



# **Frequently Asked Questions [FAQs]**

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# 1. Introduction to the Taxonomy

## 1. What is the Thailand Taxonomy?

Thailand Taxonomy is a system for classifying economic activities according to their contribution to environmental objectives. The Taxonomy classifies activities against their contribution to one or more of six environmental objectives:

1. Climate Change Mitigation
2. Climate Change Adaptation
3. Sustainable use and protection of marine and water resources
4. Promotion of resource resilience and transition to a circular economy
5. Pollution Prevention and Control
6. Protection and restoration of biodiversity and ecosystems

The Thailand Taxonomy is a tool for bond issuers, financial institutions, statistical agencies, investors, governments, municipalities and others to help them understand the type of investments that will deliver a low-carbon economy. It protects investors from greenwashing and encourages investment in more sustainable initiatives. The Thailand Taxonomy also creates a common reference for comparing investments' social and environmental impacts. A robust taxonomy is transparent and grounded in the latest climate science aligned to reach net-zero emissions by 2050 as the United Nations prescribes. Thailand's Green Taxonomy has been developed based on these principles.

It must be noted that economic activities not included in Thailand Taxonomy as substantially contributing to climate objectives are not necessarily regarded as environmentally harmful or unsustainable. They may be irrelevant to the field or not researched well enough to be considered beneficial or harmful. For example, many activities in the services sector fall into this category.

At the moment of publication, Thailand Taxonomy is intended for common reference and voluntary application.

## 2. What Thailand Taxonomy can and cannot be used for?

Thailand Taxonomy can:

- guide investors, companies, and policymakers in making decisions that align with environmental goals such as reducing carbon emissions, increasing the economy's adaptation and resilience, conserving biodiversity, and promoting resource efficiency;
- help to channel capital towards projects and initiatives that contribute to sustainability by providing a clear framework;
- be used to standardise reporting and enhance transparency, making it easier to compare the environmental performance of different organisations and investments.

While the Thailand Taxonomy is a powerful tool for promoting sustainability, it cannot be used as a one-size-fits-all solution for all environmental and economic challenges. The Thailand Taxonomy refers to Thai environmental regulations, **but it does not:**

- set environmental regulations specific to every potential activity (Thailand Taxonomy is a superstructure over the existing Thai regulations, not a replacement or a compendium of laws);
- constitute a sole tool sufficient to eliminate greenwashing, as companies may still find ways to appear more environmentally friendly than they are. A lot of regulatory scrutiny is required to tackle this issue;
- comprehensively address social and governance aspects of sustainability, thus limiting its scope in promoting holistic sustainable development;
- serve as a basis for making economic decisions as it does not address economic characteristics of an activity or a company.

## 3. How have the environmental objectives of the Thailand Taxonomy been decided on?

The Thailand Taxonomy features six environmental objectives (see Question 1). These were selected in alignment with Thailand's national priorities and global taxonomies.

#### 4. Why does Thailand Taxonomy use a “traffic lights” system?

The traffic lights system is designed to classify economic activities based on their environmental impact. It provides more flexibility for a country undergoing economic transformation in line with its climate objectives. Unlike the binary system used in the EU, South Africa and Colombia taxonomies, the traffic lights system includes a category for activities that are not currently compliant with the benchmarks but have the potential to be phased in and aligned with them. This gives the taxonomy greater flexibility and broadens its potential user base.

The practical meaning of different “lights” may differ. Still, in the case of Thailand, it uses a colour-coded scheme where

- "green" indicates activities that significantly contribute to environmental objectives by operating at or near net-zero emissions;
- "amber" represents activities that are not currently sustainable but are in transition towards becoming sustainable with sunset date 2040 and aligned with the green category by 2050 at the latest. This category is in many cases aligned with Thailand's NDCs and national decarbonisation policies;
- "red" denotes activities that are harmful to the environment.

#### 5. For activities that only have green criteria (without corresponding amber or red criteria), if an activity does not meet the green criteria, will it be classified as “Out of scope”?

Yes. Activities that only have green criteria and no amber or red criteria are considered activities that do not cause significant environmental harm. Therefore, if such activities do not meet the green criteria, they will be classified as “Out of Scope.” However, taxonomy users must also assess the activity against the DNSH and MSS principles. If the activity fails to meet either the DNSH or MSS requirements, it will instead be classified as red.

## 1.1 Activity selection and scope

### 6. What kind of activities and sectors are included in the present version of the Thailand Taxonomy?

The Thailand Taxonomy is designed to promote climate and environmental objectives. Inclusion of certain activities is determined primarily by their materiality to these climate and environmental objectives, technological feasibility (existence of decarbonisation technologies for specific sectors) and alignment with other taxonomies. Thailand Taxonomy comprises 6 sectors:

- Energy sector – refers primarily to producing electricity from various sources, including related activities on heat and cooling, transmission, distribution and storage.
- Transportation sector: reflects different modes of transport of passengers and freight from one point to another without covering the manufacturing of vehicles (according to ISIC, this is a part of the manufacturing sector)
- Agriculture sector: further subdivided into Agriculture and Forestry sub-sections – the former includes plant cultivation, livestock production, and aquaculture production while the latter includes sustainable forest management, plantation, conservation, restoration, and maintenance.
- Construction and Real Estate sector: covers construction, renovation, acquisition, installation, and maintenance works for all residential and commercial buildings and building equipment
- Manufacturing sector: includes production activities of hard-to-abate industrial materials (steel and iron, cement, basic chemicals, aluminium, and hydrogen), other low-carbon technologies and equipment, and carbon capture and storage.
- Waste Management sector: refers to the collection, management and utilisation of waste, recycling and processing of all communal, agricultural, and industrial waste.

The Taxonomy includes activities grouped into sectors aligned with comparable sectors of the International Standard Industrial Classification of All Economic Activities (ISIC). Activities under each sector are broadly comparable with ISIC-defined sectors, although these have been

adjusted or expanded in some cases to meet the requirements of the Thailand Taxonomy. Greater detail can be found under each Taxonomy sector chapter.

## 1.2 Technical Screening Criteria

### 7. How are activity thresholds, decarbonisation pathways and criteria determined?

All criteria and thresholds in this Taxonomy are developed to be credible and science-based, referencing the international standard such as Climate Bonds Initiative, including its partners' Standards and Sector criteria<sup>1</sup>. In addition, such criteria have been further adapted to meet national circumstances in recognition of the need to consider Thailand's local circumstances and decarbonisation policies.

In general, technical screening criteria for individual activities can be broadly grouped into the following categories:

- Nature of the activity/ whitelist approach – activity is automatically eligible as it supports net-zero emissions by its nature (e.g., electricity generation from solar and wind power).
- Quantitative – numeric emissions of energy intensity thresholds are set by (i) referencing credible and science-based decarbonisation trajectories. In the absence of credible pathways or data, (ii) relative improvement targets (e.g., a 30% improvement in emissions or energy intensities for building renovation activities) or (iii) best-in-class performance thresholds are determined.
- Qualitative – adoption of best practices and/or alignment with credible certification labels (e.g., agriculture and forestry activities)

### 8. In order to be aligned with the green taxonomy, does an activity need to align with every single TSC specified in the table?

A full detailed guide on how to check your activity's alignment with the Taxonomy can be found in the Business Guidelines document attached to the Taxonomy. In short – in order to

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<sup>1</sup> The Climate Bonds Initiative's primary mission is to create scientifically valid decarbonization criteria for various sectors of the economy independent of the political and financial ramifications. The documents and criteria developed by the Climate Bonds Initiative are used in varying degrees by all existing green finance systems today, including the European Union, China, Russia, South Africa, Colombia, etc.



have full alignment with the Taxonomy, the activity must comply with all relevant requirements from the relevant activity card, generic and specific DNSH requirements, while the enterprise where the activity takes place must be aligned with the MSS requirements.

For partial alignment, the activity must comply with all relevant requirements from the relevant activity card and MSS, report on its deficiencies regarding DNSH, and submit a remediation plan on that has been evaluated and approved by the relevant authorities and has undergone public consultation with stakeholders. The plan must also be made publicly accessible throughout its implementation. The remediation process must be completed within a period not exceeding 3 years from the date the limited compliance status was granted. Furthermore, it is important to note that the imposition of specific penalties for violations of status should be determined by the appropriate regulatory authorities or other relevant governing bodies.

If after 3 years remediation plan was implemented in full, a new assessment must be conducted for the alignment of the activity with the technical screening criteria, DNSH and MSS requirements. If full compliance with all three elements was established, partial compliance status must be changed to full compliance status. However, if after 3 years remediation plan was not implemented in full, limited compliance status must be revoked, and the company must be penalised in line with the relevant regulations.

**9. How should I calculate my emissions to use the present taxonomy? What scope should I consider for this?**

Unless stated otherwise, the GHG emission thresholds in the taxonomy relate to Scope 1 and 2 emissions. In this case, the activity's owner should calculate the activity's emissions and the emissions of associated electricity, heating, cooling and water supply. All GHG gas emissions should be translated into CO<sub>2</sub> equivalent. Suppose the requirements state that the emissions must be calculated according to the LCA (Life Cycle Assessment Approach). In that case, the owner must go beyond Scope 1 and 2 and calculate emissions with a prescribed methodology.

**10. Why do green and amber sectoral decarbonisation pathways end in 2050 while Thailand's NDC establishes 2065 as a Net-Zero Year?**

Thailand's NDC is a complex and comprehensive political pledge that covers many aspects of the country's economic and climate policies. It is based on many important concepts,

including the concept of common but differentiated responsibility for tackling climate change. Thailand Taxonomy, however, is based on scientific climate data that is always the same regardless of the territory where it is applied.

The Taxonomy incorporates certain aspects of Thailand's NDC; for example, the amber threshold is calculated based on NDC-aligned data. However, to ensure that we remain true to a 1.5-degree pathway, the decarbonisation pathways described in this Taxonomy do not end in 2065 but rather in 2050, and sunset dates for the NDC-aligned amber thresholds have been established for 2040.

If NDC-based thresholds were to be extended until 2065 so that companies were allowed to transition up to that date, then, according to the Climate Action Tracker, it would mean that Thailand would essentially move along the 4-degree pathway<sup>2</sup> and not the two or 1.5-degree pathway prescribed by the Paris Agreement.

In essence, the Taxonomy could be used as a guide to achieving NDC goals by decarbonising individual enterprises through global climate science.

## **11. Are energy efficiency measures eligible under the Taxonomy?**

Energy efficiencies are among the eligible technologies to achieve the emission intensity thresholds established in this taxonomy. Sometimes, energy efficiency metrics are considered an alternative to GHG emissions per tonne of production unit. However, the IPCC refers to global greenhouse gas emission reduction pathways as the appropriate science-based tool to respond to the climate change threat and boost sustainable development and poverty eradication efforts. Therefore, whilst international climate science supports businesses that use energy efficiency technologies to improve the emission profile of their activities, it considers lowering GHG emissions per unit of production to be the most important indicator that must be targeted in Thailand Taxonomy.

## **12. How often will the TSC be updated?**

The normal practice is that TSC should be updated every 5 years or when there are material changes to the criteria (such as updates in national regulations which significantly impact the performance of the activity).

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<sup>2</sup> Climate Action Tracker, "Thailand", 2024, <https://climateactiontracker.org/countries/thailand/>

## 2. Issues related to the Do No Significant Harm (DNSH) and the Minimum Social Safeguards (MSS).

### 1. How should the assessment and verification in accordance with the DNSH and MSS principles be conducted?

In general, the assessment of whether an activity is aligned with the DNSH principle considers: (1) General requirements including (1.1) an assessment of potential risks to other environmental objectives and (1.2) measures to manage and mitigate those risks until they no longer cause significant adverse impacts, and (2) Specific requirements for certain activities to ensure that assessments under the Taxonomy remain robust. For example, land transport activities should consider their impact on the environmental objective of pollution prevention and control, with reference to international or domestic standards such as ISO 362 for measuring noise levels from vehicle acceleration on roads.

**If an activity is found to be non-compliant with the DNSH principle, the owner of the activity may submit a remediation plan and is required to mitigate the adverse impacts within a grace period of three years.** During this period, the activity will be considered as having limited compliance with the Taxonomy. If the activity owner successfully addresses the impacts within the three-year timeframe as outlined in the remediation plan, the activity may retain its original classification. However, **if no remediation plan is submitted, or if the plan is not fulfilled within the grace period, the activity will be reclassified as red immediately.**

**For the assessment of compliance with the MSS principle,** the owner of the activity must act in accordance with Thailand's legal and policy frameworks, as well as internationally accepted principles and standards, supported by relevant social management systems. MSS compliance must be assessed at the organizational level (not at the individual activity level). Unlike DNSH, MSS compliance does not allow for a grace period, meaning the activity owner must maintain ongoing compliance throughout the entire lifecycle of the activity.

