Kingdom of Thailand

Sustainability-Linked Financing Framework

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สำนักงานบริหารหนี้สาธารณะ
PUBLIC DEBT MANAGEMENT OFFICE

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1. Introduction and Rationale

The Kingdom of Thailand ("**Thailand**" or "**KOT**") recognizes the severe impacts of climate change and the significance of holding the increase in the global average temperature to well below 2°C, while pursuing efforts to limit the increase to 1.5°C under the Paris Agreement. Thailand places high priority on climate change as one of the key challenges affecting communities' livelihood, economic growth, and the achievement of sustainable development. It became a party to the United Nations Framework Convention on Climate Change (UNFCCC) in 1994 and subsequently ratified the Kyoto Protocol in 2002 and the Paris Agreement in 2016.

Thailand is also committed to supporting the United Nations Sustainable Development Goals (SDGs) to combat poverty, inequality, and environmental degradation, and to realize improvements in health and justice by 2030.

According to the 2021 Global Climate Risk Index, Thailand ranks ninth among countries most affected by climate change impacts over the preceding 20 years (2000–2019). It has a total coastline of 3,151 kilometres (km) spanning 24 coastal provinces with a total area of 101,678 km^2 and a population of approximately 20 million who are among the most vulnerable to climate risks, particularly coastal erosion.

1.1 The Kingdom of Thailand's Commitment to the Paris Agreement

Thailand's carbon neutrality and net zero greenhouse gas (GHG) emissions pathway has been developed based on the country's aspiration to contribute to global efforts to achieve mid-century carbon neutrality and net zero GHG emissions, in line with the Paris Agreement. Thailand has mainstreamed the climate change agenda into its national plans, including the 20-Year National Strategy, National Economic and Social Development Plans, Climate Change Master Plan, National Adaptation Plan, Nationally Appropriate Mitigation Action (NAMA), and Nationally Determined Contributions (NDCs).

At the COP26 World Leaders Summit, Thailand announced its new ambitious targets to reach carbon neutrality and net zero greenhouse gas emissions by 2050 and 2065, respectively, and to increase its NDC ambition to 40% upon receipt of timely and adequate international support in the areas of finance, technology transfer, and capacity building. Furthermore, Thailand submitted its revised **Long-Term Low Greenhouse Gas Emission Development Strategy (LT-LEDS)**[1] and **2nd Updated NDCs**[2] to the UNFCCC ahead of COP27 in 2022.

The LT-LEDS lays out climate policies, priorities, and measures to steer Thailand toward a low level of GHG emissions and climate-resilient development, while the 2nd Updated NDCs enhanced Thailand's commitment to reduce GHG emissions by 40% by 2030 from the business-as-usual level. This includes a 30% reduction from domestic efforts and 10% from international support (subject to adequate and enhanced access to technology development and transfer, financial resources, and capacity building support). The 40% reduction was increased from KOT's previous NDC target of a 20% to 25% reduction.

Thailand's NDC takes into account key national plans and policies, including the 13th National Economic and Social Development Plan (2023–2027), 2022 National Energy Plan Framework, Climate Change Master Plan (2015–2050), Power Development Plan (2018–2037), Thailand Smart Grid Development Master Plan (2015–2036), Energy Efficiency Plan (2018–2037), Alternative Energy Development Plan (2018–2037), Master Plan for Sustainable Transport System and Mitigation of Climate Change Impacts (2013–2030), National Industrial Development Master Plan (2012–2031), and Waste Management Roadmap.

[1] https://unfccc.int/sites/default/files/resource/Thailand%20LT-LEDS%20%28Revised%20Version%29_08Nov2022.pdf
[2] https://unfccc.int/sites/default/files/NDC/2022-11/Thailand%202nd%20Updated%20NDC.pdf

Thailand has also developed the **National Adaptation Plan** with the aim to build adaptive capacity and enhance climate resilience in six priority sectors: 1) water resources management, 2) agriculture and food security, 3) tourism, 4) public health, 5) natural resources management, and 6) human settlements and security.

Institutional Arrangement toward Climate Change

Thailand's National Committee on Climate Change Policy (NCCC), which was established in 2007, is the main decision-making body for climate change management in Thailand. The NCCC is chaired by the Prime Minister and consists of members from relevant government agencies, the private sector, experts from relevant agencies (e.g. on topics such as law, economics, environment, science and technology, energy and climate change), and relevant stakeholders. The NCCC is responsible for consideration and adoption of national climate policies, guidelines, and mechanisms for international cooperation, and for approval of several internationally funded climate projects and activities.

The NCCC comprises eight subcommittees:

1) Subcommittee on Climate Change Policy and Planning Integration;
2) Subcommittee on Climate Change Knowledge and Database;
3) Subcommittee on Climate Change Negotiation and International Cooperation;
4) Subcommittee on Public Relations and Actions for Climate Empowerment;
5) Subcommittee on Climate Law;
6) Subcommittee on the Mobilization of GHG Mitigation with Carbon Sequestration in the Land Use, Land Use Change, and Forestry (LULUCF) Sector;
7) Subcommittee on the Mobilization of GHG Mitigation with Carbon Capture, Utilization, and Storage (CCUS) Technology Implications; and
8) Ad-hoc Subcommittee on Preparation of Thailand Climate Action Climate Conference

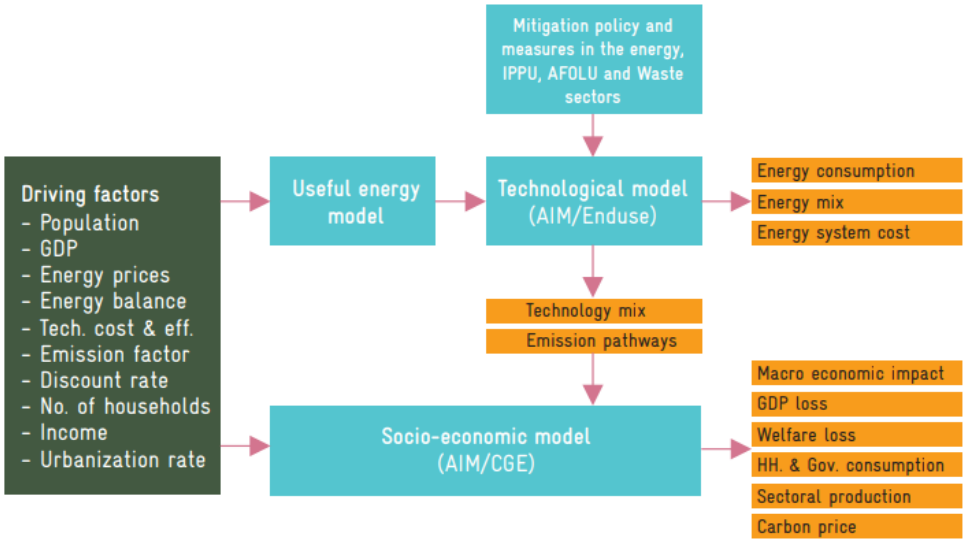
Approval and Methodology of Thailand's LT-LEDS

The preparation and approval process of Thailand's LT-LEDS includes a domestic consultative process among various interministerial working groups and relevant stakeholders to identify a set of long-term mitigation actions in the energy, transport, industrial processes and product Use (IPPU), waste, agriculture, and LULUCF sectors.

A national consultation was organized for feedback and discussions on the outcome of the technical study, followed by consideration and approval from the interministerial working group, the Subcommittee on Climate Change Policy and Planning Integration, the NCCC, and the Cabinet, before submission to the UNFCCC. A similar approval process was undertaken for the preparation of the National Adaptation Plan, which provides a basis for Thailand's Climate-Resilient Development Pathway.

In terms of the methodology used to determine Thailand's carbon neutrality and net zero pathway, the Asia-Pacific Integrated Model (AIM)/End-Use Model is used to quantify climate change assessment and relevant policies to mitigate GHG emissions. To assess the macroeconomic impacts of Thailand's carbon neutrality and net zero GHG scenarios, a multi-sector, dynamic recursive AIM/Computable General Equilibrium (CGE) Model is used. A high-level overview of Thailand's Framework for determining the carbon neutrality and net-zero pathway highlighted in the LT-LEDS is indicated in the Figure below.

