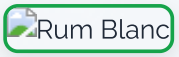
Life Cycle Assessment Report

Avallen Solutions Ltd

Generated: 08/09/2025

Rum Blanc

Environmental Impact Assessment



Rum Blanc - Subject of Environmental Assessment

Key Environmental Impact Results

CARBON FOOTPRINT	WATER FOOTPRINT
2.706 kg CO_2e	47.1 L
per unit	per unit

ANNUAL PRODUCTION	TOTAL ANNUAL IMPACT
150,000	405.9 tonnes
units	CO_2e

Methodology: This assessment follows ISO 14040 and ISO 14044 LCA standards, using the latest environmental impact databases including ecoinvent 3.5 and verified supplier data. All calculations are performed using the Avallen Sustainability Platform with OpenLCA integration.

Executive Summary

> **Study Overview:** This Life Cycle Assessment (LCA) of Rum Blanc produced by Avallen Solutions Ltd was conducted to quantify environmental impacts using internationally recognized methodologies. The assessment focused on climate change impacts represented by the Global Warming Potential in the next 100 years (GWP100).

The study shows a carbon footprint of **2.706 kg CO_2-eq per product unit**. Raw material production and packaging contribute the highest environmental impacts, followed by processing and facility operations. The water footprint analysis reveals **47.1 litres of water consumption per product unit**.

Key Findings

- Primary environmental impacts stem from raw material production (49%)
- Packaging materials contribute 10% to total climate impacts
- Facility operations account for 40% of carbon footprint
- End-of-life impacts represent 2% of total environmental footprint

Methodology & Standards Compliance

This assessment adheres to the four phases of LCA methodology as defined by ISO standards:

LCA PHASE	METHODOLOGY APPLIED	DATA SOURCES
Goal & Scope Definition	Cradle-to-gate assessment	Company production data
Inventory Analysis	Material & energy flow quantification	Ecoinvent 3.5, DEFRA 2024
Impact Assessment	IPCC 2013 GWP100 factors	OpenLCA calculations
Interpretation	Hotspot analysis & recommendations	Platform analytics

Functional Unit: The functional unit is defined as 1 750mlL bottle of Rum Blanc, representing the typical consumer product format.

Inventory Analysis

Process Description

The production process of Rum Blanc includes ingredient sourcing, processing, packaging, and distribution to retail points. Raw materials are sourced from verified suppliers and processed according to industry standards and company quality protocols.

Ingredient Composition

- Molasses, cane: 1.5 kg

Packaging Specifications

Environmental Packaging Analysis: Comprehensive assessment of packaging materials including recycled content, recyclability, and end-of-life impact calculations based on regional waste management data.

COMPONENT	MATERIAL & PROPERTIES	WEIGHT (G)	ENVIRONMENTAL PROFILE
Bottle	Glass bottle, clear 61% recycled content	530.0g	Partially recycled material reducing virgin resource demand by 61%
Label	Paper label, uncoated Biodegradable substrate	2.5g	Recyclable material with 70.2% UK recycling rate
Closure	Aluminum screw cap Premium sealing	3.0g	Recyclable material with 82.1% UK recycling rate

Production Facilities

Primary Production Location: 123 Demo Street
Annual Production Capacity: 150,000 units

> **Energy Sources:** Grid electricity, Natural gas
> **Water Sources:** Municipal supply, Treated groundwater

Dataset References

All impact calculations are based on the following environmental databases and methodological sources:

- **Ecoinvent 3.5 database** - Swiss Centre for Life Cycle Inventories
- **DEFRA 2024 emission factors** - UK Government GHG Conversion Factors
- **OpenLCA methodology** - Ingredient impact calculations
- **Verified supplier data** - Environmental product declarations where available

Environmental Impact Assessment

Impact Categories

Results of the life cycle impact assessment across all evaluated environmental categories:

Climate Change (GWP100)

2.706 kg CO_2e per unit

Global Warming Potential over 100 years, based on IPCC 2013 methodology

Water Consumption

47.1 L per unit

Freshwater consumption across ingredient production and processing

Waste Generation

0.0181 kg per unit

Production waste and end-of-life packaging impacts

Impact Breakdown by Life Cycle Stage

LIFE CYCLE STAGE	CARBON IMPACT (KG CO_2E)	WATER IMPACT (L)	% OF TOTAL
Ingredients & Raw Materials	1.335	39.0	49%
Packaging Production	0.272	5.4	10%
Facility Operations	1.084	2.8	40%

Greenhouse Gas Analysis

ISO 14064-1 Compliant GHG Breakdown: The following analysis provides a detailed breakdown of greenhouse gas emissions by individual gas species, using IPCC AR5 Global Warming Potential factors for scientifically accurate climate impact assessment.

Carbon Dioxide (CO_2) 2.2188 kg × GWP 1 | Energy consumption, transportation, material production	2.219	kg CO_2eq
Methane (CH_4) 0.011597 kg × GWP 28 | Anaerobic processes, agricultural production	0.325	kg CO_2eq
Nitrous Oxide (N_2O) 0.000613 kg × GWP 265 | Fertilizer application, soil emissions	0.162	kg CO_2eq

Total GHG Impact: 2.706 kg CO_2eq per unit

Phase 2 estimate • Upgrade to Phase 3 for advanced gas-by-gas analysis

GWP Methodology: Global Warming Potential factors based on IPCC Fifth Assessment Report (AR5) with 100-year time horizon. All calculations comply with ISO 14040/14044 LCA standards and ISO 14064-1 greenhouse gas quantification requirements.

Interpretation & Hotspot Analysis

Primary Impact Drivers: The assessment reveals that raw material production constitutes the largest environmental impact, accounting for approximately 49% of total carbon footprint. Packaging materials contribute 10% to climate impacts, while facility operations account for 40%.

The comprehensive analysis demonstrates that ingredient sourcing represents the greatest opportunity for impact reduction. Supply chain optimization and sustainable sourcing adoption could significantly reduce the total environmental footprint.

Data Quality & Transparency: Impact calculations integrate primary facility data, verified supplier declarations where available, and representative secondary data from peer-reviewed databases

including ecoinvent 3.5. Carbon footprint calculations demonstrate accuracy within ±15%, with water footprint uncertainty estimated at ±20%.

Phase 3 data verification available with advanced analytics upgrade

References & Standards

1. ISO 14040:2006 - Environmental management — Life cycle assessment — Principles and framework
2. ISO 14044:2006 - Environmental management — Life cycle assessment — Requirements and guidelines
3. IPCC 2013 - Climate Change 2013: The Physical Science Basis. Working Group I Contribution to the Fifth Assessment Report
4. Ecoinvent 3.5 database - Swiss Centre for Life Cycle Inventories, Zurich, Switzerland
5. DEFRA 2024 - UK Government GHG Conversion Factors for Company Reporting. Department for Environment, Food & Rural Affairs
6. OpenLCA 1.11 - GreenDelta GmbH. Open-source software for Life Cycle Assessment and Sustainability Assessment
7. GHG Protocol - A Corporate Accounting and Reporting Standard. World Resources Institute and World Business Council for Sustainable Development
8. PEF Guide - Product Environmental Footprint Category Rules. European Commission, Joint Research Centre

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Report Generated by Avallen Solutions Ltd

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