

The Importance of Adopting Green Manufacturing Technologies for Cosmetic Products in Reducing Pollution and Emissions: The Case of L'Oréal

Dr. Safia Bouchenaf¹

Farhat Abbas University Sétif 1, Algeria

safia88setif@hotmail.fr

Dr. Zineb Ghezali²

Farhat Abbas University Sétif 1, Algeria

ghezali19@yahoo.fr

Received: 15/03/2026 Accepted: 25/05/2026. Published: 07/07/2026

Abstract

This study aims to identify the technologies used in the manufacturing of green cosmetic products and to examine their significance in promoting environmental responsibility, reducing pollution and emissions, and reinforcing sustainable development strategies within contemporary cosmetic organizations. To achieve this objective, the study adopted a systematic review of various scientific articles and publications addressing the topic. In addition, the global company L'Oréal was selected as a case study due to its pioneering and distinguished position in the cosmetics industry, in order to analyze its practical sustainability initiatives.

The study reached several key findings, the most important being that the transition toward green manufacturing in the cosmetics industry is no longer merely a marketing option but rather an environmental necessity for reducing pollution, greenhouse gas emissions, and the industry's negative ecological footprint. This transition requires replacing conventional chemical compounds with environmentally optimized bio-based formulations relying on green chemistry and renewable raw materials, alongside innovation in sustainable packaging systems to minimize carbon waste and the full adoption of renewable energy sources throughout supply chains and manufacturing processes. Collectively, these technologies contribute directly to reducing the environmental footprint of cosmetic organizations, mitigating pollution, and minimizing adverse impacts on ecosystems, thereby supporting the integration of the green economy into the structural framework of cosmetic organizations.

Keywords: Cosmetics manufacturing; Green economy; Green cosmetics; L'Oréal; Pollution and emissions reduction.

Introduction

The global cosmetics industry has experienced unprecedented growth, surpassing previous market projections. Cosmetic products have evolved from luxury and recreational goods into essential daily necessities. This structural transformation in consumer behavior can largely be attributed to the expansion of cultural globalization and the growing influence of social media celebrities and fashion influencers in shaping individual preferences. Consequently, spending on cosmetic products has become a stable and integral component of consumers' monthly budgets.

However, this remarkable expansion in cosmetics production and consumption has generated significant environmental consequences, including chemical pollution, excessive depletion of natural resources, water wastage, persistent plastic waste that is not biodegradable, and carbon emissions generated throughout the product life cycle. These escalating environmental challenges have coincided with growing environmental awareness among modern consumers and increasingly stringent international environmental regulations. As a result, cosmetic manufacturers have been compelled to redesign their operational practices and integrate sustainable development principles into the core of their strategic planning.

The transition toward green cosmetics manufacturing, through the adoption of renewable energy sources, sustainable raw materials, and ethically sourced ingredients, represents a fundamental response to enhancing environmental sustainability, reducing pollution, meeting emerging global market requirements, and balancing the carbon footprint of organizations.

1.1 Research Problem

The cosmetics industry faces a dual challenge: responding to the continuously increasing global demand for cosmetic products while simultaneously assuming responsibility for mitigating environmental degradation resulting from industrial waste and emissions. Consequently, organizations have increasingly embraced sustainability initiatives and environmentally friendly practices as corrective and preventive mechanisms.

Accordingly, the central research question of this study is formulated as follows:

What is the significance of adopting green manufacturing technologies for cosmetic products in reducing pollution and emissions?

1.2 Objectives of the Study

This study seeks to:

Examine the current status and growth of the global cosmetics market and the requirements for implementing the principles of the green economy.

Highlight the principal technologies employed in the manufacture of green cosmetic products and demonstrate the importance of these technologies for both organizations and the environment.

Shed light on the experience of L'Oréal in the field of green cosmetics manufacturing. The company launched several sustainability initiatives, most notably the "Sharing Beauty With All" program in 2013 and the "L'Oréal for the Future" program in 2020, both of which aim to transform the Group's operations in accordance with environmental protection principles, support partners in their transition toward sustainability, and contribute to addressing social challenges. These initiatives provide a valuable model for organizations seeking to develop more effective and distinguished sustainability strategies.

1.3 Research Methodology

This study adopts the descriptive-analytical approach. The theoretical framework was developed through an extensive review of library resources, scientific articles, and electronic sources addressing the concepts of the green economy and the current state of the global cosmetics industry. The empirical component relies on information obtained from the official website of L'Oréal and its 2025 Annual Report, which were systematically analyzed to evaluate the company's sustainability practices.

1.4 Previous Studies

Several studies have addressed green cosmetics manufacturing and its role in achieving environmental sustainability and reducing pollution and emissions, including:

Costa, Martins, Ribeiro, & Marto (2026), "Sustainability Programs in the Cosmetics Industry: Scope, Credibility, and Value Chain Coverage."

This study examined the effectiveness of sustainability programs within the cosmetics industry in light of the growing risk of greenwashing. It conducted a systematic comparative analysis of 24 prominent sustainability programs in the cosmetics sector and developed an analytical framework for evaluating each program across three dimensions: value chain coverage (from raw material sourcing to end-of-life management), corporate sustainability scope (environmental, social, and governance dimensions), and verification and transparency mechanisms.

