

# Life Cycle Assessment (LCA) Report

Prepared by: Labeling Sustainability

Commissioner: Taylor Metal Products, Riverside, CA Facility

Date of Report: June 16, 2024

Conducted in accordance with: ISO 14040: 2006 and ISO 14044: 2006 standards for environmental management and life cycle assessment.

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# 1. General Requirements and Considerations

## 1.1. Type and Format of the Report

This report follows the guidelines outlined in ISO 14040: 2006 and ISO 14044: 2006. It presents the results of a cradle-to-gate LCA conducted for metal panels manufactured by Taylor Metal Products. The report is intended to be transparent and detailed, providing sufficient clarity for stakeholders to understand the data, assumptions, methods, and limitations involved. The report's purpose is to facilitate informed decision making, improving the environmental performance of the product while avoiding bias.

## 1.2. Modifications and Justifications

There were no significant modifications to the initial scope of the study. The study scope was clearly defined to focus on cradle-to-gate processes (A1, A2, and A3) in compliance with PCR requirements.

# 2. Goal of the Study

## 2.1. Reasons for Conducting the Study

The primary goal of this LCA is to assess the environmental impacts of Taylor Metal Products' metal panels in compliance with ISO 14040 and ISO 14044 standards and UL's Product Category Rules (PCR). The goal is also to improve environmental transparency, strengthen Taylor Metal's market position, and support sustainability initiatives such as LEED certification.

## 2.2. Intended Applications

The LCA results will be used as:

- Support business-to-business (B2B) communications about the environmental performance of Taylor Metal Products.
- Inform customers about the environmental impact of metal panel products.
- Serve as documentation for green building certifications such as LEED.

## 2.3. Target Audience

The primary audience includes employees of Taylor Metal Products, customers (contractors, architects, engineers), sustainability experts, and policy makers interested in sustainable building materials.

## 2.4. Comparative Assertions

This study does not support comparative assertions intended for public disclosure.

### **3. Scope of the Study**

#### 3.1. Function of the Product

The primary function of Taylor Metal Products' metal panels is to provide structural and aesthetic roofing and siding solutions. The product mitigates solar heat absorption, reduces cooling energy consumption, and enhances the sustainability of building structures.

#### 3.2. Functional Unit

The functional unit is defined as 100 square meters (m<sup>2</sup>) of metal panel product. This is consistent with the goal and scope of the study. Performance characteristics such as durability, recyclability, and energy savings are inherent in the functional unit, but additional functions like energy recovery during use are excluded from the scope.

#### 3.3. System Boundary

This cradle-to-gate LCA includes the following life cycle stages:

- A1: Raw Material Supply – Extraction and processing of raw materials such as steel, aluminum, and coatings.
- A2: Transport – Transportation of raw materials from suppliers to the manufacturing facility in Riverside, CA
- A3: Manufacturing – Processes occurring at the manufacturing plant, including energy and water consumption, material inputs, emissions, and waste generation.

Omitted stages include transportation to the site, installation, use, maintenance, and end-of-life disposal.

#### 3.4. Cut-off Criteria

The study follows the cut-off criteria outlined in ISO 14044. Processes that contribute less than 1% to the mass or energy inputs and outputs were excluded, provided that they did not cumulatively exceed 5% of total inputs. All significant material and energy flows have been included.

### **4. Life Cycle Inventory Analysis**

#### 4.1. Data Collection Procedures

Primary data were collected from Taylor Metal Products' manufacturing facility for the year 2023. Data included material use, energy consumption, transportation distances, and waste generation. Secondary data were obtained from the ecoinvent v3.10 database for upstream processes, such as raw material extraction.

#### 4.2. Unit Process Description

The key processes include:

- Raw Material Acquisition (A1) – Steel and aluminum are sourced primarily in recycled forms, with processing inputs from global suppliers.
- Transportation (A2)- Transportation of the raw materials to the manufacturing facility
- Manufacturing (A3) – Involves cutting, coating, and assembling metal panels, with the use of electricity, natural gas, and propane for machinery operations.

Table 1: LCI inputs assumed for module A1 (i.e. raw material supply)

Input	LCI Activity	Data Source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
Recycled steel (galvanized)	steel production, electric, low-alloyed/steel, low-alloyed/RoW/kg	ecoinvent v3.10 in 2024	California	2024	2	3	2	3	3
Primary steel (galvanized)	steel production, converter, low-alloyed/steel, low-alloyed/RoW/kg	ecoinvent v3.10 in 2024	California	2024	2	3	2	3	3
Recycled aluminum	aluminum alloy production, AlMg3/aluminum alloy, AlMg3/RoW/kg	ecoinvent v3.10 in 2024	California	2024	1	3	1	3	3
Primary aluminum	aluminum production, primary, ingot/aluminum, primary, ingot/RoW/kg	ecoinvent v3.10 in 2024	California	2024	2	3	2	3	3
Paint (for galvanized)	polyvinyl fluoride production/polyvinyl fluoride/RoW/kg	ecoinvent v3.10 in 2024	California	2024	2	3	2	3	3
Galvanized coating	zinc coating, coils/zinc coat, coils/RoW/m2	ecoinvent v3.10 in 2024	California	2024	2	3	2	3	3

Table 2: LCI inputs assumed for module A2 (i.e. transport of A1 inputs)

Input	LCI Activity	Data Source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
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<b>Bulk waste-freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
<b>Paint freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
<b>Paint (for galvanized freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
<b>Primary steel (galvanized)-freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
<b>Plastic wrap-freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
<b>Primary aluminum-freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
<b>Primary steel (Zincalume)-freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3
<b>Recycled aluminum-freight</b>	market for transport, freight, lorry 7.5-16 metric ton,	ecoinvent v3.10 in 2024	RER	2024	2	3	1	3	3

<b>transport via Truck</b>	EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm									
<b>Recycled steel (galvanized)-freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024		2	3	1	3	3
<b>Recycled steel (Zincalume)-freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024		2	3	1	3	3
<b>Screw-freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024		2	3	1	3	3
<b>Waste for recycling-freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	ecoinvent v3.10 in 2024	RER	2024		2	3	1	3	3