Figure 1: Framework for Thailand's LT-LEDS



Thailand's LT-LEDS is modelled using a bottom-up approach with detailed technological information. The technological selection is based on an optimization framework that minimizes the total system cost subject to various constraints (e.g., the potential of solar, wind, and bioenergy used in power generation to satisfy the end-user demand among the economic sectors). The CGE model is adopted to assess the economic and environmental impacts of climate policies at the national and sub-national levels. The CGE model used for the development of Thailand's LT-LEDS uses the input–output table obtained from the Office of the National Economic and Social Development Council to calibrate the model.

Thailand's Carbon Neutrality Pathway

To achieve carbon neutrality in 2050, Thailand has focused its attention on reducing CO2 emissions in the energy sector, which is the largest contributor of GHG emissions in the KOT.

In 2022, Thailand formulated a draft **National Energy Plan** as a policy framework to guide the relevant agencies towards clean energy systems with the goal of becoming a carbon-neutral country by 2050. In this scenario, the share of renewable energy for new power generation capacity will be at least 50% by 2050.

Further, Thailand "30@30" policy sets the ambitious target of ensuring that 30% of all new vehicles will be Zero Emission Vehicles (ZEVs), reflecting the country's commitment to sustainable mobility by 2030 under the "30@30" policy. This initiative includes significant production and usage promotion targets for various vehicle types, as well as charging stations[3]. GHG emissions from the IPPU, waste, and agriculture sectors will follow the 1.5°C pathway, where most GHG emissions are expected to come from the IPPU sector, particularly the cement industry. It is also expected that carbon capture (usage) and storage can contribute to further reductions in carbon emissions from this sector. Contribution from the LULUCF sector in carbon removal is expected to increase to 120 MtCO2e by 2037.

Thailand's Net Zero GHG Emission Pathway

To achieve net zero GHG emissions by 2065, annual carbon removals from the LULUCF sector are expected to stabilize at 120 MtCO2e from 2037 onwards. This projection is based on forest and green area targets

[3] https://www.eppo.go.th/index.php/en/component/k2/item/17415-ev-charging-221064-04

identified in the **National Strategy (2018–2037)**[4] that aim to increase Thailand's forested and green areas to 55% of the country's total land area by 2037.

Under the net zero GHG emissions by 2065 scenario, Thailand will achieve net GHG emissions of 64.1 MtCO2e by 2050, largely comprising methane emissions. Gross GHG emissions are expected to reach a peak of 388 MtCO2e in 2025, while the energy sector will play a key role in mitigating GHG emission after 2025. Post-2050 emissions will follow the Intergovernmental Panel on Climate Change's (IPCC) 1.5°C pathway, under which Thailand is expected to achieve a balance between GHG emissions from sources and carbon removal by sinks by 2065. A coal phase-out and negative emission technologies in the energy sector (e.g., bioenergy with carbon capture and storage (BECCS]), or via direct air capture and storage, will be necessary in Thailand's net zero GHG emissions pathway.

1.2 Key Policies targeting Climate Change Mitigation and Adaptation

Energy Sector

The energy sector is a main component of Thailand's transition towards carbon neutrality and net zero GHG emissions, as it is the country's largest source of GHG emissions, accounting for 70.0% of gross GHG emissions in 2019 (excluding removals from the LULUCF sector).

Thailand's **upcoming National Energy Plan** integrates five key energy plans: 1) Power Development Plan (**PDP**), 2) Alternative Energy Development Plan (**AEDP**), 3) Energy Efficiency Plan, 4) Gas Plan and 5) Oil Plan. The consolidated framework incorporates decarbonization targets for the energy sector that are expected to be launched in 2024, and further details of the draft version of the key plans, namely the PDP and AEDP, are included in Section 1.3 of the Framework. This decarbonization framework includes further increases in the renewable energy share of Thailand's power generation by ensuring the installation of renewable-based power generation at rapid rates, ensuring that renewable energy constitutes at least 50% of new power generation capacity by 2050. Solar and wind combined will account for 65% of total electricity generation by 2060.

The key Initiatives and targets across relevant subsectors are detailed below:

- **Power Generation Sector:** To achieve carbon neutrality by 2050, the share of renewable electricity is expected to account for 68% of total electricity generation in 2040 and 74% in 2050. The plan also expects the total phase-out of coal power plants by 2050, with any bioenergy-based power generation being fully equipped with CCS technologies by 2050. To achieve net zero emissions by 2065, the plan anticipates additional mitigation technologies such as solar PV with battery storage; fossil- and biomass-based power plants equipped with CCS and CCUS technologies; fuel-cell power plants; gas turbines using a natural gas–hydrogen blend, and 100% green hydrogen.

- **Transportation Sector:** Thailand targets to increase the share of new battery electric vehicles (EVs) in the market to at least 30% in 2030, while internal combustion engine vehicles will be phased out after 2035. Efficiency improvements for internal combustion engine vehicles include shifting to EURO5 and EURO6 standards, promoting liquid biofuels, and removing petroleum subsidies. Thailand's Electric Vehicle Board has also put in place a 30@30 Policy Plan, which establishes a target for ZEVs to account for at least 30% of total automotive production by 2030 based on a three-phase development plan for the EV industry.

[4] http://nscr.nesdc.go.th/wp-content/uploads/2019/10/National-Strategy-Eng-Final-25-OCT-2019.pdf

Further potential mitigation measures in the transport sector from relevant plans include Travel Demand Management, Transit-Oriented Development, expansion of the railway network to double-track, expansion of mass-rapid transit, high-speed trains, Single Rail Transfer Operation at Laem Chabang Port, improved river logistics efficiency, an east–west ferry connecting Pattaya to Hua-Hin, adjustment of excise and annual vehicle tax collection rates according to the amount of CO2 emissions, promotion of electric and hybrid intercity and public buses, and minibus and delivery motorcycle fleet upgrades.

- **Manufacturing Industries:** Thailand is targeting the energy efficiency, fuel-switching, and electrification of end-use technologies as key to the decarbonization of the industrial sector. Green hydrogen, produced using renewable-based electricity, will also play an important role in decarbonization of hard-to-abate sectors that cannot be electrified easily, such as iron and steel, aluminium, and cement. Hydrogen burners could be used in conjunction with electric heating to generate the high temperatures required in many heavy industrial processes, thereby replacing fossil-fuel burning.

- **Residential Sector:** Thailand seeks to improve the efficiency of cooling technologies such as air-conditioners and refrigeration, cooking technologies, electrical devices, and lighting technologies. Electrification of end-use technologies (e.g., shifting from LPG cooking to electric cooking and using solar for water heating) will also be considered.

- **Commercial Buildings:** Efficiency improvement of cooling technologies such as air-conditioners and refrigeration will have a major impact in this sector. Electrification of end-use technologies (e.g., shifting from LPG to electricity-based technologies) will also contribute to decarbonization efforts. Solar water heating systems will be considered as an option for water heating in commercial buildings, particularly hotels, condominiums, and hospitals.

- **Agriculture:** The use of efficient devices; electrification of end-use technologies such as tractors, threshing equipment, pumps, and motors; and solar-powered pumping are some of the mitigation measures that will be implemented in the agriculture sector.

Industrial Processes and Product Use Sector

The IPPU sector accounted for 10.3% of Thailand's total GHG emissions in 2019. As the major sources of GHG emissions in the IPPU sector are the cement, chemical, and refrigeration and air-conditioning industries, key mitigation measures in the IPPU sector focus mainly on clinker substitution and the substitution of high–global warming potential refrigerants. Both of these mitigation measures were included in the **National Action Plan for GHG Mitigation from the IPPU Sector** and the **Industrial Wastewater Measure (2021–2030)**, prepared by the Department of Industrial Works in the Ministry of Industry, and are currently being implemented. The refrigerant substitution measure will also be implemented in conjunction with hydrofluorocarbons phase-down activities in preparation for the Kigali Amendment to the Montreal Protocol.

In striving for carbon neutrality and net zero emissions, the Ministry of Industry is currently implementing the **Bio, Circular, and Green economic model** to drive sustainable growth of Thai industries with the ability to produce value-added products and increase competitiveness. As part of the Bio, Circular, and Green policy, the Department of Industrial Works is promoting businesses transition to green industry. Support is provided to increase social responsibility and environmentally friendly operations within the industrial sector through

the use of technologies and innovations to maximize resource efficiency and transition to eco-friendly manufacturing. The target is to convert all industrial plants into green industry operations by 2025, which will have co-benefits in contributing to GHG emissions reduction in the long term.

