Document No.: 22-006

Product Environmental Footprint Category Rules
Steel Transmission Chain

Version 1.0

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1. General Information

1.1 Applicable product categories

This document is the Product Environmental Footprint Category Rules for steel transmission chain. The scope of application of this product includes the manufacturing of steel transmission chains of vehicles, bicycles or industrial sprockets for transmission; the CCC codes of the product include: 73151100101 Roller chain of motorcycles, 73151100209 Roller chain of bicycles, 73151100904 Other roller chain, 73151900005 Parts of articulated link chain of iron or steel, 73158200007 Other welded link of iron or steel, and 73158900000 Other chain of iron or steel.

1.2 Drafting unit

This document is drafted by the Ministry of Environment, and with the assistance from relevant industry associations, representatives from major practitioners and stakeholder groups have been invited to engage in open consultation and discussion.

For other information related to the environmental footprint category rules of this product, please contact Green Energy & Environment Research Laboratories, Industrial Technology Research Institute (Tel.: 03-5919386).

2. Product Description

The Product Environmental Footprint Category Rules (PEFCR) of this product cover the steel transmission chain, and may apply to each stage of the full life cycle of the application scope of B2C (Business to Consumer or Customer) or B2B (Business to Business) products.

2.1 Description of product functionality and characteristics

A steel transmission chain is mainly formed by connecting many chain plates, rollers and small shafts. It is matched with sprockets for transmission in bicycles, motorcycles or industrial equipment; the rotation of sprockets is driven by the chain, to enable vehicles or mechanical equipment to generate power for movement or object handling. According to various different application environments, the transmission chains are commonly used for power transmission, object conveying and lifting operations. This product features high tensile strength, high wear resistance, and fatigue resistance, to fulfill the needs for use in various fields; steel transmission chains can be classified as single-row chain, double-chain row and multi-row chain based on number of rows, and short-pitch chain, double-pitch chain and long-pitch chain per pitch.

3. Product Composition

The main components of the steel transmission chain include but are not limited to:

1 Primary raw materials: Wrought iron, carbon steel, etc.

2 Secondary raw materials: Cutting oil, quenching oil, polishing agent, antirust agent, etc.

3 Consumables: Equipment consumables, equipment cleaning agents, gloves, rags, or other consumables.

4 Packaging materials: Plastic bags, adhesive tape, cartons, packaging materials for transportation, or other packaging materials.

4. Functional Unit

The functional unit of this product is defined as links of steel transmission chain. The product length shall be specified; the categories of chain products shall be clearly distinguished using items like nominal number, machine name, and pitch. The same product categories shall be compared.

The functional unit refers to the designated links of chain length. The service life of a steel transmission chain lasts for 5 years. The key information used to define the functional unit is shown in Table 1.

Table 1 Functional Unit

Question	Description
What? (Function?)	Steel transmission chain
How many? (Unit?)	Links
How about the effect?	Transmission
How long? (Service life?)	5 years (service life of the steel transmission chain)

5. Definitions

The main definitions related to this product are as follows:

1 Primary raw materials: Main constituent materials of the steel transmission chain, e.g., wrought iron, carbon steel, etc.

2 Secondary raw materials: Materials needed for post-treatment of the steel transmission chain, e.g., cutting oil, quenching oil, polishing agent, antirust agent, etc.

3 Consumables: Equipment consumables, equipment cleaning agents, gloves, rags, or other consumables.

4 Packaging materials: Plastic bags, adhesive tape, cartons, packaging materials for transportation, or other packaging materials.

The main definitions related to the production of this product are as follows:

1 Stamping: A process of striking materials (metal or non-metal) forcefully by the power of standard or special stamping equipment, to cut, bend or form them into finished product shape and dimensions specified by the molds.

2 Grinding: A machining process of rapidly removing materials on the workplace surface to the targeted size, which involves the elimination of relatively large unevenness or the generation of a flat and smooth surface without achieving the degree of a mirror polish finish though.

3 Heat treatment: A process of heating metal materials to a certain temperature, maintaining the temperature for a certain period, and then cooling the materials to the normal temperature or lower at a certain rate, so as to improve the structure of the materials and acquire materials with outstanding performance.

4 Quenching: A heat treatment method that heats metal parts above the phase-transition temperature, holds the temperature for a certain period, and then quickly cools the metal parts. The primary purpose of quenching is to improve the hardness and strength of parts.

5 Tempering: A process of heating the quenched parts to a certain temperature, holding the temperature for a certain period, and then cooling the parts. The primary purposes of tempering are to (1) change the quenched structure, adjust hardness, lower brittleness, and improve toughness; (2) eliminate quenching stress and structural transformation stress in tempering and reduce cracking.

6 Surface treatment: A process of protecting the base material by modifying the surface of metal materials or coating a layer of other materials on it.

