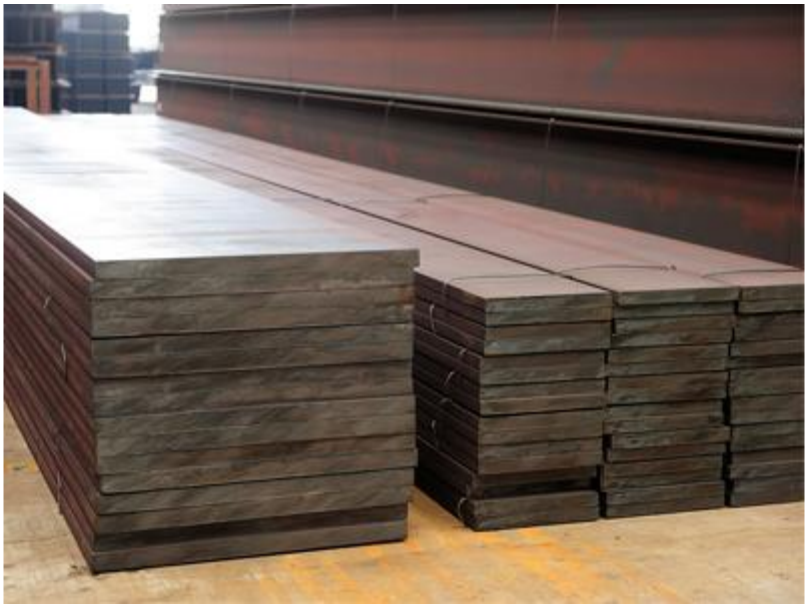
ENVIRONMENTAL PRODUCT DECLARATION

HOT ROLLED STRUCTURAL STEEL PLATE



Hot Rolled structural steel plates include "Hot Rolled H-Beam", "Checkered H-Beam" and "U-type Sheet Piles"

TUNG HO STEEL ENTERPRISE CORP.

From its beginnings in "Tung Ho Hang" to today's Tung Ho Steel Enterprise Corporation, the company has always made trustworthiness the company's spiritual essence in its business. The company's core business values and objectives are embodied in the pursuit of exceptional contributions to society. Trustworthiness does not merely represent the company's trustworthiness in relation to outside parties, customers, and society, but also signifies trustworthiness in its employees and in itself.

In response to global warming, in order to effectively mitigate the impacts of climate change, Tung Ho Steel is actively promoting energy conservation and CO_2 reductions, as well as proactively disclosing the carbon footprint information for its products. Through product carbon footprint inventory, it is possible to learn about the greenhouse gas emissions throughout a product's lifecycle. This enables effective problem identification and implementation of low-carbon and energy-conserving design philosophies to increase service competitiveness.

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UL CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

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HOT ROLLED STRUCTURAL STEEL PLATE

According to ISO 14025, EN 15804 and ISO 21930:2017

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Environment 333 Pfingsten Road Northbrook, IL 60611 https://www.ul.com/ https://spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	General Program Instructions v.2.5 March 2020
MANUFACTURER NAME AND ADDRESS	TUNG HO STEEL ENTERPRISE CORP. Headquater 6F., No.9, Sec. 1, Chang-an E. Rd., Taipei City 10441, Taiwan Site for which this EPD is representative: Miaoli Works Address: No. 22,Pingding, Erhu Vil., Xihu Township, Miaoli County 36842, Taiwan Contact: K. U. Wu h82wku@tunghosteel.com
DECLARATION NUMBER	4789597922.101.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	Hot Rolled Structural Steel Plate Declared Unit: 1 metric ton
REFERENCE PCR AND VERSION NUMBER	Part A: Life Cycle Assessment Calculation Rules and Report Requirements, UL Environment; Part B: Requirements on the EPD for Structural steels, Institut Vauen und Umwelt e.V., Version 1.6
DESCRIPTION OF PRODUCT APPLICATION/USE	Plate-type steel products from billet through hot-rolling production processes have optimal steel strength and resilience, good weldability, and are easily processed into components of various complex shapes.
PRODUCT RSL DESCRIPTION (IF APPL.)	Not Applicable
MARKETS OF APPLICABILITY	North America, Europe, Global
DATE OF ISSUE	2021 January 1
PERIOD OF VALIDITY	5 Year
EPD TYPE	Product-Specific
RANGE OF DATASET VARIABILITY	N/A
EPD SCOPE	Cradle-to-gate
YEAR(S) OF REPORTED PRIMARY DATA	2019
LCA SOFTWARE & VERSION NUMBER	SimaPro 9.0.0.49
LCI DATABASE(S) & VERSION NUMBER	Ecoinvent & U.S. LCI Database & Taiwan EPA Carbon Footprint Database
LCIA METHODOLOGY & VERSION NUMBER	CML-IA(Base line), TRACI 2.1 v1.05 EDIP2003, AWARE, Cumulated Energy Demand, Recipe 2016 Midpoint

