



Verification Report

for

**KPI 2 of Kingdom of Thailand's Sustainability-Linked Bond
Indexed to Annual Registrations of Zero Emission Vehicle
(ZEV) Passenger Cars and Pick-Up Trucks in 2024**

United Nations Development Programme (UNDP)

June 2025

Verification Report for KPI 2 of Kingdom of Thailand's Sustainability-Linked Bond Indexed to Annual Registrations of Zero Emission Vehicle (ZEV) Passenger Cars and Pick-Up Trucks in 2024

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The Verification Report is the result of a collaborative process involving UNDP staff, consultants, and academic experts from the National Energy Technology Center (ENTEC).

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1 Introduction

The Public Debt Management Office (PDMO) has requested United Nations Development Programme (UNDP) to fulfill the role of external verifier of the key performance indicator 2 (KPI 2) of the KOT Sustainability-Linked Financing Framework ¹ (hereinafter referred to as the Framework) published in October 2024. KPI 2 is on annual registrations of Zero Emission Vehicle (ZEV) passenger cars and pick-up trucks that is linked to Thailand's 30@30 policy, which entails that 30% of the vehicles produced within Thailand will be ZEVs by 2030 and includes sub-targets of ZEV manufacturing and utilization.

During March to June 2025, UNDP has carried out the verification process of KPI 2 presented in the 2024 KOT Sustainability-Linked Bond Progress Report (hereinafter referred to as the 2024 SLB Progress Report) dated June 2025 and calculated on the basis of the data from the Department of Land Transport (DLT) website².

The 2024 SLB Progress Report and the data from the DLT website were prepared and provided to UNDP by the Government of KOT between March and June 2025, according to schedule.

The Government of KOT warrants to UNDP the accuracy, integrity, quality, reliability and completeness of all technical data, files, documents, KPI value calculations and technical records, as well as any other data and materials made available to UNDP for the purpose of this verification report.

2 Scope of Verification

The verification is carried out for the key performance indicator 2 (KPI 2) of the KOT Sustainability-Linked Financing Framework published in October 2024 and reported in the 2024 SLB Progress Report dated June 2025 prepared by the Government of KOT:

KPI 2: Annual registrations of Zero Emission Vehicle (ZEV) passenger cars and pick-up trucks

SPT 2: Increase annual registrations of ZEV passenger cars and pick-up trucks by 476% by 2030, equivalent to 440,000 passenger cars and pick-up trucks

For the compilation of this KPI, the ZEV annual registration data has been derived and consolidated from the raw data disclosed on DLT website² and cross-checked against the information disclosed on the Thailand Automotive Institute (TAI) website³.

The scope of verification includes the performance of KPI 2 against SPT 2, the implementation status of the policy measures stated in the Framework with regards to KPI 2, and the alignment of the trajectory of KPI 2 with the one stated in the Framework.

¹ Available at:

https://www.pdmo.go.th/pdmomedia/documents/2024/Oct/PDMO%20SLB%20Framework_Final.pdf

² Available at: <https://web.dlt.go.th/statistics/>

³ Available at: <https://data.thaiauto.or.th/>

There is no verification of KPI 1 since the performance of KPI 1 was reviewed and verified as part of the NDC process performed by the team of technical experts of the UNFCCC via the International Consultation and Analysis process.

3 Verification Methodology

The technical review of the annual registrations of ZEV passenger cars and pick-up trucks under the Motor Vehicle Act in 2024 is conducted, with specific conclusions on:

- adherence to relevant international principles, guidelines, and standards, including TACCC principles set out in the Good Practice Guidance incorporated in the 2006 IPCC Guidelines⁴, namely the principles of transparency, accuracy, completeness, consistency, and comparability; Global Investors for Sustainable Development (GISD) Guidance on Sovereign SDG Bonds for Countries and Investors⁵; Sectoral Decarbonization Approach (SDA) of Science Based Targets Initiative⁶; and Sustainability Accounting Standards Board (SASB) Sector Standards⁷;
- compliance of the term passenger cars and pick-up trucks under the Motor Vehicle Act B.E. 2522⁸ and the term Zero Emission Vehicle (ZEV) with international and national practices^{9,10,11,12,13};
- validity of the compiled data sets from DLT website to represent the baseline annual registrations in 2023 and the target annual registrations in 2024;
- quality of data collection and reporting in accordance with the United Nations' Toolkit for Quality Assessment of Administrative Data for Official Statistics¹⁴, covering completeness, uniqueness, and validity;
- implementation status of the policy measures towards KOT's strategic goals under the 30@30 policy.

⁴ Available at: <https://www.ipcc.ch/report/2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/>

⁵ Available at: <https://gisdalliance.org/sites/default/files/2024-04/GISD%20Alliance%20Guidance%20on%20Sovereign%20SDG%20Bonds-FINAL.pdf>

⁶ Available at: <https://files.sciencebasedtargets.org/production/files/Sectoral-Decarbonization-Approach-Report.pdf>

⁷ IFRS Foundation (2023), Sustainability Accounting Standards Board (SASB) Sector Standards: Road Transportation

⁸ Available at: <https://www.dlt.go.th/th/dlt-knowledge/114>

⁹ European Union (2018), Regulation (EU) 2018/858 <https://eur-lex.europa.eu/eli/reg/2018/858/oj/eng>

¹⁰ European Union (2013), Regulation (EU) 168/2013 <https://eur-lex.europa.eu/eli/reg/2013/168/oj/eng>

¹¹ European Union (2021), Regulation (EU) 2021/2139 https://eur-lex.europa.eu/eli/reg_del/2021/2139/oj/eng

¹² ASEAN Taxonomy Board (2024), ASEAN Taxonomy for Sustainable Finance <https://asean.org/book/asean-taxonomy-for-sustainable-finance-version-3/>

¹³ Thailand Taxonomy Board (2023), Thailand Taxonomy Phase I <https://www.bot.or.th/en/financial-innovation/sustainable-finance/green/Thailand-Taxonomy.html>

¹⁴ Available at: <https://data.unwomen.org/sites/default/files/documents/Publications/2023/ESA-admin-data-toolkit.pdf>

4 Declaration of Competence and Independence

The verification activities were carried out between March and June 2025 by a qualified, multidisciplinary team of UNDP experts with good knowledge and experience in SLB and low carbon transport.

The verification fulfilled the requirements of independence, impartiality and other ethical requirements established in the UNDP Code of Ethics, which is based on the principles of integrity, accountability, transparency, professionalism, mutual respect and results orientation.

5 Activities Performed

The technical review of KPI 2 was conducted based on the 2024 SLB Progress Report and the data on registrations of ZEV passenger cars and pick-up trucks under the Motor Vehicle Act from the DLT website provided by PDMO.

The adherence of KPI 2 in the 2024 SLB Progress Report to relevant international principles, guidelines, and standards was confirmed. The compliance of the terms used to define KPI 2 was reviewed against international practices. The data of annual registrations of ZEV passenger cars and pick-up trucks under the Motor Vehicle Act in the 2024 SLB Progress Report were reviewed and cross-checked against the information disclosed on DLT and TAI websites. The quality of data collection and reporting of data on DLT website was assessed using the United Nations' Toolkit for Quality Assessment of Administrative Data.

Trajectories of annual and monthly registrations of ZEV passenger cars and pick-up trucks under the Motor Vehicle Act were developed to evaluate the prospect to achieve increase in annual registrations of ZEV passenger cars and pick-up trucks by 476% by 2030.

Finally, implementation status of the policy measures towards KOT's strategic goals under the 30@30 policy and other supporting policy measures were confirmed through consultations with relevant government agencies, including Office of Transport and Traffic Policy and Planning, Excise Department, Department of Land Transport (DLT), Office of Industrial Economics (OIE).

6 Verification Results

Monitoring of KPI 2 adheres to relevant international principles, guidelines, and standards, as follows.

- KPI 2 complies with **TACCC principles** which are good practice guidance of the 2006 IPCC Guidelines. It complies with the principle of **transparency** as the definition of KPI 2 along with the data source are clearly documented and the cross-calculation can be easily conducted. It complies with the principle of **accuracy** as it directly adopts the data sets available on DLT website which are automatically gathered through the online registration system from provincial offices. It complies with the principle of **consistency** as all annual registration data sets are based on newly registered vehicles on DLT website. KPI 2 generally complies with the principle of **comparability** as annual

registrations are basically represented by newly registered vehicles. While DLT website also includes the data sets of first registered vehicles which do not include vehicle re-registration and may better represent annual new registrations, the values are generally comparable to the newly registered vehicles, and they are not used by common users. Finally, KPI 2 complies with the principle of **completeness** since the annual registration data is sourced from government records which are based on mandatory reports by the registrants.