Waste Sector

The waste sector accounted for 4.5% of Thailand's total GHG emissions in 2019. Thailand has attempted to address its waste management challenges by developing national frameworks for waste management such as the **National Solid Waste Management Master Plan (2016–2021)** and the **Roadmap on Plastic Waste Management (2018–2030)**. At the provincial level, municipal waste management action plans have been adopted. Various measures and approaches have been implemented, including the life cycle approach, reduce-reuse-recycle principle, public–private partnerships, circular economy promotion, and eco-friendly and responsible production and consumption.

Thailand has set a goal to reduce food waste by 50% by 2030 by implementing actions in all stages of food production from raw material processing, production, and transport to household consumption and disposal. To reduce its plastic waste, Thailand banned the use of bottle cap seals, OXO-degradable plastic, and plastic microbeads in 2019. In addition, the use of thin plastic bags with a thickness of less than 36 microns, styrofoam food boxes, plastic straws, and single-use plastic cups were banned in 2022. Under the **Roadmap on Plastic Waste Management (2018–2030)** and with a shift towards sustainable plastic waste management under the circular economy model, Thailand aims to have 100% of its plastic waste recycled or reused by 2027.

The **Zero Industry Waste to Landfill Policy** and the **"Green Industry Mark"** for green processes were adopted to reduce industrial waste generation. Thailand also plays a key role in addressing marine debris at a regional level through adoption of the Bangkok Declaration on Combating Marine Debris in the ASEAN Region and the ASEAN Framework of Action on Marine Debris at the 34th ASEAN Summit in June 2019, which led to the preparation of ASEAN Regional Action Plan for Combating Marine Debris (2021–2025). In addition to reducing solid and wastewater generation, suitable waste disposal technologies, such as mechanical biological treatment and semi-aerobic technologies that have been proven effective to reduce GHG emissions from landfills, will be further explored by local Thai authorities, with examples from already successful sites to be emulated.

In sum, priorities for mitigation actions in the waste sector include community solid waste management, community wastewater management, waste reduction, landfill gas, waste-to-energy processes, semi-aerobic landfills, composting, anaerobic digestion and mechanical biological treatment, and industrial wastewater management, including increased biogas production from industrial wastewater by recycling methane gas.

Agriculture Sector

The agricultural sector plays a vital role in Thailand's economy as a major source of employment and in the generation of the domestic food supply and exports. Major agricultural exports include rubber, rice, fruits, fish, chicken meat, cassava, sugar, shrimp, and vegetables. Thailand's agricultural land area is approximately 149.3 million rai (0.239 million km^2), or around 46% of the country's total land area. The population of livestock is around 474 million, contributing 15.2% of total GHG emissions in 2019.

The **20-Year Agricultural Development Plan (2017–2036)** was adopted to lay a foundation for long-term and systematic growth of this sector. This plan aims to improve farmers' livelihoods, increase productivity and the quality standards of agricultural commodities, enhance the sector's competitiveness through technology and innovation under the "Agriculture 4.0" model, promote balanced and sustainable management of agricultural resources and the environment, and enhance the capacity of the public administration system. In relation to climate change, Thailand places high priority on addressing the impacts on and vulnerabilities of

the agriculture sector through adaptation measures as climate impacts—including shifting temperatures, more unpredictable rainfall, and extreme floods and drought—have been widely experienced across the country, affecting the yields of major crops, such as rice, maize, and sugarcane. In addition, measures to enhance competitiveness and promote balanced and sustainable agricultural systems are also important. Mitigation actions in the agricultural sector will likely focus on those with multiple benefits such as increasing climate resilience, resource efficiency, and productivity. These activities include better manure management, improved agriculture waste management, enhanced rice cultivation practices, increased efficiency in water resource management, smart farming, high-efficiency plant cultivation and livestock, promotion of organic fertilizers, increased renewable energy use (e.g., solar, biofuels, and electrification), and energy efficiency in water pumping, threshing, and tilling.

Forestry Sector

The protection and conservation of forests in Thailand is clearly reflected in the 20-year National Strategy and the 12th and 13th National Economic and Social Development Plans. The **National Forest Policy** was adopted to ensure sustainable management of forest in Thailand. To safeguard forests and enhance carbon sink, a target to increase green area cover to 55% (282,216 km^2) of the total land area in 2037 has been adopted by the government, comprising 35% natural forest, 15% economic forest, and 5% urban and suburban green areas. To achieve such an aspirational target, various measures and activities will be implemented to promote afforestation and reforestation, increase green areas and prevent deforestation. Thailand aims to increase its green areas by 9% and plans to plant more trees in natural forests, economic forests and urban areas.

1.3 Thailand's Draft National Energy Plan, Power Development Plan, and Alternative Energy Development Plan

In June 2024, Thailand published the draft version of the National Energy Plan, which includes the PDP and AEDP, for public hearing. While the final details of the plans may be subject to change, relevant high-level details of the new plans are included below for reference.

Thailand's Power Development Plan 2024 or (PDP 2024) (draft)[5] is strategic plan for the development of the country's electricity generation capacity from 2024 to 2037. The PDP2024 aims to ensure a stable, cost-effective, and sustainable electricity supply to meet the country's growing energy demands while aligning with global trends towards reducing carbon emissions and increasing the use of renewable energy sources.

The PDP2024 projects peak demand to reach 56,133 MW by 2037, with plans to add 77,407 MW of new power generation capacity. The current capacity is 53,868 MW, with 18,884 MW set to be decommissioned. By 2037, the total contracted capacity will be 112,391 MW.

The three sources of the additional 77,407 MW of electricity generation capacity are as follows:

1. **New power generation capacity of 47,251 MW** includes 34,851 MW from renewable energy, 6,300 MW from combined-cycle power plants, 600 MW from nuclear power (Small Modular Reactor: SMR), 3,500 MW from imported power from neighboring countries, and 2,000 MW from other sources (Demand Response, Vehicle-to-Grid).
2. **Reserve power generation capacity of 12,957 MW** comprises 2,472 MW from Pumped Storage Hydropower Plants and 10,485 MW from Battery Energy Storage Systems.
3. **Power generation** from existing contracts totals 17,199 MW.

[5] Final details subject to change

This PDP emphasizes several key aspects:

1. **Security**: Ensuring the stability of the electricity system by maintaining a sufficient and reliable supply of electricity to always meet demand. This includes accommodating the variable nature of renewable energy sources.
2. **Economy**: Achieving reasonable and stable electricity prices, making efficient use of existing infrastructure such as gas pipelines and terminals.
3. **Sustainability**: Increasing the proportion of electricity generated from renewable energy sources, improving energy efficiency, and achieving national CO_2 reduction targets as set by the Ministry of Natural Resources and Environment.

This plan supports Thailand's commitment to international climate agreements which is achieving carbon neutrality goal by 2050 and net zero emission goal by 2065. Also, aims to transition towards a low-carbon society by reducing greenhouse gas emissions through the increased use of clean energy, the adoption of energy-efficient technologies, and the adaption to changes in electricity demand patterns, such as the growth of EVs and integrating renewable energy technologies like solar rooftops into the national grid.

The Alternative Energy Development Plan for 2024–2037 (AEDP 2024) (draft)[6] is a strategic framework developed by Thailand to enhance the use of renewable and alternative energy sources. This plan outlines specific goals and measures aimed at increasing the share of renewable energy in the country's energy mix, reducing greenhouse gas emissions, and achieving long-term sustainability targets. The AEDP 2024 aims to increase the share of renewable energy in Thailand's energy mix to achieve carbon neutrality by 2050.

There are three renewable energy targets included in the AEDP 2024:

1) **Electricity Generation:** The plan targets 73,286 megawatts (MW) of renewable energy capacity by 2037, including significant contributions from solar (38,974 MW), wind (9,379 MW), biomass (5,490 MW), and hydropower (2,918 MW). Ground-mounted and floating solar energy is expected to be the largest contributor.

2) **Heat Production:** Heat production from renewable sources is set to reach 17,061 kilotonnes of oil equivalent (ktoe) by 2037, with biomass being the primary source (15,551 ktoe). Other contributors include biogas, waste, and solar thermal energy.

