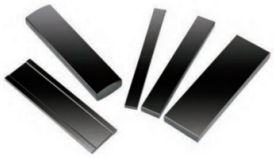
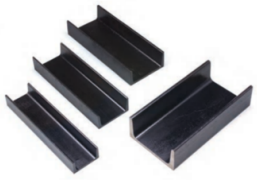
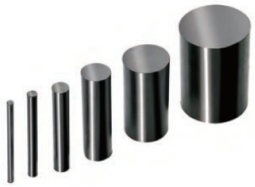
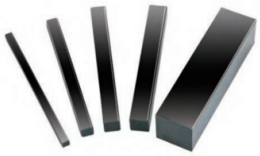
ENVIRONMENTAL PRODUCT DECLARATION

HOT ROLLED STEEL MERCHANT BAR

ANGLE BAR, CHANNEL BAR, FLAT BAR, SQUARE BAR (STRAIGHT SQUARE BAR, SQUARE BAR IN COIL), ROUND BAR (STRAIGHT BAR, BAR IN COIL)

HOT ROLLED STEEL MERCHANT BAR		
ANGLE BAR	FLAT BAR	CHANNEL BAR
		
ROUND BAR (Straight Bar, Bar In Coil)	SQUARE BAR (Straight Square Bar, Square Bar In Coil)	
		

Feng Hsin produces hot rolled section steel, which includes “Angle Bar” , “Channel Bar” , “Flat Bar” , “Square Bar” , “Round Bar”. Our steels mainly supply for civil & industrial construction, building, towers, bridges and other structural uses.

豐興鋼鐵股份有限公司
FENG HSIN STEEL CO., LTD.

Under the essence of “Honest Management & Steady Growth”, FENG HSIN STEEL CO., LTD. has devoted ourselves to the modern development of the steel industry, our business philosophy is to approach “low-carbon production and implementing a green environmentally circular economy” as well as “fulfilling corporate social responsibility”.

As the increasing awareness of environment protection rise in the world, we have long-term dedicated to reduce greenhouse gas emissions. Moreover, in order to prevent major sources of pollutions, such as natural waste, gas, and noise; we have invested vast amounts of capital to merge pollution control with production flow.

Since 1986, FENG HSIN STEEL has continually been awarded the Excellence of Pollution Prevention Assessment, as one of the top ten environmental friendly industrial plants in Taiwan. We also awarded by The Bureau of Environmental Protection Administration (EPA), Bureau of Laboratory Administration (BLA) of Industrial Pollution Prevention Performances, and the Excellence of Energy Conservation Assessment by the Ministry of Economic Affair.

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CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION
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Hot Rolled Steel Merchant Bar
Mainly supply for civil & industrial construction, building, towers, bridges and other structural uses.

According to ISO 14025 and EN 15804+A2

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL Solutions www.ul.com 333 Pfingsten Rd, Northbrook IL, 60062 www.spot.ul.com
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	Program Operator Rules v 2.7 2022
MANUFACTURER NAME AND ADDRESS	FENG HSIN STEEL CO., LTD. No. 998, Sec. 1, Jiahou Rd., Houli Dist., Taichung City, 421423, Taiwan
DECLARATION NUMBER	4790983880.101.1
DECLARED PRODUCT & FUNCTIONAL UNIT OR DECLARED UNIT	Product per metric ton
REFERENCE PCR AND VERSION NUMBER	1. Product Category Rules for Building-Related Products and Services Institut Bauen und Umwelt e.V. (IBU) Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report according to EN 15804+A2:2019 Version 1.3 2. PCR Guidance-Texts for Building-Related Products and Services From the range of Environmental Product Declarations of Institute Construction and Environment e.V. (IBU) Part B: Requirements on the EPD for Structural steels
DESCRIPTION OF PRODUCT APPLICATION/USE	Feng Hsin's hot rolled steel merchant bars, including Angle bar, Channel bar, Flat bar, Square Bar (Straight Square Bar, Square Bar in Coil) and Round Bar (Straight Bar、Bar in Coil) are made from steel billets, which are heated and rolled. These products are used for general construction or be further processed to produce screws, steel wire, steel wire cables, springs and other downstream products.
PRODUCT RSL DESCRIPTION (IF APPL.)	-
MARKETS OF APPLICABILITY	Australia, New Zealand, Hong Kong, Vietnam, Canada, North America, Malaysia and Singapore and Taiwan.
DATE OF ISSUE	July 15, 2024
PERIOD OF VALIDITY	5 Years
EPD TYPE	Product-specific
RANGE OF DATASET VARIABILITY	Mean
EPD SCOPE	Cradle to gate with options (specify options)
YEAR(S) OF REPORTED PRIMARY DATA	2022
LCA SOFTWARE & VERSION NUMBER	SimaPro v9.4.0.2
LCI DATABASE(S) & VERSION NUMBER	SimaPro v9.4.0.2 Ecoinvent3.8, SimaPro v9.4.0.2 Industry data 2.0, SimaPro v9.4.0.2 USLCI, SimaPro v9.4.0.2 EU & DK Input Output Database, IPCC AR6 (2023): 7.SM Chapter 7: The Earth's energy budget, climate feedbacks, and climate sensitivity - Supplementary Material, Taiwan Ministry of Environment - GHG EF management table ver 6.0.4: Fugitive emission sources
LCIA METHODOLOGY & VERSION NUMBER	EF 3.0 Method (adapted): EF 3.0 normalization and weighting

The PCR review was conducted by:	Institut Bauen und Umwelt e.V. (IBU) PCR Review Panel info@ibu-epd.com
This declaration was independently verified in accordance with ISO 14025: 2006. ☐ INTERNAL ☒ EXTERNAL	Cooper McCollum Cooper McCollum, UL Solutions
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Feng Hsin Steel Co., Ltd
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Ik-Kim Ik-Kim

ENVIRONMENTAL PRODUCT DECLARATION

豐興鋼鐵股份有限公司
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Hot Rolled Steel Merchant Bar
Mainly supply for civil & industrial construction, building, towers, bridges and other structural uses.

According to ISO 14025 and EN 15804+A2

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

Feng Hsin Steel Co., Ltd. was established in 1969, with its headquarters and manufacturing plant located in Houli, Taichung. Under the essence of “Honest Management & Steady Growth”, it is committed to the diversified development of the steel and environmental protection industries. As a leading manufacturer in Taiwan's electric furnace integrated steel mills, it has successfully expanded into domestic Waste-to-Energy (WtE) incinerators, dust collection, and the recycling of reducing slag for environmental protection.

Feng Hsin has a total annual production capacity of approximately 1.8 million metric tons, making it the largest steel mill in central Taiwan. It is the only integrated steel mill in Taiwan capable of producing three major categories of products: structural steel, bars, and wire rods. Its main products include steel bars, structural steel, and wire rods.

In 2021, in response to the implementation of carbon reduction policies, Feng Hsin established a net-zero emissions team, initiated a series of product carbon footprint assessments, and actively promoted green energy and carbon reduction through collaboration within the industry chain. It established an "ESG Sustainable Development Policy" to achieve the 2030 goal of reducing emissions by 25% and reaching net-zero emissions by 2050, contributing to the Earth's environment.

1.2. Product Description

Product Identification

The production of Hot Rolled Steel Merchant Bar includes Angle bar, Channel bar, Flat bar, Square Bar(Straight Square Bar, Square Bar in Coil) and Round Bar (Straight Bar, Bar in Coil). The products are carried out according to standard specifications.

Product Specification

Technical Data

- Angle Bar

Side length(B)	Thickness	Length	Standard
25mm ~ 100mm	2.3mm ~ 13mm	5.3m ~ 13m	CNS 2473, CNS 2947, CNS 13812 JIS G3101, JIS G3106, JIS G3136 ASTM A36, ASTM A572, ASTM A709 AS/NZS 3679.1 EN 10025-2

- Channel bar

Height	Side length(B)	Length	Standard
75mm ~ 150mm	40mm ~ 75mm	5.3m ~ 13m	CNS 2473, CNS 2947, CNS 13812 JIS G3101, JIS G3106, JIS G3136 ASTM A36, ASTM A572, ASTM A709 AS/NZS 3679.1 EN 10025-2

Hot Rolled Steel Merchant Bar
Mainly supply for civil & industrial construction, building, towers, bridges and other structural uses.

According to
ISO 14025 and EN 15804+A2

– Flat bar

Width	Thickness	Length	Standard
12mm ~205mm	3mm ~ 28mm	4m ~ 13m	CNS 2473, CNS 13812
			JIS G3101, JIS G3106, JIS G3136, JIS G4051
			ASTM A36, ASTM A572, ASTM A709
			AS/NZS 3679.1
			EN 10025-2

– Square Bar (Straight Square Bar, Square Bar in Coil)

Side length(A)	Length	Weight	Standard
9.5mm ~ 52.5mm	4m ~16m	≒1,500 ~ 2,000kg	CNS 2473, CNS 2947, CNS 13812
			JIS G3101, JIS G3106, JIS G3136, JIS G4051
			ASTM A36, ASTM A572, ASTM A709
			AS/NZS 3679.1
			EN 10025-2
			BS 4360

– Round Bar (Straight Bar)

Diameter	Length	Weight	Standard
9.0~103MM	5m ~12m	9.0mm ~9.5mm ≒ 1,200kg	CNS 2473, CNS 2947, CNS 3229, CNS 3271, CNS 3828, CNS 4004, CNS 8694
			JIS G3101, JIS G3106, JIS G3507, JIS G4051, JIS G4052, JIS G4053, JIS G4804
		11~100mm ≒ 1,500~2,000kg 101~103mm ≒ 1,700~2,250kg	ASTM A36, ASTM A572, ASTM A709, ASTM A570
			AS/NZS 3679.1
			EN 10025-2

– Round Bar (Bar in Coil)