- KPI 2 principally adheres to **GISD Alliance Guidance on Sovereign SDG Bonds** as it is aligned with SDG 9 Industry, Innovation and Infrastructure and SDG 11 Sustainable Cities and Communities. Although the KPI is not directly aligned with the Nationally Determined Contributions (NDCs), it serves as a foundation for emission reduction in the transport sector, ensuring the alignment with existing NDC commitments.
- KPI 2 primarily adheres to **Sectoral Decarbonization Approach (SDA)** as the promotion of ZEVs aligns with the “**improve**” strategy which is among the three strategies to attain the emission reduction target for light-duty road passenger transport: avoid, shift and improve. The adoption of ZEVs to replace internal combustion engine vehicles offers higher efficiency and significantly contributes to GHG emission reduction.
- KPI 2 adheres to **Sustainability Accounting Standards Board (SASB) Sector Standards** as it aligns with TR-RO-110a.2. discussion of long- and short-term strategy or plan to manage Scope 1 emissions. Increasing the number of ZEVs is a strategic move towards Scope 1 emission reduction in the transport sector.

The term passenger cars and pick-up trucks under the Motor Vehicle Act B.E. 2522 and the term Zero Emission Vehicle (ZEV) used to define KPI 2 comply with international and national practices.

- The term passenger cars and pick-up trucks under the Motor Vehicle Act B.E. 2522 covers RY. 1, RY. 5, RY. 6, RY. 9, RY. 10, and RY. 11, which align with M1, M2, N1, and L7e under **EU Regulation 2018/858**.
- The term Zero Emission Vehicle (ZEV) is in the category of substantial contribution to climate change mitigation for vehicles under categories M1, M2, N1, and L under EU Taxonomy or **EU Regulation 2021/2139** as its direct CO₂ emissions are zero.
- The term Zero Emission Vehicle (ZEV) also complies with technical screening criteria of Tier 1 (Green) for vehicles under categories M, N, and L of **ASEAN Taxonomy for Sustainable Finance** as its direct CO₂ emissions are zero.
- Finally, the term Zero Emission Vehicle (ZEV) complies with criteria of Green category for passenger cars and freight transport operations by road of **Thailand taxonomy** as its direct (tailpipe) CO₂ emissions are zero.

The baseline annual registrations in 2023 and the annual registrations in 2024 of Zero Emission Vehicles (ZEV) passenger cars and pick-up trucks are compiled from the annual data set of newly registered battery electric vehicles and fuel cell electric vehicles which represent the actual annual registrations. The newly registered vehicles include re-registrations due to category change, do not include EV conversions, and do not include ZEVs registered under the Land

Transport Act B.E. 2522. However, the total number of these vehicles is less than 0.1% of the total ZEV passenger cars and pick-up trucks and have negligible effects on the results. When crosschecked with the data sets from the website of TAI which were compiled from a voluntary report by the vendors, the discrepancies were negligible, i.e., less than 0.1% of the total number.

In terms of quality of annual registration data compiled from DLT website, statistical system and institutional framework, input data, data processing, and statistical outputs generally comply with **UN Toolkit for Quality Assessment of Administrative Data for Official Statistics** in all dimensions: completeness, uniqueness, and validity.

- As for **completeness**, the source data of the annual registrations, newly registered vehicles, covers all types of registrations under the Motor Vehicle Act B.E. 2522 in a year, except for EV conversion of which the number is currently statistically insignificant.
- As for **uniqueness**, the data is automatically pulled from the mandatory registration at each DLT provincial office to the central system and the serial number which is unique to each vehicle is used to avoid double counting. Therefore, all data points are traceable.
- After the digitalization of the statistical system well before the collection of the baseline data set, the format and the type of annual registration data has always been consistent, ensuring the **validity** of all data sets used for KPI 2.

Policy measures under the **30@30 policy** and other policy measures that support the uptake of ZEV passenger cars and pick-up trucks are basically in place and effectively contribute to the increase in the annual registrations. Introduction of **carbon tax** to all types of fossil fuels can be a major driver for EV adoption once the unit price increases. Yet, recent policy direction that extends the scope of policy support to cover **all electrified vehicles (xEVs)**, including hybrid electric vehicles (HEV) and plug-in hybrid electric vehicles (PHEV), with the primary aim to sustain local automotive industry, has a potential to divert ZEV buyers to HEV and PHEV.

- **EV 3.5** follows the measures listed under EV 3.0, though the **subsidy for EV purchases** decreased, the **reductions of excise tax and import duties** are smaller, and the **local production requirement** is higher. However, as the monthly registrations continued to increase in 2024, the incentives can be viewed as sufficient to continuously drive the growth in EV annual registrations.
- The KOT government is also providing incentives for **other types of ZEV**, namely commercial fleets of large trucks and buses.
- Development of EV infrastructure, especially **EV charging outlets**, is one of the key policy measures to support further EV adoption. A committee was established under the Energy Policy and Planning Office to accelerate the installation of EV charging outlets.
- The KOT government also supports **battery industry** through grants for EV battery cell manufacturers and investment promotion for service centers for repair, repack, and reuse of used EV batteries and storage systems.
- **Carbon tax** was introduced in early 2025 to raise awareness of the public on the importance of carbon tax while it is included as a part of the existing oil excise tax so as not to affect the overall energy price.

- The KOT government is extending the scope of policy support to cover **xEVs** with the primary aim to sustain local automotive industry, e.g., the reconsideration of excise tax for PHEVs.

7 Conclusions

The KOT government submitted the 2024 KOT Sustainability-Linked Bond Progress Report, complying with the frequency established in KOT Sustainability-Linked Financing Framework. In UNDP's opinion, KPI 2 reported in the 2024 KOT Sustainability-Linked Bond Progress Report has been prepared in accordance with the methodology established in KOT Sustainability-Linked Financing Framework.

KPI 2 adheres to relevant international principles, guidelines, and standards, and terms used for KPI 2 generally comply with international practices. Data sets compiled from DLT website represent the baseline annual registrations in 2023 and the target annual registrations in 2024, and the data quality is in accordance with international practices. While it may be premature to definitively conclude that the annual registration trajectory is fully on track, the monthly registration data in 2024 indicates an upward trend. Policy measures promoting ZEV passenger cars and pick-up trucks are in place and appear effective in contributing to increased annual registrations.



Technical Review Report

for

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1 Introduction

This technical review explains the scope and methodology employed to verify performance of KPI 2 against SPT 2, and assessments which are designed to follow the scope and methodology. It elaborates important information compiled to support verification of KPI 2. It also discusses policy measures and strategies towards the achievement of KPI 2 against SPT 2.

This technical review contains two main sections including scope and methodology, and results. The former explains the adopted approaches for the verification, while the latter presents results of reviews and assessments for the verification of KPI 2 against SPT 2. Two sections share similarity in structure, comprising adherence to relevant international principles, guidelines, and standards; compliance of the definitions with international practices; validity of the compiled data set; quality of data collection and processing; and prospect of the trajectory of KPI 2 against SPT 2; and implementation status of policy measures towards 30@30 policy and other policy measures relevant to KPI 2.

2 Scope and Methodology

The verification includes the performance of KPI 2 against SPT 2, the implementation status of the policy measures stated in the Framework with regards to KPI 2, and the alignment of the trajectory of KPI 2 with the one stated in the Framework. In order to verify the performance of KPI 2, ZEV annual registration data has been derived and consolidated from the raw data disclosed on DLT website and statistically cross-checked against the information disclosed on the Thailand Automotive Institute (TAI) website.

With regard to the verification of KPI 2 against SPT 2, annual registrations of ZEV passenger cars and pick-up trucks under the Motor Vehicle Act are utilized. Additionally, statistical trends of monthly registration of ZEV passenger cars and pick-up trucks in 2024 are gathered and statistically analyzed to confirm trajectory against attainment of SPT 2: increase annual registrations of ZEV passenger cars and pick-up trucks by 476% by 2030, equivalent to 440,000 passenger cars and pick-up trucks.

With regard to the verification of the implementation status of the policy measures, policy measures stated in the Framework and the 2024 SLB Progress Report, particularly, policy measures to achieve the targets under 30@30 policy, electric vehicle promotion policies, and policies to prepare supporting infrastructure and ecosystem are analyzed.

