industry

- Research and Development LCGC and LCEV
- Research and Development Flexi Car (Biodiesel and Bioethanol) and CNG/LGV
- Research and Development Electrified motor cycle and fuel cell
- Down-sizing (LCGC) manufacturing
- Research and development on main part of EV/LCEV (battery, motor, PCU)
- Flexy engine technology manufacturing
- HEV/PHEV/BEV technology manufacturing
- CNG/LGV/LNG technology manufacturing
- Research and Development Supply Chain from domestic manufacturing (up stream/down stream
- R&D Phase 1 LCEV
- Research and Development Phase 2 LCEV
- Domestic manufacturing for PHEV, EV and FC
- Main parts of domestic manufacturing (battery, motor, PCU)

Conditioning on uncertainty?

*Source:* Low Emission Vehicle and Low Carbon Emission Vehicle Scheme in Indonesia, KPBB, 2018

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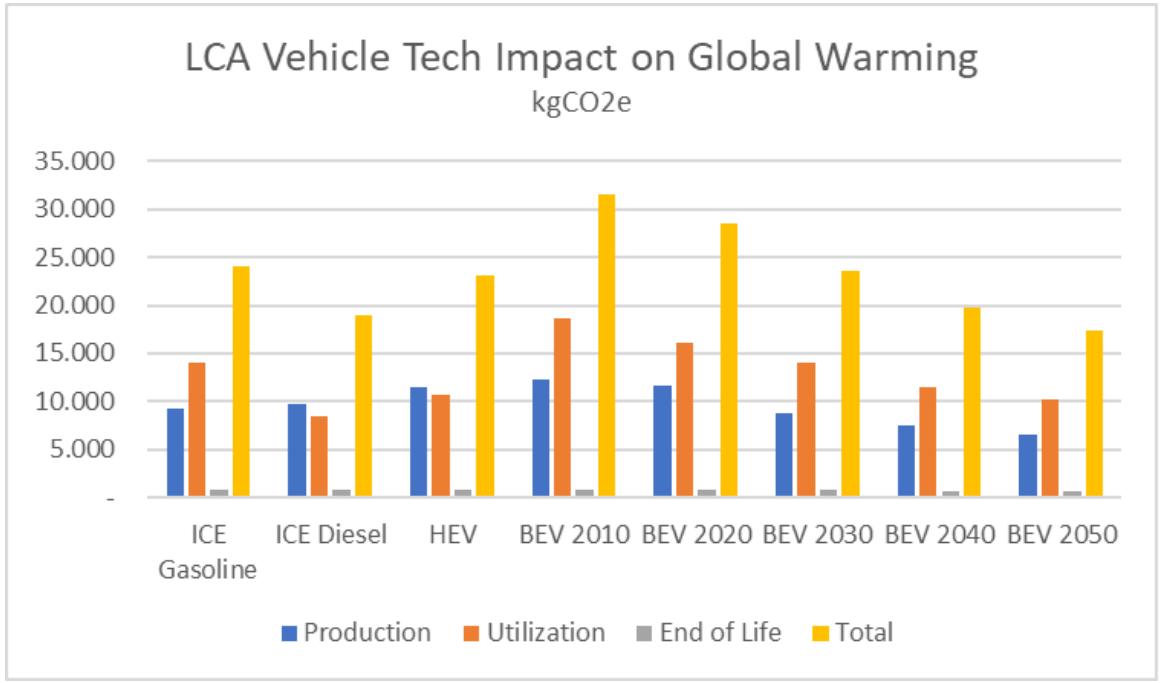
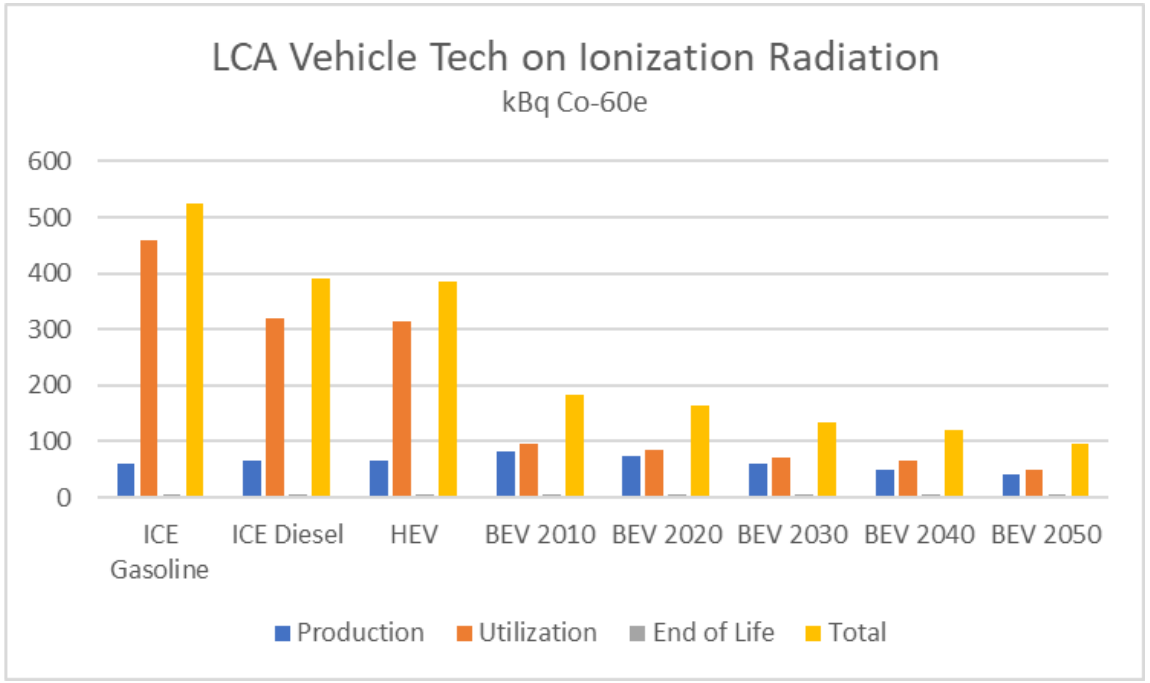
# Biaya dan Manfaat Kendaraan Rendah Carbon




