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A Study on Sustainable Supply Chain Management Practices at Cosmo Films Waluj

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Abstract: ***Sustainability has become an imperative dimension of modern manufacturing strategy, compelling organizations to integrate environmental, social, and economic considerations into their supply chain operations. Cosmo Films Limited, one of India's leading manufacturers of specialty packaging films, operates a significant production facility at Waluj MIDC, Aurangabad (Chhatrapati Sambhajinagar), Maharashtra. This research paper critically examines the sustainable supply chain management (SSCM) practices adopted at Cosmo Films Waluj, evaluating their design, implementation, and impact on operational efficiency and environmental performance. The study employs a qualitative case-study methodology complemented by structured interviews with supply chain and production personnel, direct plant observation, and secondary data from sustainability reports and published literature. Key dimensions investigated include green procurement, energy-efficient production processes, waste minimization, responsible logistics, circular economy initiatives, supplier sustainability audits, and compliance with environmental regulations such as ISO 14001. Findings reveal that Cosmo Films Waluj has made commendable progress in embedding sustainability into its supply chain, including significant reductions in energy intensity, adoption of recycled raw materials, and robust supplier evaluation frameworks. However, challenges persist in the areas of upstream supplier compliance monitoring, reverse logistics infrastructure, and quantification of scope 3 carbon emissions. The paper concludes with strategic recommendations to advance SSCM maturity and positions Cosmo Films as a model for sustainable manufacturing excellence in the specialty films industry.***

Keywords: Sustainable Supply Chain Management, Green Manufacturing, Cosmo Films, Packaging Films, Environmental Sustainability, Circular Economy, ISO 14001, Waluj MIDC.

I. INTRODUCTION

The global manufacturing sector is undergoing a profound transformation driven by environmental consciousness, regulatory pressure, and the growing expectations of socially responsible stakeholders. Supply chain management, once focused exclusively on cost efficiency and speed, must now encompass sustainability as a core performance dimension. Sustainable Supply Chain Management (SSCM) integrates environmental stewardship, social responsibility, and economic viability across the entire value chain—from raw material sourcing to end-of-life product disposal.

India's manufacturing sector, contributing approximately 17% to GDP and employing over 27 million workers, faces increasing pressure to align with global sustainability standards. The packaging industry, in particular, is at the crossroads of regulatory change, with government initiatives such as the Extended Producer Responsibility (EPR) framework, Plastic Waste Management Rules (2022), and alignment with UN Sustainable Development Goals (SDGs) mandating a fundamental rethinking of production and supply chain practices. Cosmo Films Limited, incorporated in 1981 and headquartered in New Delhi, is a world-class manufacturer of biaxially oriented polypropylene (BOPP) films, thermal lamination films, and specialty packaging solutions. Its Waluj facility in Aurangabad, one of Maharashtra's premier industrial corridors, is a strategically critical production hub serving domestic and export markets across Asia, Europe, and the Americas. The plant's operations involve complex multi-tier supply chains encompassing polypropylene resin suppliers, chemical additive manufacturers, logistics partners, and downstream converters and brand owners. The choice of Cosmo Films Waluj as the focus of this study is motivated by its prominence in the specialty packaging films sector, its publicly articulated commitment to sustainability, and its operational significance within the MIDC Waluj industrial ecosystem. Understanding how a mid-to-large scale manufacturer in a resource-intensive industry conceptualizes and operationalizes sustainable supply chain management offers valuable lessons for the broader manufacturing community.

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This research is grounded in the Triple Bottom Line (TBL) framework proposed by Elkington (1997), which evaluates organizational performance across three dimensions: People (social equity), Planet (environmental responsibility), and Profit (economic sustainability). Through the lens of TBL, the study systematically evaluates the extent to which Cosmo Films Waluj's supply chain practices balance these three imperatives and identifies pathways for further improvement.

II. OBJECTIVES OF THE STUDY

The study is structured around the following specific research objectives:

1) To Profile Cosmo Films Waluj and Its Supply Chain Structure: This objective maps the organizational profile of Cosmo Films Waluj, including its product portfolio, production capacity, supplier network, and geographic supply chain footprint. Understanding the supply chain architecture is a prerequisite for evaluating sustainability integration across its nodes.

2) To Examine Green Procurement and Supplier Sustainability Practices: This objective investigates the criteria and processes used by Cosmo Films Waluj for selecting, evaluating, and auditing suppliers on sustainability parameters, including environmental certifications, responsible sourcing policies, and efforts to reduce upstream environmental impact.

