ENVIRONMENTAL PRODUCT DECLARATION

In accordance with ISO 14025 and EN 15804 for:

Iron Oxide Black

From

Zhejiang Huayuan New Materials Co., Ltd.

Declared product:

Programme operator:	EPD China
Registration number:	EPD-CN-00039
Issued date:	2025-12-09
Valid until:	2030-12-08

Programme Information

EPD Owner	Zhejiang Huayuan New Materials Co., Ltd.
Product Name	Iron Oxide Black
Production Site	Zhongguan Town, Deqing County, Zhejiang Province, China
Identification of product	Industrial classification for national economic activities : C2643 Product identification code listed at National Bureau of Statistics of China : HS 2821100000
Field of Application	Huayuan Iron Oxide Black is widely used in various building materials products such as concrete products, cement mortar, stone coloring, asphalt, building materials, as well as industrial coatings, paints, rubber, papermaking, ceramics, etc.
Programme Operator	EPD China Address of Headquarter: Tianping Road, Xuhui District, Shanghai Website: www.epdchina.cn Email: info@epdchina.cn | secretary@epdchina.cn
LCA Practitioner	Yang Dong
Responsibility	The EPD owner has the sole ownership, liability, and responsibility for the EPD
Comparability	EPDs within same category of product in different programme operator are not suggested to be compared. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible even applying the same PCR.
Liability	The EPD owner has the sole ownership, liability, and responsibility for the EPD.
Validity	The EPD is published on 2025-12-09 and valid to2030-12-08
LCA Software (version)	SimaPro 10.2
LCI Dataset (version)	Ecoinvent 3.10
Year(s) of Primary Data	01/2024-12/2024
PCR	EPDCN-PCR-202204 PCR For Construction Products and Construction Services V2.1
Other Reference Document	EN 15804:2012+A2:2019 Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products
Verification statement according EN15804	
Independent verification of the declaration and data according to EN ISO 14025:2010 ☐ internal ☑ external Third-party institution verification: <Huifang Pang, China Standard Conformity Assessment CO.,LTD.> is an approved certification body accountable for third-party verification Approved by: EPD China	
Procedure for follow-up of data during EPD validity involves a third-party certification body: ☐ Yes ☑ No	

General Information

1.1 Company information

- **Owner of the EPD:**

Zhejiang Huayuan New Materials Co., Ltd.

- **Address:**

Zhongguan Town, Deqing County, Zhejiang Province, China

- **Email:**

huayuan@shenghuagroup.com

- **Website:**

www.ironoxide.com.cn

- **Description of the Company:**

Zhejiang Huayuan New Materials Co., Ltd., established in 1996, is a leading enterprise in the iron oxide new materials industry in Asia and even globally. It holds controlling shares in Zhejiang Huayuan New Materials Sales Co., LTD., Toda United Industry (Zhejiang) Co., LTD., Guangxi Yongfu Huayuan Technology Co., LTD., and Jiaozuo Baili United Pigment Co., LTD. The company covers an area of 350,000 square meters, has nearly 1,000 employees, and produces and sells nearly 240,000 tons of iron oxide series products annually. Its products are sold in all provinces, municipalities and autonomous regions of China as well as over 80 countries and regions on five continents.

Figure 1: Bird 's-eye view photo of the enterprise

The company offers a comprehensive range of products, including iron oxide red, iron oxide yellow, iron oxide black, iron oxide orange, iron oxide brown, composite iron green, as well as ultrafine, calcined, granular, high-temperature resistant, and color paste processing series with nearly 200 varieties. Moreover, there are dozens of high-tech and high-value-added new products applied in different industries such as tobacco, electronics, medicine, cosmetics, food, papermaking, and catalysts.

The enterprise was certified with ISO9001 international quality standard system in 1998, ISO14001 environmental management system in 2006, GB/T28001 occupational health and safety management system in 2010, and passed the CE certification strictly required by the European Union in 2010. It has also completed the official registration with the EU REACH.

