

Product-Category Rules (PCR)
for Preparing an Environmental Product
Declaration (EPD) for
Motorcycles
PCR 2011:1.0

KWANG YANG MOTOR CO., LTD.
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Table of Contents

1. General information
 2. Company and product description
 - 2.1 Product group function
 - 2.2 Product components
 - 2.3 Product technical description
 3. List of materials and chemical substances
 4. Declared unit
 5. System boundaries
 - 5.1. Specifications for different boundary settings
 6. Cut-off rules
 7. Allocation rules
 8. Units
 9. Calculation rules and data quality requirements
 10. Parameters to be declared in the EPD
 11. Recycling information
 12. Other environmental information (Optional)
 13. Information about the certification
 14. References
- Appendix I Generic data sources to refer to
- Appendix II Reporting format for the EPD
- Appendix III Abbreviations

1. General Information

This document is to be used as the product category rules (PCR) for the global production and manufacturing of motorcycle products. The requirements specified in this PCR are intended to be used for EPDs certified in accordance with ISO 14025 standard. This document shall be valid until March 31, 2013/2014.

This PCR was prepared by the Kwang Yang Moto Co., Ltd. Representatives from major Taiwanese manufacturers of similar products and stakeholders were invited by the Taiwan Transportation Vehicle Manufacturers Association to the open consultation meeting on November 30, 2011, to participate in the discussion and review of this PCR. Environment and Development Foundation (EDF) then reviewed and approved this PCR.

This PCR is applicable to products with the Harmonized System (HS) Code of 8711-1019 (<50 cc.), 8711-2090 (50-250 cc.), 8711-3000 (250-500 cc.), 711-4000 (500-800 cc.) and 8711-5000(>800 cc.).

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2. Company and product description

The EPD shall include information about the manufacturing company/organization. The information may include manufacturing process related information, and environmental related information, such as the environmental management system information. The information may also include special issues which the company/organization would like to emphasize, such as the products meeting certain environmental criteria, or environmental safety and health related information.

This PCR is applicable to both business-to-customer/consumer (B2C) and business-to-business (B2B) communications. When certification of product environmental impacts is conducted, the product accessories and packaging shall also be included in the certification scope.

2.1 Product group function

The motorcycle, also known as motorbike, is a two or three-wheeled motor vehicle which is mostly gasoline-powered. It includes the three-wheeled type vehicle, but excludes the pure electric motorcycles and all terrain vehicles (ATV). Motorcycles are one of the important means of transport which use gasoline to produce kinetic energy to drive the vehicle body through wheel contact with the ground. They are able to carry passengers and goods, and provide speedy transportation when compared with pedestrian travel.

2.2 Product components

A motorcycle consists of the following main components (Level 1 and Level 2) as shown in the table below.

LEVEL 1	LEVEL 2
1. Body frame	Welded frame system, assembled frame system, handle bar system
2. Plastic components	Plastic component system
3. Suspension	Drive related system, rear axle, rear brake, front axle, front brake, UBS brake, ABS brake
4. Frame suspension	Frame linkage, front fork damper, steering system (handlebar), turning handle
5. Transmission	Differential, drive shaft, belt, chain
6. Transmission box	Auto transmission box, manual transmission box
7. Engine	Cylinder head (air inlet), cylinder system, crankshaft system, transmission, air intake system, accessory system
8. Air intake system	Air filter, inlet tube
9. Cooling system	Radiator, reserve water tank, cooling water tank
10. Fuel system	Fuel injector, fuel tank, fuel line
11. Exhaust system	Exhaust pipe, muffler, other
12. Vehicle wiring system	Wiring diagram, main wiring, secondary wiring, ECU line, diagnostic cable, power cable, battery cable, motor starting cable, battery cable, grounding wire, fuse wire, charging circuit
13. Ignition system	Ignition system, ignition chip, ignition wire, spark plug cap
14. Charging system	Alternator
15. Starter system	Starter motor
16. Converter	Converter, charging socket
17. Lighting and lamp system	Headlight, glove box light, turn signal light, rear light, license plate light, reflector, rear window brake light, glove box light, rear position light
18. Switch system	Key lock switch, electronic switches, resistor switch, gear switch assembly, start switch
19. Meter/indicator system	Indicating instrument, tachometer, speed meter, wheel speed indicator, temperature indicator, oil level indicator
20. Other control and sensors	Engine stalling controller, speakers, police car sirens group, fuses, relays, sound muddling devices, lighting, IC KEY, KCSS, wheel speed sensor
21. Fuel injection system	Fuel injection system electronic controller, fuel pump assembly, cooling fan assembly, nozzle, sensor
22. Other electronic components	Flash, timer, tire pressure controller, instrument control, variable resistor, diagnostic tool, driver group, relay group, regulator
23. Other parts	Cargo basket, rear frame box