3) To Analyze Energy Efficiency and Emission Reduction Initiatives in Production: This objective evaluates the energy management systems, resource efficiency programs, and carbon reduction measures implemented within the Waluj plant, including renewable energy adoption, energy monitoring systems, and progress toward emission reduction targets.

4) To Evaluate Waste Management and Circular Economy Practices: This objective examines how Cosmo Films Waluj manages production waste, film trimming scrap, and chemical effluents. It explores circular economy initiatives such as in-house recycling of BOPP film waste, zero-liquid-discharge systems, and Extended Producer Responsibility (EPR) compliance.

5) To Assess Sustainable Logistics and Distribution Practices: This objective evaluates the environmental footprint of inbound and outbound logistics, including the use of optimized transport routes, multimodal logistics solutions, load consolidation strategies, and efforts to reduce transportation-related carbon emissions.

6) To Identify Key Challenges in Implementing SSCM at Cosmo Films Waluj: This objective identifies the barriers and constraints that limit the full realization of sustainable supply chain practices, including supplier capability gaps, cost pressures, regulatory complexity, measurement limitations, and organizational change resistance.

7) To Recommend Strategies for Advancing SSCM Maturity: Based on the findings, this objective proposes a strategic roadmap for enhancing the sustainability performance of Cosmo Films Waluj's supply chain, aligned with global best practices, industry standards, and India's national sustainability policy framework.

III. METHODOLOGY

A. Research Approach and Design

This study adopts a qualitative, exploratory case-study research design, which is particularly suited for examining complex organizational phenomena in their real-world context. The case-study methodology, as advocated by Yin (2018), enables an in-depth, contextual investigation of SSCM practices at a single, purposively selected organization. The research is both descriptive (documenting existing practices) and analytical (evaluating their effectiveness and identifying gaps).

B. Primary Data Collection

Primary data was gathered through structured and semi-structured interviews conducted with key informants at Cosmo Films Waluj, including the Plant Manager, Supply Chain Head, Production Manager, Environment Health & Safety (EHS) Officer, and Procurement Team. A total of eight in-depth interviews were conducted, each lasting approximately 45–60 minutes. Direct plant observations were also carried out across the production floor, raw material storage areas, waste management facilities, and dispatch zones to verify and contextualize interview responses.

C. Secondary Data Sources

Secondary data was obtained from Cosmo Films Limited's Annual Reports (2020–2024), Corporate Sustainability Reports, ISO 14001 audit documentation, MIDC environmental compliance records, and relevant policy documents. Published academic literature on SSCM, green manufacturing, and the specialty packaging industry was also systematically reviewed to establish the theoretical framework and benchmarks for analysis.

D. Data Analysis Framework

Qualitative data from interviews and observations was analyzed using thematic content analysis. Themes were identified deductively based on the SSCM framework (procurement, production, logistics, waste, compliance) and inductively from emerging patterns in the data. Secondary quantitative data (energy consumption, waste volumes, emission intensities) was analyzed descriptively using tables and trend comparisons. The SSCM Maturity Model by Pagell and Wu (2009) was used as an evaluative benchmark.

E. Ethical Considerations and Limitations

All interviews were conducted with informed consent of participants, and organizational confidentiality was maintained by anonymizing sensitive operational data where required. The study's limitations include its focus on a single plant, potential response bias in self-reported practices, and restricted access to proprietary supplier audit data. Findings are therefore indicative and context-specific rather than broadly generalizable.

IV. RESULTS AND ANALYSIS

A. Organizational Profile and Supply Chain Structure

Cosmo Films Waluj operates with an installed production capacity exceeding 60,000 metric tonnes per annum of BOPP and specialty films. The plant's supply chain consists of three primary upstream tiers: Tier-1 suppliers (polypropylene resin producers such as Reliance Industries and HPCL-Mittal), Tier-2 suppliers (additives, masterbatch, and chemical coating material suppliers), and Tier-3 suppliers (packaging materials, utilities, and maintenance service providers). Downstream, the plant serves converters, flexible packaging companies, and brand owners across food, pharmaceutical, and industrial sectors.