Methods:

- Kajian mengungkap situasi terkini terkait dampak pemanfaatan teknologi kendaraan di Indonesia (berdasarkan informasi, teknologi dan database yang tersedia).
- Fokus utama dalam LCA adalah penilaian kinerja BEV dengan skenario bauran energi listrik yang berbeda yang diperkirakan menggunakan pemodelan ilmiah untuk tahun 2020–2050, sesuai dengan tujuan yang dinyatakan dalam RUEN maupun LCCP dan asumsi yang dikembangkan dalam kajian ini.
- LCA digunakan untuk menunjukkan dampak pemanfaatan beberapa teknologi kendaraan terhadap lingkungan dengan situasi bauran energi listrik yang berbeda sesuai periodisasinya dan dengan proporsi sumber energi terbarukan yang juga berbeda.

Analisa:

- Pada skenario bauran sumber energi listrik 2020, BEV tech adalah opsi yang terbaik dalam pencegahan kelangkaan sumber daya fosil dan radiasi pengion, sedangkan HEV dan ICE tech menyebabkan dampak yang lebih rendah pada pemanasan global, penggunaan lahan, dan toksisitas karsinogenik serta toksisitas non-karsinogenik pada manusia.
- Pada skenario bauran sumber energi listrik 2030–2050 **(LCCP),** di mana proporsi sumber energi terbarukan meningkat secara signifikan; BEV tech menjadi lebih efektif dalam memitigasi *global warming* (meningkat ~42% dibanding scenario 2020).

# Life-Cycle Analysis: BEV, HEV, ICE tech

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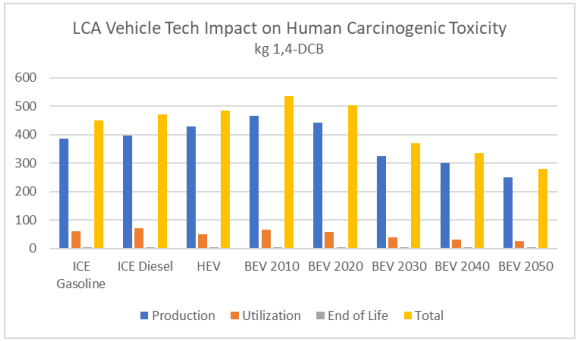


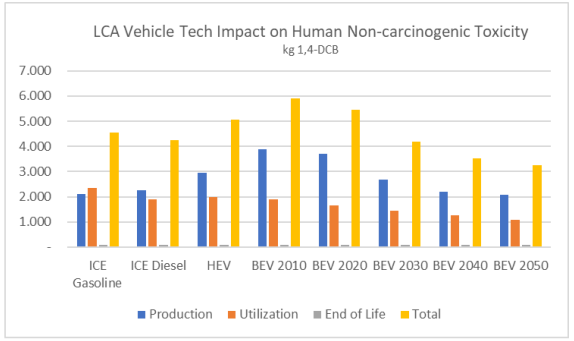


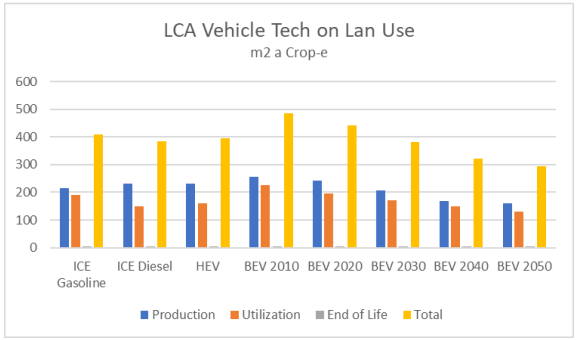


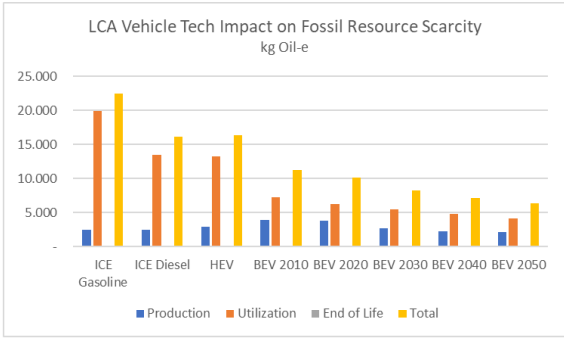


- Dampak pencemaran lingkungan lebih tinggi pada BEV2020 (dengan bauran sumber energi listrik 2020), namun terendah pada BEV 2030-2050.
- ICE tech gasoline memiliki daya rusak tinggi thd lingkungan (terutama pada *energy stock depletion of fossil resources*, berikut efek dominonya).
- HEV dan BEV dengan bauran sumber energi listrik 2020 memiliki daya rusak ~18% lebih rendah dibanding ICE-tech gasoline. Selanjutnya, ICE-diesel menyumbang dampak ~10% lebih rendah dari HEV.
- BEV dengan skenario bauran sumber energi listrik 2020–2050 (LCCP), yang sebagian besar *renewable energy*; memiliki daya rusak terendah. Sehingga BEV dengan bauran sumber energi listrik 2050 memiliki daya rusak thd lingkungan lebih kecil masing-masing 43%, 33%, dan 27% dibanding ICE-gasoline, BEV 2020 dan ICE-diesel.