This PCR review was conducted by:	Institut Bauen und Umwelt e.V. IBU Independent Expert Committee (SRV)
This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL	Grant R. Martin, UL Environment
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	James Mellentine, Thrive ESG

LIMITATIONS

Exclusions: EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc.

Accuracy of Results: EPDs regularly rely on estimations of impacts; the level of accuracy in estimation of effect differs for any particular product line and reported impact.

Comparability: EPDs from different programs may not be comparable. 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". Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

1. Product Definition and Information

1.1. Description of Company/Organization

From its beginnings in“Tung Ho Hang”to today's Tung Ho Steel Enterprise Corporation, the company has always made trustworthiness the company's spiritual essence in its business. The company's core business values and objectives are embodied in the pursuit of exceptional contributions to society.

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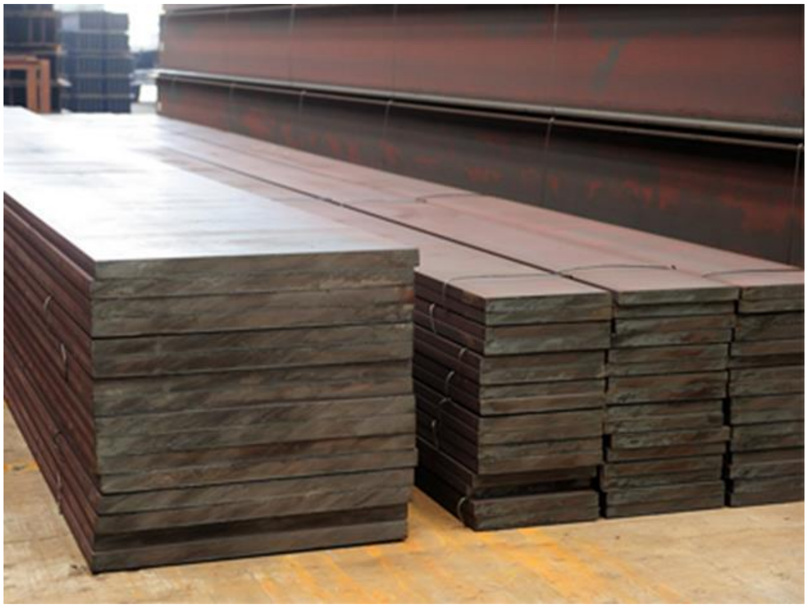
1.2. Product Description

Product Identification

Plate-type steel products from billet through hot-rolling production processes have optimal steel strength and resilience, good weldability, and are easily processed into components of various complex shapes.



Product Specification

The products own CE MARK for LRV, and can be customized in accordance with Chinese National Standard(CNS), Australian Standard(AS), Japanese Industrial Standard(JIS), European Standard(EN), British Standard(BS) and American Society for Testing and Materials Standard(ASTM). For more details of technical specifications such as: dimensions, properties and steel grade of steel plate, please visit:
https://www.tunghosteel.com/EN/HomeEg/Product/Intro/2

Technical Data

NAME	VALUE	UNIT
Density	7,850	kg/m^3
Modulus of elasticity	2.1	N/mm^2
Coefficient of thermal expansion	11.6	$10^{-6}K^{-1}$
Thermal conductivity	80.2	W/(mK)
Melting point	1,493	˚C
Electrical conductivity at 20°C	1,030	$\Omega^{-1}m^{-1}$
Minimum yield strength (für Bleche)	345	N/mm^2
Minimum tensile strength (für	450	N/mm^2

Bleche)		
Minimum elongation (für Bleche)	≧18	%
Tensile strength	≧450	N/mm²

Extraordinary effects for Fire, Water, and Mechanical Destruction

Special Fire Fighting Procedures - Do not use water on molten metal. Do not use Carbon Dioxide (CO_2). Firefighters should not enter confined spaces without wearing NIOSH/MSHA approved positive pressure breathing apparatus (SCBA) with full face mask and full protective equipment.