### 2. Will Thailand Taxonomy include additional DNSH and MSS criteria to provide a consistent standard for financial institutions when assessing the same activity, thereby reducing the cost of developing separate internal criteria?

Currently, the working group has no plan to add further DNSH and MSS criteria. Based on research findings and consultant recommendations, defining these requirements in a strict rule-based format, as done in the EU Taxonomy, may pose challenges and place unnecessary burdens on financial institutions and businesses. The European Union is also reviewing its own rules to improve practicality and ease of implementation.

**3. According to the procedures and recommendations outlined in the Business Guide, how should businesses prepare assessment reports for work or target groups related to their activities?**

The owner of the activity should collect, summarize, and disclose all necessary information that demonstrates alignment with Thailand Taxonomy. This generally includes information regarding: (1) an indication of which color category the activity or project qualifies under, and (2) an assessment of compliance with the DNSH and MSS principles. Additionally, in the case of debt instrument issuance, compliance with the Green Bond framework must also be considered. The reporting frequency should be determined based on the intended purpose of use; for example, once annually in the case of annual reports.

**4. Will there be a requirement for an external party to verify or review whether and how a company's activities comply with the DNSH and MSS principles?**

Thailand Taxonomy does not require third-party verification. Activity owners may submit relevant documents to demonstrate compliance with the DNSH and MSS principles.

**5. What are the procedures for verifying compliance with the criteria on improving efficiency of use, repair, recycling, and reuse of materials during the activity's operational life cycle?**

Activity owners may refer to standards on sustainable resource use and transition to a circular economy, such as ISO 14040 and ISO 14044 (or other equivalent international methods), for the assessment of the life cycle of products, materials, processes, or other measurable activities. Alternatively, they may conduct self-assessments and report their performance on improving efficiency of use, reduction, repair, recycling, and reuse of materials during the activity's operational life cycle.

### 3. Technical criteria related to the Energy sector

#### 3.1 Activity selection and scope

1. How are the terms “Operation”, “Construction and operation”, and “Retrofitting” different?

“Operation” refers to the process of enabling an activity to function on an ongoing basis. This includes improvement works or maintenance, such as, Transport via railways activity.

“Construction and operation” refers to investment or installation, as well as enabling the activity to function on an ongoing basis, such as, Solar energy generation activity.

“Retrofitting” refers to the process of enhancing the efficiency of an activity, such as Retrofitting of sea and coastal freight and passenger water transport activity.

2. Does the scope of Thailand Taxonomy include activities related to the oil and gas sector?

Yes, the scope of Thailand Taxonomy does include fossil fuel-based oil and gas activities. These activities are classified as non-compliant with the environmental objectives of the taxonomy and are considered red activities (see Section Red list of activities).

3. What types of activities are considered support for fossil fuel-based infrastructure?

Support for fossil fuel-based infrastructure refers to activities related to the extraction, transportation, and utilization of fossil fuels, such as installing solar panels within a fossil fuel-based power plant or at a gas or petrol station.

4. What color category would the installation of Carbon Capture & Storage (CCS) or Carbon Capture, Utilization & Storage (CCUS) extensions fall under in the following cases?

- 4.1 Installation of CCS or CCUS extensions at an oil refinery or power plant

- 4.2 If the oil refinery or power plant is in transition toward becoming a green activity and requires the installation of new technologies such as CCS or CCUS

In principle, if an activity qualifies as green but is intended to support a red activity or to prolong the use of fossil fuels, the activity will instead be classified as red. Therefore, the

installation of CCS/CCUS at oil refineries is classified as a red activity, while the installation of CCS/CCUS at power plants is subject to different criteria depending on the energy source. Further information on the classification criteria for CCS/CCUS activities can be found in the draft of Thailand Taxonomy under the manufacturing sector.

- 5. Does the Thailand Taxonomy cover activities related to Small Modular Reactors (SMRs) or nuclear energy? Since there is a push to phase out coal, alternative energy sources are needed. Nuclear power generation may offer greater stability and reliability compared to renewable energy.**

While nuclear energy, including technologies like Small Modular Reactors (SMRs), is recognised as a low-carbon option with the potential to improve a country's energy balance in terms of climate, it remains an extremely controversial solution. This is due to multiple issues such as the further processing of spent nuclear fuel and the potential for emergencies. Consequently, and consistent with other regional taxonomies like the ASEAN Taxonomy and the Singapore Taxonomy, the Thailand Taxonomy currently does not include nuclear energy. However, this decision may be reviewed in the future as technologies evolve.

### **3.2 Technical screening criteria**

#### **■ Solar energy generation**

- 6. What color category applies to the installation of solar rooftops in the following locations?**
- Oil refinery
  - Oil rig
  - Office buildings of oil production companies
  - Manufacturing facilities where fossil fuels are the primary energy source

The installation of solar rooftops that support fossil fuel-based activities or infrastructure, such as oil refineries and oil rigs, is classified as a red activity. However, the installation of solar rooftops on office buildings of oil production companies and on other types of manufacturing facilities are considered a green activity.

**7. Is the installation of solar rooftops at petrol stations, where the stations use the generated electricity, considered a green activity?**

No, such cases are classified as red activities. In principle, the installation of solar rooftops is considered red if it is done to support infrastructure associated with (1) vehicles and transportation that use fossil fuels, (2) the storage of fossil fuels, or (3) fossil fuel refueling stations and their parking areas, as these are considered non-compliant with the greenhouse gas (GHG) emission reduction objective of Thailand Taxonomy.

**8. Is the installation of solar rooftops at petrol stations considered a green activity if the generated electricity is used by a convenience store located within the station, with a separate electricity meter for the store?**

Yes, this case is classified as a green activity.

**9. Is the installation of solar rooftops at petrol stations or on oil rigs considered a green activity if the electricity is sold back to the power grid?**

No, this case is classified as a red activity.

**10. If a factory installs solar panels to generate electricity for internal use and also purchases electricity from the government — part of which may come from fossil fuel sources — would this be considered a red activity?**

No. Only the activity of producing products can be recognised as compliant with the green, amber or red category of the taxonomy, not the entire factory. Moreover, the taxonomy does not regulate the type of electricity consumed by the factory. Instead, it regulates technological processes, final products and emissions per unit of product produced at that factory. While emissions from electricity consumption undoubtedly affect the final emissions per unit of product produced, achieving the target values does not necessarily imply the consumption of only renewable energy. These target values can be achieved in various ways, including through reducing emissions from technical processes.

**11. If a solar power plant generates and sells electricity to an agency, and that agency resells the electricity to various customers — some of whom may or may not be involved in fossil fuel production — would the solar power plant be considered a red activity?**

No, the taxonomy does not regulate relationships within supply chains. The taxonomy determines whether a specific activity complies with its principles. Solar power generation is considered green regardless of who it is sold to.

The only exception, as defined by the red category, is when solar generation is directly connected to hydrocarbon infrastructure and solely serves its operation. For example, if solar panels are installed at petrol stations, oil pumps at oil fields (like in Saudi Arabia), or gas compressor stations (as seen in Egypt and Algeria).

#### ■ **Hydropower generation**

12. **“Amber criteria: Retrofitting that improves either power density or decreases emission intensity of the existing hydropower plant by at least 15% is eligible.” How is this information evaluated, and how should the comparison of power density or emission intensity before and after retrofitting be made?**

The assessment can be conducted by comparing the current energy efficiency report of the power plant with the projected energy efficiency report after retrofitting. For example, if the hydropower plant has a certain GHG emission intensity before the retrofit, then afterward, the intensity should be reduced by at least 15% (which qualifies under the amber category). You may refer to further details or consult with the Ministry of Energy and Thailand Greenhouse Gas Management Organization (Public Organization) ([TGO](#)) regarding the evaluation of power density and GHG emissions.

13. **“Green criteria: A hydropower facility can credibly demonstrate that the pumped storage will not be charged with an off-peak grid intensity that is higher than the intensity of the electricity that it will displace when it is discharged.” Who is responsible for preparing this data?**

In general, the power plant project owner should be responsible for collecting this data.

#### ■ **Bioenergy generation and production**

14. **Can wood be used as a raw material for bioenergy production? Does it need to comply with the Forest Stewardship Council (FSC)?**

Wood can be used if it is part of “agricultural waste” and follows the guidance of at least one of the recognized organizations listed in its Section., which includes the FSC. However, wood



from trees that are planted specifically for electricity generation is not eligible, as wood sourced from intentionally harvested trees for fuel violates the “Do No Significant Harm (DNSH)” principle and will be classified as a red activity.

**15. Does the Life Cycle Assessment (LCA) for bioenergy activity consider the source of raw materials? How should the assessment be conducted, and where can reference information be found?**

The LCA for bioenergy activities must include consideration of the source of raw materials. The assessment can refer to the LCA guidelines or similar evaluation frameworks, either from Thailand or international standards, such as [ISO 14040](#) and [ISO 14044](#). You may also consult the [TGO](#) for further details and guidance.

■ **Energy production from natural gas**

**16. What documents should be used as a reference for new power plants, and do those constructed from 2024 onward follow the green criteria in Table: Thresholds for certain energy sector activities, gCO<sub>2</sub>e/kWh?**

A “new power plant” refers to a project that receives a construction permit after 31 December 2023. According to the thresholds and criteria, any power plant permitted after this date and therefore defined as a “new power plant”, will be classified as a red activity.

**17. If a power plant project has already secured a Power Purchase Agreement (PPA), is it necessary to begin operations before 2024?**

If the project secured a PPA before 1 January 2024, it will be classified as an existing power plant, even if construction is completed after 1 January 2024.

■ **Production of heating and cooling using waste heat**

**18. Does the activity of producing heating and cooling from waste heat refer only to heat generated by power plants? Can waste heat also originate from other industrial facilities?**

Waste heat refers to residual heat that is a byproduct of production processes. It can originate from power plants or from other industrial facilities.

- Electricity generation from renewable non-fossil gaseous and liquid fuels, including green hydrogen

19. Is hydrogen production in an industrial facility, where hydrogen is sold to members within an industrial estate, considered a green activity?

Such hydrogen production activity is under Manufacturing sector. However, if hydrogen is used for energy generation, please refer to the classification criteria outlined in its activity Electricity generation from renewable non-fossil gaseous and liquid fuels, including green hydrogen.

- Transmission and distribution of electricity

20. How will a power plant connected to a transmission line that supplies both green and red activities be classified?

The classification of such a power plant will primarily be determined based on the type of power plant. Meanwhile, the transmission and distribution of electricity will be evaluated separately under its own criteria.

## 4. Technical criteria related to the Transport sector

1. **Has the assessment criterion for carbon emissions, expressed in gCO<sub>2</sub>e/tkm, defined a system boundary? If so, how is this boundary defined?** For example, what are the starting and ending points of the assessment? How many types of greenhouse gases (GHGs) are included in the evaluation? Which standards or methodological frameworks are referenced, such as the Life Cycle Assessment (LCA) framework, the Global Logistics Emissions Council (GLEC) framework, or other relevant approaches?

In the Transportation sector, the measurement of GHG emissions is limited to direct (tailpipe) emissions, classified as Scope 1. This approach eliminates the need for additional complex calculations or methodologies, including a Life Cycle Assessment (LCA). Furthermore, consistent with other sectors, emissions are quantified in terms of CO<sub>2</sub> equivalents, ensuring that all emitted gases are fully accounted for by converting them into CO<sub>2</sub>e for standardized reporting.

2. **Thailand Taxonomy determined a sunset date of 2040. However, the amber criteria for the activity of freight transport by road specify conditions related to direct tailpipe greenhouse gas emissions beyond the years 2040 and 2050. Therefore, if a freight operator is able to comply with the amber conditions specified for this activity, what classification status will be assigned?**

At present, due to limited technology for transitioning to zero-emission vehicles in road freight transport, the classification under the Thailand Taxonomy is primarily determined by the criteria and thresholds of each activity card. Consequently, compliance with the Amber criteria for road freight transport results in classification under the Amber status, regardless of the sunset year. However, should technological advancements facilitate the transition to zero-emission vehicles in road freight transport prior to 2040, this criterion will be subject to revision in the future.

**3. Railway and non-railway transport, and water transport: Do these activities qualify as green only if they are new projects?**

No. Both new projects and retrofitted existing projects may qualify as green, provided that the technology used meets the GHG emission thresholds specified in Table: Transportation sector activities criteria and thresholds.

**4. Transport via railways: Can loans provided to customers for the construction of a new electric railway line or for the purchase of electric trains, whether for new or existing lines, qualify as green loans under the Taxonomy?**

Yes, in two cases:

- Construction of a new electric railway line: Loans will fall under the green criteria of Enabling infrastructure for low-emission transport activity, as the loan is used in the construction phase for zero tailpipe emission trains.
- Purchase of electric trains: Loans will fall under the green criteria of Transport via railways activity.