7 Assembly: A process of assembling all components into a chain.

8 Inspection and packaging: A process of cutting, inspecting and packaging the chain.

6. System Boundaries

6.1 Life cycle flowchart

The life cycle of a steel transmission chain covers five major stages, i.e., raw material acquisition stage, manufacturing stage, distribution and sales stage, use stage, and waste disposal stage. The life cycle flowchart of the steel transmission chain is shown in Figure 1.

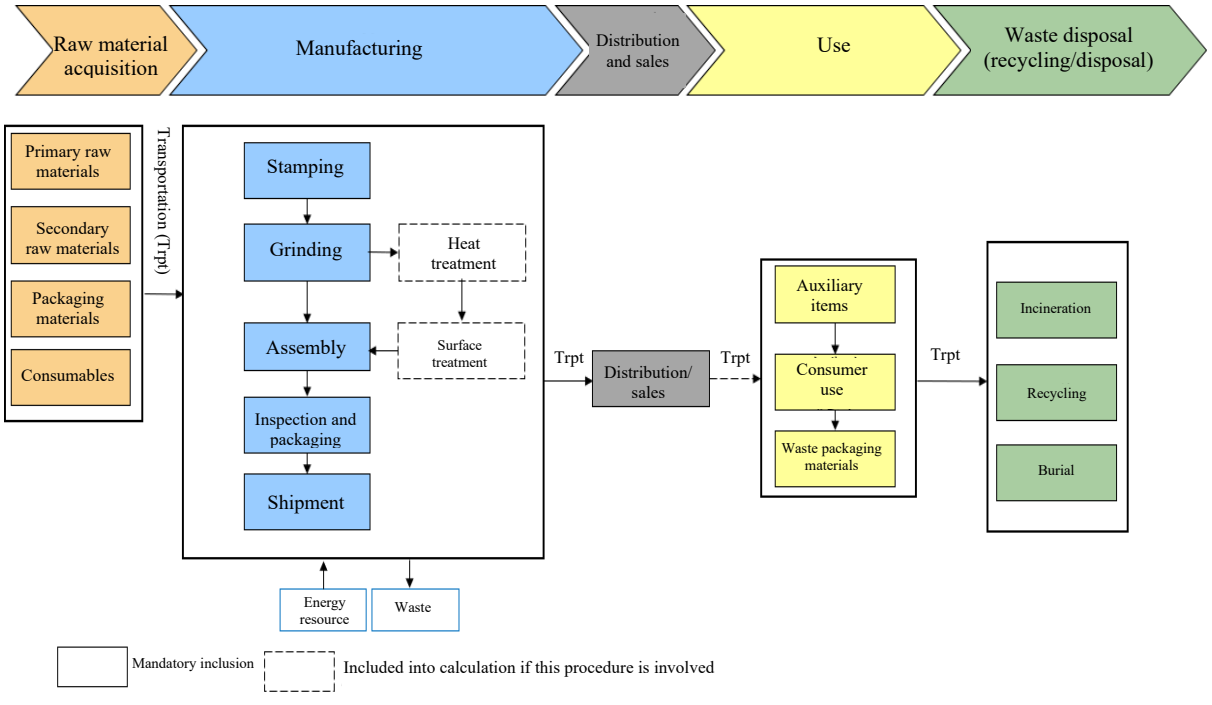

Figure 1: Life Cycle Flowchart of Steel Transmission Chain

The following life cycle stages and processes shall be included in the life cycle flowchart:

Life cycle stage	Brief description of processes included
Raw material acquisition stage	• Primary raw materials, secondary raw materials, consumables and packaging materials that constitute the components of the steel transmission chain. • Material transportation.
Manufacturing stage	• Processes of stamping, grinding, heat treatment, surface treatment, assembly, inspection and packaging, etc. • Disposal of waste generated in the processes: Transportation and treatment/disposal. • Direct and indirect emissions in the processes. • Processes related to consumption and supply of energy resources and electricity
Distribution and sales stage	• Relevant transportation processes from the manufacturing factory to the first-stage distribution locations (e.g., from the manufacturing factory to the logistics/goods collection warehouse or from the manufacturing factory to the distribution locations, etc.) shall be included in evaluation. • Processes not included in evaluation among the aforesaid processes: (1) Processes related to sales operations are not included in evaluation; (2) Relevant transportation processes involving wholesalers or distribution centers and warehouses between sales locations and consumers, and round-trip transportation of consumers to and from sales location are not included in evaluation.
Use stage	• Disposal of waste generated: Transportation and

	treatment/disposal (auxiliary materials and packaging materials). • The use stage involves relevant processes from consumers' purchase of this product from points of sale to the use of this product, and auxiliary items (e.g., maintenance oil) consumed during use shall be considered.
Waste disposal stage	• Relevant factors in the waste disposal stage (e.g., recycling rate) shall be considered as the case may be. This stage includes the following processes: 1. Transportation of waste generated after the use of the product as well as recycled resources to the place of disposal; 2. Treatment model of burial or incineration of waste generated after the use of the product at the place of disposal; 3. The quantity or recycled quantity of the waste generated after the use of the product shall be assumed according to actual waste disposal and recycling conditions in Taiwan or estimated based on the data announced by Taiwan government. • Transportation to the first-stage treatment or recycling vendor after the product is discarded. • Environmental impact of the waste disposal of the product (e.g., burial, incineration or recycling).

