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Lavazza Group's Strategies and Actions for a Sustainable Business

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Abstract

The coffee industry faces significant sustainability challenges driven by climate change, economic disparities, and evolving consumer expectations. This study examines how a manufacturing company can achieve carbon neutrality across its entire value chain (Scopes 1 to 3) while addressing supply chain vulnerabilities induced by climate change. Additionally, it explores how companies can safeguard biodiversity and the socio-economic well-being of stakeholders while mitigating environmental impact. The research adopts a single case study approach, focusing on the Lavazza Group, a global coffee manufacturer recognised for its sustainability leadership.

The study draws on Lavazza Group's Sustainability Reports and Lavazza Foundation's Social Reports, supplemented by targeted consultations with company's Sustainability Team members. The analysis evaluates Lavazza's "Roadmap to Zero" strategy, which encompasses the measurement, reduction, and compensation of non-reducible greenhouse gas (GHG) emissions, with particular focus on emissions reduction actions and the carbon insetting project in Colombia. This project integrate emissions compensation with socio-economic development, highlighting the role of regenerative agriculture and community-based climate resilience efforts.

The findings indicate tangible improvements in environmental performance. Lavazza has enhanced energy efficiency, demonstrating a decline in energy consumption per ton of coffee produced, during the timeframe considered. Significant progress has also been achieved in packaging recyclability, waste recovery, and water conservation, reinforcing efforts to optimise resources use and minimise environmental impact. Furthermore, initiatives aimed at fair trade, equitable value distribution, and sustainable agricultural practices contribute to improved livelihoods for coffee farmers and biodiversity conservation. The study highlights how a structured and data-driven sustainability strategy can support the transition toward carbon neutrality, integrating emission reduction measures with socio-environmental initiatives.

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1 Introduction

1.1 Research context

1.1.1 The Coffee Industry at Risk

The coffee industry, an integral part of countless cultures and economies worldwide, finds itself at a crossroads as it confronts a multitude of challenges amidst a rapidly evolving world (Peluso, 2023). In this ever-changing landscape, coffee producers, distributors, and retailers alike are navigating a complex web of obstacles that demand innovative solutions and adaptability (Bicer & Alpas, 2021; Bilen et al., 2023). Climate change poses a significant threat, with unpredictable weather patterns impacting coffee-growing regions, affecting crop yields (Velten et al., 2015; Davis et al., 2012). These climate changes have led to reduced yields and compromised bean quality, which in turn erodes the competitive position of coffee companies in an increasingly globalised market. The intensification of climate stresses has been accompanied by a proliferation of pests and diseases, conditions that are exacerbated by prolonged periods of drought and higher temperatures. Amidst the ever-evolving global concern of climate change, the coffee industry stands as a vulnerable witness to its far-reaching impacts (Bicer & Alpas, 2021). With each passing year, the looming threat of unpredictable weather patterns casts a shadow over coffee production, leading to potential fluctuations in crop yields and undermining the stability of the coffee supply chain (Davis et al., 2012). The once-predictable rhythms of the seasons have become erratic, leaving coffee growers grappling with the uncertainty of their harvests and facing the urgent need to adapt to a rapidly changing climate (Peluso, 2023).

1.1.2 Ethical Consumption and Economic Disparities

In addition to the tangible challenges posed by climate change, a new wave of consumer consciousness has been steadily gaining momentum (Giovannucci, 2018). The demand for sustainable and ethically sourced coffee has surged, with consumers seeking reassurance that the coffee they enjoy does not contribute to environmental degradation or exploit the labour of vulnerable communities (Peluso, 2023). This mounting pressure from consumers has sparked a movement within the coffee industry to embrace eco-friendly practices and champion fair trade initiatives (Fairtrade International, 2023).

Economic vulnerability is another critical challenge, particularly with respect to smallholder farmers who form the backbone of the coffee supply chain. The volatility of global coffee prices, coupled with limited access to financial services

and investment capital, leaves many smallholder farmers exposed to significant economic risks. Such vulnerability undermines the stability of their livelihoods and, by extension, the sustainability of the broader supply chain upon which coffee companies depend (International Coffee Organisation (ICO), Coffee Development Report (CDR) 2022-2023). Closely related to the issue of economic vulnerability is the problem of inequitable value distribution along the coffee supply chain. A disproportionate share of the value generated by coffee production is often captured by intermediaries and large-scale buyers. This dynamic results in smallholder farmers receiving only a marginal portion of the final value, thereby exacerbating existing economic disparities (BASIC, 2024).

Coffee producers, roasters, and retailers are now compelled to embark on a transformative journey toward greater environmental responsibility, recognising the urgent need to mitigate their carbon footprint and promote biodiversity conservation (Velten et al., 2015). Concurrently, they are acknowledging the vital importance of treating coffee farmers equitably, ensuring that they receive fair wages, safe working conditions, and community support (Sustainable Coffee Purchases, 2021).

1.1.3 Towards a Sustainable and Resilient Coffee Industry

The coffee industry's response to these dual challenges of climate change and ethical demands is becoming an emblematic example of how businesses can drive positive change while adapting to a changing world (Peluso, 2023). Sustainable coffee certifications and eco-friendly packaging options have become more prevalent, serving as symbols of a commitment to environmental stewardship (Peluso, 2023). Moreover, partnerships with fair-trade organisations and direct relationships with coffee-growing communities aim to create equitable and mutually beneficial business models (Sustainable Coffee Purchases, 2021). The fragility of the global coffee supply chain serves as a compelling reminder of the delicate balance between human reliance on natural resources and the imperatives of sustainability (Bicer & Alpas, 2021).

Companies operating in this sector are compelled to address pressing environmental, economic, and social issues while striving to achieve long-term sustainability and resilience. In response to these environmental challenges, an intensified focus on research and innovation is needed to develop more resilient agronomic practices. This includes exploring techniques that can better protect coffee crops from adverse weather conditions and pest outbreaks, thereby safeguarding production in the long term (ICO, CDR 2022-2023).

Furthermore, as stated in the CDR 2022-23 (ICO, 2024), existing paradigms, characterised by conventional linear production processes, are increasingly inadequate in the face of accelerating environmental changes, market volatility and evolving stakeholder expectations. Historically, the industry has operated on a take-make-dispose basis, an approach that assumes the continuous extraction of resources and the subsequent generation of waste. This paradigm is increasingly unsustainable given the finite nature of natural resources and the growing ecological constraints faced by coffee producing regions. A shift to a circular economy model, where waste is not simply discarded but instead revalued and reintegrated into the production cycle, is essential to reducing the overall environmental impact of coffee production (ICO, CDR 2022-2023). Coffee roasting companies, as integral actors within the coffee value chain, face significant challenges in resource management that are more and more critical in today's environmentally constrained landscape (ICO, CDR 2022-2023). In the context of resource management, energy consumption and waste handling are two main aspects for coffee roasting companies. Traditional roasting processes often involve high energy use, which contributes significantly to the overall carbon footprint of the production process. By investing in energy-efficient technologies and optimising operational procedures, companies can reduce their environmental impact not only mitigating adverse environmental effects but also enhancing operational efficiency, yielding economic benefits through cost savings over time. Moreover, managing by-products generated during roasting results of critical importance, in a circular economy, these by-products can be transformed from waste into valuable resources (ICO, CDR 2022-2023).

1.2 Research Questions

This research is guided by two fundamental questions that address the pressing challenges faced by the coffee industry in the context of sustainability and climate change:

- How can a manufacturing company achieve the goal of Carbon Neutrality by bringing the net balance of CO_{2eq} emissions to zero (scopes 1 to 3)?

- How can a manufacturing company address the supply chain challenges induced by climate change while preserving biodiversity and the environment in which it operates, safeguarding the socio-economic well-being of the stakeholders involved?

These questions reflect the complex interplay between sustainability imperatives and operational realities within the agri-food industry. *Carbon neutrality* is defined as the state in which an organisation's greenhouse gas (GHG) emissions are entirely offset by actions that either reduce emissions or remove an equivalent amount of CO_2 from the atmosphere. The complexity of this objective requires an in-depth analysis of emissions along the entire value chain, including not only direct emissions (scope 1), but also indirect emissions related to energy consumption (scope 2) and the entire value chain (scope 3). This precise delineation of emission sources enables the formulation of targeted strategies to reduce, remove, or offset emissions, ensuring that every facet of the company's carbon footprint is addressed in accordance with international standards and scientific guidelines. The work adopts a single case study approach, focusing on the Lavazza Group, a globally renowned coffee producer, recognised for its proactive sustainability initiatives and ambitious climate strategies.

1.3 Thesis structure

This thesis is organised into six chapters. The structure is designed to guide the reader systematically through the research context, theoretical framework, methodological rigor, company case study, results and broader implications.

Chapter 1 establishes the foundation of the thesis by presenting its research questions, objectives and relevance. It introduces the global challenges of sustainability, and a particular focus on the coffee sector as a key component of the agri-food industry. The chapter outlines the research objectives, highlighting Lavazza as a case study to explore sustainable practices and strategies that address these challenges.

Chapter 2 offers an examination of the global sustainability landscape, highlighting its relevance to the agri-food industry and, more specifically, to coffee production. This contextual analysis integrates a review of international agreements, European regulations, and emerging sustainability trends within the coffee sector, underscoring the environmental and social challenges of this industry. It provides the theoretical and regulatory context essential for interpreting the subsequent analysis. Furthermore, the chapter incorporates an overview of key statistical data pertaining to the coffee sector, specifically focusing on the leading coffee-producing countries and major coffee-consuming nations. This analysis highlights global production trends, identifying principal contributors within the coffee belt, alongside patterns of consumption in regions with significant demand.

Chapter 3 outlines the research design, providing a framework to understand how the objectives of the study were pursued. The chapter provides an overview of the rationales that led to the choice of the Lavazza Group as the subject of the case study. This section describes the sources from which the data were collected and describes the company perimeter and the time frame considered. Furthermore, the chapter reports the approach followed in the data analysis and the consultation with the Lavazza Sustainability Team and the Project Coordinator of one of the insetting projects followed by the Group, for an in-depth understanding of the sustainability strategy pursued.

Chapter 4 offers a comprehensive overview of Lavazza's evolution as a sustainability-driven enterprise. This chapter delineates the company's historical trajectory, beginning with its formative years marked by domestic market consolidation and progressing through a phase of robust industrial growth under the family leadership. The narrative then examines the strategic international expansion that coincided with the integration of sustainability as a core corporate value. Moreover, the chapter provides an analysis of Lavazza's business model,

highlighting the link between operational and sustainable practices. The discussion further extends to the Group's supply chain, describing the implementation of ethical sourcing and environmental stewardship measures designed to enhance resilience and efficiency. Additionally, the chapter explores the role of the Lavazza Foundation, underscoring its mission.

Chapter 5 presents a comprehensive analysis of the data collected to evaluate the effectiveness of the "Roadmap to Zero Strategy" adopted by the Group integrating and synthesising the key findings of the study. The analysis begins by examining the Group's approach to greenhouse gas (GHG) measurement and the reporting of emissions, thereby ensuring that all Scope 1, 2, and 3 emissions are rigorously monitored and verified. Subsequently, the chapter investigates various dimensions of emissions reduction, including a value chain approach that integrates renewable energy adoption, the promotion of a circular economy, and targeted energy efficiency initiatives. It further explores innovations in product development, specifically sustainable advancements in coffee machines and the implementation of a sustainable packaging roadmap. Additionally, the analysis addresses critical operational aspects such as waste and water management, alongside projects designed to mitigate the adverse impacts of the supply chain. The final section of the chapter explores the compensation mechanisms for non-reducible GHG emissions, detailing the role of carbon credits mechanisms, as well as insetting and offsetting projects.

Chapter 6 provides a summary of the study and reflects on its practical implications. The chapter delineates the limitations inherent in the study, including methodological constraints and data availability, which may have influenced the depth and generalisability of the findings and proposes actionable recommendations for future research, aimed at deepening the understanding of sustainable management practices within the agrifood industry. It provides an analysis of Lavazza's contributions to sustainability within the coffee sector, emphasising the company's innovative practices, achievements, areas of strength and areas of improvement.

2 Background

2.1 Global challenges in sustainability

Humanity faces unprecedented global challenges that threaten the stability of Earth's systems, requiring urgent and transformative actions (Intergovernmental Panel on Climate Change IPCC, 2023). The concept of planetary boundaries, first proposed by Rockström et al. (2009), defines nine critical Earth-system processes that regulate the planet's stability and resilience. Crossing these boundaries increases the risk of generating large-scale, abrupt, or irreversible environmental changes (Stockholm Resilience Centre, 2022). Scientific evidence shows that several boundaries, including those for climate change, biodiversity loss, and biogeochemical flows, have already been transgressed (Richardson et al., 2023)(Figure 1).

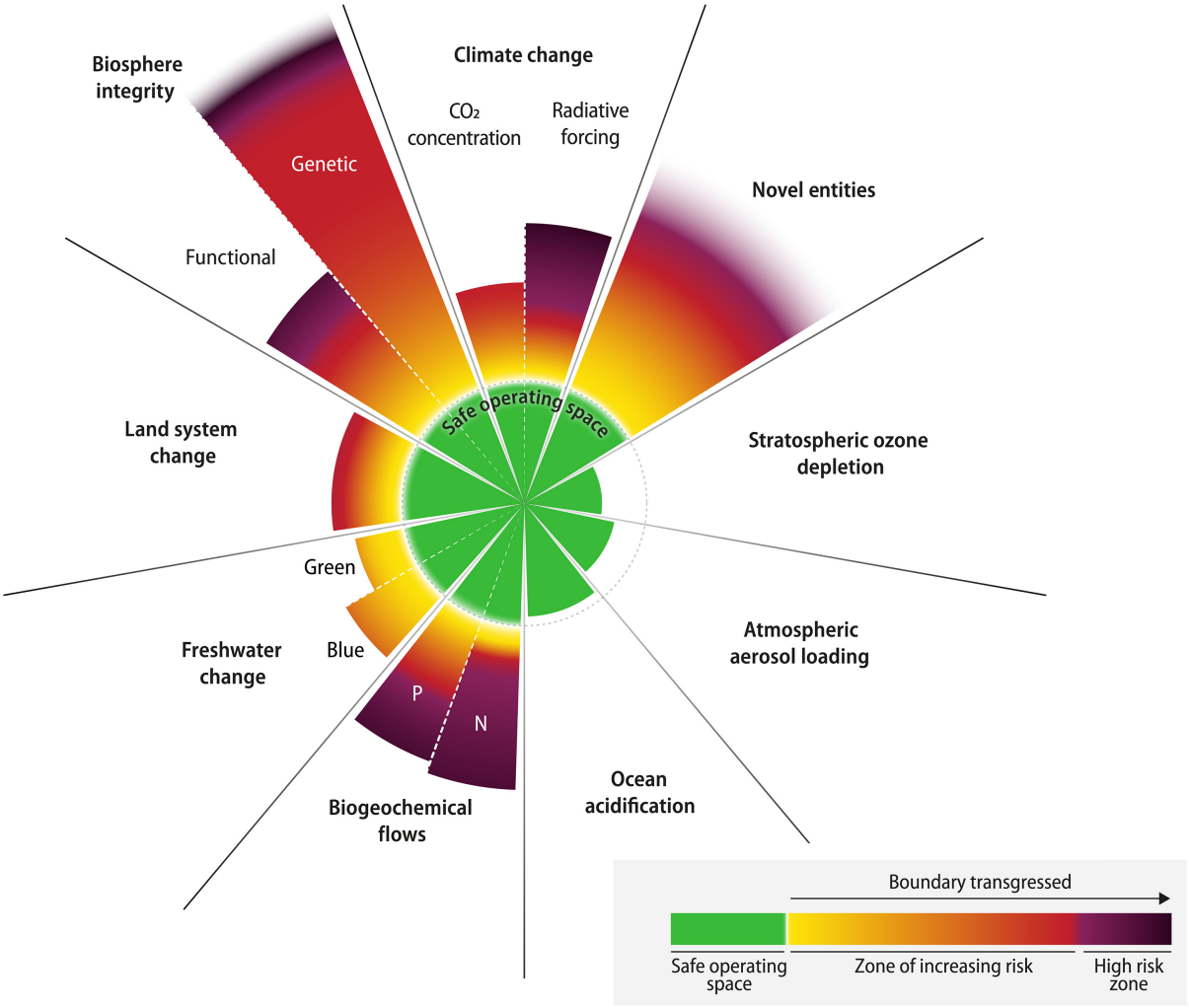


***Figure 1**. Current status of control variables for all nine planetary boundaries (Science Advances 2023, DOI: 10.1126/sciadv.adh2458)*