3) **Biofuels:** The biofuel targets include 1,621 ktoe, with specific goals for biodiesel (775 ktoe), ethanol (289 ktoe), and sustainable aviation fuel (553 ktoe).

The AEDP 2024 aims to reduce CO2 emissions by at least 75 MtCO2e by 2037 compared to current levels. This reduction is crucial for meeting Thailand's long-term goal of carbon neutrality by 2050 and aligns with the National Energy Plan.

To achieve these ambitious targets, AEDP 2024 includes measures to facilitate access to financing under favourable environmental conditions. This involves incentives such as investment privileges from the Board of Investment and green financing mechanisms. The plan also outlines policy measures to promote the purchase of electricity from renewable sources at appropriate rates and to support the development of energy storage systems. The plan details significant investments in infrastructure to support the integration of renewable energy into the grid. This includes expanding energy storage solutions and enhancing the capacity of the transmission network to handle the increased share of renewable energy. It also highlights the importance of research and development to drive innovation in renewable energy technologies and improve efficiency.

[6] Final details subject to change

2. The Kingdom of Thailand's Sustainability-Linked Financing Framework

Rationale

In July 2020, the KOT published its Sustainable Financing Framework, which allows it to allocate use of proceeds to finance projects or expenditures related to climate change mitigation and adaptation, sustainable use and protection of water resources, and protection and restoration of biodiversity and ecosystems, as well as to foster social development and socioeconomic advancement and empowerment to ensure positive social contribution, and to fight against inequality in Thailand.

As a logical next step towards advancing its sustainability commitments, the KOT has established this Sustainability-Linked Finance Framework ("Framework") under which it intends to issue sustainability-linked bonds, loans, or other debt instruments (collectively referred to as "sustainability-linked finance instruments"). The Framework reflects an enhanced commitment by the KOT towards sustainability by incorporating targets linked to the nation's climate change commitments in its debt instruments, which provides for an additional layer of accountability and transparency in the market.

Alignment

The Sustainability-Linked Financing Framework is aligned with the International Capital Market Association (ICMA) Sustainability-Linked Bond Principles (SLBP) 2024;[7]; ASEAN Capital Markets Forum (ACMF) ASEAN Sustainability-Linked Bond Standards (ASEAN SLBS) 2022;[8] and Loan Market Association (LMA), Loan Syndications and Trading Association (LSTA) and Asia-Pacific Loan Market Association (APLMA) Sustainability-Linked Loan Principles (SLLP) 2023.[9]

The Framework is structured according to the following five core components of the above principles.

1) Selection of Key Performance Indicators (KPIs)
2) Calibration of Sustainability Performance Targets (SPTs)
3) Characteristics of Sustainability-Linked Finance Instruments
4) Reporting
5) Verification

The Framework may be revised or updated anytime to remain consistent with the sustainability strategy of Thailand, best market practices, and regulatory developments. For the avoidance of doubt, any future changes to the Framework may not necessarily apply to sustainability-linked finance instruments previously issued under this Framework. The updates, if not minor or technical in nature, will be subject to the prior approval of the Public Debt Management Office (PDMO). Any new Framework will be published on the PDMO website with the date of update and replace this framework. A new second-party opinion will be obtained for a revised or updated Framework.

[7] ICMA Sustainability-Linked Bond Principles (June 2024)
[8] ACMF ASEAN Sustainability-Linked Bond Standards (October 2022)
[9] LMA/LSTA/APLMA Sustainability-Linked Loan Principles (February 2023)

2.1 Selection of Key Performance Indicators (KPIs)

KPI 1: Total Greenhouse Gas Emissions (excluding removals from LULUCF) (ktCO2e)

KPI	Total GHG emissions (excluding removals from LULUCF) (ktCO2e)
Baseline	BAU 2030: 555,000 ktCO2e (1 ktCO2e = 1 GgCO2e, 1000 ktCO2e = 1 MtCO2e) Business-as-usual (BAU) projection from reference year 2005 in the absence of major climate change policies
UN SDG Alignment	SDG 13 Climate Action: ➢ 13.2 Integrate climate change measures into policy and planning
Methodology	The KOT's GHG inventory is prepared in accordance with the **IPCC Guidelines for National Greenhouse Gas Inventories (2006).** The GHGs estimated include the following direct GHG emissions: • Carbon Dioxide (CO2) • Methane (CH4) • Nitrous Oxide (N2O) • Hydrofluorocarbons (HFCs) • Perfluorocarbons (PFCs) • Sulphur Hexafluoride (SF6) The KOT's GHG emissions are calculated by the Thailand Greenhouse Gas Emission Inventory System (TGEIS).
Key GHG Sectors	The KPI is set in accordance with the KOT's NDC commitments, which include the following sectors: • Energy • Industrial Processes and Product Use (IPPU) • Waste • Agriculture *GHG removals from the Land Use Land Use Change and Forestry (LULUCF) sector is currently excluded from the perimeter of the KPI, in line with the current formulation of Thailand's NDCs.
Key KPI Reporting Characteristics	As a Non-Annex I Party to the UNFCCC, the KOT is obligated to submit a Biennial Update Report (BUR) every 2 years, containing details of its national GHG inventory. The KOT submitted its first, second, third, and fourth BURs in 2015, 2017, 2020, and 2022, respectively. Going forward, the BUR will be replaced with the Biennial Transparency Reports (BTR). The first BTR, which is to be submitted by December 31, 2024, will contain details of the 2020 and 2021 GHG inventories. As such, KPI 1 data are reported biennially covering emissions for two individual years in each report. This cycle creates a time lag of approximately **3 years** (and no longer than 4 years) from the period of reporting (i.e., data on the GHG inventory for full-year 2030 will be available by the BTR published in 2034). The process of reporting and verification of the national GHG inventory is subject to an international consultation and analysis process through the Subsidiary Body for Implementation. The expert review team's recommendations assist Thailand's national GHG inventory in narrowing knowledge gaps and increasing efficiency in the preparation process. The results of the technical review are available on the UNFCCC's website at https://unfccc.int/ICA-cycle3.
Key Process in Collating Thailand's GHG Inventory	The key components in estimating GHG emissions are activity data and emission factors. Activity data is sourced from a collaboration between the Office of Natural Resources and Environmental Policy and Planning (ONEP) and lead agencies of the following five sectors: 1) **Energy**: including the subsectors of energy led by the Energy Policy and Planning Office (EPPO) and transport led by the Office of Transport and Traffic Policy and Planning (OTP) 2) **IPPU**: led by the Department of Industrial Works (DIW) 3) **Agriculture**: led by the Office of Agricultural Economics (OAE) 4) **LULUCF**: led by the Department of National Parks, Wildlife and Plant Conservation (DNP) 5) **Waste**: led by the Pollution Control Department (PCD)

After collection of activity data by the lead agencies, GHG emissions are calculated by TGEIS. The results from TGEIS are submitted to sectoral working groups on GHG inventory mitigation and measures, which then perform quality control processes to ensure that GHG emission estimates are valid, accurate, and complete. Following this, the GHG inventories of the five sectors are submitted to the Climate Change Knowledge and Database Subcommittee for verification. As a final step, the ONEP, as the Secretariat of the NCCC, will submit the final GHG inventories as part of the BUR/BTR to the NCCC for approval before submission to the UNFCCC.

The process of collation of Thailand's GHG inventory is subject to a domestic Measurement Reporting and Verification (MRV) system at both the national and sectoral levels.

Rationale

Thailand recognizes the severe impacts of climate change and the significance of holding the increase in global average temperature to well below 2°C, while also pursuing efforts to limit the increase to 1.5°C under the Paris Agreement. Thailand, a developing country, is highly affected by climate change impacts, both in terms of human impacts (fatalities) and direct economic losses. Hence, setting the KPI on the KOT's overall GHG emissions represents its commitment to addressing the impacts of climate change.

