THAILAND TAXONOMY

Transportation Sector

July 2025

THAILAND TAXONOMY BOARD

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Thailand Taxonomy Board

Transportation sector

1. Department of Climate Change and Environment, Ministry of Natural Resources and Environment
2. Bank of Thailand
3. Securities and Exchange Commission
4. Stock Exchange of Thailand
5. Office of Natural Resources and Environmental Policy and Planning (ONEP), Ministry of Natural Resource and Environment
6. Department of Alternative Energy Development and Efficiency (DEDE), Ministry of Energy
7. Energy Policy and Planning Office (EPPO), Ministry of Energy
8. Office of Transport and Traffic Policy and Planning (OTP), Ministry of Transport
9. Thailand Greenhouse Gas Management Organization (Public Organization) (TGO)
10. Federation of Thai Industries (FTI)
11. Renewable Energy Industry Club, Federation of Thai Industries (RE-FTI)
12. Thai Chamber of Commerce and Board of Trade of Thailand
13. The Thai Bankers' Association (TBA)
14. Association of International Bank (Thailand) (AIB)
15. Government Financial Institutions Association (GFA)

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1. Transportation sector background

The shipping sector is global, and vessels produced in different parts of the world possess roughly similar characteristics. Ships, however, are a very diverse, both in terms of sizes and in terms of purposes, and any eligibility criteria for them must be granular enough to encompass all of them.

In Thailand, transport has been the dominant sector in the Infrastructure Development Master Plan (IDMP) 2015–2022, which prioritised five transport sectors: (1) inter-link railway network, (2) road networks, (3) mass transit in Bangkok and neighbouring cities, (4) enhancement for highway network to link with key areas in the country and with the regional countries in the Greater Mekong Subregion and ASEAN, and (5) water and air transport. The estimated Investment for the IDMP reached THB3.4 trillion (USD100 bn), of which planned spending on major projects on railway and mass transit networks in Bangkok are dominant.[1]

Sustainable transport

Environmental sustainability has become an increasingly important consideration in the transport sector in Thailand. Through a short-term programme (2013–2017), and a long-term plan (2018–2030), the Environmental Sustainable Transport Master Plan (2013) aims to reduce energy intensity, GHG emissions, and air pollution from transport, with the development of public transportation and mass rapid transit systems as one of the key implementation strategies. In 2019, the Ministry of Transport (MoT) published the 20-year Transport System Development Strategy (2018–2037), which includes green and safe transport as a key pillar.

The Thailand Transport Investment Action Plan 2017 has also prioritised sustainable transport projects. The Plan outlined (1) 10 projects for Double Track Rail Network (USD11.67 bn); (2) two projects for Commuter Train (USD4.78 bn); (3) six projects for Mass Transit Development (USD6.32 bn); and (4) one project for public bus procurement and stations (USD64.92 m). The Thai Board of Investment (BOI) offers tax and non-tax incentives to domestic and international investors to invest in sustainable transport in Thailand, including rail development.[2] The

[1] Oxford Business Group. Infrastructure improvements aim to connect Thailand with the rest of Asia

[2] Thailand Board of Investment. (2019). Transport & Logistics

Government also implements a number of several public transportation development projects in provincial areas.

The NDC Sectoral Action Plan for Transport Sector 2021 – 2030 aims to reduce GHG emissions from the sector, with an emphasis on developing efficient and sustainable transportation systems to reduce energy consumption, lessen traffic congestion, and create liveable cities. Four key strategies include:

1. supporting and promoting the planned implementation of relevant agencies in the transport sector;
2. developing and improving laws supporting GHG reduction;
3. developing measurement, reporting and verification (MRV); and
4. engaging and strengthening the capacity of all agencies to reduce GHG emissions.

Thailand's key transport-related objectives and targets

- Reduce 31.0 $MtCO_2eq$ from mitigation measures in the transport sector (Thailand's NDC Roadmap 2021-2030), especially in energy efficiency in transportation
- The NDC Action Plan in the transport sector, 2021 – 2030 identifies measures of green transport, transport efficiency, and inclusive transport and is expected to contribute to the GHG emissions reduction of 35.42 $MtCO_2eq$ in 2030.[3]
- Increase to 1.2 million electric vehicles and 690 charging stations by 2036.[4]

Legal framework

All national transport-related agencies are under the control of the Ministry of Transport. The Department of Highways (DOH) is responsible for national roads and highways, while key local roads are the responsibility of the Department of Rural Roads. Around 365,000 km of other local roads are under municipal and district jurisdictions. The Expressway Authority of Thailand (EXAT) is responsible for urban express ways, presently confined to Bangkok Metropolitan Region (BMR) and its environs. Bangkok Metropolitan Administration (BMA) is responsible for urban road development in the BMR. The Office of Transport and Traffic Policy and Planning (OTP) is the national transport planning office.

[3] Office of Transport and Traffic Policy and Planning, Ministry of Transport. (2021). NDC Action Plan in the transport sector 2021 – 2030

[4] Hanh, N. M. (2022). Thailand Issues New Incentive Package for Electric Vehicle Industry

Key transport-related laws include the Land Transport Act, B.E. 2522 (1979), which governs registration of vehicles, vehicle dimensions, operation of freight and passenger transport, and annual taxation and inspection; the Highway Act, B.E.2535 (1992), which governs road design, vehicle and axle weight regulations; and the Industrial Product Standards Act, B.E. 2511 (1968) which governs product standard regulations, and emission standard of vehicles (in compliance with the National Pollution Control Board's Order).

2. Criteria and Thresholds for the Transportation Sector

The decarbonisation of transportation is critically important for the overall climate strategy of Thailand. Thresholds and screening criteria for the activities in this sector are primarily based upon the developments of the Climate Bonds and EU taxonomies but also consider national targets as well as the specific conditions of Thailand and ASEAN in general.

Due to the diverse nature of the sector itself, multiple models are used for transportation emissions mitigation. There are also limited opportunities to improve existing assets with regards to energy efficiency measures or reduction of GHG emissions (for example, the car can be replaced but not retrofitted unlike the factory.). The decarbonisation strategy here relies on the fast replacement of internal combustion engines with zero-emission solutions and phase-out of carbon-intensive technologies. Hence, most activities within the transport sector do not have an amber category, especially activities for which zero-emission alternatives exist.

The following section discusses specific considerations in establishing threshold for shipping before presenting the overall Sectoral Criteria and Thresholds for the transport sector, which contain relevant information for shipping and other transport activities in section 3 Activities thresholds and criteria.

2.1 Shipping Sector

Shipping is a globally conducted activity. While vessels manufactured across various regions may exhibit certain similarities, they also display considerable diversity in terms of size and functional purpose. Consequently, the development of evaluation criteria for these vessels must be sufficiently comprehensive and nuanced to accommodate the assessment of all ship types.

The **green threshold** for the shipping sector is calculated according to the Climate Bonds Initiative Shipping Criteria[5]. In essence, for the shipping activity to be considered green, the expected carbon-equivalent intensity of the ship must be aligned with the decarbonisation trajectory (emissions intensity threshold) of the ship's type/size category reaching zero emissions by 2050.

[5] Climate Bonds Initiative. (2021). CBI Shipping Criteria – Criteria Document

Ships below 5,000 GT with zero emissions (propelled and powered by batteries or zero-emissions fuels) not violating any conditions in the Table 1 are automatically eligible.

The related measurement metric for shipping criteria is the Annual Efficiency Ratio (AER) and it measures carbon emissions associated with transport work, but it uses a ship's size (deadweight) as a proxy for cargo carried and assumes that the ship is fully loaded on all journeys. Any vessel 5,000 GT and above must report using International Maritime Organisation Data Collection System. Mandatory collection and universal applicability of this data allows us to use AER measurement.