Climate change is widespread, rapid, and intensifying, driven by anthropogenic emissions of greenhouse gases (IPCC, 2021). The global average temperature has already increased by approximately 1.1°C compared to pre-industrial levels, causing more frequent and severe heatwaves, droughts, and floods (IPCC, 2023). Limiting global warming to 1.5°C requires rapid, far-reaching, and unprecedented changes in all aspects of society (IPCC, 2018). Concurrently, biodiversity is declining at an alarming rate. One million animal and plant species are now threatened with extinction, primarily due to human activities such as habitat destruction, overexploitation, and pollution (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), 2019). Ecosystems, species, wild populations, as well as local varieties and breeds of domesticated plants and animals, are experiencing a decline, degradation, or extinction. This loss is a direct result of human activity and constitutes a direct threat to human well-being in all regions of the world (IPBES, 2019). Biogeochemical flows of nitrogen and phosphorus are in a zone of high risk due to agricultural and industrial activities (Stockholm Resilience Centre, 2022). Nutrient pollution is a major and increasing cause of biodiversity loss and ecosystem dysfunction in terrestrial, freshwater, and coastal ecosystems, creating ocean dead zones (United Nations Environment Programme (UNEP), 2021a). The overuse of natural resources has exceeded the Earth's capacity to regenerate, with humanity currently operating at 1.7 times the planet's biocapacity (Global Footprint Network, 2024). The expansion of agriculture has been a major driver of deforestation, biodiversity loss and greenhouse gas emissions. Unsustainable food production and consumption practices are placing increasing pressure on land and water resources (FAO, 2022). Social and economic inequalities exacerbate these environmental challenges. Vulnerable populations, particularly in developing countries, are disproportionately affected by climate change, biodiversity loss, and resource scarcity (UNEP, 2022). Current commitments made by governments fall far short of what is required to limit global warming to 1.5°C (United Nations Framework Convention on Climate Change UNFCCC, 2021). Human activities continue to drive unprecedented changes in ecosystems and their ability to deliver the goods and services upon which humans depend, with recent research indicating that we have transgressed six of the nine planetary boundaries (Rockström et al. 2009; Richardson et al. 2023). Global financial flows are not consistent with pathways towards low greenhouse gas emissions and climate-resilient development (IPCC, 2023). Accelerated international cooperation and support are essential to enhance adaptation action and address gaps in implementation (UNEP, 2021b).

2.2 Sustainable Development and the 2030 Agenda

In 1987, the concept of sustainable development was mentioned in the World Commission on Environment and Development report "Our Common Future" (World Commission on Environment and Development (WCED), 1987). The concept was defined as the satisfaction of the necessities of the current time without compromising the satisfaction of future generations' necessities (Proença et al., 2022). This kind of economic growth is only possible with a proper connection between technology and social organisation, being perceived as a changing process and not a fixed state (WCED, 1987). This is because sustainability requires a balance between social, environmental, and economic interests (Carboni et al., 2013). The triple bottom-line (TBL) approach (Figure 2), developed by John Elkington in 1994, corroborates the abovementioned discussion by giving great importance to social and environmental impact as well as profit (Elkington, 2018).

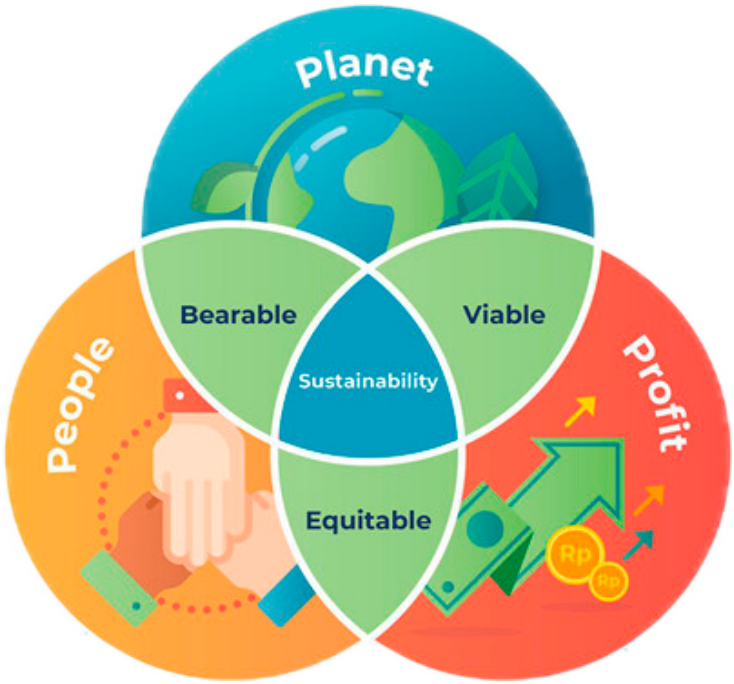


Figure 2. *The Triple Bottom Line of sustainability. ESG Summit Europe, 2023. https://www.linkedin.com/pulse/beyond-profits-how-triple-bottom-line-theory-transforming/*

Sustainability has been investigated over time according to its three pillars, according to which it is profitable throughout (economic sustainability) (De Luca et al., 2018), it has a positive or neutral impact on the natural environment (environmental sustainability) (Allegra & Zarba, 2018) and it has broad-based benefits for society (social sustainability) (Hruba, 2018). Sustainable supply chain management (SSCM), in line with the TBL approach, integrates economic, social,

and environmental sustainability into supply chains by managing materials, information, and capital flow, while fostering collaboration among supply chain partners, stakeholders, and customers to ensure that business practices positively impact society and the environment, while maintaining economic viability (Buranasiri et al., 2024; Seuring and Müller, 2003). Sustainability has been recently one of the critical business issues that accelerate business transformation (UN, 2023). Key challenges such as the Sustainable Development Goals (SDGs) (UN, 2015) are examples of current business practices (Buranasiri et al., 2024). The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 SDGs, which are an urgent call for action by all developed and developing countries in a global partnership (Figure 3).

Figure 3. *United Nations SDGs, UN 2024.*
https://www.un.org/sustainabledevelopment/news/communications-material/

They recognise that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth all while tackling climate change and working to preserve our oceans and forests, according to UN (2024).

2.3 International agreements and European regulations

Climate change poses one of the most pressing challenges to global stability and environmental health. In response to this critical issue, the Paris Agreement, a legally binding international treaty on climate change, was adopted by 196 parties at the UN Climate Change Conference (COP21) in Paris, France, on 12th December, 2015. It entered into force on 4th November 2016 (UNFCCC, 2021). Its overarching goal is to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels (UNFCCC, 2021) (Figure 4). However, in recent years, world leaders have stressed the need to limit global warming to 1.5°C by the end of this century (UNFCCC, 2021). That's because the UN's Intergovernmental Panel on Climate Change indicates that crossing the 1.5°C threshold risks unleashing far more severe climate change impacts, including more frequent and severe droughts, heatwaves and rainfall. The Paris Agreement is a landmark in the multilateral climate change process because, for the first time, a binding agreement brings all nations together to combat climate change and adapt to its effects (UNFCCC, 2021). The European Union (EU) has woven the objectives of the Paris Agreement into its legislative framework. In November 2019, the European Parliament adopted a resolution declaring a climate emergency and urged the European Commission to ensure that future legislative and budgetary proposals are aligned with the objectives of the Paris Climate Agreement (European Parliament EP, 2021). As a result, the Commission came up with the European Green Deal (EGD), the roadmap for a carbon-neutral Europe (EP, 2021). To achieve carbon neutrality, an organisation must balance the greenhouse gases it emits with an equivalent amount removed from the atmosphere. Greenhouse gas emissions, primarily composed of carbon dioxide and methane, result from activities such as fossil fuel combustion for electricity generation, manufacturing, transportation, and building operations. Mitigating these emissions involves carbon offset initiatives, including reforestation and investments in clean energy projects. Additionally, reducing emissions at the source through energy-efficient practices, such as adopting renewable energy sources, minimising transportation emissions, and promoting sustainable consumption, is essential (Swinburne University of Technology, 2025). The EGD consists of a package of policy initiatives, which set the EU on the path to a green transition, with the ultimate goal of reaching carbon neutrality by 2050. The vision of the EGD is to make the EU the first carbon-neutral area in the world by 2050, to cut pollution and restore a healthy balance in nature and ecosystems (European Council, 2024).

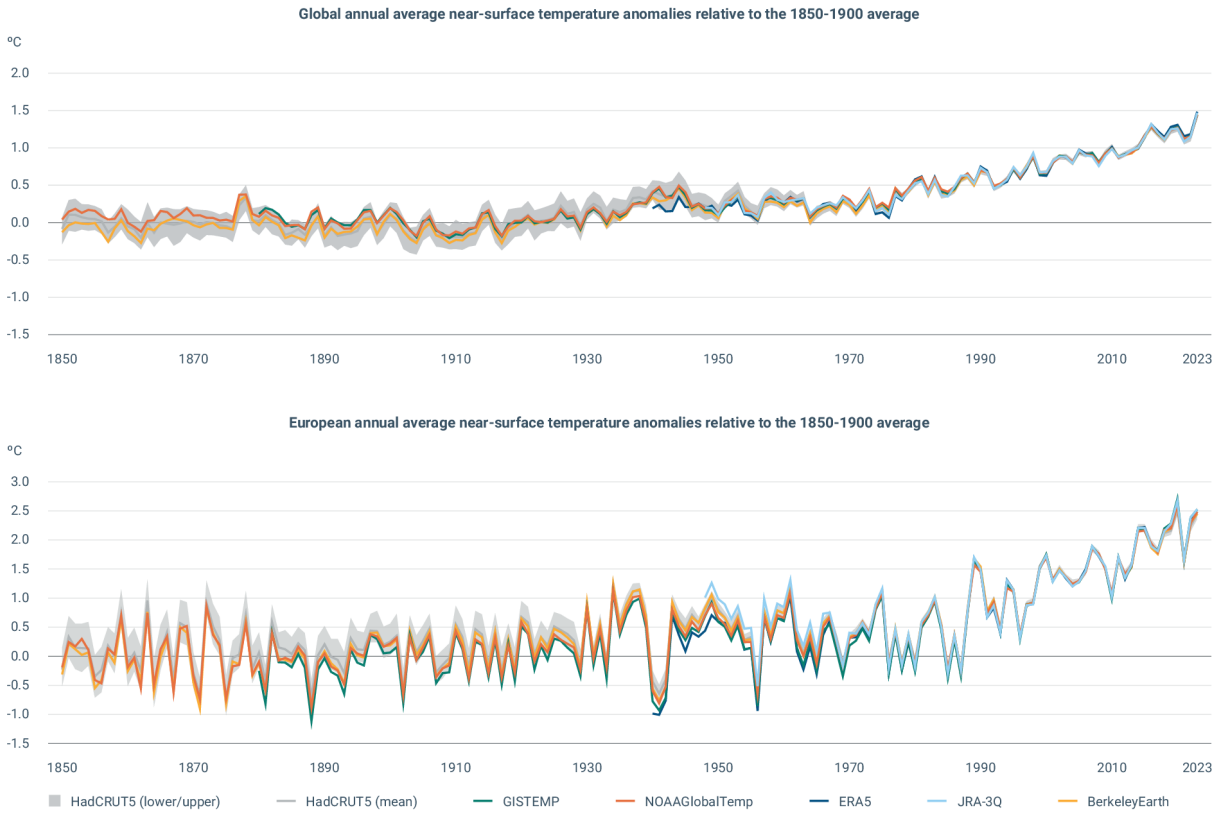


Figure 4. *Global (above) and European (below) annual average near-surface temperature anomalies relative to the pre-industrial period 1850-1900 (European Environment Agency, 2024. https://www.eea.europa.eu/en/analysis/indicators/global-and-european-temperatures)*

Above chart: Global annual averages of near-surface temperature of land and ocean expressed as the anomaly relative to the pre-industrial period 1850-1900 according to the datasets used by the Copernicus Climate Change Service (C3S): ERA5 (C3S/ECMWF), JRA-55 (JMA), GISTEMPv4 (NASA), HadCRUT5 (Met Office Hadley Centre), NOAAGlobalTempv6 (NOAA) and Berkeley Earth.

Below chart: European annual averages of near-surface temperature expressed as the anomaly relative to the pre-industrial period 1850-1900 according to the datasets used by the Copernicus Climate Change Service (C3S): ERA5 (C3S/ECMWF), JRA-55 (JMA), GISTEMPv4 (NASA), HadCRUT5 (Met Office Hadley Centre), NOAAGlobalTempv6 (NOAA) and Berkeley Earth.

As part of the European Green Deal, Directive No. 2022/2464 on the Corporate Sustainability Reporting Directive (CSRD) was approved and published in the EU Official Journal on 16 December 2022. The main objective of CSRD is to improve sustainability reporting, thus going not only to equate the relevance of environmental, social, and governance (ESG) results with those reported in traditional statutory financial statements, but to recognise their natural connection. On 5th January 2023, the CSRD entered into force. It modernises and strengthens the rules concerning the social and environmental information that companies have to report (European Commission EC, 2023). A broader set of large companies, as well as listed Small and medium enterprises (SMEs), will now be required to report on sustainability. Some non-EU companies will also have to

report if they generate over EUR 150 million on the EU market (EC, 2023). The new rules will ensure that investors and other stakeholders have access to the information they need to assess the impact of companies on people and the environment and for investors to assess financial risks and opportunities arising from climate change and other sustainability issues (EC, 2023). Finally, reporting costs will be reduced for companies over the medium to long term by harmonising the information to be provided. The first companies will have to apply the new rules for the first time in the 2024 financial year, for reports published in 2025 (EC, 2023).

In the context of increasing global attention on biodiversity loss and ecosystem degradation, the European Sustainability Reporting Standards (ESRS) have introduced the ESRS E4 standard to enhance corporate transparency and accountability in managing biodiversity-related impacts. The ESRS E4 establishes disclosure requirements for companies regarding their impacts, dependencies, risks, and opportunities related to biodiversity and ecosystems. It mandates transparency on how businesses influence biodiversity across their operations and value chains, requiring them to disclose mitigation actions, resource allocation, and biodiversity-related policies (SolidFlow, 2024). Companies must outline their transition plans to align with global frameworks such as the Kunming-Montreal Global Biodiversity Framework, integrating biodiversity considerations into their strategies and business models. They are expected to report on specific targets, detailing measurable commitments towards habitat protection, ecosystem restoration, and biodiversity conservation. Additionally, businesses must disclose key impact metrics, including land-use changes, species risks, and ecosystem health, ensuring standardised reporting over time (SolidFlow, 2024). The financial implications of biodiversity-related risks and opportunities must also be assessed, either through qualitative or quantitative disclosure, with clear articulation of assumptions and time horizons (SolidFlow, 2024).