Diameter	Inside diameter	Outer diameter	Weight	Coiling Direction	Standard
13mm~50mm	950mm, 1000mm	1250mm, 1350mm	13mm ~ 50mm ≒1,700~2,250kg	Clockwise	CNS 2473, CNS 2947, CNS 3229, CNS 3271, CNS 3828, CNS 4004, CNS 8694
					JIS G3101, JIS G3106, JIS G3507, JIS G4051, JIS G4052, JIS G4053,JIS G4804
					ASTM A36, ASTM A572, ASTM A709, ASTM A570
					AS/NZS 3679.1
					EN 10025-2

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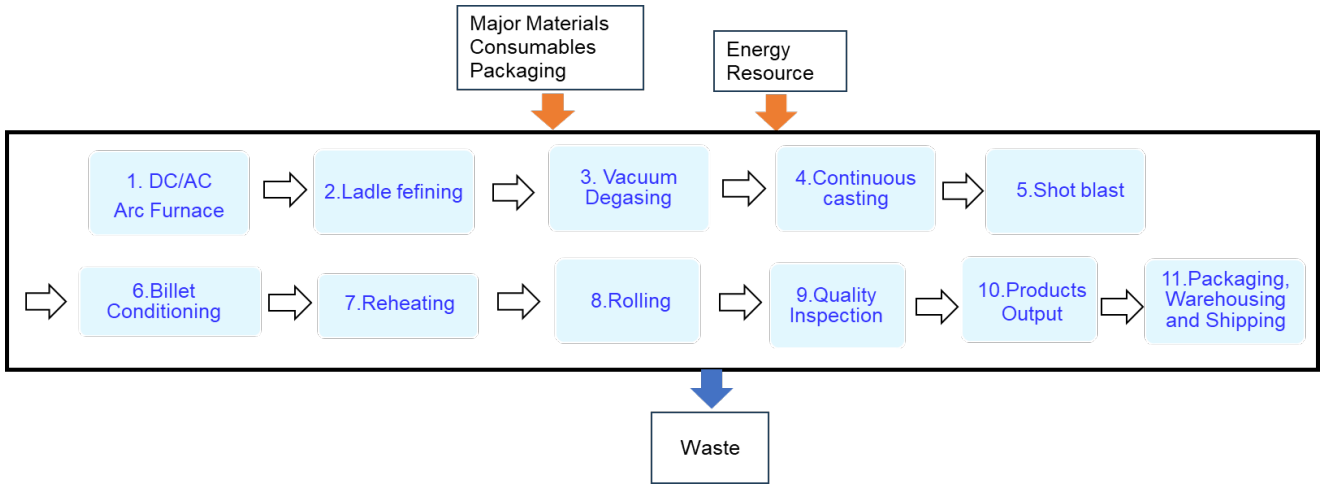
Constructional data

NAME	SYMBOL	VALUE	UNIT
Tensile strength	S235JR S235J0 S235J2	360~510	N/mm^2
	S275JR S275J0 S275J2	410~560	N/mm^2
	S355JR S355J0 S355J2 S355K2	470~630	N/mm^2

Performance data of the product in accordance with the declaration of performance with respect to its essential characteristics according to EN 10025-2: Part 2: Technical delivery conditions for non-alloy structural steels.

Flow Diagram



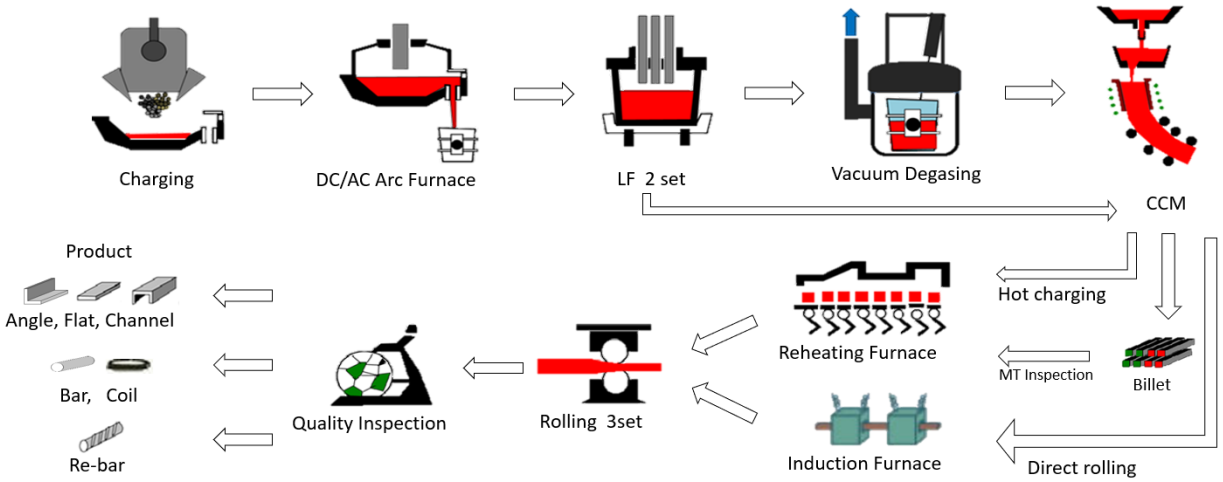


Figure 1. Production processes

Product Average

This EPD is a product-specific EPD. The declaration is for the Hot Rolled Steel Merchant Bar nominated as the product manufactured by Feng Hsin Steel.

While allocating energy, resource, waste and material usage within the production site, allocation was carried out based on the average annual mass.

1.3. Application

- Angle bar is widely used in building and structures such as transmission tower, bridges as well as mechanical equipment.
- Channel Bar is broadly applied in building structure, vehicle manufacture, mechanical equipment and other industrial use.
- Flat bar can be used in building & bridge structure, mechanical parts, packaging frame, grating plate, mold for rubber glove, vessel and vehicle field.
- Round Bar & Square bar are mostly used for motorcycle and automotive parts, mechanical internal structures (component), hand tools, and crane rail.

1.4. Declaration of Methodological Framework

In this project, a LCA approach was considered with some simplification on data modeling using generic data for most background systems. The EPD analysis uses a cradle-to-gate with options (specify options) system boundary.

Additional details on assumptions, cut-offs and allocation procedures can be found in section 2.3, 2.4, and 2.8, respectively.

1.5. Properties of Declared Product as Delivered

The dimensions of the product declared in this EPD may vary depending on the intended application.

- Angle Bar is sold in China, Canada, US, Hong Kong, New Zealand, Malaysia, Vietnam, Singapore, Australia and Taiwan. The total sales volume for the year 2022 was 95095.762 metric ton.
- Channel Bar is sold in China, Canada, US, Hong Kong, Malaysia, Singapore, Australia and Taiwan. The total sales volume for the year 2022 was 77144.540 metric ton.
- Flat Bar is sold in Japan, Canada, US, Hong Kong, Thailand, New Zealand, Malaysia, Singapore, Australia, Philippines and Taiwan. The total sales volume for the year 2022 was 90283.953 metric ton.
- Square Bar (Straight Square Bar, Square Bar in Coil) is sold in Hong Kong, Thailand, New Zealand, Malaysia, Singapore, Australia and Taiwan. The total sales volume for the year 2022 was 13743.452 metric ton.
- Round Bar (Straight Bar, Bar in Coil) is sold in Japan, China, Canada, Indonesia, Hong Kong, Thailand, New Zealand, Malaysia, Philippines, Vietnam, Singapore, Australia and Taiwan. The total sales volume for the year 2022 was 404281.409 metric ton.

1.6. Material Composition

The hot rolled steel merchant bar constitutes primarily of steel scrap (90%) and other materials include alloy and other components (10%).

1) This product does not contain substances listed in the 'Candidate List of Substances of Very High Concern for Authorisation' (SVHC) (date: 24.01.2024) exceeding 0.1 percentage by mass: No.

2) This product/article/at least one partial article contains other CMR substances in categories 1A or 1B which are not on the candidate list, exceeding 0.1 percentage by mass: No.

3) Biocide products were added to this construction product or it has been treated with biocide products (this then concerns a treated product as defined by the (EU) Ordinance on Biocide Products No. 528/2012): No.

1.7. Manufacturing

The manufacturing of Hot Rolled Steel Merchant Bar involves both steelmaking and rolling processes. Firstly, scrap iron undergoes radiographic detection and weighing before entering the DC/AC electric arc furnace for smelting. The electric arc furnace efficiently melts scrap iron into molten steel. The molten steel is then transferred to the LF refining furnace. In the LF refining furnace, the molten steel undergoes refining treatment to improve its quality. After refining, the molten steel enters the continuous casting process to become steel billets, completing the steelmaking process.

Subsequently, the steel billets are sent to the plant, where they undergo processes such as shot blasting, billet conditioning, heating and rolling according to product requirements. After processing, component analysis and pressure testing are conducted to ensure mechanical performance and composition meet standards.

1.8. Environment and health during manufacturing

No measures relating to safety, health and environmental protection during the manufacturing process extending beyond national guidelines are required.

1.9. Product processing/Installation

Planning, processing, implementation and intended use of the Hot Rolled Steel Merchant Bars have to be carried out

depending on the respective applications according to the generally recognized rules of engineering and manufacturer's recommendations.

When processing/using Hot Rolled Steel Merchant Bars according to the generally recognized rules of engineering there are no measures to be taken which are going beyond public occupational health and safety.

1.10. Packaging

The product is delivered with wire rod as packaging.

1.11. Condition of use

During usage, no changes in material composition shall occur.

1.12. Environment and health during use

The intended use of Hot Rolled Steel Merchant Bars do not endanger health or the environment in any known way. Also, no environmental impacts on water, air or soil are expected.

1.13. Transportation

Only includes raw material transportation and final waste transportation.

1.14. Reference Service Life and Estimated Building Service Life

A reference service life for Hot Rolled Steel Merchant Bar is not declared. As construction products with many different applications, a reference service life for Hot Rolled Steel Merchant Bar is not declared here.

The lifetime therefore will be limited by the service life of the work.