Table 1 Decarbonisation pathways for different ship types

No.	Type	Size	Target AER 2020-2029	Target AER 2030-2039	Target AER 2040-2049	Target AER 2050
1	Bulk carrier	0-9999 DWT	24.6	16.4	8.2	0
2	Bulk carrier	10000-39999 DWT	6.6	4.4	2.2	0
3	Bulk carrier	35000-59999 DWT	4.6	3.1	1.5	0
4	Bulk carrier	60000-99999 DWT	3.6	1.4	1.2	0
5	Bulk carrier	100000-199999 DWT	2.4	1.6	0.8	0
6	Bulk carrier	200000+ DWT	2.3	1.5	0.8	0
7	Chemical tanker	0-4999 DWT	35.4	23.6	11.8	0
8	Chemical tanker	5000-9999 DWT	19	12.7	6.3	0
9	Chemical tanker	10000-19999 DWT	11.9	7.9	4	0
10	Chemical tanker	20000+ DWT	6.5	4.3	2.2	0
11	Container	0-999 TEU	16.9	11.3	5.6	0
12	Container	1000-1999 TEU	14.8	9.9	4.9	0

No.	Type	Size	Target AER 2020-2029	Target AER 2030-2039	Target AER 2040-2049	Target AER 2050
13	Container	2000-2999 TEU	10	6.7	3.3	0
14	Container	3000-4999 TEU	8.3	5.5	2.8	0
15	Container	5000-7999 TEU	7.8	5.2	2.6	0
16	Container	8000-11999 TEU	6.7	4.5	2.2	0
17	Container	12000-14500 TEU	4.6	3.1	1.5	0
18	Container	14500+ TEU	4.6	3.1	1.5	0
19	General cargo	0-4999 DWT	24.2	16.1	8.1	0
20	General cargo	5000-9999 DWT	16.7	11.1	5.6	0
21	General cargo	10000+ DWT	13.1	8.8	4.4	0
22	Other liquid tanker	0+ DWT	97.6	65.1	32.5	0
23	Refrigerated bulk	0-1999 DWT	48.7	32.5	16.2	0
24	Ro-Ro	0-4999 GT	212.4	141.6	70.8	0
25	Ro-Ro	5000+ GT	45.9	30.6	15.3	0
26	Vehicle	0-3999 vehicles	46	30.7	15.3	0
27	Vehicle	4000+ vehicles	13.8	9.2	4.6	0
28	Cruise	60000-99999 GT	1738613.6	1159075.7	579537.9	0
29	Cruise	100000+ GT	1337274.9	891516.6	445758.3	0
30	Ferry-RoPax	0-1999 GT	822123.9	548082.6	274041.3	0
31	Ferry-RoPax	2000+ GT	1137003.8	758002.5	379001.3	0
32	Ferry-pax only	0-1999 GT	1272135.8	848090.5	424045.3	0

No.	Type	Size	Target AER 2020-2029	Target AER 2030-2039	Target AER 2040-2049	Target AER 2050
33	Ferry-pax only	2000+ GT	1740606.6	1160404.4	580202.2	0
34	Cruise	0-1999 GT	2044403.4	1362935.6	681467.8	0
35	Cruise	2000-9999 GT	1286641.3	857760.8	428880.4	0
36	Cruise	10000-59999 GT	1495064.7	996709.8	498354.9	0

Source: CBI Green Shipping Criteria

Note: 1) AER for cargo ships (lines 1-27) is measured in gCO2-e/tonne-nm. In the case of passenger ships (lines 28-39) gCO2-e/GT is used instead 2) DWT (Dead Weight Tonnes) for the weight of the cargo 3) TEU (Twenty-foot Equivalent Unit) and 4) GT (Gross tonnage, a proxy) for the number of passengers

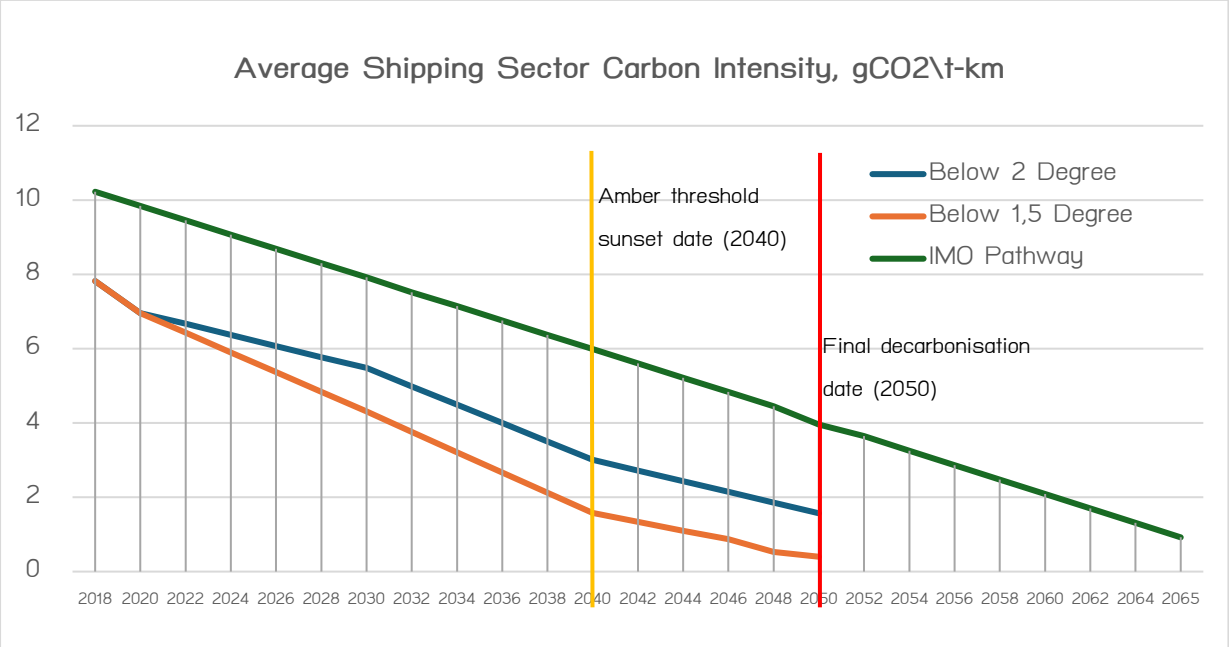
For the activity of ship exploitation to be eligible as green, the ship must comply with the threshold for the time of the particular period (bond or loan period, data collection timeframe etc.). Ships that are not zero-emissions must provide a managed reduction plan (MRP) that shows how the ship can remain under the emissions intensity threshold during the operational life of the ship.

Concerning the **amber threshold**, it was considered appropriate to apply the guidelines proposed by the International Maritime Organisation decarbonisation pathway metrics. They are relatively less stringent but are suitable for the purpose of retrofitting existing ships. According to the IMO, the average emission of ships must fall by at least 40% by 2030, pursuing efforts towards 70% by 2050, compared to 2008[6]. In 2008 Thailand, average emissions were 13.2 gCO2/t-km[7]. Subtracting of 40% gives 7.92 gCO2/t-km by 2030 while subtracting 70% gives us 3.96 gCO2/t-km by 2050.

[6] International Maritime Organization. Annex 11: Initial Imo Strategy on Reduction of Ghg Emissions from Ships

[7] Information and Communication Technology Center, Ministry of Transport. (2022). GHG Water

Figure 1 Shipping sector decarbonisation pathways



Source: TPI; Thailand Ministry of Transportation

Note: all the thresholds after 2030 are indicative and will be subject to change due to the development of science and technology.

Furthermore, that these figures are relevant for the sector in general. In order to calculate **individual amber decarbonisation pathways** for specific ships according to the IMO recommendations, the following methodology should be applied:

- First, one needs to find the emission number of the baseline year (that is 2008, the data on emission of different classes of ships must be taken from the Second IMO GHG Study, table 9.1, last column “Total Efficiency”.
- Second, one needs to subtract 40% and 70% from this number and put it on a timeline, where the first dot represents the actual current emission of the ship in the year of calculation, the second one – the result of subtracting 40% from a 2008 baseline attached to 2030, the third one – the result of subtracting 70% from a 2008 baseline attached to 2050.
- Third, the resulting graph should be utilised as an actual decarbonisation pathway for the purpose of the activity owner (for example, for issuing a bond).

For example, if the activity in question is the transportation of goods using a bulk carrier of 210.000 DWT, the table in the Second IMO GHG Study gives us 2.5 gCO2e/tkm in 2008.

Subtracting 40% gives us 1.5 gCO2e/tkm by 2030, subtracting 70% gives us 0.75 gCO2/tkm by 2050. Decarbonisation path for this type of ship should be built along this pathway.

In addition, the following types of ships are automatically ineligible regardless of their compatibility with the thresholds from Table 1.

Table 2 Red (exceptionally harmful) activities for the shipping sector

Assets	Explanation
Crude Oil Tankers and Liquefied Gas Tankers	Assets which are dedicated to transporting fossil fuels are not compliant under the criteria. This is applicable to ships which are classified as liquified natural gas (LNG) Carriers or Crude Oil Tankers.
Dry Bulk Carriers IF transporting more than the maximum threshold of coal	Assets where more than 25% of tonnage transported annually is coal or other fossil fuels. This threshold declines geometrically at 5.3% from the year 2020 onwards.
Assets dedicated to supporting the fossil fuel sector[8]	Assets used for the exploration or production of fossil fuels are not compliant under the present taxonomy. This includes but is not limited to: Floating Production, Supply and Offloading (FPSO) Vessels; Subsea, Umbilical, Risers, Flowlines (SURF) Vessels; Drilling Units; Platform Supply Vessels; Well Intervention Vessels.

2.2 Sectoral thresholds and metrics for transportation sector

While the principles by which the green criteria and thresholds for Shipping were explained above, the green thresholds for railway and non-railway transport are set to be in line with the EU Taxonomy. Table 3 provides a summary of the overall transport sector's criteria and thresholds. Some specific transport activities discussed in Section 2. will cross-reference with this Table.