A further important step taken by the European Union is dictated by the publication in 2023 of the EU Deforestation Regulation (Regulation (EU) 2023/1115). The EUDR aims to minimise deforestation and forest degradation associated with agricultural raw materials imported into the European Union and it is part of the EU's biodiversity strategy running to 2030 (EC, 2024). Products covered by the Regulation are wood, rubber, cattle, coffee, cocoa, palm oil and soybean or products which require these as part of their manufacture, thus, any operator or trader who places these commodities on the EU market, or exports from it, shall prove that the products do not originate from recently deforested

land or have contributed to forest degradation (EC, 2024). The Regulation will be binding from 30th December 2025 for large operators and traders, while micro and small companies will have to apply it as of 30th June 2026 (EC, 2024).

2.4 Sustainability in the agrifood industry

Arcese et al. (2015) classified the main issues on sustainability in the agrofood industry in three macro-areas: socio-economic, production and consumption (Bigliardi & Filippelli, 2022). As for the socio-economic perspective, due to the latest institutional changes, social and environmental sustainability became key factors in the institutional legitimacy of corporations (Bigliardi & Filippelli, 2022). As a consequence, in the last decade, the literature on this issue has grown, and the concept of sustainability has achieved legitimacy among stakeholders (Bigliardi & Filippelli, 2022). As for the production perspective, nowadays production systems face a variety of challenges, ranging from supplying food to a worldwide population to supplying energy and reducing CO_2 emissions. Indeed, it is estimated that agrifood production generates 29% of worldwide emissions of greenhouse gases (GHG) (Rivera et al., 2014). Finally, as for the consumption perspective, researchers agree in stating that improvements in traditional supply chains can help reduce losses, lower prices and increase diversity of choice (Bigliardi & Filippelli, 2022). In the agri-food industry, concepts such as quality are being surpassed and replaced by the concept of sustainability, in environmental, social and, of course, economic terms (Pérez-Mesa et al., 2021). This action highlights the importance of corporate social responsibility on consumers' perceptions and on corporate performance, which, in turn, impacts their emotions and ecological commitment (Iacobucci et al., 2020). It is often repeated that consumer demand is the impetus behind green supply chain development (Proença et al., 2022). Therefore, companies make commitments toward sustainable management (through adequate strategies and institutional structures) that lead to sustainable development (Apenko et al., 2021) and make efforts to adapt their sustainability practices to each stakeholder, once each one could have varying degrees of sustainability issues across their network or be influenced by the local sustainability issues in which they operate (Bager & Lambin, 2020). The food system has potentially surpassed the safe planetary boundaries for two major axes of impact, biodiversity loss and phosphorus pollution, and poses significant planetary risks through its greenhouse gas emissions and overuse of fresh water and cropland (Wright et al., 2024; Rockström et al. 2020). It is therefore critical to address the impacts of agriculture and develop approaches that can shift food production systems towards a more sustainable trajectory (Wright et al., 2024).

2.5 Overview of the coffee sector

2.5.1 Production, Consumption, and Trade of Coffee in the Global Economy

As the coffee plant grows mostly in the area between the Tropic of Cancer (23.43695°N) and the Tropic of Capricorn (23.43695°S), also known as the "Coffee Belt" (Franca & Oliveira, 2019), its production is mainly supplied by developing countries (Figure 5).

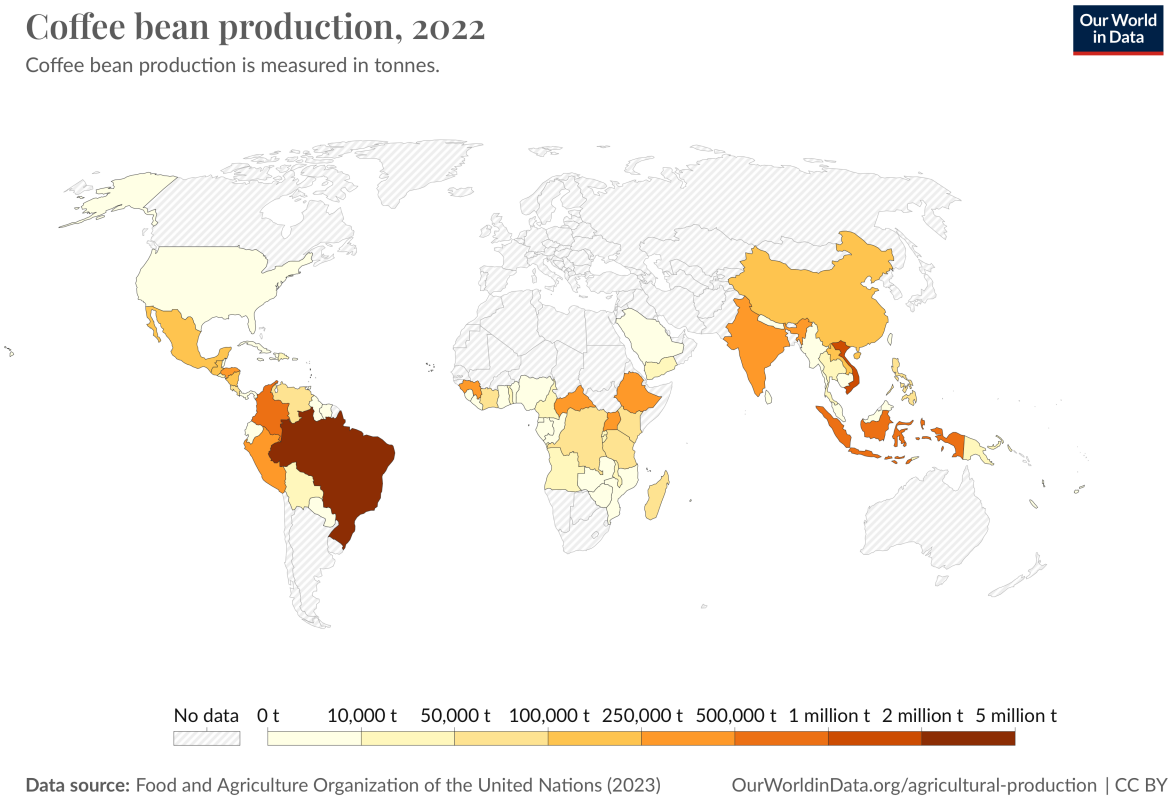


Figure 5. *Coffee bean production, 2022. https://ourworldindata.org/grapher/coffee-bean-production*

Indeed, it is estimated that in the "Coffee Belt" there are approximately 60 countries producing coffee (corresponding to a cultivation area of ~11 million ha), and of these, Brazil is the largest coffee producer, followed by Vietnam (Peixoto et al., 2023). Arabica and Robusta are the two main coffee species that have come to dominate the market (Figure 6). While many factors affect quality, Arabica coffee has historically been considered higher quality as it has a smoother, sweeter taste. Robusta has twice the caffeine content, making it more bitter and well suited for ready-to-drink applications and espresso blends (International Institute for

Sustainable Development IISD, 2022; Petruzzello, 2021). The Arabica coffee plant is more sensitive to higher temperatures and must be grown in subtropical climates at altitudes of 600 m to 2,000 m. It is well suited for agroforestry and shaded environments (IISD, 2022; Petruzzello, 2021). Robusta coffee is more resistant to temperature fluctuations and can be grown from sea level to 600 m in full sun (IISD, 2022; Petruzzello, 2021).

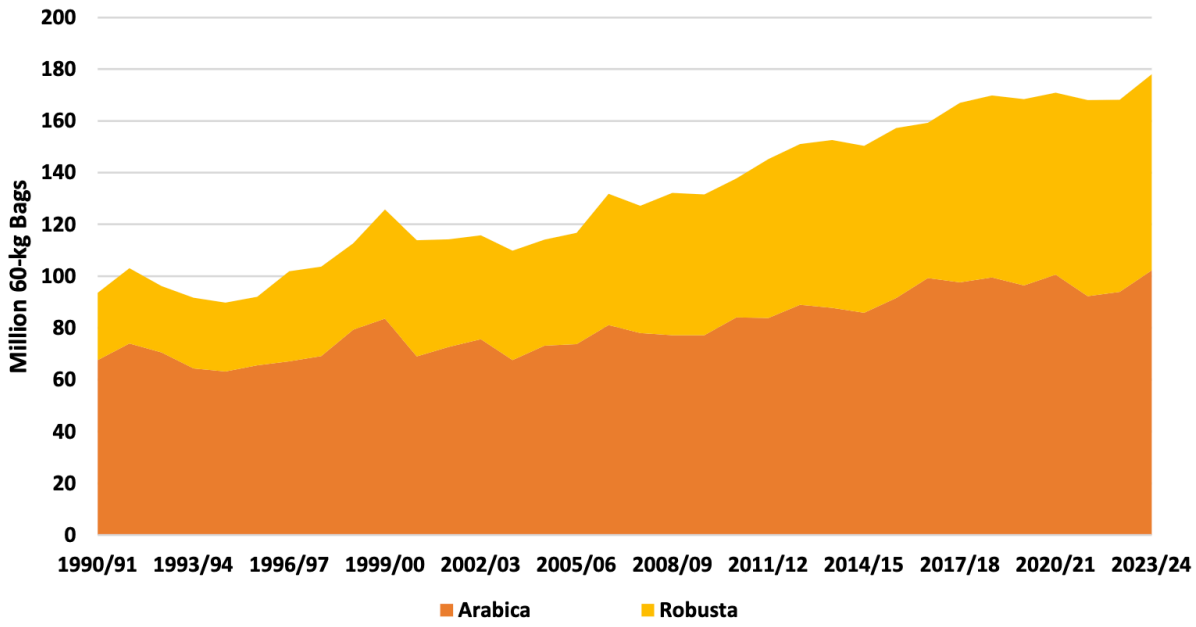


Figure 6. *World coffee production-Species, Million 60-kg Bags, International Coffee Organisation ICO 2023. https://icocoffee.org/documents/cy2023-24/Coffee_Report_and_Outlook_December_2023_ICO.pdf*

On the other hand, coffee consumption is significantly higher in developed countries, particularly in the European ones and in the United States (Figure 9). Coffee (as raw material) is a good example of a commodity frontier since it has moved across many places from its ancient home (Kefa, region of North Africa, now part of Ethiopia, 850 AD) (Beckert et al., 2021; Ludwig et al., 2014). It is also important to note that the division between "producer" and "consumer" country is not always clear since more and more producer countries are also consumers and vice versa, contributing to a more tightened production–consumption gap (Peixoto et al., 2023).

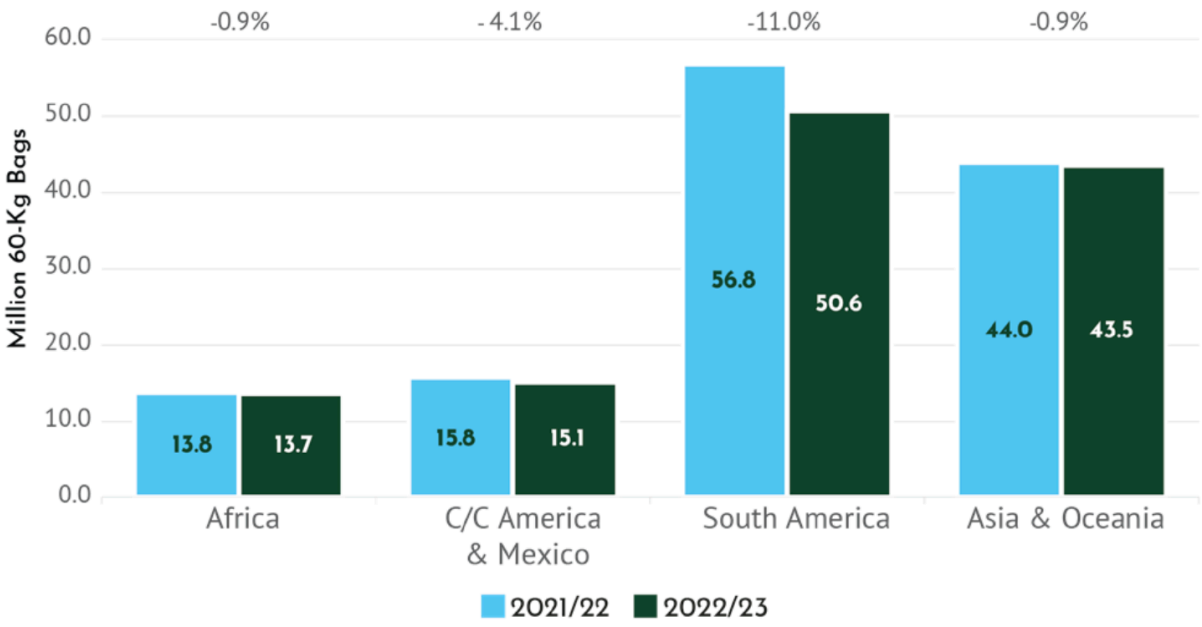


Figure 7. *Exports of all forms of coffee - Regions, millions of 60-kg bags. ICO. Coffee Development Report (CDR) 2022-23. https://ico.org/coffee-development-report-2/*

In coffee year 2022/23, global exports of all forms of coffee declined by 5.7% to 122.9 million 60-kg bags compared to the coffee year 2021/2022, marking the largest downturn since a 9.5% fall in 1994/95 (Figure 7, Figure 8). The global macroeconomic environment did little to bolster consumer confidence, with high inflation and rising interest rates across key advanced economies increasing the cost of living and reducing disposable income worldwide (ICO, CDR 2022-23). While these conditions likely contributed to a decline in coffee consumption and, consequently, green bean exports, much of the downturn's magnitude was due to a drawdown in stocks held in non-producing countries. Sustained high interest rates made stockholding increasingly uneconomical. Green beans stocks in Europe, Japan, and America dropped by 6.1 million bags in 2022/23, a 26.1% decrease compared to coffee year 2021/22 (ICO, CDR 2022-23). Green beans remain the dominant form of coffee exported worldwide, comprising 90.1% (110.7 million bags) of total coffee exports in coffee year 2022/23, a slight increase from the 90.0% share in 2021/22. Processed coffee (roasted and soluble) accounted for the remaining 9.9% (12.2 million bags) of exports (ICO, CDR 2022-23).

