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TO STUDY THE GREEN ACCOUNTING AND ITS IMPACT ON PRODUCT LIFECYCLE COSTING IN FMCG COMPANIES IN INDIA

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Abstract:

This research paper examines the integration of green accounting practices into product lifecycle costing (PLC) within the Fast-Moving Consumer Goods (FMCG) sector in India. Amidst escalating environmental regulations and consumer demand for sustainability, green accounting—encompassing the monetization of environmental costs and benefits—offers a transformative lens for PLC, which traditionally focuses on financial metrics across a product's lifecycle stages. Drawing from secondary data, case studies, and policy analyses, the study highlights cost efficiencies, regulatory compliance, and sustainability gains in Indian FMCG firms like Hindustan Unilever (HUL) and ITC. Findings reveal potential reductions in lifecycle costs by 10-20% through eco-efficient practices, though challenges like implementation costs persist. Recommendations advocate for standardized frameworks and technological integration to foster broader adoption.

Keywords: *Green Accounting, Product Lifecycle Costing, FMCG, Sustainability, India*.

Introduction:

The Fast-Moving Consumer Goods (FMCG) sector in India, valued at over ₹5 lakh crore in 2024 and projected to reach ₹8 lakh crore by 2028, is a cornerstone of the economy, employing millions and driving rural consumption. However, its high-volume production, reliance on non-renewable resources, and extensive packaging generate significant environmental externalities, including plastic waste (contributing 40% of India's total) and water depletion (FMCG accounts for 15-20% of industrial water use). Green accounting emerges as a critical tool to internalize these costs, integrating environmental impacts—such as emissions, waste, and resource depletion—into financial reporting. This aligns with India's commitments under the Paris Agreement and Sustainable Development Goals (SDGs), particularly SDG 12 (Responsible Consumption and Production).

Product Lifecycle Costing (PLC), which aggregates costs from design through disposal, traditionally overlooks these externalities, leading to undervalued long-term liabilities. In the Indian FMCG context, green accounting enhances PLC by embedding Life Cycle Assessment (LCA) metrics, enabling firms to optimize sustainability while maintaining profitability. For instance, the Business Responsibility and Sustainability Reporting (BRSR) framework, mandated by SEBI since 2022-23 for top listed companies, requires disclosure of environmental costs, compelling FMCG giants to adopt green practices.

Literature Review:

- The literature on green accounting and PLC in Indian FMCG is nascent but growing, reflecting global sustainability shifts adapted to local regulatory and economic contexts. Green accounting, rooted in the System of Environmental-

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Economic Accounting (SEEA), quantifies environmental costs (e.g., pollution abatement, resource restoration) to adjust traditional metrics like GDP or profit statements. In India, the 2013 "Green National Accounts in India" report by the Expert Committee on Green Accounting laid foundational principles, emphasizing externality valuation through methods like contingent valuation and replacement cost.

- Empirical evidence from Indian firms includes HUL's integration of green accounting for palm oil sourcing, yielding measurable lifecycle savings, as noted in a 2025 IJNRD study. ITC's ESG reports (2024) exemplify BRSR compliance, linking green metrics to PLC for packaging innovations. Challenges persist: high initial costs (2-5% expense hike) and data gaps, as per IJSRI (2024), limit SME adoption. Gaps in literature include quantitative models for FMCG-specific PLC-green linkages and longitudinal impacts post-BRSR, which this paper addresses through synthesis.

Objective of the Study:

- To Study the overview of Green Accounting
- To study the product lifecycle
- To study the impact of Green Accounting with Product Lifecycle

Research Methodology:

- This study adopts a secondary data–based research design. Data were collected from reliable and publicly available sources, including peer-reviewed journals, books, government reports, industry publications, and reputable databases such as academic journals and official statistical websites. The data selected were relevant to the research objectives and covered the required time period.

Conceptual Integration of Green Accounting and PLC: At its core, green accounting extends PLC by quantifying environmental "shadow costs"—those not directly reflected in balance sheets but borne by society, such as pollution cleanup or biodiversity loss. This is achieved through hybrid accounting systems like the System of Environmental-Economic Accounting (SEEA), which combines monetary (e.g., carbon taxes) and physical (e.g., kg of CO_2e emitted) metrics.

The integration operates on two levels:

- Micro-Level (Firm-Specific): Green accounting reorganizes PLC to include preventive, protective, and restorative costs across stages, using Activity-Based Costing (ABC) to allocate indirect environmental expenses (e.g., energy audits) to specific activities or products. This reveals cost hotspots, like high-emission raw materials, and informs "green design" for profitability.
- Macro-Level (Policy/National): It adjusts national accounts for natural capital depletion, influencing PLC in regulated sectors (e.g., via EU Green Deal or India's BRSR framework), where firms must report lifecycle emissions for compliance.

Key frameworks include:

- GHG Protocol Product Life Cycle Accounting Standard: Emphasizes an attributional approach, calculating GHG emissions/removals per functional unit (e.g., per kg of product) using activity data × emission factors. It integrates costs by linking emissions to financial risks (e.g., future carbon pricing), supporting green procurement through cradle-to-gate inventories.
- Sustainability Accounting Standards: Align PLC with Global Reporting Initiative (GRI) or ISO 14001, categorizing costs into prevention (e.g., R&D for low-toxicity materials), recycling (e.g., waste-to-resource conversion), and management (e.g., certification fees).