Table 3: LCI inputs assumed for module A3

<b>Input</b>	<b>LCI Activity</b>	<b>Data Source</b>	<b>Geo</b>	<b>Year</b>	<b>Technology</b>	<b>Time</b>	<b>Geography</b>	<b>Reliability</b>	<b>Completeness</b>	
<b>Bulk waste</b>	process-specific burdens, residual material landfill/process-specific burdens, residual material landfill/RoW/kg	ecoinvent v3.10 in 2024	California	2024		2	3	1	3	3
<b>Electricity</b>	market for electricity, medium voltage/electricity,	ecoinvent v3.10 in 2024	Multiple states	2024		2	3	2	3	3

	medium voltage/US-WECC/kWh								
<b>Natural gas</b>	market for heat, district or industrial, natural gas/heat, district or industrial, natural gas/RoW/MJ	ecoinvent v3.10 in 2024	Multiple states	2024	2	3	2	3	3
<b>Plastic wrap</b>	extrusion, plastic film/extrusion, plastic film/RoW/kg	ecoinvent v3.10 in 2024	California	2024	2	3	1	3	3
<b>Propane</b>	propane, burned in building machine/propane, burned in building machine/GLO/MJ	ecoinvent v3.10 in 2024	California	2024	2	3	2	3	3
<b>Screw</b>	steel production, electric, chromium steel 18/8/steel, chromium steel 18/8/RoW/kg	ecoinvent v3.10 in 2024	California	2024	1	3	1	3	3
<b>Waste for recycling</b>	waste/scrap to sorting center for recycling	Original facility data	Original facility data	Original facility data: 2023-01-01 to 2023-12-31	1	3	2	3	3
<b>Wooden pallet</b>	EUR-flat pallet production/EUR-flat pallet/RoW/unit	ecoinvent v3.10 in 2024	California	2024	2	3	1	3	3

#### 4.3. Calculation Procedures

Calculations were carried out using standard LCA software, with data entered into RStudio for analysis. Material and energy flows were converted into environmental impacts using characterization factors from the TRACI model.

#### 4.4. Validation of Data

Data validation was achieved through cross-referencing with publicly available literature and internal mass-energy balances. Data gaps were addressed by conservative estimates based on available secondary data.

#### 4.5. Sensitivity Analysis

A sensitivity analysis was conducted to test the effect of varying energy consumption and raw material sourcing on the final impact results. The largest variations were found in the electricity used in manufacturing and the proportion of recycled versus virgin raw materials.

#### 4.6. Allocation Principles

Allocation procedures followed the guidelines in ISO 14044. Energy and material flows were allocated based on production volume, and no co-products were identified that would require additional allocation.

### 5. Life Cycle Impact Assessment (LCIA)

5.1. LCIA Indicators, Inventory metrics and emerging impact categories included in the LCA report.

ID	LCIA indicators	Abbreviations	Units
1	Climate change: global warming potential (GWP100)	GWP100	kg CO <sub>2</sub> -eq
2	Ozone depletion: ozone depletion potential (ODP)	ODP	kg CFC-11-eq
3	Acidification: acidification potential (AP)	AP	kg SO <sub>2</sub> -eq
4	Eutrophication: eutrophication potential	EP	kg N-eq
5	Smog formation potential	SFP	kg O <sub>3</sub> -eq
6	Energy resources: non-renewable: abiotic depletion potential (ADP): fossil fuels	ADP <sub>fossil</sub>	MJ
<b>Inventory metrics</b>			
7	Inventory indicators ISO21930: Cumulative Energy Demand - renewable energy resources	RPRE	MJ
8	Inventory indicators ISO21930: Renewable primary resources with energy content used as material (i.e., PERM)	PRM	MJ
9	Inventory indicators ISO21930: Cumulative Energy Demand - non-renewable energy resources	NRPRE	MJ
10	Inventory indicators ISO21930: Non-renewable primary resources with energy content used as material (i.e., PENRM)	NRPRM	kg
11	Inventory indicators ISO21930: use of secondary material	SM	MJ
12	Inventory indicators ISO21930: use of renewable secondary fuels	RSF	MJ
13	Inventory indicators ISO21930: recovered energy	RE	MJ
14	Inventory indicators ISO21930: use of net fresh water	FW	m <sup>3</sup>
15	Inventory indicators ISO21930: hazardous waste disposed	HWD	kg
16	Inventory indicators ISO21930: non-hazardous waste disposed	NHWD	kg
17	Inventory indicators ISO21930: high-level radioactive waste disposed	HLRW	kg
18	Inventory indicators ISO21930: intermediate and low-level radioactive waste disposed	ILLRW	kg
19	Inventory indicators ISO21930: materials for recycling	MR	kg
20	Inventory indicators ISO21930: materials for energy recovery	MER	kg
21	Inventory indicators ISO21930: exported energy - electricity	EE <sub>el</sub>	MJ
22	Inventory indicators ISO21930: exported energy - heat	EE <sub>heat</sub>	MJ

It should be noted that emerging LCA impact categories and inventory items are still under

development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in any of the following categories.

- Renewable primary energy resources as energy (fuel);
- Renewable primary resources as material;
- Non-renewable primary resources as energy (fuel);
- Non-renewable primary resources as material;
- Secondary Materials;
- Renewable secondary fuels;
- Non-renewable secondary fuels;
- Recovered energy;
- Abiotic depletion potential for non-fossil mineral resources.
- Land use related impacts, for example on biodiversity and/or soil fertility;
- Toxicological aspects;
- Emissions from land use change [GWP 100 (land-use change)];
- Hazardous waste disposed;
- Non-hazardous waste disposed;
- High-level radioactive waste;
- Intermediate and low-level radioactive waste;
- Components for reuse;
- Materials for recycling;
- Materials for energy recovery;
- Recovered energy exported from the product system.

## 5.2. Limitations of LCIA Results

The results are based on regional data for raw material processing, and variations in local production or energy sourcing may impact final results. The cradle-to-gate scope means that impacts associated with the installation, use, and disposal of the products are not accounted for in this study.

## 5.3. Impact Categories and Indicators

The impact categories were selected based on the relevance to metal product manufacturing and alignment with UL's PCR requirements for metal panels. Characterization factors from the TRACI model were used to convert inventory data into environmental impacts.

## 5.4. Characterization Models

All characterization models and factors used in this study were derived from the TRACI model (2023 version). No new or untested characterization models were introduced.