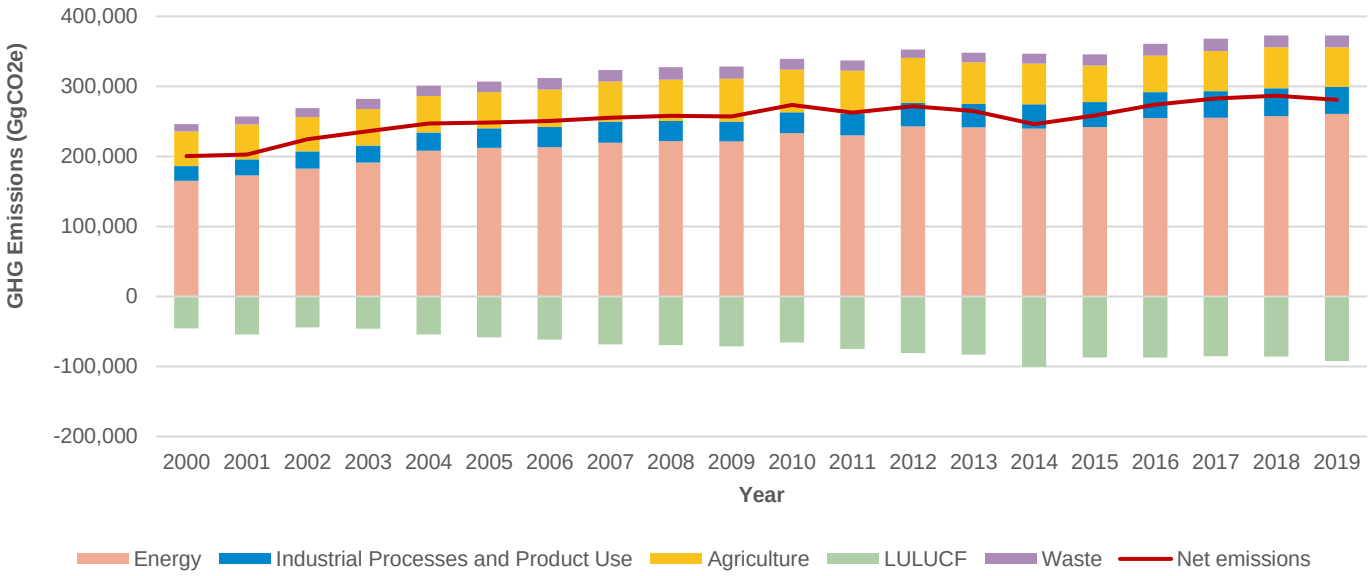
KPI 1 reflects the country's aggregate impact and covers the full scope of its activities. No key sectors are being excluded, except for LULUCF, which represents a net sink (i.e., carbon removal) and only serves to improve the country's current overall performance. The LULUCF sector is excluded from the scope of the KPI as it is not currently included as part of Thailand's NDC commitment. However, it is expected to be a key contributor toward the KOT's carbon neutrality and net zero goals, as the contribution from the LULUCF sector in carbon removal is expected to increase to 120 $MtCO_2e$ by 2037.

Table 1: Thailand's National Greenhouse Gas Inventory by Sector (ktCO2e), 2000–2019

Year	Source Categories within Scope of KPI				Total Emissions (excluding LULUCF)	Excluded from Scope of KPI	Net Emissions (including LULUCF)
	Energy	IPPU	Agriculture	Waste		LULUCF	
2000	165,092.40	21,274.82	49,065.40	10,466.94	245,899.56	-45,443.60	200,455.96
2001	172,906.76	22,873.13	50,019.89	11,281.28	257,081.06	-54,436.91	202,644.15
2002	182,317.06	24,944.60	48,691.69	12,813.68	268,767.03	-44,126.05	224,640.98
2003	191,305.31	24,217.55	52,265.60	14,281.85	282,070.31	-45,887.41	236,182.90
2004	208,180.48	26,041.51	51,958.87	14,844.36	301,025.22	-54,146.05	246,879.17
2005	212,318.12	27,883.81	51,413.70	15,167.72	306,783.35	-58,340.43	248,442.92
2006	213,020.12	28,771.00	53,870.52	16,188.61	311,850.25	-61,390.87	250,459.38
2007	219,378.63	30,424.56	57,161.74	16,569.69	323,534.62	-68,396.37	255,138.25
2008	221,716.62	28,897.09	59,059.43	17,652.74	327,325.88	-69,184.97	258,140.91
2009	221,351.88	28,344.22	61,137.46	17,455.59	328,289.15	-71,197.04	257,092.11
2010	233,105.75	29,961.53	60,694.70	15,778.55	339,540.53	-65,827.73	273,712.80
2011	229,859.44	31,290.10	61,220.57	14,900.97	337,271.08	-74,636.18	262,634.90
2012	242,867.49	33,484.60	64,250.78	11,866.89	352,469.76	-80,695.94	271,773.82
2013	241,717.77	33,299.85	59,080.05	13,978.13	348,075.80	-83,110.84	264,964.96
2014	239,724.21	34,819.39	57,995.56	14,237.77	346,776.93	-100,508.25	246,268.68
2015	241,918.80	35,675.42	52,324.55	15,998.67	345,917.44	-87,337.57	258,579.87
2016	254,540.07	37,189.17	52,303.38	16,771.89	360,804.51	-87,054.60	273,749.91
2017	255,244.90	38,054.69	57,052.83	17,666.21	368,018.75	-85,380.82	282,637.93
2018	257,340.89	40,118.18	58,486.02	16,703.68	372,648.77	-85,968.30	286,680.47
2019	260,772.69	38,301.21	56,766.32	16,876.64	372,716.86	-91,988.52	280,728.34

Source: Thailand's Fourth Biennial Update Report.

Figure 2: Thailand's GHG Emissions Trend



Thailand's Projected Business-as-Usual Level by 2030

Thailand's 2nd update to its NDCs, submitted to the UNFCCC in 2022, expressed the KOT's intent to reduce GHG emissions by 30% from the projected BAU level by 2030. In the absence of major climate change policies, Thailand's GHG emissions are projected to increase from 306,783 ktCO2e in 2005 to 555,000 ktCO2e by 2030, reflecting an average annual growth rate of approximately 2.4%. The methodology for determining the BAU 2030 involves the following:

- The calculation starts with historical data starting from 2005 as the reference year. The data are derived from national reports and GHG inventories, following the guidelines provided by the IPCC.
- The BAU scenario incorporates assumptions about economic growth, population increase, and other socioeconomic factors. These projections are based on national development plans and economic forecasts assuming no climate policy.
- Emissions are projected by analysing various sectors such as energy, industrial processes, agriculture, and waste management. Each sector's activity data, emission factors, and socioeconomic forecasts are considered to estimate future emissions.
- The BAU scenario assumes no major climate policies or measures are implemented beyond those already in place by 2005. It reflects emissions in the absence of additional mitigation actions.
- The projections use the 100-year global warming potential values from the IPCC's Fourth Assessment Report to standardize emissions across different GHGs.
- By 2030, the unconditional NDCs could bring down emissions from 555.0 MtCO2e to 388.5 MtCO2e, with peak emissions attained before 2030.

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

KPI	Annual registrations of ZEV passenger cars and pick-up trucks under the Motor Vehicle Act
Baseline	**2023: 76,731**
UN SDG Alignment	SDG 9 Industry, Innovation and Infrastructure ➢ Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all SDG 11 Sustainable Cities and Communities ➢ 11.2 By 2030, provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons
Methodology	• The KPI sums up the number of newly registered vehicles corresponding to the definition of cars and passenger pick-ups under the Motor Vehicle Act B.E.1979 (MVA),, that are ZEVs. • Newly registered vehicles refer to vehicles that have been registered for the first time under the MVA, and excludes any vehicle transfers between owners, annual registration renewals and vehicle deregistrations. • The KPI refers to annual data of newly registered vehicles within that year.
Definition of Cars and Passenger Pick-Ups	The definition corresponds to the following vehicle classes: - Sedan (not more than 7 passengers) - Microbus & Passenger Van - Van & Pick Up - Interprovincial Taxi - Urban Taxi - Hotel Taxi - Tour Taxi - Car for Hire
Definition of ZEVs	The definition only includes vehicles that have been classified as fully electric / battery electric vehicles (BEVs) and excludes hybrid electric vehicles (HEVs) and plug-in hybrid electric vehicles (PHEVs).
Key KPI Reporting Characteristics	The underlying data on newly registered passenger cars and pick-up trucks is reported with an annual (and monthly) frequency and published on the Department of Land Transport's website[10]. The data corresponding to the KPI will reported annually in the SLB Progress Report.