2.1 Adherence to relevant international principles, guidelines, and standards

Verification of the adherence of KPI 2 to relevant international principles, guidelines, and standards is designed to examine international documents, including TACCC principles incorporated in the Good Practice Guidance incorporated in the 2006 IPCC Guidelines, Global Investors for Sustainable Development (GISD) Guidance on Sovereign SDG Bonds for Countries and Investors, Sectoral Decarbonization Approach (SDA), and Sustainability Accounting Standards Board (SASB) Sector Standards.

TACCC Principles provide crucial guidance to ensure rigorous and robust practice for national inventory, ascertaining data quality and usefulness. The principles, including transparency, accuracy, consistency, comparability, and completeness, are the core part of the 2006 IPCC Guidelines.

GISD Guidance on Sovereign SDG Bonds introduces principles to guide bond issuers, investors, and relevant stakeholders in achieving United Nations' Sustainable Development Goals (SDGs).

SDA of Science Based Targets Initiative is promoted to be a method for setting greenhouse gas emission reduction targets with climate science basis, in which the target aligns with the Paris Agreement's to limit global warming to 2°C above pre-industrial level.

SASB Sector Standards guides entities to disclose sectoral information regarding sustainability-related risks and opportunities.

2.2 Compliance of definitions with international practices

Classifications of passenger cars and pick-up truck in Thai and international standards are first investigated. Alignment of passenger cars and pick-up truck classifications in the Motor Vehicle Act B.E. 2522 and EU Regulation 2018/828 are then compared.

The definition of ZEV is finally confirmed against EU Taxonomy or the Commission Delegated Regulation (EU) 2021/2139, ASEAN Taxonomy for Sustainable Finance, and Thailand Taxonomy to identify the level of contribution to greenhouse gas emission reduction.

2.3 Validity of the complied data set

For the validation of data sets for annual registrations of ZEV passenger cars and pickup trucks, two data sets, including newly registered vehicles and first registered vehicles, were examined in detail according to information in the Land Transport Act. The suitable data set was selected to be utilized for the verification.

In order to ensure the validity of the data sets on annual registrations disclosed on the Department of Land Transport (DLT) website, the data sets were cross-checked with information disclosed on the Thailand Automotive Institute (TAI) website.

2.4 Quality of data collection and processing

Quality of data collection, processing, and reporting is confirmed against the United Nations' Toolkit for Quality Assessment of Administrative Data for Official Statistics. The Toolkit covers major statistical data elements, including statistical system and institutional environment, input/source data, data processing, and statistical output. Three dimensions to assess the quality of the four elements include completeness, uniqueness, and validity. The Toolkit is perceived as a tool to assist in carrying out quality assessment of administrative data for official statistics.

2.5 Prospect of the trajectory of KPI 2 against SPT 2

Prospect of the trajectory of KPI 2 against SPT 2 is assessed using information disclosed on DLT website. The trend of historical data is investigated based on monthly registration in 2024, and linear extrapolation of the said historical registration.

Confirmation of statistical values obtained from DLT website ensures traceability of data on annual registrations. Investigation on trends of historical data of monthly registration helps explore purchase behavior according to important events in relation to EV promotion. Linear extrapolation of historical registrations predicts future trend of EV registrations against SPT 2.

2.6 Implementation status of policy measures

The achievements of KPI 2 and SPI 2 can be reached with several key policies deployed to increase annual registrations of ZEV. This report reviews current status of such policy measures. The reviews include EV 3.0 and EV 3.5 incentive packages, momentum of electric truck and bus deployments, relevant policy measures on supply chain and supporting infrastructure, and carbon tax.

EV 3.0 incentive package is the very first incentive package that promoted ZEV production and utilization in Thailand. Though the package expired in December 2023, the surge of ZEV purchase was created, leading to the rise of annual registrations.

EV 3.5 incentive package is the following incentive package that aims to promote ZEV deployment through subsidies. The package continues reduction of excise tax yet declines the reduction of import duties for high-priced vehicles and requires more local production.

For other types of vehicles, national policy to support the fleet deployment of large trucks and buses with batteries is reviewed to understand how the government encourages companies in the pursuit of commercial fleets.

In order to ensure growth in EV registrations, supporting infrastructure, in particular public charging stations, must be sufficiently prepared. The current situation and enabling policy for public charging stations are reviewed to ensure that the public's demand is fulfilled.

Finally, the details of carbon tax announced earlier this year to increase public awareness in the importance of greenhouse gas emission reduction are reviewed to ensure its support towards increase in EV registrations.

3 Results

3.1 Adherence to relevant international principles, guidelines, and standards

The **TACCC Principles** were introduced as good practice guidance and later integrated into the IPCC Guidelines to ensure the accuracy of estimated GHG inventories and to establish a systematic approach for conducting national inventory estimation. While the principles are based on the practices for the estimation of GHG emissions, they are deemed applicable to KPI 2 estimation against SPT 2 as they are meant to contribute to GHG emission reduction in the transport sector. The adherence to each principle can be confirmed as follows¹:

- 1. Transparency:** Assumptions and methodologies must be clearly explained and documented to facilitate replication and assessment. As KPI 2 and SPT 2 are based on the publicly available annual registration data on the Department of Land Transport (DLT) website, where the definitions are clearly documented and the cross-calculation can be easily conducted, the practice adopted to confirm the fulfillment of KPI 2 against SPT 2 is transparent.
- 2. Accuracy:** A relative measure of the exactness of the estimates, ensuring that calculations are neither systematically over- nor underestimated, based on the best available data and information. The annual registration data available on DLT website is based on the online registration system, to which the data is gathered from provincial land transport offices. Therefore, it can be assumed that the annual registration data on the website is highly accurate.
- 3. Consistency:** The estimates must be internally consistent across all their elements and with the estimates from previous years. The same methodologies should be applied to both the base year and all subsequent years, ensuring uniformity in data sets. The annual registration data used for KPI 2 and SPT 2 is based on newly registered vehicles for both the base year (2023) and the subsequent year (2024), showing the consistency of the approach.
- 4. Comparability:** The estimates must be comparable among Parties, adhering to globally recognized methodologies and formats. Annual registrations are generally represented by the newly registered vehicles. However, the newly registered vehicles under the Motor Vehicle Act B.E. 2522 include vehicle re-registration due to the change of the vehicle category, e.g., from a private car to a taxi. While the DLT website also shows the statistics of the first registered vehicles which do not include such vehicles, the data is not commonly known and is not used by common users. In addition, both data sets do not include EV conversions, i.e., conversion from internal combustion engine vehicles to electric vehicles. However, given the consistency with the base year and the fact that the number of re-registrations and the number of EV conversions are currently very small (both less than 0.1%), the newly registered vehicles can continue to be used as the source of data for KPI 2 and SPT 2.

¹ IPCC (2006) 2006 IPCC Guidelines for National Greenhouse Gas Inventories
<https://www.ipcc.ch/report/2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/>

- 5. Completeness:** The estimates must be reported for all relevant categories. Since the annual registration data is sourced from government records which are based on mandatory reports by the registrants, the data sets used for the estimation of KPI 2 against SPT 2 are considered complete.

GISD Alliance Guidance on Sovereign SDG Bonds provides a set of principles and recommendations to guide sovereign bond issuers, investors, and other stakeholders in supporting the United Nations' Sustainable Development Goals (SDGs) through sovereign debt issuance. Sovereign SDG bonds are instruments issued by governments to finance projects that contribute to the SDGs, such as poverty reduction, climate action, and sustainable infrastructure.

KPI 2 is aligned with SDG 9 and SDG 11 as detailed as follows.

- 1. SDG 9 Industry, Innovation and Infrastructure:** The attainment of KPI 2 contributes to the acceleration in adoption of electric vehicles, which is a part of the ambition to develop quality, reliable, sustainable and resilient infrastructure.
- 2. SDG 11 Sustainable Cities and Communities (11.2):** The fulfillment of KPI 2 contributes to the provision of access for people in cities and communities to sustainable transport systems.

Although the KPI is not directly aligned with the NDC which is another essential target that the sovereign SDG bonds should aim to fulfill, it serves as a foundation for emission reduction in the transport sector, ensuring the alignment with existing NDC commitments. In addition, KPI 1 shows full alignment with the NDC and perfectly complement KPI 2.