The data quality requirements for the main components are described in Section 9 on calculation rules and data quality requirements. The EPD shall also include the other components of the product, but their data quality requirements are different from those of the main components.

2.3 Product technical description

The product technical description part of the EPD shall include the following information:

1. Model name;
2. Engine type;
3. Displacement;
4. Cylinder bore × stroke (mm);

5. Compression ratio;
6. Maximum horsepower (ps/rpm);
7. Maximum torque (kg.m / rpm);
8. Body size (length × width × height mm);
9. Wheelbase (mm);
10. Ground clearance (mm);
11. Seat height (mm);
12. Vehicle weight (kg) (dry weight);
13. Transmission system;
14. Type of fuel supply ;
15. Suspension type;
16. Braking system;
17. Tire specifications; and
18. Fuel tank capacity.

3. List of materials and chemical substances

The contents of the following materials and substances in the product shall be declared:

- All materials of the product (excluding packaging material) with weight ratio (material weight/product weight (excluding packaging)) $\geq 1\%$;
- All materials of the packaging with weight ratio (material weight/packaging weight) $\geq 1\%$;
- All substances /materials in the product regulated by legal, customer and environmental requirements;
- The following materials in the main components: flame retardants, lead content in solder, lead and flame retardant content in solder masking agent, and substances regulated by EU's RoHS Directive (the latest version).

The declaration of halogen-free flame retardants, lead-free solders and no RoHS-regulated substances may only be made when appropriate evidences are available (for example, test reports from accredited laboratories/testing facilities). The following organizations may provide accreditation for testing facilities: Taiwan Accreditation Foundation (TAF), (Asia Pacific Laboratory Accreditation Cooperation (APLAC), International Laboratory Accreditation Cooperation (ILAC) or ILAC Mutual Recognition Arrangement (ILAC MRA). For definitions of testing methodology and confirmations of regulated hazardous substances based on the accredited laboratories' product testing methods, please refer to IEC 62321 Standard.

4. Declared unit

The declared unit is one "unit" of motorcycle, as the motorcycle products are marketed and sold in such a unit.

5. System boundaries

The main system boundaries for the declared product system are presented as follows:

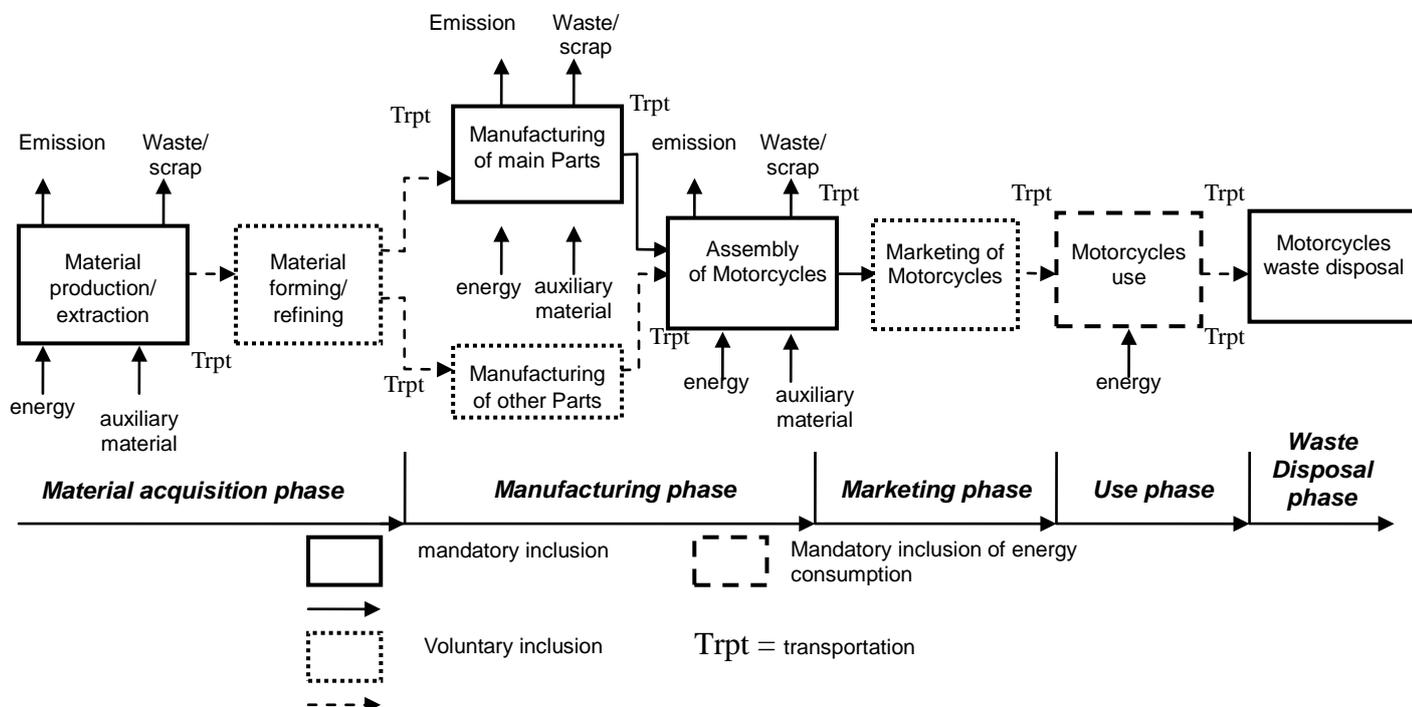


Figure 1 System boundary of the main product system

As noted in Figure 1 above, the life cycle of a motorcycle covers five life cycle stages: raw material acquisition, product manufacturing, distribution, product use and waste disposal. The data quality requirements for the inventory process of main and other components are described in Section 9 on calculation rules and data quality requirements.

Raw Materials Acquisition and Manufacturing Stage

The LCA shall include information for the following unit processes:

- Material extraction and manufacturing of main components and other components;
- Production/generation of energy used for raw material manufacturing.

The inclusion in the LCA the information on the forming and refining of raw materials and transportation of raw materials is optional (voluntary).

Manufacturing Stage

The LCA shall include information for the following unit processes:

- Manufacturing of main components and generation of associated process waste;
- Assembly of products and generation of associated process waste;
- Transportation of main components to product assembly plant.

The inclusion in the LCA the information on the input/output of packaging material during main components manufacturing process and the manufacturing of minor/secondary components/parts is optional (voluntary).

Distribution and Marketing Stage

The LCA shall include information for the following unit processes:

- Transportation of products to the distribution sites or customer designated locations;
- Inventory and reporting of energy/resource input and waste generation during the marketing process is optional (voluntary);
- Inventory and reporting of transportation from sales/distribution sites to users is optional (voluntary).

Use Stage

A motorcycle's usage scenario is assumed to be 5 years and 20,000 km. The fuel consumption during the use stage is calculated based on the average fuel efficiency as determined by recognized national or regional testing laboratories.

The motorcycle's consumption of engine oil, battery, and tires should be included into the use stage scenario. Other consumables during the use and maintenance stage can be neglected.

Recycling/end of life Stage

The LCA shall include information for the following unit processes:

- Transportation of end-of-life product to waste/resource treatment or recycling facility.
- Reporting of recycling information (such as recycling and dis-assembly report or information on recycling channels) is mandatory in the EPD. Also, the environmental impact shall be calculated based on the declared recycling rate.

5.1 Specification of different boundary settings

Boundary in time

The validity period for the LCA results presented in the LCA report shall be defined.

Boundary towards nature

If the manufacturing processes are located within Taiwan, the solid waste categories as defined in Taiwan's Waste Disposal Act shall be adopted. If the processes are located in other countries, equivalent legal requirements shall be considered.