6.2 Specifications upon setting of different boundaries

System boundaries determine specific unit processes to be included in the life cycle and comply with the requirements of this product PCR, thereby establishing the specifications for system boundaries.

1. Boundary in time

   It refers to a period in the report during which the results of life cycle analysis are effective.

2. Boundary towards nature

   (1) If the manufacturing procedure is within Taiwan, solid waste shall be classified according to the provisions of relevant waste disposal regulations of Taiwan. If the manufacturing procedure is within other countries, the provisions of other equivalent laws shall be taken into account.

   (2) Boundary towards nature shall describe the boundary of the flow of materials and energy resources from nature to the system, as well as the emissions to air and water bodies and waste discharged out of the system.

   (3) If the discarded waste is generated through wastewater treatment or incineration, it shall be included in the wastewater or incineration treatment procedure.

3. Boundaries in the life cycle

   The boundaries in the life cycle are shown in Figure 1. The production of site buildings, infrastructure and manufacturing equipment shall not be included.

4. Boundaries towards other technical systems

Boundaries towards other technical systems describe the output of primary raw materials, secondary raw materials, consumables and packaging materials from other systems and the input thereof to other systems. With respect to the input of recycled materials and energy in the product system manufacturing stage, the recycling procedure and the transportation involved in processes from recycling to material use shall be included in the dataset. In the manufacturing stage, the processes from the output of recycled products to the transportation in the recycling procedure shall

be included.

5. Boundaries regarding geographical coverage

The manufacturing stage may cover the manufacturing procedure in any place globally. For areas where this procedure is adopted, such data shall be representative. The data of primary raw materials shall be the specific regional data in the place where this procedure is adopted.

7. Cut-off Rules

For any impact categories (including carbon footprints of products), if the total environmental impact of a specific procedure/activity does not exceed 1% of the equivalents of this category, this procedure/activity may be omitted during inventory checking, with a cumulative ratio not exceeding 5%. In other words, at least 95% of the potential life cycle emissions shall be assessed. Procedures and raw materials not included in the Life Cycle Assessment (LCA) shall be documented. (Remark: The judgment on this "1% Rule" shall be based on the environmental relevancy assessment of materials allocated to the system, with special and exceptional environmental impacts not taken into account.)

8. Allocation Principles

1. The primary "Allocation Rules" shall be effective for the whole product system. For other secondary procedures, other allocation rules may be defined, but their legitimacy shall be demonstrated. Collection of product-specific information shall be collected with priority to avoid the needs for allocation.

2. In the allocation rules, physical properties such as actual quantities, weight and weighted values may be adopted as basic parameters for allocation. If other parameters other than actual quantities (e.g., economic value) are referenced, the basis for adopting such parameters shall be indicated.

3. It is recommended that the following principles be applied during the selection of allocation rules:

   (1) Multi-output: Allocated based on the changes in resource use and pollutant emissions arising from the changes in the products, functionality or economic connection generated by the researched system (e.g., quantity allocation for some main components or surface area allocation for some components).

   (2) Multi-input: Allocated based on substantial connection. For example, process emissions may be affected by changes in the input waste flow.

   (3) Open loop recycling: For material recycling or energy input in the manufacturing stage of the product system, the transportation used from the recycling procedure to the recycling of materials shall be included in the dataset. For products to be recycled in the manufacturing stage, the transportation to the recycling procedure shall be included. (Remark: Allocation may be avoided through the fragmentation avoidance procedure with reference to the case description in Section 6.3 of ISO/TR 14049; or the system boundaries may be extended as specified in the case in Section 6.4 to ensure that the revised scheme has the same product exchange volume as the original scheme.)

9. Units

The International System of Units (SI) shall be adopted as the basic principle (the units below are for reference only; please select and use the appropriate units):

1. Power and energy:

   (1) Units of power: W, kW, etc.

   (2) Units of energy: J, kJ, etc.

2. Specifications and dimensions:

(1) Units of length: cm, m, etc.

(2) Units of volume: cm^3, m^3, etc.

(3) Units of area: cm^2, m^2, etc.

(4) Units of weight: g, kg, etc.

10. Data Collection in Each Life Cycle Stage

The product data collection period shall be one year/the most recent year. If the data of one year/the most recent year hasn't been adopted during calculation, the reason therefor shall be detailed, and the correctness of the data not corresponding to one year/the most recent year must be confirmed; during the allocation of related data, physical properties like mass, feed quantity and working hours shall be adopted as basis for allocation. If other parameters are referenced, the basis for adopting such parameters shall be indicated. The total emissions from sources with no material contribution shall not exceed 5% of the equivalents of impact categories within the product's expected life cycle.