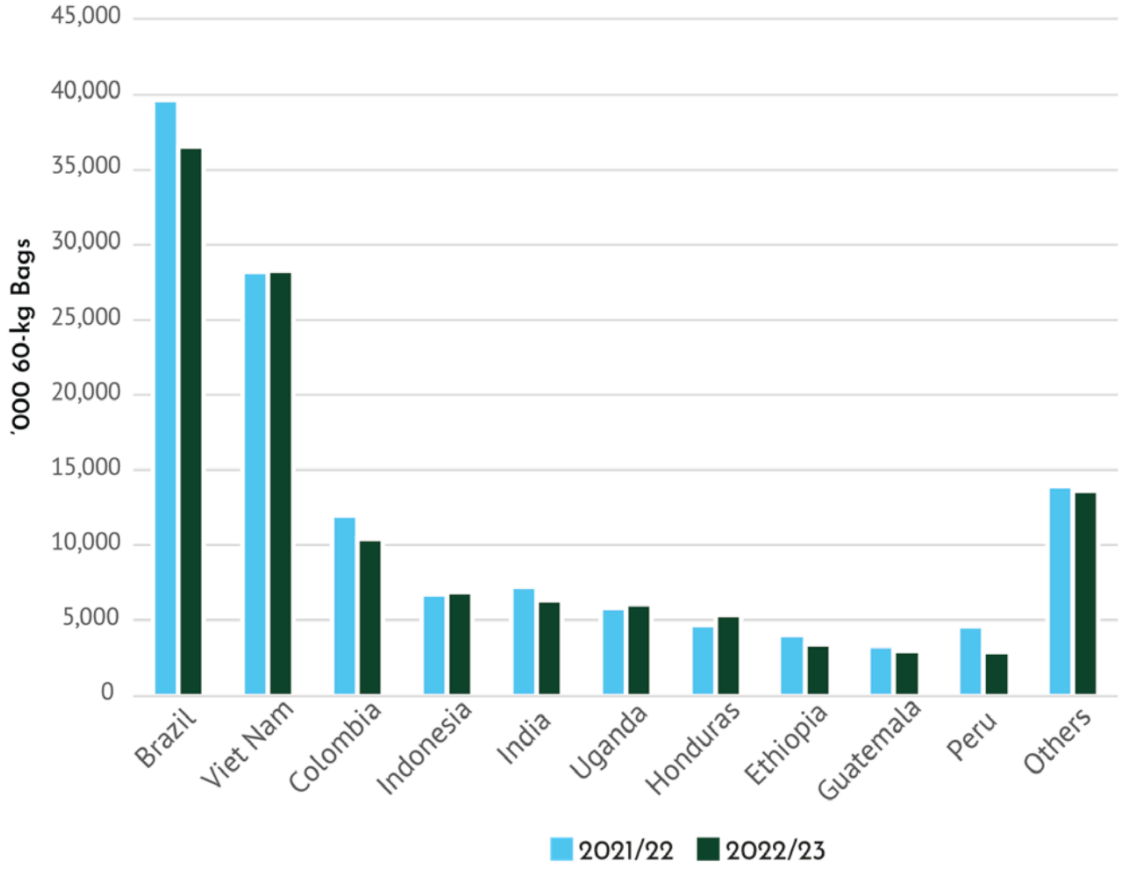


Figure 8. *Exports of all forms of coffee - top ten countries, '000 60-kg bags. ICO. Coffee Development Report (CDR) 2022-23. https://ico.org/coffee-development-report-2/*

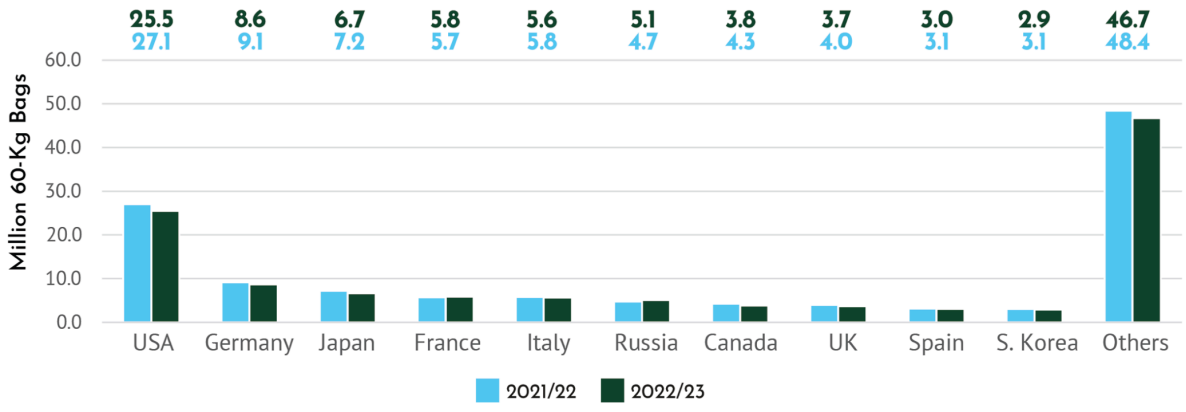


Figure 9. *Top ten consumption - non producers Countries, million 60-kg bags. ICO. Coffee Development Report (CDR) 2022-23. https://ico.org/coffee-development-report-2/*

2.5.2 Sustainability challenges in the coffee supply chain

The coffee industry is complex, and coffee has the challenge of becoming the first fully sustainable agricultural product (Sustainable Coffee Challenge, 2022). This initiative started because millions of coffee smallholders struggled with low profitability, and extensive, conventional coffee farming practices were destroying the natural ecosystem of several species (Fuller & Grebitus, 2023). The sector is facing several sustainability challenges, including water pollution, biodiversity loss, soil erosion, agrochemical use, deforestation, waste generation and labour exploitation (Meyfroidt et al., 2013; Panhuysen & Pierrot, 2014). Other issues include low prices, ageing farmers and climate change (Panhuysen & Pierrot, 2018; Pham et al., 2019). The latter will complicate production across many current coffee-growing areas, with negative impacts on livelihoods (Hannah et al., 2020; Ovalle-Rivera et al., 2015; Pham et al., 2019). Climate change and deforestation also cause the loss of natural, non commercial varieties with potentially useful properties for adaptation (e.g., drought tolerance) (Davis et al., 2019; Imbach et al., 2017). Coffee yield is strongly determined by climatic conditions, particularly during the vegetative and reproductive phases of the plant (Tavares et al. 2018). Increasing temperatures and precipitation shortages have negative impacts on flowering, fruiting and bean quality (Gay et al., 2006; Lin, 2007). Furthermore, climate variables also control the incidence of serious pests and diseases such as coffee leaf rust and coffee berry borer which could reduce coffee yield and quality and increase production costs (Pham et al., 2019). With respect to water management in the coffee supply chain, an important issue is the amount of wastewater (with high organic load and phytotoxicity) that is discarded during coffee processing, particularly in the wet method, which, likewise synthetic pesticides and fertilisers, contributes to pollution and may cause disease or death of fauna and flora (Janissen & Huynh, 2018; Rattan et al., 2015). Overall, the coffee chain has a high water footprint, with an estimate that the consumption of a 125-ml cup of coffee requires about 140 L of water (Hoekstra, 2008). In addition, the coffee supply chain also contributes to another worrying footprint: the carbon footprint. In this regard, the concerns are focused not only on the production step but mainly on the processing and consumption stages (Peixoto et al, 2023).

The demand for coffee in the local and global markets has encouraged massive production at upstream and downstream levels. The socioeconomic impact of coffee production still presents an issue, primarily related to the social benefit and economic value added for farmers (Rahmah et al., 2023). Lamentably, although most of the existing workforce in coffee production are females, only a few women own lands. In detail, it is estimated that around 70% of the labour force in coffee

production is provided by women but, of all coffee farms existing worldwide, only 20%–30% are headed by this gender (ICO, 2018). In the human ecology literature, farmers are fundamental domestic actors in organising for sustainability because they embody "ecosystem managers" and possess knowledge that is key to maintaining biodiversity stability and building a natural defense against climate change (Cerdán et al., 2012; Milligan et al., 2016; Perfecto et al., 1996; Valencia et al., 2018). Their attempts to reach compromises with the natural world are often essential in facilitating more pragmatic conservation initiatives (Garcia et al., 2010; Iverson et al., 2019; Soto-Pinto et al., 2007). One important example of such a compromise is the cultivation of coffee under the shade of tree canopies (de Beenhouwer et al., 2013; Moorhead et al., 2010). "Shade coffee" (Figure 10, Figure 11) offers fundamental advantages for the long-term protection of the forest and animal habitat (Gordon et al., 2007). These advantages range from ameliorating the local climate (Albertin & Nair, 2004) to avoiding soil erosion (Toledo & Moguel, 2012) and providing a refuge for local wildlife (Perfecto et al., 1996). While deforestation-free farming is essential to slow global climate change and biodiversity losses, coffee cultivation offers tangible opportunities to restore mixed-use forests in coffee-growing regions around the world (IISD Global Market Report, 2022). These functional benefits also create productivity advantages, encouraging farmers to become stewards and protectors of the natural world (Philpott et al., 2008; Toledo & Moguel, 2012). What is clear is that coffee farmers will have to become more resourceful and diversified by varying cropping patterns and livelihood activities to face changing weather patterns that will affect different parts of the global coffee value chain in unpredictable ways (IISD Global Market Report, 2022; Foreign Agricultural Service, 2021). Despite its vulnerability to the effects of climate change, coffee farming has climate change mitigation and adaptation potential (IISD Global Market Report, 2022).

Figure 10. *Shade coffee Plantation. Essence of Coffee, 2020. https://essense.coffee/en/what-is-shade-grown-coffee-is-it-better-than-full-sun/*

Figure 11. *Coffee bushes in a shade-grown organic coffee plantation on the western slopes of the Andes in Ecuador. Seneca Impact Advisor, 2024. https://senecaimpact.earth/perspective/shade-grown-coffee-a-profitable-planet-friendly-perk/*

2.5.3 Sustainability trends in the coffee industry

To address sustainability challenges, companies rely on governance mechanisms that variously combine codes of conduct, voluntary sustainability standards (VSSs), corporate social responsibility (CSR) programmes and direct relations with producers (Bager & Lambin, 2020). Progressive companies across the coffee sector (Bitzer et al., 2008; Giovannucci & Ponte, 2005; Jaffee, 2012; Millard, 2017; Ponte, 2019) and the wider agrifood sector (Dauvergne & Lister, 2012; Glasbergen & Schouten, 2015; Thorlakson et al., 2018) voluntarily adopt sustainability strategies to reduce regulatory risk, fill a policy vacuum, meet stakeholder expectations, increase income, protect their brand and reputation or differentiate themselves from competitors (Auld et al., 2008; Cashore, 2002; Dauvergne & Lister, 2010, 2012; Ponte, 2019; Vogel, 2008). VSSs in the coffee sector typically require farmers to adopt more sustainable farming practices, such as soil, water, forest, and energy conservation, measures that can make their operations more resilient to changes, including extended droughts (Voora et al., 2022). VSS-compliant farmers may also get higher prices and premiums for their coffee and establish stronger links with buyers, which can help them cope with market fluctuations (Bianco, 2020; Elder, 2021). To mitigate the social and environmental effects of conventional coffee farming practices, some organisations work to make these problems visible to coffee consumers (Fuller, & Grebitus, 2023). Since consumers can not physically identify sustainability efforts when purchasing or consuming coffee, sustainability standards need to be communicated through labeling. Consequently, consumers can use sustainability labels to make informed choices when purchasing coffee (Fuller, & Grebitus, 2023). These labels are issued by Non-Governmental Organisations (NGOs), non-profit organisation, Ethical and Social Trade certification entities, Organic certification bodies, third-party certifying companies, intergovernmental organisations and government agencies. All sustainability labels indicate different ways to tackle sustainability problems in coffee production. Ultimately, sustainability organisations and roasters offer coffee farmers a way to obtain larger profits by following sustainable production practices, which are then labeled on their coffee (Fuller, K., & Grebitus, C., 2023). There are three broad categories to classify sustainability labels: mandatory, voluntary, and private (Ponte, 2004). According to Ponte (2004), voluntary standards result from either a formal coordinated process in which a sector seeks consensus or as a response to consumer requests or NGOs initiatives. The most recognised and implemented voluntary sustainability labels in the coffee sector are Organic, Fairtrade, Rainforest Alliance, and Common Code for the Coffee Community (4C) (Peixoto et al., 2023)(Figure 12, Figure 15).

2.5.3.1 Main sustainability labels in the coffee sector

The EU *Organic Certification* is issued by control bodies (certification bodies) authorised by national authorities in each EU member state. These certification bodies are responsible for verifying compliance with the EU organic regulations (Regulation (EU) 2018/848). Outside the European Union, individual countries have defined their own standards that regulate organic production, for instance the NOP/USDA standard in the United States and the JAS in Japan. Organic certification is based on four principles (health, ecology, fairness, and care) and is mainly focused on the environment and good agricultural practices, avoiding or prohibiting deforestation and the use of agrochemicals, hormones, or genetically modified organisms, and replacing them by more environmentally friendly alternatives that aim to maximise the fertility of lands and the preservation of biodiversity, ecological balance, and animal well-being (European Commission, 2020a, 2020b).

Fairtrade certification, on the other hand, is mainly focused on ensuring social and economic stability of smallholders and their workers, aiming to democratically support smallholder cooperatives in developing countries by paying them a minimum price, but fair, for their services (Peixoto et al., 2023). Independent certifiers audit producers, traders and companies to check compliance with Faitrade International economic, social and environmental standards, including that producers receive the Fairtrade Minimum Price and Premium (Fairtrade International, 2024). With this certification, it is expected that labour rights are improved and that long-term trade relationships are established (Peixoto et al., 2023; Valkila, 2009). Nonetheless, this certification also has an environmental concern because it helps farmers to adapt to climate change, raising awareness and encouraging more environmentally friendly agricultural practices (Becchetti & Costantino, 2008; Fairtrade Foundation, 2020) and, in fact, it is estimated that 50% of Fairtrade coffee-certified farms are simultaneously Organic certified (Valkila, 2009).

Figure 12. *EU Organic and Fairtrade Certified labels.*
https://agriculture.ec.europa.eu/farming/organic-farming/organic-logo_en;
https://fairtrade.ca/resources/fairtrade-month-toolkit/brand-logos-2/

The *Rainforest Alliance Certification* is issued by Rainforest Alliance, an international non-governmental organisation (NGO) focused on sustainability in agriculture, forestry, and business practices. Audits are conducted by independent third-party certification bodies authorised by Rainforest Alliance (Rainforest Alliance, 2021). The main focus of this certification (which in 2018 has merged with UTZ certification) is the protection and conservation of biodiversity, always aiming to improve not only the future of nature but also the future of people. It aims to eradicate forest deforestation, implement best commercial practices to increase recognition and reward of those who invest in sustainability, raise awareness of farmers to use more efficient farming methods to deal with climate change, and manage land and crop so they are more prosperous, and, socially, ensure human rights (ICO, 2021; Souza Pião et al., 2020).

Globally, Rainforest Alliance certified coffee farms produced 1.7M metric ton (MT) of green coffee beans in 2023, a 7% increase from 2022 (RA Coffee Certification Data Report, 2023; Figure 13). The harvest of the program's largest coffee producing country showed significant growth from 368k MT to 518k MT in 2023. Large, certified groups in the country also obtained new farms leading to an increase in available volumes. The second largest coffee producing country, Vietnam, also showed certified volume growth from 209k MT in 2022 to 277k MT in 2023 (RA Coffee Certification Data Report, 2023; Figure 14).