Rationale

The KPI addresses a key contributor to GHG emissions in Thailand, specifically within the energy sector comprised the largest share (~70%) of GHG emissions in 2019. In particular, the Transport sector contributed 30% of energy sector emissions and 21% of overall GHG emissions in 2019.

The KPI 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. The target has been laid out by Thailand's National Electric Vehicle Policy Committee ("EV Board"), which is chaired by the Prime Minister of Thailand.

The 30@30 policy is comprised of the following phases:

- **Phase 1 (2021-2022):** The government will promote electric motorcycles and support infrastructure nationwide. Measures during this period include subsidies ranging from THB 18,000 to THB 150,000 per vehicle and reductions in import taxes on vehicles and their components.

[10] https://web.dlt.go.th/statistics/ https://web.dlt.go.th/statistics/

- **Phase 2 (2023-2025):** The EV industry will be developed to produce 225,000 cars and pick-up trucks, 360,000 motorcycles and 18,000 buses/trucks by 2025, including the production of batteries. This first milestone is designed to deliver cost advantages via economies of scale.
- **Phase 3 (2026-2030):** The KOT aims to produce 725,000 EV cars and pick-ups plus 675,000 EV motorcycles, which will account for 30% of all auto production in 2030 and includes domestic manufacture of batteries.

EVs play a crucial role in reducing local pollution, particularly the particulate matter (PM2.5), which is responsible for respiratory illnesses and premature deaths. In Thailand, vehicle exhaust emissions have been a dominant source of PM2.5 pollution, whether in the capital city or its provinces[11]. Switching from conventional vehicles to EVs can cut down a significant portion of PM2.5 emissions. Thailand's 30@30 policy, which targets 30% of all new vehicles produced in the country to be ZEVs by 2030, supports this transition, contributing to improved public health and environmental sustainability.

Table 2: Annual number of newly registered passenger cars and pick-up trucks (ZEVs, Total and Percentage), 2019-2023

Year	Newly Registered Passenger Cars and Pick-Up Trucks (ZEVs)	Newly Registered Passenger Cars and Pick-Up Trucks (Total)	Percentage of ZEVs (%)
2019	691	1,018,746	0.1%
2020	1,288	818,818	0.2%
2021	1,958	779,939	0.3%
2022	9,674	890,616	1.1%
2023	76,361	847,388	9.0%

[11] https://www.sciencedirect.com/science/article/pii/S0048969723007441#bb0035

2.2 Calibration of Sustainability Performance Targets (SPTs)

SPT 1: Achieve Total GHG Emissions (excluding removals from LULUCF) of 388,500 ktCO2e by 2030, which would represent a 30% reduction from the BAU scenario.

Baseline: 555,000 ktCO2e (under the BAU 2030 scenario)

Target Observation Date: December 31, 2030

The KOT has set this SPT in line with the second update to its NDCs under the Paris Agreement, which targets reducing GHG emissions by 30% from the projected BAU level by 2030. The NDCs are formulated against a BAU projection from the reference year 2005, which is considered the year since which Thailand would not have implemented any major climate change policies in its various development sectors under the BAU scenario. In the absence of major climate change policies, Thailand's GHG emissions are projected to increase from 306,783 ktCO2e in 2005 to 555,000 ktCO2e by 2030, reflecting an average annual growth rate of approximately 2.4%. Therefore, to reduce Thailand's GHG emissions by 30% from the projected BAU level by 2030, the total GHG emissions of Thailand, excluding LULUCF, shall not exceed 388,500 ktCO2e per year.

The KOT has chosen to set the SPT in line with its NDC target (i.e., 30% reduction in GHG emissions from the BAU scenario by 2030), which is also in line with its LT-LEDs strategy and the targets of carbon neutrality by 2050 and net zero emissions by 2065, as well as the Paris Agreement. The Paris Agreement's primary goal is to limit the average global temperature rise to well below 2°C above pre-industrial levels, with efforts to limit the increase to 1.5°C (Article 2.1 (a) of the Paris Agreement). Thailand's commitment to carbon neutrality by 2050 and net zero emissions by 2065 shows a long-term vision consistent with the Paris Agreement's objectives, while the KOT's NDC mitigation targets reflect a strong commitment to climate action, particularly considering its developing country status.

Table 3: Thailand's Total GHG Emissions and GHG Emissions under the BAU Scenario (ktCO2e), 2000–2019

Year	KPI 1: Total GHG Emissions (excluding removals from LULUCF) (ktCO2e)*	GHG Emissions under BAU Scenario (ktCO2e)**	Emissions Reduction to BAU (%)
2005	306,783	306,783	0%
2006	311,850	314,146	1%
2007	323,535	321,686	–1%
2008	327,326	329,406	1%
2009	328,289	337,312	3%
2010	339,241	345,407	2%
2011	337,271	353,697	5%
2012	352,470	362,186	3%
2013	348,076	370,878	6%
2014	346,177	379,779	9%
2015	345,917	388,894	11%
2016	360,805	398,228	9%
2017	370,370	407,785	9%
2018	372,649	417,572	11%
2019	372,447	427,594	13%
SPT 1 2030	**388,500**	**555,048**	**30%**

*Thailand's GHG emissions inventory (excluding LULUCF) from the 4th BUR.

** Thailand's GHG emissions under the BAU scenario, projected with a 2.4% annual growth rate.

Key Strategies for Achieving SPT 1

The key strategies to achieving the SPT are in line with Thailand's NDCs as well as its LT-LEDS, as highlighted in Section 1.2. SPT 1 specifically references the unconditional target under Thailand's 2nd updated NDCs, and is different from Thailand's 2065 Net Zero GHG Emissions pathway, which is a projection of the GHG emissions based on the model used to determine the pathway to achieve Net Zero by 2065. The trajectory of the LT-LEDS may more closely resemble the conditional pathway.

Thailand aims to achieve its GHG reduction targets as part of its NDCs by 2030 and in alignment with the Paris Agreement. Achieving Thailand's GHG emission target requires cooperation and participation from all sectors, the development of supportive mechanisms, capacity building, and international collaboration. Continuous efforts and sufficient readiness to implement GHG reduction measures are crucial for Thailand to meet its long-term emission reduction goals.

While Thailand's NDCs outline the country's short- to medium-term climate goals under the Paris Agreement, LT-LEDS provide a strategic framework for achieving long-term carbon neutrality by 2050 and net zero GHG emissions by 2065. Thailand's LT-LEDS supports the NDC by detailing specific mitigation actions across key sectors such as energy, transport, industry, waste, agriculture, and forestry. These actions aim to reduce GHG emissions, enhance carbon sinks, and increase renewable energy use, aligning with the NDC targets. The strategy includes plan for achieving the targets by incorporating advanced technologies like carbon capture, utilization, and storage (CCUS), and promoting nature-based solutions. By providing a clear and comprehensive pathway, the LT-LEDS directly supports and enhances the implementation of the NDC, ensuring Thailand meets its climate commitments effectively.

Thailand has implemented a domestic Measurement Reporting and Verification (MRV) system to track GHG emission reductions resulting from implementation of KOT's Nationally Appropriate Mitigation Action (NAMA). The GHG reductions, which can be understood as the avoided emissions from the implementation of specific initiatives, as verified under the domestic MRV system, are detailed in the following table. By 2030, Thailand seeks to achieve reductions of 30% reduction from the BAU to achieve the target of GHG emissions of 388,500 ktCO2e. Specific policies are detailed in Thailand's NDC Action Plan on Mitigation 2021-2030, which is expected to be published in 2024.

Thailand's NDC Action Plan on Mitigation 2021 – 2030 ("**NDC Action Plan**") lays out the strategy to reduce GHG emissions across five strategic sectors: 1) energy, 2) transport, 3) waste, 4) IPPU, and 5) agriculture.

Key action areas include renewable energy sources, energy efficiency, waste management, and sustainable agricultural practices. The plan emphasizes the necessity for cooperation between primary and supporting agencies, including public, private, and community stakeholders.

Periodic meetings on and updates to the NDC Action Plan will be conducted to evaluate progress and address challenges. The plan incorporates feedback and recommendations from these sessions to refine and strengthen implementation efforts. Thailand aims to achieve its long-term GHG reduction targets through these collaborative efforts, contributing to global climate change mitigation.

