Life Cycle Assessment

Hoop Industries reusable box packaging solution

Executive Summary

This report presents a comparative Life Cycle Assessment (LCA) of Hoop Industries' reusable Box packaging solution against traditional single-use cardboard boxes. The study, commissioned by Hoop Industries and conducted by Blue Marble, adheres to ISO 14040:2006, ISO 14044:2006, and ISO 14025:2010 standards, providing insight into the environmental impacts for business-to-consumer and business-to-business communication. The primary focus of the assessment is Global Warming Potential (GWP) - Fossil, a key environmental indicator.

The LCA utilizes a "cradle to grave" system boundary, encompassing raw material production to end-of-life; and assumes that, for every use-cycle, only 85% of units are returned - equivalent to a useful life of approximately 6 uses per item of packaging. Two modelling approaches were explored: Scenario A, which quantifies GWP - Fossil at a system-wide level, maintaining the “functional unit” of one packaging solution at each use cycle by adding-back the 15% product losses incurred in the previous use-cycle; and Scenario B, which models GWP - Fossil at a unit-level over a fixed product lifetime of 6 uses.

Key Findings:

- ***Initial Impact:*** Over a single use, the Hoop Box has a slightly higher GWP - Fossil impact (+6.2%) compared to the baseline single-use cardboard box.
- ***Break-even & Long-term Benefit:*** The Hoop Box demonstrates a lower environmental impact than the single-use cardboard baseline after only the second use. Over an extended number of system-wide use cycles (Scenario A), it achieves an estimated 71% reduction in GWP - Fossil compared to constantly using and replacing single-use cardboard boxes.
- ***Impact Drivers:*** Raw material production and transportation to the warehouse and then to the customer are the largest contributors to its GWP - Fossil impact.
- ***Opportunities for Reduction:*** Reducing the product loss rate from 15% to 10% can lead to an 18.9% reduction in GWP - Fossil over 6 uses. Substituting the polypropylene insert with a cardboard alternative could further reduce GWP - Fossil impacts of raw material production by 68-88%.

Digest

This report provides a condensed summary of a comparative Life Cycle Assessment (LCA) focusing on the Hoop Box reusable packaging solution and its environmental impact compared to traditional single-use packaging. The study was commissioned by Hoop Industries and conducted by Blue Marble, an environmental consultancy. This summary is intended for Hoop's merchant clients: the users and prospective users of the reusable packaging solution.

Understanding Life Cycle Assessment (LCA)

Life Cycle Assessment (LCA) is a comprehensive method for evaluating the environmental impacts of a product throughout its entire life cycle, from "cradle to grave". This includes raw material extraction, manufacturing, transportation, use, and end-of-life disposal. By analyzing inputs (like resource consumption) and outputs (like environmental emissions) at each stage, LCA helps to identify where environmental management efforts can be most effectively directed to reduce a product's overall impact.

For this study, the declared unit for the Hoop Box is 1 unit, with a mass of 0.077 kg. The system boundary covers the product's entire life cycle, from raw material production to its end-of-life, for one use of the product. The assessment complies with ISO 14040:2006, ISO 14044:2006, and ISO 14025:2010 standards. Data was collected from Hoop Industries and supplemented with secondary data from the EcoInvent v3.10.1 database.

Key Findings for the Hoop Box Solution (Global Warming Potential - Fossil)

The study primarily focuses on Global Warming Potential (GWP) - Fossil, which is a key indicator of climate change impact. Two main modeling approaches were investigated:

- Scenario A: This approach considers an expected 15% loss rate of the product per use cycle due to waste treatment and disposal. To maintain the functional unit of one packaging solution, the 15% loss is assumed to be replaced with newly manufactured product in the subsequent use cycle. This scenario provides a representative view of the impacts arising from operating a Hoop packaging system.

- Scenario B: This approach models the Hoop Box with a fixed lifetime of 6 uses and no losses during use. The entire product reaches its end-of-life at the 6th use cycle.

Here's how the Hoop Box compares to traditional single-use cardboard packaging:

1. Single Use Cycle Comparison:

Product	kg CO2e	Percentage change from baseline %
Hoop Box	3.48E-01	+6.2
Box Baseline	3.28E-01	NA

Table.1 GWP Fossil kg CO2e across products analyzed for 1 use - with percentage change values from the baseline single use solutions provided

For a single use, the Hoop Box has a slightly higher impact (+6.2%) than the baseline single-use cardboard box.

2. System-wide Comparison after 6 use cycles (Scenario A):

Product	kg CO2e	Percentage change from baseline %
Hoop Box	8.22E-01	-58.2
Box Baseline	1.97E+00	NA

Table.2 GWP Fossil kg CO2e across products analyzed for 6 uses - with percentage change values from the baseline single use solutions provided

Over its estimated average lifespan of 6 uses (Scenario A), the Hoop Box solution demonstrates a 58.2% lower impact than the baseline single-use cardboard solution (which is replaced each time). Under Scenario B, the Hoop Box shows an even greater reduction, with a 69.2% lower impact than the baseline single-use box by its 6th use. The difference between the results for the two scenarios is due primarily to Scenario A's accounting method, which assumes additional raw material production is incurred during the product's lifetime (in order to make a theoretical unit "whole again" following assumed losses at each cycle).

3. Break-Even Point and Long-Term Benefits (Scenario A):

While a single use of the Hoop Box has a higher impact than a cardboard box, its reusable design means the GWP - Fossil impact significantly diminishes with each subsequent use. The Hoop Box achieves a lower impact than the single-use cardboard baseline after only the second use of the product.

The more the Hoop Box system is used, the greater the reduction in GWP - Fossil. This reduction is seen to stabilize at approximately 71% (compared to single-use cardboard boxes) after 127 cycles of the Hoop Box system.

4. Impact of Loss Rates and Product Lifetime:

Maintaining the product in use for as long as possible with a high retention rate is crucial. A reduction in the loss rate from 15% to 10% per use cycle can lead to an 18.9% reduction in GWP - Fossil for the Hoop Box over 6 uses. Similarly, extending the product's lifetime from the expected 6 uses to 10 uses (under Scenario B) can lead to a 25.5% reduction in GWP - Fossil over 30 use cycles.

5. Material Impact Insights:

The raw material production and transportation to the place of installation/use are the largest contributors to the Hoop Box's GWP - Fossil. Other notable contributors include waste treatment at end-of-life and refurbishment activities. The insert and zip assembly are the highest contributors within raw materials, with nylon and metal components being significant.
Considering material alternatives, a cardboard insert could offer a 68% to 88% reduction in GWP - Fossil impacts from raw material production compared to the current polypropylene insert.

Importance of Operational Practices

The study emphasizes that the scale of implementation and methods of transport are very important for reducing the overall environmental impact of the Hoop Box solution. For example, transporting more units per unit of distance or utilizing lower-impact transportation methods (such as electric delivery vans) could significantly reduce transportation-related impacts.

The results of this study are based on pre-mass production runs. Therefore, actual impacts may vary with future production operations.