MKS PAMP SA – Carbon Footprint of Gold 1oz Lady Fortuna™ Minted Bar

Product Emissions Report

June 2025

Contents

1. Summary

1.1. Introduction

This report presents the results from the carbon footprint study of MKS PAMP SA's gold minted bar, namely Lady Fortuna™.

This report conforms to the requirements for public disclosure of the life cycle GHG emissions of products laid out in the "Code of Good Practice for product GHG emissions and reductions". It aims to provide the basis to allow consistent information for product GHG emissions and reduction, assessed in conformity with the ISO 14067 Standard. The Product Emissions Report should be made available in the public domain

1.2. Background Information

Table 1: MKS PAMP SA Product(s) Carbon Footprint - Background Information

Category	Description
Company name	MKS PAMP SA
Company contact information	Prom. de Saint-Antoine 10, 1204 Geneva, Switzerland
Product name(s)	Gold 1oz Lady Fortuna™ Minted Bar
Boundary	Cradle to grave
Standards, specifications and/or other documents used for footprinting methodology against which the company has been assessed for conformity	ISO 14067 Standard Carbon Trust Product Carbon Footprint - Requirements for Certification v3.0
Name of the independent, third-party verifier	Carbon Trust Assurance Ltd
Level of assurance achieved	Reasonable
Date of certification	06/06/2025

Functional unit	$kgCO_2e$ per kg
Data period	01/07/2024 – 30/06/2025
Product consistency criteria (PCC)	Product Category Criteria Form for Precious Metals (Unapproved)

1.3. Results

The overall emissions are reported in Table 2 below Please refer to the complementary MKS PAMP Footprint Expert FINAL.

Table 2: Footprinting Results Gold 1oz Lady Fortuna™ Minted Bar (Cradle-to-Grave) – Global Market

Net Total Emissions (kgCO2e per kg of gold)	**8822.94**
Fossil Emissions (kgCO2e per kg of gold)	8822.93
Biogenic Emissions (kgCO2e per kg of gold)	0.01

1.4. Data

The data quality assessments were carried out based on a key developed internally at Carbon Trust. The overall data quality for the project was good, because of the primary data quality.

1.5. Key Assumptions

Table 5 in Section 2.4.2 outlines the key assumptions that have been made.

1.6. Interpretation of results

An overall breakdown of the emissions associated with the various products and process steps for each product are reported in Table 8: Gold 1oz Lady Fortuna™ Minted Bar (Cradle-to-Grave) This table demonstrates that the highest emission process is that of the raw material (raw gold) which account for 99.7% of the total footprint.

The LUC methodology follows the 2019 IPCC Guidelines for National Greenhouse Gas Inventories. The equations and default constants used in the methodology are revised for specific land and biomes. To calculate LUC emissions, direct LUC equations and methodology were used. Indirect LUC has not been accounted for due to the lack of internationally agreed procedure.

Further details are recorded in section 2.4 Methodological Choices

1.7. Disclaimer on uncertainty

The emissions figures provided in this report have been calculated in accordance with the requirements of ISO 14067 standard, using the primary and secondary sources of data specified above. Based on ISO 14067 standard method of assessment, we believe that our assessment has identified 95% of the likely GHG emissions associated with the full life cycle of the product(s) covered in this report. However, readers should be aware that even primary sources of data are subject to variation over time, and the figures given in this report should be considered as our best estimates, based on reasonable cost of evaluation.