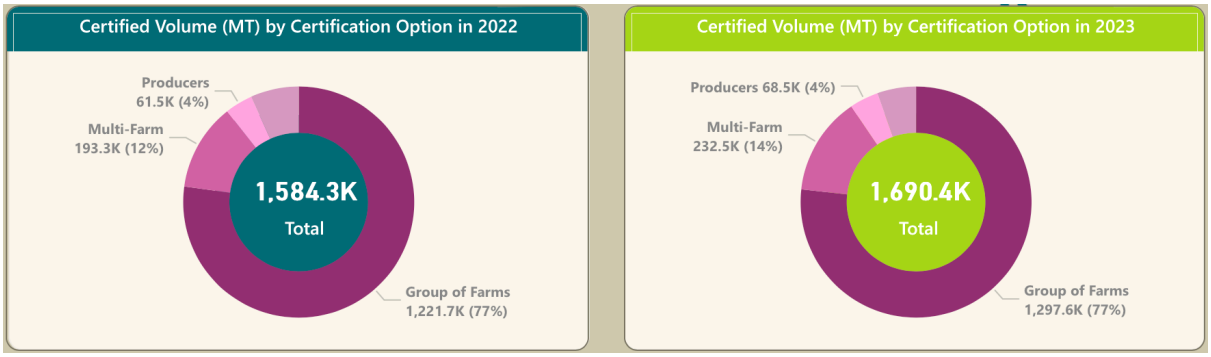


Figure 13. *Rainforest Alliance (RA), Certified Volume (metric tonnes MT) by Certification Option in 2022-2023. RA Coffee Certification Data Report 2023. https://www.rainforest-alliance.org/business/certification/coffee-certification-data-report-2023/*

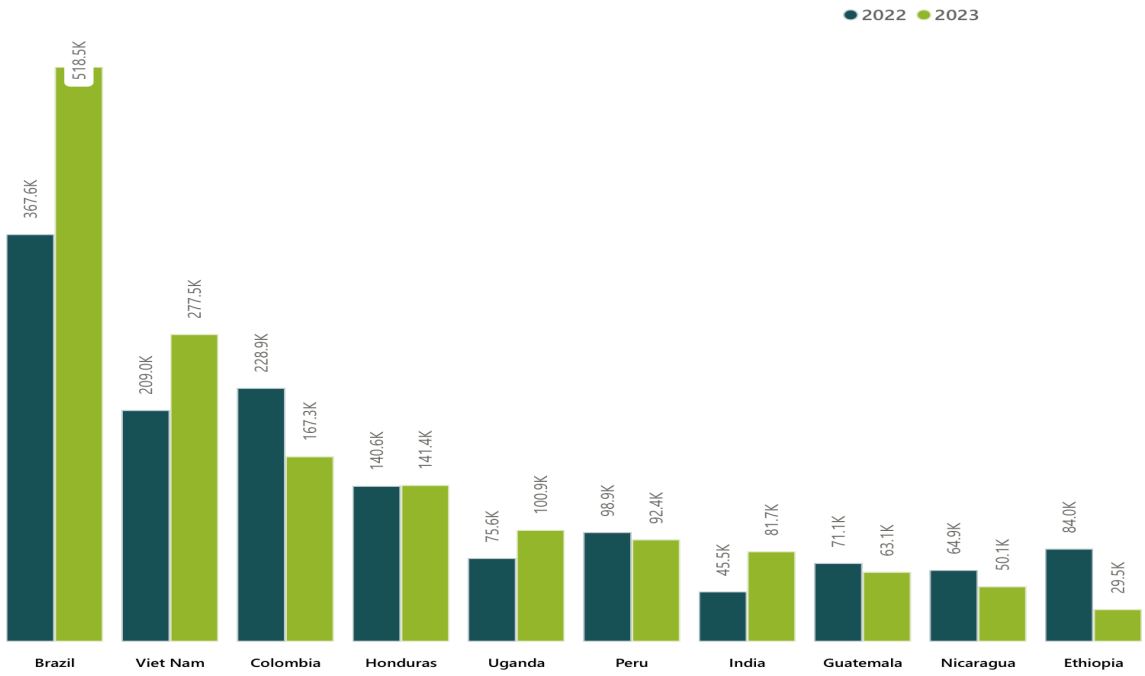


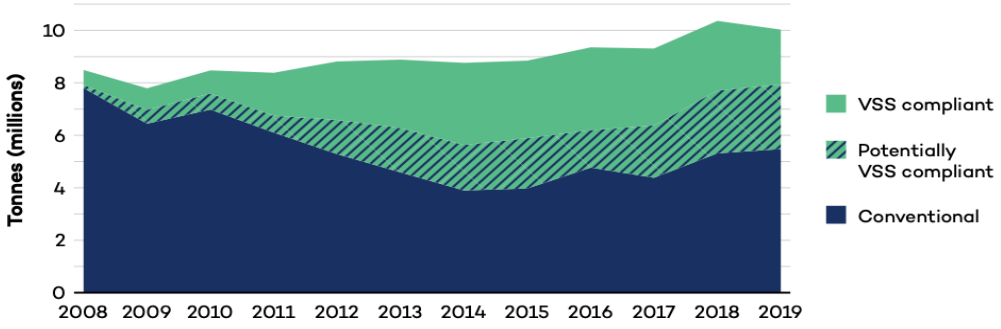
Figure 14. *Rainforest Alliance (RA), Certified Volume (MT) by country and year 2022-2023. RA Coffee Certification Data Report 2023. https://www.rainforest-alliance.org/business/certification/coffee-certification-data-report-2023/*

The *4C certification* is issued by 4C Services, a non-profit organisation that promotes sustainability in the coffee sector. The certification results from a multistakeholder collaboration between coffee producers, traders, industries, NGOs, the social sector, and the scientific community from all over the world, and is considered the gateway to other certifications as it works in the three areas of sustainability. The 4C certification uses transparent sustainable farming practices in the production and is still responsible for ensuring these same conditions in the processing of coffee (Peixoto et al., 2023; Potts et al., 2014; Souza Pião et al., 2020).

Figure 15. *RA and 4C labels. https://www.rainforest-alliance.org; https://www.4c-services.org*

2.5.3.2 Transparency in the coffee sector

Transparency fosters accountability and enables consumers decision making based on the information provided by companies (Bager & Lambin, 2020). Incorporating greater transparency and traceability into coffee supply chain will play a significant role in fostering sustainability and assisting farmers in their price negotiations (Sachs et al, 2019). Value chain transparency can also be regarded as an indication of ethical production and trading practices. The degree of transparency serves as an indicator of the supplier's ethical standards, which becomes increasingly important as consumer demand for ethical production and the need for supply chain transparency grow. Consumers are turning into a more active part of the supply chain and are also becoming more consciously engaged with the supply chains that provide them with their daily food and are demanding that their local suppliers and retailers become more transparent about their sourcing strategies. Supply chain transparency is a way consumers can distinguish ethical suppliers (Ko et al, 2023) (Figure 16).



Note: Conventional production volumes do not comply with a VSS, while VSS-compliant production volumes refer to coffee produced in compliance with at least one VSS. Production volumes that are defined as potentially VSS compliant cannot be definitively identified as conventional or VSS compliant with the data currently available.
Source: FAO, 2022a; Meier et al., 2021.

Figure 16. *Global coffee production from 2008 to 2019. IISD, Global Market report: Coffee prices and sustainability, 2022. https://www.iisd.org/system/files/2022-09/2022-global-market-report-coffee.pdf*

3 Methodology

The methodology of the thesis is divided into two sections: *Data collection for background and case study insights* and *Case study approach*. Each section highlights the specific tools, databases and approaches used to address the research objectives. Academic and institutional sources were used in full compliance with copyright and citation requirements, ensuring proper acknowledgment of intellectual contributions.

3.1 Data collection for background and case study insights

3.1.1 Academic literature review

To establish the context and the background for the thesis, an extensive review of the academic literature was undertaken. The SCOPUS database was designated as the principal repository for sourcing relevant academic literature. Targeted searches were conducted using the following keywords: “Agri-food industry”, “Coffee sector”, “Sustainable supply chain management”, “Sustainability”, “Sustainable practices”, “Coffee supply chain”, “Climate change”, “2030 Agenda”, “Green Deal”, “Coffee roasters”, “SDGs”, “Agri-food supply chain”, and “Climate change adaptation strategies”. To maintain a high standard of relevance and quality, the search was restricted to specific document types, such as "Article", "Book", "Book Chapter", "Review", "Conference Paper", "Conference Review" and "Report". Publications were evaluated based on their alignment with the research objectives, with priority given to recent and high-impact studies that offered insights into sustainability practices and challenges within the coffee industry. To enhance the depth and scope of the literature review, the Reference chapter of identified papers was examined for additional relevant studies, allowing for the inclusion of works that may not have emerged in the initial keyword searches. As part of the literature review, additional resources were consulted to supplement relevant statistical data and visual analysis. In particular, the Our World in Data and Statista platforms were consulted for their extensive repositories of data-driven insights and reports.

3.1.2 Integration of institutional frameworks and industry practices

In addition to academic sources, the research incorporates a review of institutional and policy documents from International and European organisations. Official websites and platforms of the European Union, United Nations, Food and Agriculture Organisation (FAO), GS1, International Coffee Organisation, International Institute for Sustainable Development (IISD), and Intergovernmental Panel on Climate Change (IPCC) were explored. These sources were selected to provide the latest data, policies, and regulatory frameworks relevant to sustainability and sustainable development in the corporate sector. The documents retrieved include reports on sustainability performance, regulatory guidelines, policy briefs, and best practice case studies. The inclusion of these materials ensures that the study reflects current global and regional perspectives on sustainability, particularly in the context of the agrifood and coffee sectors. To gain insights into sector-specific trends and practices, industry reports and sustainability assessments from coffee industry stakeholders were examined. These include reports published by coffee associations, non-governmental organisations (NGOs), and corporate entities. Particular attention was given to reports that focus on sustainable supply chain management, climate resilience strategies, and corporate adherence to the United Nations Sustainable Development Goals. The integration of these reports into the research process allowed the acquisition of pertinent data, encompassing both quantitative indicators and qualitative analyses.

3.2 Case study approach

3.2.1 Case study selection

Lavazza Group represents a pioneering example of sustainability within the coffee industry, revealing itself as an ideal case study for several reasons. Its global footprint and market leadership position in the coffee industry render it a significant contributor to and influencer of sustainability trends. The involvement of various stakeholders along the entire supply chain and collaborations with local communities, governmental bodies, and international organisations allow for a multi-perspective analysis of the business. Furthermore, the presence of a complex supply chain allows the study not only of the Group's core business activities, but also of upstream and downstream activities with a complete view of the product life cycle. Coffee production and distribution are inherently tied to environmental dynamics, and company's initiatives offer a clear example of how to mitigate adverse impacts. Lavazza's actions in reducing emissions, protecting biodiversity and the environment in which it operates, fighting climate change and improving the living conditions of coffee-growing communities address critical challenges in the sustainable development of the coffee sector and more generally of the entire agri-food sector. Lavazza's proactive engagement with global sustainability standards and its alignment with initiatives such as the United Nations Sustainable Development Goals (SDGs) reflect a growing recognition of the interconnectedness of environmental, social, and economic dimensions.

3.2.2 Data Collection and Analysis

The data collection for the case study on Lavazza Group involved an in-depth engagement with both company materials and personnel (Table 1), ensuring a comprehensive understanding of the company's sustainability strategies and their real-world implications. The main data sources were Lavazza Group's Sustainability Reports and Lavazza Foundation's Social Reports, which provided valuable insights into the company's overarching strategies, key initiatives, and measurable impacts in line with its commitment to sustainability. By examining these reports, it was possible to extract data on Lavazza's alignment with the SDGs, and its tailored approaches to challenges specific to the coffee industry. Besides analysing publicly available reports, targeted consultations were conducted with members of Lavazza's Sustainability Team (Table 1). These interactions allowed an exploration of the methodologies and decision-making processes underpinning the company's projects and initiatives. Through these engagements, insights were gained into the internal mechanisms and strategies driving Lavazza's sustainability agenda, particularly the integration of sustainability into the whole

supply chain. A specific focus was given to the insetting project in Colombia, managed by the Lavazza Foundation in partnership with local associations and national bodies, as the first project to generate and purchase certified carbon insetting credits within the Group's supply chain. The insetting approach offered a unique perspective on Lavazza's commitment to achieving carbon neutrality by acting on the most environmentally impactful areas of its supply chain (coffee production). A key highlight of this research was the direct engagement with the Project Coordinator with Volcafe in Colombia, who supervises the insetting project in the Meta region (Table 1). This engagement provided firsthand insights into the design, execution, and outcomes of the project. These insetting projects, as studied through the Foundation's materials and personal consultations, exemplified how Lavazza integrates environmental goals with socioeconomic development. Furthermore, the research framework has been enriched by the incorporation of additional information and definitions, which were not present in the corporate reports, retrieved from documents of organisations operating in the coffee industry and from international organisations, such as the International Coffee Organisation and the GHG Protocol. This additional contextualisation is designed to clarify key concepts and provide a comprehensive perspective, ensuring that the Group's sustainability data is interpreted within an appropriate and coherent analytical and conceptual framework.

Table 1. *Company employees and partners involved in the data collection phase*

Interviewee	Role	Themes/Topics
Veronica Rossi	Lavazza Sustainability Team Manager and Lavazza Foundation's member	Sustainability approach adopted by Lavazza Group and *Roadmap to zero* strategy
Federica Princi	Lavazza Sustainability senior spacialist	Participation of the Lavazza Group in the carbon credits market and the offsetting/insetting projects
Vivian Vasquez	Project Coordinator with Volcafe in Colombia	Insetting project in the Meta region of southeastern Colombia in partnership with the Lavazza Foundation

As a result of the various acquisitions made by the Group over the years, and therefore the continuous expansion of the reference perimeter from a reporting point of view, a precise time interval was considered in this thesis for the collection and consequent analysis of the data, in order to examine consistent and comparable data. Therefore, unless otherwise specified, the data presented in this thesis cover an overall view of the sustainability performance of the various Lavazza Group companies, carried out considering the three-year period 2021-2023. The following companies are encompassed within the defined perimeter:

- Luigi Lavazza S.p.A., parent company headquartered in Turin (data considered refers to the Headquarters, the Innovation Center, the Italian Commercial Areas and the Italian production plants in Turin (Settimo Torinese and 1895), Gattinara and Pozzilli, as well as Conficaf S.p.A. and E-Coffee Solutions S.r.l.);
- Carte Noire Sas, a Paris-based French commercial subsidiary, part of the Lavazza Group since 2016;
- Carte Noire Operations SaS, a Lavérune-based French manufacturing subsidiary, part of the Lavazza Group since 2016;
- Kicking Horse Coffee Co. Ltd, an Invermere-based Canadian manufacturing subsidiary, part of the Lavazza Group since 2018;
- Lavazza Australia Pty Ltd, a Melbourne-based Australian commercial subsidiary, part of the Lavazza Group since 2015, which includes its subsidiary Lavazza Australia OCS Pty Ltd;
- Lavazza Coffee UK Ltd, a London-based UK commercial subsidiary, part of the Lavazza Group since 1990;
- Lavazza France Sas, a Paris-based French commercial subsidiary, part of the Lavazza Group since 1982;
- Lavazza Japan GK, a Tokyo-based Japanese commercial subsidiary, part of the Lavazza Group since 2018;
- Lavazza Kaffee GmbH, a Vienna-based Austrian commercial subsidiary, part of the Lavazza Group since 1988;
- Lavazza Netherlands B.V., an Amsterdam-based Dutch commercial subsidiary, part of the Lavazza Group since 2007;
- Lavazza Professional France Sas, a Roissy-en-France-based French commercial subsidiary, part of the Lavazza Group since 2019;
- Lavazza Professional Germany GmbH, a Verden-based German commercial subsidiary, part of the Lavazza Group since 2019;

- Lavazza North America Inc., a new company established in 2023 through the merger of Lavazza Professional North America LLC, an American manufacturing subsidiary based in West Chester (Pennsylvania), part of the Lavazza Group since 2019, and Lavazza Premium Coffees Corp., a New-York-based American commercial subsidiary, part of the Lavazza Group since 1989;
- Lavazza Professional UK Ltd, a Basingstoke-based UK manufacturing subsidiary, part of the Lavazza Group since 2019;
- Lavazza Professional UK Operating Services Ltd, a Swindon-based UK commercial subsidiary, part of the Lavazza Group since 2020;
- Lavazza Spagna S.L., a Barcelona-based Spanish commercial subsidiary, part of the Lavazza Group since 1998;
- Lavazza Sweden AB, a Stockholm-based Swedish commercial subsidiary, part of the Lavazza Group since 2009;
- Luigi Lavazza Deutschland GmbH, a Frankfurt-based German commercial subsidiary, part of the Lavazza Group since 1987;
- Merrild Baltics SIA, a Riga-based Latvian commercial subsidiary, part of the Lavazza Group since 2015;
- Merrild Kaffe ApS, a Fredericia-based Danish commercial subsidiary, part of the Lavazza Group since 2015;
- Nims S.p.A., a Padua-based Italian commercial subsidiary, part of the Lavazza Group since 2017.