1.15. Extraordinary effects

Fire
The material is not flammable per CNS 14705 . The material does not emit fumes or fire gases.

Fire protection

NAME	VALUE
Building material class	Resistant grade one

Water
Steel is stable in water, insoluble and does not emit substances in water. In case of flooding, no impacts are to be expected. Steel can corrode in the presence of oxygen in the water (=slow oxidation).

Mechanical destruction
Due to the ductility of steel, steels react resiliently in the event of unforeseeable mechanical destruction: In the case of tensile load, necking will occur before cracking. In case of a lasting high compression load, components of steel may buckle or bulge. No splintering or breaking edges should result.

1.16. Reuse, Recycling, and Energy Recovery

The products can be 100% recycled as steel scrap and remelted circularly back to steel products.

1.17. Disposal

For the LCA study, the disposal of the used products adopted a country- and region-based weighted average disposal mode following literature review and Ecoinvent database. End of life disposal treatment process (C4) from Ecoinvent was used in this LCA study. According to public information, we distinguish the final disposal as recyclable and non-recyclable parts.

The recycling information of product is described by sorting from International Universal Recycling Codes and European EWC codes. See the following table.

Table 1. Recycling information

TYPE	ITEMS	INTERNATIONAL UNIVERSAL RECYCLING CODES		EUROPEAN EWC CODES	
		CODE	DESCRIPTION	CODE	DESCRIPTION
Product	Angle bar, Channel bar, Flat bar, Square Bar (Straight Square Bar, Square Bar in Coil), Straight bar(Round bar, Wire rod)	#40 FE	Steel	# 17 04 05	iron and steel
Packaging	Iron wire, Wire rod	#40 FE	Steel	# 17 04 05	iron and steel

2. Life Cycle Assessment Background Information

2.1. Functional or Declared Unit

The declared unit is defined as one (1) metric ton of Hot Rolled Steel Merchant Bar, including Angle Bar, Channel Bar, Flat Bar, Square Bar (Straight Square Bar, Square Bar In Coil) and Round Bar (Straight Bar, Bar In Coil).

The EPD covers all types and grades of Feng Hsin's Hot Rolled Steel Merchant Bar.

Declared unit

NAME	VALUE	UNIT
Declared unit	1	t

2.2. System Boundary

Type of the EPD: cradle-to-gate - with options: a) cradle to gate with modules C1–C4 and module D (A1–A3, + C + D).

1. Raw material supply and transport stages (A1-A2): including the relating information about energy use, transportation, waste disposal, etc., of the raw material acquisition process.
2. Manufacturing stage (A3): including the relating information about energy use, transportation, waste disposal, etc., of the manufacturing process.
3. End of life stage, benefits and loads beyond the system boundary (C, D): to simulate local recycling and

disposal information after the product discarded.

2.3. Estimates and Assumptions

The assumptions and limitations of the study described as following:

1. During the inventory of this product, due to the lack of product carbon content testing data, and the additional emissions generated in the refining stage of the product characteristics assessment have limited changes, therefore, when calculating the overall process emissions of the final product, the carbon content of the steel billet is used as the basis.
2. For the requirements of EPD-PCR, the study covered life cycle stages A1-A3, C, D of the targeted product from cradle to grave, and the environmental impact of end of life stage was assessed by the regional situational criteria of the EPD-PCR.
3. The weight of raw materials was collected by sampling, and the results would be different for the sampling.
4. As for the activity data, the refrigerant and septic tank items are calculated with the default value of IPCC fugitive source.
5. At end of life stage, the study estimated the distance by the public data of waste treatment location.
6. Since the deconstruction activities of the stage C1 are not available, and its estimated contribution to the environmental impact categories is also very small, the indicator of system boundaries is not declared.
7. Because there is no specific data available for activities in stages C3 and C4, the study estimated the emissions from the final disposal of the product by the official announcement data of waste disposal where the first-tier distribution sites located. The coefficients in the database already account for C3 and C4 processes, so the environmental impact results can only be displayed when these stages are combined. However, this decision will lead to a decrease in accuracy.

2.4. Cut-off Criteria

All inputs and outputs from the data collection process has been considered; covering all used materials and electrical energy ,etc.

The neglected items of the EPD include:

1. Refrigerant (Raw Material)-R22 (no environmental factors of raw material, unable to calculate)
2. Refrigerant (Raw Material)-R32 (no environmental factors of raw material, unable to calculate)
3. Refrigerant (Raw Material)-R410a (no environmental factors of raw material, unable to calculate)
4. Refrigerant (Raw Material)-R134a (no environmental factors of raw material)
5. Refrigerant (Raw Material)-R124 (no environmental factors of raw material, unable to calculate)

For lacking of statistical data or relevant coefficient information (such as the limitations in the database and the absence of similar or closely related types for calculation) for the activities mentioned above in the investigation process, and reasonably estimated its contribution to the environmental impact categories are also very small, they have been excluded. No known flows are deliberately excluded from this report.

2.5. Data Sources

For life cycle modeling of the targeted products, all relevant LCA datasets are taken from the SimaPro v9.4.0.2

software database. The datasets from the SimaPro had documented in the documentation. To ensure comparability of results in the LCA, the basic data of SimaPro database were used for energy, resources, transportation, consumables, packaging, auxiliaries, and major materials etc.

2.6. Data Quality

Raw data of the report is based on 1 year averaged data (Year 2022). The date of the generic data used in the modelling typically covers information from the past ten years. For the requirement of boundaries regarding geographical coverage, waste generated by manufacturing process has to obey local regulation where the manufacturing processes located, to disclosure related information about recycling process of the product.

Furthermore, for ease of comparison, no matter where the emissions are generated, the same environmental impact parameters should be used for life cycle impact assessment.

Data collection of the LCA study based on EPD-PCR rules, most of the data are actual measurement data in 2022 delivered by manufacturing plant, with regional and technical representation. The detailed data quality as shown in the table below.

DATA	TIME RELATED COVERAGE	GEOGRAPHICAL COVERAGE	TECHNOLOGICAL COVERAGE	DATA SOURCE	MEASURED/ ESTIMATED
Data Quality Assessment (A1- A3)					
Major Materials, Consumables, Packaging and Other Inputs Consumption	2022	Taiwan	Modern	Feng Hsin	Measured
Distance of Materials Transportation to Production Line				Digital Map	
Fuel and Resources Consumption				Feng Hsin	
Electricity Use				Feng Hsin	Measured
Effusion Sources					Estimated
Waste and Wastewater Generation					Measured
Distance of Waste Transportation to Disposal Site				Digital Map	
Data Quality Assessment (C, D)					
Scrap Steel Generation	2021~2023	Taiwan	Unknown	Public Data	Estimated
Distance of Waste Transportation to Disposal Site			Modern	Digital Map	Measured

2.7. Period under Review

- The data inventory report is from 2022-01-01 to 2022-12-31.
- LCA report review is from 2024-04-04 to 2024-07-09.

2.8. Geographic Representativeness

Land or region, in which the declared product system is manufactured, used or handled at the end of the product´s lifespan: Taiwan.

2.9. Allocation

Feng Hsin utilizes electric arc furnaces to produce a variety of steel products. Since inputs and outputs of the process cannot be allocated to each individual product, allocation follows EPD-PCR and EN 15804+A2.

The main co-products of Feng Hsin are steel products (primary product) and slag (by-product). Feng Hsin's slag treatment follows Taiwanese regulations for recycling. Other outputs such as ash, sludge, and waste bricks are also handled or recycled according to Taiwanese regulations. Apart from the primary products (Hot rolled steel merchant bar and Rebar), other outputs are not circulated as commodities in the market for sale.

Therefore, the allocation principle of economic value is not suitable. Hence, all inputs and outputs of the process, including raw materials, consumables, energy resources, and waste, are allocated based on product weight, with the allocation formula being the total weight of the target product divided by the total weight of all products in the plant.

2.10. Comparability (Optional)

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to EN 15804 and the building context, respectively the product-specific characteristics of performance, are taken into account. The SimaPro v9.4.0.2 background database was used to calculate the LCA.

3. Life Cycle Assessment Scenarios

Characteristic product properties of biogenic carbon

The biogenic carbon of declared products are from GWP-biogenic indicator.

Note: 1 kg of biogenic carbon is equivalent to 44/12 kg of CO_2.

Information on describing the biogenic carbon content at factory gate

- Angel bar:

NAME	VALUE	UNIT
Biogenic carbon content in product (to gate)	4.80E-01	kg C
Biogenic carbon content in accompanying	7.91E-05	kg C

- Channel bar :

NAME	VALUE	UNIT
Biogenic carbon content in product (to gate)	4.80E-01	kg C
Biogenic carbon content in accompanying	7.91E-05	kg C

- Flat bar :

NAME	VALUE	UNIT
Biogenic carbon content in product (to gate)	4.80E-01	kg C
Biogenic carbon content in accompanying	7.91E-05	kg C

- Square Bar (Straight Square Bar, Square Bar in Coil) :

NAME	VALUE	UNIT

Biogenic carbon content in product (to gate)	4.80E-01	kg C
Biogenic carbon content in accompanying	7.91E-05	kg C

- Round Bar (Straight Bar, Bar in Coil) :

NAME	VALUE	UNIT
Biogenic carbon content in product (to gate)	4.80E-01	kg C
Biogenic carbon content in accompanying	7.91E-05	kg C

End of life (C1 - C4)

- **End of life (C1-C4) – Angel bar**

ITEMS	DESCRIPTION
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method and transportation)	The disposal information is from the product's sales data. It assumes the local waste disposal methods and transportation distances at the sales points based on publicly available information, and calculates the environmental impact assessment based on sales volume.

NAME	VALUE	UNIT
Collected separately waste type waste type	5.22E-01	kg
Collected as mixed construction waste	-	kg
Reuse	-	kg
Recycling	4.65E-01	kg
Energy recovery	-	kg
Landfilling	-	kg

- **End of life (C1-C4) – Channel bar**

ITEMS	DESCRIPTION
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method and transportation)	The disposal information is from the product's sales data. It assumes the local waste disposal methods and transportation distances at the sales points based on publicly available information, and calculates the environmental impact assessment based on sales volume.