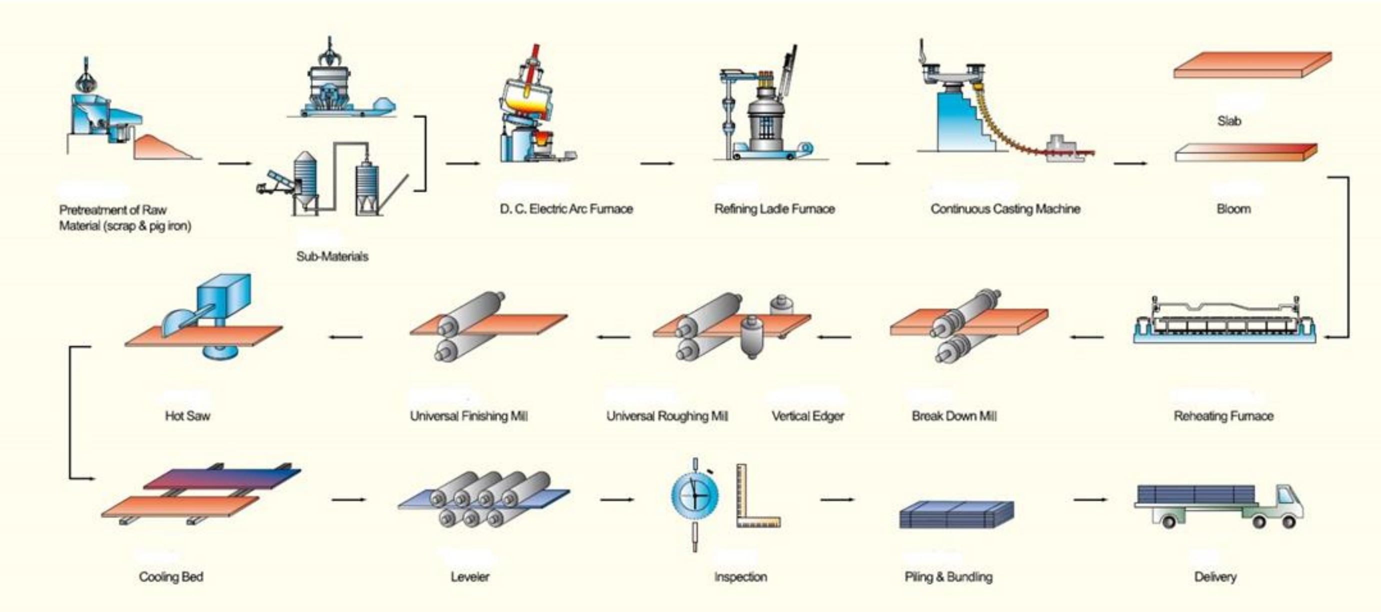
Unusual Fire or Explosion Hazards - Steel products do not present fire or explosion hazards under normal conditions. Any non-oxidized fine metal particles/ dust generated by grinding, sawing, abrasive blasting, or individual customer processes may produce materials that the customer should test for combustibility and other hazards in accordance with applicable regulations. High concentrations of combustible metallic fines in the air may present an explosion hazard.

Manufacturing Process

The manufacturing process includes two major parts, the first is electric arc furnace steelmaking process ,and the second is hot rolling process. The quality management system is ISO 9001. The environmental management system is ISO 14001. The occupational safety management system is ISO 45001.

Flow Diagram

Steel scrap and other raw materials	→	Electric arc furnace steelmaking	→	Steel refining	→	Continuous casting	→	Slab & Bloom	→
Slab & Bloom reheating	→	Hot rolling	→	Piling & Bunding	→	Hot rolled structural steel plate	→	Delivery	



1.3. Application

The narrow plate steel produced by Tung Ho Steel can be manufactured according to the width requirements of customers. Without the need to make further cuts, energy and material consumption are further reduced, with greater convenience when integrating the materials into construction and faster handover periods. The product can be broadly utilized in factories, logistics warehouses, office and residential buildings, bridges, and other buildings."