10.1 Raw material acquisition stage

10.1.1 Data collection items

Items to be collected in the raw material acquisition stage include:

1. Equivalents of life cycle environmental impact categories related to the main and secondary raw materials used for the production of steel transmission chains.
2. Equivalents of life cycle environmental impact categories related to the consumables and packaging materials for the production of steel transmission chains.
3. Other equivalents of life cycle environmental impact categories related to production raw materials.
4. Equivalents of life cycle environmental impact categories related to the transportation process of the aforesaid raw materials to the factory for manufacturing.
5. If the raw materials acquired are recycled or reutilized, the equivalents of environmental impact categories shall include the resource recycling or reutilization process.

10.1.2 Primary activity data collection items

1. Collection of primary activity data is not mandatory in this stage. However, primary activity data shall be adopted with priority, and secondary data may also be applied.
2. During the use of the secondary data, consideration shall be given to whether it corresponds to the same chemical and physical processes, or at least the same technical scope and equivalent technologies and system boundaries. Besides, it is recommended that the temporary and geographical data quality be considered as far as possible.
3. If the organization implementing this PEFCR only for the purpose of inventory checking and declaration of product carbon footprint fails to achieve the following scenario in terms of the product's greenhouse gas emissions, the requirements for the collection of primary activity data must be included in the raw material acquisition stage: "Prior to the provision of the product or input to another organization or end user, if the emission contribution of the organization implementing this specification fails to reach 10% or more of the upstream greenhouse gas emissions of its product or input, the collection of the primary activity data shall apply to organizations and any upstream suppliers with the cumulative contribution reaching 10% or more of the upstream emissions of the product or input, and the primary activity data of emissions from procedures owned, operated or controlled by them shall be collected".

10.1.3 Primary activity data collection methods and requirements

The primary activity data may be acquired using the following three methods: (1) In accordance with the energy resources allocated for the equipment or facilities needed in each process (Example: Operation time of equipment and facilities × Electricity consumption = Electricity input); (2) Allocation of energy resource consumption of each supplier within specific time to each product (Example: Allocation of the total annual fuel input to the target products manufactured); (3) Other common data collection methods for the inventory checking of related environmental impact categories (ISO 14040, ISO 14044, ISO 14046, ISO 14067、ISO14025 and ISO 14064-1, etc.).

If raw materials are acquired from multiple suppliers, it is recommended the primary activity data of all suppliers be collected. In case of a large number of suppliers, the average value of the primary activity data provided by main suppliers can be used as the secondary data of suppliers from whom data cannot be acquired. However, the total quantity of a raw material supplied by main suppliers shall exceed 50% of the total supply quantity of this raw material.

10.1.4 Secondary data collection items

The secondary data in the raw material acquisition stage may be acquired from the product carbon footprint calculation service platform of the Ministry of Environment, LCA software database, or authoritative literature; if relevant coefficients for the local region are available for reference, it is recommended that these coefficients be selected with priority, with contents including:

1. Equivalents of life cycle environmental impact categories related to fuel provision and electricity use.
2. Equivalents of life cycle environmental impact categories related to the manufacturing of primary and secondary raw materials, consumables, and packaging materials.
3. Equivalents of life cycle environmental impact categories related to waste, waste gas, and wastewater and sewage.
4. Equivalents of life cycle environmental impact categories related to the transportation of the aforesaid raw materials to the manufacturing stage.

10.1.5 Scenarios

For the transportation scenarios in the raw material acquisition stage, it is basically recommended that primary activity data such as transportation distance, vehicle tonnage, type of fuel used, fuel receipts, fuel consumption per kilometer, cargo weight (loading ratio) of the product per trip, and empty backhaul ratio be collected for the transportation from the supplier's shipping place.

Since the LCA software database recognized by the government/scheme will be used during the calculation in this stage, the data collection methods and requirements are as follows:

1. Transportation distance: Listing the transportation distance of the targeted product from the raw material manufacturing factory to the organization that uses this PEFCR.
2. Vehicle type: Appropriate emission coefficients (e.g., tonnage and EURO value (standard values of Nox and PM waste gas emissions)) shall be selected according to the types of vehicles used for the transportation to the factory of the organization that uses this PEFCR.

10.1.6 Evaluation of recycled materials and reused products

When recycled or reused raw materials are used for input, the equivalents of environmental impact categories associated with their manufacturing and transportation shall include environmental impact related to recycling process (collection, pretreatment, regeneration, etc.) and reuse processes (collection, cleaning, etc.).

Relevant processes of the aforesaid recycling materials and reused products shall be evaluated according to the following priorities:

1. Inventory data provided by the suppliers of recycled materials and reused products.
2. When the government/scheme has announced GHG emission coefficients of relevant processes, calculation and evaluation shall be conducted as specified.
3. When the government/scheme hasn't announced GHG emission coefficients of relevant processes, the LCA software databases recognized by the international community or the government/scheme will be used for calculation and evaluation.