The study concluded that although sustainability programs play a significant role in environmental protection, they still exhibit several shortcomings, highlighting the need for greater integration of product life-cycle management, enhanced transparency, and stronger alignment with comprehensive corporate sustainability frameworks.

Nguyen, Nguyen, & Vuong (2024), "The Cosmetics Industry, Climate Change, and Biodiversity Loss: Can Humanity Have 'Stories of Kindness' Toward a Culture of Healing Nature?"

This study investigated the environmental impacts of the cosmetics industry within the context of climate change and biodiversity loss. It also explored the risks faced by organizations that fail to fulfill their environmental responsibilities, particularly the threat of negative public evaluations and consumer-led boycott campaigns.

The study concluded that multinational cosmetics companies should play a proactive role by directing resources toward the sustainable utilization of biodiversity through greater reliance on environmentally friendly raw materials, avoiding excessive and wasteful packaging, and allocating resources to research and innovation in environmentally sustainable manufacturing processes.

Bom, Ribeiro, & Marto (2020), "The Sustainability Calculator: A Tool for Assessing Sustainability in Cosmetic Products."

This study aimed to develop a sustainability assessment tool based on the opinions of experts from various branches of the cosmetics industry. A comprehensive questionnaire covering every stage of the cosmetic product life cycle was designed and distributed to cosmetics specialists.

The findings revealed that no raw material, packaging material, or manufacturing practice can be considered 100% sustainable. Nevertheless, appropriate strategies can substantially reduce the sustainability impacts associated with virtually any type of cosmetic product.

Our study complements previous research by addressing the importance of adopting green manufacturing technologies for cosmetic products in reducing pollution and emissions through an examination of the experience of L'Oréal.

1.5 Study Plan

To address the research problem, the study was divided into two main parts:

Part One: Presents the theoretical framework of the study, focusing on the current state of the cosmetics industry, the key concepts related to the green economy, and the most important green cosmetics manufacturing technologies.

Part Two: Presents a case study of L'Oréal, aiming to identify the principal mechanisms adopted by the company in the production of green cosmetic products and to examine how these strategies have positively contributed to environmental protection.

Theoretical Framework of the Study

2.1 The Current State of the Global Cosmetics Industry

Today, the cosmetics industry is growing faster than ever before, with revenues projected to reach approximately USD 140 billion by 2030 (Statista Research Department, 2026).

2.1.1 The Emergence of the Cosmetics Industry

The earliest archaeological evidence of cosmetics dates back to 4000 BC in Ancient Egypt, where the Pharaohs attached great importance to self-image, hygiene, and beauty (HOW COSMETOLOGY SCHOOL HAS EVOLVED OVER TIME, 2014).

The commercial cosmetics industry, however, emerged in the early twentieth century alongside the rise of the film industry and celebrity culture. Its development can be divided into three major stages. (Frith, 2014, pp. 05-26)

The first stage centered on soap and cleaning products. During the period 1880–1920, the cosmetics industry was largely limited to soap production, particularly following the invention of floating soap through the use of vegetable oils instead of lard in soap manufacturing.

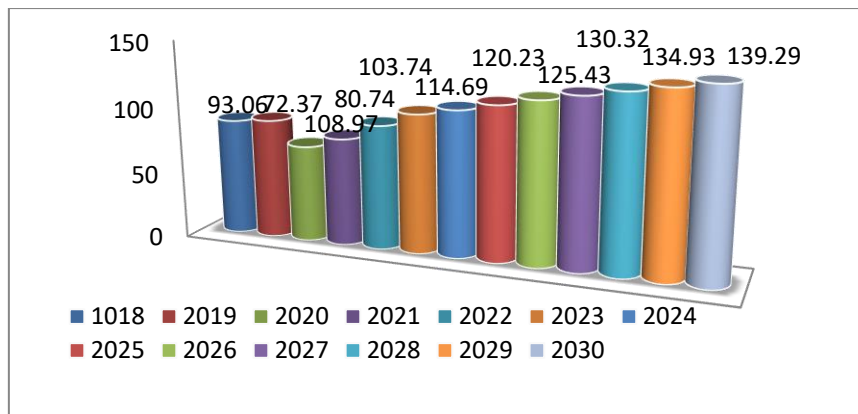
The second stage (1920–1990) witnessed a shift from cleaning products to makeup products and cosmetics. During this period, Hollywood and the film industry significantly influenced women's perceptions of beauty. Lipsticks, face powders, and foundations became widely available, while hair dyes were developed and marketed through professional hairdressers, who played an important role in promoting these products.

The third stage (1990–2013) was characterized by a transition from conventional cosmetics to a more radical transformation through cosmetic surgery, which was increasingly used to correct physical imperfections, enhance facial appearance, and achieve weight loss.

2.1.2 Growth of the Global Cosmetics Industry

The cosmetics industry is one of the fastest-growing manufacturing sectors worldwide. The following figure illustrates the annual growth rate of the global cosmetics industry over the period 2018–2030.