# 6. Life Cycle Interpretation

## 6.1. Results

This study represents sheet metal produced for manufacturing residential and industrial roof panels. Primary Taylor metals data include galvanized primary and recycled steel, paint, electricity fuel consumption, and bulk waste. Stage A2 also includes inbound truck transportation for steel scrap.

The most significant contribution to Taylor Metals Riverside's carbon footprint, measured in Kg CO<sub>2</sub> eq, was from the raw material, A1. Taylor Metals primarily uses recycled steel and aluminum sheets as the main source for paneling.

The most significant A1 contributions include recycled steel and aluminum sheets, coatings, and paint. Since recycled steel and aluminum make up the largest portion of the raw material, the A2 transportation stage of this recycled material contributes more.

The A3 manufacturing stage contributes to the product's overall GWP and global warming potential through electricity's highest single-process contribution to the product's carbon footprint. Other contributions to A3 include hardware and natural gas.

The following table reports the total LCA results for each product produced at the given metal panel facility per 100 m<sup>2</sup> of Average Metal Panel Product basis.

*Table 4: Total life cycle (across modules in scope) impact results for All declared products, assuming the geometric mean point values on a per 100 m<sup>2</sup> of Average Metal Panel Product basis*

Indicator/LCI Metric	GWP <sub>100</sub>	ODP	AP	EP	SFP	ADP <sub>fossil</sub>
Unit	kg CO <sub>2</sub> -eq	kg CFC-11-eq	kg SO <sub>2</sub> -eq	kg N-eq	kg O <sub>3</sub> -eq	MJ
<b>Minimum</b>	680	7.24e-06	7.95	4.4	43.9	7250
<b>Maximum</b>	1960	1.18e-05	28.9	8.42	135	18400
<b>Mean</b>	1080	9.12e-06	18.2	5.86	71.8	10800
<b>Median</b>	1070	8.37e-06	18.4	5.37	68.9	11400
<b>Standing Seam Panel (Painted Galvanized)</b>	1090	1.17e-05	28.9	7.07	70.5	11600
<b>Standing Seam Panel (Painted Zincalume)</b>	1070	1.14e-05	28.1	6.9	68.9	11400
<b>Standing Seam Panel (Painted Aluminum)</b>	1960	1.18e-05	12.5	8.42	135	18400
<b>Exposed Fastener Panel (Painted Galvanized)</b>	783	8.37e-06	20.8	5.08	50.6	8360
<b>Exposed Fastener Panel (Painted Zincalume)</b>	766	8.15e-06	20.2	4.96	49.4	8170
<b>Exposed Fastener Panel (Painted Aluminum)</b>	1410	8.47e-06	8.95	6.04	96.7	13200

<b>Concealed Fastener Siding (Painted Galvanized)</b>	695	7.43e-06	18.4	4.51	45	7420
<b>Concealed Fastener Siding (Painted Zincalume)</b>	680	7.24e-06	17.9	4.4	43.9	7250
<b>Concealed Fastener Siding (Painted Aluminum)</b>	1250	7.52e-06	7.95	5.37	85.9	11700

Indicator/LCI Metric	RPRE	PRM	NRPRE	NRPRM	SM	RSF	RE	FW
Unit	MJ	MJ	MJ	kg	MJ	MJ	MJ	m3
<b>Minimum</b>	716	0.00454	714	0.14	27.8	0.0366	3.26	1.71
<b>Maximum</b>	1470	0.0193	1490	0.534	299	0.0889	9.81	10.2
<b>Mean</b>	979	0.0122	984	0.331	166	0.061	6.41	4.11
<b>Median</b>	936	0.0129	947	0.34	190	0.0574	6.25	2.69
<b>Standing Seam Panel (Painted Galvanized)</b>	1150	0.0193	1150	0.534	299	0.0889	9.81	2.82
<b>Standing Seam Panel (Painted Zincalume)</b>	1120	0.0189	1120	0.51	293	0.087	9.57	2.69
<b>Standing Seam Panel (Painted Aluminum)</b>	1470	0.00802	1490	0.22	43.7	0.0574	5.11	10.2
<b>Exposed Fastener Panel (Painted Galvanized)</b>	827	0.0142	825	0.383	215	0.0638	7.04	2.03
<b>Exposed Fastener Panel (Painted Zincalume)</b>	806	0.0137	804	0.366	210	0.0624	6.87	1.93
<b>Exposed Fastener Panel (Painted Aluminum)</b>	1050	0.00585	1070	0.158	31.3	0.0412	3.67	7.33
<b>Concealed Fastener Siding (Painted Galvanized)</b>	734	0.0129	732	0.34	190	0.0567	6.25	1.8
<b>Concealed Fastener Siding (Painted Zincalume)</b>	716	0.0121	714	0.325	187	0.0554	6.1	1.71
<b>Concealed Fastener Siding (Painted Aluminum)</b>	936	0.00454	947	0.14	27.8	0.0366	3.26	6.5

Indicator/LCI Metric	HWD	NHWD	HLRW	ILLRW	MR	MER	EEel	EEheat
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Unit	kg	kg	kg	kg	kg	kg	MJ	MJ
<b>Minimum</b>	164	2350	0.00397	0.00754	0.314	6e-04	2.21	0.996
<b>Maximum</b>	371	7710	0.00672	0.0149	5.28	0.00293	6.47	3.38
<b>Mean</b>	233	4960	0.0051	0.0102	1.64	0.00176	4.25	2.16
<b>Median</b>	236	4920	0.0047	0.0095	0.492	0.00187	4.13	2.16
<b>Standing Seam Panel (Painted Galvanized)</b>	262	7710	0.00672	0.0121	0.504	0.00293	6.47	3.38
<b>Standing Seam Panel (Painted Zincalume)</b>	257	7560	0.00655	0.0118	0.492	0.00286	6.3	3.31
<b>Standing Seam Panel (Painted Aluminum)</b>	371	3680	0.00623	0.0149	5.28	0.000942	3.47	1.56
<b>Exposed Fastener Panel (Painted Galvanized)</b>	188	5540	0.00482	0.00871	0.362	0.0021	4.65	2.43
<b>Exposed Fastener Panel (Painted Zincalume)</b>	184	5430	0.0047	0.00849	0.353	0.00205	4.52	2.38
<b>Exposed Fastener Panel (Painted Aluminum)</b>	266	2640	0.00447	0.0107	3.79	0.000676	2.49	1.12
<b>Concealed Fastener Siding (Painted Galvanized)</b>	167	4920	0.00428	0.00774	0.321	0.00187	4.13	2.16
<b>Concealed Fastener Siding (Painted Zincalume)</b>	164	4820	0.00417	0.00754	0.314	0.00182	4.02	2.11
<b>Concealed Fastener Siding (Painted Aluminum)</b>	236	2350	0.00397	0.0095	3.37	6e-04	2.21	0.996

## 6.2. Assumptions and Limitations

The key assumption is that raw materials are sourced using average global data. Variations in regional sourcing, energy mix, and material quality could affect the environmental outcomes. The exclusion of downstream processes (installation and end-of-life) limits the assessment's ability to provide a full life cycle impact.

