A global leader in reusable packaging solutions

Comparative footprint of Tosca reusable load carriers vs alternative single-use options

Environmental Impact Using Screening Life Cycle Analysis

Report Details

Project Description: Tosca reusable pooled RPCs (9,880,741 rotations) vs a mix of 1,776,690 foam and 8,104,051 cardboard boxes (identical capacity).
Analysis Method: COMPASS (2023)
Company: Tosca

Basic assumptions:

Average number of trips/service life:

Tosca RPC´s: 100
Tosca reusable pallets: 100 (same pallet type & use scenario for both alternatives)
Foam and cardboard: single use

Material and end-of-life:

All plastic: PP virgin & end-of-life 100% recycled
Cardboard: 75% PCR recycled raw material & recycling 96% waste to energy 1% landfill 3% (Compass US market average)
Foam: recycling 30% waste to energy 50% landfill 20%
Average weight ratio of RPC vs alternative single use material of 3 to 1.

Transport (miles):

RPC model	units	distance
4319 f	1,776,690	336
4319 c	193,440	467
6332	3,074,316	259
6419	2,076,185	428
6428	1,698,190	594
65226	1,061,920	282

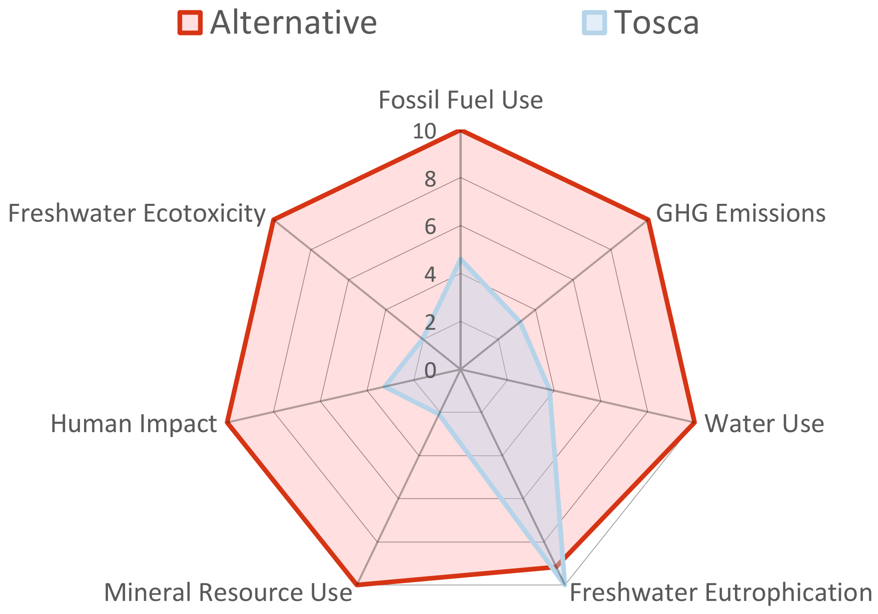
Distances calculated based on weighted average (volumes per Tosca depot and client location for delivery and pickup of empty units), road transport only.
Similar cube efficiency for both types of load carriers, emissions from transportation loader to unloader left out under assumption of “all else equal”.

Alternative: source of raw material to manufacturer to loader + unloader to end-of-life = 350

Note: This COMPASS report uses life cycle inventory (LCI) data that represents an industry average for materials, manufacturing processes, and end of life impacts. The Life Cycle Analysis (LCA) in this report can be used for directional guidance in internal decision making and understanding trade-offs.

Overview

Results for both alternatives are expressed on a scale to 10, with the highest of the two being converted to 10 and the other value expressed as a proportion of the first. The overview for all 7 impact categories is shown as a spider chart, with a smaller shaded area representing less of an environmentally harmful package.



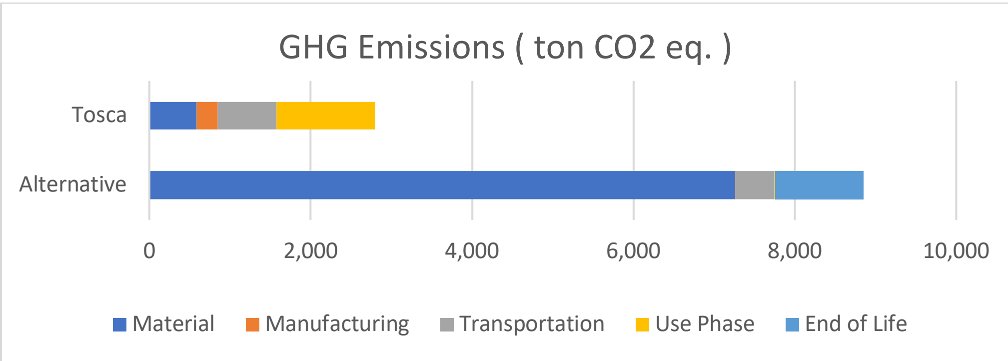
Total Environmental Impact

This section shows the total impact for each of the selected indicators used for the Life Cycle Analysis. Each indicator is composed of the material extraction, manufacturing, transportation, use phase and end of life impacts. The use phase impact reflects the washing before reuse.