**5. Other passenger land transport: Can a vehicle be classified as green if it does not directly emit carbon dioxide but emits other gases, such as sulfur dioxide or carbon monoxide?**

To be classified as a green activity, the vehicle must not directly emit carbon dioxide and must also meet the DNSH criteria, such as compliance with the environmental objective on pollution prevention and control, as well as the Minimum Social Safeguards (MSS).

**6. Why are hybrid cars of other passenger land transport activity categorized in red under Thailand Taxonomy?**

Hybrid cars are an interim measure that is locking in suboptimal technologies. Meanwhile, there are currently more efficient technological options available for achieving zero greenhouse gas emissions, which are already being widely adopted. In addition, according to research in 2022, Tests were run on some of Europe's best-selling hybrid cars - including the BMW X5 and Volvo XC60 - and show that hybrids can actually emit up to 89% more CO<sub>2</sub> than

initial reports show<sup>3</sup>. Currently hybrids are cheaper than electric cars, but the cost of the latter is decreasing rapidly, and we see no reason to lock in suboptimal technology for the next decade.

**7. Urban and suburban passenger land transport: What is the meaning and difference between the terms “scheduled passenger road transport” and “scheduled passenger urban suburban rail transport”?**

The term “scheduled passenger road transport” is used for road-based transport services, while “scheduled passenger urban suburban rail transport” is used for rail-based services.

**8. If a parking is constructed with a solar rooftop installed on its roof, would this activity fall under the transport sector in the Thailand Taxonomy?**

The construction or renovation of parking facilities, including the installation of solar rooftops, can be classified under different economic sectors in the Thailand Taxonomy as follows:

1. Solar rooftop installation: This activity falls under the activity “Solar energy generation” within the energy sector.
2. Construction and renovation of parking facilities, whether in the form of outdoor parking or enclosed parking garage: This activity is “out of scope” of Thailand Taxonomy, as such car park accommodates both internal combustion engine and electric vehicles. To achieve the taxonomy compliance, the facility must be designated exclusively for zero-emission vehicles, thereby qualifying under the activity “Enabling infrastructure for low-emission transport” within the transportation sector.
3. Installation of EV charging stations: This activity falls under the activity “Enabling infrastructure for low-emission transport” within the transportation sector.

Users must review the criteria and thresholds associated with each activity in the Thailand Taxonomy, including essential criteria such as Do No Significant Harm (DNSH) and Minimum Social Safeguards (MSS), to ensure that this construction project is aligned with the Thailand Taxonomy.

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<sup>3</sup> [Hybrid v electric cars: What's the cheapest and most sustainable choice?](#), Euronews

9. Due to limitations in domestic production of Sustainable Aviation Fuel (SAF), airlines are required to import SAF from abroad. The long transportation distances result in increased greenhouse gas emissions from SAF logistics, which contradicts the objective of mitigation under the Thailand Taxonomy. Therefore, during this transition period, can airlines use SAF credits to offset fossil fuel usage in order to qualify for green status?

The use of SAF credits does not fall within the scope of the Thailand Taxonomy, which prioritizes tangible reductions in greenhouse gas emissions within the aviation sector and promotes domestic SAF production as the most climate-effective strategy currently available. However, airlines may still utilize SAF credits to fulfill their individual corporate environmental goals.

## 5. Technical criteria related to Agricultural sector

### 1. Why does the Agricultural sector of the Thailand Taxonomy not use a traffic light system like other sectors?

The approach suggested for the agricultural sector in Thailand is different in mechanics from the traffic lights system used for other sectors of the taxonomy. This approach aligns with agricultural sector methodologies in other taxonomies and incorporates additional content to enhance the utility and applicability of the eligibility criteria within the country's context. The suggested approach is the culmination of extensive, multi-year research conducted by the Climate Bonds Initiative (CBI). It has been developed based on Climate Bonds Agricultural Criteria and specifically tailored to ensure that it meets the unique needs and challenges of the agricultural sector in Thailand.

This approach is based on the understanding that, at present, collecting, analysing and evaluating accurate data on the impact of different practices on key agricultural climate indicators is extremely challenging for individual farmers and government agencies. Without years of country-specific research, the lack of reliable, comparable data makes defining precise science-based boundaries for the green, amber and red categories virtually impossible. Against this background, the CBI has developed a practice-based approach that enables farmers to contribute significantly to agricultural sustainability without overly complex and costly measurements.

The agricultural sector is also more heterogeneous in terms of its impact on the ecosystem and climate than other sectors, and therefore, sustainable practices proposed under a practice-based approach can contribute not only to the objective of climate change mitigation but also to the objectives of climate change adaptation, sustainable use and protection of marine and water resources, pollution prevention and control, protection and restoration of biodiversity and ecosystems and to circular economy promotion. In most cases, each recommended practice contributes to several objectives at once.

## 5.1 Activity selection and scope

2. Does Thailand Taxonomy include criteria or activities related to the agricultural sector promoting products or services that have lower carbon emissions compared to current practices (e.g., production of alternative proteins)?

The Thailand Taxonomy is a "living document" that can be updated over time to include new activities. When developing the Thailand Agriculture Taxonomy, the focus is on climate relevance, available technology, and economic impact. These factors determine the selection of activities. Some promising activities, like producing alternative proteins, are not currently included due to limited data and the lack of universally agreed-upon technologies.

However currently, activities related to the production of alternative proteins can follow the criteria under the manufacturing sector by applying energy efficiency measures and decarbonisation measures to manufacturing activities not specifically defined in Thailand Taxonomy in "Introduction of energy efficiency and decarbonisation measures in manufacturing activities not specified in the Thailand Taxonomy" activity

3. Is animal-feed production included in the agricultural sector?

The scope of activities covered is limited to "farm gate to farm gate," which means animal feed production does not fall within the agricultural sector. However, animal feed producers can align themselves with the manufacturing sector by implementing energy efficiency measures and decarbonisation measures. Additionally, to ensure the use of environmentally-friendly feed, Thailand Taxonomy includes a DNSH (Do No Significant Harm) provision. This ensures that agricultural products associated with environmental destruction such as cornfield burning, cannot be classified as compliant with Thailand Taxonomy.

4. Does agricultural product processing fall within the scope?

If the processing is conducted outside the farm, it will fall outside the agricultural sector's scope and be classified under the manufacturing industry (flat-out activity).



## **5. Is community forestry applicable?**

The agricultural section of Taxonomy incorporates the Community Forest Act B.E. 2562 to empower local communities residing in community forests. Community forest areas can conduct activities under the Taxonomy.

## **6. Does agri-waste fall under the agricultural sector or the waste sector, and where do their scopes overlap?**

The classification of agricultural waste or plant residues under a specific sector depends on the nature of the activity, as follows:

- Collection and transportation of plant waste for utilization outside the farm falls under the waste management sector (Activity 3: Waste collection and transportation - EO5).
- Plant residues used for bioenergy production fall under the energy sector in Thailand Taxonomy (Activity: Electricity generation from bioenergy and bioenergy production).
- Plant residues fermented for use within the farm are considered activities within the agricultural sector.

## **7. Does the treatment of wastewater from the agricultural sector for reuse fall under an activity in the waste management sector?**

The reuse of wastewater from the agricultural sector on farms or plantations falls under agricultural activities. However, if the wastewater is discharged from agricultural production areas and sent to decentralized wastewater treatment plants (Activity 11) or centralized wastewater treatment plants (Activities 12/13), it will then fall under the criteria of the waste management sector.

## **8. Is carbon footprint measurement in agriculture—such as measuring the carbon footprint of a fruit product—considered aligned with the Thailand Taxonomy?**

No, this is not among the approved practices. The rationale is that these indicators are inherently unstable and subject to variability influenced by numerous external factors, thereby possessing limited technical value.

## 5.2 Technical screening criteria

- 9. Is there a plan to have specific Technical Screening Criteria (TSC) for the sector? Will there be a specific TSC for the agricultural sector?**

For the agricultural sector, the focus will be practice-based to ensure activities reflect the context of each country. However, for forestry-related activities, there will be specific TSC.

- 10. If an agricultural activity aligns with the Taxonomy, it is classified as “green.” But if it does not align, is it considered “red”?**

The Agricultural Taxonomy is designed based on best practice approach. Therefore, alignment with the taxonomy results in a green classification. However, if an activity does not follow these guidelines, it is simply considered out of scope of the taxonomy and not classified as red. An exception applies to forestry-related activities, which follow a traffic-light system.

- 11. What are the differences between the basic, intermediate, and advanced agricultural practices, and should the basic practices be fully implemented before moving to the next level?**

Since the practices become progressively more complex at each level, it is recommended to adopt the higher-level practices only after fully implementing the preceding level.

- 12. Why wasn’t a separate sub-sector specifically for animal feed corn created, given that it is an important crop associated with burning and significant GHG/PM2.5 emissions?**

Eligible agricultural practices for maize cultivation are included under the general guidelines for cultivating either perennial or annual crops. Additionally, if agricultural products involve on-farm burning activities, such as slash-and-burn practices or the burning of agricultural residues at any stage of production, these are considered to have significant negative impacts. Such practices violate the Do No Significant Harm (DNSH) criteria and are inconsistent with the objectives of the Taxonomy.

It is important to note that the DNSH guidelines and requirements apply only within the boundaries of the farm, as farmers have limited control over activities outside their own farms.

However, there are traceability and certification practices available for those who wish to monitor and improve the sourcing of their agricultural products.

**13. If the practices are followed, will the production be considered green for only 2 years. Why is the 2-year period specified, and will the expenses be considered green permanently?**

This provision is added to stimulate farmers constantly improve their production units and make it more sustainable.

If a farmer chooses to invest in eligible agricultural practices in 2024, the resulting production from this operation will be considered green for the next two years. However, if the farmer continues to invest in additional eligible agricultural practices, the following production can also be counted as green.

As for operational expenses incurred in line with the eligible agricultural practices, these can continue to be counted as green expenses.

**14. In aquaculture activities, if one basic-level and one intermediate-level practice are implemented, for example, obtaining certifications such as GAP or ASC (basic practice), and installing solar panels (intermediate practice)—is it still necessary to implement an Integrated Farm Management Plan (IFMP) to validate the intermediate-level practice and achieve a green classification?**

Users of the taxonomy can choose one of two paths to obtain taxonomy alignment: either by preparing the IFMP or by obtaining a certificate from a list of recognized providers. If a user obtains a certificate, preparing IFMP is therefore not required. Apart from following one of these two paths, the user must also implement at least two eligible practices, comprising at least one basic and at least one non-basic practice. While obtaining certification is a prerequisite for taxonomy alignment, it was also included as one of the eligible practices. This provides a user with an opportunity to cover the costs of certification using taxonomy-aligned funds. In this case, a user can obtain a certification (as a prerequisite for compliance), then choose certification obtainment as one of the two required practices, and then choose just one additional intermediate or advanced practice. This approach ensures the user will be compliant with both requirements: certification and implementation of two practices.

**15. In the case of option 2, who can issue the certificate? Must it be a law firm, audit firm, or licensed company?**

It depends on the specific certificates. Each certification body sets the criteria and issues the certifications.

**16. Is planting fast-growing trees for industries such as paper pulp or furniture and using leftover wood as woodchips for biomass energy considered green?**

Forestry plantation and sustainable forest management activities are included in the forestry sector of the taxonomy. If the forest is planted and managed in line with the requirements, the project can be considered green or amber.

**17. Can sugarcane harvesters using fuel be classified as green?**

Investments in Electric or Hybrid or biofuels Harvesters can be green. Investments in harvesters that use fossil fuels are not classified as green activities because they promote the use of fossil fuels.

**18. If a farm has already implemented intermediate and advanced practices, can it be considered aligned with the Thailand Taxonomy, since the practices are already in place?**

A farm itself cannot be directly considered “aligned” or “not aligned” with the Thailand Taxonomy, as the taxonomy does not assess the farm. Instead, it evaluates the sustainability of agricultural practices being implemented.

In this case, practices can be considered aligned with the taxonomy—or “green”—only if all required conditions are met. These conditions include compliance with relevant laws and the presence of an IFMP or certification from a list of recognized providers. If these conditions are fulfilled, both previously implemented and newly adopted practices can be considered taxonomy-aligned.

**19. If investments have already been made in intermediate and advanced practices—such as maintaining existing drone operations or smart farm efficiency systems—can these be counted as taxonomy-aligned expenditures?**

Expenditures for procuring inputs to support agricultural practices can be considered taxonomy-aligned only if all required conditions are met (as referenced in question 18). Expenditures for both initiating new practices and maintaining existing ones can then be considered aligned with taxonomy.