2. Main Report

2.1. Goal of the study

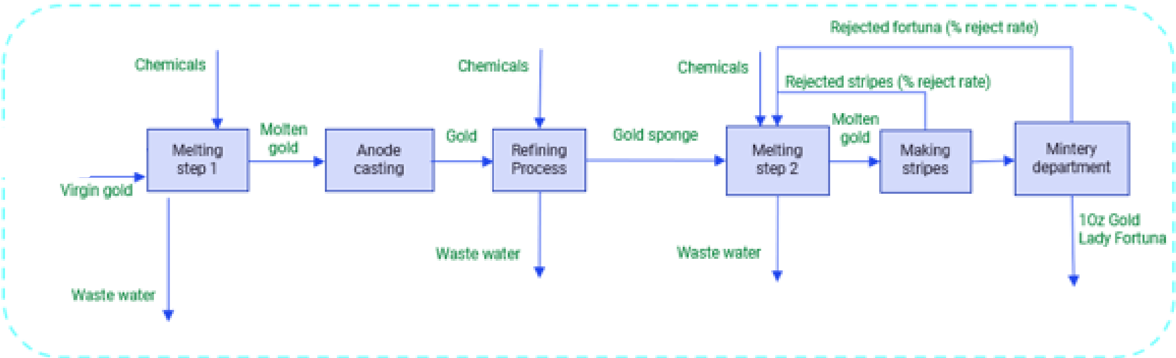
Table 3: Goal of the Study

Category	Description
Intended applications of study	Business to Consumer (or business consumer) with label license
Environmental footprint impact category	Climate change
Methodological or environmental footprint impact category limitations	Land use change implications
Reasons for carrying out the study	To calculate and verify the carbon footprints of the products
Target audience	Customers of the reporting company, MKS PAMP SA
Reference PEFCRs	N/A
Commissioner of the study	Tamara Jomaa-Shakarchi

2.2. Scope

The project scope involves calculating the carbon footprint of Gold 1oz Lady Fortuna™ Minted Bar within the general feed. These product(s) will be footprinted cradle-to- grave, using kgCO2e/kg as the functional unit.

2.3. Boundary



2.3.1. Raw materials

Gold inputs come from virgin gold. The activity data provided by MKS PAMP SA was the total mass of the raw material inputs for each footprinted product over the reporting year.

The largest emission source within the raw materials was the gold input. The emission factors used for the gold were calculated using the EU Product Environmental Footprint Circular Footprint Formula (PEF CFF). The virgin emission factor for gold was calculated for specific suppliers provided by MKS PAMP SA. Recycled emission factors for gold were taken from the World Gold Council.

The Product Environmental Footprint (PEF) is a life cycle assessment (LCA) based method to quantify the environmental impacts of products established by the EU. The overarching purpose of PEF is to enable to reduce the environmental impacts of goods, accounting for supply chain activities (from extraction of raw materials, through production and use and to final waste management). This purpose is achieved through the provision of detailed requirements for modelling the environmental impacts of the flows of material/energy and the emissions and waste streams associated with a product throughout its life cycle.

The Circular Footprint Formula (PEF CFF) provides the approach that shall be used to estimate the overall emissions associated to a certain process involving recycling and/or energy recovery. These moreover also relate to waste flows generated within the system boundary.

The emission factor applied to the input gold material was calculated using the following two formulae which have been derived from PEF CFF below.

Pr = R2 x (1−A)MQL+R1A

EF = Pr x Er + (1-Pr) x Ev + Pr x Er + (1-Pr)

Table 4: Explanation of PEF CFF formula

Parameter	Definition
Pr	The portion of the emission factor which can use Er (the recycled content)
Ev	Specific emissions and resources consumed (per functional unit) arising from the acquisition and pre-processing of virgin material, 3-year rolling average applied to this figure.
Ev LUC	Specific emissions and resources consumed (per functional unit) arising from land use change emissions caused by extraction of the virgin material.