10.2 Manufacturing stage

10.2.1 Data collection items

Items to be collected in the manufacturing stage include:

1. Inputs
   (1) Input of primary raw materials.
   (2) Input of secondary raw materials.
   (3) Input of consumables.
   (4) Input of packaging materials.
   (5) Fuel and electricity consumption.
   (6) Water resource consumption (e.g., tap water, groundwater or well water or river water, etc.).
   (7) Filling or fugitive volume of refrigerants.
   (8) Consumption of other energy resources.
2. Outputs
   (1) Product production volume.
   (2) Waste gas treatment volume.
   (3) Wastewater and sewage treatment volume.
   (4) Waste output, including the outputs of general/industrial waste, recycled materials, and eliminated or discarded raw materials associated with processes.

10.2.2 Primary activity data collection items

Primary activity data collection items required include:

1. Inputs
   (1) Input of primary raw materials.
   (2) Input of secondary raw materials.
   (3) Input of consumables.
   (4) Input of packaging materials.
   (5) Fuel and electricity consumption.
   (6) Water resource consumption (e.g., tap water, groundwater or well water or river water, etc.).
   (7) Filling or fugitive volume of refrigerants.
   (8) Consumption of other energy resources.

2. Outputs

   (1) Product production volume.

   (2) Waste gas treatment volume.

   (3) Wastewater and sewage treatment volume.

   (4) Waste output, including the outputs of general/industrial waste, recycled materials, and eliminated or discarded raw materials associated with processes.

10.2.3 Primary activity data collection methods and requirements

1. The primary activity data collection methods are same as those in 10.1.3. For more than one manufacturing place, the primary activity data of all such places shall be collected. In case of a large number of manufacturing places, the average value of the primary activity data of important manufacturing places can be used as the secondary data of all other places only on condition that the gross manufacturing volume of these important manufacturing places exceeds 75% of the total manufacturing volume.

2. During the use of the secondary data, consideration shall be given to whether it corresponds to the same chemical and physical processes, or at least the same technical scope and equivalent technologies and system boundaries. Besides, it is recommended that the temporary and geographical data quality be considered as far as possible.

3. For the composition of finished products, it is required to collect the operation data of production equipment, including production volume of each unit, raw materials input, consumption of energy resources (water, electricity, gas, etc.), types and quantity of water, types, quantity and treatment methods of waste, as well as primary data concerning the transportation of the finished products to the factory.

4. For the production and packaging of finished products, it is required to collect the operation data of production equipment, including production volume of finished products, raw materials of components input, bundled packaging materials of finished products, consumption of energy resources (water, electricity, gas, etc.), types and quantity of water, types, quantity and treatment methods of waste.

5. The data from direct sectors shall be collected, and the input or output of the input/output items of required machines and equipment (product production lines, lighting and air-conditioning within the buildings, etc.) in the operation units (unit operation time, one batch, etc.) shall be mastered for calculation.

6. The electricity mix used in the manufacturing stage shall be site-specific data. However, when the site-specific data is unavailable, the official electricity mix of the country where the manufacturing site is located may be used as an approximate value. The electricity mix shall be documented.

7. The definition of hazardous waste shall comply with relevant waste disposal regulations if such waste is used in Taiwan, or relevant national laws of other countries if the waste is used in these countries.

10.2.4 Secondary data collection items

If it can be proved in this manufacturing stage that certain items can be controlled and mastered by organizations that do not use this PEFCR, the secondary data may be used for processing. The contents and sources of the secondary data available are as follows:

1. Data prepared by the organization using this PEFCR on condition that the evidence guaranteeing the validity of the application of such data has been properly prepared. The validity of the data provided by the organization using this PEFCR shall be validated simultaneously upon the validation of the environmental footprint calculation results.

2. Selected from product life cycle environmental impact emission data published by the government/scheme, e.g., tap water supply, and consumption and supply of fuel and electricity.

3. Selected from the LCA software database recognized by the international community or the government/scheme. The basis for adopting this software shall be indicated if it is not recognized by the international community or the government/scheme.

10.2.5 Scenarios

For the transportation scenarios in the manufacturing stage, it is basically recommended that primary activity data such as transportation distance, vehicle tonnage, type of fuel used, fuel receipts, fuel consumption per kilometer, cargo weight (loading ratio) of the product per trip, and empty backhaul ratio be collected for the transportation between manufacturing factories as well as intermediate transportation.

Since the LCA software database recognized by the government/scheme will be used during the calculation in this stage, the data collection methods and requirements are as follows:

1. Transportation distance: Listing the transportation distance of the target product from the raw material manufacturing factory to the organization that uses this PEFCR.

2. Vehicle type: Appropriate emission coefficients (e.g., tonnage and EURO value (standard values of Nox and PM waste gas emissions)) shall be selected according to the types of vehicles used for the transportation to the factory of the organization that uses this PEFCR.

10.3 Distribution and sales stage

In the distribution and sales stage, relevant transportation processes from the manufacturing factory to the first-stage distribution locations (e.g., from the manufacturing factory to the logistics/goods collection warehouse or from the manufacturing factory to the distribution locations, etc.) shall be included in evaluation.