1.4. Reasons for carrying out the study; intended applications of the study; target audiences

Since more and more clients care about and ask for the environmental impacts of our products, we started the study of life cycle assessment of our products.

1.5. Material Composition

The hot rolled structural steel plate manufactured by Tung Ho is made of 100% low alloyed steel manufactured in electric arc furnace with 90% of recycled material.

The typical composition of the low alloyed is presented in Table 1.

Table 1

ELEMENT	TYPICAL CONTENT
Iron	98.0%
Carbon	0.14%
Manganese	0.18%

Silicon	1.25%
Phosphorus	0.01%
Sulfur	0.01%
Copper	0.02%
Others(Sn, V, Nb, Al, B, Ni, Cr, Mo, Ti)	0.39%
Total	100%

The product does not contain any hazardous substances listed in the “Candidate List of Substances of Very High Concern for Authorisation” (SVHC) exceeding 0.1% of the weight of the product.

1.6. Manufacturing

The steel structure site production flow is: Receiving steel plate materials → Assembly → Welding → Wing plate leveling → Welding bead rectification → Heat shaping → Inspection → Entry into warehouse.

1.7. Packaging and Delivery Status

The hot rolled structural steel plate are packaged by rod-carbon steel for delivery.

1.8. Disposal/ Re-use/ Recycling

Hot rolled structural steel sections is easy to recycling, but it is not suggested to be re-used as structural elements. The European Waste Index code for hot rolled structural steel plate is ewc-code-17-04-05– iron and steel.

2. Life Cycle Assessment Background Information

2.1. Functional or Declared Unit

Declared Unit: 1 metric ton of HOT ROLLED STRUCTURAL STEEL PLATE

Table 2

NAME	VALUE	UNIT
Declared unit	1	t
Thickness (des Bleches)	please visit: https://www.tunghosteel.com/EN/HomeEg/Product/Intro/2	mm
Density	7,850	kg/m^3

Conversion factor to 1 kg	1,000	-

2.2. System Boundary

This is a cradle to gate EPD. The following life cycle stages were considered:

A1 – Raw material supply.

A2 – Transport.

A3 – Manufacturing.

*Not including “CONSTRUCT-ION PROCESS STAGE”, “USE STAGE” and “END OF LIFE STAGE”.

2.3. Estimates and Assumptions

*The most representative overseas scrap yard is in Long Beach, USA, is assumed all scrap yards operate in the same way.

*The most representative local scrap yard is Hongtian, is assumed all scrap yards operate in the same way.

2.4. Cut-off Criteria

Life Cycle Inventory data for 100% of total inflows (mass and energy) to the upstream and core module have been included. Company infrastructure, employee’s transportation and administrative activities were kept out of the scope of this study.

2.5. Data Sources

The maetrial, energy, transportation, waste treatment and air emission data colleted are from the year 2019, and the major data source is from the ERP system of Miaoli Works. The LCA software used for this study is SimaPro 9.0.0.49, the LCI databases include Ecoinvent & U.S. LCI Database & Taiwan EPA Carbon Footprint Database.

2.6. Data Quality

The collected data were checked for plausibility and consistancy. Good data quality can be assumed. Data quality assessment per information module is provided in Tables 4, 5 and 6.

Table 3. Raw material supply module data quality assessment

Data	Time Related Coverage	Geographical coverage	Technological covegare	Data Source	Measured or estimated
Raw materials consumption	2019	Taiwan	Modern	Tung Ho	M
Distance of scrap transportation to	2019	Taiwan	Modern	Tung Ho	M

recycling center					
Energy and materials consumption of scrap processing in recycling center, as well as waste and generated emissions	2019	Taiwan	Modern	Tung Ho	M
Fuels consumption and emissions related to electricity generation and distribution in Taiwan	2019	Taiwan	Modern	Tung Ho	M&E
Energy consumption and generation of emissions related to natural gas production in Taiwan	2019	Taiwan	Modern	Tung Ho	M&E
Energy and materials consumption to raw materials production for the steelworks	2019	Taiwan	Modern	Tung Ho	M&E