However, revenue generated from agricultural products resulting from taxonomy-aligned practices can only be classified as “green” for a period of two years following the completion of the farm transformation project (as referenced in question 13).

## 6. Technical criteria related to Construction and real estate sector

### 6.1 Activity selection and scope

#### 1. How do the Buildings and Real Estate sector cover construction works and land acquisition?

The criteria in the buildings and real estate sector are centred around the final facility, whether residential or commercial and its operational emissions. Expenditure on things incidental to the creation of the building, such as construction or land purchase, can only be recognised as compliant with the Taxonomy if it leads to creating a building that complies with the Taxonomy. However, it is critical to enforce the obligations of the developer, who may raise a green loan to buy land and construct a green building but may end up constructing a building that is not compliant. The definition of sanctions in the event of such a development lies outside the scope of the Taxonomy and should be determined by national authorities and professional associations.

#### 2. Should investments in the construction of government infrastructure, such as airports and subway systems, be included in the Thailand Taxonomy?

The construction of infrastructure, such as railway tracks, has been included in the Thailand Taxonomy for the transportation sector. However, investments in roads and airports are out of scope of the Taxonomy (not classified as red or any other category), except for passenger terminals and office buildings, which can be referenced according to the construction and real estate sector of the Thailand Taxonomy.

#### 3. Is the installation of solar rooftop systems considered part of the Energy sector or the Construction and Real Estate Sector under the Thailand Taxonomy?

The installation of solar cell or solar rooftop systems may be classified under more than one sector within the Thailand Taxonomy, depending on the primary purpose and technical characteristics of the activity. Where the primary objective is electricity generation, activity is generally categorized under the Energy Sector. Conversely, where solar installations are integrated into buildings and contribute to reducing greenhouse gas (GHG) emissions in accordance with the thresholds and technical criteria defined for the Construction and Real Estate Sector, such activities may appropriately be classified under that sector. In summary,

the classification of solar cell installations under the Thailand Taxonomy is context-dependent, and may be determined based on their functional objective, emissions impact, and alignment with sector-specific technical screening criteria.

**4. What is the difference between “renovation of buildings” and “installation of energy-saving equipment,” given that both may involve efficiency improvements?**

“Renovation of buildings” refers to comprehensive or project-level renovation of the entire building (major renovation), which must demonstrate measurable reductions in energy consumption or greenhouse gas emissions in line with the thresholds set under the Thailand Taxonomy. In contrast, “installation, maintenance, or repair of equipment” refers to measure-based activities targeting specific components such as energy-efficient lighting which are implemented at the system or equipment level and are intended to support or complement other green activities, without necessarily improving the overall performance of the entire building.

## **6.2 Technical screening criteria**

**5. How are the elements of the activity supply chain represented in the Taxonomy?**

Currently, many international taxonomies devote little attention to supply chain analysis due to methodological or data-availability reasons. In many cases, taxonomies define low carbon activities in terms of emissions at the activity itself, although some other activities TSC consider scope 1, 2 and 3 emissions. Some elements of supply chains are either covered in other sections of the Taxonomy (e.g., in the case of the construction and real estate sector, construction of building materials such as steel, cement, and plastic are included in the Manufacturing sector) or do not affect climatic materiality (such as packaging, logistics or financial processing) and therefore are not relevant for the Taxonomy.

**6. Will embodied emissions be incorporated in the future?**

Currently there is no data to create criteria based on embodied emissions.

It depends on the availability of data for assessing embodied emissions, as well as the quantity of construction materials that meet the green activity criteria being sufficient to meet market demand.

**7. Will Scope 3 emissions, including supply chain-related emissions, be included in future Taxonomy updates for buildings?**

At present, the Taxonomy does not include Scope 3 emissions due to data and methodology limitations. However, the inclusion of upstream emissions, such as embodied carbon in materials, is under consideration for future updates. This will depend on improved data availability, alignment with international practices, and market readiness to adopt low-embodied carbon materials.

**8. Regarding low-rise residential projects, what recommendations are there to ensure alignment with Option 1 (decarbonization pathway) criteria for EIU compliance?**

There are several measures to align with the decarbonization pathway. One key approach is implementing energy efficiency measures, such as optimizing energy systems to minimize energy consumption. Beyond this, electrifying the building can be considered, guided by the targets and metrics defined in the pathway.

**9. Does a building classified as green mean that it complies with the Paris Agreement target of 1.5 degrees Celsius? Additionally, can it be referenced as adhering to the carbon reduction targets based on the Science Based Targets initiative (SBTi)?**

The classification of buildings as green aims to control the temperature increase to no more than 1.5 degrees Celsius. However, the methodology for determining the Taxonomy differs from the calculation methods based on the SBTi, which has specific objectives. Therefore, it cannot be stated that a building classified as green according to the Taxonomy will comply with SBTi. Nonetheless, the Thailand Taxonomy does not prohibit project owners from evaluating greenhouse gas reduction approaches according to SBTi.

**10. For existing buildings undergoing retrofitting, if a green building certification like EDGE is obtained, will it automatically be considered green?**

There are additional requirements associated with each certification, they're indicated in the table within the section. If the building fulfills these requirements as well as DNSH and MSS – it is considered green.



**11. Does installing building-integrated PV panels count as a green activity?**

The installation of solar panels on a building fall under the activity category "Installation, maintenance, and repair of special-purpose building equipment." Installing renewable energy (RE) equipment is considered a green activity because it promotes the use of clean energy. The value of the investment in the installation can be considered as green, but not the entire building. To claim the entire building as green, it must meet the relevant pathway criteria.

**12. Can other green building standards, such as DGNB (Germany) or others, be included as proxy certification labels with additional requirements in the future?**

We reviewed all existing standards, but during the discussion in the Technical Expert Group this standard was removed as not consistent with taxonomy objectives.

**13. For renovations categorized as amber, requiring a 30% reduction in emission intensity compared to the baseline, could you explain more about how the baseline is calculated?**

Baseline can be calculated using a variety of methodologies, for example, Operational carbon emissions calculation ([Link](#)). If a building lacks baseline data, the project owner may consider using proxy data from other buildings with similar characteristics or the average data of the same building.

**14. For renovation projects requiring at least a 30% reduction in GHG emissions or energy use (as outlined in the documentation), projects meeting these criteria are categorized as amber. If a building is not renovated to reduce emissions or energy use, but it is not related to fossil fuels (red), how is it categorized?**

Project owners can assess the energy consumption and greenhouse gas emissions of buildings. If the figures align with the guidelines for greenhouse gas reduction (Option 1), the project can be classified as green. However, if the renovation project cannot reduce greenhouse gas emissions by at least 30%, it will be considered out of scope of the taxonomy.

**15. If a company rents an office building aligned with the green taxonomy, under what activity category does the rental expense fall (without constructing or renovating)?**

We focus exclusively on owner emissions and do not account for tenant emissions, as these fall outside the defined scope. Tenant activities during the rental period do not influence the decisions of the asset manager or asset owner.

**16. Can rental agreements structured as "Green Leases" be considered aligned with the Taxonomy?**

While tenant emissions are currently not accounted for under the Taxonomy, a Green Lease that includes binding commitments on energy efficiency, water savings, or waste reduction may support the overall greenness of the building if such actions are verifiably implemented and monitored by the asset owner. However, rental payments alone are not considered green expenditures unless linked to an underlying green-certified asset that meets all technical criteria, including DNSH and MSS.

**17. If a company in the fossil fuel or oil & gas industry constructs a green building, would it meet the green taxonomy criteria?**

If an oil and gas company invest in a building directly supporting its core oil and gas business, it will be classified as red. However, if the company invests in an office building that meets green criteria, the investment can qualify as a green activity. It is important to note that only the activity will be certified as green, not the company itself.

**18. For TREES v2, which references ASHRAE 90.1 (2007), does this mean a building must achieve TREES Platinum certification and demonstrate 30% energy efficiency improvement using the latest version of 90.1?**

Yes, according to the criteria, the asset manager or asset owner have to include both of them.

**19. Regarding CRVA calculation, how can damage assessments for buildings (e.g., NAV or other metrics) be performed based on RCP 8.5?**

Typically, climate physical risk assessments involve defining potential scenarios and translating those hazards into economic damages (economic value). Each model has its own method of converting hazards into economic value, depending on the location and type of disaster. Therefore, the Taxonomy does not specify which model must be used, as long as the model is credible and applicable to the context. However, the Taxonomy does emphasize the completeness of the risk assessment for the building.

**20. For older hotels requiring renovations, can they achieve green status if certified to comply with new building criteria?**

Yes, if the renovation meets the specified green criteria while adhering to the principles of DNSH (Do No Significant Harm) and MSS (Minimum Social Safeguards), it can also be considered green.

**21. Are hybrid-use buildings — combining green and non-green components — eligible for partial inclusion under the Taxonomy?**

For mixed-use developments, only the portion of the building that meets the Taxonomy's technical screening criteria (TSC) can be counted as green. The project proponent must demonstrate proportional compliance through clear physical and financial boundaries (e.g., floor area, energy systems, metering). The remainder of the project that does not align with green criteria will not be classified as green.

## 7. Technical criteria related to Manufacturing sector

### 7.1 Activity selection and scope

#### 1. Why does Thailand Taxonomy not cover all sub-sectors within the manufacturing sector?

Thailand Taxonomy does not cover all sub-sectors within the manufacturing sector primarily because its development is guided by the principles of environmental materiality, technological feasibility, and international taxonomies relevance.

The Taxonomy targets sectors that are notable contributors to climate change via GHG emissions. Within manufacturing, the highly climate-material sub-sectors, such as the manufacturing of cement, basic chemicals, iron and steel, aluminium, and plastics, are specifically included in the Taxonomy. Many other manufacturing sub-sectors that are important to the Thai economy (e.g., textiles, food, paints) may not be large direct emitters of greenhouse gases themselves. Therefore, they are not explicitly covered by Thailand Taxonomy. However, Thailand Taxonomy includes an auxiliary transitional activity for these manufacturing activities. This enables businesses in other manufacturing sub-sectors to be recognized for implementing energy efficiency improvements, electrification, and switching to renewable energy sources, even if their specific sub-sector doesn't have its own detailed criteria yet. This activity was specifically developed for the Thailand Taxonomy and has no direct precedent in other taxonomies.

#### 2. How do we scope activities between Manufacturing and Waste management sectors?

Thailand Taxonomy differentiates the scope of Manufacturing and Waste Management sectors according to the primary function of their respective economic activities:

- Manufacturing focuses on the creation of new products from raw materials or components. The environmental focus is on reducing emissions and resource consumption during the production process of these goods.
- Waste Management focuses on the handling and treatment of unwanted materials or byproducts from various sources (including manufacturing) after they have served their initial purpose. The environmental objectives are to minimise the negative impacts of these wastes through proper collection, treatment, recovery, and disposal.

Therefore, the principle of separation is determined by the primary objective of the activity whether it is a value creation through product manufacturing (utilizing byproducts as inputs) or mitigation of the environmental impact of discarded materials through treatment and disposal. Activities that directly reintegrate waste streams into the production cycle are typically considered part of manufacturing and contribute to circularity within that sector. Activities focused on the end-of-life management of waste streams, even if conducted on-site, are generally classified under Waste Management.

For example, If the waste treatment primarily focuses on managing and disposing of waste that is not directly reintegrated into the production as a raw material (e.g., treating wastewater before discharge, incinerating non-recyclable byproducts for volume reduction without direct energy recovery back into the main manufacturing process), this activity has characteristics of waste management, even if it occurs within the factory's physical boundaries. Thailand Taxonomy has a dedicated Waste Management sector with specific activities and ISIC codes for various waste treatment processes.

Another example, the production of plastic resins falls under Manufacturing, while the sorting and recycling of plastic waste is a Waste Management activity. Similarly, the manufacturing of equipment for renewable energy is in the Manufacturing sector, whereas the management and disposal of waste from old renewable energy installations would fall under Waste Management.

The Taxonomy also includes a provision for "Waste to Energy" within the Waste Management sector, recognizing that waste can be a feedstock for energy production, thus linking waste management to energy generation, which was a focus of Energy sector of Thailand Taxonomy. However, the primary driver for including this activity is still the management and valorization of waste streams.

### **3. Does Thailand Taxonomy include Research, development and innovation for CCS-related technologies, including direct air capture (DAC)?**

The current scope of the Thailand Taxonomy does not explicitly list these activities as a separate defined activity with its own specific technical screening criteria. Nevertheless, manufacturers can invest in R&D and innovation for CCS-related technologies.