Note: The material phase measures the environmental footprint of extracting and processing materials. The manufacturing phase calculates the impact of the manufacturing or conversion processes that companies use to add value and create the package or product. For the *transportation phase, the impact is calculated based on the mode of transportation (road, rail, air, sea) as well as the distances travelled. The end of life impact calculation incorporates the most likely fate of the product/package and its components based on proportions going to landfill, waste-to-energy or recycling.*

GHG Emissions (ton CO2 eq.)

The total quantity of greenhouse gases (GHG) emitted throughout the lifecycle reported in tons of CO2 equivalents. This calculation follows the IPCC Sixth Assessment Report (AR6) 2021 100a w/o CO2 Uptake method and considers climate feedback loops.



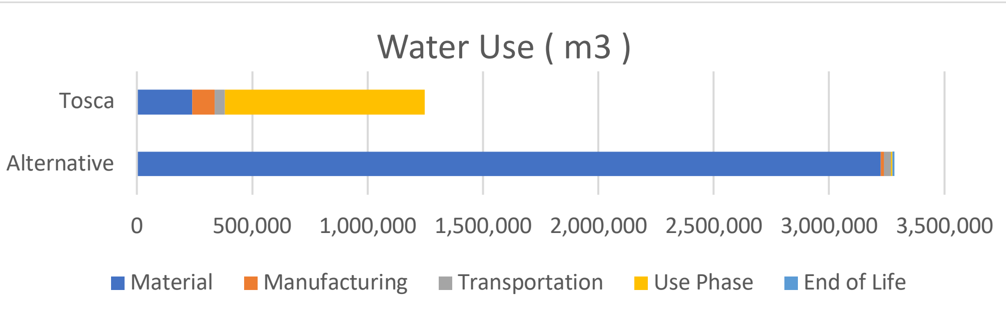
SIMPLE Indicators

GHG Emissions Differences for Each BOM Compared to the Reference

GHG Emissions (ton CO2 eq.)	6,049
Miles Driven by Passenger Vehicles Yearly	28,943,728
Acres of Forests Yearly	7,117

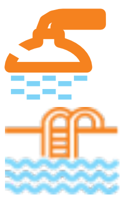
Water Use (Kiloliter)

The relative available water remaining per area in a watershed after the demand of humans, aquatic ecosystems, and manufacturing process has been met. This metric accounts for water scarcity and the result represents the relative value in comparison with the average liters consumed in the world. Essentially, the total water consumed to make the package is multiplied by the region's scarcity factor which will either increase or decrease the water usage value based on the scarcity or excess availability of water in a specific region, respectively.



SIMPLE Indicators

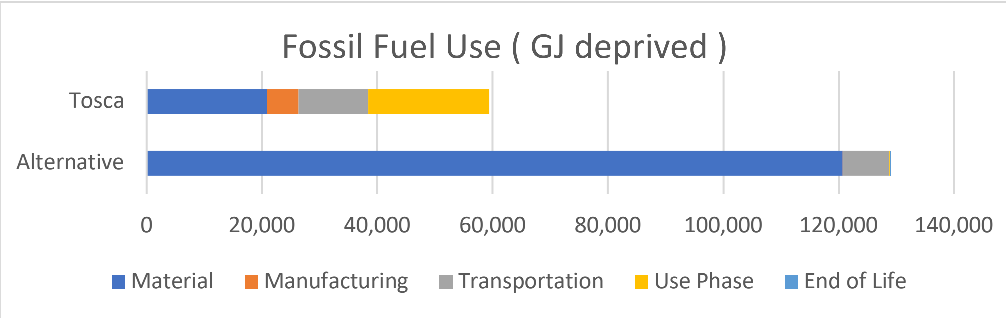
Water Use Differences for Each BOM Compared to the Reference



Water Use (m3)	2,034,777
Average Showers	33,912,955
Olympic Sized Swimming Pools	814

Fossil Fuel Use (GJ deprived)

Total quantity of fossil fuel consumed throughout the life cycle reported in gigajoules (GJ) equivalents deprived. This calculation uses the IMPACT World+ method and assumes fossil resources mainly used for energy purposes. Fossil fuels include coal, petroleum, and natural gas. Inputs for nuclear fuel such as uranium are accounted for in the MINERAL CONSUMPTION metric.