[8] Various actions and projects that facilitate the extraction, processing, transportation, and consumption of fossil fuels such as coal, oil, and fossil gas. This includes the construction and operation of facilities like refineries, pipelines, storage terminals, and power plants that utilise fossil fuels for energy production. It also includes renewable energy elements that support fossil fuel infrastructure (e.g., solar panels installed on the petrol stations).

Table 3 Transportation sector activities criteria and thresholds

Green Activities	2022-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Railway; Non-Railway, gCO2/t-km	0	0	0	0	0	0
Shipping, gCO2/t-km	Declining threshold for different ship classes according to **Table 1**					
Amber Activities	2022-2025	2026-2030	2031-2035	2036-2040	2041-2045*	2046-2050*
Railway and Non-Railway;	See individual articles in Section 2					
Shipping, gCO2/t-km	8.9	7.92	7	6	N/A	N/A
Red Activities	**The activities carried out with the ships, that belong to the categories from Table 2 as well as those that exceed the thresholds for amber and green are harmful to the objective of climate change mitigation**					

Note: All thresholds are subject to review every three to five years in accordance with new data and technological development.

* Post-sunset dates, amber certification is no longer available.

2.3 Aviation Sector

Decarbonising the aviation industry presents several significant challenges due to the unique energy requirements of aircraft and the limitations of current alternative technologies. Aviation relies heavily on high-energy-density fuels, such as kerosene-based jet fuel, which enables long-range travel and high speeds. Alternatives like Sustainable Aviation Fuels (SAFs), hydrogen, and electric propulsion face technical limitations, particularly lower energy densities, which complicate their use in long-haul flights. Hydrogen, while having a high gravimetric energy density, requires bulky storage systems that impact aircraft design and capacity, and batteries are far too heavy and limited in energy storage for anything beyond short-haul flights. These challenges in fuel density and storage are exacerbated by the need for new infrastructure, such as cryogenic hydrogen storage facilities and high-power charging systems, which current airports and supply chains are not equipped to handle.

Given these complexities, and in the absence of a globally agreed-upon emissions reduction path from organisations like the International Civil Aviation Organization (ICAO), the most technologically and economically viable way to decarbonise air transport today is to increase the use of Sustainable Aviation Fuels (SAFs).

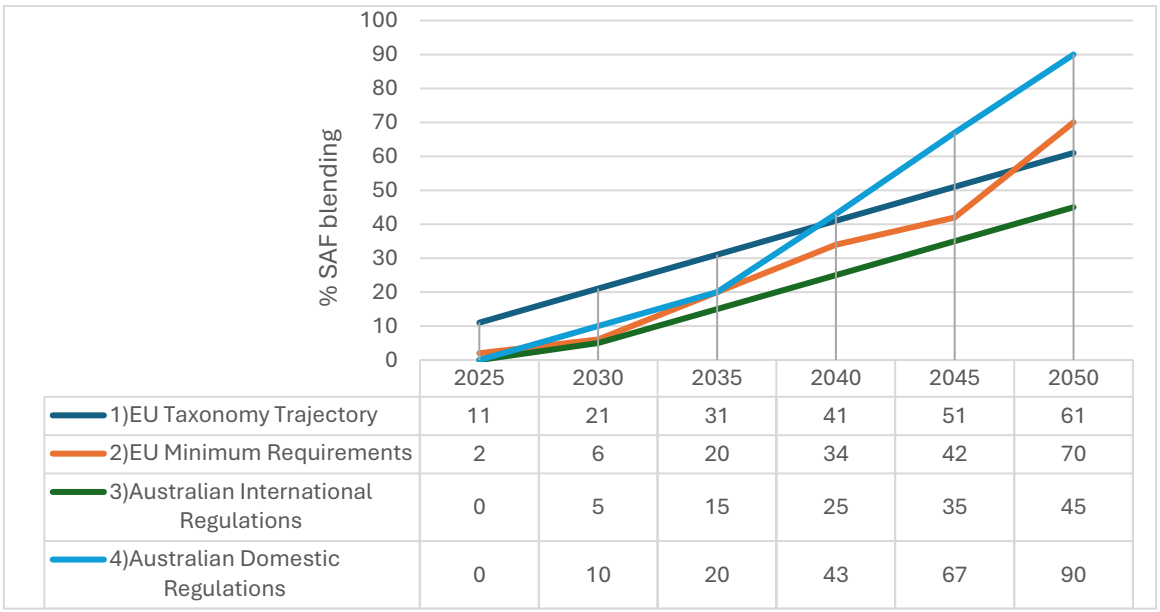
Therefore, the most practical approach is to set a clear trajectory for increasing the percentage of SAF that airlines must blend into their fuel supply. This strategy has two key benefits:

1. It ensures a necessary level of decarbonisation for the industry.
2. It sends a clear market and demand signal to producers to scale up the supply of SAFs.

While the use of hydrogen and electric aircraft is certainly compatible with the Taxonomy's long-term objectives, the immediate focus on SAFs is a pragmatic step. Recognising the complexities of this sector, the Taxonomy Propose changing to does not establish any activities as a "red" category allowing for future technological breakthroughs.

In the absence of established international practice, different jurisdictions set their own SAF blending targets according to their ambitions and vision. Here are how two jurisdictions, the EU and Australia with the developed SAF blending requirements approach this issue: Figure 2. SAF blending requirements in the EU Taxonomy and Australian national regulations

Figure 2 SAF decarbonisation pathways



	2025	2030	2035	2040	2045	2050
1)EU Taxonomy Trajectory	11	21	31	41	51	61
2)EU Minimum Requirements	2	6	20	34	42	70
3)Australian International Regulations	0	5	15	25	35	45
4)Australian Domestic Regulations	0	10	20	43	67	90

Sources: Pathway 1: EU Taxonomy[9]; Pathway 2: EU SAF Regulation (ReFuelEU Aviation[10]); Pathways 3 and 4: Aviation White Paper. Towards 2050[11]

Thailand has shown continuous support for SAF development and has established its own national targets for blending SAF into jet fuel: 2027-2029 (2%), 2030-2032 (3%) and 2032-2037 (5-8%)[12]. This national target establishes a robust minimum requirement to energise the local market. For the Thailand Taxonomy benchmark, it is recommended to adopt the EU's Minimum Requirements pathway, as this approach combines a necessary level of ambition with economic feasibility and aligns well with the Thai government's plans for SAF production and distribution.

While SAFs reduce carbon emissions, their production can still have a significant environmental footprint, depending on feedstock and processing methods. Hydrogen's combustion at high altitudes can lead to contrail formation, potentially increasing the climate impact through non-CO2 emissions. To tackle these problems and ensure that the alternatives are genuinely sustainable, Thailand Taxonomy requires an additional crucial step: obtaining a recognised sustainability certification for the SAFs used. Currently, these certifications are international labels (e.g. CORSIA Sustainability Certification schemes), but in the future, they may also include relevant Thai labels as they are developed and adopted.

[9] EU Parliament and the European Council. Commission Delegated Regulation (EU) 2023/2485 of 27 June 2023 amending Delegated Regulation (EU) 2021/2139 establishing additional technical screening criteria for determining the conditions under which certain economic activities qualify as contributing substantially to climate change mitigation or climate change adaptation and for determining whether those activities cause no significant harm to any of the other environmental objectives. Article_6.19. Passenger and freight air transport

[10] EU Parliament and the European Council. Regulation (EU) 2023/2405 of the European Parliament and of the Council of 18 October 2023 on ensuring a level playing field for sustainable air transport (ReFuelEU Aviation). Annex I. Shares of SAF referred to in the Article 4

[11] Australian Government. Aviation White Paper. Towards 2050. (2024) All parts of the aviation sector need to play their role in reducing emissions

[12] Thailand's Ministry of Energy. Department of Energy Business. "Highlight of (Draft) Oil Plan 2024. For public hearing on June 28, 2024

3. Activities thresholds and criteria

While the previous section presented general Sectoral thresholds and criteria for the sector, this section presents specific thresholds and criteria for each individual activity within each sector. It should be noted that for some individual activities, their own screening tables below will contain complete information on eligibility criteria for green and amber activities, and can thus be used independently without having to refer back to the table of sectoral thresholds and criteria in the previous section. But for other activities, their screening tables will contain information which needs to be used in conjunction with the table of sectoral thresholds and criteria in the previous section. The cross-referencing situation is also applicable for many of the transport activities presented in Section 3 as well.

A note on scoping:

A user of the Taxonomy can use it to establish compliance with it for a variety of activity-related operations, including the construction of new structures and facilities, operations on existing facilities and retrofitting them to better meet the Taxonomy criteria. The user can read a detailed description of all eligible operations in the "Description" section of each activity card. Additionally, for orientation purposes, a "Scope" line has been added to the activity cards, which contains fundamentally important information about what is allowed within a given activity:

- **Operations**: only operations on existing objects (e.g. managing a fleet of vehicles or repairing them) are aligned with the Taxonomy. All cash flows associated with these operations (including profits, costs and credits) are also Taxonomy compliant and can be recognised as such in the documents. The specific list of Taxonomy-compliant operations can be seen in the "Description" line of the activity card.