Figure (01): Global cosmetics industry revenues from 2018 to 2030 (in U.S. dollars).



Source: (Statista, 2026, p. 4)

The figure illustrates the actual and projected global cosmetics industry revenues from 2018 to 2030. The industry is expected to generate revenues of approximately USD 139.29 billion by 2030. Consumers are now spending a greater share of their income on cosmetic products than in the past. However, the COVID-19 pandemic had a significant negative impact on the market, with industry revenues falling to their lowest level in 2020, reaching USD 72.37 billion, before recovering in the following years.

2.1.3 Global Cosmetics Market Segments

The global cosmetics market was valued at USD 354.68 billion in 2025. It is projected to grow from USD 375.62 billion in 2026 to USD 644.17 billion by 2034, registering a compound annual growth rate (CAGR) of 6.97% during the forecast period (Fortune Business Insights, 2026).

The global beauty market is generally divided into several major product segments. Skincare products account for the largest market share, representing approximately 44% of the total market. This segment includes anti-aging creams, moisturizers, and cleansers. In recent years, increasing attention has been devoted to self-care and skin health products (**weitnauer, 2025**)

The haircare products segment represents around 20% of the global cosmetics market and is expected to grow at a CAGR of 7.4% between 2026 and 2033. Demand for haircare products continues to rise as consumers become more aware of scalp health, hair texture, and the prevention of long-term hair damage (**grandviewresearch, 2025**)

The makeup products segment accounts for approximately 17%–20% of the total cosmetics market value, with facial and eye makeup products generating the majority of segment revenues. Fragrances constitute one of the fastest-growing sub-segments. Meanwhile, although organic and natural cosmetics represent a niche across different product categories, their market value exceeded USD 37 billion in 2021. (**Ruf, 2024, p. 7464**)

2.1.4 Leading Companies in the Cosmetics Industry

The global cosmetics manufacturing industry is dominated by a limited number of multinational corporations. The following table presents the leading companies ranked according to their 2024 revenues and the value of their most valuable brands in 2026.

Table (02): Ranking of the Leading Cosmetics Companies by 2024 Revenue and the Value of Their Strongest Brand in 2026

Value of Strongest Brand in 2026 (USD Billion)	2024 Revenue (USD Billion)	Country of Origin	Company	Rank
13.5	47.04	France	L'oreal	01
5.5 :Dove	26.63	United Kingdom	Unilever	02
4.9	15.2	United States	The Estée Lauder Companies.	03
Gillette: 8.4	15	United States	Procter & Gamble Co	04
/	9.11	France	LVMH Moët Hennessy Louis Vuitton	05
24.4	8.54	France	Chanel	06
NIVEA: 7.9	8.53	Germany	Beiersdorf	07
/	6.55	Japan	Shiseido	08
/	6.1	France	Coty	09

Source: Prepared by the authors based on (Statista, 2026, p. 30) and (Brand Finance, 2026).

The table shows that L'Oréal, the French cosmetics company, was the world's leading cosmetics manufacturer in terms of revenue, generating approximately USD 47.04 billion in 2024. Meanwhile, Chanel ranked first among the world's most valuable cosmetics brands in 2026, with a brand value of approximately USD 24.4 billion.

2.1.5 Negative Environmental Impacts of the Cosmetics Industry

Among the most significant environmental impacts of the cosmetics industry are the following (Yılmaz, 2025, p. 103)

The most harmful environmental impact is forest destruction and pollution caused by packaging waste and toxic emissions released from cosmetics manufacturing facilities.

The industry contributes to the increased extinction of wildlife through the contamination of water sources with toxic substances, in addition to the widespread practice of animal testing, which has been prohibited by legislation in many countries.

The growing reliance on palm oil, one of the least expensive vegetable oils available, has intensified environmental pressures associated with its production.

The industry contributes to higher carbon dioxide (CO₂) emissions, resulting both from deforestation and from emissions generated during cosmetics manufacturing processes.

Water resources also represent a major environmental concern, as cosmetics production is highly water-intensive. Palm oil production contributes to increased CO₂ emissions, rising water temperatures, and higher concentrations of toxic substances in freshwater resources associated with cosmetics manufacturing.

With growing consumer concerns about the potential toxic risks of cosmetic products to both human health and the environment, market segments offering fragrance-free products made from natural ingredients and essential oils have experienced strong growth. Consequently, global cosmetics companies are increasingly focusing their efforts on developing organic products to attract new consumers while retaining their existing customer base.

2.2 The Concept of the Green Economy

The concept of the green economy represents a new perspective on the interrelationship between the economic, environmental, and social dimensions of sustainable development. It aims to conserve energy resources, improve energy efficiency, enhance water-use efficiency, create green jobs, and promote green production, including organic agriculture, the encouragement of organic products, green architecture, forest conservation, and effective waste management.

2.2.1 Definition of the Green Economy

The concept of the green economy has emerged prominently over the past few years and has been widely discussed within the context of sustainable development and poverty eradication. It can be defined as:

"An economy based on clean energy and environmental quality improvement through reducing greenhouse gas emissions, minimizing environmental impacts, and improving the efficient use of natural resources. It encompasses various economic sectors and is not limited to the capacity to produce clean energy but also includes technologies that enable cleaner production processes" (تقرارات، مرداسي، و بوطبة، 2017، صفحة 565).