Er	Specific emissions and resources consumed (per functional unit) arising from the recycling process of the recycled (reused) material, including collection, sorting and transportation process.
Er LUC	Specific emissions and resources consumed (per functional unit) arising from land use change emissions caused by the recycled material
R1	Proportion of material in the input to the production that has been recycled from a previous system.
R2	Proportion of the material in the product that will be recycled (or reused) in a subsequent system. R_2 shall therefore take into account the inefficiencies in the collection and recycling (or reuse) processes. R_2 shall be measured at the output of the recycling plant.
A	Allocation factor of burdens and benefits (jointly: "credits") between supplier and user of recycled materials. *For metals, this value is 0.2.*
MQL	The recycling process shall account for material quality loss during recycling, which is pre-defined for most materials. *For metals, this value is 1.*

Definitions from: Publications Office

For other chemical inputs, emission factors were taken from BEIS 2023 and EcoInvent 3.10. In the cases when the emission factors were not available in either database, an emission factor of a similar chemical was applied from EcoInvent.

2.3.2. Manufacturing

The raw materials were transported to MKS PAMP SA's manufacturing facility in Switzerland.

The activity data provided by MKS PAMP SA included the distance and mode of transport for each of the raw materials, as well as supplier location. Using these distances, the Carbon Trust's road freight v4.5 calculator was used, whereas air freight and sea freight BEIS 2023 was used. This methodology calculators were used to find the emission factors for each raw materials upstream transport.

For manufacturing, electricity was the main energy source and 100% of the electricity was derived from hydroelectric power. Other energy sources used at the plant were natural gas and propane. This activity data was provided by MKS PAMP SA in MWh / year (for electricity) and m^3 / year (for natural gas and propane) for each process step. IEA 2023 emission factor was used for electricity as they use renewable energy. Emission factors from BEIS 2023 were used for natural gas and propane. For each process step a specific amount of $kgCO_2e$ emissions were associated with them, namely for example the first melting or the anode casting.

There were the following waste streams: black water, white water, non-precious metal waste, used crucibles. Waste activity data was derived from input data provided by MKS PAMP SA and BEIS 2023 was used for waste treatment emission factors.

2.3.3. Packaging

Packaging was carried out at MKS PAMP SA's facility in Ticino, Switzerland.

Gold 1oz Lady Fortuna™ Minted Bar are individually packaged in protective plastic rolls with a paper certificate each. 25 bars are packaged in one plastic box for shipping.

In terms of activity data, the mass of materials for one box or pallet was provided. These masses were then scaled up to account for the total production output for each product. Emission factors applied to these packaging materials came from the Carbon Trust's biogenic database.

2.3.4. Transport

Finished products are transported by road from MKS PAMP SA in Switzerland to Zurich airport to its final customers. The products are flown internationally, and from here, the products are transported to the end customer, by air and/or road.

The activity data was calculated using the specific mode and distance of the type of transport used. Using these distances, the Carbon Trust Road Freight Calculator v4.5 was used, whereas air freight and sea freight BEIS 2023 was used.

2.3.5. End of life

It is assumed that 100% of the metal is recycled due to the nature of the product being a precious metal The End-of-Life profile for packaging was calculated using BEIS 2023 disposal emission factors and the disposal method percentages of the different countries of the sold products.

2.3.6. Excluded attributable processes

Use phase has been excluded from the boundary of lifecycle of these products as they are used as investment bars, and therefore have no emissions associated with them as they would remain in a closed vault.

2.4. Methodology

2.4.1. Methodological choices

Significant methodological choices for calculating the product footprint of MKS PAMP SA's SKU are listed below:

- Calculation models were based on templates available in Footprint Expert Multi SKU and Footprint Expert 5.1 (FPX). These were set out in the different life cycle stages of gold bar, from the raw materials entering the facility and going through the first round of the foundry, to the grain entering the minting department, packaging, and sent to retailers.

- Global warming potential (GWP) factors were taken from the PEF CFF Calculator, Road Freight Calculator v4.5, EcoInvent 3.10 and BEIS 2023.
- Based on low materiality, emissions from upstream packaging of the raw material inputs, namely the chemicals and silver, and land use change for procured gold where the mine source could not be verified and accurately calculated, are being excluded.

2.4.2. Key Assumptions

Table 5 outlines the key assumptions that have been made for this metal type.

