

Product-Category Rules (PCR)
for Preparing an Environmental Product
Declaration (EPD) for
Charcoalization Products of Wood and Bamboo
PCR 2014:1.0

Taiwan Eco-Materials Industry Development Association

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1. General Information

This document is to be used as the product category rules (PCR) for the manufacturing of charcoalization products of wood and bamboo (“products”). The scope of products covers wood and bamboo materials produced after the charcoalization process, and includes both solid products and liquid products (wood/bamboo vinegar). However, wood and bamboo products produced through further processing of products covered by this PCR are not included in the scope of this PCR. The products include goods with the following CCC Codes: charcoal (4402100000-4), other charcoal (4402900000-7), and wood/bamboo vinegar (3824909990-2). The requirements specified in this PCR are intended to be used for EPDs certified in accordance with the ISO 14025 standard. This document shall be valid until December 31, 2017.

This PCR was first drafted by the Taiwan Eco-Materials Industry Development Association (TEMA), which also managed this PCR development project. Representatives from major Taiwanese manufacturers of similar products and stakeholders were invited by the TEMA to the open consultation meeting held on November 20, 2014, to participate in the discussion and review of this PCR. The Environment and Development Foundation (EDF) subsequently reviewed and approved this PCR.

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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-Business (B2B) and Business-to-Consumer/Customer, (B2C) communications. During the inventory of product related environmental impacts, the scope of inventory shall cover both the product and its packaging.

2.1 Product group function

The charcoalization products of wood and bamboo are solid and liquid products which are generated through the charcoalization process of bamboo and wood materials. When in contact with the environment, the solid charcoalization products can modify the ambient humidity and achieve the effects of odor reduction and soil improvement; while liquid charcoalization products (wood/bamboo vinegar) can be used as deodorant, soil improvement agent, plant growth promoter and antibacterial agent, etc.

Due to the difference in raw materials and manufacturing process, solid and liquid charcoalization products with different characteristics can be obtained, described as follows:

1. Wood charcoal: usually made from wood through the charcoalization process; commonly used for the purpose of humidity removal, filtration, adsorption, deodorant, soil improvement, far infrared heating, electromagnetic shielding, and fuel.
2. Bamboo charcoal: finished products are rich in holes, micro pores, and natural minerals. After charcoalization and activation process, the products are commonly used for the purpose of filtration, adsorption, odor removal, humidity removal, far infrared heating, electromagnetic shielding, soil improvement, insulation, etc.
3. Wood/bamboo vinegar: The main ingredient of this product is acetic acid, and is commonly used for the purpose of deodorant, antibacterial, soil improvement, plant growth promoter, pest control and environmental purification, etc.

2.2 Product components

The product's components include but not limited to the following:

1. Product: wood or bamboo charcoal (in the form of flakes, granules or powder) and wood/bamboo vinegar.
2. Packaging material: The exterior packaging of products may be in the form of fabric, non-woven cloth, decorative object, exterior housing, box, bag, and bottle.

2.3 Product technical description

The product technical description part of the EPD may include but not limited to the following information:

- product name
- product use
- type and nature of raw materials, such as Moso bamboo, Acacia tree, etc.
- scope of usage
- shelf life
- product size/weight

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 restricted/regulated by legal and customer requirements. For example, requirements on halogen-free (or low-halogen content), and restricted substances regulated by EU RoHS Directive; as well as complying with the requirements of EU Toy Safety

Directive (2009/48/EC), Packaging and Packaging Waste Directive (94/62/EC), REACH SVHC, or the United States Consumer Product Safety Programme (CPSIA), and other legal requirements on volatile organic compounds (VOC), food utensils, containers, packaging and other related hygiene standards.

4. Declared unit

The declared unit is one (1) piece or bag of product, with the indication of product weight or capacity/size.