Sectoral Decarbonization Approach (SDA) introduced as a science-based method for those who aimed for setting greenhouse gas emission reduction targets necessary to stay within a 2°C temperature rise. The approach indicated sectors that have emission reduction potential to remain at the 2°C temperature rise. Light-duty road passenger transport is one of the indicated sectors where the strategies to attain the emission reduction target include:

- 1. Avoid** – slows individual travel growth via city planning and demand management.
- 2. Shift** – enables people and business to shift to more efficient modes, such as rail.
- 3. Improve** – encourages the adoption of new technologies and fuels².

ZEVs primarily align with the "improve" strategy as they encourage the adoption of electricity-driven vehicles to replace those powered by internal combustion engines, offering higher efficiency and contributing significantly to GHG emission reduction.

Sustainability Accounting Standards Board (SASB) Sector Standards intended to guide entities in disclosing information regarding sustainability-related risks and opportunities. The standards determine which disclosure topics are relevant.

² Science Based Targets (2015), Sectoral Decarbonization Approach (SDA): A method for setting corporate emission reduction targets in line with climate science

Regarding road transportation, the standards encourage entities to disclose the following information:

1. **TR-RO-110a.1.** Gross global Scope 1 emissions;
2. **TR-RO-110a.2.** Discussion of long- and short-term strategy or plan to manage Scope 1 emissions, emissions reduction targets, and an analysis of performance against those targets;
3. **TR-RO-110a.3.** (1) Total fuel consumed, (2) percentage natural gas and (3) percentage renewable.

In relation to these disclosures, KPI 2 aligns with TR-RO-110a.2, as it involves increasing the number of ZEV, a strategic move towards Scope 1 emission reduction in the transport sector. Furthermore, if the Measurement, Reporting, and Verification (MRV) scheme is adopted to ensure the linkage between the number of annual registrations and the emission reduction, KPI 2 will also fall under TR-RO-110a.1.³

3.2 Compliance of definitions with international practices

3.2.1 Passenger cars & pick-up trucks

Vehicles in Thailand are classified into 17 categories according to the Motor Vehicle Act B.E. 2522 taken charge by Department of Land Transport (DLT), as detailed below.

- RY. 1 Sedan
- RY. 2 Microbus & passenger van
- RY. 3 Van & pick-up
- RY. 4 Motor-tricycle
- RY. 5 Interprovincial taxi
- RY. 6 Urban taxi
- RY. 7 Fixed route taxi
- RY. 8 Tuk Tuk
- RY. 9 Hotel taxi
- RY. 10 Tour taxi
- RY. 11 Car for hire
- RY. 12 Motorcycle
- RY. 13 Tractor
- RY. 14 Road roller
- RY. 15 Farm vehicle
- RY. 16 Automobile trailer
- RY. 17 Public motorcycle

The verification of KPI 2 focuses on passenger cars and pick-up trucks, which covers eight specific categories of vehicles under the Motor Vehicle Act B.E. 2522, as follows.

³ IFRS Foundation (2023), Sustainability Accounting Standards Board (SASB) Sector Standards: Road Transportation

RY. 1 Sedan (not more than 7 passengers) refers to a passenger car with seating capacity of no more than seven passengers⁴ as shown in Figure 1.

๑. รถยนต์นั่งส่วนบุคคลไม่เกิน ๗ คน (รย. ๑)

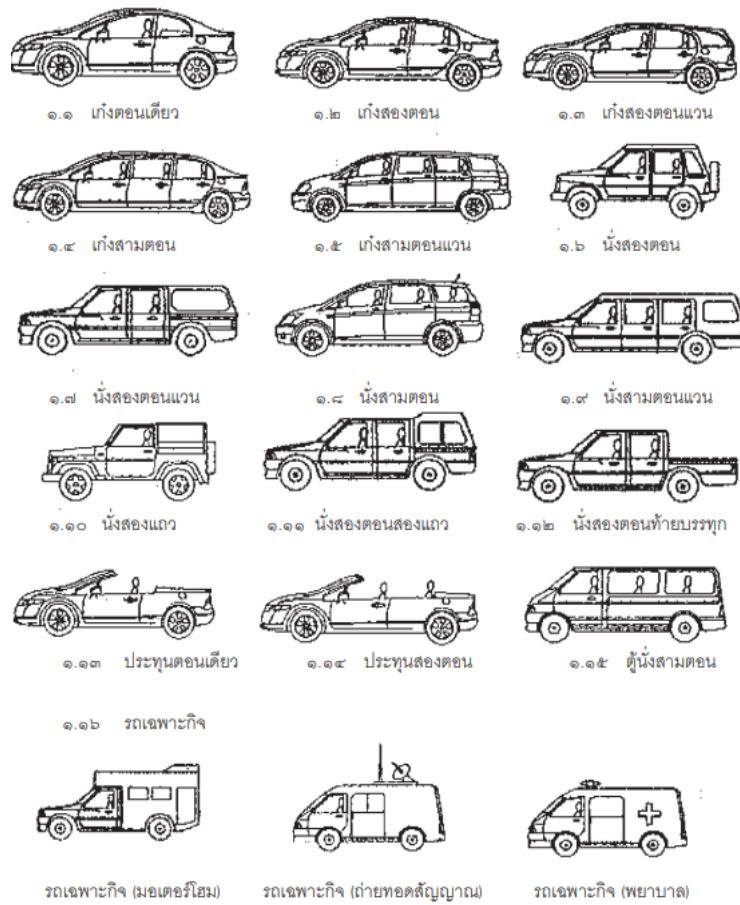


Figure 1 Sedan

⁴ DLT, New Vehicle Registration Statistics <https://web.dlt.go.th/statistics/>

RY. 2 Microbus & passenger van refers to a passenger car with seating capacity of more than seven passengers⁴ as shown in Figure 2.

๒. รถยนต์นั่งส่วนบุคคลเกิน ๗ คน (รย. ๒)

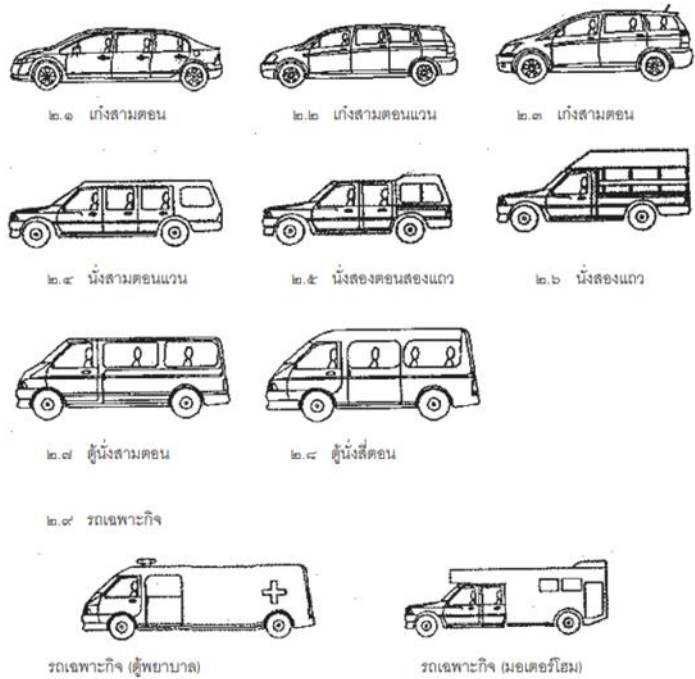


Figure 2 Microbus & passenger van

RY. 3 Van & pick-up refers to a carriage of goods⁴ as shown in Figure 3.