The green economy directs both the public and private sectors toward improving resource-use efficiency, reducing carbon emissions, waste, and pollution, while preventing biodiversity loss and ecosystem degradation.

The United Nations Environment Programme (UNEP) defines the green economy as:

"An economy that results in improved human well-being and social equity while significantly reducing environmental risks and ecological scarcities. It is characterized by low carbon emissions, enhanced resource efficiency, and social inclusiveness. In today's world, production is no longer measured merely by how much is produced, but rather by how production is carried out, which resources are used, and what environmental impacts are generated. The development pathway should preserve, enhance, and, where necessary, restore natural capital, as it constitutes a source of public benefit, particularly for the poor whose livelihoods depend directly on nature" (ولهي، 2014، صفحة 179)

2.2.2 Requirements for the Transition to the Green Economy

The main requirements for countries to shift from the traditional economy to the green economy can be summarized as follows : (قرين و حراق، 2019، صفحة 335)

Reviewing, redesigning, and restructuring government policies to stimulate green transformations in production, consumption, and investment patterns.

Promoting rural development to alleviate rural poverty while preserving and enhancing natural resources.

Improving water resource management through efficient use, reuse, conservation, and pollution prevention.

Encouraging sustainable investments in the energy sector and implementing measures to improve energy efficiency.

Developing strategies to reduce carbon emissions and adopting more efficient production technologies in industrial facilities.

Supporting sustainable public transportation systems.

Adopting environmental standards in the construction sector and promoting sustainable, recyclable building systems.

Addressing the problem of municipal solid waste through environmentally friendly and beneficial waste management and utilization practices.

2.3 Benefits of the Transition to the Green Economy

The green economy offers numerous environmental, economic, and social benefits, as illustrated in the following table.

Table (03): Benefits of the Transition to the Green Economy

Benefits	Main Aspects of the Green Economy
- The transition to a green economy implies a shift in employment that will create numerous additional jobs alongside existing employment.- Green investments in agriculture, buildings, and transportation generate employment growth in the short, medium, and long term compared to conventional investments.- Allocating at least 1% of global GDP to improving energy efficiency and expanding renewable energy use creates additional employment opportunities while ensuring competitive energy supplies.	The green economy creates employment opportunities and promotes social justice.
- Renewable energy offers significant economic opportunities.- Government policies play a fundamental role in creating incentives for investment in renewable energy.	The green economy replaces fossil fuels with renewable energy and low-carbon technologies.
- Manufacturers have numerous opportunities to improve resource-use efficiency.- There is substantial evidence that the global economy still possesses untapped opportunities to generate wealth using fewer resources and greater reliance on renewable energy.- Recycling and energy recovery	The green economy promotes resource efficiency, energy efficiency, and clean energy.

from waste have become increasingly profitable, as waste is now regarded as a valuable resource.	
- Promoting green cities.- Constructing new green buildings.- Improving energy efficiency in the transport sector, adopting clean fuels, and shifting from private vehicles to public transportation, thereby generating significant economic and health benefits.- The transition of most economic sectors toward the green economy contributes substantially to reducing greenhouse gas emissions.- The green economy supports long-term economic growth by mitigating resource scarcity.	The green economy promotes low-carbon urban living and more sustainable transportation.

Source: (ثابتي و برکتو، 2014، صفحة 95).

Table Analysis

The table shows that the main sectors that can facilitate the transition to a green economy are:
 Renewable Energy: Generating energy from renewable and environmentally friendly sources.
 Waste Management: Recycling waste, reusing it in various sectors, and treating hazardous waste that pollutes the environment.

Land Management: Expanding organic agriculture, promoting reforestation, and protecting natural rangelands.

Water Management: Reusing water through wastewater treatment for agricultural purposes, as well as harvesting rainwater and floodwater.

Sustainable Transport: Developing environmentally friendly transportation systems.

Green Buildings: Expanding the use of eco-friendly construction materials, greening existing industries, and promoting sustainable tourism through the development of natural tourist complexes and the expansion of green spaces and water bodies that help moderate the climate.

2.4 Green Cosmetics Manufacturing Technologies

Today, consumers have become increasingly aware of the importance of protecting their rights and preserving the environment. Consequently, demand for green products has grown significantly, while natural and organic ingredients have become the most common components in cosmetic product lines due to their positive effects on both human health and the environment. The cosmetics industry has responded to consumers who value both beauty products and environmental protection by making cosmetics more environmentally friendly and sustainable through four main approaches (Yılmaz, 2025, pp. 109-113)

2.4.1 Using Packaging Made from Recycled or Renewable Materials

The cosmetics industry places great importance on designing visually attractive, appealing, and easy-to-understand packaging. However, when it comes to sustainable cosmetics, aesthetic appearance alone is no longer sufficient. Growing public awareness and media attention

regarding the environmental impacts of packaging waste have encouraged cosmetics manufacturers to produce packaging that is partially or entirely made from recycled materials, reduce unnecessary packaging, and minimize the environmental impact of packaging waste on ecosystems and oceans. (Dube, 2023, p. 02)