- **Construction**: this activity involves the construction of new facilities (power plants, factories and other facilities) that will host Taxonomy-compatible activities (e.g. solar power plants or low-carbon transport infrastructure). All cash flows directed towards the construction of these facilities (including loans taken out, bonds issued, etc.) are considered compatible with the Taxonomy.

- **Retrofitting**: this activity is limited to the modernisation of existing facilities to a level approaching the requirements of the Taxonomy. The funds spent on such an activity are also Taxonomy compliant.

This report will reference ISIC codes from National Statistical Office Thailand (TSIC).

2.1 Transportation sector activities: an overview

The transport sector in Thailand is significantly more developed than its Southeast Asian neighbours. Road transport is the dominant subsector in terms of investment, traffic flow, national coverage, and economic impact, accounting for 98% of passenger traffic and 95% of the country's freight traffic[13] Despite the developed transport infrastructure network, access to the public transportation system is limited only to city centres. Overall, only 24 percent of the urban population has convenient access to the public transportation system. Other key problems of the sector include road safety, inefficient highway network, and low road infrastructure competitiveness measured in terms of logistics costs. In terms of carbon footprint, the transportation sector contributed the largest share (38.40%) of final energy consumption in 2020.[14]

The following sections present the screening criteria and thresholds for the different activities within the transport sector.

[13] Asian Development Bank. Sector Assessment (Summary): Transport

[14] Department of Alternative Energy Development and Efficiency, Ministry of Energy. (2021). Energy Balance of Thailand 2020.

1. Transport via railways

Sector	Transportation
Activity	Transport via railways
ISIC code	491
Description	Purchase, financing, rental, leasing and operation of passenger transport using railway rolling stock on mainline networks, spread over an extensive geographic area, passenger transport by interurban railways and operation of sleeping cars or dining cars as an integrated operation of railway companies.
Scope	Operations only
Objective	Mitigation
Green	The activity is aligned with Taxonomy objectives if it aligns with one of the following criteria: • the trains and passenger coaches/wagons have zero direct (tailpipe) CO_2 emissions; • the trains and passenger coaches/wagons have zero direct (tailpipe) CO_2 emission when operated on a track with necessary infrastructure, and use a conventional engine where such infrastructure is not available (bimodal) AND • The trains and wagons are not solely dedicated to the transport of fossil fuels
Amber	• Passenger rolling stock is aligned with Taxonomy objectives if its direct emissions are below 50 gCO2e/pkm until 2027 (after this year only rolling stock with zero direct emissions will be eligible) • As for freight transport by rail, it is aligned with Taxonomy objectives if direct emissions are below 25 gCO2/tkm until 2027 (after this year only rolling stock with zero direct emissions will be eligible)
Red	The activities that are not compliant with green or amber criteria are harmful to the objective of climate change mitigation
Criteria reference	Climate Bonds Initiative Land Transport Criteria Background Paper

2. Other passenger land transport

Sector	Transportation
Activity	Other passenger land transport
ISIC code	4932
Description	This class includes purchase, financing, renting, leasing and operation of the following types of vehicles: • scheduled long-distance bus services; • charters, excursions and other occasional coach services; • taxi operation; • passenger cars; • airport shuttles. • other renting of private cars with driver; • operation of school buses and buses for transport of employees; • passenger transport by man- or animal-drawn vehicles.
Scope	Operations only
Objective	Mitigation
Green	If direct (tailpipe) CO2 emissions of the vehicle are zero, they are aligned with Taxonomy objectives
Amber	N/A
Red	The activities that are not compliant with green criteria are harmful to the objective of climate change mitigation
Criteria reference	Climate Bonds Initiative Land Transport Criteria Background Paper

3. Urban and suburban passenger land transport

Sector	Transportation
Activity	Urban and suburban passenger land transport
ISIC code	4920 4931
Description	This class includes purchase, financing, renting, leasing and operation of vehicles exercising land transport of passengers by urban or suburban transport systems. This may include different modes of land transport, such as: • by motorbus, • tramway, • streetcar, • trolley bus, • underground • motorbikes and three-wheelers • elevated railways etc. The transport is carried out on scheduled routes normally following a fixed time schedule, entailing the picking up and setting down of passengers at normally fixed stops. The class also includes: • town-to-airport or town-to-station lines operation of funicular railways, aerial cableways etc. if part of urban or suburban transit systems.
Scope	Operations only
Objective	Mitigation
Green	For scheduled passenger road transport, the activity complies with Taxonomy objectives if it aligns with the following criteria: • the activity provides urban or suburban passenger transport, and its direct (tailpipe) CO_2 emissions are zero For scheduled passenger urban suburban rail transport, the activity complies with Taxonomy objectives if it aligns with the following criteria:

	• the trains and passenger coaches have zero direct (tailpipe) CO_2 emissions; the trains and passenger coaches have zero direct tailpipe CO_2 emission when operated on a track with necessary infrastructure and use a conventional engine where such infrastructure is not available (Bi-Mode).
Amber	N/A
Red	The activities that are not compliant with green criteria are harmful to the objective of climate change mitigation
Criteria reference	Climate Bonds Initiative Land Transport Criteria Background Paper

4. Freight transport by road

Sector	Transportation
Activity	Freight transport by road
ISIC code	4933
Description	This class includes purchase, financing, renting, leasing, retrofitting and operation of the following types of vehicles: • all freight transport operations by road • motorbikes and three-wheelers • logging haulage • stock haulage • refrigerated haulage • heavy haulage • bulk haulage, including haulage in tanker trucks • haulage of automobiles • transport of waste and waste materials, without collection or disposal This class also includes: • furniture removal • renting of trucks with driver • freight transport by man or animal-drawn vehicles
Scope	Operations and retrofitting
Objective	Mitigation
Green	The activity complies with Taxonomy objectives if it aligns with the following criteria:

	• direct (tailpipe) CO_2 emissions of vehicles are zero AND • vehicles are not dedicated to fossil fuel transport
Amber	Retrofitting of vehicles to be able to run on low carbon liquid fuels aligned with the Thailand Taxonomy, such as biofuels, hydrogen and hydrogen-derived fuels (ammonia and synthetic hydrocarbon fuels produced from hydrogen and CO2) etc. is aligned with Taxonomy objectives; OR Purchase, financing, renting, leasing and operation of the freight vehicles that have direct tailpipe emission of: • Before the end of 2029: less than 42 gCO2e/tkm; • from 2030 to 2050: less than 21 gCO2/tkm • from 2050 onwards: less than 18 gCO2/tkm is aligned with Taxonomy objectives
Red	The activities that are not compliant with green or amber criteria are harmful to the objective of climate change mitigation
Criteria reference	Climate Bonds Initiative Land Transport Criteria Background Paper, European Commission Delegated Regulation (EU) 2021/2139 of 4 June 2021

5. Enabling infrastructure for low-emission transport

Sector	Transportation
Activity	Enabling infrastructure for low-emission transport
ISIC code	No specific code available
Description	Construction, modernisation, maintenance and operation of infrastructure that is required for zero tailpipe CO_2 operation of zero-emissions road, rail, air or water transport, as well as infrastructure dedicated to transhipment, and infrastructure required for operating taxonomy-aligned urban transport.
Scope	Construction and operations
Objective	Mitigation
Green	The following activities and actions are aligned with Taxonomy objectives:

	• Personal mobility or cycle logistics: pavements, bike lanes and pedestrian zones, electrical charging and hydrogen refuelling installations for personal mobility devices. **Rail transport**: • for electrified trackside infrastructure and associated subsystems: infrastructure, energy, on-board control-command and signalling, and trackside control-command and signalling subsystems. • for new and existing trackside infrastructure and associated subsystems where there is a plan for electrification as regards line tracks, and, to the extent necessary for electric train operations, as regards sidings, or where the infrastructure will be fit for use by zero tailpipe CO2 emission trains within 10 years from the beginning of the activity: infrastructure, energy, onboard control-command and signalling, and trackside control command and signalling subsystems. • the infrastructure and installations that are dedicated to transhipping freight between the modes: terminal infrastructure and superstructures for loading, unloading and transhipment of goods. • infrastructure and installations that are dedicated to the transfer of passengers from rail to rail or from other modes to rail. **Road transport:** • electric charging points, electricity grid connection upgrades, hydrogen fuelling stations or electric road systems (ERS). • the infrastructure and installations are dedicated to transhipping freight between the modes: terminal infrastructure and superstructures for loading, unloading and transhipment of goods. • the infrastructure and installations are dedicated to urban and suburban public passenger transport, including associated signalling systems for metro, tram and rail systems. **Water transport**: • electricity charging, hydrogen-based refueling • the infrastructure is dedicated to the provision of shore-side electrical power to vessels at berth. • the infrastructure is dedicated to the performance of the port's own operations with zero direct (tailpipe) CO2 emissions.

