

STREAMLINED LIFE CYCLE ASSESSMENT* E-COMMERCE SHOE PACKAGING CASE STUDY

SHOE PACKAGE COMPARISON

Clothing and footwear represent a key area of significant growth in e-commerce. For this case study, shoes were purchased from two separate e-commerce retailers, both of which shipped the shoes in a traditional corrugated shoe box. One retailer placed that shoe box into a corrugated overbox for e-commerce shipping while the other used a flexible pouch with a feature to enable returns—both scenarios were evaluated with a cradle-to-grave boundary.

The standard measurement for this study.



SHOE BOX WITH FLEXIBLE POUCH



SHOE BOX WITH OVERBOX

FOSSIL FUEL CONSUMPTION

The shoe box with an overbox results in approximately **14%** more fossil fuel use than the flexible mailer. This is largely driven by the flexible mailer using **less than half (228.5g vs. 536.6g)** the amount of packaging material for an e-commerce delivery.



6.26
MJ-EQUIV



7.15
MJ-EQUIV

GREENHOUSE GAS EMISSIONS

The shoe box with the overbox results in greenhouse gas (GHG) emissions about **66%** greater than the shoe box and flexible mailer. Driven by the amount of material used for the overbox scenario, the material impact alone is greater than the material, manufacturing, transportation and end of life GHG impacts combined for the flexible mailer.



.3943
KG-CO2 EQUIV



.6529
KG-CO2 EQUIV

WATER CONSUMPTION

Water use for the shoe box with the overbox and the poly mailer are nearly identical, with the production of LDPE being more water intensive on a per gram basis than corrugated, even though far less material is used.



94.23
L



92.68
L

END OF USE SUMMARY

SOURCE REDUCTION BENEFITS

Flexible packaging offers the ability to source reduce, which is one of the most preferred methods of waste management, according to the U.S. EPA Waste Hierarchy.

As a result, a major benefit of flexible packaging is the high product-to-package ratio that it offers.

HIGH product-to-package ratio:

75.4%

Product weight

24.6%

Package weight



LOW product-to-package ratio:

56.6%

Product weight

43.4%

Package weight

RECOVERY BENEFITS



In either scenario, all of the packaging material can be recycled using existing infrastructure: the corrugated shoe box and the overbox can be recycled in the curbside system; and the HDPE bubble wrap dunnage (used with the overbox) and HDPE flexible poly mailer can be recycled as part of store drop-off recycling programs—if they go through the How2Recycle® certification process, that is.

The corrugated overbox scenario results in less material being discarded to landfill because of the high recycling rate and consumer convenience in recycling corrugated. This highlights some of the tradeoffs that must be considered when looking at the environmental impacts of any packaging material in an e-commerce application.

IMPLICATIONS

The results of the shoe e-commerce case study show that the flexible mailer results in a lower environmental impact across fossil fuel use, greenhouse gas emissions and water use than the shoes arriving in an overbox. However, the flexible pouch results in more material discarded in landfill due to the low recycling rates for the flexible mailer and additional steps consumers need to take by cutting out labels and taking the mailer to a store drop-off location. Both package formats allow for product protection during delivery, though the flexible mailer may hold up better in a wet or humid environment, while also allowing for easy opening and returns, important considerations for consumer convenience.

FORMAT	FOSSIL FUEL CONSUMPTION (MJ-DEPRIVED)	GHG EMISSIONS (KG-CO ² EQUIV)	WATER USE (L)	PRODUCT-TO-PACKAGE RATIO AND PERCENT WT.	PKG LANDFILLED (G)/1,000 KG SHOES
FLEXIBLE E-COMMERCE POUCH 	6.26	0.3943	94.23	3.1:1 75.4%:24.6%	80,259
OUTER OVERBOX 	7.15 (+14.2%)	.6529 (+65.6%)	92.68 (-1.6%)	1.3:1 56.6%:43.4%	63,819 (-20.5%)

For more information and methodologies of assessments, please visit www.flexpack.org to download the "Sustainability and Life Cycle Impacts of Flexible Packaging in E-commerce" report. For additional findings on the impact of flexible packaging on dimensional weight and shipping costs, visit www.flexpack.org/resources/sustainability-resources.