# Life-Cycle Analysis: BEV, HEV, ICE tech $_2$

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# Cost Benefit Analysis
# Vehicular Emission Control Strategy in Indonesia

| Particular | Policy Option | | | | | | |
|---|---|---|---|---|---|---|---|
| | Euro 2 since 2005* | Euro 3 Since 2013 (2/3-Wheelers) | Euro 4 (Since 2020)* | Euro 6 (Since 2025) | HEV* | BEV | Scrappage Car* |
| **Cost** | | | | | | | |
| Refinery/Energy Storage Production | 467,416 | 0 | 466,745 | 926,550 | 338,794 | 387,452 | 464,669 |
| Technology Utilization | 493,312 | 390,921 | 493,312 | 540,769 | 784,586 | 722,604 | 30,911 |
| Total Cost | 960,728 | 390,921 | 960,057 | 1,467,319 | 1,123,380 | 1,110,056 | 495,580 |
| | | | | | | | |
| **Benefit** | | | | | | | |
| Health Improvement | 1,656,264 | 2,706,545 | 1,648,305 | 2,873,522 | 2,854,542 | 3,468,269 | 1,667,728 |
| Production Saving | 27,712 | 45,285 | 31,387 | 54,718 | 448,393 | 544,797 | 36,237 |
| Fuel/Energy Saving | 286,392 | 468,001 | 324,084 | 564,982 | 4,601,071 | 5,590,301 | 373,975 |
| Total Benefit | 1,970,368 | 3,219,831 | 2,003,776 | 3,493,221 | 7,904,006 | 9,603,367 | 2,077,940 |
| | | | | | | | |
| **FY Until 2030** | | | | | | | |
| Net Benefit | 1,009,640 | 2,828,910 | 1,043,719 | 2,025,903 | 6,780,626 | 8,493,312 | 1,582,360 |
| NPV; SDR 8% | 38,963 | 166,967 | 47,736 | 338,787 | 1,563,678 | 3,264,400 | 290,778 |
| Net Benefit Average | 38,832 | 166,406 | 40,143 | 337,650 | 260,793 | 1,415,552 | 60,860 |
| | | | | | | | |
| **FY Until 2030** | | | | | | | |
| Fuel Saving | 286,392 | 468,001 | 324,084 | 564,982 | 4,601,071 | 5,590,301 | 373,975 |
| NPV; SDR 8% | 71,395 | 178,434 | 84,727 | 293,791 | 1,098,827 | 1,118,060 | 91,202 |
| Net Benefit Average | 13,018 | 27,529 | 14,731 | 94,164 | 209,140 | 559,030 | 16,999 |

- BEV or Battery Electric Vehicle is **the most economic benefits** of vehicular emission control strategy (Rp 9,603 trillion by 2030), whether local air pollution and GHGs.
- HEV or Hybrid Electric Vehicle is the next control strategy which generate the most economic benefits (Rp 7,904 trillion by 2030).
- Sustainability on applying control strategy through Euro Standard (Euro 2 by 2005, Euro 3 for 2-wheelers by 2013, Euro 4 by 2018, and Euro 6 by 2025; would be generate economic benefits Rp 3,493 trillion by 2030.
- Scrappage car program also generates economic benefits significantly.
- Economic benefits are generated by fuel saving (energy efficiency), health improvement, and production saving.

*infokpbb*

UN environment programme

Partnership for Clean Fuels and Vehicles
www.unep.org/PCFV

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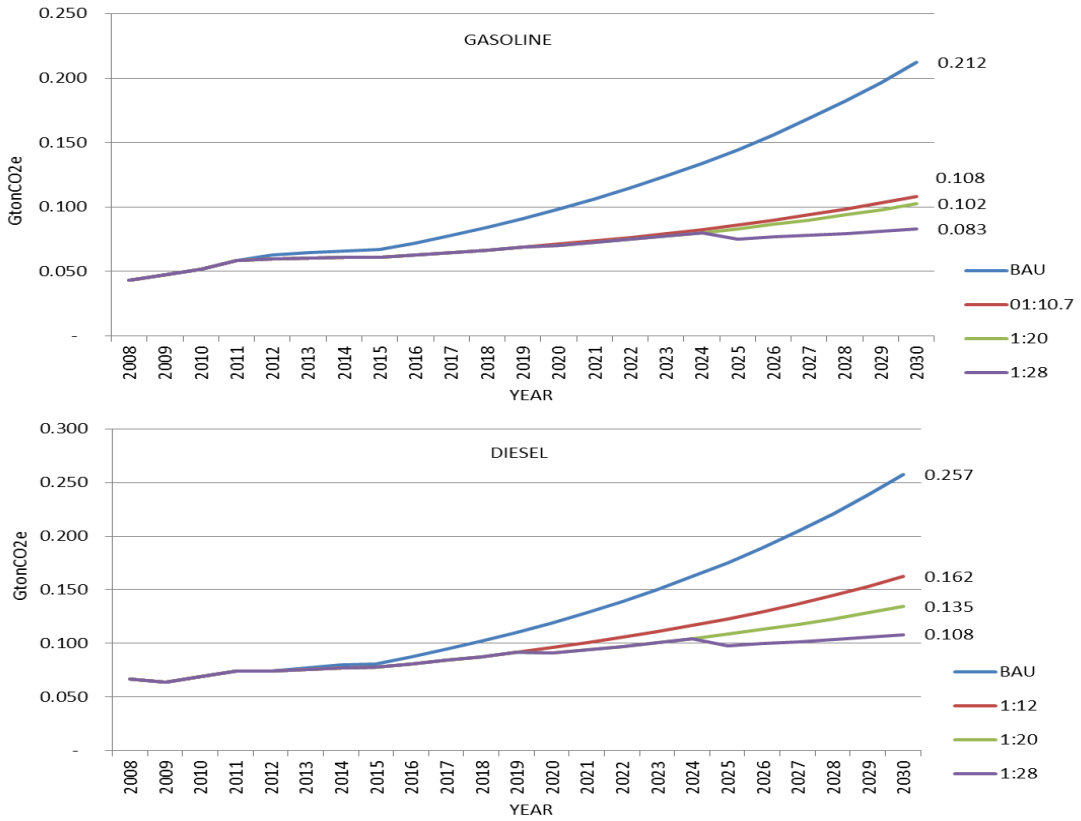
Low Sulfur Fuel