5. System boundaries

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

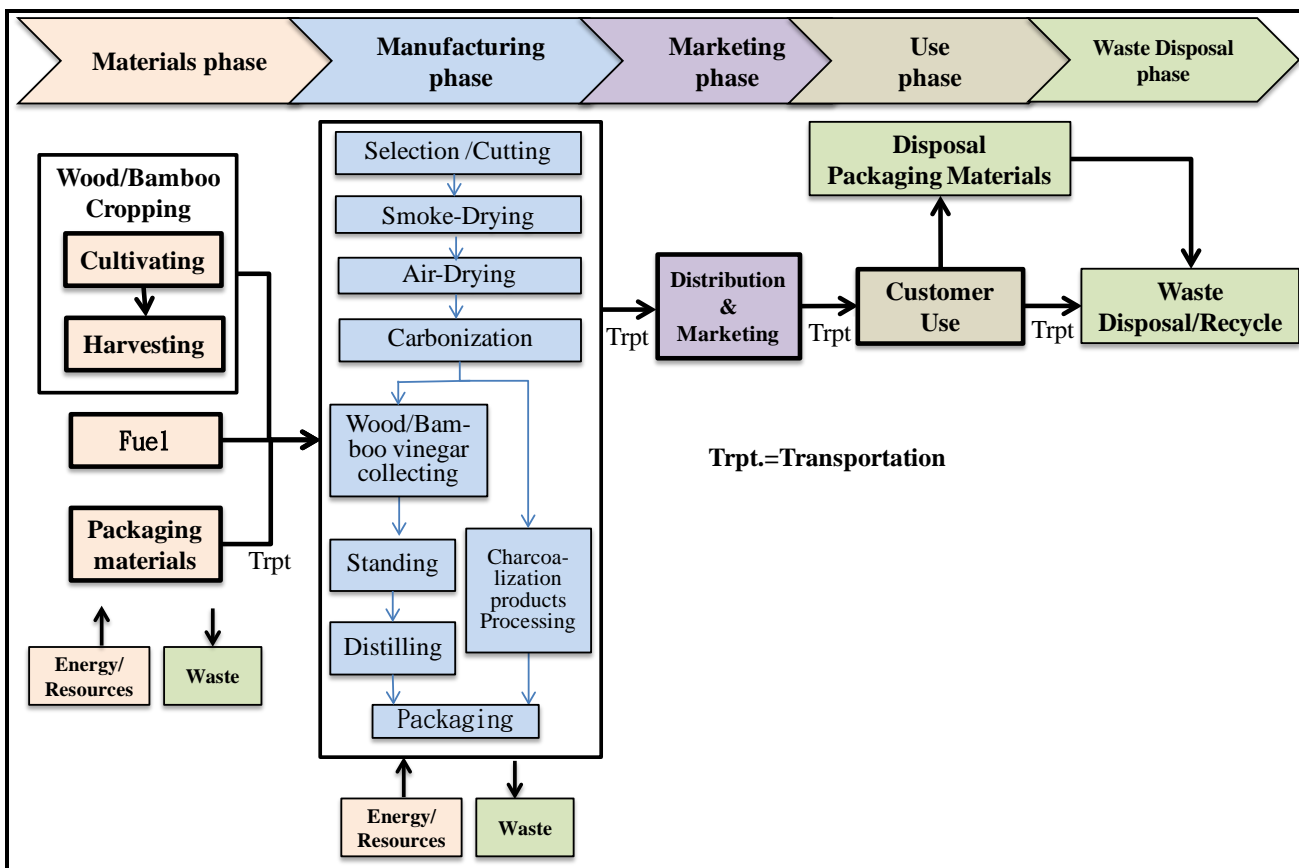


Figure 1 System boundary of the product system

As noted in Figure 1 above, the life cycle of the charcoalization products of wood and bamboo covers the five stages of product life cycle, including: raw material acquisition, product manufacturing, product distribution and marketing, product use, and recycling and end-of-life. The data quality requirements for the main raw materials are described in Section 9 on calculation rules and data quality requirements.

Raw Materials Acquisition Stage

The LCA shall include information for the following unit processes:

- Relevant processes for wood/bamboo growing stage and packaging material manufacturing;
- Relevant processes for energy and resource inputs during wood/bamboo harvesting;
- Processes associated with the raw material manufacturing within the above processes;
- Transportation of raw material/fuels to the manufacturing plant;
- Storage of carbon during the growing of wood and bamboo shall be calculated independently;

Reporting of raw material refining and forming, and transportation of raw materials is optional.