## 6.3. Data Quality Assessment

The data used were recent (2023) and specific to Taylor Metal's facility, ensuring high geographical and temporal relevance. Data gaps were minimal and were addressed using conservative secondary data sources from ecoinvent.

#### 6.4. Transparency

All value choices, including the exclusion of downstream processes, were documented. Expert judgments were kept to a minimum, and where used, they were based on established industry standards.

### **7. Critical Review**

#### 7.1. Reviewers

This study was reviewed by an independent third-party verifier, Geoffrey Guest, under the Labeling Sustainability program.

#### 7.2. Critical Review Reports

The report underwent a third-party critical review as per ISO 14025: 2006 standards. The review confirmed that the study adhered to ISO 14040 and ISO 14044 requirements.

#### 7.3. Responses to Recommendations

All reviewer recommendations were incorporated into the final report, particularly in the areas of data transparency and allocation procedure documentation.

This LCA report presents a comprehensive analysis of the environmental impacts associated with metal panels manufactured by Taylor Metal Products. The results provide valuable insights into improving the sustainability of the product and offer a transparent view of the methodologies and data used.

## References

### ISO Standards:

ISO 6707-1: 2014 Buildings and Civil Engineering Works - Vocabulary - Part 1: General Terms

ISO 14021:1999 Environmental Labels and Declarations - Self-declared Environmental Claims (Type II Environmental Labeling)

ISO 14025:2006 Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures

ISO 14040:2006 Environmental Management - Life Cycle Assessment - Principles and Framework

ISO 14044:2006 Environmental Management - Life Cycle Assessment - Requirements and Guidelines

ISO 14067:2018 Greenhouse Gases – Carbon Footprint of Products – Requirements and Guidelines for Quantification

ISO 14050:2009 Environmental Management - Vocabulary

ISO 21930:2017 Sustainability in Building Construction - Environmental Declaration of Building Products

### Other References:

UL Environment (2018). Guidance for Building-Related Products and Services, Part B: Insulated Metal Panels, Metal Composite Panels, and Metal Cladding: Roof and Wall Panels. UL 10010-5, [www.ul.com/businesses/environment](http://www.ul.com/businesses/environment).

USGBC LEED v4 for Building Design and Construction, 11 Jan 2019 available at <https://www.usgbc.org/resources/pcr-committee-process-resources-part-b>

USGBC PCR Committee Process & Resources: Part B, USGBC, 7 July 2017 available at <https://www.usgbc.org/resources/pcr-committee-process-resources-part-b>.

US EPA (2020) Advancing Sustainable Materials Management: 2018 Fact Sheet, [https://www.epa.gov/sites/production/files/2021-01/documents/2018\\_ff\\_fact\\_sheet\\_dec\\_2020\\_fnl\\_508.pdf](https://www.epa.gov/sites/production/files/2021-01/documents/2018_ff_fact_sheet_dec_2020_fnl_508.pdf)

## Appendix A: Contribution Analysis by Product

### Standing Seam Panel (Painted Galvanized)

Table 5: Detailed breakdown of inputs and related impact statistics for product design Standing Seam Panel (Painted Galvanized) and impact category climate change: global warming potential (GWP100) (GWP100), impact units = kg CO<sub>2</sub>-eq per 100 m<sup>2</sup> of Average Metal

Module	LCI.activity	Value	Units	Impact.per.unit	geo.Mean	geo.MeanRel
A1	steel production, electric, low-alloyed/steel, low-alloyed/RoW/kg	3.49E+02	kg	1.42E+00	4.96E+02	45.50%
A1	steel production, converter, low-alloyed/steel, low-alloyed/RoW/kg	9.28E+01	kg	2.36E+00	2.19E+02	20.09%
A1	zinc coating, coils/zinc coat, coils/RoW/m <sup>2</sup>	1.00E+02	m <sup>2</sup>	3.37E+00	3.37E+02	30.92%
A1	polyvinylfluoride production/polyvinylfluoride/RoW/kg	2.35E-02	kg	1.52E+01	3.57E-01	0.03%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	7.33E+00	tonne-km	2.31E-01	1.69E+00	0.16%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.95E+00	tonne-km	2.30E-01	4.49E-01	0.04%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	4.93E-04	tonne-km	2.29E-01	1.13E-04	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	3.69E-03	tonne-km	2.30E-01	8.49E-04	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	3.13E-02	tonne-km	2.30E-01	7.21E-03	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.60E-01	tonne-km	2.30E-01	3.68E-02	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.65E+00	tonne-km	2.30E-01	3.80E-01	0.03%
A3	market for electricity, medium voltage/electricity, medium voltage/US-WECC/kWh	9.28E+00	kWh	3.77E-01	3.50E+00	0.32%
A3	market for heat, district or industrial, natural gas/heat,	1.30E+00	MJ	3.75E-02	4.87E-02	0.00%

	district or industrial, natural gas/RoW/MJ					
A3	propane, burned in building machine/propane, burned in building machine/GLO/MJ	1.05E-01	MJ	9.41E-02	9.88E-03	0.00%
A3	extrusion, plastic film/extrusion, plastic film/RoW/kg	7.37E-02	kg	6.34E-01	4.67E-02	0.00%
A3	steel production, electric, chromium steel 18/8/steel, chromium steel 18/8/RoW/kg	6.25E-01	kg	4.94E+00	3.09E+00	0.28%
A3	EUR-flat pallet production/EUR-flat pallet/RoW/unit	6.46E-05	unit	7.94E+00	5.13E-04	0.00%
A3	waste/scrap to sorting center for recycling	1.60E+00	kg	0.00E+00	0.00E+00	0.00%
A3	process-specific burdens, residual material landfill/process-specific burdens, residual material landfill/RoW/kg	3.29E+01	kg	3.59E-03	1.18E-01	0.01%
<b>Cradle-to-gate</b>	<b>NA</b>	<b>1.00E+00</b>	<b>100 m2 of Average Metal Panel Product</b>	<b>1.09E+03</b>	<b>1.09E+03</b>	<b>100.00%</b>

