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Carbon footprint of products—Product category rule—Electric bicycle

产品碳足迹产品种类规则电动自行车

(*English Translation*)

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**Foreword**

China Bicycle Association is in charge of this English translation. ln case of any doubt about the contents of English translation, the Chinese original shall be considered authoritative.

This document is drafted in accordance with the rules given in the GB/T 1.1—2020 *Directives for standardization—Part 1: Rules for the structure and drafting of standardizing documents*.

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This document was proposed and prepared by China Bicycle Association.

Carbon footprint of products—Product category rule—Electric bicycle

**1 Scope**

This document specifies the basic rules and requirements for quantification and information exchange of the greenhouse gas emissions and removals of electric bicycles at the product level, including requirements and guidelines for system boundaries, life cycle stages, data collection and information exchange for products.

This document is applicable to the scope of carbon footprint evaluation of electric bicycle products.

**2 Normative references**

There are no normative references in this document.

**3 Terms and definitions**

For the purposes of this document, the following terms and definitions apply.

**3.1**

**greenhouse gas**

**GHG**

gaseous constituent of the atmosphere, both natural and anthropogenic, that absorbs and emits

radiation at specific wavelengths within the spectrum of infrared radiation emitted by the earth’s

surface, the atmosphere and clouds.

Note: Unless otherwise specified, greenhouse gases in this document include carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF6), and nitrogen trifluoride (NF3).

[Source: GB/T 32150—2015,3.1]

**3.2**

**electric bicycle**

bicycle,equippedwith an on-board battery as an auxiliary energy source, capable of pedal riding, electric assisted or electric driven

[Source: GB 17761—2018, 3.1]

**3.3**

**life cycle**

consecutive and interlinked stages related to a product system, from raw material acquisition or generation from natural resources to final disposal

[Source: GB/T 24040—2008, 3.1]

**3.4**

**life cycle assessment**

**LCA**

compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle

[Source: GB/T 24040—2008, 3.2]

**3.5**

**carbon footprint of a product**

various GHG emissions of a product throughout its life cycle, i.e., the sum of GHG emissions and removals at all stages from raw material acquisition, manufacturing, distribution, use, and disposal/recycling

**3.6**

**assessment of carbon footprint of a product**

the process of calculating and evaluating the carbon footprint of a product according to agreed evaluation guidelines and documenting it

**3.7**

**product category**

group of products that can fulfil equivalent functions

[Source: GB/T 24025—2009, 3.12]

**3.8**

**carbon dioxide equivalent**

**CO2e**

unit for comparing the radiative forcing of a GHG to that of carbon dioxide

Note: The carbon dioxide equivalent of a greenhouse gas is equal to the mass of a given gas multiplied by its global warming potential.

[Source: GB/T 32150—2015, 3.16]

**3.9**

**global warming potential**

**GWP**

a coefficient that relates the effect of the radiation intensity of a unit mass of a greenhouse gas in a given time period to the effect of the radiation intensity of an equivalent amount of carbon dioxide

[Source: GB/T 32150—2015, 3.15]

**3.10**

**emission factor**

a factor that characterizes the amount of greenhouse gas emissions per unit of production or consumption activity

[Source: GB/T 32150—2015, 3.13]

**3.11**

**greenhouse gas emission**

total release amount of greenhouse gases (in mass units) into the atmosphere in a given time period

**3.12**

**functional unit**

quantified performance of a product system for use as a reference unit

[Source: GB/T 24040—2008, 3.20]

**3.13**

**system boundary**

set of criteria specifying which unit processes are part of a product system

[Source: GB/T 24040—2008, 3.32]

**3.14**

**activity data**

a tabulated value of the amount of production or consumption activity that results in greenhouse gas emissions

Note: Such as the consumption of a certain fossil fuel, the use of raw materials, purchased electricity, purchased heat, etc.