NAME	VALUE	UNIT
Collected separately waste type waste type	7.03E-01	kg
Collected as mixed construction waste	-	kg
Reuse	-	kg
Recycling	6.36E-01	kg
Energy recovery	-	kg
Landfilling	-	kg

- **End of life (C1-C4) – Flat bar**

ITEMS	DESCRIPTION
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method and transportation)	The disposal information is from the product's sales data. It assumes the local waste disposal methods and transportation distances at the sales points based on publicly available information, and calculates the environmental impact assessment based on sales volume.

NAME	VALUE	UNIT
Collected separately waste type waste type	2.71E-01	kg
Collected as mixed construction waste	-	kg
Reuse	-	kg
Recycling	2.26E-01	kg
Energy recovery	-	kg
Landfilling	-	kg

- **End of life (C1-C4) – Square Bar (Straight Square Bar, Square Bar in Coil)**

ITEMS	DESCRIPTION
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method and transportation)	The disposal information is from the product's sales data. It assumes the local waste disposal methods and transportation distances at the sales points based on publicly available information, and calculates the environmental impact assessment based on sales volume.

NAME	VALUE	UNIT
Collected separately waste type waste type	7.43E-01	kg
Collected as mixed construction waste	-	kg
Reuse	-	kg
Recycling	6.74E-01	kg
Energy recovery	-	kg
Landfilling	-	kg

- **End of life (C1-C4) – Round Bar (Straight Bar, Bar in Coil)**

ITEMS	DESCRIPTION
Assumptions for scenario development (description of deconstruction, collection, recovery, disposal method and transportation)	The disposal information is from the product's sales data. It assumes the local waste disposal methods and transportation distances at the sales points based on publicly available information, and calculates the environmental impact assessment based on sales volume.

NAME	VALUE	UNIT
Collected separately waste type waste type	8.63E-01	kg
Collected as mixed construction waste	-	kg
Reuse	-	kg
Recycling	7.85E-01	kg

Energy recovery	-	kg
Landfilling	-	kg

Reuse, recovery and/or recycling potentials (D), relevant scenario information

The recycling rate of scrap steel comes from public information and data of each sales country.

- Angle bar

NAME	VALUE	UNIT
Recycling rate of product	9.31+01	%

- Channel bar

NAME	VALUE	UNIT
Recycling rate of product	9.37+01	%

- Flat bar

NAME	VALUE	UNIT
Recycling rate of product	9.02+01	%

- Square Bar (Straight Square Bar, Square Bar in Coil)

NAME	VALUE	UNIT
Recycling rate of product	9.38+01	%

- Round Bar (Straight Bar, Bar in Coil)

NAME	VALUE	UNIT
Recycling rate of product	9.41+01	%

Recycling Information Description in Module C, D

MODULE	ITEMS	TREATMENT ASSUMPTIONS	
		TREATMENT	RATIO
Reuse, Recovery, Recycling Potential	Scrap steel in Taiwan	Recycling	94.10%
Waste processing, Disposal	Scrap steel in Taiwan	Disposal	5.90%
Reuse, Recovery, Recycling Potential	Scrap steel in New Zealand	Recycling	28.00%
Waste processing, Disposal	Scrap steel in New Zealand	Disposal	72.00%
Reuse, Recovery, Recycling Potential	Scrap steel in Hong Kong	Recycling	21.90%
Waste processing, Disposal	Scrap steel in Hong Kong	Disposal	78.10%
Reuse, Recovery, Recycling Potential	Scrap steel in Japan	Recycling	19.93%
Waste processing, Disposal	Scrap steel in Japan	Landfill	8.35%
Waste processing, Disposal	Scrap steel in Japan	Disposal	71.72%
Reuse, Recovery, Recycling Potential	Scrap steel in China	Recycling	21.90%
Waste processing, Disposal	Scrap steel in China	Disposal	78.10%
Reuse, Recovery, Recycling Potential	Scrap steel in Canada	Recycling	66.00%
Waste processing, Disposal	Scrap steel in Canada	Disposal	34.00%

MODULE	ITEMS	TREATMENT ASSUMPTIONS	
		TREATMENT	RATIO
Reuse, Recovery, Recycling Potential	Scrap steel in the US	Recycling	86.00%
Waste processing, Disposal	Scrap steel in the US	Disposal	14.00%
Reuse, Recovery, Recycling Potential	Scrap steel in Malaysia	Recycling	55.00%
Waste processing, Disposal	Scrap steel in Malaysia	Disposal	45.00%
Reuse, Recovery, Recycling Potential	Scrap steel in Singapore	Recycling	99.00%
Waste processing, Disposal	Scrap steel in Singapore	Disposal	1.00%
Reuse, Recovery, Recycling Potential	Scrap steel in Australia	Recycling	90.00%
Waste processing, Disposal	Scrap steel in Australia	Disposal	10.00%
Reuse, Recovery, Recycling Potential	Scrap steel in Philippines	Recycling	39.00%
Waste processing, Disposal	Scrap steel in Philippines	Disposal	61.00%
Reuse, Recovery, Recycling Potential	Scrap steel in Thailand	Recycling	90.00%
Waste processing, Disposal	Scrap steel in Thailand	Disposal	10.00%
Reuse, Recovery, Recycling Potential	Scrap steel in Vietnam	Recycling	90.00%
Waste processing, Disposal	Scrap steel in Vietnam	Disposal	10.00%
Reuse, Recovery, Recycling Potential	Scrap steel in Indonesia	Recycling	50.00%
Waste processing, Disposal	Scrap steel in Indonesia	Disposal	50.00%

4. Life Cycle Assessment Results

Table 2. Description of the system boundary modules

	PRODUCT STAGE			CONSTRUCTION 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	X	X	X	X	X

(X: included in LCA; MND: module or indicator not declared; MNR: module not relevant)

4.1. Results of The LCA - Environmental Impact according to EN 15804+A2

Table 3. Environmental Impact of Angle bar (1 metric ton)

EF3.0	Unit	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	Total	D
GWP-total	kg CO_2 eq	2.77E+02	5.84E+01	5.55E+02	MND	MND	0.00E+00	3.11E+00	3.05E-01	8.93E+02	0.00E+00
GWP-fossil	kg CO_2 eq	2.75E+02	5.83E+01	5.54E+02	MND	MND	0.00E+00	3.08E+00	3.04E-01	8.91E+02	0.00E+00
GWP-biogenic	kg CO_2 eq	1.61E+00	1.52E-02	1.29E-01	MND	MND	0.00E+00	1.15E-03	1.57E-04	1.76E+00	0.00E+00
GWP-luluc	kg CO_2 eq	2.30E-01	1.27E-01	4.29E-01	MND	MND	0.00E+00	2.18E-02	8.89E-04	8.08E-01	0.00E+00
ODP	kg CFC-11 eq	3.58E-05	1.18E-05	1.73E-05	MND	MND	0.00E+00	6.54E-07	9.44E-08	6.57E-05	0.00E+00
AP	mol H+ eq	2.39E+00	1.54E+00	1.89E+00	MND	MND	0.00E+00	1.70E-02	2.39E-03	5.83E+00	0.00E+00
EP-freshwater	kg P eq	9.75E-02	2.57E-03	3.41E-01	MND	MND	0.00E+00	2.56E-04	1.01E-06	4.41E-01	0.00E+00
EP-marine	kg N eq	3.42E-01	3.86E-01	3.67E-01	MND	MND	0.00E+00	6.08E-03	4.93E-06	1.10E+00	0.00E+00
EP-terrestrial	mol N eq	3.93E+00	4.28E+00	3.26E+00	MND	MND	0.00E+00	6.54E-02	9.19E-03	1.15E+01	0.00E+00
POCP	kg NMVOC eq	1.41E+00	1.12E+00	9.23E-01	MND	MND	0.00E+00	1.89E-02	2.66E-03	3.48E+00	0.00E+00
ADPE	kg Sb eq	5.86E-03	1.07E-04	2.32E-04	MND	MND	0.00E+00	1.05E-05	8.08E-07	6.21E-03	0.00E+00
ADPF	MJ	3.60E+03	7.74E+02	6.19E+03	MND	MND	0.00E+00	4.65E+01	6.65E+00	1.06E+04	0.00E+00
WDP	m3 depriv.	7.60E+01	1.77E+00	5.92E+01	MND	MND	0.00E+00	1.82E-01	2.32E-01	1.37E+02	0.00E+00

Table 4. Environmental Impact of Channel bar (1 metric ton)

EF3.0	Unit	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	Total	D
GWP-total	kg CO_2 eq	2.77E+02	5.84E+01	5.55E+02	MND	MND	0.00E+00	3.23E+00	3.74E-01	8.94E+02	0.00E+00
GWP-fossil	kg CO_2 eq	2.75E+02	5.83E+01	5.54E+02	MND	MND	0.00E+00	3.21E+00	3.72E-01	8.91E+02	0.00E+00
GWP-biogenic	kg CO_2 eq	1.61E+00	1.52E-02	1.29E-01	MND	MND	0.00E+00	1.20E-03	1.94E-04	1.76E+00	0.00E+00
GWP-luluc	kg CO_2 eq	2.30E-01	1.27E-01	4.29E-01	MND	MND	0.00E+00	2.27E-02	1.10E-03	8.09E-01	0.00E+00
ODP	kg CFC-11 eq	3.58E-05	1.18E-05	1.73E-05	MND	MND	0.00E+00	6.80E-07	1.17E-07	6.57E-05	0.00E+00
AP	mol H+ eq	2.39E+00	1.54E+00	1.89E+00	MND	MND	0.00E+00	1.77E-02	2.95E-03	5.83E+00	0.00E+00
EP-freshwater	kg P eq	9.75E-02	2.57E-03	3.41E-01	MND	MND	0.00E+00	2.66E-04	1.02E-06	4.42E-01	0.00E+00
EP-marine	kg N eq	3.42E-01	3.86E-01	3.67E-01	MND	MND	0.00E+00	6.32E-03	5.13E-06	1.10E+00	0.00E+00
EP-terrestrial	mol N eq	3.93E+00	4.28E+00	3.26E+00	MND	MND	0.00E+00	6.80E-02	1.13E-02	1.15E+01	0.00E+00
POCP	kg NMVOC eq	1.41E+00	1.12E+00	9.23E-01	MND	MND	0.00E+00	1.97E-02	3.28E-03	3.48E+00	0.00E+00
ADPE	kg Sb eq	5.86E-03	1.07E-04	2.32E-04	MND	MND	0.00E+00	1.09E-05	9.97E-07	6.21E-03	0.00E+00
ADPF	MJ	3.60E+03	7.74E+02	6.19E+03	MND	MND	0.00E+00	4.84E+01	8.21E+00	1.06E+04	0.00E+00
WDP	m3 depriv.	7.60E+01	1.77E+00	5.92E+01	MND	MND	0.00E+00	1.90E-01	2.86E-01	1.37E+02	0.00E+00