Table 4. Transportation module data quality assessment

Data	Time Related Coverage	Geographical coverage	Technological covegare	Data Source	Measured or estimated
Distance of scrap and others raw materials transportation	2019	Taiwan	Not Applicable	Tung Ho	M
Distance of auxiliary items transportation	2019	Taiwan	Not Applicable	Tung Ho	M
Distance of natural gas transportation	2019	Taiwan	Not Applicable	Tung Ho	M
Consumption of materials and energy and emissions related to the transport requirements of raw materials and auxiliary inputs	2019	Taiwan	World average	Ecoinvent	M&E

Table 5. Manufacture module data quality assessment

Data	Time Related Coverage	Geographical coverage	Technological covegare	Data Source	Measured or estimated
Production efficiency and generation of by-products	2019	Taiwan	Modern	Tung Ho	M
Consumption of auxiliary items	2019	Taiwan	Modern	Tung Ho	M&E
Energy and materials consumption of auxiliary items production	2019	Taiwan	Modern	Tung Ho	M&E
Waste generation	2019	Taiwan	Modern	Tung Ho	M
Waste treatment process	2019	Taiwan	Modern	Tung Ho	M&E
Air emissions and waste water generation	2019	Taiwan	Modern	Tung Ho	M&E
Distance of waste transportation	2019	Taiwan	Modern	Tung Ho	M&E
Requirements of waste transportation	2019	Taiwan	Modern	Tung Ho	M&E

2.7. Period under Review

From January 1st to Deceber 31st, 2019.

2.8. Allocation

Allocation of inputs and outputs of the system between product and coproducts was based on a mass relation, considering the quantity produced per year of each product and coproduct at the level of unit process.

The slag and arc furnace Dust produced from the electric arc furnace process are treated as wastes, not as coproducts in this study, so we didn't use economic allocation approach to allocate the environmental impacts to the slag and arc furnace Dust.

There are no credits from recycling or energy recovery of packaging materials and production waste. On the other hand, this is a "cradle to gate" study, so there are no credits from recycling or energy recovery from the end of life of the product.

Table 6

ITEM	ALLOCATION METHOD
the use of recycled and/orsecondary raw materials	By weight of output of bloom & beam-blank & slab
electricity used for electric arc furnace	By weight of output of bloom & beam-blank & slab
electricity used for sections hot rolling	By weight of output of hot rolling steel products
auxiliary and operating materials	By weight of output of bloom & beam-blank & slab
packaging materials	By weight of output of hot rolling steel products
production waste	By weight of output of bloom & beam-blank & slab

3. Life Cycle Assessment Results

Table7. Description of the system boundary modules

	PRODUCT STAGE			CONSTRUCT-ION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
	Raw material supply	Transport	Manufacturing	Transport from gate to site	Assembly/Install	Use	Maintenance	Repair	Replacement	Refurbishment	Building Operational Energy Use During Product Use	Building Operational Water Use During Product Use	Deconstruction	Transport	Waste processing	Disposal	Reuse, Recovery, Recycling Potential
EPD Type	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	x

(X = included in LCA; MND = Module Not Declared).

3.1 Life Cycle Impact Assessment Results

Parameters describing environmental potential impacts were calculated using CML-IA method version 3.04 (Guinee et al. 2001; Huijbregts et al. 2003; Wegener et al. 2008) as implemented in SimaPro 9.0.0.49. Water scarcity potential was calculated using AWARE method (Boulay et al. 2018). Table 8 below shows the LCA results per the declared unit and Figure 2 depicts the impact contribution per module.

Table 8 RESULTS OF THE LCA - ENVIRONMENTAL IMPACT (CML-IA method version 3.05): declared unit and product

Impact Category	Unit	A1 - Raw materials supply	A2 - Transportation	A3 - Manufacturing	Total(A1 - A3)
GWP(Global warming potential)	kg CO_2-Eq/ ton	2.82E+02	1.08E+02	5.43E+02	9.33E+02
	%	30.22%	11.62%	58.16%	100.00%
ODP(Depletion potential of the stratospheric ozone layer)	kg CFC-11Eq/ ton	3.65E-05	4.40E-06	3.16E-06	4.41E-05
	%	82.85%	9.98%	7.17%	100.00%