[Source: GB/T 32150—2015, 3.12]

**3.15**

**data quality**

characteristics of data that relate to their ability to satisfy stated requirements

[Source: GB/T 24040—2008, 3.19]

**3.16**

**cut-off criteria**

specification of the amount of material or energy flow or the level of environmental significance associated with unit processes or product system to be excluded from a study

[Source: GB/T 24040—2008, 3.18]

**3.17**

**allocation**

partitioning the input or output flows of a process or a product system between the product system under study and one or more other product systems

[Source: GB/T 24040—2008,3.17]

**3.18**

**verification**

confirmation, through the provision of objective evidence, that specified requirements have been fulfilled

[Source: GB/T 19000—2016,3.8.12]

**4 Principles and requirements**

It is appropriate to use Life Cycle Assessment (LCA) techniques for evaluating and quantifying the carbon footprint of electric bicycle products. Quantification and communication of GHG emissions and removals at the product level for electric bicycle. This document shall be used in its entirety if the user claims to meet the requirements of this document.

The evaluation and quantification of the carbon footprint of electric bicycle products shall cover the whole life cycle of the product, including the stages of raw material acquisition, production, distribution, use, and disposal. During the evaluation of product carbon footprint , the principles of relevance, completeness, consistency, accuracy, and transparency shall be considered.

If the product carbon footprint evaluation and quantification results based on this document are used for external communication to the public, the user shall simultaneously disclose all the specific information of the product specified in this document.

**5 Product category and description**

**5.1 Product category**

The composition of the electric bicycle shall include motor, battery, electrical system, frame and iron parts system, steering system, braking system, driving and transmission system, appearance system, etc. or alternatives withequal function.

**5.2 Product description**

Electric bicycle product descriptions shall enable the user to clearly identify the product, including but not limited to:

a) Product name;

b) Product information;

c) Production plant and address;

d) Manufacture and address (when the manufacturer and production plant are different organizations or corporations);

e) Product’s CCC certification number;

f) Product’s CCC certification mark;

g) Product schematic diagram;

h) Product’s main technical and performanceparameters.

**6 Product functional unit, GHGs categories and emission sources**

**6.1 Product functional unit**

Travel service provided per unit of mileage traveled during the life cycle of an electric bicycle. An example of determining the product functional unit is the travel service provided by an electric bicycle traveling 1km.

**6.2 GHGs categories**

The carbon footprint evaluation of electric bicycle products shall include the following greenhouse gases within the life cycle: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF6) and nitrogen trifluoride (NF3).

**6.3 Emission sources**

The GHG emission sources involved in the carbon footprint evaluation of electric bicycle products as GHG emissions from various stages, processes, inputs and outputs within the product life cycle, including but not limited to:

a) Energy use;

b) Combustion processes;

c) Chemical reactions;

d) Losses of refrigerant and other fugitive gases;

e) Operation;

f) Service provision and delivery;

g) Wastes.

**7 System boundary**

**7.1 Product lifecycle process**

The electric bicycle is a consumer end-use product, and the system boundary is established for the entirebusiness-consumerlife cycle process, i.e., from the acquisition of raw materials to the end of the life cycle of product disposal, as shown in Figure 1.