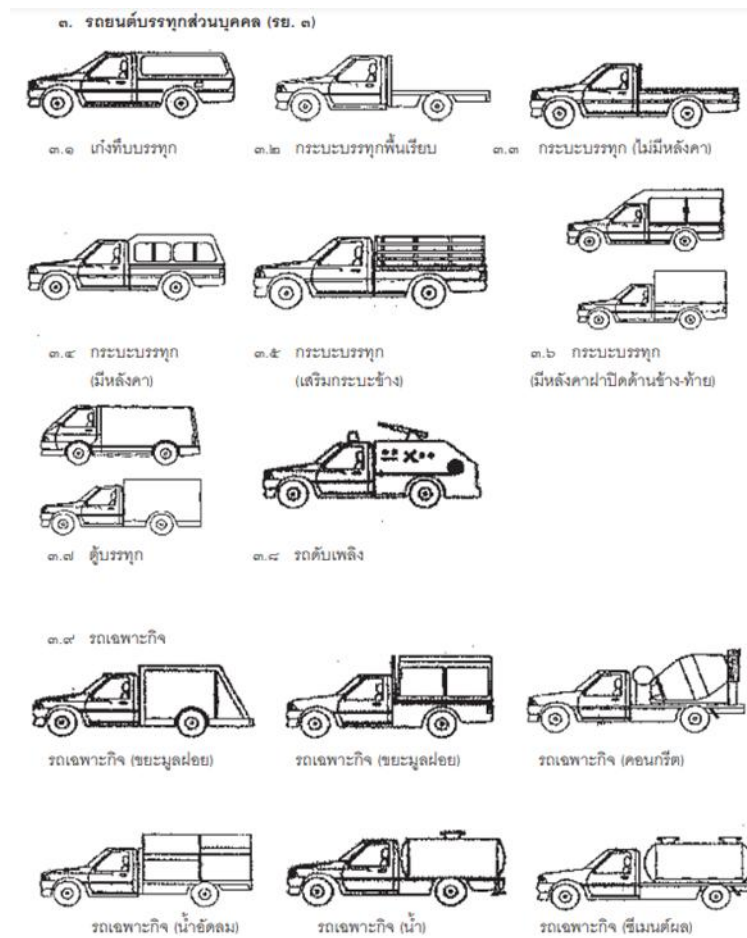


Figure 3 Van and pick up

RY. 5 Interprovincial taxi refers to a passenger car for hire with seating capacity of no more than seven passengers⁴ as shown in Figure 4.



Figure 4 Interprovincial taxi

RY. 6 Urban taxi refers to a passenger car for hire with seating capacity of no more than seven passengers⁴ as shown in Figure 5.

๖. รถยนต์รับจ้างบรรทุกคนโดยสารไม่เกิน ๗ คน (รย. ๖)

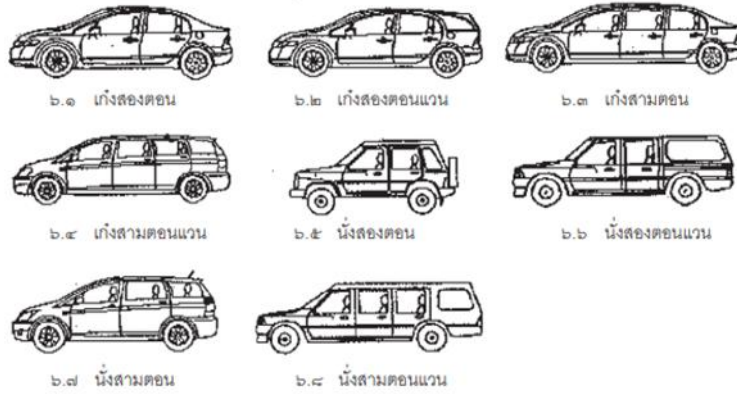


Figure 5 Urban taxi

RY. 9 Hotel taxi refers to a public passenger vehicle which is used to transport passengers between airports, ports, bus stations, train stations, or to transport passengers to hotels, residences, passenger offices, or business operators, and carries no more than seven passengers⁴ as shown in Figure 6.

๙. รถยนต์บริการธุรกิจ (รย. ๙)



Figure 6 Hotel taxi

RY. 10 Tour taxi refers to a passenger car or a rental car with at least four doors which is a registered vehicle that tourism business operators use to transport passengers for tourism, with seating capacity of no more than seven passengers⁴ as shown in Figure 7.

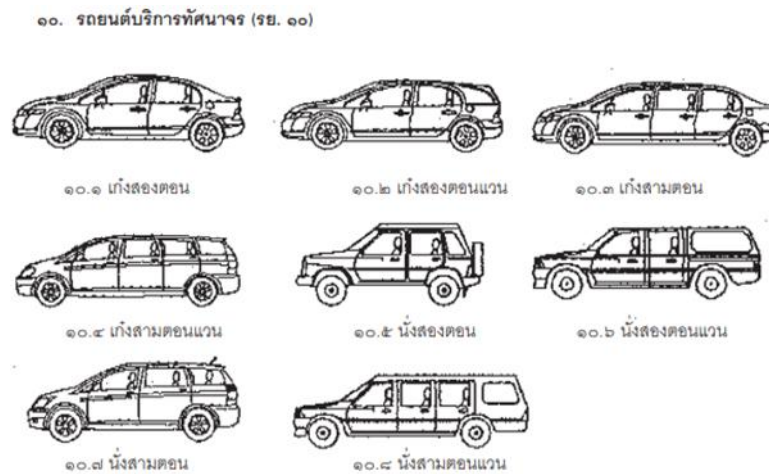


Figure 7 Tour taxi

RY. 11 Car for hire refers to a passenger car or a rental car that can seat only seven people and is a car provided for rent, not for hire to transport passengers or goods⁴ as shown in Figure 8.



Figure 8 Car for hire

3.2.2 Zero Emission Vehicle (ZEV)

As per EU vehicle classification, vehicles are classified for regulatory purposes into the following main groups⁵:

- Category M: vehicles carrying passengers;
- Category N: vehicles carrying goods;
- Category L: two- and three-wheel vehicles and quadricycles;
- Category T: agricultural and forestry tractors and their trailers.

⁵ European Commission, Vehicle categories https://single-market-economy.ec.europa.eu/sectors/automotive-industry/vehicle-categories_en

Vehicles classified under Category M (passenger vehicles) and Category N (goods vehicles) are further divided into: light-duty vehicles (passenger cars and vans), or heavy-duty vehicles (trucks, buses, and coaches)⁵

Passenger cars and pick-up trucks covering eight categories under the Motor Vehicle Act B.E. 2522 correspond to several vehicle types under EU Regulation 2018/858 which classifies vehicle types into two main categories: Category M (vehicles designed for the carriage of passengers and their luggage) and Category N (vehicles designed for the carriage of goods).

Table 1 presents the alignment of Thai vehicle classifications with EU regulation vehicle categories. Motor Vehicle Act B.E. 2522 classifies vehicles based on their intended use, number of seats, and vehicle dimensions. Vehicle classification under EU Regulation 2018/858 is also based on intended use and number of seats, while it accounts for vehicle weight rather than vehicle dimensions.

Table 1 confirms the compliance of Thai vehicle categorization with EU Regulation 2018/858, with the exception of heavy quadricycles under RY. 1 which falls under Category L7e under EU Regulation 168/2013.

Table 1 Compliance of Thai vehicle standards with EU Regulation 2018/858⁶

Motor Vehicle Act B.E. 2522	EU Regulation 2018/858	
RY. 1, RY. 5, RY. 6, RY. 9, RY. 10, RY. 11	M1: Motor Vehicle with not more than eight seating positioning	Category M (the carriage of passengers and their luggage)
RY. 2	M2: Motor Vehicle with more than eight seating positions and having a maximum mass not exceeding 5 tonnes	
	M3: Motor Vehicle with more than eight seating positions and having a maximum mass exceeding 5 tonnes	
RY. 3	N1: Motor Vehicle with a maximum mass not exceeding 3.5 tonnes	Category N (the carriage of goods)
	N2: Motor Vehicle with a maximum mass exceeding 3.5 tonnes but not exceeding 12 tonnes	
	N3: Motor Vehicle with a maximum mass exceeding 12 tonnes	

Note: RY. 1 also include L7e vehicles (heavy quadricycles) under EU Regulation 168/2013⁷

⁶ European Union (2018), Regulation (EU) 2018/858 <https://eur-lex.europa.eu/eli/reg/2018/858/oj/eng>

⁷ European Union (2013), Regulation (EU) 168/2013 <https://eur-lex.europa.eu/eli/reg/2013/168/oj/eng>

EU Taxonomy or the Commission Delegated Regulation (EU) 2021/2139⁸ introduced technical screening criteria to determine the conditions under which an economic activity qualifies as contributing substantially to climate change mitigation or climate adaptation. ZEV proposed in KPI 2 of which the direct (tailpipe) CO₂ emissions are zero complies with technical screening criteria of **substantial contribution to climate change mitigation**, detailed as follows.

1. Urban and suburban transport, road passenger transport

- a. The activity provides urban or suburban passenger transport, and its direct (tailpipe) CO₂ emissions are zero.