Processes not included in evaluation among the aforesaid processes: (1) Processes related to sales operations are not included in evaluation; (2) Relevant transportation processes involving wholesalers or distribution centers and warehouses between sales locations and consumers, and round-trip transportation of consumers to and from sales location are not included in evaluation.

10.3.1 Data collection items

Items to be collected in the distribution and sales stage include:

1. Product transportation quantity and weight.

2. Transportation distance.

3. Vehicle-related data.

4. Loading ratio and empty backhaul ratio.

5. Recycling conditions of recyclable packaging materials of finished products.

10.3.2 Primary activity data collection items

This stage is a product downstream stage that involves relatively complicated scenario assumptions and data collection. Therefore, the collection of the primary activity data is not mandatory. When the conditions permit, the items collected include but are not limited to the following:

1. Fuel method: Fuel consumption.

2. Ton-kilometer method: Equivalents of environmental impact categories per unit of fuel consumed per unit distance traveled.

(1) Transportation distance.

(2) Equivalents of environmental impact categories of fuel consumption per 1 ton of goods transported and 1 kilometer of fuel consumption.

3. If refrigeration or thermal insulation and heating are involved in the product transportation process, the equivalents of environmental impact categories related to the refrigerant or electricity shall be considered.

10.3.3 Primary activity data collection methods and requirements

1. The actual transportation mode and distance shall be considered during transportation to the downstream vendors.

2. The input of energy resources and the output of waste in the distribution and sales stage shall be taken into account.

3. The use of fuel shall be reviewed through reasonable “fuel method”, “fuel cost method” or “ton-kilometer method”; the transportation distance may be actually measured, or recorded using electronic map and navigation software.

4. If the product is transported via more than one transportation route, the primary activity data of all routes shall be collected, and then weighted average shall be calculated according to the transportation volume; in case of a large number of transportation routes, the weighted average of the transportation routes of the sales locations with their sales volume accounting for more than 50% of the total sales volume may be used as the primary activity data, and the weighted average of the data collected from the routes shall be adopted as the secondary data for the routes where data cannot be acquired.

5. If the primary activity data of transportation routes cannot be acquired, the data may be calculated by multiplying the transportation distance per trip (measured with mapping tools), transport weight per unit of product (including weight of packaging materials), and the transportation emission coefficient obtained from the LCA software database.

10.3.4 Secondary data collection items

The secondary data in the distribution and sales stage may be acquired from the LCF software database or authoritative literature. It is recommended that the secondary data should include but not limited to:

1. Transportation distance recorded using electronic map and navigation software.

2. Vehicle tonnage.

3. Equivalents of environmental impact categories per unit mileage of product transportation.

10.3.5 Scenarios

1. With respect to the transportation scenario of the product, the primary activity data shall be adopted as data related to product transportation process with priority, including transportation distance and mode.

2. With respect to the sales of the product, the transportation scenario shall be defined in consideration of relevant transportation distance, transportation mode, loading ratio and load ton-kilometers, freight cost, average fuel consumption/fuel price (fee), etc.

10.4 Use stage

10.4.1 Data collection items

Items to be collected in the use stage include:

Consumption of auxiliary items (e.g., maintenance oil) in the scenario of the use stage of the steel transmission chain.

10.4.2 Primary activity data collection items

It is not required to collect primary activity data collection items for this product.

10.4.3 Primary activity data collection methods and requirements.

This product does not involve primary activity data collection methods and requirements.

10.4.4 Contents and sources of secondary data

The secondary data in the use stage may be acquired from the LCA software database, or authoritative literature, e.g., auxiliary items consumed in product use or equivalents of environmental impact categories.

10.4.5 Scenarios

Auxiliary items (e.g., maintenance oil) will be consumed during product use. The use shall be estimated based on reasonable scenarios, to calculate the environmental impact caused by maintenance during the calculation of the use stage; currently, no unified standards have been established due to the differences in the types and design specifications of the steel transmission chains or the equipment carrying the chains, and various chain specifications shall be adopted for establishing such standards; for example, maintenance plans or paint spraying cycle and frequency provided in the operational manual of bicycles can be used as reference for bicycle chains; escalator chains shall comply with the maintenance contract. Recommended usage methods marked on the product packaging shall be adopted with priority, if any. If no such methods are recommended, calculations may be conducted with reference to the following scenarios:

(1) Maintenance oil shall be used for maintenance after the daily operation of the product following a service life of 5 years or operation distance of 3,000km.

(2) Consumption setting of maintenance oil: The consumption of maintenance oil of the product is set as 3ml per time.

(3) Setting of timing of product maintenance: The product shall be maintained once every 250 kilometers' operation.

(4) This product is set to be operated for 3,000km after purchased by the consumers. The equivalents of life cycle environmental impact categories of consumed maintenance oil shall be calculated according to the foregoing.