The natural boundary of the system shall describe the boundary where the materials and energy resources flow from nature into the system, and where the water and air emissions and waste are released out of the system.

Only the waste which is required to be disposed of needs to be considered; landfilling process does not need to be included. If the waste is generated through wastewater treatment or incineration process, such waste should be included into the wastewater treatment or incineration process.

Boundaries in the life cycle

The boundaries in the product life cycle are described in Figure 1. The construction of the site and infrastructure, as well as the production of manufacturing equipment and activities of the workers, does not need to be included.

Boundaries towards other technical systems

Boundaries towards other technical systems describe the inputs of material and other components towards other systems, as well as outputs of materials towards other systems. For the inputs of recycled materials and energy towards the product manufacturing stage, the transportation between the recycling process and use of recycled materials shall be included in the data set. For the production of recyclable products during the manufacturing stage, the transportation towards the recycling process shall be included.

(Note: Further explanations are provided in Section 7 on open-loop recycling)

Boundaries regarding geographical coverage

The manufacturing stage may cover manufacturing processes located on any sites around the world. For processes located in a specific region, the data used should be representative of the region. The data for the main components shall be the specific regional data for the region where the process takes place (see Section 9). For ease of comparison, no matter where the emissions are generated, the same parameters should be used for life cycle impact assessment (see Section 10).

6. Cut-off rules

For any impact category, if the sum of various impacts from a specific process/activity is less than 1% of the impact equivalent in that category, such a process/activity may be neglected during the inventory analysis. Nonetheless, the accumulated impact of neglected process/activity may not exceed 5%. Components and materials omitted from the LCA shall be documented.

(Note: This judgment for this “1% Rule” is based on the environment relevance assessment of material input to the system, and does not consider special and exceptional environmental impacts.)

7. Allocation rules

The main allocation rules shall be valid for the entire product system. For other secondary processes, other allocation rules may be defined; however, the use of these rules should be justified. Product-specific information should be preferentially collected in order to avoid the need for allocation. While selecting allocation rules, the following principles are recommended.

- Multi-output: The allocations are based on the changes in the resource consumption and pollutant emissions (for example, adopted quantity allocation for some main component, or surface allocation for some components), following the changes in the studied system's output product or function or economical relationship.
- Multi-input: The allocation is based on actual relationship. For example, the manufacturing process's emissions may be affected by the change in waste flow input.
- Open loop recycling: For the input of recycled materials or energy during the manufacturing stage of the product system, the transportation between the recycling process and the recycling to material use shall be included in the dataset. For the product which shall be recycled during the manufacturing stage, the transportation towards the recycling process shall be included.

Notes:

- *Allocation may be avoided through avoidance of dividing processes, for example as described*

in Section 6.3 of ISO/TR 14049; or through expansion of system boundary (for example as described in Section 6.4), so that the amended system shares the same product exchanges as the original system.

8. Units

The base units and derived units of the International System of Units (SI, *Système International d'unités*) shall be used preferentially.

Power & energy units:

- power unit: W
- energy unit: J

Specification units:

- length unit: m
- capacity unit: m³
- area unit: m²
- weight unit: kg

If necessary, prefixes may be used before the SI units.

- 10⁹ = giga, symbol “G”
- 10⁶ = mega, symbol “M”
- 10³ = kilo, symbol “k”
- 10⁻² = centi, symbol “c”
- 10⁻³ = milli, symbol “m”
- 10⁻⁶ = micro, symbol “μ”
- 10⁻⁹ = nano, symbol “n”

9. Calculation rules and data quality requirements

Date quality requirements for the raw material acquisition stage

- Generic data may be used for the acquisition, production, forming and refining of raw materials used for the components of motorcycle products. Please refer to Appendix I for the common sources of generic data.

Date quality requirements for the manufacturing stage

Site specific data (for example, specific factory data or transportation data for a specific manufacturing process) shall be used for the manufacturing of components and assembly of motorcycle products. If other types of information are used, description of the information and rationale for using the information shall be provided. For site specific data of main component manufacturing plants, specific data from a plant representative of such a site may be used.