Table 5. Environmental Impact of Flat bar (1 metric ton)

EF3.0	Unit	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	Total	D
GWP-total	kg CO_2 eq	2.77E+02	5.84E+01	5.55E+02	MND	MND	0.00E+00	2.79E+00	1.11E-01	8.93E+02	0.00E+00
GWP-fossil	kg CO_2 eq	2.75E+02	5.83E+01	5.54E+02	MND	MND	0.00E+00	2.77E+00	1.11E-01	8.90E+02	0.00E+00
GWP-biogenic	kg CO_2 eq	1.61E+00	1.52E-02	1.29E-01	MND	MND	0.00E+00	1.03E-03	5.09E-05	1.76E+00	0.00E+00
GWP-luluc	kg CO_2 eq	2.30E-01	1.27E-01	4.29E-01	MND	MND	0.00E+00	1.96E-02	2.70E-04	8.05E-01	0.00E+00

ODP	kg CFC-11 eq	3.58E-05	1.18E-05	1.73E-05	MND	MND	0.00E+00	5.87E-07	6.70E-08	6.56E-05	0.00E+00
AP	mol H+ eq	2.39E+00	1.54E+00	1.89E+00	MND	MND	0.00E+00	1.53E-02	1.70E-03	5.83E+00	0.00E+00
EP-freshwater	kg P eq	9.75E-02	2.57E-03	3.41E-01	MND	MND	0.00E+00	2.30E-04	1.00E-06	4.41E-01	0.00E+00
EP-marine	kg N eq	3.42E-01	3.86E-01	3.67E-01	MND	MND	0.00E+00	5.46E-03	4.70E-06	1.10E+00	0.00E+00
EP-terrestrial	mol N eq	3.93E+00	4.28E+00	3.26E+00	MND	MND	0.00E+00	5.87E-02	6.53E-03	1.15E+01	0.00E+00
POCP	kg NMVOC eq	1.41E+00	1.12E+00	9.23E-01	MND	MND	0.00E+00	1.70E-02	1.89E-03	3.47E+00	0.00E+00
ADPE	kg Sb eq	5.86E-03	1.07E-04	2.32E-04	MND	MND	0.00E+00	9.45E-06	5.74E-07	6.21E-03	0.00E+00
ADPF	MJ	3.60E+03	7.74E+02	6.19E+03	MND	MND	0.00E+00	4.18E+01	4.72E+00	1.06E+04	0.00E+00
WDP	m3 depriv.	7.60E+01	1.77E+00	5.92E+01	MND	MND	0.00E+00	1.64E-01	1.65E-01	1.37E+02	0.00E+00

Table 6. Environmental Impact of Square Bar(Straight Square Bar, Square Bar in Coil) (1 metric ton)

EF3.0	UNIT	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	TOTAL	D
GWP-total	kg CO_2 eq	2.77E+02	5.84E+01	5.55E+02	MND	MND	0.00E+00	3.35E+00	3.88E-01	8.94E+02	0.00E+00
GWP-fossil	kg CO_2 eq	2.75E+02	5.83E+01	5.54E+02	MND	MND	0.00E+00	3.33E+00	3.87E-01	8.91E+02	0.00E+00
GWP-biogenic	kg CO_2 eq	1.61E+00	1.52E-02	1.29E-01	MND	MND	0.00E+00	1.24E-03	2.01E-04	1.76E+00	0.00E+00
GWP-luluc	kg CO_2 eq	2.30E-01	1.27E-01	4.29E-01	MND	MND	0.00E+00	2.35E-02	1.14E-03	8.10E-01	0.00E+00
ODP	kg CFC-11 eq	3.58E-05	1.18E-05	1.73E-05	MND	MND	0.00E+00	7.05E-07	1.21E-07	6.58E-05	0.00E+00
AP	mol H+ eq	2.39E+00	1.54E+00	1.89E+00	MND	MND	0.00E+00	1.83E-02	3.07E-03	5.83E+00	0.00E+00
EP-freshwater	kg P eq	9.75E-02	2.57E-03	3.41E-01	MND	MND	0.00E+00	2.75E-04	1.02E-06	4.42E-01	0.00E+00
EP-marine	kg N eq	3.42E-01	3.86E-01	3.67E-01	MND	MND	0.00E+00	6.55E-03	5.17E-06	1.10E+00	0.00E+00
EP-terrestrial	mol N eq	3.93E+00	4.28E+00	3.26E+00	MND	MND	0.00E+00	7.05E-02	1.18E-02	1.16E+01	0.00E+00
POCP	kg NMVOC eq	1.41E+00	1.12E+00	9.23E-01	MND	MND	0.00E+00	2.04E-02	3.41E-03	3.48E+00	0.00E+00
ADPE	kg Sb eq	5.86E-03	1.07E-04	2.32E-04	MND	MND	0.00E+00	1.13E-05	1.04E-06	6.21E-03	0.00E+00
ADPF	MJ	3.60E+03	7.74E+02	6.19E+03	MND	MND	0.00E+00	5.01E+01	8.54E+00	1.06E+04	0.00E+00
WDP	m3 depriv.	7.60E+01	1.77E+00	5.92E+01	MND	MND	0.00E+00	1.97E-01	2.98E-01	1.37E+02	0.00E+00

Table 7. Environmental Impact of Round Bar (Straight Bar, Bar in Coil) (1 metric ton)

EF3.0	UNIT	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	TOTAL	D
GWP-total	kg CO_2 eq	2.77E+02	5.84E+01	5.56E+02	MND	MND	0.00E+00	3.87E+00	4.31E-01	8.95E+02	0.00E+00
GWP-fossil	kg CO_2 eq	2.75E+02	5.83E+01	5.55E+02	MND	MND	0.00E+00	3.84E+00	4.30E-01	8.93E+02	0.00E+00
GWP-biogenic	kg CO_2 eq	1.61E+00	1.52E-02	1.29E-01	MND	MND	0.00E+00	1.43E-03	2.24E-04	1.76E+00	0.00E+00
GWP-luluc	kg CO_2 eq	2.30E-01	1.27E-01	4.29E-01	MND	MND	0.00E+00	2.71E-02	1.27E-03	8.14E-01	0.00E+00
ODP	kg CFC-11 eq	3.58E-05	1.18E-05	1.73E-05	MND	MND	0.00E+00	8.14E-07	1.35E-07	6.59E-05	0.00E+00
AP	mol H+ eq	2.39E+00	1.54E+00	1.89E+00	MND	MND	0.00E+00	2.12E-02	3.43E-03	5.84E+00	0.00E+00
EP-freshwater	kg P eq	9.75E-02	2.57E-03	3.41E-01	MND	MND	0.00E+00	3.18E-04	1.02E-06	4.42E-01	0.00E+00
EP-marine	kg N eq	3.42E-01	3.86E-01	3.67E-01	MND	MND	0.00E+00	7.57E-03	5.30E-06	1.10E+00	0.00E+00
EP-terrestrial	mol N eq	3.93E+00	4.28E+00	3.26E+00	MND	MND	0.00E+00	8.14E-02	1.32E-02	1.16E+01	0.00E+00
POCP	kg NMVOC eq	1.41E+00	1.12E+00	9.23E-01	MND	MND	0.00E+00	2.35E-02	3.80E-03	3.48E+00	0.00E+00
ADPE	kg Sb eq	5.86E-03	1.07E-04	2.32E-04	MND	MND	0.00E+00	1.31E-05	1.16E-06	6.21E-03	0.00E+00
ADPF	MJ	3.60E+03	7.74E+02	6.19E+03	MND	MND	0.00E+00	5.79E+01	9.53E+00	1.06E+04	0.00E+00
WDP	m3 depriv.	7.60E+01	1.77E+00	5.92E+01	MND	MND	0.00E+00	2.27E-01	3.32E-01	1.38E+02	0.00E+00

4.2. Results of the LCA - indicators to describe resource use according to EN 15804+A2

Table 8. Resource Use of Angle bar (1 metric ton)

PARAMETER	UNIT	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	TOTAL	D
PERE	MJ	0.00E+00	7.32E+00	1.02E+02	MND	MND	0.00E+0	7.98E-01	7.75E-02	1.10E+02	0.00E+00
PERM	MJ	2.49E+02	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	2.49E+02	0.00E+00
PERT	MJ	2.49E+02	7.32E+00	1.02E+02	MND	MND	0.00E+0	7.98E-01	7.75E-02	3.59E+02	0.00E+00
PENRE	MJ	0.00E+00	7.78E+02	6.19E+03	MND	MND	0.00E+0	4.66E+01	6.67E+00	7.02E+03	0.00E+00
PENRM	MJ	3.60E+03	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	3.60E+03	0.00E+00
PENRT	MJ	3.60E+03	7.78E+02	6.19E+03	MND	MND	0.00E+0	4.66E+01	6.67E+00	1.06E+04	0.00E+00
SM	Kg	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	2.01E+00	6.01E-02	1.26E+00	MND	MND	0.00E+0	6.19E-03	5.61E-03	3.35E+00	0.00E+00