10.5 Waste disposal stage

10.5.1 Data collection items

Items to be collected in the waste disposal stage include:

1. Equivalents of life cycle environmental impact categories related to the transportation of used products and their waste packaging materials to the disposal location.
2. Weight of used products and their waste packaging materials incinerated at the disposal location.
3. Weight of used products and their waste packaging materials buried at the disposal location.
4. Weight of used products and their waste packaging materials recycled at the disposal location.
5. Equivalents of life cycle environmental impact categories related to the incineration at the disposal location.
6. Equivalents of life cycle environmental impact categories related to the burial at the disposal location.
7. Equivalents of life cycle environmental impact categories related to the recycling at the disposal location.
8. Recycling rate of discarded products and their waste packaging materials.

During the calculation of the equivalents of life cycle environmental impact categories related to the incineration of used products and waste packaging materials at the disposal location, the equivalents will not be included into calculation if they come from biomass energy.

10.5.2 Primary activity data collection items

It is not required to collect primary activity data collection items in the waste disposal stage.

10.5.3 Primary activity data collection methods and requirements

It is difficult to collect the data for this product in the waste disposal stage. There are no site-specific data collection methods and requirements.

10.5.4 Secondary data collection items

The secondary data in the waste disposal stage (recycling/disposal) may be acquired from the LCA software database or authoritative literature. However, considerations shall be given based on the actual circumstances (for example, for materials announced for regulation that are designated by the Recycling Fund Management Board for recycling, the calculation may be conducted according to the recycling rate specified in all previous statistical tables of recycling rates of materials announced for regulation published by the Recycling Fund Management Board, Ministry of Environment). The contents include:

1. Equivalents of life cycle environmental impact categories related to the transportation of used products and their waste packaging materials to the disposal location.
2. Equivalents of life cycle environmental impact categories related to the incineration at the disposal location.
3. Equivalents of life cycle environmental impact categories related to the burial at the disposal location.
4. Equivalents of life cycle environmental impact categories related to the recycling at the disposal location.

10.5.5 Scenarios

The scenario assumption of this product in the waste disposal stage is the distance of transportation of waste to the disposal location. In consideration of the existing resource recycling and disposal system, corresponding consideration will be given in the future according to the requirements specified in the competent authority’s relevant measures. For the waste disposal, it is recommended that secondary data be acquired as the case may be.

11. Declaration Information

To apply for the carbon reduction label for the product, the following specifications shall be observed:

I. Form, location and size of label

(1) The labeling unit of this product is defined as the basic unit upon sales, and the number of links of the product shall be specified, e.g., per chain (OO links).

(2) The use of the carbon footprint labor of the product shall comply with "Regulations Governing Voluntary Product Carbon Footprint Verification, Labeling and Management".

(3) The icon of the carbon label shall not be deformed, or added with any extra words except that the product carbon footprint data and measurement unit shall be marked according to the actual values in the heart-shaped area. However, the icon may be enlarged or reduced in equal proportion.

(4) The carbon label may be affixed on the product or its secondary packaging.

(5) Relevant information shall be added beneath the product carbon footprint label and words including Tan-Piao-Tzu No. ○○○○ and declared unit shall be marked. See the example in the diagram below.

Tan-Piao-Tzu No. ○○○○○
Per chain (○○ links)

II. Additional information

The description of the additional information shall comply with the "Regulations Governing Voluntary Product Carbon Footprint Verification, Labeling and Management" and "Key Points for the Ministry of the Environment's Promotion of Product Carbon Footprint Management", and only the content reviewed and recognized by the Ministry of Environment can be used as additional information. Furthermore, please evaluate the future reduction targets in the raw material and manufacturing stage first, and specify them in the application form when applying for the carbon footprint label for the product.

12. Environmental Impact Categories of "Steel Transmission Chain" for Disclosure

During the application for product carbon footprint label and carbon footprint reduction label, the applicant may only disclose the environmental impact category of greenhouse effect (product carbon footprint).

The environmental impact categories including but not limited to the following shall be disclosed and the units below shall be used in response to the requirements of the Ministry of Environment for product environmental footprint:

1 Greenhouse effect (unit: kg CO_2 eq)

2 Particulate matter/inorganic respiratory substances (unit: disease incidences)

3 Resource depletion-Fossil fuels (unit: MJ)

4 Acidification (unit: mol H^+ eq)

5 Resource depletion-Minerals and metals (unit: kg Sb eq)

13. Inventory Reference Template of "Steel Transmission Chain"

Activity data							Remarks
Life cycle stage	Group	Name	Total activity volume	Unit	Qty per unit	Unit	
Raw material acquisition stage	Primary raw material	Wrought iron					Please specify the material.
Raw material acquisition stage	Primary raw material	Carbon steel					Please specify the material.
Raw material acquisition stage	Auxiliary item	Cutting oil					Please specify the material.
Raw material acquisition stage	Auxiliary item	Quenching oil					Please specify the material.
Raw material acquisition stage	Auxiliary item	Polishing agent					Please specify the material.
Raw material acquisition stage	Auxiliary item	Antirust agent					Please specify the material.
Raw material acquisition stage	Auxiliary item	Equipment consumable					Please specify the material.
Raw material acquisition stage	Auxiliary item	Equipment cleaning agent					Please specify the material.
Raw material acquisition stage	Auxiliary item	Gloves					Please specify the material.
Raw material acquisition stage	Energy resource	Water					If groundwater, well water or river water is used, please fill it out separately from tap water.
Raw material acquisition stage	Auxiliary item	Packaging materials-Plastic bag					Please specify the material.
Raw material acquisition stage	Auxiliary item	Packaging materials-Adhesive tape					Please specify the material.
Raw material acquisition stage	Auxiliary item	Packaging materials-Cartoon					Please specify the material.
Raw material acquisition stage	Auxiliary item	Transportation of raw materials to the factory-Land transportation (TKM)					Please specify truck tonnage and storage condition as refrigerated or general.