#### **4. What is the scope of "the activity repurposes batteries that have been produced"?**

To be considered a green activity under the "Manufacture of batteries" category, the economic activity can either manufacture rechargeable batteries (including from secondary raw materials) or it can repurpose batteries that have been produced.

The activity repurposes batteries that have been produced refers to taking batteries that have already been manufactured and using them for a new purpose, particularly in energy storage applications, thereby extending their lifespan and promoting resource resilience and circular economy. This is supported by the alignment with the Singapore Taxonomy's specific mention of repurposing for energy storage. The Thailand Taxonomy also lists "Resource resilience and circular economy promotion" as an objective for the "Manufacture of batteries" activity.

It is important to note that Thailand Taxonomy acknowledges that the issue of raw material sourcing for batteries cannot be currently addressed due to the absence of scientific criteria, and the Taxonomy should be updated in this regard as these criteria are developed. This suggests a focus on the management and reuse of already produced batteries in the current scope.

#### **5. Regarding battery recycling, is there any overlap with the waste management sector?**

No, it does not overlap as they are separate activities. In Thailand Taxonomy, battery recycling is classified under the battery manufacturing sector, while the waste management sector focuses on disassembly and disposal.

## **7.2 Technical screening criteria**

#### **6. Why is the amber category of the Manufacturing sector structured differently than the other sectors?**

As best as possible, Taxonomy references credible and science-based decarbonisation trajectories. – e.g., amber pathways for the Energy sector reference Thailand's NDC. However, there is a lack of credible data for manufacturing activities to construct similar amber pathways. For this reason, it is difficult to set amber emissions or energy intensities thresholds and determine if an activity falls under Amber or Red. In this case, the starting points of such manufacturing activities are secondary, and it is most important to ensure that activities are

improving and transitioning towards green – through the adoption of decarbonisation measures.

The amber category under Manufacturing refers to a list of measures that any company, regardless of its current level of development, can apply to receive transition financing. This category is also structured to allow the largest number of potential users in the Manufacturing sector in Thailand.

**7. As chemical recycling is a new technology for primary plastic production, should the Thailand Taxonomy exclude it from the current phase?**

Since EU and other taxonomies allow to use chemical recycling in primary plastic production, Thailand Taxonomy includes this process to align with international taxonomies. Thailand Taxonomy also minimizes impacts through the DNSH and incorporates information from the Intergovernmental Negotiating Committee under UNEP, which is working on an international legally binding instrument to address plastic pollution, including in the marine environment, as recommended by Thai experts such as Plastics Institute Of Thailand.

Furthermore, the research shows that chemically recycled plastics can reduce GHG emissions by at least 50%-60% compared to virgin fossil-based feedstocks. As technology advances, these reductions could potentially reach 110% by 2030. This process also avoids emissions from incineration, which is a major contributor to CO<sub>2</sub> release. Chemical recycling can also handle mixed or contaminated plastics that mechanical recycling struggles to process efficiently, thereby reducing waste sent to landfills or incinerators and improving overall recycling rates.

Additionally, chemical recycling produces feedstock nearly identical to virgin materials, making it suitable for high-value applications such as food-grade packaging, which is often not possible with mechanically recycled plastics.

**8. In the case of the aluminum industry, how is the management of aluminum scrap and dross aluminum typically handled?** For example, instead of using ingots as the primary raw material, increasing the use of aluminum scrap to reduce the reliance on ingots, as well as utilizing dross aluminum to produce ingots.

Dross aluminium is considered a scrap. Therefore, the management of both scrap and dross aluminum through recycling can be considered either as waste management or as part of the production process within the manufacturing sector.

In addition, according to aluminium production criteria, all secondary aluminium production is considered automatically green. Secondary aluminium means the one that is not produced through electrolysis of bauxites, but from smelting scrap of any kind, which is a method that significantly reduces energy consumption and GHG emissions.

#### **9. Why is there no amber criteria for primary plastic production?**

The primary plastic production does not have the amber criteria because the technology for transitioning to green practices in the plastics industry is already widely available. Introducing the amber criteria could hinder progress toward fully green practices, as it might create a loophole that delays the adoption of sustainable solutions.

#### **10. Is CCS for oil and gas classified as red or outside the scope of evaluation?**

CCS associated with oil extraction is categorized under the red classification, as it poses a risk to achieving the objective of climate change mitigation. In contrast, CCS applied to natural gas operations may contribute positively to decarbonization efforts within that sector and the classification depends on whether the activity meets the relevant technical screening criteria.

#### **11. What is the rationale for energy efficiency criteria?**

The rationale for including the "Auxiliary transitional activity: Introduction of energy efficiency and decarbonisation measures in manufacturing activities not specified in the Thailand Taxonomy" is primarily to enable a broader participation of industrial companies in the Taxonomy application. This activity serves as a way to address the decarbonisation of manufacturing sectors and activities that are important to the Thai economy but are not themselves large direct emitters of greenhouse gases. Given the wide variation in applications across manufacturing activities, it is challenging to develop a single "best practice" or specific criteria for all of them. This auxiliary activity provides a pathway for improvement even without detailed, sector-specific technical screening criteria.

Also, this criteria can drive decarbonisation and energy efficiency. The activity focuses on the introduction of energy efficiency measures, the electrification of production processes, and



the replacement of non-renewable energy sources with renewable ones in these unspecified manufacturing activities. The goal is to achieve a substantial reduction of emissions. The criteria is also aligned with national energy efficiency goals, for the amber category of this activity, one option for recognition as transitional involves improving energy efficiency relative to the baseline energy intensity of the facility. This threshold is linked to the Draft Energy Efficiency Plan 2024, which aims for a significant reduction in Thailand's overall energy intensity.

## 8. Technical criteria related to Waste management sector

### 8.1 Activity selection and scope

1. **What is the scope of Thailand Taxonomy waste management activities? For industrial waste, does it cover only solid waste? If a factory treats its own wastewater, is this included in the scope?**

The Thailand Taxonomy Waste Management Sector covers a range of activities related to the treatment, recycling, recovery, and safe disposal of both solid and liquid waste, including industrial waste. This includes activities carried out by licensed facilities that manage hazardous and non-hazardous industrial waste, as well as decentralised wastewater treatment systems such as on-site treatment at the source of waste generation.

For industrial solid waste, the taxonomy includes activities conducted by facilities holding the required licenses (e.g., Factory License Types 101, 105, 106) for the collection, treatment, or disposal of industrial waste. If a factory is licensed to treat its own waste, this can also fall within the taxonomy scope.

For industrial wastewater, the scope includes both centralised and decentralised wastewater treatment systems. If a factory treats its own wastewater through an on-site treatment system, this is considered within the scope—provided the system operates in compliance with relevant environmental standards and ensures proper monitoring before discharge into the environment.

In summary, the taxonomy covers both solid and liquid waste management activities, including those performed on-site by industrial operators, as long as they meet regulatory and environmental requirements.

2. **Why is Waste-to-Energy (WtE) considered in the Thailand Taxonomy but not in the EU Taxonomy?**

Waste-to-Energy is not included in the EU Taxonomy as it is felt that it might result in lock-in effects and may discourage reuse and recycling activities. However, the development of Thailand Taxonomy is grounded in the local context. In Thailand, WtE plays a significant role in addressing the country's waste management challenges and in securing energy in areas lacking sufficient landfill capacity or access to renewable energy. Thailand plans to increase

the capacity of WtE plants to 400 MW by 2037<sup>4</sup>. The TSC of WtE are designed based on the waste hierarchy which recycling is still prioritised over incineration. While the Singapore Taxonomy provided a useful foundation, Thailand's context differs particularly regarding regulatory capacity. Therefore, the Thailand Taxonomy adopts detailed TSC to address domestic environmental and social concerns.

When properly regulated and designed, WtE facilities can reduce landfill volume and associated methane emissions, minimise risks of leachate pollution, and reduce open burning and its associated air pollution. This is evidenced by successful cases in Sweden<sup>5</sup> where WtE plants are integrated into sustainable urban planning with high environmental standards.

To address the concerns on lack of robust regulatory oversight and ensure environmental integrity, Thailand Taxonomy introduces stricter TSC than existing national regulations by requiring disclosure of baseline environmental assessments or Continuous Emissions Monitoring (CEM) reports, and requiring facilities to implement a certified environmental management system (e.g., ISO 14001). These criteria are designed to improve environmental integrity and governance, helping prevent siting in inappropriate locations and reducing potential harm to surrounding communities.

Furthermore, the TSC implicitly address the issue of moisture content and potential odour nuisance through the following:

- **Efficiency Requirements:** The minimum 25% plant efficiency criterion for 'Green' classification necessitates the use of feedstock that is conducive to efficient combustion. High moisture content significantly reduces calorific value and hinders efficient energy conversion, making it difficult to meet this threshold without prior segregation of high-humidity waste.
- **Certified Environmental Management System:** As previously mentioned, a certified environmental management system (e.g., ISO 14001) is a mandatory requirement for 'Green' and 'Amber' classifications. If a WtE plant employs air-drying methods for high-humidity waste that result in odour nuisance and negatively impact the surrounding communities, this would be considered a significant deficiency in their environmental

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<sup>4</sup> [Thailand PDP 2018](#)

<sup>5</sup> [Malmo case study](#)

management practices. Such practices would likely lead to a failure to meet the requirements for a certified environmental management system, and consequently, the facility would not qualify as 'Green' or 'Amber' under the Thailand Taxonomy.

- **Focus on Pre-segregation:** While specific numerical thresholds for moisture content or heavy metal contamination may be further elaborated in future updates, the current criteria strongly encourage and, in practice, necessitate pre-segregation to achieve efficiency targets and maintain responsible environmental practices. This pre-segregation step is crucial for removing not only recyclable materials but also waste fractions that would impede efficient combustion due to high moisture or contaminant levels.

The emphasis on achieving a 25% plant efficiency for 'Green' activities, coupled with the requirement for a certified environmental management system, serves as a strong mechanism to discourage practices like open-air drying of high-humidity waste that cause odour problems. Facilities that fail to manage their feedstock appropriately and cause environmental or social nuisance will not meet the 'Green' criteria.

### **3. How does a Certified Environmental Management System (e.g. ISO 14001) relate to managing air pollution issues from Waste-to-Energy plants?**

ISO 14001 is an internationally recognised standard for environmental management systems (EMS). The core principle of ISO 14001 is to create a framework for organisations (in this case, WtE plants) to continuously identify, control, and improve their significant environmental impacts.

For a WtE plant, air emissions such as particulate matter (PM<sub>2.5</sub>, PM<sub>10</sub>), heavy metals, various gases, and odour are considered "Significant Environmental Aspects" under the ISO 14001 system.

Implementing ISO 14001 in a WtE plant helps to ensure that:

- Sources of air pollution and the types of pollutants emitted are systematically identified.
- The impacts of these pollutants on the environment and health are assessed.
- Environmental objectives and targets are set to reduce or control pollution.

- There is a strong emphasis on identifying and complying with all applicable legal requirements and other obligations. This is crucial as it directly links the management system to national environmental laws and standards, such as those potentially listed in Annex II of the Thailand Taxonomy Waste Management document, providing a clear reference for required environmental performance.
- Control measures are planned and implemented, such as installing and maintaining air pollution control systems, ensuring they meet the standards set by these regulations.
- Environmental performance is regularly monitored, measured, and evaluated, often using methods mandated by national regulations (like CEMS).
- The management system is reviewed and improved continuously to drive pollution reduction and ensure ongoing compliance.

Obtaining ISO 14001 certification involves an independent audit by a certified third-party body. This process verifies that the WtE plant's environmental management system meets the requirements of the ISO 14001 standard, including its commitment to complying with environmental laws and regulations (such as those for air emissions and odor, and potentially listed in documents like the Thailand Taxonomy).

This third-party validation adds a layer of credibility and transparency. It provides stakeholders, including regulatory bodies and the public, with assurance that the plant has a structured and independently assessed system in place to manage its environmental impacts and legal obligations effectively. It demonstrates a proactive approach to environmental responsibility.

#### **4. Which sector do activities related to energy production from biomass, biogas, and waste-to-energy (WtE) fall under, and where do these activities intersect?**

Energy production from biomass, biogas, and biofuels falls under the activity of "bioenergy generation and production" in the energy sector. Waste-to-energy (WtE) falls under the waste management sector. The distinction between these sectors is determined by the primary objective of the activity and the International Standard Industrial Classification (ISIC) codes. Biomass, biogas, and biofuels (ISIC 3510) are categorized under the energy sector, while WtE (ISIC 382) is categorized under the waste management sector.

WtE's primary objective is waste disposal, with energy as a byproduct, whereas biomass, biogas, and biofuels are directly focused on energy production, placing them within the energy sector.