### Standing Seam Panel (Painted Aluminum)

Table 6: Detailed breakdown of inputs and related impact statistics for product design Standing Seam Panel (Painted Aluminum) and impact category climate change: global warming potential (GWP100) (GWP100), impact units = kg CO2-eq per 100 m2 of Average Metal Panel

Module	LCI activity	Value	Units	Impact per unit	geo. Mean	geo. Mean Rel
A1	aluminium production, primary, ingot/aluminium, primary, ingot/RoW/kg	3.47E+01	kg	2.12E+01	7.34E+02	37.45%
A1	aluminium alloy production, AlMg3/aluminium alloy, AlMg3/RoW/kg	1.58E+02	kg	7.47E+00	1.18E+03	60.20%
A1	polyvinylfluoride production/polyvinylfluoride/RoW/kg	9.65E-03	kg	1.52E+01	1.47E-01	0.01%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	7.29E-01	tonne-km	2.30E-01	1.68E-01	0.01%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	3.32E+00	tonne-km	2.30E-01	7.64E-01	0.04%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	2.03E-04	tonne-km	2.30E-01	4.67E-05	0.00%

A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.51E-03	tonne-km	2.30E-01	3.48E-04	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.28E-02	tonne-km	2.30E-01	2.95E-03	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	6.57E-02	tonne-km	2.30E-01	1.51E-02	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	6.76E-01	tonne-km	2.31E-01	1.56E-01	0.01%
A3	market for electricity, medium voltage/electricity, medium voltage/US-WECC/kWh	3.81E+00	kWh	3.78E-01	1.44E+00	0.07%
A3	market for heat, district or industrial, natural gas/heat, district or industrial, natural gas/RoW/MJ	5.34E-01	MJ	3.75E-02	2.00E-02	0.00%
A3	propane, burned in building machine/propane, burned in building machine/GLO/MJ	4.32E-02	MJ	9.40E-02	4.06E-03	0.00%
A3	extrusion, plastic film/extrusion, plastic film/RoW/kg	3.03E-02	kg	6.34E-01	1.92E-02	0.00%
A3	steel production, electric, chromium steel 18/8/steel, chromium steel 18/8/RoW/kg	2.57E-01	kg	4.94E+00	1.27E+00	0.06%
A3	EUR-flat pallet production/EUR-flat pallet/RoW/unit	2.69E-05	unit	7.92E+00	2.13E-04	0.00%
A3	waste/scrap to sorting center for recycling	6.57E-01	kg	0.00E+00	0.00E+00	0.00%
A3	process-specific burdens, residual material landfill/process-specific burdens, residual material landfill/RoW/kg	1.35E+01	kg	3.59E-03	4.85E-02	0.00%
<b>Cradle-to-gate</b>	<b>NA</b>	<b>1.00E+00</b>	<b>100 m2 of Average Metal Panel Product</b>	<b>1.96E+03</b>	<b>1.96E+03</b>	<b>100.00%</b>

### Standing Seam Panel (Painted Zinalum)

Table 7: Detailed breakdown of inputs and related impact statistics for product design Standing Seam Panel (Painted Zinalum) and impact category climate change: global warming potential (GWP100) (GWP100), impact units = kg CO2-eq per 100 m2 of Average Metal Panel

Module	LCI.activity	Value	Units	Impact.per.unit	geo.Mean	geo.MeanRel
A1	steel production, electric, low-alloyed/steel, low-alloyed/RoW/kg	3.42E+02	kg	1.42E+00	4.87E+02	45.51%

A1	steel production, converter, low-alloyed/steel, low-alloyed/RoW/kg	9.10E+01	kg	2.35E+00	2.14E+02	20.00%
A1	zinc coating, coils/zinc coat, coils/RoW/m2	9.72E+01	m2	3.36E+00	3.27E+02	30.56%
A1	polyvinylfluoride production/polyvinylfluoride/RoW/kg	2.24E-02	kg	1.52E+01	3.41E-01	0.03%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	7.19E+00	tonne-km	2.31E-01	1.66E+00	0.16%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.91E+00	tonne-km	2.30E-01	4.40E-01	0.04%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	4.71E-04	tonne-km	2.29E-01	1.08E-04	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	3.51E-03	tonne-km	2.30E-01	8.08E-04	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	2.98E-02	tonne-km	2.30E-01	6.86E-03	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.52E-01	tonne-km	2.30E-01	3.50E-02	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.57E+00	tonne-km	2.30E-01	3.61E-01	0.03%
A3	market for electricity, medium voltage/electricity, medium voltage/US-WECC/kWh	8.85E+00	kWh	3.77E-01	3.34E+00	0.31%
A3	market for heat, district or industrial, natural gas/heat, district or industrial, natural gas/RoW/MJ	1.24E+00	MJ	3.75E-02	4.65E-02	0.00%
A3	propane, burned in building machine/propane, burned in building machine/GLO/MJ	1.00E-01	MJ	9.42E-02	9.42E-03	0.00%
A3	extrusion, plastic film/extrusion, plastic film/RoW/kg	7.03E-02	kg	6.34E-01	4.46E-02	0.00%
A3	steel production, electric, chromium steel 18/8/steel, chromium steel 18/8/RoW/kg	5.96E-01	kg	4.93E+00	2.94E+00	0.27%
A3	EUR-flat pallet production/EUR-flat pallet/RoW/unit	6.34E-05	unit	7.93E+00	5.03E-04	0.00%
A3	waste/scrap to sorting center for recycling	1.52E+00	kg	0.00E+00	0.00E+00	0.00%