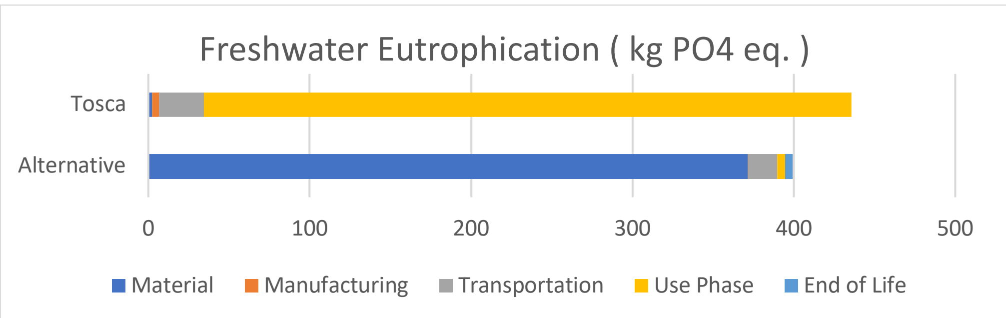
SIMPLE Indicators

Fossil Fuel Use Differences for Each BOM Compared to the Reference

Fossil Fuel Use (GJ deprived)	69,648
Barrels of Oil	11,384
Average Homes Powered Yearly	4,910

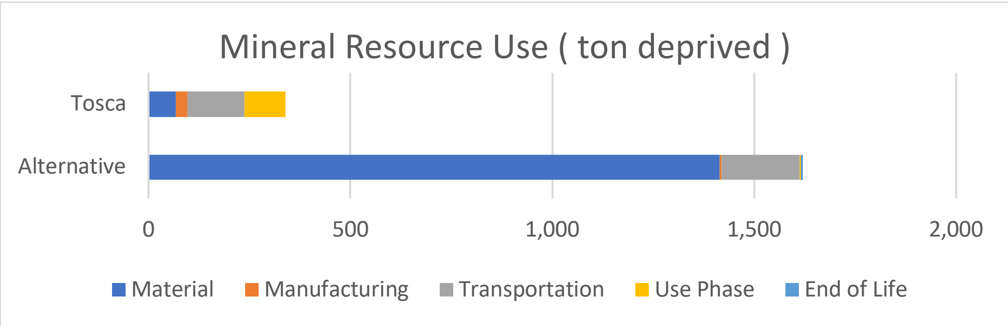
Freshwater Eutrophication (kg PO4 eq.)

Eutrophication is the abnormal increase in chemical nutrients that results in excessive plant/algal growth and decay resulting in an anoxic condition in freshwater systems. (The major consequence are algal blooms.) Typically, these are emissions of phosphorus compounds released during the production of materials.



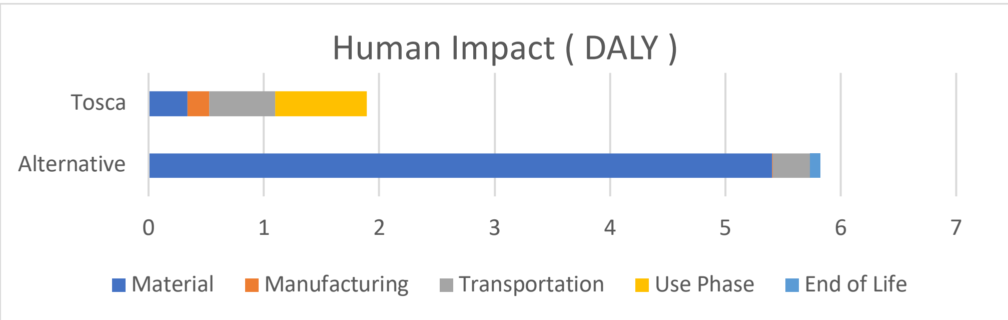
Mineral Resource Use (ton deprived)

This indicator uses the material competition scarcity index from de Bruille (2014) as a midpoint indicator. The factor represents the fraction of material needed by future users that are not able to find a reliable substitute for the mineral. It is expressed in units of kilograms of deprived resource per kilogram of resource dissipated. It considers mineral scarcity and viable substitutes.



Human Impact (DALY)

The quantity of environmental emissions resulting in particulate, cancer & toxic non-cancer impacts to humans released throughout the lifecycle. The metric reports these three measurements in Disability Adjusted Life Years (DALY). Calculated using Impact World+ and considers severity factors of any adverse effects.



Freshwater Ecotoxicity (CTUe)

The quantity of environmental emissions resulting in aquatic toxic impacts released throughout the lifecycle reported in Comparative Toxic Unit ecosystem (CTUe). CTUe corresponds to a fraction of disappeared species over a cubic meter of freshwater (or marine water) during one year. This is a measure of ecotoxicity impact of chemical releases to air, water, and land using aquatic toxicity factors and is calculated using characterization factors from USEtox 2.0.