In 2019, the enterprise was awarded the Quality Award by the Deqing County Government and was recognized as a Four-star Green Factory in Huzhou City. In 2020, the enterprise's sustainable development project was certified, the high-tech enterprise was re-recognized, the "HYROX" trademark was re-recognized as a Zhejiang export famous brand, and the tobacco-specific iron oxide yellow pigment was released as a "Three-Character Mark Zhejiang Manufacturing" group standard. In 2021, the enterprise was selected as a provincial "hidden champion" cultivation enterprise and was awarded the title of "Demonstration Enterprise for Technological Innovation in China's Petrochemical Industry". In 2022, the enterprise was recognized as a national-level "Little Giant" enterprise specializing in niche markets. The company's tobacde-specific iron oxide yellow, low-arsenic iron oxide red, and high-temperature resistant coated iron oxide yellow products have been successively recognized as national key new products, national Torch Program projects, and high-tech products of Zhejiang Province. In 2023, the "HYROX" trademark was re-recognized as a famous export brand in Zhejiang Province. The company's "Key Technology Research and Industrialization of Near-Infrared Reflective Function Coated Iron Oxide Green Pigment" was included in the first batch of "Sharpshooter" research and development breakthrough projects of Zhejiang Province in 2023. The project "Key Technology Research and Development of Environmentally Friendly High Temperature Resistant Coated Iron Oxide Yellow Pigment" won the first prize of the "National Commercial Science and Technology Progress Award" of the China General Chamber of Commerce in 2023. The projects "New Functional Iron Oxide Materials for Environmental Purification" and "High-Activity Iron Oxide Combustion Accelerator for Waste Incineration" passed the provincial industrial new product appraisal and review. In 2024, it was awarded the title of "Meritorious Enterprise of Zhejiang Coatings Industry Association" and "Demonstration Enterprise for Technological Innovation in China's Petroleum and Chemical Industry".

At present, the enterprise has a total of 90 valid independent patents, including 40 invention patents and 50 utility model patents. It is a patent demonstration enterprise in Zhejiang Province.

The enterprise has always adhered to the business tenet of "people-oriented, meticulous management, technology-driven development, and industrial contribution to the country", with sustainable development as its business philosophy. It constantly enhances its comprehensive competitive strength, actively builds a healthy and happy enterprise, and is committed to "adding brilliant colors to the world".

1.2 Scope and type of EPD

- **Description of system boundaries:**

Cradle-to-gate（A1-A3）

This study adopts a system boundary from "cradle to gate", covering only the product stage (Modules A1-A3), raw material supply, transport, and production.

Due to the inability to obtain relevant data after the product leaves the factory, this study does not include the construction process stage (Modules A4-A5) and the usage stage (Modules B1-B7). Because the product must be physically integrated with other products during use, it cannot be physically separated at the end of its lifespan; due to physical changes, the product cannot be identified at the end of its life cycle; and the product does not contain bio-carbon. Therefore, this study does not include the end-of-life stage (Modules C1-C4) and the reuse, recycling and recovery outside the system boundary (Module D).

- **Time representativeness:**

01/2024-12/2024

- **System diagram:**

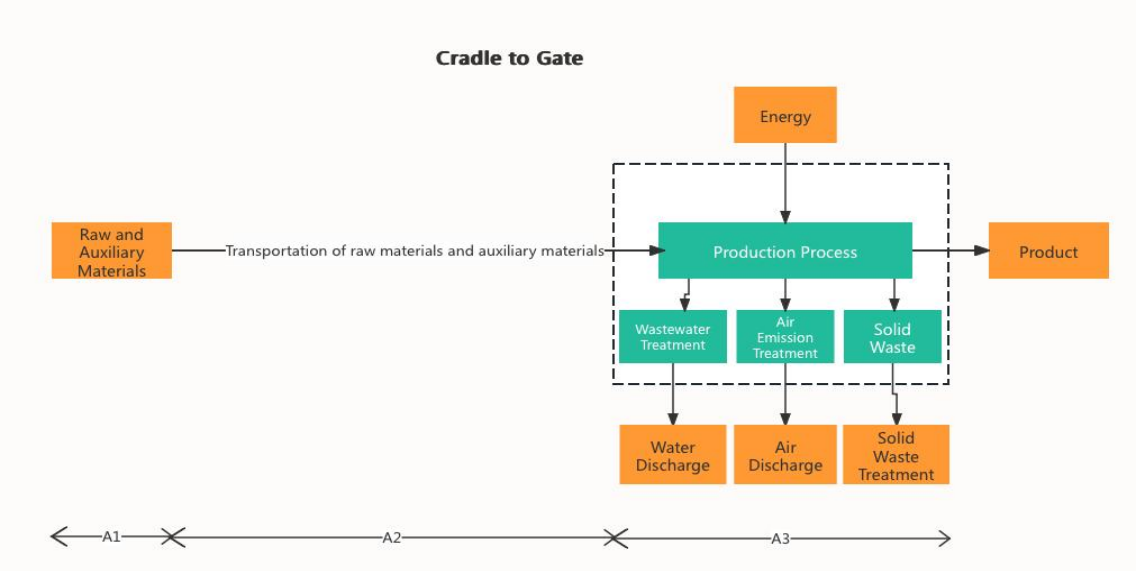

Figure 2: System diagram

Table 1: Process stages and and EPD modules.

PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITSAND LOADSBEYOND THESYSTEM BOUNDARIES
Raw material supply	**Transport**	**Production**	**Transport from the gate to the**	**Assembly**	**Use**	**Maintenance**	**Repair**	**Replacement**	**Refurbishment**	**Operational energy use**	**Operational water use**	**Deconstruction/ demolition**	**Transport**	**Waste processing**	**Disposal**	**reuse- recovery- recycling- potential**
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
x	x	x	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

- **A1 Raw material supply:**

Module A1 mainly involves the emissions generated by various raw materials provided by upstream suppliers, including those resulting from the production processes of various raw materials and energy.

- **A2 Transportation of raw materials to manufacturer**

Module A2 mainly involves the emissions resulting from the transportation of various raw materials provided by upstream suppliers to the factory.

- **A3 Manufacturing**

Module A3 mainly involves the emissions generated. The carbon emissions produced during the production process mainly consist of those from energy usage and waste disposal.

2 Detailed Product Description

- Description of the product

The iron oxide black products of Zhejiang Huayuan New Materials Co., Ltd. have a complete range of specifications. Their physical forms include powder type and ultrafine powder type, meeting the individualized needs of different customers.

These products are widely used in various building materials such as concrete products, cement mortar, stone coloring, asphalt, building coatings, industrial coatings, paints, rubber, papermaking, ceramics, etc.

Figure 3: Picture of the declared product.

- Description of the production processes

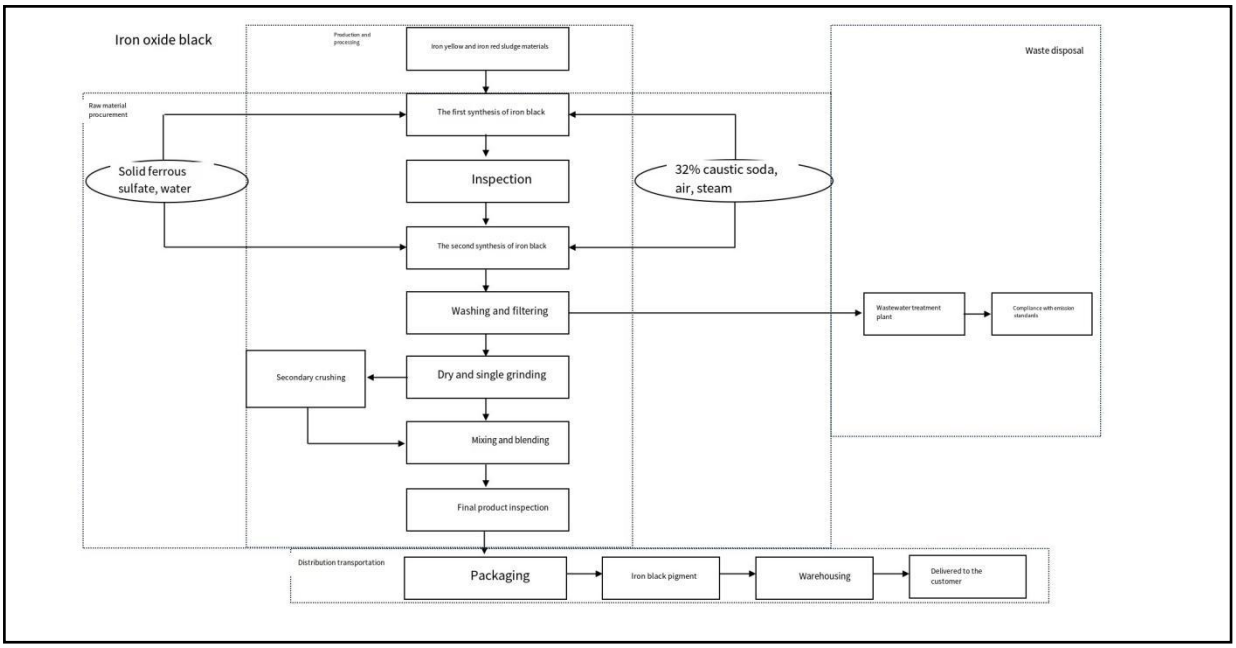

Figure 4: The production process in selected stages.