AP(Acidification potential of land and water)	kg SO_2-Eq/ ton	1.16E+00	1.61E+00	2.02E-01	2.98E+00
	%	39.07%	54.16%	6.78%	100.00%
EP(Eutrophication potential)	kg PO_4-Eq/ ton	7.02E-02	1.68E-01	2.33E-02	2.61E-01
	%	26.86%	64.24%	8.90%	100.00%
POCP(Formation potential of tropospheric ozone photochemical oxidants)	kg C_2H_4-Eq/ ton	7.48E-02	7.75E-02	1.09E-02	1.63E-01
	%	45.83%	47.51%	6.67%	100.00%
ADPE(Abiotic depletion potential for nonfossil resources)	kg Sb-Eq/ ton	3.27E-04	1.58E-06	3.45E-04	6.74E-04
	%	48.55%	0.23%	51.22%	100.00%
ADPF(Abiotic depletion potential for fossil resources)	MJ/ ton	3.90E+03	5.58E+02	4.57E+02	4.92E+03
	%	79.37%	11.35%	9.28%	100.00%

Table 9 RESULTS OF THE LCA - ENVIRONMENTAL IMPACT (TRACI method version 2.1): declared unit and product

Impact Category	Unit	A1 - Raw materials supply	A2 - Transportation	A3 - Manufacturing	Total(A1 - A3)
GWP(Global warming potential)	kg CO_2-Eq/ ton	3.37E+02	6.84E+01	5.11E+02	9.17E+02
	%	36.80%	7.46%	55.74%	100.00%
ODP(Depletion potential of the stratospheric ozone layer)	kg CFC-11Eq/ ton	7.26E-05	5.83E-06	3.95E-06	8.23E-05
	%	88.13%	7.08%	4.79%	100.00%

AP(Acidification potential of land and water)	kg SO_2-Eq/ ton	2.47E+00	1.70E+00	2.05E-01	4.37E+00
	%	56.43%	38.88%	4.68%	100.00%
EP(Eutrophication potential)	kg N-Eq/ ton	7.36E+00	6.47E-02	0.00E+00	7.43E+00
	%	99.13%	0.87%	0.00%	100.00%
POCP(Formation potential of tropospheric ozone photochemical oxidants)	kg O_3-Eq/ ton	2.89E+01	2.27E+01	2.37E+00	5.40E+01
	%	53.53%	42.07%	4.40%	100.00%
ADPE(Abiotic depletion potential for nonfossil resources)	kg Sb-Eq/ ton	3.27E-04	1.58E-06	3.45E-04	6.74E-04
	%	48.55%	0.23%	51.22%	100.00%
ADPF(Abiotic depletion potential for fossil resources)	MJ/ ton	3.90E+03	5.58E+02	4.57E+02	4.92E+03
	%	79.37%	11.35%	9.28%	100.00%

3.2 Life Cycle Inventory Results

Parameters describing resource use were evaluated with the Cumulated Energy Demand method version 1.09 (Frischknecht et al. 2007) except for the indicator of use of net fresh water that was evaluated with Recipe 2016 Midpoint (H) version 1.00 (Huijbregts et al. 2017). The detailed description of the use of resources is provided in Table 7.

Table 10 RESULTS OF THE LCA - RESOURCE USE: declared unit and product

Parameter	Unit	A1 - Raw materials supply	A2 - Transportation	A3 - Manufacturing	Total(A1 - A3)
PERE(Renewable primary energy as energy carrier)	MJ	2.87E+01	2.01E-01	5.47E+00	3.44E+01

PERM(Renewable primary energy resources as material utilization)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERT(Total use of renewable primary energy resources)	MJ	2.87E+01	2.01E-01	5.47E+00	3.44E+01
PENRE(Nonrenewable primary energy as energy carrier)	MJ	8.40E+03	5.58E+02	4.93E+02	9.45E+03
PENRM(Nonrenewable primary energy as material utilization)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT(Total use of nonrenewable primary energy resources)	MJ	8.40E+03	5.58E+02	4.93E+02	9.45E+03
SM(Use of secondary material)	kg	1.10E+03	0.00E+00	1.54E-01	1.10E+03
RSF(Use of renewable secondary fuels)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF(Use of nonrenewable secondary fuels)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW(Use of net fresh water)	m^3	7.19E-01	1.37E-01	1.64E+01	1.73E+01