Manufacturing Stage

The LCA shall include information for the following unit processes:

- Processes associated with the processing of raw wood/bamboo materials, including smoking, gas drying, charcoalization, and processing (cutting/grinding);
- Processes associated with collection, storage and distillation of collected wood/bamboo vinegar after the charcoalization process;
- Processes associated with the packaging and shipping of finished products;
- Processes related to energy and resources consumption and electricity generation;
- Processes associated with the wastewater, waste gas and solid waste generated of the above processes;
- CO₂ emissions from wood or bamboo materials directly used as fuels for the above processes are not considered;

Reporting of information regarding the packaging material input/output during the manufacturing process and manufacturing of other materials is optional (voluntary).

Distribution and Marketing Stage

The distribution and marketing stage include the following processes:

- Transportation of products from the manufacturing plant to the distributors;
- If the packaging for finished products is recyclable, the packaging's actual recycling should be considered (e.g., recycling ratio);
- The following processes are not considered:
 - Marketing related processes;
 - Transportation from the point of sale to consumers, between various distribution centers or distributors, and consumers' transportation to the point-of-sales.

Use Stage

Depending on product use, the use stage shall include the following processes:

1. If the product is being used for the purpose of humidity and odor removal, there is no need to consider the environmental impact of the use stage.
2. If the product is being used as a fuel, the following impact shall be considered:
 - Energy/resource required for the wood/charcoal to reach ignition/burning point temperature;
 - CO₂ emissions from wood or bamboo materials directly used as fuels are not considered.
3. If the product is being used as a soil improvement agent, the associated greenhouse gas emissions shall be included into the calculation of the product as a carbon sink.

Recycling/end of life Stage

The recycling/end of life stage shall be considered based on the actual practice and shall include the following processes.

- Transportation of waste generated by end-of-life product to the recycling/disposal facilities;
- Environmental impacts associated with treatment of waste generated from the product through land-fill disposal or incineration at the treatment facilities.

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 quantity of the disposed waste needs to be considered; landfilling process does not need to be considered. 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 do 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 constituents 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 environmental impact 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.
- **Closed loop recycling**: For materials from the product system that are being recycled and reused within the same product system, the recycling ratio shall be considered to avoid double counting. The transportation and energy inputs from the recycling process to the reuse of materials 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

Data quality requirements for the raw material acquisition stage

- Generic data may be used for the extraction, forming and refining of the products' raw material.
- If recycled materials are used as the raw materials for the product, generic data may be used for the raw materials' manufacturing processes, including resource recycling process (recovery, pre-processing and reprocessing, etc.), or resource reuse process (recycling and cleaning, etc.).
- When generic data are used, the equivalence between the chemical and/or physical process, as well as the technology and system boundaries of the referred generic system with the declared product system shall be considered. Moreover, it is also recommended to consider the date or geographic aspects of the data quality when feasible. Please refer to Appendix I for the common

sources of generic data used internationally.

Data quality requirements for the manufacturing stage

- Site specific data (for example, specific data for a specific manufacturing plant's manufacturing process or transportation data) shall be used for the manufacturing of the products.
- If the product is produced by multiple manufacturers or manufacturing sites, the data may be weighted based on actual production, or cumulated for suppliers accounted for more than 50% of the product. The rationale for using such data shall be provided
- 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 exceptions 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 shall 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 transportation of main raw materials to the manufacturing plant, the actual transportation modes used and distance traveled shall be considered.

Data quality requirements for the distribution and marketing stage

- For transportation of products to the distributors or points-of-sales, the actual mode of transportation and distance traveled shall be considered.

Data quality requirements for the use stage

- Reporting of information related to this stage is optional.
- If the product is being used as a soil improvement agent, the associated greenhouse gas emissions shall be included into the calculation of the product as a carbon sink.

Data quality requirements for the recycling/end of life stage

- For transportation of post-consumer end-of-life products to the processors/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.
- If for specific reason the site specific data for the recycling/waste disposal system cannot be obtained, 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:

Resource use

- non-renewable resources
 - materials resources
 - energy resources (used for energy conversion purposes)
- renewable resources
 - material resources
 - energy resources (used for energy conversion purposes)
- secondary resources
 - material resources (pre-consumer or post-consumer recycling and reuse)
 - energy resources (used for energy conversion purposes)
- recovered energy flows (such as thermal energy) expressed in MJ
- water use divided into:
 - total amount of water (consider make-up water for in-plant recycling and reuse)
 - direct amount of water used by the core process

The following requirements on the resource declaration also apply:

- all parameters for resource consumption shall be expressed in mass, with the exception of renewable energy; resources used for the generation of hydroelectric, wind electricity and solar energy, which shall be expressed in MJ;
- all parameters shall not be aggregated but reported separately. Resources which contribute for less than 5% in each category shall be included in the resources list as “other”;
- nuclear power shall be reported among the non-renewable energy resources as kg of uranium calculated by converting the thermal energy (MJ) considering a reactor of III generation with an efficiency of 33%;
- the PCR can define other resources (for example rare materials originating from the LCI data) which may be listed and detailed in the EPD for each specific product category;
- the energy content into some products (such as paper or plastic based products) is useful information for the end of life management. For this reason, the “energy content of product” shall be declared in MJ: its estimation shall be made considering the gross calorific value of the product. Only the energy that is suitable for an eventual energy recovery at the end of life shall be considered (energy content of steel due to its carbon content for example shall not be considered since it is not practically recoverable);
- energy content of biomass used for feed or food purposes shall not be considered.

Impact equivalents expressed as potential environmental impacts

The potential environmental impacts associated with the various types of use of resources and pollutant emissions shall be reported into the following impact categories:

- Emission of greenhouse gases (expressed as the sum of global warming potential, GWP, 100 years, in CO₂ equivalents).
- Emission of acidifying gases (expressed as the sum of acidifying potential in sulphur dioxide (SO₂) equivalents).
- Emission of gases that contribute to the creation of ground-level ozone (expressed as the sum of ozone-creating potential, ethene-equivalents).
- Emission of substances to water contributing to oxygen depletion (expressed as phosphate (PO₄) equivalents).

Impact categories for optional declaration

- Emission of ozone-depleting gases (expressed as the sum of ozone-depleting potential in mass of CFC 11-equivalents, 20 years).

Waste

- hazardous waste (as defined in Taiwan's Waste Disposal Act, or follow host countries' laws for sites outside Taiwan).
- non-hazardous waste

Note: For characterization factors of each impact category, please refer to *General Programme Instructions For The International EPD System, Version 2.01 (2013-09-18)*.

11. Recycling information

If practical, information for the constituents/components which can not be recycled and therefore should be disposed of properly during the end-of-life stage may also be included.

Recycling marking for product's plastic components and plastic packaging material (optional information):

- Plastic parts marking: Where technologically possible, plastic parts of the product 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 material marking: The Plastic packaging materials shall be labeled on the parts with SPI or other international standards for ease of sorting.

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 aspects.

If this PCR is to be used for product carbon footprint declaration purpose, in the declaration, information regarding commitment on GHG reduction should be included and shall ensure that the commitment is measurable, reportable and verifiable. The organization may also list environmental and energy management related information, such as awards, commendations and system certifications (e.g., ISO 14001, ISO 14064-1, IECQ HSPM) etc.

13. Information about the certification

The information on PCR review, EPD verification and verification organization shall be included.

<p>EPD Certification is valid until 20XX- __ - __</p> <p>According to the Requirements for the international EPD system, <i>General Programme Instructions, Version 2.01 (2013)</i> – www.environdec.com.</p> <p>The PCR review for _____ (PCR 2014:) was administered by the Environment and Development Foundation and carried out by an LCA expert panel chaired by Dr. Wen-Ching Chen (wencc@edf.org.tw).</p> <p>Independent verification of the declaration, according to ISO 14025:2006</p> <p style="text-align: center;"><input type="checkbox"/> Internal <input checked="" type="checkbox"/> External</p>	
<p>Third party verifier: Environment and Development Foundation in Taiwan.</p> <p>Accredited by :</p>	
<p>Name:</p> <p>Title:</p> <p>Organization:</p>	<p>Signature: _____</p>
<p>Name:</p> <p>Title:</p> <p>Organization:</p>	<p>Signature: _____</p>
<p>Name:</p> <p>Title:</p> <p>Organization:</p>	<p>Signature: _____</p>
<p>Environmental declarations from different programmes may not be comparable.</p>	

14. References

The EPD shall make reference to the following documents:

- GENERAL PROGRAMME INSTRUCTIONS FOR THE INTERNATIONAL EPD® SYSTEM, Version 2.01 (2013-09-18), downloadable
from: http://www.environdec.com/Documents/GPI/General_programme_instructions_2_01_20130918.pdf
- 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. When data from the following generic databases are used, the most current and updated data should be used.

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 (see Section 13)

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

References (see Section 14)

- *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