Application Across Product Lifecycle Stages:

Green accounting's usage in PLC is stage-specific, ensuring holistic coverage from "cradle-to-grave" (or "cradle-to-cradle" for circular models). Each stage

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incorporates environmental costing to identify interventions.

- **Design Phase:** 70-80% of lifecycle costs are locked in here; green accounting mandates eco-design tools (e.g., Design for Environment) to evaluate material toxicity, recyclability, and energy efficiency. Usage: R&D costs for low-impact prototypes, risk analysis for regulatory changes. Example: Selecting biodegradable polymers to cut disposal costs by 20%.
- **Raw Material Sourcing/Acquisition:** Focuses on supplier audits and green procurement; costs include extraction impacts (e.g., land-use change via IPCC guidelines). Usage: ABC to price "embedded emissions" (e.g., 35% of emissions from fertilizer in agriculture). Example: PepsiCo's orange juice LCA, reducing sourcing costs via low-emission suppliers.
- **Production/Manufacturing:** Tracks process emissions and waste; MFCA quantifies losses (e.g., volatile organic compounds). Usage: Preventive investments (e.g., energy-efficient machinery) amortized over PLC. Example: Alcoa's recycling allocation for aluminum wheels, displacing virgin material costs by 10%.
- **Distribution and Use:** Monetizes logistics emissions (fuel) and consumer impacts (e.g., energy consumption). Usage: Functional unit normalization (e.g., per service hour) for in-use costing. Example: Levi Strauss' allocation by mass/floor space for apparel distribution.
- **End-of-Life (Disposal/Recycling):** Internalizes remediation and circularity costs; closed-loop approximation for recycling (e.g., credit for displaced virgin production). Usage: Scenario modeling (incineration vs. landfill) to minimize liabilities. Example: Toner cartridge inventory showing 20% emissions from disposal, mitigated via recycling targets.

Benefits of Green Accounting in Product Lifecycle Costing (PLC)

- **Enhanced Cost Efficiency and Waste Reduction:** In the FMCG sector, green accounting via tools like Activity-Based Costing (ABC) and Environmental Management Accounting (EMA) has led to 10-20% reductions in operational costs by precisely allocating environmental expenses (e.g., waste disposal) across PLC stages; for instance, Unilever's integration of green metrics in packaging lifecycle costing achieved measurable savings through recyclable designs, minimizing raw material dependency.
- **Improved Profitability and Market Resilience:** Sustainable SKUs in FMCG declined only 28% globally in 2025 (vs. 31% for non-sustainable), boosting their digital shelf share by 2.1pp amid volatility; brands like Nescafé exceeded regenerative sourcing goals, sourcing one-third of coffee from low-emission farms, enhancing long-term profitability and supply chain stability.
- **Emission and Resource Optimization:** PepsiCo's Positive Agriculture initiative, informed by green PLC, covered 400,000+ acres and reduced farmer emissions by up to 60% using low-carbon fertilizers, translating to lower lifecycle costs in sourcing and production while aligning with carbon offset requirements.
- **Regulatory Compliance and Reputational Gains:** In Egypt's healthcare sector (analogous to FMCG waste management), integrating green accounting with LCA yielded 15-25% cost savings and toxic emission reductions via optimized waste recycling, improving compliance and stakeholder trust; similarly, FMCG firms like Danone's USD65M nearshoring investment cut transportation emissions and built ESG appeal.

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Challenges of Green Accounting in Product Lifecycle Costing (PLC)

- High Initial Implementation Costs: Upfront investments strain margins; Danone's 2025 nearshoring for emission reductions required USD65M, while SMEs face 2-5% expense hikes for tech like AI-SAP green costing, delaying ROI in volatile FMCG environments.
- **Data Access and Measurement Uncertainties:** Limited accurate environmental data hinders precise PLC; monetizing impacts (e.g., biodiversity loss) lacks accepted methods, as seen in Egyptian medical waste cases where data gaps complicated 15-25% savings projections.
- **Lack of Standardized Frameworks:** Absence of uniform reporting (e.g., for circular economy costs) impedes comparisons; Unilever and Tesla case studies highlight how inconsistent standards slow adoption in FMCG, overlapping with regulations like EU Deforestation rules.

Conclusion:

The usage of green accounting in PLC represents a paradigm shift toward sustainable value creation, embedding environmental intelligence into every lifecycle decision. By leveraging tools like ABC, MFCA, and GHG standards, organizations achieve not just cost control but regenerative outcomes—turning liabilities into assets in a net-zero world. As of 2025, with escalating regulations (e.g., EU CSRD), adoption is accelerating, yet gaps in SMEs and developing markets persist. Future research should focus on AI-enhanced predictive models and blockchain for supply chain transparency, ensuring green PLC evolves as a cornerstone of resilient business strategies. For practitioners, starting with pilot assessments in high-impact stages yields quick wins, paving the way for full integration.

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