2. Transport by motorbikes, passenger cars and light commercial vehicles

- a. For vehicles of category M1 and N1: Until 31 December 2025, specific emissions of CO₂, as defined in Article 3(1), point (h), of Regulation (EU) 2019/631, are lower than 50 gCO₂/km (low- and zero-emission light-duty vehicles). From 1 January 2026, specific emissions of CO₂, as defined in Article 3(1), point (h), of Regulation (EU) 2019/631, are zero.
- b. For vehicles of category L, the tailpipe CO₂ emissions equal to 0 gCO_{2e}/km calculated in accordance with the emission test laid down in Regulation (EU) 168/2013.

Compliance of KPI 2 against **ASEAN Taxonomy for Sustainable Finance**⁹ was also confirmed. The document was developed as a designated guide for just energy transition towards sustainable finance and harmonizing classification of sustainable activities across ASEAN. ZEV proposed in KPI 2 of which the direct (tailpipe) CO₂ emissions are zero complies with technical screening criteria of **Tier 1 (Green)** as follows.

1. Urban and suburban transport, road passenger transport

- a. The activity provides urban or suburban passenger transport, and its direct (tailpipe) CO₂ emissions are zero.

2. Transport by motorbikes, passenger cars and light commercial vehicles

- a. For vehicles of category M1 and N1: Until 31 December 2025, direct emissions of CO₂ are < 50 gCO_{2e}/v-km. From 1 January 2026, direct emissions of CO₂ are 0 gCO_{2e}/v-km.
- b. For vehicles of category L, tailpipe CO₂ emissions are 0 gCO_{2e}/v-km.

Compliance of KPI 2 against **Thailand Taxonomy**¹⁰ was also confirmed. The taxonomy aims to provide guidance, frameworks and standards for investors and stakeholders, attract international climate-oriented capital, enable and harmonize data disclosure, assess environmental risks and risk mitigation options, modulate state policy in the desired manner, and

⁸ European Union (2021), Regulation (EU) 2021/2139 https://eur-lex.europa.eu/eli/reg_del/2021/2139/oj/eng

⁹ ASEAN Taxonomy Board (2024), ASEAN Taxonomy for Sustainable Finance <https://asean.org/book/asean-taxonomy-for-sustainable-finance-version-3/>

¹⁰ Thailand Taxonomy Board (2023), Thailand Taxonomy Phase I <https://www.bot.or.th/en/financial-innovation/sustainable-finance/green/Thailand-Taxonomy.html>

serve as a basis for data collection. ZEV proposed in KPI 2 of which the direct (tailpipe) CO₂ emissions are zero complies with criteria of **Green** category as follows.

1. Other passenger land transport (which includes passenger cars)

- a. Direct (tailpipe) CO₂ emissions of the vehicle are zero.

2. Freight transport by road (which includes all freight transport operations by road)

- a. Direct (tailpipe) CO₂ emissions of vehicles are zero, and vehicles are not dedicated to fossil fuel transport.

3.3 Validity of the complied data set

3.3.1 Newly registered vehicles and first registered vehicles

The annual registrations in KPI 2 correspond to the number of ZEV passenger cars and pick-up trucks that are newly registered in a specific year. There are two data sets on DLT website that may represent the annual registrations, namely the newly registered vehicles and the first registered vehicles.

The definitions of vehicles categorized as **newly registered vehicles** are shown as follows.

- New vehicles produced from domestic factories or vehicles imported from abroad for sale;
- New vehicles obtained from the Customs Department auction;
- New vehicles imported from overseas that are not for sale;
- Vehicles that have been registered under the Military Vehicle Act or vehicles that have been registered and have a symbol according to the regulations set by the Commissioner-General of the Police Department;
- Vehicles imported into the Kingdom as "used vehicles" that are not for sale;
- Vehicles made from old car parts;
- A vehicle assembled from some old car parts;
- Vehicles purchased from government auctions without registration or where the actual registration cannot be verified;
- Vehicles with chassis changes;
- The car that was previously reported not to be used forever;
- Vehicles previously registered under the Land Transport Act.

It should be noted that as the newly registered vehicles include the vehicles previously registered under the Land Transport Act, it includes re-registered vehicles due to category changes, e.g., from a private car to a taxi. It also does not include a vehicle converted from a vehicle driven by internal combustion engine to a battery-powered vehicle, i.e., EV conversion. These vehicles will only need to report the change of fuel type (from gasoline or diesel to electricity) while it is not required to renew the registration as its category remains the same. In addition, it also does not include vehicles registered under the Land Transport Act B.E. 2522.

First registered vehicles refer to newly registered vehicles, which have never been registered anywhere before, and are registered for the first time according to the Motor Vehicle Act or the Land Transport Act and have already paid taxes. This only includes the following cases:

1. New vehicles produced from domestic factories or vehicles imported from abroad for sale;
2. New vehicles obtained from auctions by the Customs Department that have never been registered anywhere before;
3. New vehicles imported from overseas that are not for sale.

First registered vehicles also do not include EV conversion and vehicles registered under the Land Transport Act B.E. 2522. Additionally, the data set was not used for the preparation of the Sustainability-linked Financing Framework. Given that the total number of re-registered ZEVs, converted ZEVs, and ZEVs registered under the Land Transport Act B.E. 2522, are less than 0.1% of the total ZEV passenger cars and pick-up trucks and have negligible effects on the annual registrations of ZEV passenger cars and pick-up trucks, it is advisable to use the data set of newly registered vehicles for the verification of KPI 2 with the attention on re-registered ZEVs, converted ZEVs, and ZEVs registered under the Land Transport Act B.E. 2522.

3.3.2 Crosschecking with vendor reporting

Thailand Automotive Institute (TAI) publishes the sales of ZEVs based on a voluntary report by the vendors on its website. The annual sales of ZEV passenger cars and pick-up trucks compiled from vendors' voluntary report generally agrees with the data sets based on mandatory report on DLT website. The discrepancies were negligible, i.e., less than 0.1% of the total number. It is also worth noting that the updates of TAI website are slightly slower than DLT website as the reporting is not mandatory and not automatically done through a digitalized statistical system.

3.4 Quality of data collection and processing

Data quality assurance framework, as outlined in the **UN Toolkit for Quality Assessment of Administrative Data for Official Statistics**, covers data quality assurance of four key elements¹¹:

1. **Statistical system and institutional environment:** This refers to the overall framework within which data is collected, processed, and disseminated, ensuring proper governance and institutional support for data management.
2. **Input/source data:** This concerns the original data collected, ensuring that it is accurate, reliable, and representative of the population or phenomenon being studied.
3. **Data processing:** This involves the methods and procedures used to clean, transform, and analyze the raw data, ensuring that any errors or inconsistencies are addressed, and that the data is appropriately prepared for analysis.

¹¹ UN Women and UNSD (2022), Toolkit for Quality Assessment of Administrative Data for Official Statistics <https://data.unwomen.org/sites/default/files/documents/Publications/2023/ESA-admin-data-toolkit.pdf>

- 4. Statistical outputs:** This refers to the final data products or reports that are disseminated, ensuring they are relevant, accurate, and useful for the intended audience.

There are three dimensions to assess the quality of the four elements of the administrative data:

- 1. Completeness:** This dimension measures the extent to which the data source includes all the necessary information to fully describe the subject matter as required by the users of the statistical product. The source data of the newly registered vehicles, representing the annual registrations of ZEV passenger cars and pickup trucks, covers all relevant types of registrations in a year except for EV conversion. However, as mentioned above, the number of EV conversions is currently statistically insignificant.
- 2. Uniqueness:** This dimension evaluates whether each data point can be traced back to an individual unit within the population, ensuring no duplication in the data. Since the data sets of newly registered ZEV passenger cars and pickup trucks are automatically pulled from the mandatory registration at each DLT provincial office to the central system, and the serial number which is unique to each vehicle is used to avoid double counting, all data points are traceable.
- 3. Validity:** This measures how well the data conforms to the expected format, type, and range, ensuring the data is consistent with predefined standards and expectations. The validity of the data sets of newly registered ZEV passenger cars and pickup trucks is ensured as the format and the type of data has always been consistent after the digitalization of the statistical system well before the collection of the baseline data set.

It can therefore be concluded that statistical system and institutional framework, input data, data processing, and statistical outputs of the data sets of newly registered ZEV passenger cars and pickup trucks compiled from DLT website generally comply with UN Toolkit for Quality Assessment of Administrative Data for Official Statistics.