	• the infrastructure and installations are dedicated to transshipping freight between the modes: terminal infrastructure and superstructures for loading, unloading and transshipment of goods. **Airports**: • electricity charging and hydrogen refueling. • the infrastructure is dedicated to the provision of fixed electrical ground power and preconditioned air to stationary aircrafts. • the infrastructure is dedicated to the zero direct emissions performance of the airport's own operations: electric charging points, electricity grid connection upgrades, hydrogen refueling stations • Infrastructure facilitating the use of sustainable aviation fuels (SAF)
Amber	N/A
Red	Infrastructure dedicated solely to the support of internal combustion engines vehicles as well as transport or storage of fossil fuels, including parking facilities and fossil fuel filling stations, is harmful to the objective of climate change mitigation
Criteria reference	Climate Bonds Initiative Land Transport Criteria Background Paper, European Commission Delegated Regulation (EU) 2021/2139 of 4 June 2021

6. Sea and coastal water transport

Sector	Transportation
Activity	Sea and coastal water transport
ISIC code	501
Description	This class includes purchase, financing, renting, leasing and operation of the following types of vehicles dedicated to the transportation of passengers or freight overseas and coastal waters, whether scheduled or not: • operation of excursion, cruise or sightseeing boats; • operation of ferries, water taxis etc.; • transport of freight overseas and coastal waters, whether scheduled or not; • transport by towing or pushing of barges, oil rigs etc. This class also includes: rental of pleasure boats with crew for sea and coastal water transport.
Scope	Operations only
Objective	Sea and coastal water transport

Green	The activity that complies with the green thresholds established for the specific kinds of ships (Table 1) as well as additional criteria in the Section above aligns with Taxonomy objectives
Amber	To align with Taxonomy objectives, the activity must follow an individual decarbonisation path defined against the emission baseline of particular ship class in 2008. The activity must demonstrate 40% reduction of emissions against the baseline by 2030 and 70% of reduction against the baseline by 2050. AND Vessels are not dedicated to fossil fuel transport
Red	The activity does not meet green or amber criteria is harmful to the objective of climate change mitigation
Criteria reference	Climate Bonds Initiative Shipping Criteria Background Paper, European Commission Delegated Regulation (EU) 2021/2139 of 4 June 2021

7. Inland water transport

Sector	Transportation
Activity	Inland water transport
ISIC code	502
Description	This class includes purchase, financing, renting, leasing and operation of the vehicles involved in the following activities: • transport of passenger or freight via rivers, canals, lakes, and other inland waterways, including inside harbours and ports This class also includes: • rental of pleasure boats with crew for inland water transport
Scope	Operations only
Objective	Mitigation
Green	To align with Taxonomy objectives, the activity must comply with the following • criteria: vessels have zero direct (tailpipe) CO_2 emissions. OR For passenger inland water transport, the activity must comply with the following criteria:

	• until 31 December 2027, hybrid and dual fuel vessels derive at least 50% of their energy from zero direct (tailpipe) CO_2 emission fuels or plug-in power for their normal operation
Amber	To align with Taxonomy objectives, the activity must comply with the amber threshold established for the Shipping Sector with a prescribed sunset date (Table 3) AND Vessels are not dedicated to fossil fuel transport.
Red	The activity does not meet green or amber criteria is harmful to the objective of climate change mitigation
Criteria reference	Climate Bonds Initiative Shipping Criteria Background Paper European Commission Delegated Regulation (EU) 2021/2139 of 4 June 2021

8. Retrofitting of sea and coastal freight and passenger water transport

Sector	Transportation
Activity	Retrofitting of sea and coastal freight and passenger water transport
ISIC code	3312
Description	Retrofitting of vessels that leads to their compliance with green and amber threshold of the Thailand Taxonomy
Scope	Retrofitting only
Objective	Mitigation
Green	Retrofitting of vessels that leads to their compliance with the green threshold for the Shipping Sector (Table 1) or green category of the activity card: Inland water transport is aligned with Taxonomy objectives
Amber	Retrofitting of vessels that leads to their compliance with amber threshold for the Shipping Sector with a prescribed sunset date (Table 3) is aligned with Taxonomy objectives
Red	Retrofitting of fossil fuels carrying vessels is harmful to the objective of climate change mitigation
Criteria reference	Various sources of references

9. Passenger and freight aircrafts

<table>
<tr><td>Sector</td><td>Transportation</td></tr>
<tr><td>Activity</td><td>Passenger and freight aircrafts</td></tr>
<tr><td>ISIC code</td><td>5110, 5120</td></tr>
<tr><td>Description</td><td>Purchase, financing, renting, leasing and operation of the new and existing low-emission aircrafts or aircrafts using blended SAF</td></tr>
<tr><td>Scope</td><td>New and existing aircrafts (operations and retrofitting only)</td></tr>
<tr><td>Objective</td><td>Mitigation</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td>Green</td><td>Activities with the following aircraft types are aligned with Taxonomy objectives:
• Zero direct (tailpipe) emissions aircrafts
OR
• Aircrafts using SAF must meet the %SAF in total fuel blending trajectory:
<table>
<tr><th></th><th>2025</th><th>2030</th><th>2035</th><th>2040</th><th>2045</th><th>2050</th></tr>
<tr><td>%SAF*</td><td>≥2%</td><td>≥6%</td><td>N/A</td><td>N/A</td><td>N/A</td><td>N/A</td></tr>
<tr><td></td><td colspan="2">Recommendation: The EU Minimum Requirements pathway</td><td>≥20%</td><td>≥34%</td><td>≥42%</td><td>≥70%</td></tr>
</table>
OR
aircraft using SAF must meet the percentage of SAF required by the 1.5°C-aligned pathway developed by ICAO, once it is announced.
AND
• SAF must possess one of the internationally recognised certificates (CORSIA Sustainability Certification Schemes.)[15]
AND
• Aircrafts are not dedicated to fossil fuel transport</td></tr>
</table>

[15] Currently these certifications include only international labels, but in the future it may also include relevant Thai labels if they are developed and adopted.

Amber	• Retrofitting of aircrafts to be able to blend fuel in line with the trajectory for the green category is aligned with Taxonomy objectives AND • SAF must possess one of the internationally recognised certificates (CORSIA Sustainability Certification Schemes.)[16]
Red	N/A
Criteria reference	Various sources of references

*Note: Given the current limitations in data availability and the ongoing development of mapping frameworks related to fuel consumption—including Sustainable Aviation Fuel (SAF)—Thailand will determine appropriate SAF utilisation targets for the period 2035 to 2050 in alignment with the 1.5°C Paris Agreement once sufficient data has been compiled. In the interim, it is recommended that stakeholders could reference the benchmarks established by the EU Minimum Requirements pathway as provisional guidelines.

2.2 Red list of activities

Activities that are clearly inconsistent with goals of the present taxonomy are outlined in the table below with their corresponding ISIC codes. Only activities that are outlined in the table are considered non-compliant, not the whole code (if it's not stated explicitly). The activities that are neither green, nor amber, no red **are not considered non-compliant**. They are considered **out of the scope** of the present taxonomy. The taxonomy does not define of cover them.

This table outlines, clarifies and complements, not replaces red categories in all activity cards.

[16] Currently these certifications include only international labels, but in the future it may also include relevant Thai labels if they are developed and adopted.

Table 4 List of activities not in compliance with the present taxonomy

ISIC Code	Activity
491 - Transport via railways (all subcodes included)	● Railway vehicles or rolling stock designated as using biofuels, even partially, qualify as non-compliant ● Infrastructure and rolling stock for railway lines that are built with the over-riding objective of transporting fossil fuels qualify as non-compliant. They are considered built with this objective if: ○ The primary purpose of the line is clearly described as fossil fuel freight by authoritative government sources; or ○ More than 25% of the freight in t-km transported by the line, on average, is comprised of fossil fuels; or alternatively: or ○ More than 25% of the rolling stock is dedicated to the transport of fossil fuels
492 - Transport via buses **493 - Other land transport (including 4931, 4932, 4933)**	● For road freight vehicle and component manufacturers, purchasers and operators, any proportion of a vehicle or fleets cargo being made up of fossil fuels makes that vehicle or fleet non-compliant (except for those complying with amber criteria for the activity Freight transport by road) ● Road vehicles or rolling stock designated as using biofuels, even partially, are considered non-compliant
No code – infrastructure for low-carbon transport	Infrastructure dedicated solely to the support of internal combustion engines vehicles as well as transport or storage of fossil fuels, including parking facilities and fossil fuel filling stations, is considered non-compliant
501 Sea and coastal water transport (all subcodes included) **502 Inland water transport**	Ships that are solely dedicated to the transport of fossil fuel and/or otherwise support the fossil fuel sector (by shipping staff to the oil rigs, transporting fossil fuel extraction equipment etc.) are considered non-compliant. However, ships that technically may carry non-fossil fuels goods alongside with fossil fuel goods are NOT excluded and may be compliant

ISIC Code	Activity
(all subcodes included)	if comply with the relevant criteria. For this reason, products and chemical tankers are not excluded.