Challenges to Achieving SPT 1

The KOT may require significant capital investment to reach its targets and will also need to consider how to mitigate the macroeconomic impacts of implementing the LT-LEDS policy. The KOT will need to prepare a transition plan for the transformation of the energy and transport sectors, mitigating against reduced productivity in its petroleum refineries, coal and lignite mining industries, manufacturing industries, and agriculture and transport sectors, which could also lead to GDP losses. The implementation of emissions

reduction measures under Thailand's LT-LEDS will also require increased government spending on welfare benefits (to mitigate against any expected welfare losses), education, research, and training.

Key barriers to transition in the energy sector include the limitations of grid connection due to inadequate capacity of transmission lines; a lack of support by financial institutions for energy efficiency and renewable energy investments; a lack of domestic technological and technical resources; and negative public perceptions, particularly related to waste-to-energy and biomass power plants. Several measures will require a high level of technical capacity and effective coordination across different sectoral agencies, whereas such technical capacity and effective coordination in a developing country like Thailand is currently lacking.

The challenge also includes raising awareness and participation from all relevant sectors, particularly the private sector, which urgently needs to adapt and enhance its capacity for business competition to keep pace with rapidly changing global circumstances and trends.

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

Baseline: 2023: 76,361

Target Observation Date: December 31, 2030

	Historical Data			SPT 2030
	2021	2022	2023 (Baseline)	
KPI 2: Annual registrations of ZEV passenger cars and pick-up trucks	1,958	9,674	76,361	**440,000**
Percentage Increase (%)	-	-	-	**476%**

The target to achieve 440,000 annual registrations of ZEV passenger cars and pick-up trucks corresponds to the 2030 utilization target under the 30@30 plan, which aims for ZEVs to account for 50% of new registrations of passenger cars and pick-up trucks by 2030. Thailand has also set interim targets of 225,000 (corresponding to 30% of total new registrations) new registrations of passenger cars and pick-up trucks by 2025, according to the National EV Committee.

Key Strategies for Achieving SPT 2

Thailand's EV Board has implemented a series of measures to support the adoption of EVs within the passenger car and pick-up sector, including subsidies and reduction in excise tax. These include the EV 3.5 and 3.0 policies, which have been approved by Thailand's Cabinet.

Under the earlier EV 3.0 policy, EV importers are granted tax incentives and the price of electric vehicles is subsidised by a maximum of THB 150,000 per vehicle.

- The incentive package under the policy includes a THB 70,000 subsidy for an EV car with a < 30kWh battery, and THB 150,000 subsidy for vehicles with a capacity >30kWh going at a recommended retail price of under THB 2 million.
- In order to stimulate local production, EV manufacturers are required to produce the cars locally at a ratio of 1:1 to those imported in 2024 (importing 1 EV for every 1 locally produced EV) and a 1:1.5 ratio for cars imported in 2025 (importing 1 EV for every 1.5 locally produced EVs), in order to avail the subsidy. Manufacturers that fail to achieve the ratio of domestic production to offset their imports would be required to return the subsidies and will also face a penalty at twice the amount of import tax exempted.

As part of the EV 3.5 package, the government will provide subsidies for the purchase of electric cars, electric pickup trucks, and electric motorcycles based on the vehicle types and battery capacities.

- Electric passenger cars and pick-up trucks priced under THB 2 million (equivalent to USD 58,000), EVs with a battery capacity of >50 kWh will be subsidized in range between THB 50,000 to THB 100,000 (equivalent to USD1,450 to USD 2,900) per unit, while those with battery capacity <50 kWh (not applicable for pick-up trucks) will be subsidized THB 20,000 to THB 50,000 (USD 580 to USD 1,450) per unit.
- Electric passenger cars priced under THB 7 million (equivalent to USD 200,000) will be incentivized with the reduction of excise tax from 8% to 2%, while for electric passenger cars priced under THB 2 million (equivalent to USD 58,000), importing EVs as Completely Built-Up Units (CBUs) during the first two years (2024-2025) will benefit additionally a reduction in import duties up to 40%.
- To promote EV production locally in Thailand, companies applying to this package will be contingent on the condition of EV production offset domestically for CBUs imported at 1:2 ratio by 2026 and 1:3 by 2027. Both imported and domestically manufactured electric cars, the batteries must acquire the Thai Industrial Standards (TIS) and pass testing based on international standards at the Automotive and Tire Testing National Center (ATTRIC).

In February 2024, Thailand's EV Board approved incentives to encourage companies to transition their commercial fleets of large trucks and buses to battery electric vehicles (BEV), and cash grants for EV battery cells manufacturers.

In addition, since Zero-Emission Vehicles charging stations are a crucial piece of infrastructure supporting the use of electric vehicles and are a key factor in the transition to electric vehicles in the transportation sector, Thailand's EV Board has set targets for the number of EV charging outlets. The target for DC Fast Chargers is set at 2,200 to 2,400 outlets by 2025 and 12,000 outlets by 2030[12]. Data from Electric Vehicle Association of Thailand (EVAT) as of December 31, 2023, indicates that there are 2,658 charging stations[13].

Challenges to Achieving SPT 2

One of the primary challenges is the development of a robust EV ecosystem. This includes building the necessary infrastructure, such as charging stations, and ensuring a reliable supply chain for EV components like batteries. The current infrastructure is insufficient to support the widespread adoption of EVs, and significant investments are required to expand it nationwide. Additionally, Thailand must address the limited availability of critical raw materials and the technological capabilities required for EV production.

Another challenge lies in consumer adoption. Despite government incentives, the relatively high cost of EVs compared to conventional vehicles remains a significant barrier. Moreover, there is a need to increase public awareness and confidence in EV technology, particularly regarding concerns about vehicle range, battery life, and the availability of charging stations.

Thailand's automotive industry also faces the challenge of transitioning from conventional vehicle manufacturing to EV production. This shift requires re-skilling the workforce, upgrading manufacturing facilities, and ensuring that the domestic automotive sector remains competitive in the global market. The country's reliance on traditional vehicle exports adds complexity to this transition, as the global market's demand for EVs will influence Thailand's ability to achieve its production targets.

[12] https://www.erc.or.th/th/energy-articles/3094
[13] https://evat.or.th/images/evinfo/current-status/2024-03/EVAT-Charging-Station-December2023.pdf

In addition, regulatory and policy challenges persist. The government must continue to develop and enforce policies that encourage EV adoption while balancing environmental objectives with economic growth. Coordination among various stakeholders, including government agencies, the private sector, and international partners, is essential to create a conducive environment for achieving the 30@30 target.

While ZEVs are considered a step towards a green transition, the KOT may require significant subsidies and infrastructure investment to reach its targets. The upfront cost of EVs in Thailand remains high compared to traditional ICE vehicles. This price difference can deter potential buyers, especially those in middle to lower-income brackets. The range of EV models available in Thailand is still relatively limited compared to traditional vehicles. This restricts consumer choice and may not cater to the diverse preferences and needs of Thai drivers. In addition, insuring EVs can be more expensive due to the high cost of parts and the perceived risks associated with new technology. This can add to the overall cost of ownership.

Although the number of charging stations is increasing, the current infrastructure is still insufficient, especially in rural areas. This limitation makes long-distance travel with EVs less convenient.

End of Life Management of EV Batteries

Since 2019, the Ministry of Industry has signed a memorandum of understanding (MOU) for a pilot project called “ELV Project: End-of-life Vehicles in Thailand” in collaboration with the Industrial Estate Authority of Thailand and the New Energy and Industrial Technology Development Organization (NEDO), a Japanese governmental R&D funding agency. The project aims to establish an efficient and appropriate resource circulation system from end-of-life vehicles in Thailand, focusing on energy conservation and recycling. The goal is to develop a circular economy model in Thailand and the Asian region in the future. As part of this collaboration, a standard working manual for vehicle dismantling and appropriate practices for dismantling end-of-life vehicles have been compiled. These guidelines will provide management strategies and incentives for individuals to properly dispose of their old vehicles, thereby stimulating economic activity by encouraging the purchase of environmentally friendly new vehicles. This will contribute to the establishment of an efficient end-of-life vehicle management system in Thailand for the foreseeable future. The project is in line with the policy to promote the use of Electric Vehicles (EVs) where the target to manufacture EVs by 2030 was set at 30% of the domestic automotive manufactures to achieve the goal of the effectively environmental pollution reductions.