**5. Does agricultural or manufacturing waste fall under the waste management sector?**

Within the context of sectoral classification, materials are generally considered to fall under the scope of the waste management sector once they are deemed no longer suitable for use on the site where they were generated (i.e., the farm or factory) and are transported off-site for further management, such as treatment, recovery, or disposal. Therefore, for agricultural residues and industrial waste that leave the originating site for off-site treatment, the activities that fall under the waste management sector typically commence with their collection and transportation to the designated facility. Crop residues or residues from manufacturing that are utilised on the farm or at the manufacturing site fall under the agriculture sector and manufacturing sector, respectively.

**6. Does Waste-to-Energy (WtE) include co-processing in cement manufacturing? What are the differences between waste input for WtE and for co-processing in cement production? Must both comply with the regulations of the Department of Industrial Works? Please also explain the requirement for metal ash recovery of no less than 75%.**

Co-processing in cement manufacturing is not considered part of the waste management sector, but rather falls under the activity of cement manufacturing, which belongs to Thailand Taxonomy's Manufacturing Sector.

Waste, whether used for WtE or co-processing, must comply with applicable laws. In cases where the law mandates waste disposal via method 044 (co-processing) and prohibits disposal by method 075 (incineration of hazardous waste), then method 044 must be used. If the waste is allowed to be disposed of by either method 044 or 075, the decision is left to the waste handler. Operators handling waste for WtE or co-processing must register as a factory type 105/106 as stipulated by the Department of Industrial Works' regulations.

The requirement for metal recovery from ash is derived from other taxonomies. In Thailand, waste generally undergoes a metal recovery process before entering the WtE process.

After incineration, if laboratory results indicate that the ash still contains metal content, it is required to recover at least 75% of that metal content. However, if laboratory results confirm there is no metal content, recovery is not necessary. This requirement aligns with both national and international best practices.

## **7. Does battery recycling fall under the waste sector or the manufacturing sector?**

According to the Thailand Taxonomy, the activities related to end-of-life batteries are categorised across both the waste management and manufacturing sectors, depending on the specific step in the process.

1. **Collection and Transportation:** Once a battery is no longer usable and is discarded, it enters the waste stream. The initial stages of collecting these used batteries from consumers or businesses and are considered part of the waste management sector's activities (Activity 3: Collection and Transportation of Waste).
2. **Dismantling:** Used batteries often require dismantling to separate different components and materials (like plastics, metals, and cell components) before recycling or disposal. According to the Thailand Taxonomy, the dismantling of end-of-life batteries are categorised under the waste sector. This stage handles the battery as waste material to prepare it for subsequent steps. (Activity 4: Depollution and dismantling of end-of-life products)
3. **Recycling and Material Recovery:** After dismantling, the separated components containing valuable materials are sent to specialised recycling facilities. The process of extracting and recovering materials (such as lithium, cobalt, nickel, manganese, etc.) from these components, which are then used as secondary raw materials, is categorised by the Thailand Taxonomy under the manufacturing sector (specifically, related to the manufacturing of batteries).
4. **Disposal:** If batteries or certain components cannot be recycled or recovered for materials, they must be disposed of safely. The ultimate disposal of residual waste from end-of-life batteries falls under the waste management sector (Activity 10: Treatment of hazardous waste).

In summary, the journey of an end-of-life battery typically starts and ends within the waste management sector (collection, dismantling, disposal), but the crucial step of recycling and

recovering materials to re-enter the economy is categorised under the manufacturing of batteries activity within the Manufacturing Sector of the Thailand Taxonomy.

**8. Is using dross aluminum to produce ingot considered "production of secondary aluminum" under the manufacturing sector, or "treatment of hazardous waste" under the waste sector?**

The production of secondary aluminum is automatically considered a green activity under the manufacturing sector. However, it can also be considered as contributing to Environmental Objective 4 (EO4) - Resource Resilience and Transition to a Circular Economy, specifically within the "treatment of hazardous waste" activity in the waste sector if the focus of the activity is to treat hazardous waste. The Technical Screening Criteria (TSC) for both the waste management and manufacturing sectors share a core principle: they prioritize the use of materials to produce secondary raw materials. This focus aims to reduce reliance on primary resources and promote a circular economy by ensuring that waste is recovered and reused in production processes.

Regardless of whether the activity is classified under the waste or manufacturing pathway, it must also demonstrate compliance with the Do No Significant Harm (DNSH) criteria for the other five environmental objectives (EOs).

When an activity, such as using aluminum dross to produce ingots, aligns with criteria in more than one sector or specific activity within the taxonomy, the guidance is to classify it under the **most specific pathway** that describes the core industrial process and its output. In this case, while the input is waste (dross), the fundamental activity is the transformation of this material into a finished product (aluminum ingot) that re-enters the manufacturing value chain. Therefore, the **"aluminium manufacturing"** activity is considered the more specific and appropriate classification route under the Thailand Taxonomy for the process of producing secondary aluminum ingots from dross.

**9. Does reuse of wastewater generated by the industrial sector within the industrial sector fall under waste management or manufacturing sector?**

The reuse of treated wastewater within industrial plants falls under the EO4: 'Resource Resilience and Transition to a Circular Economy' of Activity 11: 'Construction, extension,



upgrade, operation and renewal of decentralised wastewater collection and treatment’ in the Waste Management Sector.

**10. If a project improves a centralised wastewater treatment system by separating rainwater from wastewater before it enters the treatment system (which helps reduce the treatment load), what category or criteria could this type of project fall under?**

Separating rainwater from wastewater before it enters the treatment system is considered a way to reduce the treatment needed. This type of project can qualify under the Green Criteria EO1 of Activity 12: ‘Construction, extension, upgrade, and operation of centralised wastewater collection and treatment’ because it leads to a reduction in net energy consumption. With less volume (as rainwater is diverted) and potentially a more concentrated wastewater flow (depending on the system design), the energy required for pumping and treatment processes like aeration is expected to decrease.

**11. For wastewater treatment facility, is the transportation of wastewater by truck subject to specific requirements, such as the use of electric vehicles (EVs) or containers meeting industry standards, in order to align with green criteria?**

Based on the definition of industrial waste according to the Ministry of Industry's announcement on the disposal of faecal matter or disused materials, ‘industrial waste’ covers both solid and liquid waste, including wastewater not transported via pipes. Therefore, the transportation of industrial wastewater by vehicle to a wastewater treatment plant falls under Activity 3: Collection and Transport of Waste which requires the vehicle to conform to Transportation Requirements. If an EV truck is used for transporting industrial wastewater, it can also refer to the low-carbon transport activity included in Thailand Taxonomy: Transportation Sector.

**12. Are entities involved in the manufacturing of wastewater treatment equipment or those contracted for the construction and installation of such systems classified as performing green activities?**

Criteria are applied to specific activities as defined by classifications like ISIC codes, rather than classifying the entire entity (manufacturer or contractor) as green. Construction, extension, upgrade, operation and renewal of decentralised wastewater collection and treatment falls

under Activity 11 of Waste Management Sector. However, manufacturing of equipment is not part of the scope of this activity. The manufacturing activity may be classified under a relevant category within the Manufacturing Sector providing that the criteria specific to that manufacturing activity are met.

## 8.2 Technical screening criteria

### 13. Why do some of the green or amber Technical Screening Criteria (TSC) of Waste Management activities take the form of qualitative criteria, such as adoption of best practices or compliance with regulations?

The TSC for Waste Management activities often take the form of qualitative criteria for several key reasons.

1. **Alignment with Established Taxonomies and the Waste Hierarchy:** Many of these TSC refer directly to existing and well-established sustainability taxonomies, such as the EU Taxonomy and the Singapore Taxonomy. These taxonomies explicitly apply the concept of the waste hierarchy. This hierarchy prioritises waste management options in a specific order (prevention, preparing for reuse, recycling, other recovery, and finally disposal).
2. **Focus on Operational Processes and Implementation:** The environmental impact of waste management is fundamentally linked to the nature of its business models and operational processes. Maximising efficiency and minimising lifecycle emissions relies heavily on the successful execution of strategies like waste prevention, separate hazardous waste collection, reuse, and recycling. Qualitative criteria are better suited to assess the implementation and effectiveness of these complex operational practices.
3. **Relevance to EO4 and EO5:** Waste management activities are highly relevant to EO4 - Resource Resilience and Transition to a Circular Economy and EO5 - Pollution Prevention and Control). Qualitative criteria are essential for evaluating whether waste management activities are employing the necessary operational controls, management systems, and best practices to meet the requirements of these process-oriented environmental goals, rather than relying solely on quantitative output measures (like GHG emissions, which are more central to EO1 - Climate Change Mitigation).

#### **14. Why do Waste Management activities have a sunset date of 31 December 2029?**

For waste-related activities, the Pollution Control Department (PCD) has established the Waste Management NDC Action Plan 2021 – 2030<sup>6</sup>. The NDC Action Plan crafts out the yearly goal from 2021 up to 2030 for GHG emission reduction by each waste management activity as this document serves as the reference point for waste management actors in low-carbon targets setting, introducing 31 December 2029 as the Sunset Date aligns with PCD Waste Management NDC Action Plan and allows operators sufficient time and resources to achieve their existing targets set for 2030 while getting ready to transition to the new goals beyond 2030.

#### **15. How is the compliance verified for TSC that require adherence to laws, such as Activity 10: Hazardous Waste Treatment under EO5? Is having a valid license alone sufficient?**

No, having a valid license is not sufficient. While a valid license is a minimum requirement, it is also necessary to present other evidence to prove that good or best practices and legal compliance are adhered to. Examples of acceptable evidence include standard operating procedures (SOPs), photos, training logs, and other relevant documentation as listed out in Annex I of the document provides further examples of compliance evidence.

#### **16. For anaerobic digestion of wastewater with high concentration of bio-waste from agriculture activities, shall I refer to the agriculture sector or the waste sector?**

Classification under the Thailand Taxonomy for wastewater activities can be sought through:

- the Agricultural sector by adopting bio-digestion, or
- the Waste sector by ‘1. Anaerobic digestion of bio-waste or wastewater’ (EO1 or EO4)

Farmers are encouraged to select Agriculture Sector Pathway if anaerobic digestion is integrated into efforts to improve agricultural practices, such as enhancing resource efficiency or reducing emissions as part of farm operations. Waste Management Sector Pathway is to be chosen if the activity focuses solely on treating bio-waste or wastewater, independent of broader agricultural improvements.

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<sup>6</sup> [Waste Management NDC Action Plan 2021 – 2030](#) (แผนปฏิบัติการลดก๊าซเรือนกระจกของประเทศ ปีพ.ศ. 2564-2573)

Please note that in either case, DNSH still applies. This means that even if the activity is to contribute to an EO other than EO1, EO1 DNSH must be fulfilled by showing that methane leakage is minimised.

**17. There are additional best practices which my organization plans to implement but they are not listed in the TSC. Can implementation those practices alone be accepted as green?**

No, only those criteria which are listed in the Thailand Taxonomy and for which TSC has been defined can be assessed as green or amber. While most green TSC are perceived as ambitious, it is possible that some operators can be more advanced than the green TSC. Implementing the best practices on top of fulfilling the TSC is highly recommended. An example of those practices could include:

- To continuously monitor and assess the quantity and quality of wastes collected based on predefined KPIs for waste collection and transport activity.
- To offset the methane leakage for bio-waste anaerobic digestion.

**18. How should municipal solid waste (MSW) be segregated at the source, and is this measured by the percentage of waste recycled? Why is source segregation important?**

As outlined in the Thailand Taxonomy: Waste Management Sector document, MSW should be segregated at source into General Waste, Bio-waste, Recyclable Waste, Hazardous Waste, and Infectious Waste (where applicable). Source segregation is a foundational step in waste management hierarchy as it enhances the effectiveness of subsequent waste management activities and reduces environmental harm. Thailand's MSW contains a high proportion of bio-waste (almost 50%), which, if not segregated, contaminates recyclable and other waste streams, rendering them unusable.

Illustrating source segregation of MSW in terms of specific percentages requires detailed data on the composition and quantity of waste segregated at the household level. However, obtaining such precise percentages is challenging due to lack of household record-keeping, and cost and feasibility of waste audits. Waste audits, which involve physically sorting and analysing waste to determine its composition and segregation accuracy, are resource-intensive. They require trained personnel, equipment, and time to collect, sort, weigh, and analyze

waste samples from households, communities, or disposal sites. In Thailand, where financial and logistical resources for waste management may be limited, especially in rural areas, the cost of conducting regular, large-scale audits can be prohibitive.

**19. Is Refuse-Derived Fuel (RDF) allowed as an input for WtE?**

Yes, RDF is allowed as an input for WtE facilities, as long as recyclable materials are removed beforehand, adhering to the waste hierarchy. The process is well-documented, with clear guidelines for waste sorting and preparation to ensure hazardous waste and high quality recyclable waste is combusted.