Table 9. Resource Use of Channel bar (1 metric ton)

PARAMETER	UNIT	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	TOTAL	D
PERE	MJ	0.00E+00	7.32E+00	1.02E+02	MND	MND	0.00E+0	8.31E-01	9.57E-02	1.10E+02	0.00E+00
PERM	MJ	2.49E+02	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	2.49E+02	0.00E+00
PERT	MJ	2.49E+02	7.32E+00	1.02E+02	MND	MND	0.00E+0	8.31E-01	9.57E-02	3.59E+02	0.00E+00
PENRE	MJ	0.00E+00	7.78E+02	6.19E+03	MND	MND	0.00E+0	4.85E+01	8.23E+00	7.02E+03	0.00E+00
PENRM	MJ	3.60E+03	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	3.60E+03	0.00E+00
PENRT	MJ	3.60E+03	7.78E+02	6.19E+03	MND	MND	0.00E+0	4.85E+01	8.23E+00	1.06E+04	0.00E+00
SM	Kg	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	2.01E+00	6.01E-02	1.26E+00	MND	MND	0.00E+0	6.44E-03	6.91E-03	3.35E+00	0.00E+00

Table 10. Resource Use of Flat bar (1 metric ton)

PARAMETER	UNIT	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	TOTAL	D
PERE	MJ	0.00E+00	7.32E+00	1.02E+02	MND	MND	0.00E+0	7.17E-01	5.51E-02	1.10E+02	0.00E+00
PERM	MJ	2.49E+02	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	2.49E+02	0.00E+00
PERT	MJ	2.49E+02	7.32E+00	1.02E+02	MND	MND	0.00E+0	7.17E-01	5.51E-02	3.59E+02	0.00E+00
PENRE	MJ	0.00E+00	7.78E+02	6.19E+03	MND	MND	0.00E+0	4.19E+01	4.73E+00	7.01E+03	0.00E+00
PENRM	MJ	3.60E+03	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	3.60E+03	0.00E+00
PENRT	MJ	3.60E+03	7.78E+02	6.19E+03	MND	MND	0.00E+0	4.19E+01	4.73E+00	1.06E+04	0.00E+00
SM	Kg	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00

FW	m^3	2.01E+00	6.01E-02	1.26E+00	MND	MND	0.00E+0	5.56E-03	3.98E-03	3.34E+00	0.00E+00

Table 11. Resource Use of Square Bar(Straight Square Bar, Square Bar in Coil) (1 metric ton)

PARAMETER	UNIT	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	TOTAL	D
PERE	MJ	0.00E+00	7.32E+00	1.02E+02	MND	MND	0.00E+0	8.61E-01	9.95E-02	1.10E+02	0.00E+00
PERM	MJ	2.49E+02	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	2.49E+02	0.00E+00
PERT	MJ	2.49E+02	7.32E+00	1.02E+02	MND	MND	0.00E+0	8.61E-01	9.95E-02	3.59E+02	0.00E+00
PENRE	MJ	0.00E+00	7.78E+02	6.19E+03	MND	MND	0.00E+0	5.02E+01	8.56E+00	7.03E+03	0.00E+00
PENRM	MJ	3.60E+03	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	3.60E+03	0.00E+00
PENRT	MJ	3.60E+03	7.78E+02	6.19E+03	MND	MND	0.00E+0	5.02E+01	8.56E+00	1.06E+04	0.00E+00
SM	Kg	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	2.01E+00	6.01E-02	1.26E+00	MND	MND	0.00E+0	6.68E-03	7.19E-03	3.35E+00	0.00E+00

Table 12. Resource Use of Round Bar (Straight Bar, Bar in Coil) (1 metric ton)

PARAMETER	UNIT	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	TOTAL	D
PERE	MJ	0.00E+00	7.32E+00	1.02E+02	MND	MND	0.00E+0	9.94E-01	1.11E-01	1.10E+02	0.00E+00
PERM	MJ	2.49E+02	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	2.49E+02	0.00E+00
PERT	MJ	2.49E+02	7.32E+00	1.02E+02	MND	MND	0.00E+0	9.94E-01	1.11E-01	3.59E+02	0.00E+00
PENRE	MJ	0.00E+00	7.78E+02	6.19E+03	MND	MND	0.00E+0	5.80E+01	9.55E+00	7.04E+03	0.00E+00
PENRM	MJ	3.60E+03	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	3.60E+03	0.00E+00
PENRT	MJ	3.60E+03	7.78E+02	6.19E+03	MND	MND	0.00E+0	5.80E+01	9.55E+00	1.06E+04	0.00E+00
SM	Kg	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	2.01E+00	6.01E-02	1.26E+00	MND	MND	0.00E+0	7.71E-03	8.02E-03	3.35E+00	0.00E+00

4.3. Results of the LCA - waste categories and output flows according to EN 15804+A2

Table 13. Waste Categories and Output Flows of Angle bar (1 metric ton)

PARAMETER	UNIT	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	TOTAL	D
HWD	MJ	0.00E+00	7.32E+00	1.02E+02	MND	MND	0.00E+0	7.98E-01	7.75E-02	1.10E+02	0.00E+00
NHWD	MJ	2.49E+02	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	2.49E+02	0.00E+00
RWD	MJ	2.49E+02	7.32E+00	1.02E+02	MND	MND	0.00E+0	7.98E-01	7.75E-02	3.59E+02	0.00E+00
MFR	MJ	0.00E+00	7.78E+02	6.19E+03	MND	MND	0.00E+0	4.66E+01	6.67E+00	7.02E+03	0.00E+00
MER	MJ	3.60E+03	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	3.60E+03	0.00E+00
CRU	MJ	3.60E+03	7.78E+02	6.19E+03	MND	MND	0.00E+0	4.66E+01	6.67E+00	1.06E+04	0.00E+00
EEE	Kg	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 14. Waste Categories and Output Flows of Channel bar (1 metric ton)

PARAMETER	UNIT	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	TOTAL	D
HWD	MJ	1.02E-02	1.06E-03	2.40E-03	MND	MND	0.00E+0	1.26E-04	1.47E-05	1.38E-02	0.00E+00
NHWD	MJ	6.47E+01	1.53E+01	2.01E+01	MND	MND	0.00E+0	3.35E+00	4.23E+01	1.46E+02	0.00E+00
RWD	MJ	1.40E-02	5.31E-03	1.87E-02	MND	MND	0.00E+0	3.19E-04	5.36E-05	3.84E-02	0.00E+00
MFR	MJ	0.00E+00	0.00E+00	2.10E-01	MND	MND	0.00E+0	0.00E+00	6.36E-01	8.46E-01	0.00E+00
MER	MJ	0.00E+00	0.00E+00	1.41E-06	MND	MND	0.00E+0	0.00E+00	0.00E+00	1.41E-06	0.00E+00
CRU	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	Kg	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 15. Waste Categories and Output Flows of Flat bar (1 metric ton)

PARAMETER	UNIT	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	TOTAL	D
HWD	MJ	1.02E-02	1.06E-03	2.40E-03	MND	MND	0.00E+0	1.09E-04	8.45E-06	1.37E-02	0.00E+00
NHWD	MJ	6.47E+01	1.53E+01	2.01E+01	MND	MND	0.00E+0	2.90E+00	2.43E+01	1.27E+02	0.00E+00
RWD	MJ	1.40E-02	5.31E-03	1.87E-02	MND	MND	0.00E+0	2.75E-04	3.08E-05	3.83E-02	0.00E+00
MFR	MJ	0.00E+00	0.00E+00	2.10E-01	MND	MND	0.00E+0	0.00E+00	2.26E-01	4.36E-01	0.00E+00
MER	MJ	0.00E+00	0.00E+00	1.41E-06	MND	MND	0.00E+0	0.00E+00	0.00E+00	1.41E-06	0.00E+00
CRU	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	Kg	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 16. Waste Categories and Output Flows of Square Bar(Straight Square Bar, Square Bar in Coil) (1 metric ton)

PARAMETER	UNIT	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	TOTAL	D
HWD	MJ	1.02E-02	1.06E-03	2.40E-03	MND	MND	0.00E+0	1.31E-04	1.53E-05	1.38E-02	0.00E+00
NHWD	MJ	6.47E+01	1.53E+01	2.01E+01	MND	MND	0.00E+0	3.47E+00	4.40E+01	1.48E+02	0.00E+00
RWD	MJ	1.40E-02	5.31E-03	1.87E-02	MND	MND	0.00E+0	3.30E-04	5.57E-05	3.84E-02	0.00E+00
MFR	MJ	0.00E+00	0.00E+00	2.10E-01	MND	MND	0.00E+0	0.00E+00	6.74E-01	8.84E-01	0.00E+00
MER	MJ	0.00E+00	0.00E+00	1.41E-06	MND	MND	0.00E+0	0.00E+00	0.00E+00	1.41E-06	0.00E+00
CRU	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	Kg	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 17. Waste Categories and Output Flows of Round Bar (Straight Bar, Bar in Coil) (1 metric ton)

PARAMETER	UNIT	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	TOTAL	D
HWD	MJ	1.02E-02	1.06E-03	2.40E-03	MND	MND	0.00E+0	1.51E-04	1.70E-05	1.38E-02	0.00E+00
NHWD	MJ	6.47E+01	1.53E+01	2.01E+01	MND	MND	0.00E+0	4.01E+00	4.89E+01	1.53E+02	0.00E+00
RWD	MJ	1.40E-02	5.31E-03	1.87E-02	MND	MND	0.00E+0	3.81E-04	6.22E-05	3.84E-02	0.00E+00
MFR	MJ	0.00E+00	0.00E+00	2.10E-01	MND	MND	0.00E+0	0.00E+00	7.85E-01	9.94E-01	0.00E+00