In this study, a comprehensive analysis was conducted on data primarily sourced from the sustainability reports of the Lavazza Group and its Foundation. The objective was to evaluate the implications and efficacy of the sustainability actions implemented across environmental, social, and economic dimensions. Central to the study was the "Roadmap to Zero" strategy and its foundational pillars (measurement, reduction, and offsetting) which were examined to assess their impact on sustainability outcomes. To ensure methodological rigor and facilitate a valid comparison, the analysis was confined to a clearly defined temporal interval during which reporting parameters remained constant. This constraint was imposed to guarantee that the data derived from both the Group and Foundation reports were directly comparable over the three-year period, thereby enhancing the internal consistency of the study. The evaluation of quantitative data was conducted by comparing results year by year, enabling the identification of trends and the assessment of progress toward sustainability objectives. This approach allowed for an examination of the extent to which the measures adopted by the Lavazza Group led to tangible improvements in key performance indicators, such

as energy efficiency, emissions reduction, and resource optimisation. On the other hand, the assessment of qualitative data, particularly those related to the improvement of living conditions and social development within communities impacted by the Group's operations, required a different analytical approach. These evaluations were based on the information and narratives provided in the sustainability reports, which documented initiatives aimed at fostering social welfare, enhancing education, and promoting economic empowerment. Such qualitative insights provided a deeper understanding of the social dimension of Lavazza's sustainability strategy, complementing the quantitative findings.

4 Overview of the Lavazza Group Case Study

4.1 Company history

4.1.1 Foundational years and domestic market consolidation

In 1895, Luigi Lavazza established an artisanal coffee roasting business in the historical center of Turin (Figure 17), initiating a practice that would prove to be a seminal development in the history of coffee: the creation of the first coffee blends for consumer use. At that time, blends intended for domestic consumption did not exist, resulting in unpredictable and variable coffee flavour profiles dependent on both origin and harvest year. Leveraging his background in chemistry and his passion for the product, Luigi Lavazza formulated blends with more balanced flavour characteristics, capable of satisfying the diverse preferences of the market, thereby achieving immediate commercial success (Lavazza Group, 2024).

Figure 17. *St Thomas 10 - photograph of the grocery store, 1980s. Lavazza's historical archive, 2024. https://archiviostorico.lavazza.com/en*

In 1934, Luigi Lavazza undertook a transatlantic voyage to Brazil, accompanying a delegation of prominent importers of Brazilian coffee. The objective of this expedition was to conduct firsthand observations of coffee plantations. During this

visit, he witnessed the destruction of substantial quantities of surplus coffee, an event that profoundly impacted him. Upon his return, he declared, “A world that destroys the goods of nature is one I do not belong in,” a sentiment that presaged the approach subsequently adopted by the company, characterised by a heightened awareness of environmental, social, and cultural issues (Lavazza Group, 2024).

4.1.2 Industrial growth and family leadership

The second generation transitioned the company into an industrial entity, consolidating its market presence throughout Italy. During this period, managerial responsibility was transferred to Luigi’s sons, Giuseppe and Pericle, who maintained a commitment to investing in product quality enhancement. The year 1957 marked the inauguration of the manufacturing facility in Turin’s Corso Novara (Figure 18, Figure 19), resulting in a substantial increase in production capacity and the creation of Qualità Oro, a product that retains iconic status within the company’s portfolio to this day. Subsequently, the third generation of the family assumed a prominent role in the domestic market and promoted the brand through innovative communication strategies, establishing Lavazza as synonymous with Italian coffee (Lavazza Group, 2024).

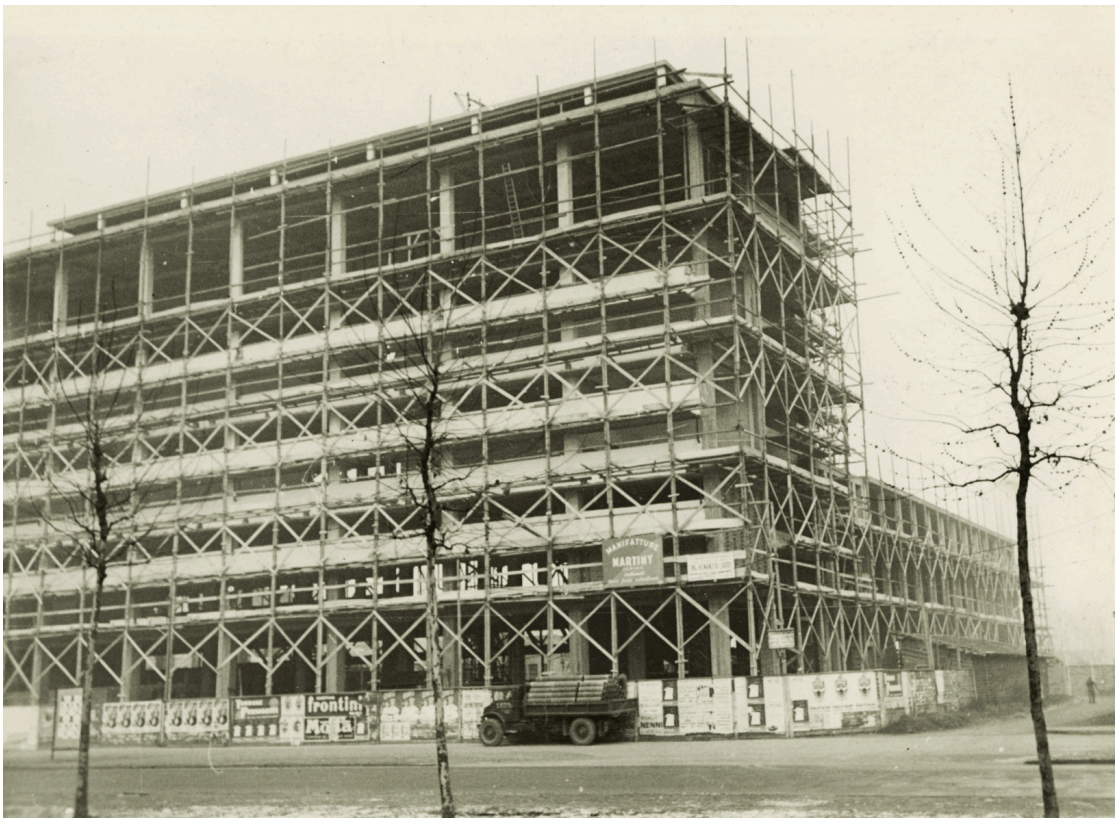


Figure 18. *Corso Novara facility under construction, 1955. Lavazza’s historical archive, 2024. https://archiviostorico.lavazza.com/en*

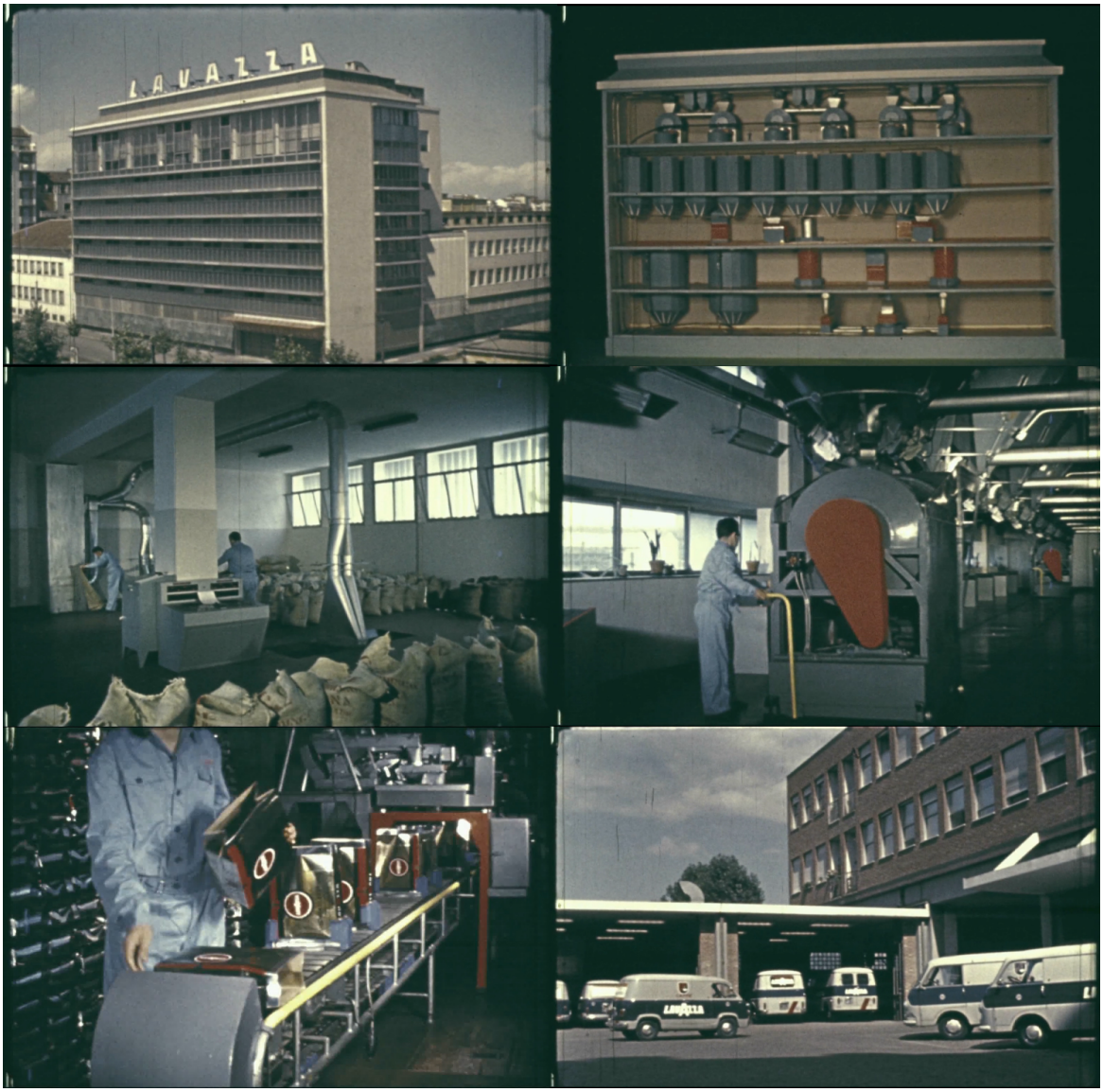


Figure 19. *Corso Novara facility, c. 1962. Lavazza's historical archive, 2024. https://archiviostorico.lavazza.com/en*

4.1.3 International expansion and the rise of Sustainability as a Core Value

Lavazza progressively transitioned into a multinational corporation, evolving its communication strategy and increasing its emphasis on sustainability and corporate social responsibility. The significance of environmentally and socially responsible initiatives progressively developed into fundamental components of corporate strategy, representing an early acknowledgement of issues that are now widely recognised as paramount (Lavazza Group, 2024). Over the past decade, Lavazza has restructured its organisational framework to address the complexities of the global market and ensure sustainable long-term growth.

This involved integrating a forward-looking vision with a management-oriented approach, notably through the expansion of the Board of Directors to include non-family members. Beginning in 2015, a series of strategic acquisitions was initiated with the objective of reinforcing the Group's autonomy and transforming it into a global pure premium coffee enterprise (Lavazza Group, 2024). This strategy involved the incorporation of leading brands to facilitate continued growth in key geographical markets. In 2015, Merrild, a market leader in Denmark and the Baltic states, joined the Group. The subsequent year witnessed the acquisition of Carte Noire, a prominent coffee brand within the French retail market, subsequently establishing France as the Group's second most significant market. In 2017, Kicking Horse Coffee, a major player in the North American organic and fair-trade coffee sector, was integrated into the Group. Further acquisitions were pursued to expand the business-to-business (B2B) segment, strengthening strategic distribution channels such as vending machines and office coffee service (OCS) (Lavazza Group, 2024).

Figure 20. *Lavazza Group headquarters in Turin. Lavazza's historical archive, 2024. https://archiviostorico.lavazza.com/en*

This expansion resulted in the integration of the French company Espresso Service Proximité; Mars Drinks (rebranded as Lavazza Professional), encompassing the Flavia and Klix systems operating across Europe, North America, and Japan; and

Nims, an Italian company specialising in the distribution of coffee capsules and espresso machines for domestic use. In 2023, the Group furthered its international expansion within France, a key market, through the acquisition of 100% of the share capital of MaxiCoffee, a company operating in the coffee sector with an integrated platform encompassing e-commerce, retail stores, concept stores, and training academies (Lavazza Group, 2024). Headquartered in Turin, Italy, at its Nuvola complex (Figure 20), the Lavazza Group maintains operations across all business and distribution channels, supported by a global workforce exceeding 5.500 employees and collaborators and eight manufacturing facilities located in five countries. The Group's products are exported to over 140 countries, while maintaining the core values established by the original coffee shop founded over a century ago in Turin's historical center (Lavazza Group, 2024).

4.2 Business Model

The Lavazza Group operates within the coffee industry, following a business model that emphasises creating value through ethical and responsible practices. This approach centers on the efficient use of key resources, referred to as "inputs," to generate value throughout the entire supply chain (Figure 21). The deployment of these inputs supports the Group's goals and contributes to its sustainable development path (Lavazza Sustainability Report (LSR), 2023). Governance practices that emphasise transparency and incorporate sustainability into business decisions are considered essential to this approach. This involves conducting comprehensive and up-to-date scenario analysis of the coffee industry and monitoring prevailing sustainability trends in line with the Group's strategic priorities. Additionally, the integration of ESG factors into risk assessments aims to facilitate the identification and mitigation of potential threats to business operations. Through cyclical monitoring of both financial and non-financial performance, the Company generates short and medium-term outputs that ultimately contribute to long-term outcomes. These outputs and outcomes are systematically monitored through structured action plans and specific performance indicators managed by various organisational departments. The guiding principles for this entire process are derived from the Group's core values ("Authenticity", "Passion for excellence , "Inventiveness" and "Responsibility") and purpose, fostering a consistent approach across all brands (LSR, 2023).