- Generic data may be used for the manufacturing of other components for the motorcycle products, and based the calculation on actual consumption. Please refer to Appendix I for the common sources of generic data.
- When generic data are used, the equivalence between the chemical and/or physical process of referred systems shall be considered. The system referred in the generic data should have equivalent technology and system boundaries with the declared product system. Moreover, it is also recommended to consider the date or geographic aspects of the data quality when

feasible.

- Generic data may also be used when suppliers refuse to provide specific data, or when even if generic data are used in place of specific data, there is only minor impact to the results. The general rule is that if generic data are used in place of specific data, their combined contribution for all life cycle stages shall not be greater than 20% of total impacts for each impact category. But there may be certain exception to specific products, and such exceptions shall be explained.
- The data shall be representative for the average of a specific year. If the average data for a specific year cannot be obtained, the average data for a specific time period may be used, the data shall be representative, and the reason for using such data shall be provided.
- The electricity mix for the manufacturing stage should be site specific data. If site specific data cannot be obtained, the official electricity mix for the country where the site is located may be used as approximate value. The electricity mix should be documented.
- For the definition of hazardous waste, the definition as defined in Taiwan's Waste Disposal Act shall be used for sites located in Taiwan. For sites located outside Taiwan, legal requirements for the host country shall be observed.
- For the transportation of main components to the assembly plant, the actual transportation modes used and distance traveled shall be considered.

Date quality requirements for the distribution and marketing stage

- For the transportation of product to the distribution sites or retailer sites, the actual mode of transportation and distance traveled shall be considered.

Date quality requirements for the use stage

- The energy consumption of the motorcycle shall be determined based on testing methodology stipulated in applicable international, national or industrial standards.
- For the electricity mix of the use stage, the generic data for the official electricity mix for the country/region where the product is being use may be used as approximate value. Please refer to Appendix I for the common sources of generic data used internationally.

Date quality requirements for the recycling/waste disposal stage

- For transportation of end-of-life motorcycles as post-consumer waste for delivery to processors or recyclers, the data from national, industry or consumer surveys can be used. When such data cannot be obtained, evaluation based on assumed scenario can be made, and the assumptions for such a scenario shall be reported in the EPD.
- Generic data may be used during the recycling/end-of-life stage, if for specific reason the site specific data for the recycling/waste disposal system can not be obtained. Then generic data and recycling rate may be used to calculate environmental impact. Please refer to Appendix I for the common sources of generic data used internationally.

10. Parameters to be declared in the EPD

The following parameters shall be declared in the EPD:

1. Energy use

- The energy consumption during each stage shall be declared, especially the electricity consumption during the use stage when the product is being used by the end user.

- The following units shall be used preferentially:
kW or W for power; J or MJ for energy.

2. Resource use

The resource input during each stage shall be declared.

3. Impact equivalents expressed as potential environmental impacts

-Global warming	kg CO ₂ equivalent
-Acidification	kg SO ₂ equivalent
-Photochemical oxidant formation	kg C ₂ H ₄ equivalent
-Eutrophication	kg PO ₄ ³⁻ equivalent
-Ozone depletion	kg CFC-11 equivalent

Note: For characterization factors of each impact category, please refer to *EPD Supporting Annexes*, Version 1.0 (2008-02-29), The International EPD Cooperation, downloadable from www.environdec.com.

4. Additional information

- Recyclable materials (optional)
- Information on secondary materials (optional)
- Waste (classification):
 - Hazardous waste as defined in Taiwan's Waste Disposal Act. Follow host countries' laws for sites outside Taiwan.
 - Other waste.
 - Where technologically possible, plastic parts of the motorcycle weighing ≥ 25 g shall be marked in accordance with the ISO 11469 and ISO 1043 Part 1/2/3/4, SPI or other international standard label to facilitate their identification and recovery at the end of life.
 - Plastic packaging materials marking: The Plastic packaging materials shall be labeled on the parts with SPI or other international standards for ease of sorting.

11. Recycling information

The recycling information shall include information such as dis-assembly instructions, which parts/components are suitable for recycling (such as metal casing) or not suitable for recycling. The information which the EU WEEE Directive requires the end product manufacturer to provide may also be included in the product declaration information for motorcycle products.

