INVESTIGATING THE ENVIRONMENTAL IMPACT OF COMMON COSMETIC PRODUCT PACKAGING FOR IMPROVED SUSTAINABILITY

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Name of the supervisor: Dr. J.R. Gamage

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Abstract

Investigating the environmental impact of common cosmetic product packaging for improved sustainability

The cosmetic industry is a significant contributor to global plastic waste, largely due to the extensive use of plastic-based packaging materials. In Sri Lanka, a rapid growth in personal care consumption is also evident. This study investigates the life cycle environmental impacts of three widely used cosmetic packaging types in Sri Lanka, namely a plastic bottle with flip cap, a collapsible squeeze tube, and a thick-bottom plastic tub. The life cycle assessment is carried out by using, SimaPro 9.3.0.3, along with the ReCiPe 2016 Endpoint (H) method under the World (2010) H/A scenario.

The study evaluated each packaging under two functional units, packaging required for 100ml of product and packaging based on the original SKU size for clarity purposes. Environmental impacts were assessed with and without the inclusion of filling and sealing energy to determine the sensitivity of energy use in the total life cycle impacts. The findings reveal that packaging material selection significantly outweighs energy consumption in terms of total environmental impacts. Across both functional units, the collapsible squeeze tube made of LDPE showed the highest environmental impacts.

A sustainable packaging design framework was developed based on the LCA results by recommending the use of mono material structures, lightweight packaging, clear recycling labels and right size SKU selection. The framework aims to guide Sri Lankan cosmetic manufacturers in making informed, data driven decisions with a best compromise of the functionality and environmentally friendliness.

In conclusion, the study shows the importance of material selection, design simplification and system compatibility in minimizing the environmental footprint of cosmetic packaging. Future research may further explore consumer behaviour, end of life infrastructure development and comparative assessment involving bio based and refillable packaging alternatives.

Life Cycle Assessment, Cosmetic Packaging, Environmental Impact, SimaPro, Sustainable Packaging in Sri Lanka, Plastic Waste Reduction

Table of Contents

List of Figures

List of Tables

List of Abbreviations

LCA	life cycle assessment
PET	polyethylene terephthalate
HDPE	high-density polyethylene
ISO	international organization for standardization
PLA	polylactic acid
LCI	life cycle inventory
ABS	Acrylonitrile Butadiene Styrene
PP	polypropylene
FU	functional unit
SKU	stock keeping unit
LDPE	low-density polyethylene
DALY	disability-adjusted life years
species.yr	species lost per year
PHA	Polyhydroxyalkanoates