# Fuel Economy Standard to Mitigate *GtonCO$_2$e* - Road Transportation




Source: Low Carbon Emission Vehicle Initiative in Indonesia, 2017, KPBB

- Nat'l (BAU) 2030 ~ 2.82 GtonCO$_2$e
  - Road Transportation 470 MtonCO$_2$e (16.66%):
    - 212 MtonCO$_2$e Gasoline
    - 257 MtonCO$_2$e Diesel
- Scenario Fuel Economy Standard or Low Carbon:
  - **2012 (applied)**
    - 9.34 L/100 Km ~ 219.96 grCO$_2$/Km Gasoline
    - 8.33 L/100 Km ~ 216.99 grCO$_2$/Km Diesel
  - **2020 (proposal)**
    - 5 L/100 Km ~ 117.75 grCO$_2$/Km Gasoline
    - 5 L/100 Km ~ 130.25 grCO$_2$/Km Diesel
  - **2025 (proposal)**
    - 3.57 L/100 Km ~ 84.07 grCO$_2$/Km Gasoline
    - 3.57 L/100 Km ~ 92.99 grCO$_2$/Km Diesel
- Above scenario will decrease GHGs (2030) total 280 MtonCO$_2$e or 59% of BAU:
  - > target NDC (41%)
  - Competitive advantage nat'l auto-industry at regional market (4.4 L/100 Km).
  - Equivalent to 59.86 Mio KL gasoline p.a. dan 56 Mio KL diesel fuel p.a. on 2030 ~ Rp 677 trillions.

*Fuel Economy Standard* atau Low Carbon Standard: *prasyarat* menggapai target NDC 2030 (sub-sector transportation); *a paving the way to realize NZE target.*

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# LCC-TCO

Life-cycle Cost – Total Cost Ownership

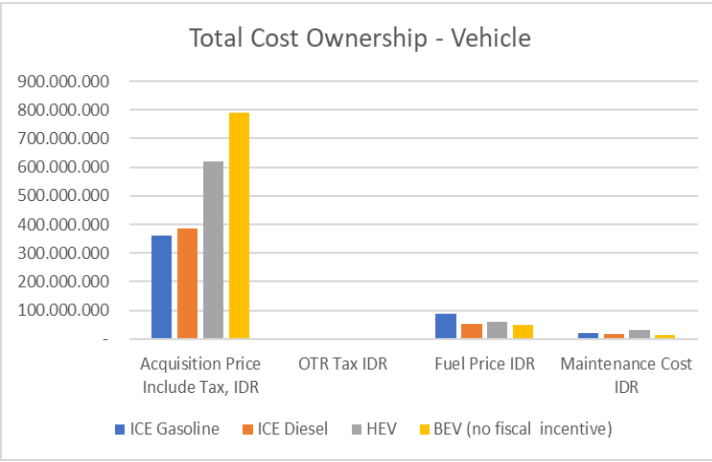
## Heavy Duty – e-Bus

| Particular | ICE Diesel Bus with 1800 ppm Dirty Subsidied Fuel | ICE Diesel Bus with 350 ppm Non-Subsied Fuel | ICE CNG-Bus | e-Bus | e-Bus with Incentive Tariff of Electricity |
|---|---|---|---|---|---|
| Contractual period (year) | 7 | 7 | 7 | 8 | 8 |
| CAPEX | | | | | |
| Chasis unit price | 1.230.000.000 | 1.230.000.000 | 2.200.000.000 | 3.570.000.000 | 3.570.000.000 |
| Import duty | - | - | - | 178.500.000 | 178.500.000 |
| Importation VAT | - | - | - | 357.000.000 | 357.000.000 |
| Importation Income Tax | - | - | - | 89.250.000 | 89.250.000 |
| Vehicle Tax | 29.096.600 | 29.096.600 | 29.096.600 | 55.000.000 | 55.000.000 |
| Total Price - Chassis unit | 1.259.096.600 | 1.259.096.600 | 2.229.096.600 | 4.249.750.000 | 4.249.750.000 |
| Caroserry | 828.500.000 | 828.500.000 | 828.500.000 | 1.050.000.000 | 1.050.000.000 |
| Air Conditioning | 126.400.000 | 126.400.000 | 126.400.000 | | |
| Replacement Battery | - | - | - | | |
| Replacement Caroserry | - | - | - | | |
| Residu Price | - 126.197.806 | - 126.197.806 | - 126.197.806 | - 302.085.750 | - 302.085.750 |
| Insurance and Provision | 216.528.867 | 216.528.867 | 216.528.867 | 518.315.550 | 518.315.550 |
| TOTAL CAPEX | 2.304.327.661 | 2.304.327.661 | 3.274.327.661 | 5.515.979.800 | 5.515.979.800 |
| | | | | | |
| OPEX | | | | | |
| Maintenance and Reparation | 4.599.325.045 | 4.599.325.045 | 4.139.392.541 | 2.667.608.526 | 2.667.608.526 |
| Fuel | 1.200.212.650 | 2.598.518.650 | 722.458.100 | 2.093.737.375 | 1.871.275.990 |
| Overhaed Cost | 110.825.016 | 110.825.016 | 110.825.016 | 62.579.058 | 62.579.058 |
| TOTAL OPEX | 5.910.362.711 | 7.308.668.711 | 4.972.675.657 | 4.823.924.959 | 4.601.463.574 |
| TOTAL CAPEX + OPEX | 8.214.690.372 | 9.612.996.372 | 8.247.003.318 | 10.339.904.759 | 10.117.443.374 |
| Rp/Km | 19.100 | 22.352 | 19.176 | 21.037 | 20.584 |
| Operation day/year | 320 | 320 | 320 | 320 | 320 |
| VKT/day | 192 | 192 | 192 | 192 | 192 |