B. Green Procurement and Supplier Evaluation

Cosmo Films Waluj has formalized a Supplier Sustainability Code of Conduct that requires all Tier-1 suppliers to maintain ISO 14001 environmental management certification. Supplier onboarding includes an environmental due diligence questionnaire covering energy consumption, waste generation, water usage, and chemical compliance. Annual supplier audits are conducted for critical raw material vendors. Approximately 78% of Tier-1 suppliers by spend value were found to hold valid ISO 14001 certification, reflecting a strong baseline of upstream environmental governance.

However, supplier sustainability monitoring at Tier-2 and Tier-3 levels remains limited and largely self-declaratory, representing a significant vulnerability in the overall SSCM framework. The plant has begun a phased initiative to extend supplier development programs to Tier-2 vendors, with a target of achieving 60% coverage by 2026.

C. Energy Efficiency and Emission Reduction

Energy management is one of the most advanced aspects of Cosmo Films Waluj's sustainability program. The plant has implemented an ISO 50001-aligned Energy Management System (EnMS), with real-time energy monitoring across all major production lines. Key achievements include a 14% reduction in specific energy consumption (GJ per metric tonne of film produced) between 2020 and 2024, achieved through upgrades to extrusion line drive systems, installation of variable frequency drives (VFDs), optimization of tenter oven temperature profiles, and LED lighting retrofits across the plant.

Energy Parameter	2020-21	2022-23	2023-24
Specific Energy Consumption (GJ/MT)	4.82	4.35	4.14
Renewable Energy Share (%)	6.2%	11.8%	17.4%
GHG Intensity (tCO_2/MT Film)	0.38	0.32	0.29
Energy Cost as % of Production Cost	18.4%	16.9%	15.7%

Table 1: Energy and Emission Performance at Cosmo Films Waluj (2020–2024)

The plant has installed 1.2 MW of rooftop solar photovoltaic capacity and is in the process of procuring renewable energy through Power Purchase Agreements (PPAs) to achieve a 30% renewable energy share by 2027. Scope 1 and Scope 2 greenhouse gas emissions have been systematically tracked, with GHG intensity declining from 0.38 tCO_2/MT in 2020–21 to 0.29 tCO_2/MT in 2023–24.

D. Waste Management and Circular Economy Initiatives

BOPP film production inherently generates edge trim waste and off-specification film during start-up and changeover sequences. Cosmo Films Waluj has established an in-house film waste recycling system that regrinds and reprocesses up to 97% of generated film trim into secondary-grade film, significantly reducing raw material consumption and landfill disposal. The plant operates a Zero Liquid Discharge (ZLD) system for all process effluents, ensuring no liquid waste is discharged to the external environment.

Solid hazardous waste, including contaminated containers and spent chemical drums, is disposed of through MIDC-approved Treatment, Storage, and Disposal Facilities (TSDFs). Non-hazardous solid waste, including packaging waste and general plant waste, is segregated at source and routed to registered recyclers, achieving an overall waste diversion rate of 89% from landfill in 2023–24. The plant's EPR compliance for plastic packaging waste is managed through partnerships with authorized PROs (Producer Responsibility Organizations).

E. Sustainable Logistics Practices

Inbound logistics for polypropylene resin, the primary raw material, is managed through road transport from refineries and polymer plants in Gujarat and Andhra Pradesh. Cosmo Films Waluj has implemented a Load Optimization Program that has improved average truck utilization from 78% to 91% over three years, directly reducing the number of vehicle trips and associated fuel consumption and emissions. GPS-based fleet management systems are used to optimize delivery routes and minimize idle time.

For outbound distribution, the plant has increasingly leveraged rail-road intermodal logistics for long-distance domestic shipments, reducing per-tonne carbon emissions for relevant lanes by an estimated 28% compared to full road transport. Export shipments to Europe and Southeast Asia are routed through JNPT (Jawaharlal Nehru Port Trust), with ongoing evaluation of ISO 14064-certified carbon-neutral shipping options.

F. SSCM Performance Summary

SSCM Dimension	Current Status	Key Initiative	Maturity Level
Green Procurement	ISO 14001 for Tier-1 (78%)	Supplier Code of Conduct	Advanced
Energy Management	14% specific energy reduction	Solar PV + VFDs	Advanced
Waste & Circular Economy	89% landfill diversion, ZLD	In-house film recycling	Advanced
Sustainable Logistics	91% truck utilization	Intermodal rail-road	Developing
Scope 3 Emissions	Limited tracking	Data collection initiative	Emerging
Supplier Tier-2/3 Audit	Self-declaration only	Planned audit program	Emerging

Table 2: SSCM Maturity Assessment at Cosmo Films Waluj

V. ADVANTAGES OF SSCM IMPLEMENTATION

A. Enhanced Operational Efficiency and Cost Reduction

Sustainability initiatives at Cosmo Films Waluj have yielded substantial operational co-benefits. Energy efficiency improvements have directly reduced production costs, with energy expenditure as a proportion of total production cost declining from 18.4% to 15.7% over four years. In-house film waste recycling has reduced raw material procurement costs for lower-grade film applications, generating measurable cost savings while simultaneously reducing waste disposal expenditure.