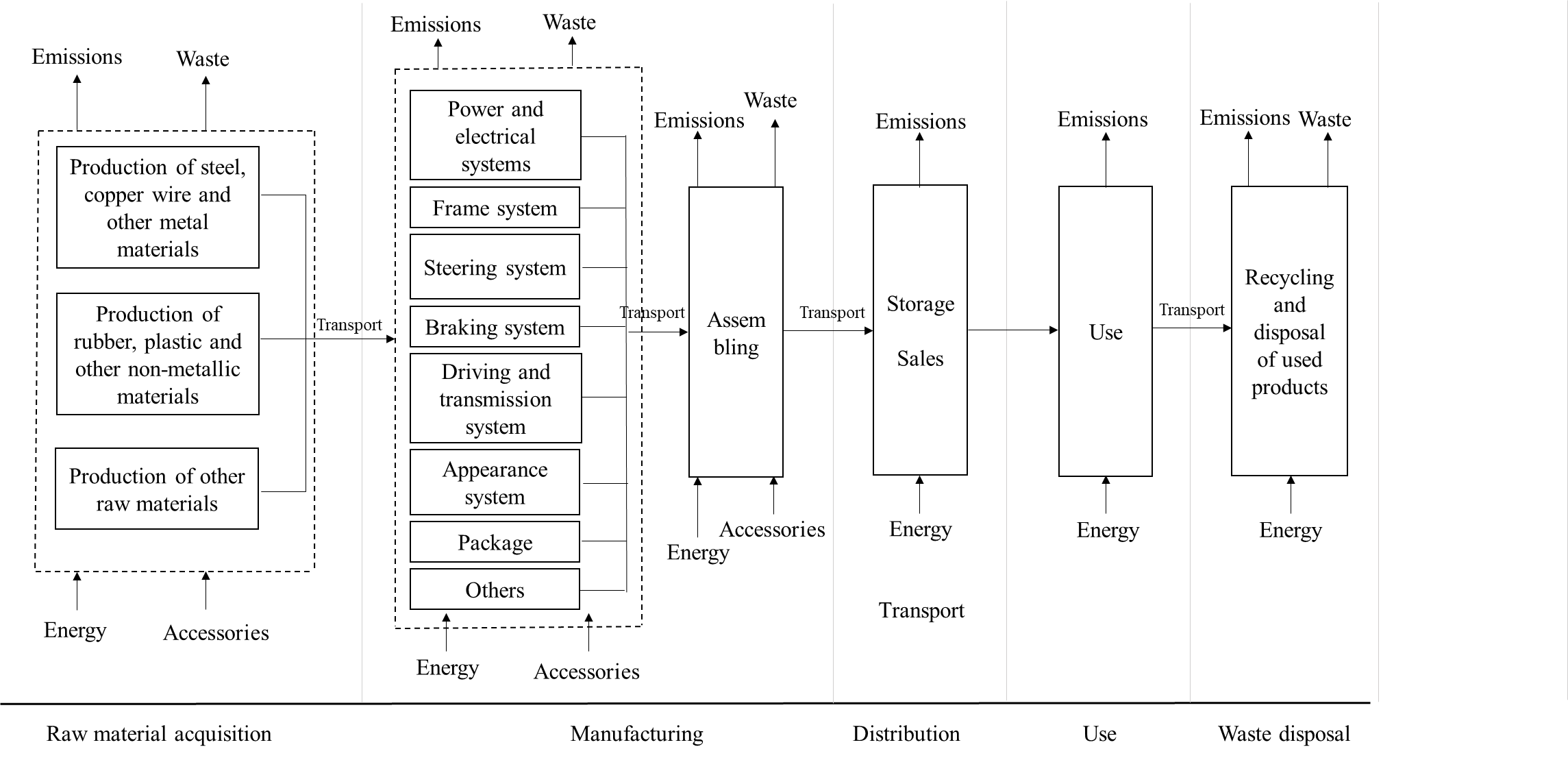


Figure 1 Diagram of whole lifecycle system boundary of an electric bicycle

Note: Depending on the actual situation of the supply chain or different production function settings, each production plant may have some or all of the intermediate materials, pre-processing, and parts production included in the raw material acquisition stage. An example of the producing cases is shown in Figure 1.

**7.2 Product lifecycle stages**

**7.2.1 Raw material acquisition**

The raw material acquisition stage begins with the acquisition of resources from nature and ends with the arrival of raw materials at the product manufacturing plant. Thisstage includes：

a) Extraction and processing of final products’raw materials such as steel, plastics, rubber,etc.;

b) Pre-treatment and pre-processing of raw materials, transportation of raw materials and packaging materials from suppliers to the production site:

c) Processing of parts and components outside the production plant (if any);

d) Others.

**7.2.2 Manufacturing**

The manufacturing phase begins when raw materials and product parts (if any) enter the production plant and ends when the products leave the production plant upon completion of production. Thisstage includes:

a) The production and processing of each raw material and each product part and component;

b) Transportation in the production process;

c) Assembly and installation;

d) Inspection and packaging;

e) Production process waste disposal;

f) Other manufacturing processes.

**7.2.3 Distribution**

The distribution phase begins when the product leaves the production plant and ends when the consumer acquires it. Thisstage includes:

a) All types of transportation between the production plant and the distribution destination;

b) Transshipment and storage;

c) Wholesale and retail;

d) Others.