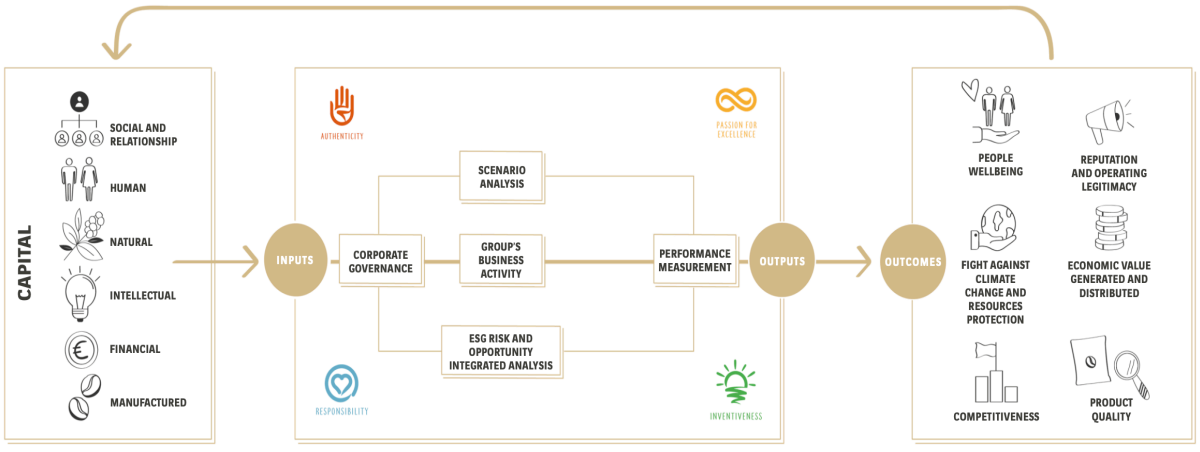


Figure 21. *Lavazza Group's Business Model. (LSR, 2023). https://www.lavazzagroup.com/en/sustainability/the-sustainability-report.html%3f*

4.3 The Group's supply chain

4.3.1 From cultivation to Export

The coffee supply chain is characterised by significant complexity and fragmentation within the agricultural sector (Figure 23). The production process begins with the cultivation of *Coffea* plants on plantations managed by producers ranging in scale from smallholders, cultivating approximately one hectare, to larger, more structured enterprises. Smaller-scale farmers frequently organise into cooperatives or associations and collaborate with local intermediaries. In certain regions, these intermediaries assume responsibilities beyond logistical management, often necessitated by inadequate infrastructure, extending to production financing and/or the procurement of raw materials (LSR, 2023). The agricultural phase initiates with the sowing of coffee seeds, which typically germinate within several months, contingent upon meticulous irrigation practices, a regulated balance of solar exposure and shade, and consistent protection against prevalent coffee diseases and pests. After a period of approximately three years, coffee plants begin to yield their initial harvest of coffee cherries (Figure 22), which may be harvested through manual (picking), mechanical (stripping), or mixed methods. Following harvesting, the cherries undergo processing, employing various techniques (LSR, 2023).

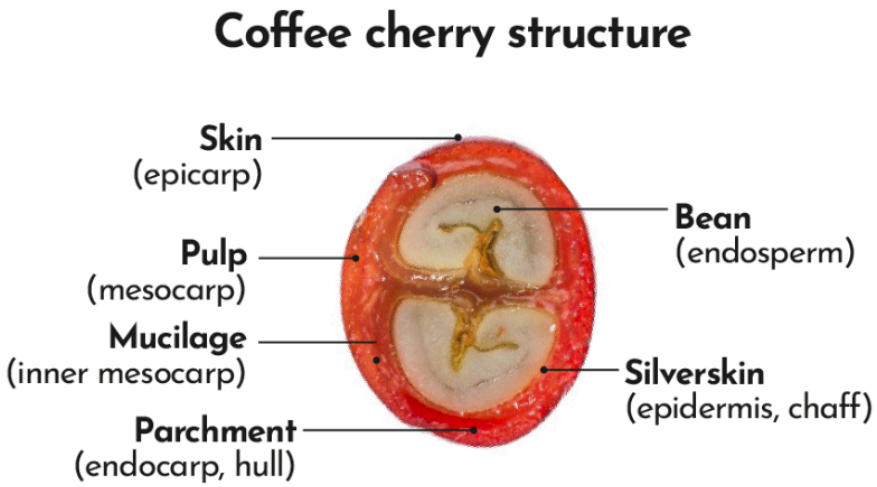


Figure 22*. Coffee cherry structure. International Coffee Organisation ICO. Coffee Development Report (CDR) 2022-23 (2024). https://ico.org/coffee-development-report-2/*

"Natural processing" involves spreading the cherries for sun-drying followed by pulping. "Washed processing" entails pulping, partial removal of mucilage, fermentation in water, and subsequent sun-drying. A third method, termed "honey processing," incorporates partial mechanical pulping, retaining the mucilage until complete sun-drying, facilitating the absorption of natural sugars by the beans. The drying stage is a critical determinant of the product's ultimate flavour profile and quality. Subsequent to processing, the beans are sorted and graded based on physical attributes such as size, color, and quality, and subsequently transported to local collection centers for shipment to the port of departure (LSR, 2023).

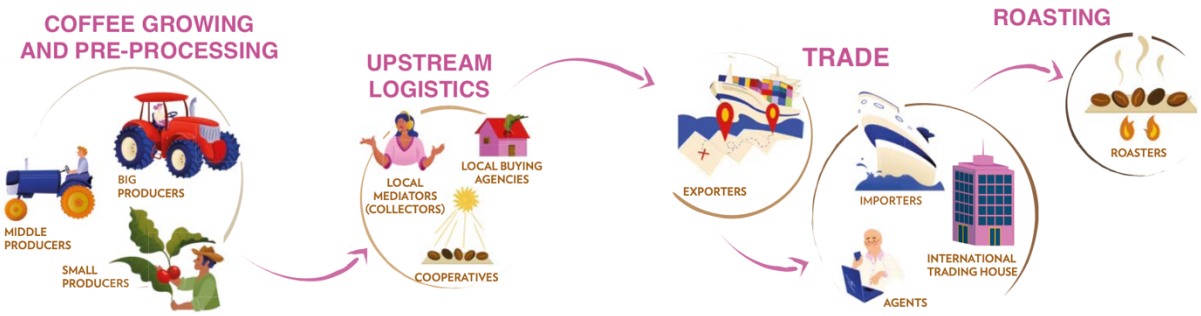


Figure 23. *Group's supply chain, from farm to plant. LSR, 2022. https://www.lavazzagroup.com/en/sustainability/the-sustainability-report.html%3f*

4.3.2 Logistics, quality control, and production

The majority of the estimated 25 million coffee farmers are small to medium-sized agricultural entrepreneurs who operate on limited landholdings, often located in remote and geographically challenging areas due to the specific ecological requirements of *Coffea* cultivation. Consequently, logistical operations from the field to the port of origin involve a diverse range of actors, including cooperatives (prevalent in Central and Latin America) and local mediators, commonly referred to as "bulk traders," who serve as crucial intermediaries connecting farmers with exporters. Exporters prepare coffee containers at their processing facilities, including the requisite documentation for shipping the coffee beans. Lavazza's coffee procurement process involves collaboration between coffee buyers, coffee tasters, and exporters. Exporters supply the commodity in accordance with established standards to maintain a consistent 'in-cup profile' (LSR, 2023). These standards are monitored by the Coffee Buying Department, which is also responsible for the procurement of raw coffee (referred to as "green coffee" due to the bean's pre-roast color), as well as the management of transportation and customs procedures. Upon arrival at destination ports, purchased coffee containers are transferred to customs warehouses where all necessary procedures are completed to facilitate product release for production. A representative sample is extracted from each container and dispatched to Lavazza's laboratories. There, expert coffee tasters conduct sensory evaluations and analyses to verify conformity with the specifications of the coffee procured in the producing countries. Each coffee lot is assigned a unique identification code to track key characteristics, such as the month of embarkation and the agreed-upon price. This procedure also ensures traceability of the coffee to its region of origin. The lot remains in the customs warehouse pending the completion of analyses and a determination of its suitability for processing at the company's plants (LSR, 2023). Upon arrival at the production plant, the coffee undergoes a further series of visual and humidity assessments, adhering to specific reference and control standards, before being placed in storage silos. Each plant maintains a dedicated tasting laboratory where all finished product lots are evaluated by trained personnel. These evaluations confirm the presence of the correct blend within each package and assess for any defects (LSR, 2023). Lavazza Group's production facilities hold process and product certifications addressing quality, product safety, and the social and environmental impacts of production processes (Table 2).

Table 2. *Certifications in the Group's plants. LSR, 2023. https://www.lavazzagroup.com/en/sustainability/the-sustainability-report.html%3f*

	Turin (IT)	Gattinara (IT)	1895 (IT)	Pozzilli (IT)	Lavérune (FR)	Basingstoke (UK)		West Chester (USA)	Invermere (CAN)
						Drinks	Machines		
Process certifications									
ISO 9001:2015[4]	✓	✓	✓	✓	✓		✓		
HACCP[5]				✓					
FSSC 22000[6]	✓	✓	✓		✓	✓		✓	✓
Product certifications									
UTZ/Rainforest Alliance[7]	✓	✓	✓	✓	✓			✓	
Fairtrade[8]									✓
Confida[9]	✓	✓	✓						
Bio-Organic[10]	✓	✓	✓	✓	✓				
National Organic Program (NOP)[11]								✓	
Canadian Organic Regime (COR)[12]									✓
Certifications of a religious nature									
Kosher	✓	✓	✓	✓	✓	✓		✓	✓
Halal	✓	✓	✓	✓	✓				

4) Quality Management System.
5) (Ref. CodeXAlimentarius) HACCP System – International Food Standards.
6) Food Safety Management System.
7) Rainforest Alliance is a certification attesting the origin of products deriving from sustainable agriculture that helps farmers and their families to adopt good agricultural practices and run their farms profitably, while respecting people and the planet's resources.
8) Fairtrade certification ensures growers a stable minimum price (regardless of market variations and in support of sustainable production) and a Fairtrade prize that growers' cooperatives can allocate to social projects, schools and clinics or improved production.
9) Confida (the Italian Automatic Distribution Association) ensures that companies that own automatic vending machines comply with a series of parameters and meet a high standard of quality in the provision of vending services.
10) Bio-Organic certification guarantees that production processes comply with the specific requirements for the processing of raw ingredients of organic origin. It covers all the levels of the production chain.
11) NOP is the US federal standard for organic products.
12) COR is the Canadian certification of biologic agriculture.

4.4 Ethical Standards and Child Welfare Measures

In this operating context, Lavazza Group's procurement policy is founded on principles that emphasise the promotion and safeguarding of human rights, environmental stewardship, and ethical business practices throughout its supply chain. Acknowledging the potential for human rights abuses in certain coffee-producing areas, Lavazza has introduced measures to mitigate such risks, particularly with regard to child protection (LSR, 2023). The Group aligns itself with the fundamental principles and labour rights outlined by the International Labour Organisation (ILO) and has incorporated the United Nations Guiding Principles on Business and Human Rights into its sustainability agenda. Since 2016, suppliers of green coffee have been contractually required to confirm that their coffee does not come from farms listed on Danwatch's Transparency List on Contemporary Slavery in Brazil, nor from operations that violate applicable regulations or laws (LSR, 2023). In 2017, the company integrated the Children's Rights and Business Principles (CRBP) into its framework. These guidelines, developed in partnership with Save the Children, the Global Compact, and UNICEF, aim to provide businesses with a framework to protect and advance children's rights. Consistent with these commitments, Lavazza has progressively reinforced its operational policies, introducing instruments such as the Code of Ethics, the Supplier Code of Conduct, and specific documents like *Our Commitment to Human Rights* and *Our Commitment to Children's Rights* (LSR, 2023).

4.5 Lavazza Foundation

Following the 2001 conclusion of the International Coffee Agreement (ICA), a deal between coffee-producing and consuming nations designed to stabilise prices through export quotas, many producing countries adopted structural reforms to liberalise their export markets. These measures did not prevent fluctuations in international coffee prices. Concurrently, the expansion of cultivated coffee areas in Brazil and Vietnam contributed to a supply surplus that exceeded global demand. This situation coincided with coffee prices reaching a historic low of 45 cents per pound, creating economic challenges that particularly affected small-scale producers. In this context, Lavazza introduced ¡Tierra!, its first sustainability project entirely developed internally. The initiative was intended to encourage sustainable agricultural practices, promote environmental conservation, and support the economic and social development of coffee-growing communities. Initial beneficiaries included smallholder coffee producers in Peru, Honduras, and Colombia (Lavazza Foundation Social Report (LFSR), 2022).

In 2004, the company established the non-profit Giuseppe and Pericle Lavazza Foundation to oversee its growing portfolio of sustainability projects, including ¡Tierra!. The foundation was named in recognition of Giuseppe and Pericle, sons of the company's founder, Luigi Lavazza (LFSR, 2022).

4.5.1 Mission

The Lavazza Foundation supports initiatives in coffee-growing regions aimed at enhancing coffee yields and quality, promoting entrepreneurship among growers, and improving living conditions (LFSR, 2023).

To achieve these goals, it encourages the adoption of agricultural practices intended to support both coffee quality and environmental conservation. The Foundation also assists coffee growers in establishing and managing organisations such as cooperatives and associations, which can improve access to markets, production services, credit, and marketing opportunities. Its projects further seek to address gender dynamics within communities, offer training programs to encourage youth participation in coffee farming and entrepreneurship, and promote crop diversification to strengthen food security. Additional initiatives focus on reforestation efforts through agroforestry systems to help conserve biodiversity, foster farming techniques to address climate-related challenges, and introduce technologies that complement traditional cultivation methods. (LFSR, 2023).

4.5.2 Theory of Change

The Foundation's Theory of Change (Figure 24) is based on the recognition that coffee production faces considerable challenges due to increasing climate instability, which poses risks to the availability of high-quality coffee. Studies indicate that without timely intervention, vast areas of coffee plantations could be lost in the coming decades, potentially displacing many farmers who depend on coffee cultivation as their primary source of income. Key issues affecting the sector include the decline of arable land, the need to shift cultivation to higher altitudes, reduced water availability due to erratic rainfall, diminished flowering caused by rising temperatures, more frequent pest and disease outbreaks, and heightened vulnerability among producers (LFSR, 2023).