MER	MJ	0.00E+00	0.00E+00	1.41E-06	MND	MND	0.00E+0	0.00E+00	0.00E+00	1.41E-06	0.00E+00
CRU	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EEE	Kg	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EET	MJ	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4.4. Results of the LCA - additional impact categories according to EN 15804+A2-optional

Table 18. Additional environmental impact indicators of Angle bar (1 metric ton)

PARAMETER	UNIT	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	TOTAL	D
PM	Disease incidence	1.02E-02	1.06E-03	2.40E-03	MND	MND	0.00E+0	1.09E-04	8.45E-06	1.37E-02	0.00E+00
IRP	kBq U235 eq.	6.47E+01	1.53E+01	2.01E+01	MND	MND	0.00E+0	2.90E+00	2.43E+01	1.27E+02	0.00E+00
ETP-fw	CTUe	1.40E-02	5.31E-03	1.87E-02	MND	MND	0.00E+0	2.75E-04	3.08E-05	3.83E-02	0.00E+00
HTP-c	CTUh	0.00E+00	0.00E+00	2.10E-01	MND	MND	0.00E+0	0.00E+00	2.26E-01	4.36E-01	0.00E+00
HTP-nc	CTUh	0.00E+00	0.00E+00	1.41E-06	MND	MND	0.00E+0	0.00E+00	0.00E+00	1.41E-06	0.00E+00
SQP	—	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 19. Additional environmental impact indicators of Channel bar (1 metric ton)

PARAMETER	UNIT	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	TOTAL	D
PM	Disease incidence	1.02E-02	1.06E-03	2.40E-03	MND	MND	0.00E+0	1.09E-04	8.45E-06	1.37E-02	0.00E+00
IRP	kBq U235 eq.	6.47E+01	1.53E+01	2.01E+01	MND	MND	0.00E+0	2.90E+00	2.43E+01	1.27E+02	0.00E+00
ETP-fw	CTUe	1.40E-02	5.31E-03	1.87E-02	MND	MND	0.00E+0	2.75E-04	3.08E-05	3.83E-02	0.00E+00
HTP-c	CTUh	0.00E+00	0.00E+00	2.10E-01	MND	MND	0.00E+0	0.00E+00	2.26E-01	4.36E-01	0.00E+00
HTP-nc	CTUh	0.00E+00	0.00E+00	1.41E-06	MND	MND	0.00E+0	0.00E+00	0.00E+00	1.41E-06	0.00E+00
SQP	—	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 20. Additional environmental impact indicators of Flat bar (1 metric ton)

PARAMETER	UNIT	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	TOTAL	D
PM	Disease incidence	1.02E-02	1.06E-03	2.40E-03	MND	MND	0.00E+0	1.09E-04	8.45E-06	1.37E-02	0.00E+00
IRP	kBq U235 eq.	6.47E+01	1.53E+01	2.01E+01	MND	MND	0.00E+0	2.90E+00	2.43E+01	1.27E+02	0.00E+00
ETP-fw	CTUe	1.40E-02	5.31E-03	1.87E-02	MND	MND	0.00E+0	2.75E-04	3.08E-05	3.83E-02	0.00E+00
HTP-c	CTUh	0.00E+00	0.00E+00	2.10E-01	MND	MND	0.00E+0	0.00E+00	2.26E-01	4.36E-01	0.00E+00
HTP-nc	CTUh	0.00E+00	0.00E+00	1.41E-06	MND	MND	0.00E+0	0.00E+00	0.00E+00	1.41E-06	0.00E+00
SQP	—	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 21. Additional environmental impact indicators of Square Bar(Straight Square Bar, Square Bar in Coil) (1 metric ton)

PARAMETER	UNIT	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	TOTAL	D
PM	Disease incidence	1.02E-02	1.06E-03	2.40E-03	MND	MND	0.00E+0	1.09E-04	8.45E-06	1.37E-02	0.00E+00
IRP	kBq U235 eq.	6.47E+01	1.53E+01	2.01E+01	MND	MND	0.00E+0	2.90E+00	2.43E+01	1.27E+02	0.00E+00
ETP-fw	CTUe	1.40E-02	5.31E-03	1.87E-02	MND	MND	0.00E+0	2.75E-04	3.08E-05	3.83E-02	0.00E+00
HTP-c	CTUh	0.00E+00	0.00E+00	2.10E-01	MND	MND	0.00E+0	0.00E+00	2.26E-01	4.36E-01	0.00E+00
HTP-nc	CTUh	0.00E+00	0.00E+00	1.41E-06	MND	MND	0.00E+0	0.00E+00	0.00E+00	1.41E-06	0.00E+00
SQP	—	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 22. Additional environmental impact indicators of Round Bar (Straight Bar, Bar in Coil) (1 metric ton)

PARAMETER	UNIT	A1	A2	A3	A4-A5	B1-B7	C1	C2	C3-C4	TOTAL	D
PM	Disease incidence	1.02E-02	1.06E-03	2.40E-03	MND	MND	0.00E+0	1.09E-04	8.45E-06	1.37E-02	0.00E+00
IRP	kBq U235 eq.	6.47E+01	1.53E+01	2.01E+01	MND	MND	0.00E+0	2.90E+00	2.43E+01	1.27E+02	0.00E+00
ETP-fw	CTUe	1.40E-02	5.31E-03	1.87E-02	MND	MND	0.00E+0	2.75E-04	3.08E-05	3.83E-02	0.00E+00
HTP-c	CTUh	0.00E+00	0.00E+00	2.10E-01	MND	MND	0.00E+0	0.00E+00	2.26E-01	4.36E-01	0.00E+00
HTP-nc	CTUh	0.00E+00	0.00E+00	1.41E-06	MND	MND	0.00E+0	0.00E+00	0.00E+00	1.41E-06	0.00E+00
SQP	—	0.00E+00	0.00E+00	0.00E+00	MND	MND	0.00E+0	0.00E+00	0.00E+00	0.00E+00	0.00E+00

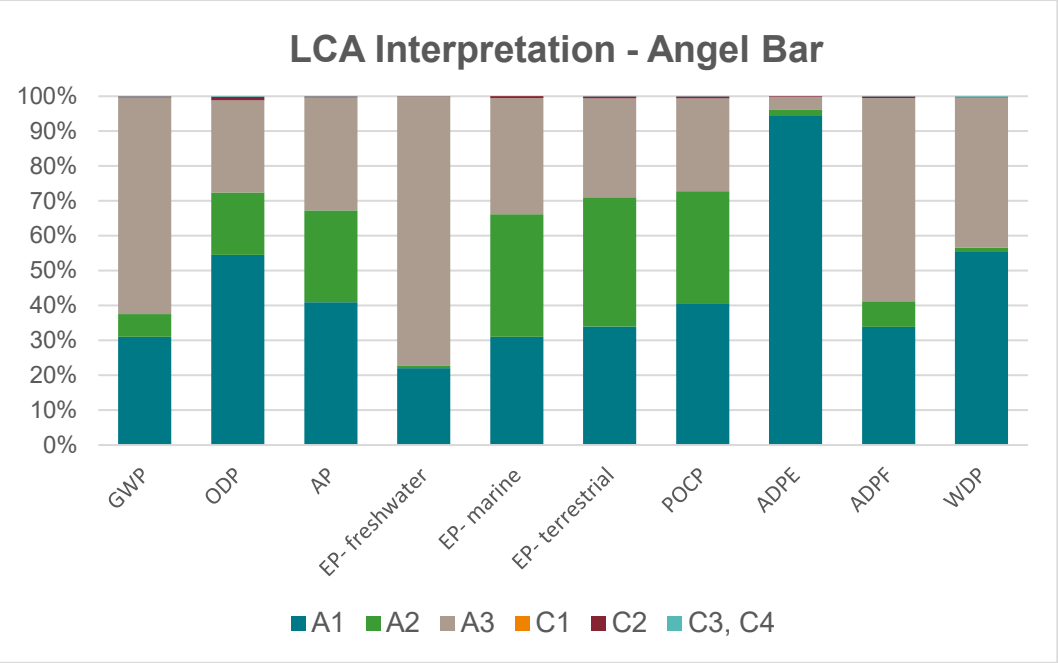
Disclaimer 1 – for the indicator “Potential Human exposure efficiency relative to U235”. This impact category deals mainly with the eventual impact of low-dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure or radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, radon and from some construction materials is also not measured by this indicator.

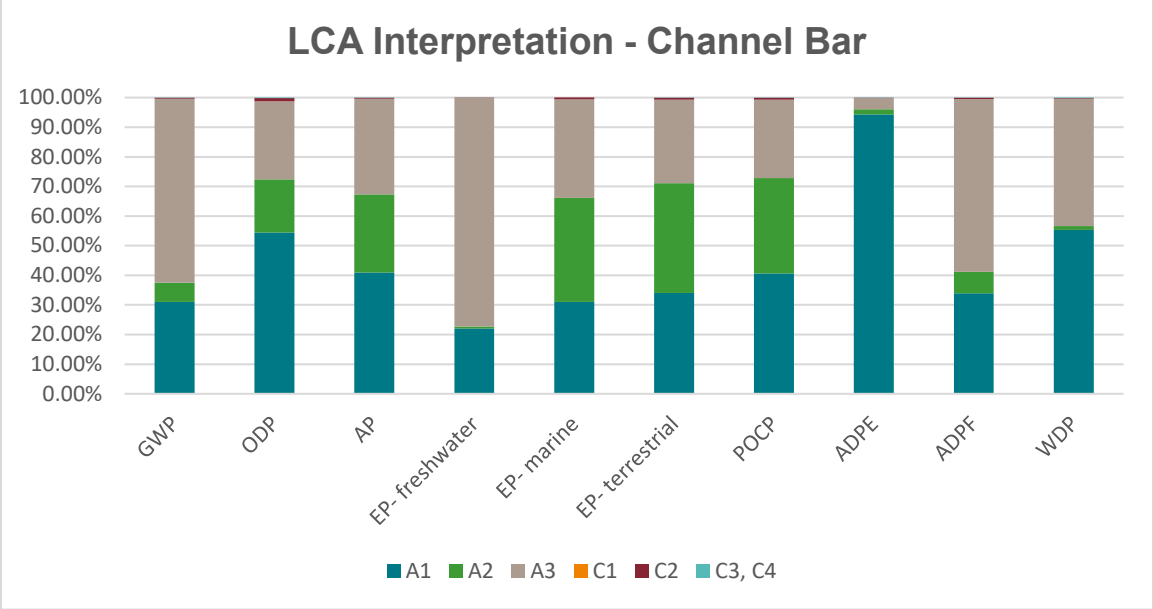
Disclaimer 2 – for the indicators “abiotic depletion potential for non-fossil resources”, “abiotic depletion potential for fossil resources”, “water (user) deprivation potential, deprivation-weighted water consumption”, “potential comparative toxic unit for ecosystems”, “potential comparative toxic unit for humans – cancerogenic”, “Potential comparative toxic unit for humans - not cancerogenic”, “potential soil quality index”. The results of this environmental impact indicator shall be used with care as the uncertainties on these results are high as there is limited experience with the indicator.