Table 5: List of Assumptions

Process Step	Key Assumption
Emission factors	Where specific raw materials did not have an equal emission factor, a generic Ecoinvent 3.10 organic chemical emission factors were applied.
Mass balance	MKS PAMP SA inputs include raw metals and chemicals. Due to inconsistency in the mass balance, to balance the inputs and output materials, it is assumed all chemicals are wasted as copper sulphates.
Recycled EF for gold	The WGC emission factor was used for the recycled gold within the PEF CFF formula.
Water	No water input data was provided; therefore, it was assumed that the sum of black and white water was that of input water.
End of life	Where specific packaging disposal data could not be provided, assumptions were made based on the percentage of gold sold in each geographical region and applied to each SKU to calculate end of life emissions per country.
Allocation of inputs	The data received was for the family group of the product and not per different SKU, hence an allocation key was created which was then used to determine the amount of gold produced and consequently the amount of materials/utilities is used.
End of life	In terms of the PEF CFF, a 100% recycling rate of finished gold is assumed for finished gold products. Due to the nature of the value of the end product, we assume that this will not be disposed of through waste streams and will eventually be recycled. Furthermore, the products are sold branded and stored in vaults so unlikely that they are purchased for further processing.
End of life	Waste disposal percentages per each country were uplifted to ensure that the total added up to 100%
Exclusion	Assume no land use change where land type is rocky or desert or where there has been no visible expansions or change to the landscape in the last 20 years. Due to the type of land type being rocky, mountainous and desert-like, no land use change has been calculated.

2.4.3. Allocation of inputs

MKS PAMP SA produce several products at their facility. Raw materials, outputs and utilities were provided for each process step for all products within project scope. When modelling the individual product footprints, a calculation was made to identify the production inputs and utilities required for 1kg of each product and the associated outputs for 1kg of product. This was then multiplied by the total output of the product to determine the total input emissions associated with each SKU.

The inbound transportation file included the transportation information for all inbound gold. In order to allocate only the emissions related to SKU, an allocation factor was required. Using the percentage of gold procured from each mine of the total gold procured, an allocation was calculated to determine the input gold transported from each mine for the SKUs. An additional adjustment was made to the inbound gold to remove the inbound gold related solely to the provenance products. The client provided a percentage split of gold per product from each of these source mines.

The LUC emissions were also calculated using an allocation factor. The change in land use was calculated by drawing polygons on google earth of the developed land areas. The land use change in hectares was apportioned based on the percentage of gold procured by MKS PAMP SA for this product over the total metals production of the mine.

2.4.4. Allocation due to recycling

Recycling allocation allows products to use the generally lower, recycled material emissions factor, rather than exclusively using virgin material emissions factors, for a portion of some input materials — thereby reflecting the benefits of recycling in reducing GHG emissions. The methodology (PEF CFF) used, balances how much benefit is attributed to products that use recycled input materials and how much is attributed to products that are recycled and provided these materials

It was assumed that gold had a recycling rate of 100% due to the high value of the end product. The end-of-life fates for packaging materials were found at a country level.

Please refer to section 2.3.1 where further information is provided on the PEF CFF.

Table 6: SKU list and ID Number

Product Name	ID Number
Gold 1oz Lady Fortuna™ Minted Bar	ZAUFS00610

2.5. Data

2.5.1. Data Collection and Validation

MKS PAMP SA provided all activity data used for the analysis. All the input data drivers are summarised in the footprint model under their relevant process sheet. The main point of contacts for the data was MKS PAMP SA ESG team members. The Carbon Trust provided MKS PAMP SA with a data collection template to be used.

2.5.2. Data Quality

The data quality assessments were carried out based on a key developed internally at Carbon Trust. The overall data quality for the project was medium, because of the quality of data that was provided for the chemicals and raw precious metals. Table 7 summarises the data quality assessment of the most material data points.