List of references

All Around Plastics. (2021). Exploring the Perspective: “Environmental Problems are Problems for Everyone” with Dr. Wijarn Simachaya, President of the Thailand Environment Institute. Retrieved from https://www.allaroundplastics.com/en/article/interview-en/29703/

Anwar, R.S., Mohamed, M., Hamzan, S.M., Malek, N.S.A., Zain, M.H.M., Jaafar, M.H., Sani, S., Brazil-De Vera, R.M., Desquitado, M. C. T., Praneeprachachon, V., Wong, D., Lim, B. A., Goh, G., Tan, W., and Hong, J. (2020). *Report on The Roles of ASEAN Central Banks in Managing Climate and Environment-related Risks. Kuala Lumpur*. Retrieved from https://asean.org/?static_post=report-roles-asean-central-banks-managing-climate-environment-related-risks

ASEAN. (2016). *ASEAN Socio-cultural Community Blueprint 2025*. Retrieved from https://www.asean.org/wp-content/uploads/2012/05/8.-March-2016-ASCC-Blueprint-2025.pdf

ASEAN Taxonomy Board. (2021). *ASEAN Taxonomy for Sustainable Finance Version 1*. Retrieved from https://asean.org/wp-content/uploads/2021/11/ASEAN-Taxonomy.pdf

Asian Development Bank. (2021). *Accelerating Sustainable Development after COVID-19: The Role of SDG Bonds*. Retrieved from https://www.adb.org/news/videos/accelerating-sustainable-development-after-covid-19-role-sdg-bonds

Asian Development Bank. (n.d.). *Eastern Economic Corridor Independent Power Project (RRP THA 53239).* Retrieved from https://www.adb.org/sites/default/files/linked-documents/53239-001-so.pdf

Asian Development Bank. (n.d.). *Sector Assessment (Summary): Transport*. Retrieved from https://www.adb.org/sites/default/files/linked-documents/41682-039-ssa.pdf

Banerjee, N. (2019). Thailand: The Government Is Taking Steps To Increase Renewable Energy, But Must Do More To Engage Key Stakeholders In The Process. Retrieved from https://www.climatescorecard.org/2019/11/the-government-is-taking-steps-to-increase-renewable-energy-but-must-do-more-to-engage-key-stakeholders-in-the-process/

Bangkok Post. (2021). *10 more areas picked to be developed into smart cities*. Retrieved from https://www.bangkokpost.com/thailand/general/2188615/10-more-areas-picked-to-be-developed-into-smart-cities

BloombergNEF. (2022). *1H 2022 Sustainable Finance Market Outlook*. Retrieved from https://about.bnef.com/blog/1h-2022-sustainable-finance-market-outlook/

Chatrudee Theparat and Wichit Chantanusornsiri. (2022). *Plan aims for 50% renewable by 2050*. Retrieved from https://www.bangkokpost.com/business/2281002/plan-aims-for-50-renewable-by-2050.

Chaturong Kongkeaw, Jawanit Kittitornkool, Peter Vandergeest, Kongkiat Kittiwatanawong. (2019). *Explaining success in community based mangrove management: Four coastal communities along the Andaman Sea, Thailand*. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S0964569118307403?via%3Dihub

Climate Action Tracker. (n.d.). *Thailand*. Retrieved from https://climateactiontracker.org/countries/thailand/

Climate Bonds Initiative. (2013). *Solar Energy and the Climate Bond Standard*. Retrieved from https://www.climatebonds.net/files/files/standards/Solar/Solar%20Criteria%20Background%20Paper.pdf

Climate Bonds Initiative. (2020). *CBI Shipping Criteria – Background Paper*. Retrieved from https://www.climatebonds.net/files/files/CBI%20Certification%20-%20Shipping%20Background%20Paper%281%29.pdf

Climate Bonds Initiative. (2020). *Financing Credible Transitions - A framework for identifying credible transitions*. Retrieved from https://www.climatebonds.net/transition-finance/fin-credible-transitions

Climate Bonds Initiative. (2020). *Marine Renewable Energy Assets and the Climate Bonds Standard*. Retrieved from https://www.climatebonds.net/files/files/standards/Marine%20Renewable/BPMarine%20Renew_V1_2_Jul2020__Final.pdf

Climate Bonds Initiative. (2020). *Wind Sector Eligibility Criteria of the Climate Bonds Standard*. Retrieved from https://www.climatebonds.net/files/files/Sector%20Criteria%20-%20Wind%20v1_2_28September2020.pdf

Climate Bonds Initiative. (2021). *CBI Shipping Criteria – Criteria Document*. Retrieved from https://www.climatebonds.net/files/files/standards/Waterborne%20Transport%20%28Shipping%29/CBI%20Certification%20-%20Shipping%20Criteria%20V1b%2020211215.pdf

Climate Bonds Initiative. (2021). *Electrical Grids and Storage Criteria*. Retrieved from https://www.climatebonds.net/files/files/CBI_Background%20Doc_Grids%20and%20Storage_March%202022.pdf

Climate Bonds Initiative. (2021). *Hydropower Criteria*. Retrieved from https://www.climatebonds.net/files/files/Hydropower-Criteria-doc-March-2021-release3.pdf

Climate Bonds Initiative. (2021). *Hydropower Criteria, Background Paper*. Retrieved from https://www.climatebonds.net/files/files/Hydro-Background-Paper-Mar%202021-release3%281%29.pdf

Climate Bonds Initiative. (2021). *Notice on Issuing the Green Bond Endorsed Projects Catalogue (2021 Edition)*. Retrieved from https://www.climatebonds.net/files/files/the-Green-Bond-Endorsed-Project-Catalogue-2021-Edition-110521.pdf

Climate Bonds Initiative. (2022). *ASEAN Economies' Exposure to Climate Transition Risks Applying Taxonomy to Enhance Climate Disclosures*. Retrieved from https://www.climatebonds.net/files/reports/cbi_asean_centralbanks_02b.pdf

Climate Bonds Initiative. (2022). *ASEAN Sustainable Finance State of the Market 2021*. Retrieved from https://www.climatebonds.net/files/reports/cbi_asean_sotm2022_final.pdf

Climate Bonds Initiative. (2022). *Bioenergy Criteria under the Climate Bonds Standard*. Retrieved from https://www.climatebonds.net/files/files/Bioenergy%20Criteria%20Document%20Aug%202022.pdf

Climate Bonds Initiative. (2022). *Global Green Taxonomy Development, Alignment, and Implementation* . Retrieved from https://www.climatebonds.net/files/reports/cbi_taxonomy_ukpact_2022_01f.pdf

Climate Bonds Initiative. (2022). *Hydrogen Criteria Background Paper*. Retrieved from https://www.climatebonds.net/files/files/Background%20paper_Hydrogen_Final%20Version%20to%20be%20published.pdf

Climate Bonds Initiative. (2022). *Land Transport Criteria Version 2*. Retrieved from https://www.climatebonds.net/files/files/CBI_Background%20Doc_Transport_Aug2022%281%29.pdf

Climate Bonds Initiative. (2023). *Climate Bonds Taxonomy*. Retrieved from https://www.climatebonds.net/standard/taxonomy

Climate Bonds Initiative. (n.d.). *Bioenergy Criteria under the Climate Bonds Standard: Non-Wood Feedstocks Background Paper*. Retrieved from https://www.climatebonds.net/files/files/standards/Bioenergy/Background%20paper%20for%20bioenergy%20%28not%20inc%20wood%29.pdf

Climate Bonds Initiative. (n.d.). *Geothermal Energy and the Climate Bond Standard*. Retrieved from https://www.climatebonds.net/files/files/standards/Geothermal/Geothermal%20Energy%20Background%20paper%20and%20Criteria.pdf

Climate Cooperation China. (2020). *Green Bond Endorsed Project Catalogue (2020 Edition)*. Retrieved from https://climatecooperation.cn/climate/the-peoples-bank-of-china-the-national-development-and-reform-commission-and-the-china-securities-regulatory-commission-release-green-bond-endorsed-project-catalogue/

Climate-Related Risk Taxonomy. (n.d.). Retrieved from https://www.openriskmanual.org/wiki/Climate-Related_Risk_Taxonomy

Daniel Workman. (2023). *Thailand's Top Trading Partners*. Retrieved from https://www.worldstopexports.com/thailands-top-import-partners/

Data from CBI database. (n.d.).