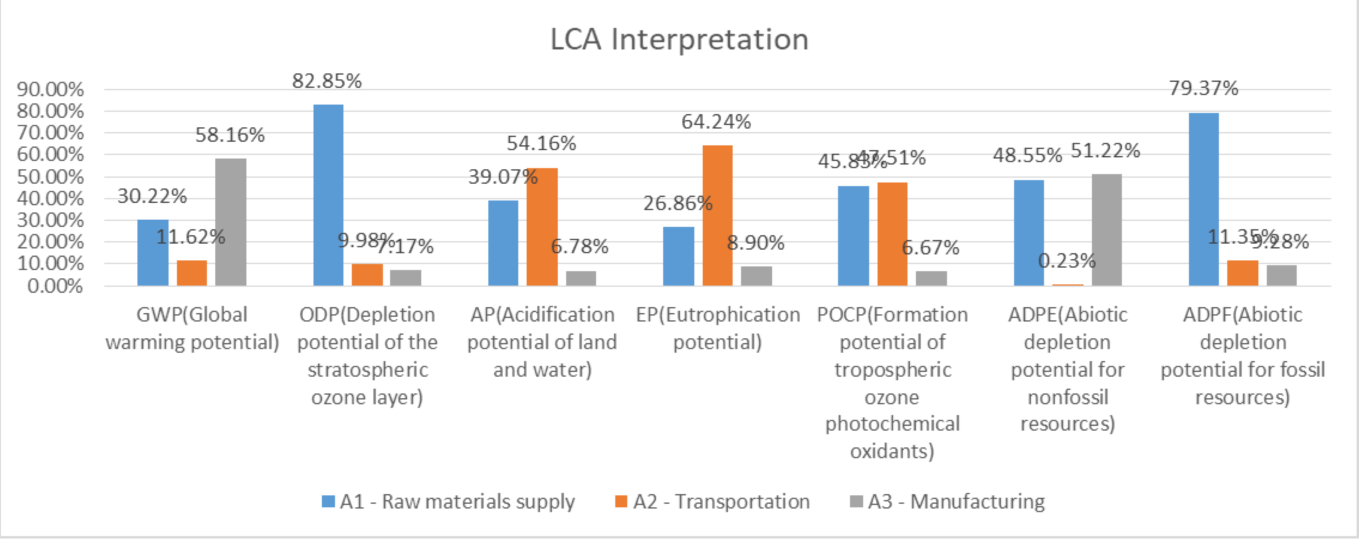
Environmental indicators describing waste generation were obtained from LCI except for background information which has been calculated using EDIP 2003 method (Hauschild and Potting, 2005). Table 9 shows waste and other outputs generated during each information module.

Table 11 RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: declared unit and product

Parameter	Unit	A1 - Raw materials supply	A2 - Transportation	A3 - Manufacturing	Total(A1 - A3)
HWD(Hazardous waste disposed)	kg	4.71E-03	4.10E-04	1.86E-01	1.91E-01
NHWD(Nonhazardous waste disposed)	kg	9.03E+02	3.07E+00	1.80E+01	9.24E+02
RWD(Radioactive waste disposed)	kg	1.36E-02	2.86E-04	1.10E+00	1.12E+00
CRU(Components for reuse)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR(Materials for recycling)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER(Materials for energy recovery)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE(Exported electrical energy)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET(Exported thermal energy)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4. LCA Interpretation

The highest proportion of GWP(Global warming potential) impact of the product is module A3(manufacturing), 58.16%. The highest proportion of ODP(Depletion potential of the stratospheric ozone layer) impact of the product is module A1(raw material supply), 82.85%. The highest proportion of AP(Acidification potential of land and water) impact of the product is module A2(transportation), 54.16%. The highest proportion of EP(Eutrophication potential) impact of the product is module A2(transportation), 64.24%. The highest proportion of POCP(Formation potential of tropospheric ozone photochemical oxidants) impact of the product is module A2(transportation), 47.51%. The highest proportion of ADPE(Abiotic depletion potential for nonfossil resources) of the product is module A3(manufacturing), 51.22%. The highest proportion of ADPF(Abiotic depletion potential for fossil resources) impact of the product is module A1(raw material supply), 79.37%.