- Product components

Table 2: Main product components per unit.

Product components	Weight, kg	Weight-% (versus the product)
Fe_2O_3	962.00	96.2%
Impurity	27.30	3.80%
TOTAL	1000.00	100%
Product components	Weight, kg	Weight-% (versus the product)
Packaging bag（polypropylene）	2.3	0.23%

These products contain no substances of very high concern (SVHC) on the REACH Candidate List published by the European Chemicals Agency.

3 LCA results according to EN 15804

3.1 Environmental Impacts

The results of the underlying LCA are provided in this section as environmental impacts, resource use, output flows and additional information on biogenic carbon. All pre-set parameters of EN 15804 are required.

Table 3: Environmental impacts according to EN 15804.

RESULTS OF THE LCA - ENVIRONMENTAL IMPACT per functional or declared unit					
Core indicator	Unit	A1-A3	A1	A2	A3
Global Warming Potential total (GWP-total)	kg CO2 eq.	2.80E+03	9.77E+02	6.28E+01	1.76E+03
Global Warming Potential fossil fuels (GWP-fossil)	kg CO2 eq.	2.80E+03	9.73E+02	6.27E+01	1.76E+03
Global Warming Potential biogenic (GWP-biogenic)	kg CO2 eq.	5.74E-01	2.91E+00	3.57E-02	-2.37E+00
Global Warming Potential land use and land use change (GWP-luluc)	kg CO2 eq.	1.72E+00	1.31E+00	8.19E-02	3.30E-01
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 eq.	9.73E-5	7.78E-5	7.85E-7	1.86E-5
Acidification potential, Accumulated Exceedance (AP)	mol H+ eq.	1.43E+01	7.01E+00	5.36E-01	6.71E+00
Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater)	kg P eq.	7.24E-01	4.93E-01	5.33E-03	2.25E-01
Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine)	kg N eq.	2.78E+00	1.44E+00	2.40E-01	1.11E+00
Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	mol N eq.	2.92E+01	1.49E+01	2.62E+00	1.17E+01
Formation potential of tropospheric ozone (POCP)	kg NMVOC eq.	9.75E+00	4.44E+00	7.27E-01	4.59E+00
Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	kg Sb eq.	1.87E-02	1.80E-02	7.4403874E-5	6.14E-04
Abiotic depletion potential for fossil resources (ADP-fossil)	MJ, net calorific value	3.67E+04	1.43E+04	7.61E+02	2.16E+04
Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	m3 world eq. Deprived	5.76E+02	4.92E+02	4.70E+00	7.98E+01

3.2 Resource use and waste categories

Table 4: Resource use and waste categories according to EN 15804.

RESULTS OF THE LCA - Resource use and waste categories per functional or declared unit					
Core indicator	**Unit**	A1-A3	**A1**	**A2**	**A3**
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE)	MJ	2.01E+03	1.46E+03	1.65E+01	5.33E+02
Use of renewable primary energy resources used as raw materials (PERM)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of renewable primary energy resources (PERT) (primary energy and primary energy resources used as raw materials)	MJ	2.01E+03	1.46E+03	1.65E+01	5.33E+02
Use of non-renewable primary energy excluding non- renewable primary energy resources used as raw materials (PENRE)	MJ	3.92E+04	1.53E+04	8.17E+02	2.30E+04
Use of non-renewable primary energy resources used as raw materials (PENRM)	MJ	0.00E+00	1.06E+02	0.00E+00	-1.06E+02
Total use of non-renewable primary energy resources (PENRT) (primary energy and primary energy resources used as raw materials)	MJ	3.92E+04	1.54E+04	8.17E+02	2.29E+04
Use of secondary material (SM)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels (RSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels (NRSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Net use of fresh water (FW)	m3	1.56E+01	1.32E+01	1.45E-01	2.18E+00
Hazardous waste disposed (HWD)	kg	1.07E+01	0.00E+00	0.00E+00	1.07E+01
Non-hazardous waste disposed (NHWD)	kg	4.25E+01	0.00E+00	0.00E+00	4.25E+01
Radioactive waste disposed (RWD)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Components for re-use (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for recycling(MR)	kg	4.25E+01	0.00E+00	0.00E+00	4.25E+01
Materials for energy recovery (MER)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy (EE)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00

3.3 Information on biogenic carbon content

Information on biogenic carbon content which shall be included in the EPD as follows:

Table 5: Information on biogenic carbon according to EN 15804

Biogenic carbon content	**Unit (expressed per functional unit or per declared unit)**
Biogenic carbon content in product	0 kg C
Biogenic carbon content in accompanying packaging	0 kg C
NOTE：1 kg biogenic carbon is equivalent to 44/12 kg of CO2.	