Table 7: Gold 1oz Lady Fortuna™ Minted Bar quality assessment for material data points

Data point	Emission Factor Data Quality Indicator	Activity Data Quality Indicator	Application Data Quality Indicator
Raw Materials	Good	Good	Medium
Packaging	Good	Good	Good
Manufacturing	Good	Good	Good
Downstream distribution	Good	Good	Good
End-of-Life	Good	Good	Good

2.6. Results

An overall breakdown of the emissions associated with the various products and process steps is reported in Table 8 below.

Table 8: Gold 1oz Lady Fortuna™ Minted Bar – Global Average Market

Data Category	Emissions	Emissions	%
Process	*$kgCO_2e/kg$*	*Total tCO_2e*	
Input Materials (Gold)	8,793.63	27,351,261.50	99.67%
Input Material	2.910967	9,054.12	0.03%
Transport	8.69	27,029.60	0.10%
Utility	5.52	17,154.40	0.06%
Packaging	0.83	2,586.41	0.01%
Output (Waste)	0.08	234.29	0.001%
Downstream Distribution	11.28	35,078.16	0.13%
End of Life	0.004	11.97	0.00004%
PRODUCT CARBON FOOTPRINT	**8822.93**	**27,442,410.46**	**100%**

2.7. Conclusions

The main hotspot within the carbon footprint are that of the raw materials, namely the raw gold driven by the carbon intensity surrounding the emission factors.

2.8. Recommendations

2.8.1. Emissions reductions

The main emissions hotspot of both products is the gold raw material input from the source mine. Sourcing raw materials with a higher percentage of recycled content would be the most impactful way of reducing the product footprint.

Moreover, switching to the use of low-carbon methods of transport, both upstream and downstream (business to business transport), will decrease this further. This might include alternative fuels, electric vehicles, or even more efficient delivery routes. For third-party logistics, (retailer to consumer) it is recommend that MKS PAMP SA engage with suppliers in switching to more sustainable transport options.

In addition to the procurement of recycled gold, MKS PAMP SA could work more with mines to understand what land rehabilitation projects they are involved and see where they could lower LUC emissions by sourcing from mines that are in not in expansion or increasing emissions through land use change.

2.8.2. Data quality improvements

There are several recommendations to improve future recertification and results:

Raw materials (Gold): MKS PAMP SA provided the gold sourcing data of the mine and the emission factors from the mine. Obtaining more visibility would help create a more accurate recycled gold emission factor.

Other inputs: Obtaining supplier-specific emission factors would increase the accuracy of the footprint as generic emission factors would no longer be required.

Inbound transportation and downstream distribution: Attaining more clarity over the transportation stages could improve footprint accuracy. For example, it may be that the suppliers use electric vehicles, or particularly efficient logistical practices.

Mine Data: For the calculation of land use change, a large amount of data research was required by the delivery team as the client did not hold specific data on the mines. Challenges such as, some mines not exclusively mining gold, unknowns around how much land has actually been changed and the age of the mines, difficulty accessing reports which disclosed development or production resulted in a number of assumptions and a lower data quality score for the LUC emissions. Gaining visibility on the expansion of mines and land use change due to gold exploration will help with the calculation of the land use change emissions.

2.9. Disclaimer on potential uses of this report

The results presented in this report are unique to the assumptions and practices of MKS PAMP SA. The results are not meant as a platform for comparability to other companies and/or products. Even for similar products, differences in unit of analysis, use and end-of-life stage profiles, and data quality may produce incomparable results. The reader may refer to the ISO 14067 standard for additional insight into the GHG inventory process.

3. Annex

Annex 1: Certification Details (Third Party Sign-Off)

This product footprinting study has been subject to an independent critical review to verify whether the methodology used for this LCA is compliant with ISO 14067 standard.

Category	Description
Name of the certifier	Rajul Shah
Date of certification	06/06/2025
Data valid until	05/06/2026

carbontrust.com

+44 (0) 20 7170 7000

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