## Light Duty – Passenger Car

**Technical Specification of Selected BEV**

| Parameter | Value |
|---|---|
| Fuel | Electricity |
| Car body | Hatchback |
| Height | 1530 mm |
| Length | 4490 mm |
| Width | 1788 mm |
| Battery capacity | 40 kWh |
| Battery weight | 296 kg |
| Vehicle weight without battery | 1249 kg |
| Vehicle energy consumption | 4.85 km/kWh |




Total Consumer Life-Cycle Cost

| Passanger Vehicle | Manufacuring Phase | | Operation Phase | | End-of-Life Phase | Revenue | Total Cost IDR/1500,000 km | Total Cost IDR/km |
|---|---|---|---|---|---|---|---|---|
| | Acquisition Price Include Tax, IDR | OTR Tax IDR | Fuel Price IDR | Maintenance Cost IDR | Deregistration Tax IDR | Dismantled Price IDR | | |
| ICE Gasoline | 360.255.600 | | 88.727.400 | 19.213.200 | 0 | - 27.019.170 | 441.177.030 | 2.941 |
| ICE Diesel | 386.062.200 | | 53.306.100 | 17.366.400 | 0 | - 28.954.665 | 427.780.035 | 2.852 |
| HEV | 618.678.000 | | 61.479.000 | 32.950.800 | 0 | - 46.400.850 | 666.706.950 | 4.445 |
| BEV (no fiscal incentive) | 791.856.000 | | 49.484.536 | 13.235.400 | 0 | - 59.389.200 | 795.186.736 | 5.301 |

Berdasaran LCC atau TCO (Total Cost Ownership) menunjukkan bahwa BEV masih relative sangat mahal (saat ini), sekalipun memiliki Operating Cost yang sangat rendah dan efektif memitigasi GHG untuk (*long-term environmental and economic policy*) apalagi dengan LCCP scenario.

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# *Life-Cycle Cost*: BEV, HEV, ICE tech

Analysis didasarkan pada perspektif ekonomi untuk BEV, HEV dan ICE tech mobil penumpang (LDV, light-duty vehicle) dan bus (HDV, heavy-duty vehicle)

- Menunjukkan bahwa **saat ini (2020)** mobil listrik di Indonesia tidak kompetitif *(tidak ada insentif fiscal dan belum ada kepastian insentif tarif listrik sebagai kendaraan LCEV dan efisien energi)*.
- Justru mobil diesel adalah yang paling kompetitif, di mana total biaya siklus hidup lebih rendah dari yang lain (dengan segala pemborosan fiscal, fossil energy stock dan emisi).
- Analisis dari sisi produsen dan konsumen menunjukkan bahwa BEV adalah kendaraan yang paling hemat biaya selama tahap operasi, apalagi jika pengisian *battery BEV* dilakukan malam hari.
  - Menantikan:
    - Tahapan *mass production*
    - *Fairness business* dengan *fiscal incentive*, sebagaimana harga bensin dan solar serta biodiesel yang memperoleh subsidi dan atau perlakuan khusus dari pemerintah
    - Kondisioning siklus hidup social atas benefits dari kendararaan  listrik dalam memitigasi pencemaran udara dan dampak perubahan iklim.

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# Kebijakan Pemantik Percepatan Kendaraan Rendah Carbon

# Komposisi PPnBM (PP 73/2019)

## Semakin tinggi level CO2 kendaraan => semakin mewah

| Kategori | | Fuel Consumption km/l | | CO2 g/km | EG Volume (cc) | | |
|---|---|---|---|---|---|---|---|
| | | Bensin | Diesel | | <1.5 | 1.5-3.0 | >3.0 |
| Mobil penumpang | < 10 penumpang | >15.5 | >17.5 | <150 | 15% | | 40% |
| | | 15.4-11.6 | 17.4-13.1 | 151-200 | 20% | | 50% |
| | | 11.5-9.3 | 13.0-10.5 | 201-250 | 25% | | 60% |
| | | <9.3 | <10.5 | >250 | 40% | | 70% |
| | ≥ 10 penumpang/ minibus | <11.6 | <13.1 | <200 | 15% | | 25% |
| | | <11.6 | <13.1 | >200 | 20% | | 30% |
| Mobil komersial | Double Cabin | >15.5 | >17.5 | <150 | 5% | | 20% |
| | | 15.5-11.6 | 17.4-13.1 | 150-200 | 10% | | 25% |
| | | <11.1 | <13.1 | >200 | 15% | | 30% |
| | Truck, bus, pick-up | Semua tipe | Semua tipe | Semua tipe | 0% | | |
| Program | KBH2/LCGC | 20 | 21.8 | 120 | 3% | | |
| | Hybrid/Mild Hybrid | >23 | >26 | <100 | 2%/8% | | 20% |
| | | 23-18.5 | 25.9-21 | 101-125 | 5%/10% | | 25% |
| | | 18.4-15.5 | 20.8-17.5 | 126-150 | 8%/12% | | 30% |
| | Flexy Engine (E100/B100) | — | — | — | 8% | | |
| | PHEV, EV/FC | Semua tipe | Semua tipe | Semua tipe | 0% | | |