A3	process-specific burdens, residual material landfill/process-specific burdens, residual material landfill/RoW/kg	3.14E+01	kg	3.60E-03	1.13E-01	0.01%
<b>Cradle-to-gate</b>	<b>NA</b>	<b>1.00E+00</b>	<b>100 m2 of Average Metal Panel Product</b>	<b>1.07E+03</b>	<b>1.07E+03</b>	<b>100.00%</b>

### Exposed Fastener Panel (Painted Galvanized)

Table 8: Detailed breakdown of inputs and related impact statistics for product design Exposed Fastener Panel (Painted Galvanized) and impact category climate change: global warming potential (GWP100) (GWP100), impact units = kg CO<sub>2</sub>-eq per 100 m<sup>2</sup> of Average Metal Panel

Module	LCI.activity	Value	Units	Impact.per.unit	geo.Mean	geo.MeanRel
A1	steel production, electric, low-alloyed/steel, low-alloyed/RoW/kg	2.50E+02	kg	1.42E+00	3.56E+02	45.47%
A1	steel production, converter, low-alloyed/steel, low-alloyed/RoW/kg	6.66E+01	kg	2.36E+00	1.57E+02	20.05%
A1	zinc coating, coils/zinc coat, coils/RoW/m <sup>2</sup>	7.19E+01	m <sup>2</sup>	3.37E+00	2.42E+02	30.91%
A1	polyvinylfluoride production/polyvinylfluoride/RoW/kg	1.68E-02	kg	1.53E+01	2.57E-01	0.03%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	5.26E+00	tonne-km	2.30E-01	1.21E+00	0.15%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.40E+00	tonne-km	2.30E-01	3.22E-01	0.04%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	3.54E-04	tonne-km	2.30E-01	8.15E-05	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	2.65E-03	tonne-km	2.30E-01	6.10E-04	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	2.25E-02	tonne-km	2.30E-01	5.18E-03	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.15E-01	tonne-km	2.30E-01	2.65E-02	0.00%

A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.18E+00	tonne-km	2.31E-01	2.72E-01	0.03%
A3	market for electricity, medium voltage/electricity, medium voltage/US-WECC/kWh	6.67E+00	kWh	3.76E-01	2.51E+00	0.32%
A3	market for heat, district or industrial, natural gas/heat, district or industrial, natural gas/RoW/MJ	9.34E-01	MJ	3.75E-02	3.50E-02	0.00%
A3	propane, burned in building machine/propane, burned in building machine/GLO/MJ	7.56E-02	MJ	9.39E-02	7.10E-03	0.00%
A3	extrusion, plastic film/extrusion, plastic film/RoW/kg	5.30E-02	kg	6.34E-01	3.36E-02	0.00%
A3	steel production, electric, chromium steel 18/8/steel, chromium steel 18/8/RoW/kg	4.49E-01	kg	4.94E+00	2.22E+00	0.28%
A3	EUR-flat pallet production/EUR-flat pallet/RoW/unit	4.78E-05	unit	7.93E+00	3.79E-04	0.00%
A3	waste/scrap to sorting center for recycling	1.15E+00	kg	0.00E+00	0.00E+00	0.00%
A3	process-specific burdens, residual material landfill/process-specific burdens, residual material landfill/RoW/kg	2.37E+01	kg	3.58E-03	8.48E-02	0.01%
<b>Cradle-to-gate</b>	<b>NA</b>	<b>1.00E+00</b>	<b>100 m2 of Average Metal Panel Product</b>	<b>7.83E+02</b>	<b>7.83E+02</b>	<b>100.00%</b>

### Exposed Fastener Panel (Painted Zinalum)

Table 9: Detailed breakdown of inputs and related impact statistics for product design Exposed Fastener Panel (Painted Zinalum) and impact category climate change: global warming potential (GWP100) (GWP100), impact units = kg CO2-eq per 100 m2 of Average Metal panel

Module	LCI.activity	Value	Units	Impact.per. unit	geo.Me an	geo.Mean Rel
A1	steel production, electric, low-alloyed/steel, low-alloyed/RoW/kg	2.46E+02	kg	1.41E+00	3.47E+02	45.30%
A1	steel production, converter, low-alloyed/steel, low-alloyed/RoW/kg	6.53E+01	kg	2.31E+00	1.51E+02	19.71%
A1	zinc coating, coils/zinc coat, coils/RoW/m2	6.98E+01	m2	3.41E+00	2.38E+02	31.07%
A1	polyvinylfluoride production/polyvinylfluoride/RoW/kg	1.61E-02	kg	1.51E+01	2.43E-01	0.03%

A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	7.37E+00	tonne -km	2.29E-01	1.69E+00	0.22%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.96E+00	tonne -km	2.30E-01	4.50E-01	0.06%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	4.83E-04	tonne -km	2.30E-01	1.11E-04	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	3.39E-03	tonne -km	2.30E-01	7.79E-04	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.43E-02	tonne -km	2.30E-01	3.29E-03	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.14E-01	tonne -km	2.30E-01	2.62E-02	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	2.97E-01	tonne -km	2.30E-01	6.82E-02	0.01%
A3	market for electricity, medium voltage/electricity, medium voltage/US-WECC/kWh	1.38E+01	kWh	3.75E-01	5.17E+00	0.67%
A3	market for heat, district or industrial, natural gas/heat, district or industrial, natural gas/RoW/MJ	1.94E+00	MJ	3.71E-02	7.19E-02	0.01%
A3	propane, burned in building machine/propane, burned in building machine/GLO/MJ	1.69E-01	MJ	9.47E-02	1.60E-02	0.00%

A3	extrusion, plastic film/extrusion, plastic film/RoW/kg	9.67E-02	kg	6.27E-01	6.06E-02	0.01%
A3	steel production, electric, chromium steel 18/8/steel, chromium steel 18/8/RoW/kg	4.07E-01	kg	4.91E+00	2.00E+00	0.26%
A3	EUR-flat pallet production/EUR-flat pallet/RoW/unit	2.63E-04	unit	7.98E+00	2.10E-03	0.00%
A3	waste/scrap to sorting center for recycling	1.14E+00	kg	0.00E+00	0.00E+00	0.00%
A3	process-specific burdens, residual material landfill/process-specific burdens, residual material landfill/RoW/kg	5.93E+00	kg	3.56E-03	2.11E-02	0.00%
Cradle-to-gate	NA	1.00E+00	100 m2 of Average Metal Panel	7.66E+02	7.66E+02	100.00%