Legislative and regulatory measures have been instrumental in driving progress in ELV management in Thailand. The government has introduced Extended Producer Responsibility policies and draft laws that require vehicle manufacturers and importers to take responsibility for the proper disposal of their end-of-life products. These regulations place the onus on manufacturers to establish systems for collecting and managing ELVs, encouraging them to adopt environmentally friendly practices throughout the vehicle life cycle. However, such regulation is still under consideration.

In June 2024, The Thailand Board of Investment (BOI) approved the introduction of a new investment promotion category covering service centers for the repair, repack, and reuse of used electric vehicle (EV) batteries and energy storage systems, that further complements the BOI’s comprehensive EV supply chain policy and incentives.

2.3 Characteristics of Sustainability-Linked Finance Instruments

The financial characteristics of sustainability-linked finance instruments can vary, such as including but not limited to, coupon step-ups and step-downs, due to

1) success or failure in achieving the SPTs by the target observation date, and
2) the failure to confirm the performance of the KPIs against the SPTs through a verification assurance report provided in a timely and satisfactory manner.

Any variation of the financial characteristics will be commensurate and meaningful relative to the original sustainability-linked finance instrument's financial characteristics. Each sustainability-linked finance instrument may have one or more SPTs with an associated target observation date and financial implications.

The exact variation of the financial characteristics such as the amount, timing, and mechanism for payment of the financial implications will be specified in the corresponding legal documentation of the sustainability-linked finance instrument. The corresponding legal documentation will also detail the definition of the KPIs; calculation methodologies; SPTs; target observation dates; trigger event dates (trigger event refers to the change in financial characteristics of the instrument as a result of whether the SPT has been achieved); dates for verification assurance report to be provided; and any fallback mechanism if the SPTs cannot be calculated, observed, or reported in a timely and satisfactory manner.

Where relevant, additional language will be provided in the corresponding legal documentation to take into consideration the following:

1) **The potential impact on KPIs, SPTs, or baselines from a change in KPI calculation methodologies, data accessibility, or exceptional or extreme events that could significantly impact the regulatory, socioeconomic, and political environment.**

   In such a situation, a recalculation of KPIs, SPTs, or baselines may be carried out in good faith to reflect such a change, subject to

   a) the government, represented by PDMO, providing the rationale for the revision; and

   b) an external reviewer has confirmed that the proposed revision is in line with KOT national policies and strategies, in line or more ambitious than the initial level of ambition of SPT, and that there is no material impact on the original second-party opinion provided to the issuer in connection with the framework. In case of a material impact, the framework will be revised, and a new second-party opinion will be obtained.

2) **Automatic adjustment to outstanding sustainability-linked finance instrument at the issuance of any future sustainability-linked finance instrument with an SPT of <u>greater</u> ambition that is based on the same KPI and target observation date.**

   Such adjustments are intended to:

   a) Reflect the KOT's progressive strengthening of ambition over time,

   b) Avoid coexistence of sustainability-linked finance instruments with different SPTs at the same target observation date for the same KPI, and

   c) Facilitate the reporting exercise by avoiding the need to validate the KPI against multiple SPTs.

2.4 Reporting

Annually, the KOT will publish, and keep readily available and easily accessible, an SLB Progress Report on the PDMO's website (https://www.pdmo.go.th/en) at least until after the last SPT trigger event date. The report will contain qualitative or quantitative explanations of the main factors behind the evolution of the KPIs, as well as (when available) the progress of the KPIs established in this Framework.

The SLB Progress Report will be published no later than June 30 of each year for data as of December 31 of the preceding year, subject to the following considerations:

- Information regarding KPI 1 will be produced biennially, because the current NDC protocol limits the KOT's ability to publish results annually due to the complexity of the data collection and verification. The SLB Progress Report will contain the most updated official data as well as qualitative factors behind the evolution of the KPIs. Furthermore, there is expected to be a time lag of 3 years (and no longer than 4 years) from the end of each year to the reporting of GHG inventory data as part of the UNFCCC process.
- Information regarding KPI 2 will be produced annually and included in the SLB Progress Report. As such, there is expected to be a time lag of 6 months for the publication of final data.

Where feasible, the report may also include the following:

- Any other information enabling investors to monitor the level of ambition of the SPTs or an illustration of the positive sustainability impacts of the performance improvement.
- Any recalculation of KPIs, SPTs, or baselines due to a change in KPI calculation methodologies, data accessibility, or exceptional or extreme events.

2.5 Verification

Performance of KPI 1, i.e., KOT's GHG inventory, will be 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. A summary report will be available on the UNFCCC website.

The KOT is committed to engage an independent external reviewer to verify the performance of the KPI 2 against each SPT annually, at least until after the last SPT trigger event date. The limited assurance verification report will be made available on the PDMO's website together with the SLB Progress Report.

3. Second-Party Opinion

The KOT has appointed DNV (Thailand) Co., Ltd to assess the Sustainability-Linked Finance Framework and its alignment with the SLBP, ASEAN SLBS, and SLLP, and to issue a second-party opinion accordingly.

The second-party opinion will be made available on the PDMO's website.

Glossary

°C	degree Celsius
ACMF	ASEAN Capital Markets Forum
AIM	Asia-Pacific Integrated Assessment Model
AEDP	Alternative Energy Development Plan
ALPMA	Asia-Pacific Loan Market Association
ASEAN	The Association of Southeast Asian Nations
ASEAN SLBS	ASEAN Sustainability-Linked Bond Standards
ATTRIC	Automotive and Tire Testing National Center
BAU	Business-as-usual
BECCS	Bioenergy with carbon capture and storage
BEV	Battery Electric Vehicle
BTR	Biennial Transparency Report
BUR	Biennial Update Report
CCS	Carbon capture and storage
CCUS	Carbon capture, utilization, and storage
CGE	Computable General Equilibrium
CH4	Methane
CO_2	Carbon dioxide
COP	Conference of the Parties
DCCE	Department of Climate Change and Environment
DEDE	Department of Alternative Energy Development and Efficiency
DIW	Department of Industrial Works
DNP	Department of Natural Parks, Wildlife and Plant Conservation
EPPO	Energy Policy and Planning Office
EURO5,6	European emission standards
EV	Electric vehicles
EVAT	Electric Vehicle Association of Thailand
GDP	Gross domestic product
GHG	Greenhouse gas
HFCs	Hydrofluorocarbons
ICMA	International Capital Market Association
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial processes and product use
km	kilometer
km^2	square kilometer
KOT	Kingdom of Thailand
KPI	Key Performance Index
$ktCO_2e$	kilotonnes of carbon dioxide equivalent
ktoe	kilotonne of oil equivalent
kWh	kilowatt hours
LMA	Loan Market Association
LPG	Liquefied petroleum gas
LSTA	Loan Syndications and Trading Association
LT-LEDS	Long-Term Low Greenhouse Gas Emission Development Strategies
LULUCF	Land use, land-use change and forestry
MRV	Measurement reporting and verification
$MtCO_2e$	million tonnes of carbon dioxide equivalent
MW	Megawatt
NAMA	Nationally Appropriate Mitigation Action
N_2O	Nitrous oxide
NCCC	National Committee on Climate Change Policy
NDC	Nationally Determined Contribution
OAE	Office of Agricultural Economics
ONEP	Office of Natural Resources and Environmental Policy and Planning
OTP	The Office of Transport and Traffic Policy and Planning
PCD	Pollution Control Department
PDMO	Public Debt Management Office
PDP	Power Development Plan
PFCs	Perfluorocarbons
PM2.5	Particulate matter (2.5 micrometers or less)
PPA	Power purchase agreement
SDGs	Sustainable Development Goals
SF6	Sulphur hexafluoride
SLBP	Sustainability-Linked Bond Principles
SLLP	Sustainability Linked Loan Principles
SMR	Small modular reactor
SPO	Second-Party Opinion
SPT	Sustainability Performance Target
TGEIS	Thailand Greenhouse Gas Emission Inventory System
THB	Thai Baht
TIS	Thai Industrial Standards
UNFCCC	United Nations Framework Convention on Climate Change
ZEV	Zero emissions vehicle