**7.2.4 Use**

The use stage begins when the product is acquired by the consumer and ends when the product is discarded and transported to a disposal point. Thisstage includes:

a) Electricity consumed in the use stage;

b) Repair and maintenance;

c) Others.

**7.2.5 Waste disposal**

The waste disposal stage begins with the transportation of waste electric bicycles to the waste disposal point and ends with waste disposal or reuse. Thisstage includes:

a) Waste collection transportation and management;

b) Waste disassembly, crushing and classification;

c) Transportation of waste parts;

d) Recycling;

e) Other recycling and disposal processes.

**7.3 System boundary exclusion**

The product system boundary shall exclude processesemissionsthat are not directly related to assessing the product, including:

a) Human physical energy input to the processes and/or pre-treatment processes;

b) Transportation of consumers to and from retail purchase locations;

c) Employee commuter transportation;

d) Livestock for transportation services;

e) Plant capital goods;

f) Group activities and services (e.g., R&D, marketing);

g) Auxiliary operations (e.g., facility lighting, office air conditioning).

A process may be excluded from the system boundary if all of the following conditions are met:

a) Data gaps occur when primary or secondary data cannot be collected;

b) The extrapolated and representative data cannot be confirmed and thus the data gaps cannot be filled;

c) The data is confirmed insignificant by estimation.

**8 Data**

**8.1 Calculation method**

The carbon footprint evaluation of electric bicycle products is calculated according to Equation (1) and Equation (2).

**………………………………………（1）**

where:

——Total greenhouse gas emissions over the life cycle of the product, in kilograms of carbon dioxide equivalent（kgCO2e）；

——Total greenhouse gas emissions at each stage of the product life cycle, in kilograms of carbon dioxide equivalent（kgCO2e）；

*i*——stages within the product life cycle, *i =1,2,3,…,k.*

where，

**…………………（2）**

where：

*AD*——Activity data

*EF*——Emission factor

*GWP*——Global warming potential

*j*——Data on different types of activities in each phase of the product life cycle，*j=1,2,3,…,k.*

**8.2 Data collection rules**

Data collection includes primary and secondarydata collection. Wherein, priority is given to primary data collection, that is direct emissions data for all processes in which the product manufacturing plant has ownership, operation, or control, and contains data obtained from specific processes and specific sites during the life cycle of the evaluated product. Direct emissions data, process activity data, and data assigned to the corresponding processes in the product are collected as primary data if they meet this definition. Primary activity data are required not to be applied to downstream emission sources.

Primary data are collected as follows:

a) Directly monitored or recorded, e.g., mass of raw materials and components consumed during the production phase (kg);

b) Consumption of electrical energy (kW·h) for a process, e.g.: distribution of electrical energy consumption based on target products;

c) Data from first-party or third-party laboratory test results, e.g., range values per kilowatt-hour;

d) Volume (L) or mass (kg) of fossil fuel consumed in a process.

Primary data can also be collected, if possible, for all processes in which the production plant does not have ownership, management or control right, to ensure data quality. Where primary data cannot be collected, secondary data may be used, including literature, calculated, estimated, or other representative data; preference is given to secondary data from peer-reviewed publications, as well as data from other qualified sources (official UN publications or UN-supported organizationspublications).

Data that do not meet the definition of primary data are collected as secondary data, which are collected as follows:

a) Officially published life-cycle GHG emissions data for a raw material or product component by governments, administrative departments, industry associations, research institutes, etc;

b) LCA software database recognized by international or governments;

c) Literature data, empirical values of experts in the industry;

d) Average of fuel consumption for a process obtained from life cycle databases;

e) Industry average kilograms of material entered for a process;

f) Life cycle data for the target product, using as an approximation the electrical energy consumed within another similar process;

g) Data for a similar process or activity controlled by the production plant or its suppliers.

If the product is produced continuously, data collection on GHG emissions shall continue for at least one year. If the product is produced and sold in a shorter cycle and does not last more than one year, data collection on GHG emissions shall last for at least one quarter.