2.4.2 Adopting Organic and Sustainable Practices

Consumers today increasingly reject harsh chemicals and toxic substances in their daily personal care products and fragrances. The organic cosmetics market experienced a growth rate of approximately 20% in 2014 alone (thegoodtrade, 2016). Although plant-derived ingredients generally require more resources and energy than petrochemical alternatives, they are renewable and more appealing to environmentally conscious consumers. The major challenge facing the green cosmetics industry today is identifying the most effective green technologies capable of balancing profitability, environmental protection, and consumer satisfaction. Organic cosmetic products are free from harmful chemicals, making them safer for both the environment and the workers involved in their production. (Hirata, 2022, p. 277)

2.4.3 Banning Plastic Microbeads

Microbeads are tiny plastic particles found in numerous personal care and beauty products, including soaps, toothpaste, hand cleansers, shaving foam, body wash, sunscreen, shampoos, and facial scrubs (Miraj, 2019, p. 01)

On December 18, 2015, the United States Congress amended the Federal Food, Drug, and Cosmetic Act (FD&C Act) by enacting the Microbead-Free Waters Act. This legislation was introduced because microbeads pollute aquatic environments. After facial cleansing or tooth brushing, these particles are not effectively removed by wastewater treatment systems and ultimately enter lakes and oceans, where they are ingested by small fish and other wildlife, posing significant environmental . (Miraj, 2019, p. 05)

2.4.4 Using Renewable Energy

The manufacturing stage of cosmetic products represents a critical area for improving sustainability throughout the supply chain. Companies are increasingly adopting renewable energy sources such as wind and solar power, improving energy efficiency, reducing water consumption, minimizing carbon emissions, and promoting waterless beauty products, particularly among younger consumers.

The transition toward green economy practices is not merely a positive contribution to environmental protection or a pathway toward broader societal transformation. Organizations that embrace green economy principles also achieve greater profitability, as an increasing number of consumers prefer purchasing products that are environmentally responsible and sustainably produced.

3. Case Study: L'Oréal

3.1 Introduction to L'Oréal Group

L'Oréal is the world's largest cosmetics company. It is a French multinational founded on 30 June 1909. The company distributes its products in approximately 130 countries and owns more than 32 international brands, offering a wide range of products including skincare, cosmetics, anti-aging products, and perfumes. In 2025, L'Oréal recorded sales of approximately USD 47.04 billion (l'oreal, 2026, p. 23).

Brand Portfolio: The company owns brands valued at more than USD 10 billion and is recognized worldwide through its distinctive corporate identity. Its portfolio includes more than 32 brands, such as Lancôme, Garnier, and many others.

3.2 L'Oréal's Sustainability Commitments

L'Oréal recognizes that strong corporate social responsibility enhances both corporate reputation and profitability. Consequently, the company seeks to maintain high ethical and social standards that are fully integrated into its business activities. It actively contributes to building sustainable communities, while sustainability has become a core pillar of its corporate strategy, characterized by ambitious and progressive initiatives.

The company's first major sustainability initiative, "Sharing Beauty With All," launched in 2013, established the foundation for integrating sustainability throughout every stage of its value chain. In 2020, L'Oréal introduced its "L'Oréal for the Future" program, which aims to transform the Group's operations in line with environmental protection, support its business partners in their transition toward sustainability, and contribute to addressing major social challenges.

3.3 L'Oréal's Green Cosmetics Manufacturing Strategy

L'Oréal's efforts toward green cosmetics manufacturing can be broadly divided into two major areas: green innovation and green production (L'Oréal, 2018, p. 04)

3.3.1 Green Innovation

L'Oréal promotes green innovation through several key performance indicators, including reducing the environmental footprint of its products, protecting biodiversity, improving packaging sustainability, and committing to zero deforestation (L'Oréal, 2018, p. 10). The following table presents the green innovation objectives achieved by L'Oréal in 2025.

Table (04): Green Innovation Indicators and Achieved (2025) and Targeted (2030)
Objectives of L'Oréal

2030 Targets	2025 Achievements	Indicators	
L'Oréal aims for 90% of its formula ingredients to be bio-based, derived from abundant minerals, or sourced through circular processes by 2030.	67% of the ingredients used in product formulations are derived from natural sources or recycled materials. In addition, 100% of new formulas are assessed using the SPOT environmental design tool.	Reducing the environmental footprint of L'Oréal product formulas	Reducing the Environmental Footprint of Products and Enhancing Biodegradability
Continuous commitment to achieving 100% of all new products meeting these standards.	96% of new and renovated products demonstrate environmental and social improvements.	Product improvement	
Achieve full biodegradability and minimize the impact of all	Biodegradability levels of new formulations and reformulated shampoos have exceeded 98% for certain products.	Biodegradability	