3.5 Prospect of the trajectory of KPI 2 against SPT 2

3.5.1 Baseline and 2024 annual registrations of ZEV passenger cars and pick-up trucks

Table 2 shows the recalculation of the annual registrations of ZEV passenger cars and pick-up trucks under the Motor Vehicle Act shown on the 2024 SLB Progress Report based on publicly available data sets on DLT website. The 2024 SLB Progress Report also compiled the annual registrations of all passenger cars and pick-up trucks and calculated the ZEV market share and achievement against SPT 2. The recalculated data matched perfectly with the information provided in the 2024 SLB Progress Report, showing the validity and traceability of the calculation. The annual registrations of ZEV passenger cars and pick-up trucks slightly decreased from 76,361 in 2023 (baseline year) to 70,582 in 2024. Yet, it can also be observed from Table 2 that the annual registrations of all passenger cars and pick-up trucks also decreased by nearly one fourth. The market share of ZEV within the sector of passenger cars and pick-up trucks actually increased from 9.01% in 2023 to 10.87% in 2024.

Table 2 Information for evaluation of annual registrations of ZEV passenger cars and pick-up trucks

Item	Unit	2019	2020	2021	2022	2023	2024
Total passenger cars and pick-up trucks registered	Car	1,018,722	818,810	779,924	890,615	847,385	649,280
Number of registered ZEV passenger cars and pick-up trucks	Car	691	1,288	1,958	9,674	76,361	70,582
ZEV market share	%	0.07	0.16	0.25	1.09	9.01	10.87
Achievement against target	%	0.16	0.29	0.45	2.20	17.35	16.04

3.5.2 2024 monthly registrations of ZEV passenger cars and pick-up trucks

Monthly registration of ZEV passenger cars and pick-up trucks was plotted to confirm the trend of customers' appetite for ZEVs. Figure 9 shows the monthly registration of ZEV passenger cars and pick-up trucks in 2024. The spike in January is due to a national level automotive event paired with the leftover buyers benefitting from EV 3.0 and should be considered an outlier. Linear regression of the remaining months shows a gradual increase in monthly registrations in 2024. This synchronizes with the fact that the ZEV market share is increasing.

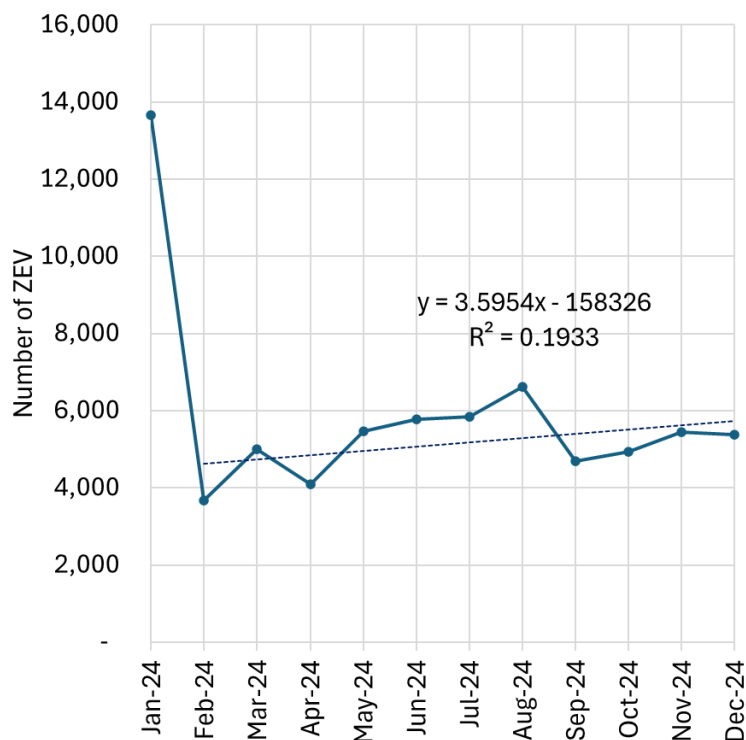


Figure 9 Monthly registrations of ZEV passenger cars and pick-up trucks

3.6 Implementation status of policy measures

Striving to attain KPI 2 against SPT 2 aligns well with multiple policies designed to accelerate the annual registrations of ZEVs. The following policies serve as key strategies to drive the adoption of ZEVs, and their implementation status was confirmed.

3.6.1 EV 3.0 and EV 3.5 incentive packages

EV 3.0 incentive package was issued to support the acceleration of ZEV production and utilization in Thailand. It provided subsidies for purchasing an EV and reduction of excise tax and import duties, and in turn requires local production from the manufacturers as detailed below.

1. Subsidy for EV purchase

- a. 70,000 THB subsidy for EV passenger cars priced not more than 2 million THB, with a capacity < 30 kWh battery
- b. 150,000 THB subsidy for EV passenger cars and pick-up trucks priced not more than 2 million THB, with a capacity > 30 kWh battery

2. Reduction of excise tax and import duties

- a. Reduction of excise tax from 8 to 2% with additional reduction in import duties up to 40% for EV passenger cars priced not more than 2 million THB.
- b. Reduction of excise tax from 8 to 2% with additional reduction in import duties up to 20% for EV passenger cars priced over 2 million THB.

3. Local production requirement

- a. A ratio of 1:1 local production to those imported in 2024
- b. A ratio of 1:1.5 local production to those imported in 2025

Although the incentive package expired in December 2023, the implementation has successfully led to an increase in the number of EVs and a significant growth in the domestic market.

EV 3.5 incentive package superseded EV 3.0 incentive package to continue subsidies for EV purchase at lower rates. It maintained the reduction of excise tax, but it did not cut import duties for high-price vehicles. It also increased the requirement for local production as detailed below.

1. Subsidy for EV purchase

- a. 25,000 to 50,000 THB for EV passenger cars and pick-up trucks priced under 2 million THB, with a capacity < 50kWh battery
- b. 50,000 to 100,000 THB for EV passenger cars and pick-up trucks priced under 2 million THB, with a capacity > 50kWh battery

2. Reduction of excise tax and import duties

- a. Reduction of excise tax from 8 to 2% with additional reduction in import duties up to 40% for EV passenger cars priced not more than 2 million THB.
- b. Reduction of excise tax from 8 to 2% for EV passenger cars priced over 2 million THB but not more than 7 million THB.

3. Local production requirement

- a. A ratio of 1:2 locally production or import by 2026
- b. A ratio of 1:3 locally production or import by 2027

In December 2024, the EV Board approved extended production timeframe for ZEVs to allow ZEV manufacturers to cope with the stagnation of domestic ZEV purchases. The portion of the production commitment not completed under EV 3.0 package will be transferred to the conditions of EV 3.5 package, but it will not receive subsidies under either package. The subsidies for EV 3.5 package will only come into force once the production for the amount transferred from EV 3.0 package is completed¹².

3.6.2 Support for commercial fleets of large electric trucks and buses

The EV Board also approved a tax incentive to encourage companies to transition commercial fleets of large trucks and buses to ZEVs in February 2024. Companies buying ZEVs manufactured domestically and imported ZEVs can deduct expenses of two times and 1.5 times the actual price of the vehicles, respectively. Although the incentive does not directly contribute to KPI 2, it helped create the enabling ecosystem for ZEVs.

3.6.3 Improving ZEV supply chain

There are several other policy measures that support ZEV supply chain. In February 2024, the EV Board also approved grants for EV battery cell manufacturers from the Competitiveness Enhancement Fund. The investors must be a well-recognized battery manufacturer, have a clear production plan, and produce battery cells with high energy density and high life cycle which are suitable for EVs¹². In June 2024, Thailand Board of Investment approved a new investment promotion category covering service centers for repair, repack, and reuse of used EV batteries and storage systems. The policy can indirectly enhance the progression of KPI 2 as it ensures the availability of services throughout the EV life cycle. Thailand is also promoting extended producer responsibility (EPR) policy, requiring producers' responsibility for environmental impacts of targeted products. In this sense, vehicle manufacturers and importers are required to take proper responsibility for the end-of-life of their products. Although this policy does not directly impact KPI 2, it ensures sustainable use of ZEVs in the long run.

3.6.4 Supporting infrastructure

Thailand's EV Board also set an ambition towards EV charging outlets. The EV Board has set targets for the number of DC fast chargers as 2,200 to 2,400 outlets by 2024 and 12,000 outlets by 2030. Electric Vehicle Association of Thailand indicated 2,658 charging stations as of 31 December 2023, which has surpassed the 2024 target. The increase in public charging stations can indirectly promote the public's demand for EVs as the sufficient number of charging stations would ensure EV owners' long-distance drive, which is currently one of the main concerns of the potential buyers. However, given the sharp increase in the number of EVs in 2023 after the targets were set and the continuous sales of EVs in 2024, the targets for charging stations are being revisited in order to facilitate EV utilization.