### Exposed Fastener Panel (Painted Aluminum)

Table 10: Detailed breakdown of inputs and related impact statistics for product design Exposed Fastener Panel (Painted Aluminum) and impact category climate change: global warming potential (GWP100) (GWP100), impact units = kg CO2-eq per 100 m2 of Average Metal panel

Module	LCI activity	Value	Units	Impact.per.unit	geo.Mean	geo.MeanRel
A1	aluminium production, primary, ingot/aluminium, primary, ingot/RoW/kg	2.49E+01	kg	2.12E+01	5.27E+02	37.38%
A1	aluminium alloy production, AlMg3/aluminium alloy, AlMg3/RoW/kg	1.14E+02	kg	7.44E+00	8.48E+02	60.14%
A1	polyvinylfluoride production/polyvinylfluoride/RoW/kg	6.93E-03	kg	1.52E+01	1.05E-01	0.01%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	5.24E-01	tonne-km	2.31E-01	1.21E-01	0.01%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	2.39E+00	tonne-km	2.30E-01	5.50E-01	0.04%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry	1.45E-04	tonne-km	2.30E-01	3.34E-05	0.00%

	7.5-16 metric ton, EURO4/RER/tkm					
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.09E-03	tonne-km	2.30E-01	2.51E-04	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	9.22E-03	tonne-km	2.30E-01	2.12E-03	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	4.72E-02	tonne-km	2.31E-01	1.09E-02	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	4.86E-01	tonne-km	2.30E-01	1.12E-01	0.01%
A3	market for electricity, medium voltage/electricity, medium voltage/US-WECC/kWh	2.74E+00	kWh	3.76E-01	1.03E+00	0.07%
A3	market for heat, district or industrial, natural gas/heat, district or industrial, natural gas/RoW/MJ	3.83E-01	MJ	3.76E-02	1.44E-02	0.00%
A3	propane, burned in building machine/propane, burned in building machine/GLO/MJ	3.10E-02	MJ	9.42E-02	2.92E-03	0.00%
A3	extrusion, plastic film/extrusion, plastic film/RoW/kg	2.17E-02	kg	6.36E-01	1.38E-02	0.00%
A3	steel production, electric, chromium steel 18/8/steel, chromium steel 18/8/RoW/kg	1.84E-01	kg	4.95E+00	9.10E-01	0.06%
A3	EUR-flat pallet production/EUR-flat pallet/RoW/unit	1.96E-05	unit	7.96E+00	1.56E-04	0.00%
A3	waste/scrap to sorting center for recycling	4.72E-01	kg	0.00E+00	0.00E+00	0.00%
A3	process-specific burdens, residual material landfill/process-specific burdens, residual material landfill/RoW/kg	9.71E+00	kg	3.58E-03	3.48E-02	0.00%
<b>Cradle-to-gate</b>	<b>NA</b>	<b>1.00E+00</b>	<b>100 m2 of Average Metal Panel Product</b>	<b>1.41E+03</b>	<b>1.41E+03</b>	<b>100.00%</b>

### Concealed Fastener Siding (Painted Zincaalum)

Table 11: Detailed breakdown of inputs and related impact statistics for product design Concealed Fastener Siding (Painted Zincaalum) and impact category climate change: global warming potential (GWP100) (GWP100), impact units = kg CO2-eq per 100 m2 of Average Metal panel

Module	LCI.activity	Value	Units	Impact.per.unit	geo.Mean	geo.MeanRel
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A1	steel production, electric, low-alloyed/steel, low-alloyed/RoW/kg	2.18E+02	kg	1.42E+00	3.10E+02	45.59%
A1	steel production, converter, low-alloyed/steel, low-alloyed/RoW/kg	5.80E+01	kg	2.36E+00	1.37E+02	20.15%
A1	zinc coating, coils/zinc coat, coils/RoW/m2	6.19E+01	m2	3.36E+00	2.08E+02	30.59%
A1	polyvinylfluoride production/polyvinylfluoride/RoW/kg	1.43E-02	kg	1.52E+01	2.18E-01	0.03%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	4.58E+00	tonne-km	2.29E-01	1.05E+00	0.15%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.22E+00	tonne-km	2.30E-01	2.81E-01	0.04%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	3.00E-04	tonne-km	2.30E-01	6.91E-05	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	2.24E-03	tonne-km	2.30E-01	5.16E-04	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.90E-02	tonne-km	2.30E-01	4.37E-03	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	9.73E-02	tonne-km	2.30E-01	2.24E-02	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.00E+00	tonne-km	2.30E-01	2.30E-01	0.03%
A3	market for electricity, medium voltage/electricity, medium voltage/US-WECC/kWh	5.65E+00	kWh	3.77E-01	2.13E+00	0.31%
A3	market for heat, district or industrial, natural gas/heat, district or industrial, natural gas/RoW/MJ	7.91E-01	MJ	3.74E-02	2.96E-02	0.00%
A3	propane, burned in building machine/propane, burned in building machine/GLO/MJ	6.40E-02	MJ	9.39E-02	6.01E-03	0.00%
A3	extrusion, plastic film/extrusion, plastic film/RoW/kg	4.49E-02	kg	6.33E-01	2.84E-02	0.00%
A3	steel production, electric, chromium steel 18/8/steel, chromium steel 18/8/RoW/kg	3.81E-01	kg	4.93E+00	1.88E+00	0.28%

A3	EUR-flat pallet production/EUR-flat pallet/RoW/unit	4.05E-05	unit	7.93E+00	3.21E-04	0.00%
A3	waste/scrap to sorting center for recycling	9.73E-01	kg	0.00E+00	0.00E+00	0.00%
A3	process-specific burdens, residual material landfill/process-specific burdens, residual material landfill/RoW/kg	2.00E+01	kg	3.59E-03	7.18E-02	0.01%
<b>Cradle-to-gate</b>	<b>NA</b>	<b>1.00E+00</b>	<b>100 m2 of Average Metal Panel</b>	<b>6.80E+02</b>	<b>6.80E+02</b>	<b>100.00%</b>