**20. Is RDF counted as output of Sorting and Material Recovery of non-hazardous waste Activity?**

No, MRF outputs are defined as secondary raw materials recovered for recycling or reuse, aligning with the waste hierarchy's focus on material recovery. RDF, produced from non-recyclable residual waste for energy recovery, is a secondary by-product of MRF operations in both frameworks, but it does not contribute to the taxonomies' criteria for material recovery activities. Neither Singapore or EU Taxonomy counts RDF toward the substantial contribution criteria for material recovery activities, as it is not a recycled or reused material.

**21. For the activity of remediating legally non-conforming landfills and abandoned or illegal waste dumps, how or who should conduct the risk assessment or monitoring plan?**

The risk assessment and monitoring plan for the remediation of legally non-conforming landfills and abandoned or illegal waste dumps should be conducted in accordance with the guidelines provided by the Pollution Control Department (PCD) of Thailand. These guidelines specify the procedures and responsible parties for assessing and managing contaminated sites. The relevant documents are Guidelines for the Management of Areas Contaminated with Hazardous Substances – Pollution Control Department ([pcd.go.th](http://pcd.go.th)) ([Link](#)) and Guidelines for Risk Assessment of Soil or Groundwater Pollution – Pollution Control Department ([pcd.go.th](http://pcd.go.th)) ([Link](#)). Both guidelines emphasize that the responsible parties, such as site owners, operators, or government agencies, should engage qualified professionals to conduct risk assessments and develop monitoring plans.

## 9. Issues related to the implementation of Thailand Taxonomy

### 1. Who is Thailand Taxonomy applicable to; for example, lenders, borrowers, or businesses?

Thailand Taxonomy does not have legal enforcement. Taxonomy users may voluntarily adopt it as a reference. Examples of its implementation include businesses using it to support operational disclosures, financial institutions using it to design financial products, and government agencies referencing it in policymaking.

### 2. Can the Taxonomy damage the economy? What will happen to activities not aligned with the Green Taxonomy?

Thailand Taxonomy is designed to guide the economy's transition toward environmental sustainability by providing a standardized, science-based definition of what economic activities are considered environmentally sustainable ("Green") or on a credible transition pathway ("Amber"), aligning with national climate goals. This will support long-term economic resilience, while attracting green investment from both domestic and international financial markets.

Therefore, Taxonomy will not harm the economy but is intended to ensure an orderly and efficient transition. Moreover, having the Amber category will offer some degree of flexibility by supporting the transition of activities that are not yet Green but are on a clear path to decarbonization. Meanwhile, Thailand Taxonomy does not list every single business activity, "out-of-scope" activities, given a very small effect on climate and environment.

However, going forward, activities that are not environmentally friendly (Red) may face increasing financing challenges as investors and banks prioritize sustainability and manage environmental risks.

### 3. Is the Taxonomy alone enough to use in the real economy?

In most cases, no. The Taxonomy is an "information tool" of the green finance system, but it needs supplementary documents, instructions or pieces of national/international legislation to be connected to the real economy and financial market:

- To **label green bonds**, a green bond standard and framework must be applied. This defines the proper process for the use and management of proceeds, process for evaluation and selection of projects, disclosure rules and regulations etc. Among the

prominent examples of standards and framework are the Climate Bonds Standard<sup>7</sup>, China Green Bond Principles<sup>8</sup>, ICMA Green Bond Principles<sup>9</sup>, Asian Development Bank Green Bond Framework<sup>10</sup> etc.

- To **label green loans**, a green loan standard and framework is needed. In essence, it is similar to a green bond standard and some countries combine green load and bond standard into one document<sup>11</sup>, but it contains a few distinct features mostly attributed to the fact that loans issuances do not usually require the same level of transparency such as the Loan Markets Association Green Loan Principle and Green Finance Guidelines for the Banking and Insurance Industry of China<sup>12</sup>.
- To facilitate **disclosure** by national companies, certain reporting guidelines in terms of climate should be established in Thailand. In the future, Taxonomy-linked disclosure standards may help the country to measure the climate-aligned economy. The examples include the “Sustainable Finance Disclosure Regulation”<sup>13</sup> and the “Corporate Sustainability Reporting Directive”<sup>14</sup> issued by the European Union.
- To make the Taxonomy a successful instrument of Thailand’s government climate policy, a set of **support measures** must also be adopted to nudge investors in the right direction. The main goal of these measures is to direct domestic and foreign capital towards green projects. Examples of these measures can be found in [Climate Bonds Initiative report](#) “101 sustainable finance policies for 1.5°C”.

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<sup>7</sup> [Climate Bonds Standard V3.0](#), CBI

<sup>8</sup> [China Green Bond Principles](#), National Association of Financial Market Institutional Investors

<sup>9</sup> [Green Bond Principles](#), ICMA

<sup>10</sup> [Green and Blue Bonds](#), Asian Development Bank

<sup>11</sup> Such as Russia [Resolution No. 1587, 21 September 2021, On The Approval of The Criteria for Sustainable \(Including Green\) Development Projects in The Russian Federation and the Verification System Requirements for Sustainable \(Including Green\) Development Projects In The Russian Federation](#)

<sup>12</sup> [Green Finance Guidelines for the Banking and Insurance Industry of China](#), China Banking and Insurance Regulatory Commission

<sup>13</sup> [Sustainability-related disclosure in the financial services sector](#), European Commission

<sup>14</sup> [Corporate sustainability reporting](#), European Commission

4. **The complexity of the Taxonomy assessment might be obstacles for SMEs in implementing Thailand Taxonomy. Has Thailand Taxonomy developed exclusively for large enterprises? If SMEs cannot comply with the requirements, will this impact their inclusion in funding opportunities?**

No, Taxonomy does not limit the use only to large enterprises. Enterprises of any size are encouraged to apply the Taxonomy, including SMEs, in order to transition to environmental sustainability. Moreover, if SMEs' activities are not aligned with the Taxonomy, this does not preclude SMEs from funding opportunities. Nevertheless, there are many other factors that financial institutions will have to consider when issuing funding, such as SMEs' repayment ability.

5. **Is Thailand Taxonomy related to government policies, such as government subsidies or carbon taxes?**

Currently, the Thailand Taxonomy is a voluntary tool. The government can use the Thailand Taxonomy as a reference in designing policies to support environmental adaptation and climate change mitigation. For example, the Department of Climate Change and Environment under the Ministry of Natural Resources and Environment has incorporated Thailand Taxonomy into the draft Climate Change Act. The objective is for government agencies to use the Taxonomy as a reference for developing policies, action plans, GHG reduction measures, and climate change adaptation initiatives, as well as for supporting the implementation of climate change measures, including the use of the Climate Change Fund.

6. **Is it true that the BOT prohibits financial institutions from providing loans to energy and transport sector activities classified as red from 2050 onward?**

The BOT does not have a policy prohibiting financial institutions from providing loans to activities classified as red. Loan approvals and credit limit reviews remain at the discretion of each financial institution. In addition, Thailand Taxonomy serves as a voluntary reference framework for classifying and grouping environmentally friendly economic activities in Thailand. Financial institutions may choose to use it as one of the tools to support their credit product design and credit assessment processes.



**7. If a project/activity is evaluated and deemed out-of-scope according to the taxonomy, is it possible for it to receive financial or tax incentives to develop its future classification as green?**

Yes. The support programs depend on the policies of various agencies.

**8. What is the scope of application and reporting requirements with respect to compliance with Thailand Taxonomy in the following cases?**

- Which types of loans are covered, such as loans denominated in Thai Baht or foreign currencies?
- Which borrowers are covered, such as borrowers residing in Thailand or abroad?
- Which activities or projects are covered, such as activities or projects based in Thailand or abroad?

Thailand Taxonomy serves as a reference for classifying and grouping environmentally friendly economic activities in Thailand. It is available for voluntary adoption by all sectors and is not legally binding for financial institutions. Its adoption depends on the readiness of each financial institution. Financial institutions may use the Taxonomy to classify activities that contribute to GHG emission reduction goals, covering both loans denominated in Thai Baht and foreign currencies, as well as financing for projects based either within Thailand or overseas.

**9. In reporting or disclosure, how should activities be referred to ISIC 4, and what should be done if there is no ISIC code available for a particular activity?**

Taxonomy users may refer to Table of sub-sectors and activities of Thailand Taxonomy or the Excel Tool, published on the websites of agencies involved in the working group (such as the [DCCE](#), [BOT](#), [SEC](#), and [SET](#)). In cases where a specific ISIC code cannot be identified for an activity in Thailand Taxonomy, users may refer to the relevant ISIC division-level code.

**10. What indicators can be used when disclosing that a company's activities are aligned with Thailand Taxonomy?**

Taxonomy users may disclose information based on the proportions of revenue, Capex, and Opex, to reflect how the company's activities align with Thailand Taxonomy.

**11. How should assessment specialists interpret each detailed criterion when assessing whether an activity is aligned with Thailand Taxonomy?**

The steps for assessing alignment with Thailand Taxonomy are as follows: (1) determine whether the activity or project falls under the green, amber, or red categories, based on the conditions and technical screening criteria specified for each activity, and (2) assess compliance with the DNSH and MSS principles. Users can refer to the Usability Guideline for Thailand Taxonomy available on the websites of the [DCCE](#), [BOT](#), [SEC](#), and [SET](#).

**12. Is it necessary for the technologies used for GHG reduction to be certified by an international standard or organization?**

Taxonomy users should refer to the specific requirements each activity. Some activities require additional international certification standards. For example, bioenergy production activity may require certification by the Roundtable on Sustainable Biomaterials (RSB).

**13. If a company conducts both green and non-green activities and wants to apply a Green Loan or issue a Green Bond by restricting the use of proceeds exclusively to green activities, can it report the transaction as a Green Loan or Green Bond? What conditions must be met for such reporting?**

If a company applies for a Green Loan or issues a Green Bond, and the use of proceeds is explicitly designated and controlled for green activities only, the company may report the transaction as a Green Loan or Green Bond, provided that it complies with the agreed-upon terms and conditions for green financing.

**14. How can financial institutions calculate the targets they are responsible for based on the reference tables in Thailand Taxonomy, such as energy and transportation sectors, given that the size of the energy and transport sector portfolios varies across financial institutions?**

Financial institutions may calculate their GHG emissions reduction targets and develop transition plans for each sector as appropriate. They may refer to current international standards, such as the Science Based Targets initiative (SBTi) and the Net-Zero Banking Alliance (NZBA).

The BOT encourages domestic systemically important banks (DSIBs) to develop environmental transition plans focusing on the management of GHG emissions from their business operations for at least one priority sector by 2025. Meanwhile, the SEC requires companies listed on the SET and MAI to disclose environmental targets and action plans in accordance with the International Financial Reporting Standards (IFRS) S1 and S2, starting from 2026.

**15. What should financial institutions do if customers do not have the necessary information for assessing the progress of activities based on the conditions and indicators under Thailand Taxonomy?**

In the case of new loans, financial institutions may establish requirements and conditions for customers to provide the necessary data for assessment and progress monitoring.

For existing loans, financial institutions should review the customer's activity status during loan review cycles and may request additional information from customers. In cases where customers request credit limit increases or loan renewals, financial institutions may consider adding conditions requiring customers to disclose GHG emissions data and other relevant information in line with Thailand Taxonomy.

**16. Should the classification of an activity's color status be conducted only once at the time of initial loan approval, and is it necessary to revalidate the information over time?**

Financial institutions should review the customer's information throughout the loan period to ensure that the activity's status remains consistent, particularly if there are changes in the activity's indicators over time. However, the review approach may vary depending on the internal policies of each financial institution.

**17. When assessing compliance with Thailand Taxonomy, should financial institutions use customer information as of the date the loan application is made, current information, or future projections? Should the information come from customer reporting or estimates?**

Financial institutions may consider using information from the loan application date, the most recent available information, or reasonable projections, depending on the availability of customer data and the discretion of the institution. In addition, financial institutions may agree

with customers on conditions related to data monitoring and reporting, including specifying the frequency of required updates on taxonomy compliance assessments.

- 18. What actions must financial institutions take if some of the activities they finance are assessed as red under Thailand Taxonomy? For example, must financial institutions require customers to implement GHG reduction measures or gradually discontinue lending to red activities?**

Thailand Taxonomy serves only as a reference tool for classifying environmentally friendly economic activities to promote a common understanding. It does not impose any prohibitions on undertaking or investing in specific activities. Therefore, lending decisions remain at the discretion of financial institutions, and the BOT does not have a policy prohibiting investment or lending in such activities. However, the BOT encourages domestic systemically important banks (DSIBs) to develop transition plans for at least one priority sector by 2025.