The data provided, whether primary or secondary, shall be provided with sources and supporting information. Primary data shall also be reproducible, such as production reports, invoices, original record forms, texts of data release documents, etc.

**8.3 Data quality requirements**

In determining the primary and secondary data used in the product carbon footprint evaluation process, data quality requirements shall be specified, and the requirements shall include the following:

a) Temporal coverage: priority shall be given to the year of the data and the shortest time period for which the data are collected, as well as temporal data for the specific product being evaluated;

b) Geographical characteristics: priority shall be given to data specific to the product for which the data are collected in the geographical area (e.g., district, region);

c) Technical coverage: priority shall be given to whether the data are for a specific technology or a mixed set of technologies, and to the specific technical data for the product (e.g., the standard method used in range values per kilowatt-hour test during the use phase);

d) Accuracy of information (e.g., data, models, and assumptions), priority shall be given to the most accurate data;

e) Accuracy: priority shall be given to the range of variability (e.g., variance) of each data representation value, as well as to the more accurate (i.e., with the lowest statistical variance) data;

f) Completeness: the percentage of the data measured and the degree of representativeness of the data (sampling range, periodicity of measurements, etc.);

g) Consistency: data selection shall be carried out in a uniform manner across the processes of the evaluation analysis;

h) Reproducibility: the extent to which information about the methods and data values would allow independent, dedicated persons to reproduce the results of the study and make qualitative evaluations;

i) Data sources, concerning the primary or secondary nature of the data.

**8.4 Data allocation**

In boundary setting or data collection, if at least one process is found to have multiple products as input and output, the total emissions need to be allocated within the product life cycle.

Possible allocation scenarios for the electric bicycle carbon footprint evaluation process are: a common process with inputs of generic raw materials or components, electrical energy, and outputs of multiple different products and wastes including the product under study and evaluation, data allocation shall be made according to the following guidelines:

a) Avoid data allocation as much as possible;

b) It’s preferred to use physical relationship parameters (including but not limited to production volume, production hours, etc.) for allocation;

c) When physical relationships cannot be found, allocate based on economic value;

d) If other allocation methods are used, the basis of the parameters used and the description of the calculation need be provided.

**8.5 Data selection criteria**

There are varioustypes of unit process data, and the data shall be appropriately roundedaccording tothe following rounding guidelines:

a) All inputs for energy are listed;

b) All inputs of raw materials are listed;

c) Inputs for items where the mass of auxiliary materials is less than 0.1% of the total consumption of raw materials can be ignored;

d) General solid waste that is less than 1% of the total solid waste emissions can be ignored;

e) If estimated GHG emissions from a source are less than or equal to 1% of the total GHG emissions from the product life cycle, the emissions may be trimmed, but the total estimated value of all trimmed items shall not exceed 5% of the total estimated GHG emissions from the product life cycle.

**8.6 Data collection at all stages of the life cycle**

**8.6.1 Raw material acquisition stage**

When a product manufacturing plant has ownership, operation or control right of a raw material supplier, primary data corresponding to the raw material acquisition stage shall be collected as much as possible; when primary data cannot be collected, secondary data for that stage are collected. Data include: processes such as energy extraction and production, raw material production, intermediate material and auxiliary material production, parts pre-processing (if any), packaging material production, and waste disposal; data on the types of carriers used in transportation processes such as raw material transportation, packaging material transportation, and auxiliary material transportation, the types and consumption of fuels, load weights, load ratios, etc.; data on the storage emissions of each raw material and intermediate material. Secondary data for relevant life cycle greenhouse gas emission factors.

**8.6.2 Manufacturing stage**

Primary data to be collected at the manufacturing stage include: consumption of raw materials and components; consumption of energy such as fuel, electricity and heat consumed at the production stage; consumption of water for production and generationwaste and pollutant output amount; waste disposal at the production stage; and data collection of storage and transportation emissions related to the product at the production stage.

Secondary data can be used for life cycle GHG emission factors related to the consumption process of fuel, electricity, heat and other energy sources, pollutant emissions and waste disposal.

**8.6.3 Distribution stage**

The following primary data shall be collected at the distribution stage of the product: the type of transportation facilities, the distance of transportation, the type and consumption of fuel consumed, the load weight and load ratio.