2015

| No | Segmen/Nama | | | | CC/Cilinder | Tarif PPnBM | Jumlah Produksi 2015 | CO2 Level |
|---|---|---|---|---|---|---|---|---|
| 1 | Sedan Type | | Entry & Low | Limo Taxi | CC ≤ 1.500 (G/D) | 0% | 4,883 | 158 |
| | | | Entry & Low | All new City, Vios | CC ≤ 1.500 (G/D) | 30% | 3,647 | 158 |
| | | | Medium | BMW 320i | 1.501 < CC ≤ 3.000 (G) / 2.500 (D) | 40% | 1,201 | 158 |
| | | | Medium | BMW Seri 5 | 1.501 < CC ≤ 3.000 (G) / 2.500 (D) | 40% | 542 | 179 |
| | | | Medium | Accord, Camry, Teana, Mazda6 | 1.501 < CC ≤ 3.000 (G) / 2.500 (D) | 40% | 2,084 | 179 |
| | | | Medium | Civic AT, Altis, | 1.501 < CC ≤ 3.000 (G) / 2.500 (D) | 40% | 2,072 | 179 |
| | | | Medium | Mercedes Seri E | 1.501 < CC ≤ 3.000 (G) / 2.500 (D) | 40% | 475 | 179 |
| | | | Medium | Mercedes Seri C | 1.501 < CC ≤ 3.000 (G) / 2.500 (D) | 40% | 1,279 | 179 |
| | | | Medium | Audi | 1.501 < CC ≤ 3.000 (G) / 2.500 (D) | 40% | 145 | 179 |
| | | | Medium | Lain-Lain | 1.501 < CC ≤ 3.000 (G) / 2.500 (D) | 40% | 515 | 179 |
| | | | Luxury | Mercedes Benz S 400 | CC > 3.001 (G) / 2.501 (D) | 125% | 579 | 190 |
| 2 | 4 x 2 Type | H/B | Entry & Low | Etios, Brio, Mirage | CC ≤ 1.500 (G/D) | 10% | 66,567 | 173 |
| | | | Medium | Swift Sport, Geely Emgrand 7 (RV) | 1.501 < CC ≤ 2.500 (G/D) | 20% | 147 | 253 |
| | | | High | | 2.501 < CC ≤3.000 (G) | 40% | - | |
| | | | Luxury | | CC > 3.001 (G) / 2.501 (D) | 125% | - | |
| | | MPV | Entry & Low | Avanza, Mobilio, Xenia | CC ≤ 1.500 (G/D) | 10% | 299,280 | 173 |
| | | | Medium | Innova, | 1.501 < CC ≤ 2.500 (G/D) | 20% | 43,444 | 253 |
| | | | Medium | Alphard 2,5, | 1.501 < CC ≤ 2.500 (G/D) | 20% | 3,019 | 253 |
| | | | Medium | Serena | 1.501 < CC ≤ 2.500 (G/D) | 20% | 1,661 | 253 |
| | | | Medium | Lain-Lain | 1.501 < CC ≤ 2.500 (G/D) | 20% | 7,930 | 253 |
| | | | High | | 2.501 < CC ≤3.000 (G) | 40% | - | 253 |
| | | | Luxury | Alphard, Elgrand 3,5, Pregio | CC > 3.001 (G) / 2.501 (D) | 125% | 114 | 224 |
| | | SUV | Low | Katana, Rush, Terios, BRV, HRV | CC ≤ 1.500 (G/D) | 10% | 72,985 | 173 |
| | | | Medium | HRV 1,8 | 1.501 < CC ≤ 2.500 (G/D) | 20% | 7,929 | 253 |
| | | | Medium | X-Trail, Pajero Sport 2,5, CRV, CX-5, Fortuner 2,5 | 1.501 < CC ≤ 2.500 (G/D) | 20% | 32,179 | 253 |
| | | | Medium | Outlander Sport, Captiva | 1.501 < CC ≤ 2.500 (G/D) | 20% | 2,943 | 253 |
| | | | Medium | MU-X, MY15, Sportage, dll | 1.501 < CC ≤ 2.500 (G/D) | 20% | 5,274 | 253 |
| | | | High | Fortuner 2.7 TRD Sportivo | 2.501 < CC ≤3.000 (G) | 40% | 1,567 | 253 |
| | | | Luxury | | CC > 3.001 (G) / 2.501 (D) | 40% | - | |
| 3 | 4 x 4 Type | | Entry & Low | Renault Duster Duster 1.5 dCi RxZ 4x4, Audi Q3 1.4 TFSI A/T | CC ≤ 1.500 (G/D) | 30% | 45 | 290 |
| | | | Medium & High | uner 2.5 G TRD SPORTIVO VNT AT, Pajero Sport 2.5 HP 4X4 AT Di | 1.501 < CC ≤ 3.000 (G) / 2.500 (D) | 40% | 7,735 | 290 |
| | | | Luxury | Jeep Wrangler, ML 400, Lexus LX 570 | CC > 3.001 (G) / 2.501 (D) | 125% | 973 | 290 |
| 4 | Bus | | | Hino R260, Mitsubishi FE 84G - BC - 6W | GVW 5 - 10 Ton (G/D) | 0% | 3,743 | 400 |
| 5 | Pick Up 4x2 / 4x4 | | | Grand Max, Carry, APV, L-300 | GVW < 5 Ton (G/D) | 0% | 186,081 | 160 |
| 6 | Truck | | | Canter, Dyna, Dutro | GVW 2 - 5 Ton (G/D) | 0% | 74,773 | 400 |
| 7 | Double Cabin 4x2 / 4x4 | | | Hilux, Strada, Ford Ranger | GVW < 5 Ton (G/D) | 20% | 12,034 | 260 |
| 8 | Affordable Energy Saving Cars 4x2 | | | Agya, Brio Satya, Datsun Go, Wagon R | CC ≤ 1.200 (G) | 0% | 165,434 | 120 |
| | | | | | CC ≤ 1.200 (D) | | | |
| | | | | | | | 1,013,279 | |

- Regulasi PPnBM kendaraan bermotor harus direformulasi sehingga hanya dikaitkan dengan tingkat kemewahan kendaraan.
- Sementara pengendalian emisi Carbon diatur dengan instrument Cukai Carbon.