rinse-off products on aquatic ecosystems.			
Achieve 100% of new or renovated products with an improved environmental profile.	93% of new or renovated products exhibit an improved environmental profile thanks to new formulations incorporating responsibly sourced renewable raw materials or ingredients developed according to green chemistry principles.	Renewable raw materials	Respect for Biodiversity
Ensure that 100% of the plastic used in packaging comes from recycled or bio-based sources by 2030.	L'Oréal increased the proportion of recycled plastic used in packaging to approximately 32%, with an interim target of 50%. In addition, 49% of plastic packaging has been designed to be refillable, recyclable, or compostable.	Packaging recycling	Sustainable Packaging
Achieve 100% sustainability for all paper and wood procurement.	L'Oréal maintained 100% of the cardboard and paper used in packaging and product leaflets as certified and sourced from sustainably managed, deforestation-free forests.	Paper-based packaging	
Achieve zero deforestation throughout the entire supply chain.	Since 2012, 100% of palm oil, palm kernel oil, and their derivatives have been sourced from fully certified sustainable supplies in accordance with RSPO standards, with strict mill traceability to prevent deforestation.	Palm oil	Commitment to Zero Deforestation
Fully support regenerative agriculture and protect crop biodiversity.	100% of the soybean oil used in products is organic.	Soybean oil	

Source: Prepared by the researchers based on: (L'ORÉAL, 2026, pp. 189–235) and (L'Oréal, 2025).

From the above table, it can be observed that L'Oréal seeks to implement the principles of green innovation through the following initiatives:

Reducing the environmental footprint and enhancing biodegradability: L'Oréal has conducted life cycle assessments (LCAs) for many years to measure the environmental impacts of its products. These studies have shown that one of the most significant environmental impacts is associated with water, particularly wastewater generated by consumers during face washing

and product rinsing. Consequently, L'Oréal focuses on improving the environmental profile of its products through two main approaches(L'Oréal, 2018, p. 12):

Enhancing product biodegradability, meaning the ability of products to decompose naturally through microorganisms without generating harmful environmental effects or toxic substances. Reducing the impact of products on water resources by eliminating plastic microbeads and minimizing the adverse effects of products on aquatic ecosystems.

Biodiversity: Within this framework, L'Oréal prioritizes the use of renewable raw materials. Renewable raw materials account for 93% of the company's ingredients and are largely plant-based. L'Oréal uses approximately 1,600 raw materials derived from around 340 plant species cultivated in nearly 100 countries. Furthermore, the company promotes the use of ingredients that are either sustainably sourced or produced according to the principles of green chemistry, which involve manufacturing processes that reduce the number of chemical synthesis steps while minimizing solvent and energy consumption.

Sustainable packaging: L'Oréal has adopted a sustainable packaging policy based on three key pillars(L'Oréal, 2018, p. 13):

Respecting the environment by using responsibly managed forest resources to preserve biodiversity.

Reducing and optimizing packaging materials by designing packages with optimal size and weight while using fewer resources, including larger formats and refillable packaging.

Replacing conventional packaging materials with more sustainable alternatives by using recycled or renewable raw materials. L'Oréal also establishes strategic partnerships to develop innovative plastic recycling solutions.

Commitment to zero deforestation: As part of its Zero Deforestation Policy, L'Oréal has committed since 2018 to ensuring that none of the ingredients or raw materials used in its products are associated with deforestation.

2.3.2 Green Production

As part of its commitment to social and environmental responsibility, L'Oréal aims to reduce the environmental footprint of its manufacturing sites and distribution centers by 100% by 2030. The following table presents the environmental improvements achieved in the company's key industrial performance indicators in 2025, together with the targets set for 2030.

Table (05): Environmental Improvement of L'Oréal's Industrial Performance Indicators Achieved in 2025 and Targeted for 2030

Target for 2030	Achieved in 2025	Indicators years
By 2030, L'Oréal aims to reduce Scope 1 and Scope 2 carbon emissions by 57% compared with 2019. By 2030, L'Oréal aims to reduce Scope 3 carbon emissions by 28% compared with 2019. By 2030, L'Oréal also aims for 100% of its sites and stores to operate with	L'Oréal reduced Scope 1 and Scope 2 carbon emissions by 58% compared with 2024. L'Oréal reduced Scope 3 carbon emissions by 6% compared with 2024.	Reduction of CO₂ emissions from manufacturing plants and

improved energy efficiency and renewable energy.		distribution centers
By 2030, L'Oréal aims to recycle 100% of water and reuse it in industrial manufacturing processes.	Since 2017, L'Oréal's factories have operated under the Waterloop system, which aims to: 1. Optimize production processes by reducing the volume of water used in manufacturing. 2. Reuse and recycle water by treating wastewater with advanced technologies such as ultrafiltration and reverse osmosis. In 2025, 56% of water was recycled.	Water consumption in manufacturing plants and distribution centers
Full transition to a circular economy, with 100% of packaging plastic being recycled or bio-based, and a 50% reduction in the use of virgin plastic.	Zero Waste to Landfill (100% of industrial waste recycled or recovered).	Waste generation in manufacturing plants and distribution centers (since 2005, grams per finished product)

Source: Prepared by the researchers based on: (L'ORÉAL, 2026, pp. 189–235) and (L'Oréal, Fighting Climate Change, 2023, pp. 1–3).