Department of Alternative Energy Development and Efficiency, Ministry of Energy. (2021). *Energy Balance of Thailand 2020.*

Department of Alternative Energy Development and Efficiency, Ministry of Energy. (2022). *(Draft) Energy Efficiency Plan: EEP 2022.*

Department of Land Transport, Ministry of Transportation. (n.d.). *Thailand'snational Standard of Vehicle Weights, Dimensions and Emissions*. Retrieved from https://www.unescap.org/sites/default/files/Thailand_18.pdf

Document distributed as part of public consultation organized on July 18, 2022. Centara Grand at Central Ladphrao Hotel, Bangkok. (2022). *Longterm Development Strategy (LT-LEDS) and Thailand's National Determined Contribution (NDC) - Public Consultation .*

EIA. (n.d.). *Thailand*. Retrieved from https://www.eia.gov/international/analysis/country/THA

Energy Policy and Planning offic, Ministry of Energy. (2019). *NDC - Action Plan of Energy Sector*. Retrieved from https://climate.onep.go.th/wp-content/uploads/2021/09/NDC_Action_Plan_Energy_sector.pdf

Energy Policy and Planning Office, Ministry of Energy. (2019). *The NDC Sectoral Action Plan for the Energy Sector 2021 – 2030.*

Energy Policy and Planning Office, Ministry of Energy. (2022). PDP Action Plan 2022 (2022-2037). *สัมมนา New Energy : แผนพลังงานชาติ สู่ความยั่งยืน โดยฐานเศรษฐกิจ.*

European Commission. (2021). *European Commission Delegated Regulation (EU) 2021/2139 of 4 June 2021*. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32021R2139

European Commission. (2022). *European Commission Delegated Regulation (EU) 2022/1214 of 9 March 2022*. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022R1214

European Commission. (2022). *Inform Index for Risk Management. Thailand – Country Profile 2022 Scores*. Retrieved from https://web.jrc.ec.europa.eu/dashboard/INFORMRISK/?no-header=1&v-vISO3=AFG&no-scroll=1

European Commission. (n.d.). *EU Taxonomy Navigator*. Retrieved from https://ec.europa.eu/sustainable-finance-taxonomy/

European Commission. (n.d.). *International Platform on Sustainable Finance*. Retrieved from https://finance.ec.europa.eu/sustainable-finance/international-platform-sustainable-finance_en

German Watch. (2019). *Global Climate Risk Index 2020*. Retrieved from https://germanwatch.org/sites/default/files/20-2-01e%20Global%20Climate%20Risk%20Index%202020_14.pdf

Global Mangrove Alliance. (2018). *Pakistan-Thailand-Vietnam*. Retrieved from http://www.mangrovealliance.org/wp-content/uploads/2018/05/MFTF-Pakistan-thailand-vietnam.pdfm

Global Mangrove Alliance. (2021). *The State of the Worlds Mangroves*. Retrieved from https://www.mangrovealliance.org/wp-content/uploads/2021/07/The-State-of-the-Worlds-Mangroves-2021-FINAL-1.pdf

Global Wind Energy Council. (2019). *Wind industry calls for additional 7 GW of wind energy to be installed in Thailand by 2037*. Retrieved from https://gwec.net/wind-industry-calls-for-additional-7-gw-of-wind-energy-to-be-installed-in-thailand-by-2037/

Government of the Russian Federation. (2021). *Decree of the Government of the Russian Federation No. 21 of 09.2021.1587*. Retrieved from http://publication.pravo.gov.ru/Document/View/0001202109240043

Hanh, N. M. (2022). *Thailand Issues New Incentive Package for Electric Vehicle Industry*. Retrieved from https://www.aseanbriefing.com/news/thailand-issues-new-incentive-package-for-electric-vehicle-industry/

IEA. (2020). *Putting a price on carbon – an efficient way for Thailand to meet its bold emission target*. Retrieved from https://www.iea.org/articles/putting-a-price-on-carbon-an-efficient-way-for-thailand-to-meet-its-bold-emission-target

IEA. (2021). *Thailand Power System Flexibility Study*. Retrieved from https://iea.blob.core.windows.net/assets/19f9554b-f40c-46ff-b7f5-78f1456057a9/ThailandPowerSystemFlexibilityStudy.pdf

IEA. (n.d.). *Thailand*. Retrieved from https://www.iea.org/countries/thailand

IECC. (2019). *Energy*. Retrieved from https://iecc.energy.go.th/wp-content/uploads/2019/03/00_Energy-4.pdf

Information and Communication Technology Center, Ministry of Transport. (2022). *GHG Water*. Retrieved from https://datagov.mot.go.th/dataset/ghg-water

Institute of Industrial Energy, Federation of Thai Industries, Clean Energy for Peoples Foundation. (2021). *National Energy Plan (Public).*

International Finance Corporation. (2012). *Biodiversity Conservation and Sustainable Management of Living Natural Resources*. Retrieved from https://www.ifc.org/wps/wcm/connect/topics_ext_content/ifc_external_corporate_site/sustainability-at-ifc/policies-standards/performance-standards/ps6

International Finance Corporation. (n.d.). *Performance Standards*. Retrieved from https://www.ifc.org/wps/wcm/connect/Topics_Ext_Content/IFC_External_Corporate_Site/Sustainability-At-IFC/Policies-Standards/Performance-Standards

International Maritime Organization. (2009). *Second IMO GHG Study 2009*. Retrieved from https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/SecondIMOGHGStudy2009.pdf

International Maritime Organization. (n.d.). *Annex 11: Initial Imo Strategy on Reduction of Ghg Emissions from Ships*. Retrieved from https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/Resolution%20MEPC.304%2872%29_E.pdf

International Monetary Fund and World Bank. (2019). *Thailand Financial Sector Assessment*. Retrieved from https://openknowledge.worldbank.org/handle/10986/32604

IPCC. (2022). *IPCC Sixth Assessment Report*. Retrieved from https://www.ipcc.ch/report/ar6/wg3/

IPCC. (2022). *Summary for Policymakers*. Retrieved from https://www.ipcc.ch/sr15/chapter/spm/

IPCC. (n.d.). Assessments Reports on Climate Change: Impacts, Adaptation and Vulnerability. Retrieved from https://www.ipcc.ch/reports%20/

IPCC. (n.d.). *Sea Level Rise and Implications for Low-Lying Islands, Coasts and Communities*. Retrieved from https://www.ipcc.ch/srocc/chapter/chapter-4-sea-level-rise-and-implications-for-low-lying-islands-coasts-and-communities/

IRENA. (2021). *Renewable Energy Statistics 2021*. Retrieved from https://www.irena.org/publications/2021/Aug/Renewable-energy-statistics-2021

IRENA, Ministry of Energy. (2017). *Renewable Energy Outlook Thailand*. Retrieved from https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/Nov/IRENA_Outlook_Thailand_2017.pdf

IUCN. (2020). *Thailand*. Retrieved from https://www.iucn.org/our-work/region/asia/countries/thailand

IUCN. (n.d.). *The IUCN Red List of Threatened Species*. Retrieved from https://www.iucnredlist.org/

Japan International Cooperation Agency. (n.d.). *Coastal Erosion* . Retrieved from https://openjicareport.jica.go.jp/pdf/12015442_03.pdf

KPMG. (2021). *Net Zero Readiness Index 2021*. Retrieved from https://home.kpmg/xx/en/home/insights/2021/09/net-zero-readiness-index.html

Manuamorn, O., Nguyet, P.M., Tukiainen, K. (2022). *ASEAN Sustainable Finance State of the Market 2021.*

Ministry of Energy. (2014). *Energy Efficiency Promotion Measures in Thailand*. Retrieved from https://unece.org/fileadmin/DAM/energy/se/pp/eneff/5th_Forum_Tunisia_Nov.14/4_November/Prasert_Sinsukprasert.pdf

Ministry of Energy. (2019). *Thailand Power Development Plan 2018-2037*. Retrieved from https://climate-laws.org/document/thailand-power-development-plan-2018-2037_110d

Ministry of Energy. (2020). *Thailand Alternative Energy Development Plan 2018-2037*. Retrieved from https://climate-laws.org/document/alternative-energy-development-plan-2018-2037_c79f

Ministry of Foreign Affairs. (2021). Thailand's Voluntary National Review on the Implementation of the 2030 Agenda for Sustainable Development 2021.