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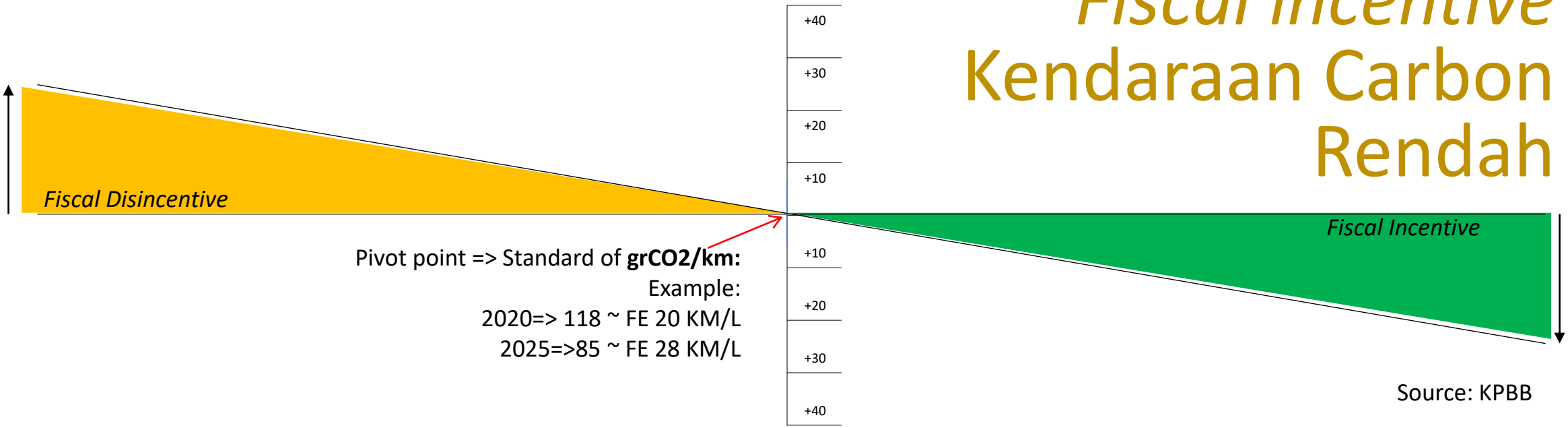
# *Fiscal incentive* Kendaraan Carbon Rendah




*Insentif Fiskal kendaraan Carbon rendah* (Low Carbon Emission Vehicle) diambil dari cukai yang dipungut dari kendaraan yang tidak memenuhi **grCO2/km standard**.

*Notes:*

- Kendaraan dengan level **grCO2/km** terendah sebagai kendaraan paling hemat energi akan menjadi kendaraan paling murah.
- Cukai Carbon dan atau insentif fiscal hanya dikenakan sekali pada saat pembelian.
- Cost neutral principle. Bukan sebagai sumber pendapatan negara, melainkan instrument pengendali CO2 kendaraan.
- Untuk memotivasi produk LCEV dalam negeri, perlu dipertimbangkan CO2 foot-print dipertimbangkan pada perhitungan ini.

Cukai Carbon akan menjadikan LCEV sebagai preferensi pasar karena harga yang lebih murah.

# LCEV Competitiveness

Rp '000

| PARTICULAR | Tax Component | BeV | HeV | ICE 2000 |
|---|---|---|---|---|
| HPP | | 350,000.00 | 320,000.00 | 242,857.00 |
| Import Duty | 50.00% | 175,000.00 | 160,000.00 | 121,428.50 |
| **PPh Import** | 10.00% | 35,000.00 | 32,000.00 | 24,285.70 |
| PPN | 10.00% | 35,000.00 | 32,000.00 | 24,285.70 |
| PPnBM | 0 - 125% | - | - | 97,142.80 |
| BBN | 12.50% | 43,750.00 | 40,000.00 | 30,357.13 |
| PKB | 2.00% | 7,000.00 | 6,400.00 | 4,857.14 |
| Profit | 20.00% | 70,000.00 | 64,000.00 | 48,571.40 |
| TOTAL | | 715,750.00 | 654,400.00 | 593,785.37 |

| PARTICULAR | Tax Component | BeV 60 grCO2/km | HeV 85 grCO2/km | ICE 2000 180 grCO2/km |
|---|---|---|---|---|
| HPP | | 350,000.00 | 320,000.00 | 242,857.00 |
| Import Duty | 50.00% | 175,000.00 | 160,000.00 | 121,428.50 |
| **PPh Import** | 10.00% | 35,000.00 | 32,000.00 | 24,285.70 |
| PPN | 10.00% | 35,000.00 | 32,000.00 | 24,285.70 |
| PPnBM | 0 - 125% | - | - | - |
| Carbon Excise | | (130,500.00) | (74,250.00) | 117,000.00 |
| BBN | 12.50% | 43,750.00 | 40,000.00 | 30,357.13 |
| PKB | 2.00% | 7,000.00 | 6,400.00 | 4,857.14 |
| Profit | 20.00% | 70,000.00 | 64,000.00 | 48,571.40 |
| TOTAL | | 585,250.00 | 580,150.00 | 613,642.57 |