The following primary data shall be collected for the carbon emission process at storage and point of sale: the amount of energy consumed by environmental controls such as lighting while the product is in storage, and the amount of energy consumed by environmental controls such as lighting while the product is at the point of sale.

Relevant life-cycle GHG emission factors can be used for secondary data.

**8.6.4 Use stage**

The following primary data shall be collected during the use phase of the product: range values per kilowatt-hour, and the type and amount of parts replaced during the life cycle of the electric bicycle.

Electricity consumption during the use phase of an electric bicycle = total life cycle mileage / range value per kilowatt-hour. It is recommended that the total life cycle mileage of electric bicycles shall be set at 60,000km, and the range values per kilowatt-hour data shall be measured by a laboratory with test qualification.

Note 1: The accessories replaced during the life cycle of electric bicycle products are: lithium batteries, brakes, brake shoes, tires and others.

Note 2: Electric bicycle according to the industry's existing average level of product life and the use of the actual statistical analysis of the stage, can be set to: life cycle of use for 5 years, 300 days per year, 40km per day, life cycle mileage is recommended to set the value of 60000km.

**8.6.5 Waste disposal stage**

If primary data cannot be collected for the disposal of products, secondary data can be used.

When the waste is recycled and not used in the production of the product, this recycling process shall be excluded from the system boundary of the product carbon footprint evaluation; when the recycled material is used as material in any unit process of the product system, then this recycling process shall be included in the system boundary; when the heat generated from the incineration process is reused in the product system, the heat of the reused portion shall be offset accordingly. The following secondary data shall be collected during the waste disposal phase:

a) Energy and resources consumed in the process of product disassembly, crushing, sorting, material reuse processing, parts remanufacturing, etc., and the associated life cycle GHG emission factors;

b) Transportation data related to the product waste disposal stage, including transportation mode, transportation distance, transportation weight, GHG emissions per unit mile, etc.;

c) Disposal methods of waste at the disposal site, including landfill, incineration, etc., and the GHG emission factors associated with different disposal methods;

d) The weight of the waste to be treated at the treatment site, and the recovery rate of the product;

e) Data on energy recovery, organic recovery or other recovery processes;

f) Data on storage emissions at the disposal stage.

**9 Product carbon footprint report**

The electric bicycle product carbon footprint evaluation report shall include, but not be limited to, the following:

a) Company/organization description, including:

--Company/organization profile;

--Contact person and address, contact information.

b) Product description, including:

-- Product name (product type, production plant);

--Product process flow;

--Product information;

--Product CCC certification information;

--Product schematic diagram;

--Main technical parameters and performance of the product.

c) Report results, including:

--Functional units;

--System boundaries;

--Life cycle phase identification and description;

--Data description, primary data collected as well as secondary data;

--Data trade-off guidelines;

--Data allocation;

--Data quality;

--Data coverage time;

--Data collection;

--Data calculation, GHG emission inventories for all processes within the system boundary;

--Uncertainty;

--The percentage of total emission inventory results for each stage of the life cycle;

--Validity of the reported results;

--Method of validation.

d) References.

**10 Verification and declaration of conformity**

The product carbon footprint evaluation report shall be validated either by the first party (self-validation of the reporting enterprise) or an independent third-party validation agency.

When making external declarations, the declaring party shall specifythe validation methodused for the product carbon footprint evaluation report.

The statement that the results of the carbon footprint evaluation of electric bicycle products comply with this document shall be published by the organization conducting the product carbon footprint verification. When declaring compliance with this document, the verifying party shall comply with all provisions of this document.

The publication of the results of the declaration of conformity shall comply with the relevant national or local regulations, and if there are no special regulations, the enterprise may adopt one or more of the following ways of publication:

a) Disclosing the carbon footprint information to consumers through the form of carbon label, the specific disclosure information and requirements shall be stipulated by the carbon label issuing management agency;

b) Disclosing carbon footprint information in the product instruction manual and stating the meaning of the value;

c) Printing the product carbon footprint information on the company's brochures or publishing it on the company's website.

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