4 Supplementary information

4.1 Calculation rules

- **Declared unit**

The 1000kg powder type and ultra-fine powder type iron oxide black pigment products produced by Zhejiang Huayuan New Materials Co., Ltd.

- **Cut off rules**

There are many types of unit process data, but some data account for a very small proportion. If all of them are collected, it will be difficult to complete the list. The principles for data selection in the LCA unit process of the product are as follows:

(1) All inputs of energy are listed;

(2) All inputs of raw materials are listed;

(3) Input items where the mass of auxiliary materials is less than 1% of the total raw material consumption can be ignored;

(5) The consumption and emissions of infrastructure for roads and factories, equipment for each process, personnel within the factory area, and living facilities can all be disregarded.

(6) The selection criteria do not apply to toxic and harmful substances. Any toxic and harmful materials and substances should be included in the list.

(7) The total amount of materials ignored in the system shall not exceed 5% of the mass, energy or environmental emissions.

- **Data quality**

The data sources for life cycle assessment are divided into two categories: on-site data from Zhejiang Huayuan New Materials Co., Ltd. and background data. On-site data was collected in the form of research forms, which were completed by personnel from each production department on a per-unit process basis. The specific contents of the research form include: input-output data of raw materials, auxiliary materials and energy, as well as the transportation methods and distances of raw materials, auxiliary materials and waste.

The background data is selected from Ecoinvent3.10, with priority given to life cycle assessment data representing the average domestic production level in China, to minimize the impact of external data quality on the practical application value of the list results to the greatest extent.

In this project, the data quality is controlled in the following ways:

(1) The data quality evaluation system of this project refers to the PEF data quality scoring rules. The methods for evaluating data quality are detailed in Appendix B: Data Quality Scoring Principles.

(2) In the actual operation process, each piece of data records information such as its data source, data time, and the origin and destination of the data.

(3) According to the data quality evaluation requirements in ISO 14044 standard, the following evaluations of data quality are made:

The activity data is on-site data, and the data collection period is from January to December 2024. Collecting specific technologies and their combinations can truly reflect the characteristics of time span, geographical scope and technical coverage, and has good representativeness.

Background data should be selected from Ecoinvent 3.10, with priority given to life cycle assessment data representing the average domestic production level in China.

- **Allocations**

The iron oxide black workshop only produces iron oxide black products and does not produce any other co-products. The energy consumption data of the iron oxide black product is recorded by the energy metering equipment in this workshop and does not involve any allocation.

System boundary is "cradle-to-gate", which includes three stages: A1: raw material supply, A2: transportation, and A3: production, without involving the waste recycling and disposal stage.

The production process of the product utilizes both municipal grid electricity and photovoltaic electricity (Electricity usage ratio：municipal grid electricity 98.92%、photovoltaic electricity 1.08%).

The municipal electricity is provided by the national grid (East China Grid), and the electricity consumption is recorded by the national grid's electricity meter. A monthly electricity settlement statement is provided by the national grid. The municipal electricity data set is selected from “Electricity, medium voltage {CN-ECGC}| market for electricity, medium voltage | Cut-off, U” of Ecoinvent 3.10 database.

The photovoltaic electricity comes from the rooftop photovoltaic systems within the enterprise's premises (in Zhejiang region), and the usage method is to sign a electricity purchase contract with a third-party electricity sales enterprise. The photovoltaic electricity is used for self-generation and self-consumption, and the usage amount of photovoltaic electricity is recorded by the photovoltaic electricity meter. The photovoltaic electricity data set is selected from “Electricity, low voltage {CN-ZJ}| electricity production, photovoltaic, 3kWp slanted-roof installation, single-Si, panel, mounted | Cut-off, U” of Ecoinvent 3.10 database.

4.2 Scenarios and additional technical information

The on-site data types of Zhejiang Huayuan's Iron Oxide Black include transportation data, input-output data of unit processes, etc.