From the table, it can be observed that:

L'Oréal aims to reduce both direct greenhouse gas (GHG) emissions associated with the consumption of natural gas and fuel oil across all the sites it operates (factories, distribution centers, administrative offices, and research centers), including GHG emissions resulting from potential refrigerant gas leaks (Scope 1), as well as indirect greenhouse gas emissions associated with purchased electricity, heating, cooling, and steam across all its operational sites (Scope 2), by 58% by 2030 compared with 2019. In addition, L'Oréal seeks to reduce other indirect greenhouse gas emissions related primarily to its product supply chain and the use of products and services throughout their life cycle (Scope 3) by 28% by 2030 compared with 2019. This is to be achieved by reducing reliance on fossil fuels and expanding the use of renewable energy. L'Oréal places great importance on the responsible use of water in its manufacturing operations by reducing its water requirements while taking into account the local availability of this vital resource. Since 2017, the company has introduced the Waterloop system in its factories to

optimize production processes by reducing water consumption, as well as by reusing and recycling water through the treatment of wastewater using advanced technologies such as ultrafiltration and reverse osmosis. By 2025, the proportion of recycled water had reached 56%, and L'Oréal aims to recycle and reuse 100% of water in its industrial manufacturing processes by 2030.

In 2025, L'Oréal recovered 100% of its industrial waste through reuse, recycling, or energy recovery. The company aims to complete its transition to a circular economy across all its operations by 2030.

4. Conclusion

This study, which examined the importance of adopting green manufacturing technologies for cosmetic products in reducing pollution and emissions, using L'Oréal as a case study, led to the following conclusions:

The cosmetics industry has a negative environmental impact through the generation of waste, carbon dioxide emissions from manufacturing facilities, and the intensive consumption of water and non-renewable resources.

The main green manufacturing technologies include the use of sustainable packaging, the adoption of organic and natural production practices, the use of renewable energy, recycling, and the elimination of microplastics from cosmetic products.

The adoption of green (sustainable) packaging, made wholly or partially from recycled materials, together with reducing and optimizing packaging materials through ideal size and weight design, contributes to waste reduction and minimizes adverse impacts on the environment and oceans.

The use of renewable energy in the production of green cosmetics significantly reduces greenhouse gas emissions.

Recycling materials used in cosmetic manufacturing helps reduce the volume of waste generated and mitigates its environmental impact.

Although producing organic cosmetics free from synthetic chemicals may require more energy than manufacturing petrochemical-based products, organic products are renewable, biodegradable, more attractive to consumers, and safer for both the environment and the workers involved in their production.

The adoption of the green economy encourages cosmetic manufacturers to implement responsible water management by reducing water consumption, considering local water availability, installing water treatment plants at manufacturing sites, and developing what are known as dry factories.

The shift toward manufacturing green cosmetic products not only strengthens companies' environmental commitments and preserves natural resources for future generations but also generates long-term economic benefits and profitability.

In light of the findings of this study, the following recommendations are proposed:

Organizations should adopt the principles of the green economy because of their role in environmental protection, waste reduction, and the long-term economic benefits they provide. Cosmetic manufacturers should invest in research and development in the field of sustainability to achieve more effective and innovative outcomes.

There is a need for a common international policy establishing standardized methods for verifying the safety and sustainability of cosmetic products.

Governments should enact legislation and impose penalties on cosmetic companies that fail to comply with sustainability standards, use microplastics in their products, or conduct animal testing.

Recycling infrastructure should be further developed, while the use of renewable energy should be expanded and diversified to facilitate the production of green cosmetic products.

Misleading marketing practices by cosmetic companies that falsely claim their products are natural or organic should be strictly monitored and addressed.

Consumer awareness of the importance of purchasing environmentally friendly cosmetic products should be enhanced.

Companies should study the experiences of leading firms in the green cosmetics industry and examine their sustainability strategies in order to benefit from their successful practices.

References:

1-Bom, S., Ribeiro, H., & Marto, J. (2020). Sustainability Calculator: A Tool to Assess Sustainability in Cosmetic Products. *Sustainability*, 12, pp. 1-15.

2-Brandfinance. (2026, March 12). the most valuable and strongest cosmetics brands in 2026. Consulté le March 13, 2026, sur [brandfinance.com](https://brandfinance.com/press-releases/pechoin-remains-among-the-top-15-most-valuable-cosmetics-brands-for-the-sixth-consecutive-year#media-downloads): <https://brandfinance.com/press-releases/pechoin-remains-among-the-top-15-most-valuable-cosmetics-brands-for-the-sixth-consecutive-year#media-downloads>

3-Costa, R., Martins, A. M., Ribeiro, H. M., & Marto, J. (2026). Sustainability Schemes in the Cosmetic Industry: Scope, Credibility, and Value Chain Coverage. *Sustainability*, 18 (5), 1-41.

4-Dube, M., & Dube, S. (2023). Towards Sustainable Cosmetics Packaging. *Cosmetics*, MDPI, 2 (193), p. 2.