### Concealed Fastener Siding (Painted Galvanized)

Table 12: Detailed breakdown of inputs and related impact statistics for product design Concealed Fastener Siding (Painted Galvanized) and impact category climate change: global warming potential (GWP100) (GWP100), impact units = kg CO2-eq per 100 m2 of Average Metal panles

Module	LCI activity	Value	Units	Impact.per.unit	geo.Mean	geo.MeanRel
A1	steel production, electric, low-alloyed/steel, low-alloyed/RoW/kg	2.22E+02	kg	1.42E+00	3.16E+02	45.47%
A1	steel production, converter, low-alloyed/steel, low-alloyed/RoW/kg	5.91E+01	kg	2.35E+00	1.39E+02	20.00%
A1	zinc coating, coils/zinc coat, coils/RoW/m2	6.38E+01	m2	3.37E+00	2.15E+02	30.94%
A1	polyvinylfluoride production/polyvinylfluoride/RoW/kg	1.50E-02	kg	1.52E+01	2.28E-01	0.03%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	4.67E+00	tonne-km	2.31E-01	1.08E+00	0.16%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.24E+00	tonne-km	2.30E-01	2.85E-01	0.04%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	3.14E-04	tonne-km	2.30E-01	7.23E-05	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	2.35E-03	tonne-km	2.30E-01	5.41E-04	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	2.00E-02	tonne-km	2.30E-01	4.60E-03	0.00%

	7.5-16 metric ton, EURO4/RER/tkm					
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.02E-01	tonne-km	2.30E-01	2.35E-02	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.05E+00	tonne-km	2.30E-01	2.42E-01	0.03%
A3	market for electricity, medium voltage/electricity, medium voltage/US-WECC/kWh	5.93E+00	kWh	3.76E-01	2.23E+00	0.32%
A3	market for heat, district or industrial, natural gas/heat, district or industrial, natural gas/RoW/MJ	8.30E-01	MJ	3.75E-02	3.11E-02	0.00%
A3	propane, burned in building machine/propane, burned in building machine/GLO/MJ	6.71E-02	MJ	9.40E-02	6.31E-03	0.00%
A3	extrusion, plastic film/extrusion, plastic film/RoW/kg	4.71E-02	kg	6.35E-01	2.99E-02	0.00%
A3	steel production, electric, chromium steel 18/8/steel, chromium steel 18/8/RoW/kg	3.99E-01	kg	4.94E+00	1.97E+00	0.28%
A3	EUR-flat pallet production/EUR-flat pallet/RoW/unit	4.33E-05	unit	7.94E+00	3.44E-04	0.00%
A3	waste/scrap to sorting center for recycling	1.02E+00	kg	0.00E+00	0.00E+00	0.00%
A3	process-specific burdens, residual material landfill/process-specific burdens, residual material landfill/RoW/kg	2.10E+01	kg	3.59E-03	7.54E-02	0.01%
<b>Cradle-to-gate</b>	<b>NA</b>	<b>1.00E+00</b>	<b>100 m2 of Average Metal Panel</b>	<b>6.95E+02</b>	<b>6.95E+02</b>	<b>100.00%</b>

### Concealed Fastener Siding (Painted Aluminum)

Table 13: Detailed breakdown of inputs and related impact statistics for product design Concealed Fastener Siding (Painted Aluminum) and impact category climate change: global warming potential (GWP100) (GWP100), impact units = kg CO2-eq per 100 m2 of Average Metal Panel

Module	LCI.activity	Value	Units	Impact.per.unit	geo.Mean	geo.MeanRel
A1	aluminium production, primary, ingot/aluminium, primary, ingot/RoW/kg	2.21E+01	kg	2.12E+01	4.68E+02	37.44%
A1	aluminium alloy production, AlMg3/aluminium alloy, AlMg3/RoW/kg	1.01E+02	kg	7.46E+00	7.53E+02	60.24%
A1	polyvinylfluoride production/polyvinylfluoride/RoW/kg	6.15E-03	kg	1.52E+01	9.37E-02	0.01%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry	4.65E-01	tonne-km	2.30E-01	1.07E-01	0.01%

	7.5-16 metric ton, EURO4/RER/tkm					
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	2.12E+00	tonne-km	2.30E-01	4.88E-01	0.04%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	1.29E-04	tonne-km	2.30E-01	2.97E-05	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	9.65E-04	tonne-km	2.30E-01	2.22E-04	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	8.19E-03	tonne-km	2.31E-01	1.89E-03	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	4.19E-02	tonne-km	2.30E-01	9.65E-03	0.00%
A2	market for transport, freight, lorry 7.5-16 metric ton, EURO4/transport, freight, lorry 7.5-16 metric ton, EURO4/RER/tkm	4.31E-01	tonne-km	2.30E-01	9.92E-02	0.01%
A3	market for electricity, medium voltage/electricity, medium voltage/US-WECC/kWh	2.43E+00	kWh	3.77E-01	9.16E-01	0.07%
A3	market for heat, district or industrial, natural gas/heat, district or industrial, natural gas/RoW/MJ	3.40E-01	MJ	3.76E-02	1.28E-02	0.00%
A3	propane, burned in building machine/propane, burned in building machine/GLO/MJ	2.75E-02	MJ	9.42E-02	2.59E-03	0.00%
A3	extrusion, plastic film/extrusion, plastic film/RoW/kg	1.93E-02	kg	6.32E-01	1.22E-02	0.00%
A3	steel production, electric, chromium steel 18/8/steel, chromium steel 18/8/RoW/kg	1.64E-01	kg	4.93E+00	8.08E-01	0.06%
A3	EUR-flat pallet production/EUR-flat pallet/RoW/unit	1.52E-05	unit	7.96E+00	1.21E-04	0.00%
A3	waste/scrap to sorting center for recycling	4.19E-01	kg	0.00E+00	0.00E+00	0.00%
A3	process-specific burdens, residual material landfill/process-specific burdens, residual material landfill/RoW/kg	8.62E+00	kg	3.58E-03	3.09E-02	0.00%
<b>Cradle-to-gate</b>	<b>NA</b>	<b>1.00E+00</b>	<b>100 m2 of Average Metal Panel</b>	<b>1.25E+03</b>	<b>1.25E+03</b>	<b>100.00%</b>