5. LCA Interpretation

Hot Rolled Steel Merchant Bar
Mainly supply for civil & industrial construction, building, towers, bridges and other structural uses.

According to ISO 14025 and EN 15804+A2





豐興鋼鐵股份有限公司
FENG HSIN STEEL CO., LTD.

CERTIFIED
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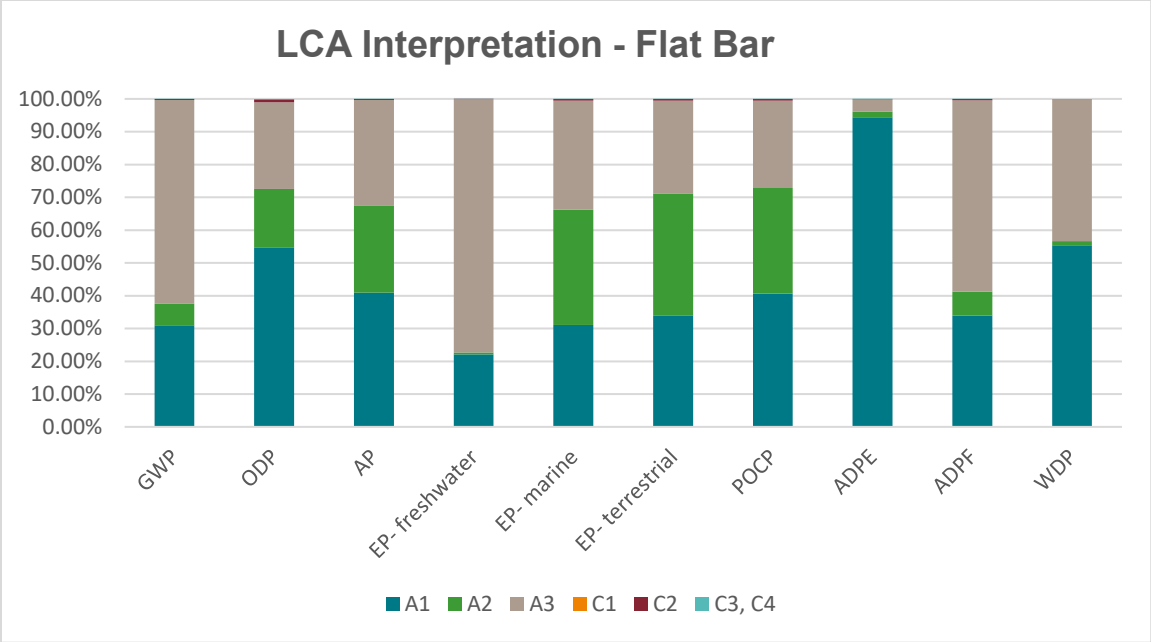

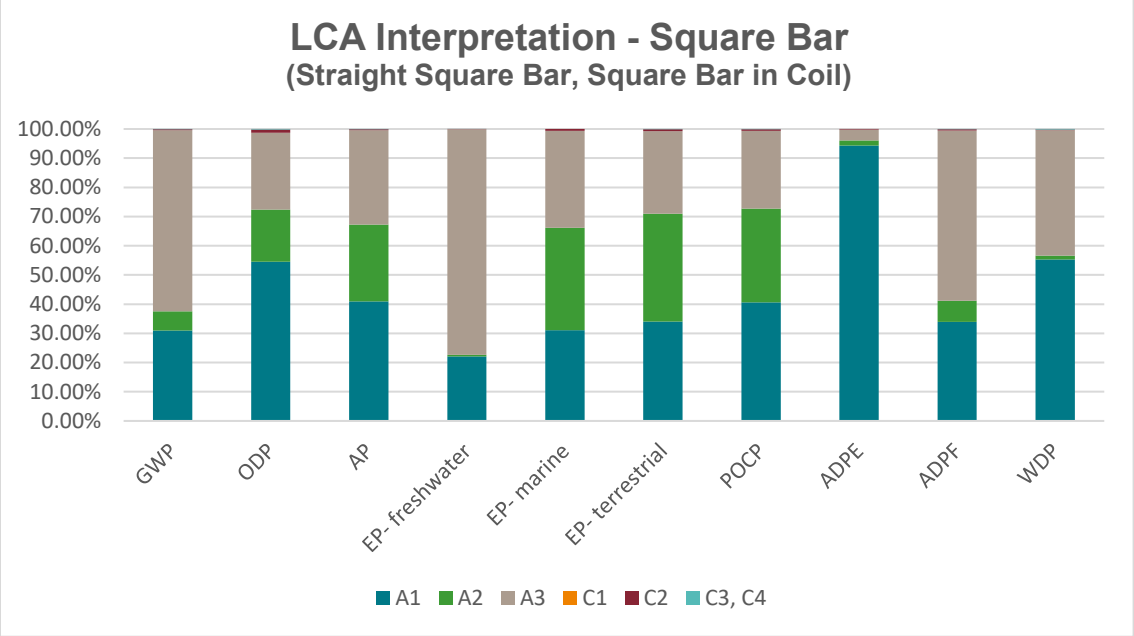

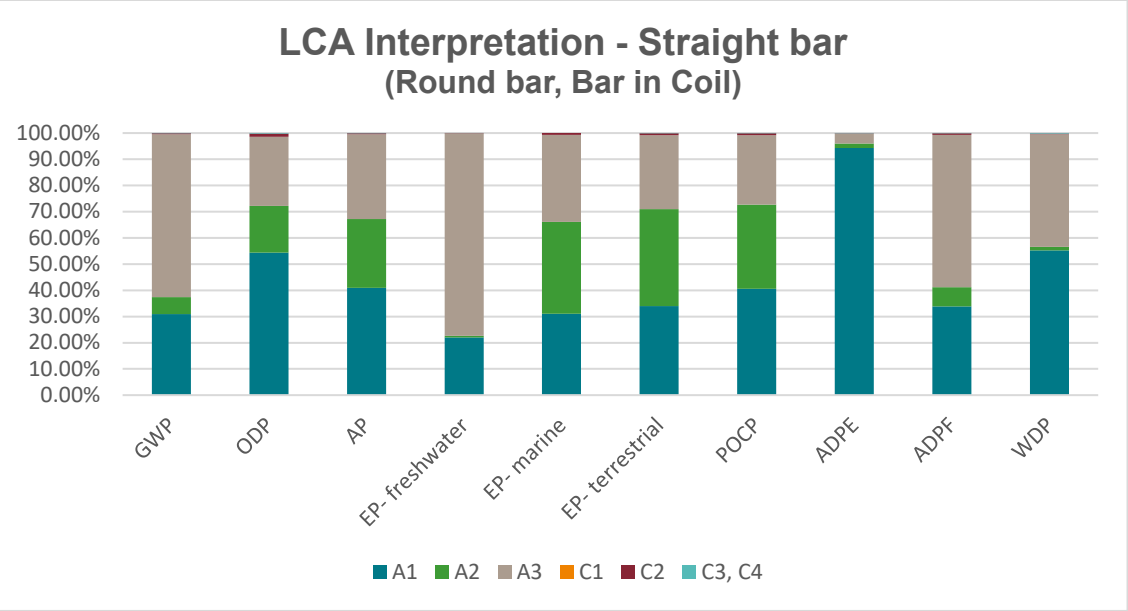

From the LCA Interpretation figures, the highest proportion of environmental impact of the stages are shown as follows:

- GWP : A3 Manufacturing
- ODP : A1 Raw material supply
- AP : A1 Raw material supply
- EP-freshwater : A3 Manufacturing
- EP-marine : A2 Transport
- EP- terrestrial : A2 Transport
- POCP : A1 Raw material supply
- ADPE : A1 Raw material supply
- ADPF : A3 Manufacturing
- WDP : A1 Raw material supply

6. Additional Environmental Information

RoHS

The sample(s) was / were tested with reference to RoHS. To determine Cd, Pb, Hg, Cr +6, PBB, PBDE, DIBP, DBP, BBP and DEHP in the submitted sample(s).

Based on the performed tests on submitted sample(s), the test results are N.D.(Not detected.).

REACH

The sample(s) was / were tested with reference to REACH. To determine Anthracene, MDA, DBP ,etc. in the submitted sample(s).

Based on the performed tests on submitted sample(s), the test results are N.D.(Not detected.).

7. Requisite evidence

This EPD covers semi-finished structural steel products. Further processing and fabrication depend on the intended application. Therefore, further documentation is not applicable.

7.1. Weathering performance

The rusting rate of steel products depends on the position of the component and the conditions of the surrounding atmosphere (corrosivity categories according to ISO 12944-2.)

If required, the surfaces of fabricated structural components are usually protected with anticorrosion material in order to prevent any direct contact with the atmosphere. The weathering of this protection depends on the applied protection system.

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