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B. Strengthened Regulatory Compliance and Reduced Legal Risk

Proactive compliance with the Plastic Waste Management Rules, EPR mandates, and environmental clearance conditions has insulated Cosmo Films Waluj from regulatory penalties and operational disruptions. ISO 14001 certification provides a structured mechanism for legal compliance monitoring, ensuring the plant stays ahead of evolving environmental regulations in India and in export destination countries.

C. Enhanced Brand Reputation and Customer Preference

Growing demand from multinational brand owners for sustainably sourced packaging materials has created a significant competitive advantage for Cosmo Films. Customers in the food and pharmaceutical sectors, particularly in Europe, increasingly mandate supplier sustainability assessments as a condition of business. Cosmo Films' demonstrated SSCM credentials have enabled it to retain key accounts and secure new business from sustainability-conscious global buyers.

D. Attraction of ESG-Conscious Investment

The plant's sustainability performance contributes to Cosmo Films Limited's Environmental, Social, and Governance (ESG) rating, which is increasingly scrutinized by institutional investors and lending institutions. Strong ESG scores reduce the cost of capital, enhance access to green financing instruments such as sustainability-linked bonds, and improve the company's position in sustainability indices.

VI. CHALLENGES IN SSCM IMPLEMENTATION

A. Multi-Tier Supplier Sustainability Compliance

While Tier-1 supplier sustainability standards are well-established, extending environmental and social compliance requirements to Tier-2 and Tier-3 suppliers remains a significant challenge. Many smaller, regional suppliers lack the organizational capacity, financial resources, and technical expertise to implement environmental management systems. Monitoring compliance across a fragmented and geographically dispersed supplier base is resource-intensive and difficult to verify independently.

B. Quantification of Scope 3 Emissions

Scope 3 carbon emissions—those occurring in the value chain outside the direct control of the plant, including raw material extraction, supplier manufacturing, customer use, and end-of-life disposal—account for the majority of the product's life-cycle carbon footprint. Cosmo Films Waluj currently lacks a comprehensive Scope 3 measurement framework, making it difficult to set science-based reduction targets or communicate credible carbon neutrality roadmaps to customers and investors.

C. Cost of Sustainability Investments

Several high-impact sustainability measures, such as large-scale renewable energy procurement, advanced wastewater treatment upgrades, and implementation of blockchain-based supply chain transparency platforms, require significant capital investment. Balancing these sustainability-related capital expenditures against the need for production capacity expansion and competitiveness maintenance presents an ongoing strategic challenge for plant management.

D. Circular Economy Scaling Limitations

While in-house BOPP film waste recycling is highly effective, the circular economy potential for specialty coated and laminated films is constrained by technical challenges in separating multi-layer film structures for material recovery. End-of-life collection and recycling infrastructure for flexible packaging in India remains underdeveloped, limiting the plant's ability to close the material loop through post-consumer recycled content incorporation.

VII. CONCLUSION

This research paper has provided a comprehensive evaluation of sustainable supply chain management practices at Cosmo Films Waluj, situated within the broader context of India's manufacturing sustainability transition. The study demonstrates that Cosmo Films has made substantive and measurable progress in embedding sustainability across its supply chain, particularly in the domains of energy management, waste minimization, and green procurement from primary suppliers.

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The plant's achievements—including a 14% reduction in specific energy intensity, 89% landfill waste diversion, full Zero Liquid Discharge compliance, and in-house BOPP film recycling—position it as a sustainability leader within the Indian specialty packaging films industry. These outcomes are not merely environmental achievements but have also generated tangible business value through cost reduction, enhanced customer relationships, and strengthened regulatory standing.