(1) Transportation data

Transportation data includes the mode and distance of material delivery to the factory area, including road transportation and inland waterway shipping. During the transportation stage, the transportation of major purchased raw materials and auxiliary materials such as caustic soda, ferrous sulfate was taken into consideration. Transportation data also includes the distance and mode of transportation of the waste output from each unit process out of the factory.

(2) Input-output data of the process (unit process)

The input-output data of unit processes include eight categories: products, raw materials, energy, auxiliary materials, solid waste, air emissions, and water body emissions. Activity data is collected through on-site investigations, meter reading records, company monthly reports or test reports, etc., and the data is checked through material balance checks. Raw materials are calculated based on the declared units and allocated according to the product output. Based on the company's statistical data, collect energy consumption such as electricity and water usage, and calculate them by product output according to the declared units. The output of each process is also calculated based on the declared unit/functional unit.

4.3 Analysis of uncertainty

Based on the recommended base uncertainty factors and uncertainty data based on data quality listed in the LCA report template below, Zhejiang Huayuan conducted a sensitivity analysis of the list data. This analysis mainly refers to the change rate of corresponding indicators caused by the change rate of the unit of list data. Through the sensitivity analysis of list data, the aim is to evaluate the reliability by determining whether the final results and conclusions are affected by uncertainties such as the calculation of data or type parameters. Combined with the sensitivity analysis, the most important environmental emission load factors in the entire process can be identified. And in combination with the potential improvement assessment, the most effective improvement points can be identified.

Iron filings, biochemical waste, and wastewater are collected based on the ledger data formed by the company's regular statistics. Key pollutant indicators for water bodies and air, such as COD and sulfuric acid mist (sulfuric acid), are measured through outlet detection and recorded according to the data from third-party testing reports, and have been incorporated into the model to become driving factors for AP and EP indicators.

The uncertainty method used in this study is the Monte Carlo Simulation (MCS) method, based on the probability distribution of the input parameters, through 10,00 iterations of sampling, the probability distribution function of the results is generated. The type of parameter distribution mainly adopts the log-normal distribution, and the 95% confidence interval of the key primary data is determined.

Table 6: Uncertainty assessment results

Core indicator	Unit	Coefficient of Variation, CV%	Result upper and lower limits (95% confidence interval)
Global Warming Potential total (GWP-total)	kg CO2 eq.	3.91%	[2.59E3,3.03E3]
Global Warming Potential fossil fuels (GWP-fossil)	kg CO2 eq.	3.91%	[2.58E3,3.03E3]
Global Warming Potential biogenic (GWP-biogenic)	kg CO2 eq.	50.30%	[0.0281,1.2]
Global Warming Potential land use and land use change (GWP-luluc)	kg CO2 eq.	7.26%	[1.49,1.97]
Depletion potential of the stratospheric ozone layer (ODP)	kg CFC 11 eq.	7.61%	[8.39E-5,0.000112]
Acidification potential, Accumulated Exceedance (AP)	mol H+ eq.	4.61%	[11.7,14]
Eutrophication potential, fraction of nutrients reaching freshwater end compartment (EP-freshwater)	kg P eq.	6.56%	[0.618,0.797]
Eutrophication potential, fraction of nutrients reaching marine end compartment (EP-marine)	kg N eq.	4.67%	[2.21,2.66]
Eutrophication potential, Accumulated Exceedance (EP-terrestrial)	mol N eq.	4.58%	[23.1,27.6]
Formation potential of tropospheric ozone (POCP)	kg NMVOC eq.	4.21%	[8,9.43]
Abiotic depletion potential for non-fossil resources (ADP-minerals&metals)	kg Sb eq.	9.14%	[0.0155,0.0221]
Abiotic depletion potential for fossil resources (ADP-fossil)	MJ, net calorific value	4.06%	[3.29E4,3.87E4]
Water (user) deprivation potential, deprivation-weighted water consumption (WDP)	m3 world eq. Deprived	8.06%	[480,657]

References

(1) ISO 14025:2006 Environmental labels and declarations — Type III environmental declarations — Principles and procedures
(2) ISO 14040:2021 – Environmental management – Life cycle assessment – Principles and framework
(3) ISO 14044:2021 – Environmental management – Life cycle assessment – Requirements and guidelines.
(4) EN15804 :2012+A2:2019: Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.
(5) EPD CN-PCR-202204 PCR For Construction Products and Construction Services V2.1
(6) EPD China General Programme Instruction.

Programme operator EPD China
Registration number EPD -CN - 00039

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