## **9.1 Carbon intensity assessment**

- 19. What are the differences in carbon intensity assessment methods for activities under Thailand Taxonomy between LCA methods and non-LCA methods?**

LCA-based GHG emission assessment evaluates the environmental impact of a product or service throughout its entire life cycle, from sourcing raw materials to end-of-life. Activities that require LCA-based assessment typically involve significant Scope 3 emissions, such as bioenergy production and hydrogen energy production. However, for activities with near-zero GHG emissions or activities that primarily involve Scope 1 and Scope 2 emissions, LCA-based assessment is generally not required. Examples include solar energy production and wind energy production.

- 20. When calculating carbon intensity using the LCA method, is it necessary to use GHG emission data across the entire supply chain, including data from suppliers? What should be done if supplier data are not available?**

Yes, LCA-based GHG emission assessment requires data across the entire supply chain, including data from suppliers. However, if assessors do not have all the suppliers' data, they may use proxy data or estimation techniques to fill the data gap. For reference, please see the Technical Guidance for Calculating Scope 3 Emissions under the GHG Protocol.

**21. When assessing carbon intensity at the activity level, is it necessary to evaluate GHG emissions across the entire life cycle (life cycle assessment: LCA) of the project, or only during the construction or operational phases?**

It depends on the specific requirements of each activity. For example, bioenergy production activities require assessment across both the construction and operational phases. Therefore, taxonomy users must conduct an LCA covering both the construction and operational stages of the project.

**22. In practice, how should GHG emissions be assessed for the energy sector? For example, should a power plant operator assess GHG emissions separately for each plant?**

If a power plant uses only a single energy source, GHG emissions can be assessed on a plant-by-plant basis. However, if a power plant uses multiple energy sources, GHG emissions must be assessed separately for each activity based on each energy source.

**23. How should GHG emissions be calculated according to the conditions specified for each period?**

Taxonomy users may calculate GHG emissions using internationally recognized or equivalent standard methodologies, such as the carbon footprint calculation for products certified by TGO or carbon calculation platforms, including the Thai Carbon Footprint Calculator by TGO ([link](#)) or other carbon calculation platforms certified by TGO ([link](#)).

**24. What should a company do if it cannot fully collect the necessary data for GHG emissions assessment?**

In the initial stages, the company may consider using proxy data from other companies engaged in similar businesses or industry averages from other countries. However, the company should begin collecting base-year data and projecting future GHG emissions to ensure that the information reflects the current situation as accurately as possible.

**25. What should a financial institution do if it cannot obtain data from customers or verify GHG emissions data?**

Financial institutions may advise customers to begin collecting data, referencing internationally recognized GHG emissions calculation guidelines or those issued by TGO. They may also

encourage customers to conduct preliminary calculations using carbon calculation platforms. In addition, financial institutions may consider using proxy data from other companies engaged in similar businesses or industry averages from other countries for initial assessments.

## 9.2 Verification / Verifier

### **26. Is it necessary to have a verifier or third-party verifier to confirm compliance with Thailand Taxonomy? If verification is required, where can verifiers be sourced from?**

Thailand Taxonomy does not require third-party verification, and there are currently no officially accredited verifiers specifically for Thailand Taxonomy compliance. However, taxonomy users may consider engaging environmental consulting firms with expertise in environmental assessment.

### **27. If a financial institution's customer or a bond issuer has already obtained third-party verification of compliance with Thailand Taxonomy, is it necessary for the financial institution or investor to conduct a separate verification?**

No, it is not necessary. This is subject to the internal policies of the financial institution or at the discretion of the investor.

### **28. What is the assurance model for Thailand Taxonomy? Who and how to verify the compliance with the TSC or DNSH?**

Thailand Taxonomy is a voluntary guidance. There is no currently established assurance model. While the best practice is to acquire a third-party verification body to verify the accuracy of the data, the level of accuracy required depends on the uses. As explained in the question above, Thailand Taxonomy needs to be applied along with other core documents. For recommended verification methods, please refer to the guidance documents such as the ASEAN Green Bond Standards, Green Bond Principles or Green Loan Principles. Nevertheless, the requirement for verifiers depends on the implementing policies of each agency.

### **29. Does my company's good sustainability or green rating from a third-party provider such as MSCI or Vigeo Eiris make its activities automatically green?**

No. The Taxonomy focuses on the environmental aspect and evaluates green and non-green activities within an entity. A sustainable rating incorporates social and governance aspects of

a business model. As such, a company with activities that are not compliant with the present Taxonomy can technically still have a good sustainability rating due to the S and G elements of ESG.

### 9.3 Implementation in Agricultural sector

**30. Trade regulations for the agricultural sector are progressing more slowly compared to other economic sectors in global trade discussions. For example, the EU Taxonomy does not yet include the agricultural sector. Why, then, does the Thailand Taxonomy need to include agriculture?**

The agricultural sector is indeed one of the hardest to process and turn into taxonomy. EU failed to do it due to the rigid nature of their document, they can only include activities that are either green or not. We made a step forward compared to this and proposed lists of sustainable practices. This gives farmers options and guidance on how to align themselves with the decarbonization policy of the country.

Thailand is not the only country developing an agricultural Taxonomy. Other examples include Singapore, Rwanda, Colombia, Mexico, and Panama.

**31. What about revenue? Should it be "marginal revenue" from transformation?**

The whole revenue, not just the marginal, but, as of now, it is going to be valid just 2 years after the transformation is done.

**32. Who is responsible for verifying the accuracy of the IFMP?**

The responsibility depends on the requirements of the Thailand Taxonomy user. For instance, in cases of funding applications, the applicant may request the financier to verify the accuracy of the IFMP. Alternatively, the applicant may engage a third-party certifier to endorse the IFMP, ensuring credibility for the purpose of mobilizing funds.

### 9.4 Implementation in Construction and real estate sector

**33. Does the Taxonomy include consultancy and design fees?**

If an activity qualifies under the Taxonomy and involves the use of consultants, consultancy, and design fees can be counted as green expenses.

**34. Will the Thailand Taxonomy affect construction contractors, and if so, how?**

The developer can get a green loan from the bank for the construction of a green building which is aligned with the taxonomy. This loan will be spent on the work of the contractor, who is obliged to follow taxonomy criteria for green buildings.

**35. If the taxonomy for the building sector excludes embedded emissions, would this cause issues when disclosing carbon emissions from construction? Would the disclosures be considered incomplete?**

Currently, greenhouse gas emissions from materials (Embedded Emissions) are out of scope of the Thailand Taxonomy. Therefore, It is considered as regular fundraising.

**36. In the case where an office building has already been developed or renovated to meet green building standards, can refinancing that building be considered a green-eligible activity? Are there any time limitations or eligibility conditions?**

If the office building has been newly constructed or renovated in accordance with the green category criteria under the Thailand Taxonomy, it may be considered eligible for green refinancing. However, for the refinancing activity to retain its green status, the building must continue to comply with all relevant green criteria throughout the duration of the loan or debt instrument, as specified under the Thailand Taxonomy.

## **9.5 Implementation in Manufacturing sector**

**37. Are there any requirements or standards for transition plan?**

Manufacturers and financial institutions can reference any credible and acceptable international or national methodologies, such as those provided by the International Energy Agency (IEA), the Science Based Targets initiative (SBTi), the International Platform on Sustainable Finance (IPSF) Transition Guidelines, and the ASEAN Transition Finance Guidelines.

**38. As Thai manufacturers currently cannot access to clean energy, can they purchase Renewable Energy Certificates (RECs) to offset Scope 2 emissions?**

If alternatives are unavailable, RECs can be used for all activities in the Manufacturing sector except for “Auxiliary transitional activity: Introduction of energy efficiency and decarbonisation



measures in manufacturing activities not specified in the Thailand Taxonomy” as it would contradict the very idea of that activity.

**39. According to most manufacturing activities, the requirement to achieve 30% energy efficiency improvement may be too difficult for SMEs. Is it possible to reduce the target or introduce phasing for SMEs?**

The requirement for 30% energy efficiency improvement aligns with Thailand's national energy plan. However, Thailand Taxonomy does not specify the year by which users must achieve the 30% target. This means that, in practice, SMEs are allowed to set the appropriate length of transition period that is most achievable for them, considering their business operations and capacities.

## **9.6 Implementation in Waste management sector**

**40. If a private contractor is hired to remediate a contaminated site, would the loan provided to that contractor be considered a green loan?**

To determine whether an activity qualifies as green, the focus is on the activity itself, not the entity performing it. Both private contractors and public entities can apply for loans if the activity meets the relevant criteria. However, for remediation of contaminated sites or legally non-conforming landfills and illegal waste dumps activities under the Thailand Taxonomy Waste Management Sector, operations conducted by the polluter responsible for the contamination are excluded. If the contractor is hired by the polluter, the activity does not qualify as green, as the polluter is obligated to remediate the site under the polluter-pays principle. Therefore, a loan for remediation activities can only be considered green if the polluter cannot be identified or is unable to bear the responsibility for remediation.

**41. If a municipality or the Bangkok Metropolitan Administration (BMA) undertakes waste management activities, would a loan provided for these activities be classified as Green or Social, considering it benefits the community?**

When a municipality or the Bangkok Metropolitan Administration (BMA) conducts waste management activities, the loan can qualify as either Green or Social, depending on the activity's objectives. According to the Asia Pacific Loan Market Association (APLMA), Loan Market Association (LMA) and Loan Syndications & Trading Association (LSTA) Social Loan

Principles (SLP), a project can be classified as Social if it targets specific populations, such as those defined in the SLP's target population categories, including communities living in underserved or remote areas, populations facing socio-economic challenges, or those with limited access to essential services. For example, if the waste management activity serves communities in remote or disadvantaged areas, it aligns with the SLP's target population criteria and can be considered Social.

Conversely, if the activity meets the green criteria outlined in the Thailand Taxonomy Waste Management Sector, such as reducing greenhouse gas emissions, enhancing resource recovery, or preventing pollution, it can be classified as Green.

Even if a project has both social and environmental objectives, the **Use of Proceeds (UoP)** must be clearly delineated as either Green or Social to ensure accurate tracking of positive impacts aligned with the specified UoP, as emphasized in the Social Loan Principles and Green Loan Principles. If a project includes both social and environmental UoP, it is possible to issue a sustainability loan to cover both objectives, provided the UoP for each component is distinctly identified and reported.

#### **42. How should a Climate Risk and Vulnerability Assessment (CRVA) be conducted for wastewater treatment plant activities (Activities 11, 12, 13) to meet the Thailand Taxonomy's Environmental Objective 2 (EO2) requirements?**

A Climate Risk and Vulnerability Assessment (CRVA) is a systematic process to evaluate the risks and vulnerabilities of community, or organization to climate change impacts. It helps identify the most vulnerable areas, populations, or assets and informs adaptation strategies.

While ISO 14091:2021: Adaptation to climate change – Guidelines on vulnerability, impacts and risk assessment provides guidelines for conducting CRVAs, including assessing vulnerability and risks, the Thailand Taxonomy does not mandate adherence to ISO standards for EO2 compliance. Instead, it requires a CRVA to demonstrate that wastewater treatment activities reduce material physical climate risks (e.g., flooding) and align with national laws and best practices, as outlined in the document. A CRVA template example can be acquired from Thailand Taxonomy in the annex of Chapter 3 to demonstrate that the activity does not only reduce material physical climate risks to the activity itself, but also contributes to reduction of material physical climate risks to the surrounding activities or communities.

43. In Activity 13 (Renewal of Centralised Wastewater Collection and Treatment) of the Thailand Taxonomy, it is stated that energy efficiency improvements should achieve a 20% reduction in energy consumption compared to the average baseline performance over 3 years. Can you provide an example of how to calculate this?

Calculation Steps:

**1. Collect Baseline Energy Consumption Data:**

- Gather energy consumption data (in kWh/year) for the wastewater treatment plant over the past 3 years.
- Calculate the average energy consumption per year.

**2. Measure Post-Renew Energy Consumption:**

- After renewal (e.g., installing energy-efficient pumps or advanced treatment systems), record the energy consumption for 1 year post-renew.

**3. Calculate the Percentage Reduction. Example Calculation:**

Suppose a wastewater treatment plant has the following data:

Year 1: 500,000 kWh

Year 2: 520,000 kWh

Year 3: 480,000 kWh

Post-Upgrade (Year 4): 420,000 kWh

Step 1: Calculate Baseline Average =  $(500,000 + 520,000 + 480,000)/3 = 500,000$  kWh/year

Step 2: Calculate Percentage Reduction

Reduction =  $500,000 - 420,000 = 80,000$  kWh

Percentage Reduction =  $80,000/500,000 \times 100 = 16\%$

**Result: The 16% reduction falls under Amber Category.**