Ministry of Transport. (2013). *Thailand's Environmenatl Sustainable Transport Master Plan*. Retrieved from https://www.uncrd.or.jp/content/documents/7EST-B1G4-6.pdf

Nation Thailand. (2018). *Experts Contradict Govt on Coastal Erosion*. Retrieved from https://www.nationthailand.com/national/30339814

National Treasury, Republic of South Africa. (2022). *South African Green Finance Taxonomy 1st Edition*. Retrieved from http://www.treasury.gov.za/comm_media/press/2022/SA%20Green%20Finance%20Taxonomy%20-%201st%20Edition.pdf

Nazli Yeşiller, James L. Hanson, Emma H. Yee. (2015). *Waste heat generation: A comprehensive review*. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S0956053X15002755

New York Times. (2019). *Revised forecast puts Bangkok underwater by 2050*. Retrieved from https://www.bangkokpost.com/thailand/general/1785569/revised-forecast-puts-bangkok-underwater-by-2050

Office of Natural Resources and Environmental Policy and Planning, Ministry of Natural Resources and Environment. (2019). *Climate Change Master Plan 2015-2050*. Retrieved from https://climate.onep.go.th/wp-content/uploads/2019/07/CCMP_english.pdf

Office of Natural Resources and Environmental Policy and Planning, Ministry of Natural Resources and Environment. (n.d.). *NDC Action Plan*. Retrieved from https://climate.onep.go.th/th/topic/policy-and-strategy/thailand-ndc-roadmap-on-mitigation/แผนปฏิบัติการลดก๊าซ

Office of the National Economic and Social Development Council. (n.d.). *National Strategy*. Retrieved from http://nscr.nesdb.go.th/wp-content/uploads/2019/10/National-Strategy-Eng-Final-25-OCT-2019.pdf

Office of Transport and Traffic Policy and Planning, Ministry of Transport. (2019). *Intelligent Transport System (ITS) in Thailand*. Retrieved from https://www.unescap.org/sites/default/files/Country%20presentation%20-%20Thailand_3.pdf

Office of Transport and Traffic Policy and Planning, Ministry of Transport. (2021). *NDC Action Plan in the transport sector 2021 –2030*. Retrieved from https://climate.onep.go.th/wp-content/uploads/2021/09/NDC_Action_Plan_Transport_sector.pdf

Oxford Business Group. (n.d.). *Infrastructure improvements aim to connect Thailand with the rest of Asia*. Retrieved from https://oxfordbusinessgroup.com/reports/thailand/-report/economy/path-to-prosperity-infrastructure-improvements-are-at-the-heart-of-plans-to-connect-thailand-to-the-rest-of-asia-2

Pollution Control Department, Ministry of Natural Resources and Environment. (2021). *Thailand Roadmap on Plastic Waste Management 2018–2030*. Retrieved from https://www.pcd.go.th/wp-content/uploads/2021/10/pcdnew-2021-10-19_08-59-54_995414.pdf

Pollution Control Department, Ministry of Natural Resources and Environment. (2021). *Thailand State of Pollution 2020 (B.E. 2563) (Volume 26, 5 March 2021 (B.E. 2564)*. Retrieved from https://www.pcd.go.th/wp-content/uploads/2021/03/pcdnew-2021-04-07_06-55-47_218070.pdf

Poonsri Wanthongchai, Orathai Pongruktham . (2019). *Mangrove Cover, Biodiversity, and Carbon Storage of Mangrove Forests in Thailand*. Retrieved from https://link.springer.com/chapter/10.1007/978-3-030-04417-6_28

Pranadi, A. D. (2016). *The Current Status of RE and its Target in ASEAN Member States*. Retrieved from https://aseanenergy.org/the-current-status-of-re-and-its-target-in-asean-member-states/

Renewable Energy Industry Club, Federation of Thai Industries. (2021). *AEDP (Public).*

Richards and Friess. (2016). *Rates and drivers of mangrove deforestation in Southeast Asia, 2000–2012*. Retrieved from https://www.pnas.org/content/113/2/344

RSB. (n.d.). *GHG Calculator*. Retrieved from https://rsb.org/services-products/ghg-calculator/

Siam Commercial Bank. (2020). *"SME Go Green" Loan from SCB lets SMEs go lean and green, while boosting sustainability and a positive economy*. Retrieved from https://www.scb.co.th/en/about-us/news/jul-2020/nws-sme-go-green.html

Simachaya, W. (2020). Retrieved from http://www.tei.or.th/en/blog_detail.php?blog_id=49

Thai PBS. (2021). *Thailand vows to reach net zero carbon emissions by 2065 at COP26*. Retrieved from https://www.thaipbsworld.com/thailand-vows-to-reach-net-zero-carbon-emissions-by-2065-at-cop26/

Thailand Board of Investment. (2015). *Enhancing Infrastructure Development for Thailand's Future Growth*. Retrieved from https://www.boi.go.th/upload/content/5.%20Enhancing%20Infrastructure%20Development%20f_92919.pdf

Thailand Board of Investment. (2019). *Transport & Logistics*. Retrieved from http://www.boi.go.th/upload/content/TIR6_2019_5e2e956d55219.pdf

Thailand Board of Investment. (n.d.). *Additional Investment Promotion Measures*. Retrieved from https://www.boi.go.th/index.php?page=add_investment

Thammasart University. (2020). The revision and update of Thailand's Long-Term Low Greenhouse Gas Emission lopment Strategy (LT-LEDS) and Thailand's National Determined Contribution (NDC).

Thomson Reuters. (n.d.). *Practical Law*. Retrieved from https://uk.practicallaw.thomsonreuters.com/

Transition Pathway Initiative. (2021). *Carbon Performance Assessment of Electricity Utilities: Note on Methodology*. Retrieved from https://transitionpathwayinitiative.org/publications/94.pdf?type=Publication

UNDP. (2021). The Biodiversity Finance Plan – The Biodiversity Finance Initiative (BIOFIN) – Thailand.

UNDP, Fiscal Policy Research Institute. (2022). Final Report: Conducting a Country Diagnostic on Inclusive Insurance and Risk Finance for Thailand. UNDP, Bangkok.

UNFCCC. (n.d.). *NDC Registry*. Retrieved from https://unfccc.int/NDCREG

UNFCCC, Office of Natural Resources and Environmental Policy and Planning, Ministry of Natural Resources and Environment. (2020). *Thailand Third Biennial Update Report*. Retrieved from https://unfccc.int/sites/default/files/resource/BUR3_Thailand_251220%20.pdf

UNFCCC, Office of Natural Resources and Environmental Policy and Planning, Ministry of Natural Resources and Environment. (2021). *Mid-century, Long-term Low Greenhouse Gas Emission Development Strategy: Thailand*. Retrieved from https://unfccc.int/sites/default/files/resource/Thailand_LTS1.pdf

UNFCCC, Office of Natural Resources and Environmental Policy and Planning, Ministry of Natural Resources and Environment. (2022). *Thailand First NDC (Updated submission)*. Retrieved from https://unfccc.int/documents/497980

UNFCCC, Office of Natural Resources and Environmental Policy and Planning, Ministry of Natural Resources and Environment. (2022). *Thailand. Biennial update report (BUR). BUR 4*. Retrieved from https://unfccc.int/documents/624750

UNFCCC, Office of Natural Resources and Environmental Policy and Planning, Ministry of Natural Resources and Environment. (2022). *Thailand's Fourth National Communication*. Retrieved from https://unfccc.int/sites/default/files/resource/Thailand%20NC4_22122022.pdf

UNFCCC, Office of Natural Resources and Environmental Policy and Planning, Ministry of Natural Resources and Environment. (2022). *Thailand's Long-Term Low Greenhouse Gas Emission Development Strategy (Revised version)*. Retrieved from https://unfccc.int/documents/622276

Working Group on Sustainable Finance. (2021). *Sustainable Finance Initiatives for Thailand*. Retrieved from https://www.bot.or.th/content/dam/bot/financial-innovation/sustainable-finance/green/Sustainable_Finance_Initiatives_for_Thailand.pdf

World Bank. (2011). *The World Bank Supports Thailand's Post-Floods Recovery Effort*. Retrieved from https://www.worldbank.org/en/news/feature/2011/12/13/world-bank-supports-thailands-post-floods-recovery-effort

World Bank. (2012). *Thai Flood 2011 : Rapid Assessment for Resilient Recovery and Reconstruction Planning. World Bank, Bangkok*. Retrieved from https://documents1.worldbank.org/curated/en/677841468335414861/pdf/698220WP0v10P106011020120Box370022B.pdf

World Bank. (2022). Thailand Economic Monitor June 2022: Building Back Greener: The Circular Economy.

World Bank. (n.d.). *Thailand*. Retrieved from www.worldbank.org/en/country/thailand/overview

World Bank, Asian Development Bank. (2021). *Climate Risk Country Profile Thailand*. Retrieved from https://climateknowledgeportal.worldbank.org/sites/default/files/2021-08/15853-WB_Thailand%20Country%20Profile-WEB_0.pdf

World Economic Forum. (2022). *Global Risks Report 2022: What you need to know*. Retrieved from https://www.weforum.org/agenda/2022/01/global-risks-report-climate-change-covid19/

World Resource Institue. (n.d.). *Aqueduct*. Retrieved from https://www.wri.org/aqueduct

World Wide Fund for Nature. (n.d.). *Thailand*. Retrieved from https://wwf.panda.org/discover/our_focus/climate_and_energy_practice/ndcs_we_want/reviewed_ndcs_/thailand/

World Wide Fund for Nature. (n.d.). *WWF Risk Filter Suite*. Retrieved from https://waterriskfilter.org/