If practical, information for the parts which cannot be recycled and therefore should be disposed of properly during the end-of-life stage may also be included.

12. Other environmental information (Optional)

The EPD may cover information including technology adopted, site of product manufacturing and assembly, as well as information on other working environment, health and risk-related

14. References

The EPD shall make reference to the following documents:

- EPD General Program Instructions, Version 1.0 (2008-02-29), The International EPD Cooperation, downloadable from <http://www.environdec.com/>;
- Relevant PCR documents;
- The underlying LCA report.

When available, the following documents shall also be referenced:

- Other documents and recycling instructions which verify and complement the EPD.

Appendix I – Generic Data Sources to Refer to

For processes located within Taiwan, Taiwan generic data or the data published by the commercial, industrial and energy competent authorities of the Republic of China (ROC) government, may be used. However, for other regions (such as EU), if there are more relevant generic data available, these data should be used instead. The following generic databases are recommended for use.

Material	Database
Packing materials, transport, Waste treatments	BUWAL 250
Steel, Primary copper, Copper products, Electricity, Fuels, Aluminum, Chemicals, Transports, Waste management	ELCD
	EIME (Environmental Information and Management Explorer) EcoBilan
Plastics	PE Plastics Europe (Association of Plastics Manufacturers in Europe)
	ELCD
	EIME (Environmental Information and Management Explorer) EcoBilan
Electronic components	ELCD
	EIME (Environmental Information and Management Explorer) EcoBilan
General Database	Ecoinvent
	The Boustead Model
	PE-GaBi
	DoITPro(Taiwan)

Appendix II – Reporting Format for the EPD

This appendix provides guidance information for the titles of sections, types of data and required information to be reported in the mandatory reporting part of the EPD. As a generic reporting template, the following titles and sub-titles are recommended:

(Refer to the PCR manual for the section numbering, the information in Italics are the recommended data/information for inclusion)

Introductory part

Each EPD should have an introduction part on the top part of the EPD which includes the following information:

- *Company/organization name*
- *Product name*
- *EPD registration number*

Description of the company/organization and product/service

Company/Organization

- *Description of company/organization*
- *Description of overall working environment, existing quality system and environmental management system*

Product and services (see Section 2)

- *Product's main applications*
- *Description of product specification, manufacturing process, manufacturing sites (if there are several sites)*
- *For product's environmental performance aspects, characteristics which may improve the usefulness of product*
- *Other types of relevant information, for example, special manufacturing processes with special advantages to the environment*

List of materials and chemical substances

- *Content declaration (see Section 3)*

Presentation of the environmental performance

- *Outline of the LCA methodology, for example, period of LCA, declared units, system boundaries (graphical presentation), cut-off and allocation rules, and data sources.*

Manufacturing stage (see Section 10)

Use stage (see Section 10)

- Geographical region for product delivery
- Transportation data
- End-of-life information

Information about Company and Certification Organization

Recycling information (see Section 11)

Other environmental information (see Section 12)

Information regarding certification

- Names of certification and verification organizations
- Validity of certification certificates
- Compliance with legal and relevant requirements

References (see Section 13)

- relevant PCR documents
- EPD General Program Instructions, Version 1.0 (2008-02-29)
- underlying LCA study
- other supporting documents for LCA information
- other relevant documents regarding company/organization's environmental activities

Appendix III Abbreviations

Acronym	Common Name
APLAC	Asia Laboratory Accreditation Cooperation
CFP	Carbon Footprint of Product
EPD	Environmental Product Declaration
ErP	Energy Related Product
ILAC	International Laboratory Accreditation Cooperation
ILAC MAR	International Laboratory Accreditation Cooperation Mutual Recognition Arrangement
ISO	International Organization for Standardization
LCA	Life Cycle Assessment
PCR	Product Category Rule
RoHS	The Restriction of the use of certain Hazardous Substances in electrical and electronic equipment
SPI	Society of the Plastics Industry
TAF	Taiwan Accreditation Foundation
TEC	Typical Energy Consumption
Trpt	Transportation
WEEE	The Waste Electrical and Electronic Equipment Directive