Activity data							Remarks
Life cycle stage	Group	Name	Total activity volume	Unit	Qty per unit	Unit	
Raw material acquisition stage	Auxiliary item	Transportation of raw materials to the factory-Sea transportation (TKM)					
Raw material acquisition stage	Auxiliary item	Transportation of raw materials to the factory-Air transportation (TKM)					
Manufacturing stage	Energy resource	Electricity					Please specify if renewable energy (e.g., solar energy) is used, and fill it out separately from general electricity.
Manufacturing stage	Energy resource	Heavy oil					Fill out other energy separately if any.
Manufacturing stage	Energy resource	LPG					Fill out other energy separately if any.
Manufacturing stage	Energy resource	Official vehicle-Gasoline					
Manufacturing stage	Energy resource	Stationary-source diesel					
Manufacturing stage	Energy resource	Mobile-source diesel					
Manufacturing stage	Energy resource	Water					If groundwater, well water or river water is used, please fill it out separately from tap water.
Manufacturing stage	Auxiliary item	Kerosene					
Manufacturing stage	Auxiliary item	Lubricating oil (agent)					Please specify the material.
Manufacturing stage	Auxiliary item	Decreasing oil					Please specify the material.
Manufacturing stage	Auxiliary item	Liquid oxygen					
Manufacturing stage	Auxiliary item	Face mask					Please specify the material.

Activity data							Remarks
Life cycle stage	Group	Name	Total activity volume	Unit	Qty per unit	Unit	
Manufacturing stage	Emissions	Septic tank					
Manufacturing stage	Emissions	Refrigerant					1. Please specify the type of refrigerant used, e.g., R410a, R134a, R22, etc. 2. If multiple refrigerants are used, please fill them out separately.
Manufacturing stage	Residues	Process waste					1. Please specify the waste disposal method as burial, incineration, or recycling, etc. 2. If there are different disposal methods for each type of process waste, please fill them out separately according to the corresponding waste disposal methods.
Manufacturing stage	Residues	Non-process waste					1. Please specify the waste disposal method as burial, incineration, or recycling, etc. 2. If there are different disposal methods for each type of process waste, please fill them out separately according to the corresponding waste disposal methods.
Manufacturing stage	Auxiliary item	Transportation of process waste from the factory-Land transportation (TKM)					
Manufacturing stage	Auxiliary item	Transportation of non-process waste from the factory-Land transportation (TKM)					
Distribution and sales stage	Auxiliary item	Goods transportation, distribution and sales-Land transportation (TKM)					Please specify truck tonnage and storage condition as refrigerated or general.
Distribution and sales stage	Auxiliary item	Goods transportation, distribution and sales-Sea transportation (TKM)					
Distribution and sales stage	Auxiliary item	Goods transportation, distribution and sales-Air transportation (TKM)					

Activity data							Remarks
Life cycle stage	Group	Name	Total activity volume	Unit	Qty per unit	Unit	
Use stage	Auxiliary item	Maintenance oil					Please specify the composition.
Waste disposal stage	Residues	Waste packaging materials					1. Please specify the waste disposal method as burial, incineration, or recycling, etc. 2. If there are different disposal methods for each type of process waste, please fill them out separately according to the corresponding waste disposal methods.
Waste disposal stage	Auxiliary item	Transportation of waste packaging materials-Land transportation (TKM)					
Self-added	Self-added	Please enter the name of activity data					

14. References

1. Ministry of Environment, Regulations Governing Voluntary Product Carbon Footprint Verification, Labeling and Management, published in 2025.
2. Ministry of Environment, Key Points for the Ministry of the Environment's Promotion of Product Carbon Footprint Management, published in 2025
3. ISO/CNS 14025:2006 Environmental labels and declarations-Type III environmental declarations-Principles and procedures
4. ISO/CNS 14040:2006 Environmental management-Life cycle assessment-Principles and framework
5. ISO/CNS 14044:2006 Environmental management-Life cycle assessment-Requirements and guidelines
6. ISO/CNS 14046:2014 Environmental management-Water footprint-Principles, requirements and guidelines
7. ISO/TS 14027:2017 Environmental labels and declarations-Development of product category rules
8. ISO 14067:2018 Greenhouse gases-Carbon footprint of products-Requirements and guidelines for quantification
9. Product Environmental Footprint Category Rules-Steel Transmission Chain