| PARTICULAR | Tax Component | BeV 60 grCO2/km | HeV 85 grCO2/km | ICE 2000 180 grCO2/km |
|---|---|---|---|---|
| HPP | | 350,000.00 | 320,000.00 | 242,857.00 |
| Import Duty | 50.00% | 175,000.00 | 160,000.00 | 121,428.50 |
| **PPh Import** | 10.00% | 35,000.00 | 32,000.00 | 24,285.70 |
| PPN | 10.00% | 35,000.00 | 32,000.00 | 24,285.70 |
| PPnBM | 0 - 125% | 97,142.80 | 97,142.80 | 97,142.80 |
| Carbon Excise | | (130,500.00) | (74,250.00) | 117,000.00 |
| BBN | 12.50% | 43,750.00 | 40,000.00 | 30,357.13 |
| PKB | 2.00% | 7,000.00 | 6,400.00 | 4,857.14 |
| Profit | 20.00% | 70,000.00 | 64,000.00 | 48,571.40 |
| TOTAL | | 682,392.80 | 677,292.80 | 710,785.37 |

## 1. Pengecualian PPnBM sebagai instrument pengendalian CO2 tidak efektif:

- LCEV Tetap memiliki selling price yang lebih tinggi sehingga tidak diminati oleh pasar dan gagal melakukan penetrasi pasar.
- Produk yang tidak diminati oleh pasar akan ditinggalkan oleh auto-industry.

***Zero import duty, tapi mengancam industry nasional***

PMK-13/MK.010/2022 tentang Perubahan Keempat Atas Peraturan Menteri Keuangan Nomor 6/PMK.010/2017 tentang Penetapan Sistem Klasifikasi Barang dan Pembebanan Tarif Bea Masuk atas Barang Impor, 22 Februari 2022.

| PARTICULAR | Tax Tariff | BEV | HEV | ICE 2000 | Note |
|---|---|---|---|---|---|
| HPP | | 350.000.000 | 320.000.000 | 242.857.000 | |
| Impor duty | 50% | 17.500.000 | 16.000.000 | 121.428.500 | IKD |
| PPh Import | 10% | 35.000.000 | 32.000.000 | 24.285.700 | |
| PPN | 10% | 35.000.000 | 32.000.000 | 24.285.700 | |
| PPnBM | 0 - 125% | - | - | 97.142.800 | |
| BBN | 12,50% | 43.750.000 | 40.000.000 | 30.357.125 | |
| PKB | 2% | 7.000.000 | 6.400.000 | 4.857.140 | |
| Profit | 20% | 70.000.000 | 64.000.000 | 48.571.400 | |
| TOTAL | | 558.250.000 | 510.400.000 | 593.785.365 | |

## 2. Cukai Carbon dengan *Tax Feebate/Rebate Scheme* (efektif mengendalikan CO2):

- LCEV memiliki selling price lebih rendah sehingga kendaraan dengan CO2 lebih rendah akan diminati oleh pasar dan berhasil melakukan penetrasi pasar.
- Produk yang diminati oleh pasar akan menarik bagi auto-industry untuk investasi.

## 3. Cukai Carbon dengan *Tax Feebate/ Rebate Scheme* dengan mempertahankan PPnBM (efektif mengendalikan CO2):

- PPnBM tetap diberlakukan secara equal berdasarkan tingkat kemewahan kendaraan.
- Kendaraan dengan Carbon rendah tetap mampu bersaing karena memiliki penetrasi harga pasar yang lebih rendah.

- Cukai Carbon efektif men-*trigger* penetrasi pasar LCEV => mengendalikan vehicular CO2.
- Sementara PPnBM biarkan menjadi sumber pendapatan negara dari barang mewah.
- Pembebasan Bea Masuk, mengancam inovasi dan produksi dalam negeri.

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# Mimpi Produksi EV Nasional?

## Kesimpulan dan Rekomendasi

- *Electric Vehicle* dipromosikan sebagai pilihan transportasi masa depan yang berwawasan lingkungan dan dengan manfaat ekonomi serta *trigger* transportasi perkotaan yang berkelanjutan.
- Kajian LCA mengungkapkan adanya perbaikan kinerja lingkungan dan ekonomi jika kita beralih ICE tech ke kendaraan BEV.
  - Sekalipun untuk jangka pendek (2020) hanya mampu memberikan manfaat dalam pencegahan *fossil fuel depletion*.
  - Untuk Jangka Panjang 2030 - 2050 memberikan manfaat ke semua parameter yang dikaji (global warming, dampak radiasi ionisasi, pencemaran udara, land use dan solusi kelangkaan *fossil fuel*).
- Berdasar perspektif ekonomi, biaya siklus hidup (LCC/TCO) menunjukkan:
  - LCC analysis mobil listrik di Indonesia tidak kompetitif *(tidak ada insentif fiscal dan belum ada kepastiasn insentif tarif listrik sebagai kendaraan LCEV dan efisien energi)*. Justru mobil diesel adalah yang paling kompetitif, di mana total biaya siklus hidup lebih rendah dari yang lain (karena full of subsidy).
  - BEV adalah kendaraan yang paling hemat biaya selama tahap operasi, apalagi jika pengisian *battery BEV* dilakukan malam hari.
- **Agar tak sekadar bermimpi dapat mengaspalkan EV bahkan memiliki produk EV nasional**, segera menetapkan Low Carbon Standard; parallel dengan penetapan *Fiscal Policy with feebate/rebate scheme.*

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# *Terimakasih*

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