¹² Thailand Board of Investment (2024), Thailand EV Board Approves Extended Production Timeframe for BEV and Inclusion of Mild HEV in Hybrid Incentive Package to Support Industry's Electrification

3.6.5 Carbon tax

The Parliament approved the carbon tax of 200 Thai Baht per ton-CO₂ equivalent for all fossil fuels in January 2025. It replaces a portion of the same amount of excise tax on respective fossil fuels resulting in no increase in unit prices. The aim of the introduction of carbon tax is to raise awareness and familiarize the citizens with the concept of carbon tax without affecting their energy expenditure. In the long run, carbon tax can serve as an additional mechanism to expedite greenhouse gas emission reduction in both energy and transportation sectors.

3.7 Discussion on decreased annual registrations of ZEV passenger cars and pickup trucks

There were several reasons listed in the 2024 SLB Progress Report for the decreasing annual registrations of ZEV passenger cars and pickup trucks, including high household debts, stricter loan approval process, and initial surge and market saturation. In addition, availability of public charging stations and the policy direction to cover support for xEV can also potentially affect the annual registrations.

3.7.1 High household debt

As shown in Table 3, the proportion of household debt to KOT's GDP has remained at the level of 90% for several years. Therefore, it is hard to expect that many households will invest in new vehicles only to shift towards zero emission vehicles.

Table 3 Proportion of household debt to GDP

Year	Quarter	Debt to GDP (%)
2021	Q1	95.5
	Q2	94.2
	Q3	94.1
	Q4	94.6
2022	Q1	93.7
	Q2	92.8
	Q3	91.6
	Q4	91.6
2023	Q1	90.8
	Q2	90.9
	Q3	91.0
	Q4	91.4
2024	Q1	90.8
	Q2	89.8
	Q3	89.0

3.7.2 Strict loan approval process

As shown in Table 4, the proportion of non-performing loans has remained high, toughening the loan approval process. However, it is important to note that loan approval is strict across the board, including both internal combustion engine vehicles and zero emission vehicles.

Table 4 Proportion of non-performing loans

Year	Quarter	Non-Performing Loans (NPLs)
2023	Q1	2.63%
	Q2	2.67%
	Q3	2.70%
	Q4	2.66%
2024	Q1	2.74%
	Q2	2.84%
	Q3	2.97%
	Q4	2.78%

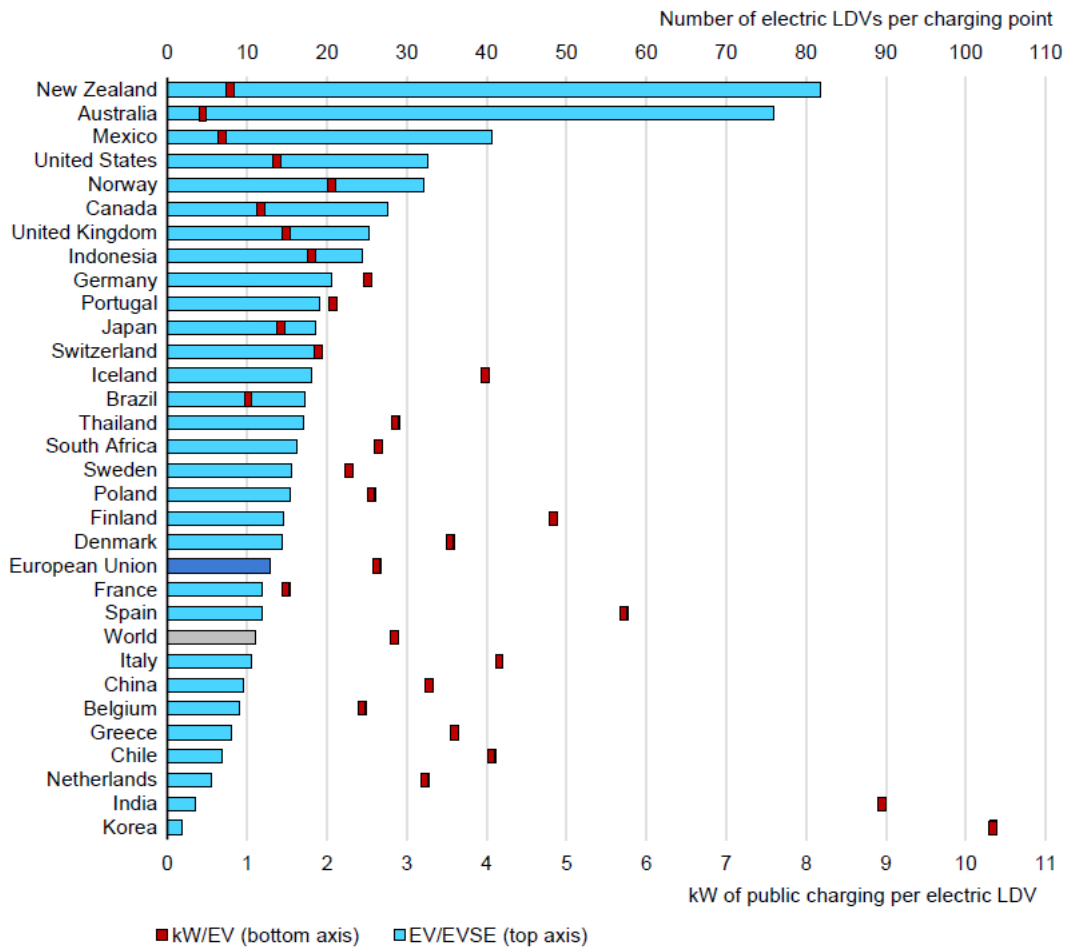
3.7.3 Initial surge & market saturation

A surge in the number of ZEV passenger cars and pickup trucks can be observed in 2023. It was driven by substantial incentives provided by the government and compounded with the early adopter enthusiasm. However, as can be seen in Figure 9, the statistics of monthly registrations still show an increasing trend in 2024, indicating that the market may not have been saturated yet.

3.7.4 Availability of public charging stations

According to Global EV Outlook 2025¹³ as indicated in Figure 10, the number of electric light-duty vehicles per public charging point and the kilowatt per electric light-duty vehicle in 2024 has significantly improved compared to 2023. It can be seen from the figure that while the kilowatt per electric light-duty vehicle is around the global average value due to the promotion of fast chargers, the number of electric light-duty vehicles per public charging point is slightly below the world's average. KOT is aware of the issue and established a committee to address issues surrounding public charging outlets, having Energy Policy and Planning Office (EPPO) as a secretariat.

¹³ IEA (2025), Global EV Outlook 2025 <https://www.iea.org/reports/global-ev-outlook-2025>



IEA. CC BY 4.0.

Notes: EV = electric vehicle; EVSE = electric vehicle supply equipment; LDV = light-duty vehicle. Kilowatts per EV are estimated assuming 15 kW for slow and 50 kW for fast chargers and 150 kW for ultra-fast chargers. For countries in Europe, average power per EVSE was used per power group: slow (lower than 22 kW), fast (between 22 kW and 150 kW) and ultra-fast (higher than 150 kW) and multiplied with reported stock of chargers. Official national statistics, which rely on more granular data, might differ from these values.

Sources: IEA analysis based on BNEF, EV Volumes, [EAFO](#) and Eco-Movement, [US AFDC](#).

Figure 10 Number of electric light-duty vehicles per public charging point and kilowatt per electric light-duty vehicle

3.7.5 Policy direction to cover support for xEV

While KOT set an ambitious target of achieving 30% zero-emission vehicle (ZEV) production and usage by 2030, known as the "30@30" target, the government has also extended the scope of policy support to cover xEV, including hybrid electric vehicles (HEV) and plug-in hybrid electric vehicles (PHEV). For example, the Excise Department is going to determine the excise tax of PHEVs based on the electric range instead of the fuel tank size¹⁴. This is to enable gradual transition towards greener options for existing automotive industry which contributes to nearly 20% of the country's GDP. While this helps sustain the local automotive industry, it has potential to divert ZEV buyers to HEV and PHEV.

¹⁴ Autolifethailand (2025), Excise Department to restructure PHEV tax (in Thai) <https://autolifethailand.tv/phev-tax-2025/>