Sensitivity Check

The study considered sensitivities of most uncertain and significant aspects of the data set, including “input of steel scrap”, “transportation distance of overseas steel scrap” and “Input of electricity”. After adjusting 20% on each item and check the changes of each LCA result, the results of sensitivity check is as shown on the tables below. All sensitivities of each LCA results are under 15%.

Table 12

Impact Category	Item of Sensitivity Check	The current LCA result	The LCA result after adjusting 20% on input of steel scrap	Sensitivity(%)
GWP(Global warming potential)	Input of steel scrap	9.33E+02	9.56E+02	2.42%

ODP(Depletion potential of the stratospheric ozone layer)	Input of steel scrap	4.41E-05	4.69E-05	6.39%
AP(Acidification potential of land and water)	Input of steel scrap	2.98E+00	3.30E+00	10.98%
EP(Eutrophication potential)	Input of steel scrap	2.61E-01	2.97E-01	13.75%
POCP(Formation potential of tropospheric ozone photochemical oxidants)	Input of steel scrap	1.63E-01	1.79E-01	9.76%
ADPE(Abiotic depletion potential for nonfossil resources)	Input of steel scrap	6.74E-04	7.12E-04	5.73%
ADPF(Abiotic depletion potential for fossil resources)	Input of steel scrap	4.92E+03	5.10E+03	3.67%

Table 13

Impact Category	Item of Sensitivity Check	The current LCA result	The LCA result after adjusting 20% on transportation distance of overseas steel scrap	Sensitivity(%)
GWP(Global warming potential)	Transportation distance of overseas steel scrap	9.33E+02	9.48E+02	1.58%
ODP(Depletion potential of the stratospheric ozone layer)	Transportation distance of overseas steel scrap	4.41E-05	4.43E-05	0.39%
AP(Acidification potential of land and water)	Transportation distance of overseas steel scrap	2.98E+00	3.27E+00	9.80%

EP(Eutrophication potential)	Transportation distance of overseas steel scrap	2.61E-01	2.90E-01	10.82%
POCP(Formation potential of tropospheric ozone photochemical oxidants)	Transportation distance of overseas steel scrap	1.63E-01	1.77E-01	8.71%
ADPE(Abiotic depletion potential for nonfossil resources)	Transportation distance of overseas steel scrap	6.74E-04	6.74E-04	0.05%
ADPF(Abiotic depletion potential for fossil resources)	Transportation distance of overseas steel scrap	4.92E+03	5.03E+03	2.19%

Table 14

Impact Category	Item of Sensitivity Check	The current LCA result	The LCA result after adjusting 20% on input of electricity	Sensitivity(%)
GWP(Global warming potential)	Input of electricity	9.33E+02	9.46E+02	1.36%
ODP(Depletion potential of the stratospheric ozone layer)	Input of electricity	4.41E-05	4.43E-05	0.48%
AP(Acidification potential of land and water)	Input of electricity	2.98E+00	2.99E+00	0.44%
EP(Eutrophication potential)	Input of electricity	2.61E-01	2.63E-01	0.65%
POCP(Formation potential of tropospheric ozone photochemical oxidants)	Input of electricity	1.63E-01	1.64E-01	0.34%
ADPE(Abiotic depletion potential for nonfossil resources)	Input of electricity	6.74E-04	6.74E-04	0.07%

ADPF(Abiotic depletion potential for fossil resources)	Input of electricity	4.92E+03	4.96E+03	0.86%

5. Conclusion and Recommendation

This LCA Report has provided an assessment of the potential environmental impacts associated with the system boundary "cradle to gate" , including module A1(raw material supply) & module A2(transportation) & module A3(manufacturing). The LCA software used for this study is SimaPro 9.0.0.49, the LCI databases include Ecoinvent & U.S. LCI Database & Taiwan EPA Carbon Footprint Database, and LCIA methodologies include CML-IA(Base line) version 3.05, TRACI version 2.1, EDIP2003 version 1.06, Cumulated Energy Demand method version 1.10 and Recipe 2016 Midpoint (H) version 1.00.

The specific site of this study is located in Miaoli, Taiwan. However, most of databases we used as environmental impact factors are not local database. In the future, if the local government can develop more databases of environmental impact factors, it will be very helpful for preciser assessment of the potential environmental impacts.

The study is not intended to support comparative assertions intended to be disclosed to the public.

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