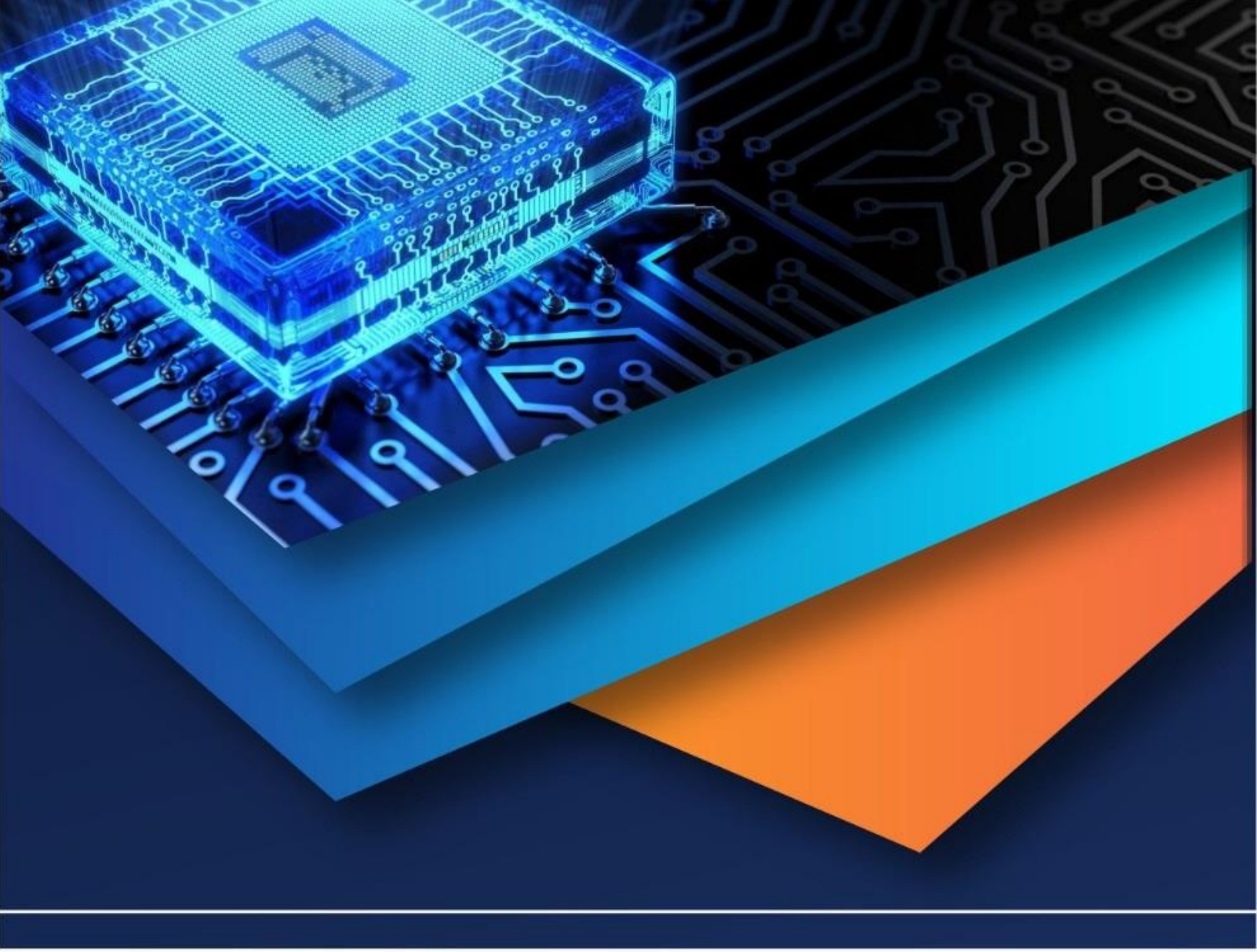
However, significant opportunities for SSCM advancement remain, particularly in extending supply chain sustainability governance to lower-tier suppliers, developing a comprehensive Scope 3 emissions measurement capability, accelerating renewable energy procurement, and investing in circular economy infrastructure for specialty film waste streams. Addressing these gaps will require cross-functional collaboration, strategic investment planning, and industry-level advocacy for improved recycling infrastructure.

As India accelerates its sustainable development agenda and global customers raise the bar on supply chain sustainability expectations, organizations like Cosmo Films Waluj have both the responsibility and the opportunity to demonstrate that manufacturing excellence and environmental stewardship are not competing priorities but mutually reinforcing imperatives. With continued commitment and strategic foresight, Cosmo Films Waluj can evolve into a globally recognized benchmark for sustainable manufacturing in the specialty packaging films sector.

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