5-fortunebusinessinsights. (2026, March 01). Beauty & Personal Care. Consulté le March 10, 2026, sur [www.fortunebusinessinsights.com](https://www.fortunebusinessinsights.com/cosmetics-market-102614): <https://www.fortunebusinessinsights.com/cosmetics-market-102614>

6-Frith, K. T. (2014). Globalizing Beauty: A Cultural History of the Global Beauty Industry. Annual Conference Seattle, WA, (pp. 5-26). USA.

7-grandviewresearch. (2025, December). Cosmetics Market (2026 - 2033). Consulté le March 10, 2026, sur [www.grandviewresearch.com](https://www.grandviewresearch.com/industry-analysis/cosmetics-market): <https://www.grandviewresearch.com/industry-analysis/cosmetics-market>

8-Hirata, D., Rocha, E., Nogueira, R. A., Soto Herek, L. C., & Felipe, D. F. (2022). Natural and organic cosmetics: Beneficial properties for the environment and health. *International Journal of Advanced Engineering Research*, 9 (11), p. 277.

9-HOW COSMETOLOGY SCHOOL HAS EVOLVED OVER TIME. (2014, November 26). Consulté le November 30, 2025, sur [https://www.avenuefive.edu/](https://www.avenuefive.edu/brief-history-beauty-industry/): <https://www.avenuefive.edu/brief-history-beauty-industry/>

10-L'Oréal. (2018). 2018 PROGRESS REPORT. France: L'Oréal.

11-L'ORÉAL. (2026). UNIVERSAL REGISTRATION DOCUMENT 2025. FRANCE: L'ORÉAL.

- 12-l'oreal. (2023). Fighting climate change. Consulté le January 14, 2026, sur www.loreal.com: <https://www.loreal.com/-/media/project/loreal/brand-sites/corp/master/lcorp/3-commitments/for-the-planet/3-pagers-updates-160523/en/fighting-climate-change--loral-for-the-future.pdf>
- 13-l'oreal. (2025). L'Oréal for the Future. Consulté le January 14, 2026, sur www.loreal.com: <https://www.loreal.com/en/commitments-and-responsibilities/for-the-planet/>
- 14-Miraj, S. S., Parveen, N., & Zedan, H. S. (2019). Plastic microbeads: small yet mighty concerning. International Journal of Environmental Health Research , p. 1.
- 15-Nguyen, M.-H., Nguyen, Q.-Y. T., & Vuong, Q.-H. (2024). The beauty industry, climate change, and biodiversity loss: Can humanity have “stories of kindness” for a healing culture? Visions for Sustainability (22), pp. 235-251.
- 16-Ruf, J., Menrad, K., & Emberger-Klein, A. (2024). The local range of natural cosmetics: Consumer perceptions and assessments in Germany. Business Strategy and the Environment , 33 (7), pp. 7462-7478.
- 17-Statista. (2026). Cosmetics industry worldwide. Germany: Statista Research Department.
- 18-Statista Research Department. (2026, January 16). Cosmetics industry - statistics & facts. Consulté le March 06, 2026, sur www.statista.com: https://www.statista.com/topics/3137/cosmetics-industry/?srsltid=AfmBOorjuGZgx_o1vK7Zly6r7QSZwziK0ZE5R6KmXvysHXcPbfoWf3LQ#topicOverview
- 19-thegoodtrade. (2016, October 20). 5 Ways The Beauty Industry Is Becoming More Eco-Friendly. Consulté le December 30, 2025, sur www.thegoodtrade.com: <https://www.thegoodtrade.com/features/5-ways-the-beauty-industry-is-becoming-more-eco-friendly/>
- 20-weitnauer. (2025, October 14). Global Trends In The Cosmetics Market: Overview 2026. Consulté le January 30, 2026, sur weitnauer.com: <https://weitnauer.com/trends-in-cosmetics-market-2025-regional-overview>
- 21-Yılmaz, D. (2025). Sustainability in the Cosmetics Industry: Environmental Impacts, Statistics, and Solutions. Dans Y. Tahtal, L. Bayyurt, & İ. Demir, Current Approaches in Applied Statistics I (p. 103). Turkey: ozguryayinlari.
- 22- الحبيب ثابتي، و نصيرة بركتو. (2014). دور الإقتصاد الأخضر في خلق الوظائف الخضراء والمساهمة في الحد من الفقر. *الملتقى الدولي حول تقييم سياسات الاقلال من الفقر في الدول العربية في ظل العولمة*، (صفحة 95). الجزائر.
- 23- بوعلام ولهي. (2014). آفاق تطبيق الإستراتيجية المالية الخضراء في ظل الدور الجديد للدولة مع الإشارة إلى حالة الدول العربية النفطية. *مجلة العلوم الاقتصادية والتسيير والعلوم التجارية*، 7 (12)، صفحة 179.
- 24- ربيع قرين، و مصباح حراق. (جوان، 2019). خيار الإقتصاد الأخضر بين فرص النجاح ومؤشرات الفشل في المنطقة العربية. *مجلة العلوم الإنسانية*، 51.
- 25- يزيد تقرار، أحمد رشاد مرداسي، و صبرينة بوطبة. (ديسمبر، 2017). الإقتصاد الأخضر تنمية مستدامة تكافح التلوث. *مجلة الدراسات المالية والمحاسبية والإدارية* (8).