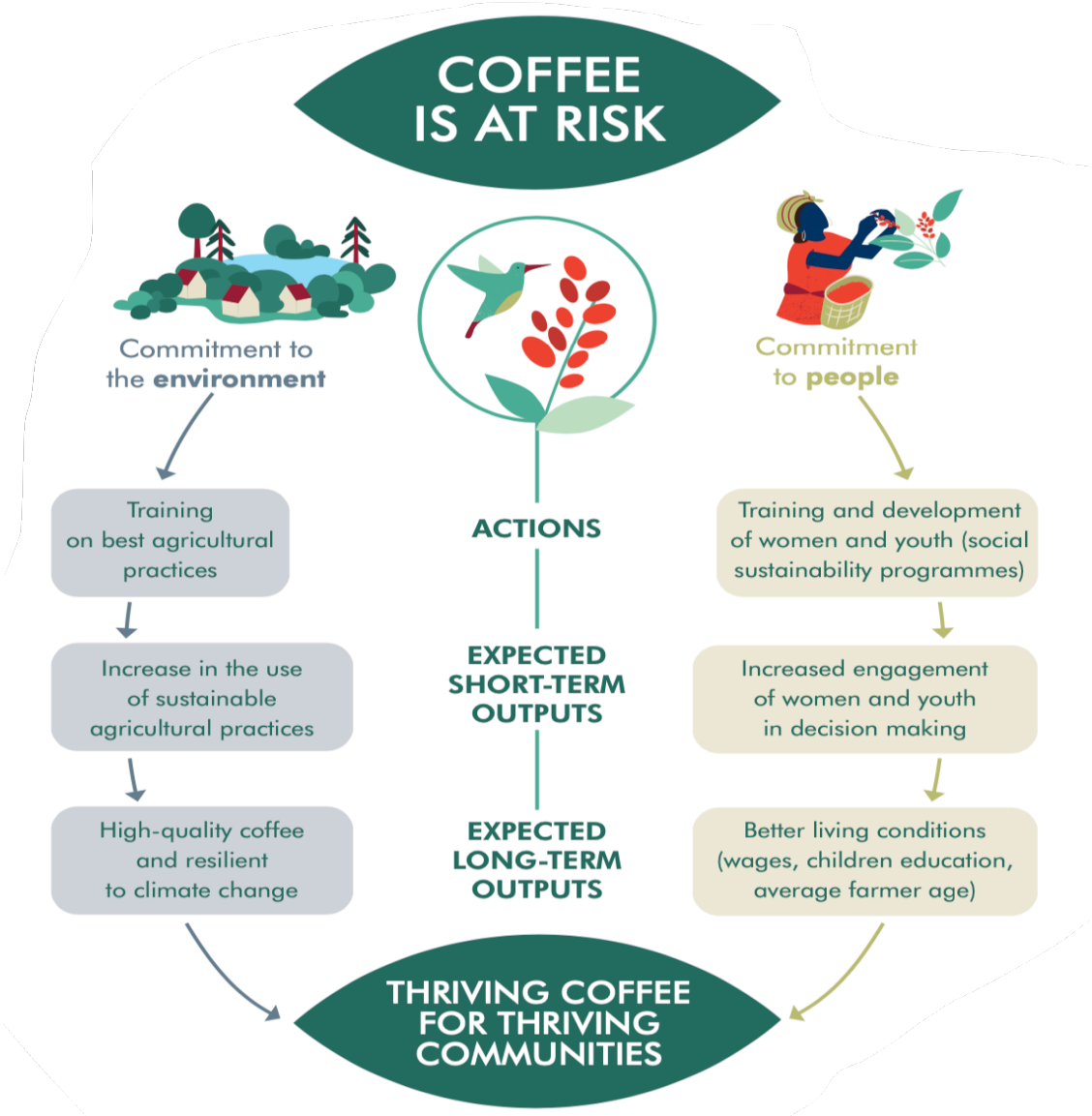


Figure 24. *Scheme of the Lavazza Foundation's Theory of Change (Lavazza Foundation Social Report LFSR, 2023). https://fondazionelavazza.com/wp-content/uploads/2024/08/Lavazza-bilancio-interno-2023_eng_web_bassa.pdf*

In response, the Foundation supports sustainable coffee production as a means of promoting long-term social and economic development, with the goal of supporting environmentally responsible and economically viable coffee-growing communities. Technological advancements increasingly contribute to these efforts by enhancing training processes and improving the efficiency of fieldwork. Expanding access to these technologies, including in remote regions, is viewed as important for reducing disparities and enabling farmers to adopt improved agricultural practices. Reported outcomes include improved coffee quality, enhanced climate resilience, better living conditions, increased income levels, greater participation of women and youth, and strengthened cooperative structures (LFSR, 2023). The Foundation's strategy prioritises collaboration with local organisations, including NGOs, institutions, and community groups, to better assess and address the specific needs of both communities and the environment. This approach seeks to ensure that solutions are contextually relevant, practical, and delivered in a timely manner, effectively responding to local challenges (LFSR, 2023).

4.6 Lavazza's approach to Sustainability

Lavazza Group's business practices, as outlined in its sustainability reports, involve attention to human capital, engagement with local communities and geographical areas, and efforts to reduce environmental impact. These actions have contributed to the ongoing development of a structured program of coordinated initiatives across its operational locations in Italy and internationally, aimed at integrating sustainability into business functions, with verification from third-party certifying organisations. In 2015, the Group published its inaugural Sustainability Report and subsequently endorsed the United Nations 2030 Agenda and its 17 Sustainable Development Goals. The path undertaken led to a gradual integration of sustainability into all business areas and to the identification, in 2020, of the four priority SDGs. The selection included two social SDGs (Goals 8 and 5) and two environmental SDGs (Goals 12 and 13) (Figure 25, Figure 26). These goals were selected for integration within the business model and application across the value chain (LSR, 2023).

Figure 25. *The SDGs integrated in the Lavazza Group's Sustainable Strategy. (LSR, 2023). https://www.lavazzagroup.com/en/sustainability/the-sustainability-report.html%3f*

Furthermore, the Group designated SDG 17 – Partnerships for the Goals – as a mechanism to contribute to the achievement of all other SDGs. Engagement with multi-stakeholder organisations focused on sustainability, such as World Coffee Research and International Coffee Partners, the implementation of public-private partnership projects, and collaboration with other stakeholders, including pre-competitive collaborations, are used to contribute to the realisation of the 2030 Agenda (LSR, 2023).

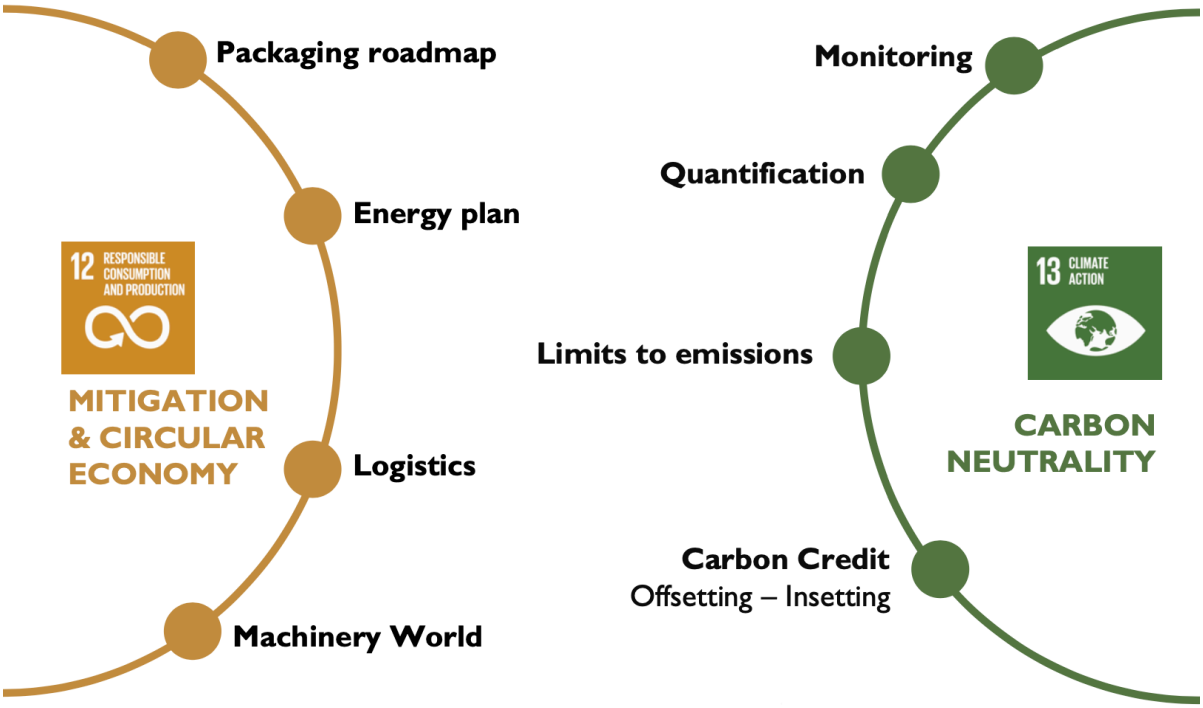


Figure 26. *Environmental SDGs and actions of the Group's sustainability stretegy, 2024*

As illustrated in Figure 26, the Group's main areas of action in relation to SDGs 12 and 13 are the following:

- **Packaging Roadmap**: A structured approach aimed at enhancing the environmental sustainability of packaging through the use of recyclable, compostable, and reusable materials, as well as reducing plastic consumption. These efforts seek to minimise waste generation and support more sustainable production methods.

- **Energy Plan**: Initiatives focused on enhancing energy efficiency, transitioning towards renewable energy sources, and reducing greenhouse gas emissions across production plants. This approach contributes to lowering the environmental footprint of industrial operations while promoting cleaner energy solutions.

- **Logistics**: Measures to optimise logistics processes by improving transport efficiency, reducing emissions, and promoting more sustainable distribution models in collaboration with supply chain partners.

- **Machinery World**: Technological innovations applied to production equipment to improve energy efficiency, optimise resource consumption, and reduce waste during manufacturing processes. These advancements

contribute to mitigating environmental impacts within operational processes.

- **Monitoring**: The continuous assessment of carbon emissions across the value chain to support data-driven decision-making, transparency, and accountability in emission reduction efforts. This process helps track trends and evaluate the effectiveness of implemented strategies.

- **Quantification**: The measurement and analysis of greenhouse gas emissions at various stages of operation, enabling the identification of primary emission sources and the development of targeted mitigation strategies. This approach is essential for establishing verifiable baselines and tracking progress.

- **Limits to Emissions**: The adoption of measures to reduce greenhouse gas emissions, including improvements in energy efficiency, the use of renewable energy, and process optimisations aimed at lowering the environmental footprint.

- **Carbon Credits (Offsetting – Insetting)**: The application of carbon offsetting (compensating for emissions through externally verified initiatives such as afforestation and renewable energy projects) and insetting (implementing emission reduction measures within the organisation's own supply chain) to support carbon neutrality. This combined approach aims to balance emissions while integrating sustainability considerations into business operations.

Sustainability is integrated into Lavazza's corporate strategy, addressing environmental, social, and economic dimensions, as detailed in the company's sustainability reports. This approach has developed alongside Lavazza's engagement with coffee-growing communities, incorporating initiatives aimed at reducing environmental impact, advancing social equity within the supply chain, and promoting sustainable economic development (Figure 27). A key component of this strategy is the generation of sustainable value for stakeholders, ensuring that the company's initiatives contribute not only to environmental and social well-being but also to the long-term economic sustainability of all parties involved. Lavazza focuses on the entire coffee value chain, adopting a "from bean to cup" perspective, which facilitates the identification and addressing of sustainability challenges at each stage (LSR, 2023). Concurrently, the company recognises the

importance of biodiversity in coffee-originating countries as a fundamental element for the health of the coffee-growing ecosystem. Collaboration between the company, the Lavazza Foundation, major coffee traders, local farmers, and institutions contributes to biodiversity preservation within producing country ecosystems and promoting actions against deforestation (LSR, 2023).
This approach emphasises ongoing engagement and collaboration with all supply chain stakeholders, and is supported by the Corporate Policy for Occupational Health & Safety, Energy, and Environment (LSR, 2023). This policy prioritises environmental protection, energy conservation, and worker health and safety as components of business development.

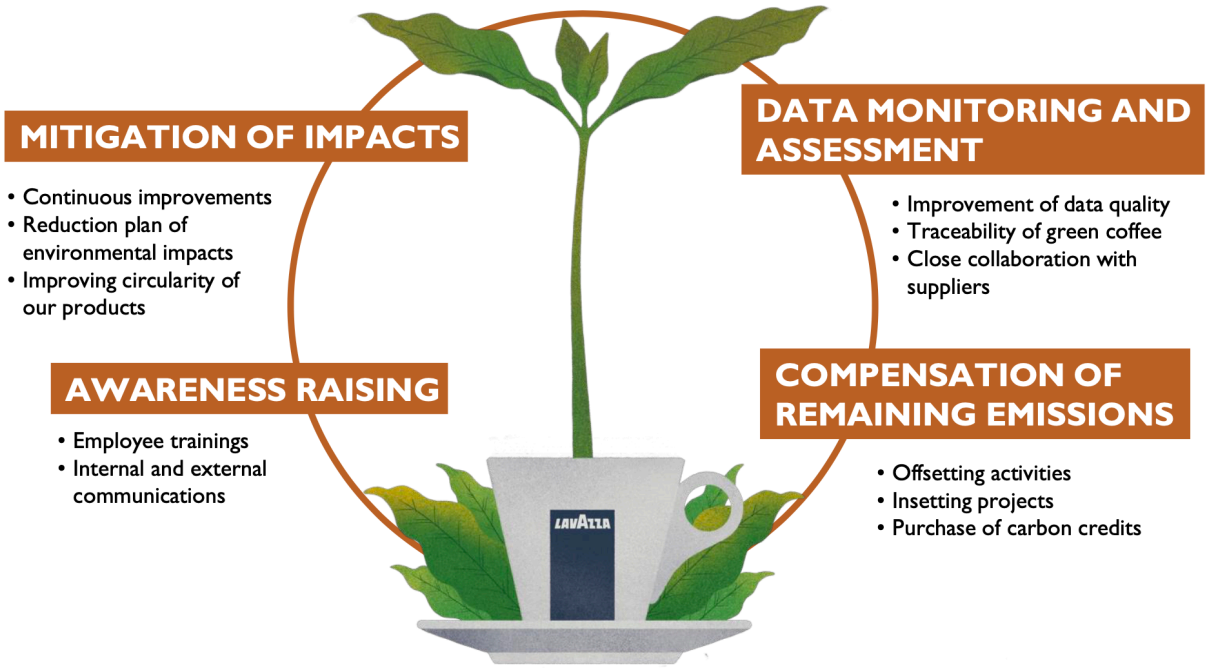


Figure 27. *Scheme of Lavazza's approach to a sustainable business, 2024*

5 Results

This chapter presents a comprehensive analysis of the 'Roadmap to Zero' strategy, detailing the key measures implemented to progress towards the objective of achieving carbon neutrality by 2030. It is structured into three main sections: Measurement, Reduction, and Compensation.

The Measurement section details the Group's approach to GHG quantification, including methodologies for emissions assessment and reporting.

The Reduction section explores initiatives aimed at minimising emissions across the value chain. This includes strategies related to renewable energy adoption, circular economy principles, and energy efficiency improvements. Specific projects such as sustainable packaging development, waste and water management, and efforts to mitigate supply chain impacts are also discussed. Furthermore, targeted programs address deforestation and biodiversity protection, with projects highlighting sustainable coffee production in Ecuador and Cuba.

The Compensation section focuses on carbon credits mechanisms, detailing the Group's offsetting and insetting strategies. It includes an analysis of the insetting project in Colombia, where agroforestry and land restoration initiatives contribute to carbon sequestration and sustainable agriculture. The section also examines carbon offsetting efforts through externally verified projects that complement internal reduction measures.

5.1 Roadmap to Zero Strategy

As a manufacturing company, Lavazza addresses the reduction and mitigation of greenhouse gas emissions from combustion in coffee production and roasting, and from the consumption of resources such as energy, water, and raw materials, through the "Roadmap to Zero," a framework for this gradual impact mitigation (Figure 28). Launched in 2020 and continuously updated, the roadmap prioritises the progressive reduction of emissions and the subsequent compensation of residual, non-reducible emissions, with a focus on continuous improvement and engagement with key stakeholders (LSR, 2023).

Operational activities involve the consumption of packaging materials, energy, and water, as well as the generation of waste and production residues. Each of these processes carries an associated environmental impact, contributing to direct and indirect emissions attributable to the Group. Based on the quantification of greenhouse gas emissions, expressed in tonnes of CO_2 equivalent (tCO_{2eq}), the "Roadmap to Zero" strategy has been formulated (LSR, 2023). The focus on

reducing and offsetting emissions aligns with the broader global goal of achieving carbon neutrality, where anthropogenic GHG emissions are balanced by anthropogenic removals. This concept is crucial for mitigating climate change, as underscored by the Intergovernmental Panel on Climate Change (IPCC) in its Sixth Assessment Report (IPCC, 2021), which highlights the urgent need for substantial and sustained reductions in GHG emissions to limit global warming to well below 2.0°C, compared to pre-industrial levels.

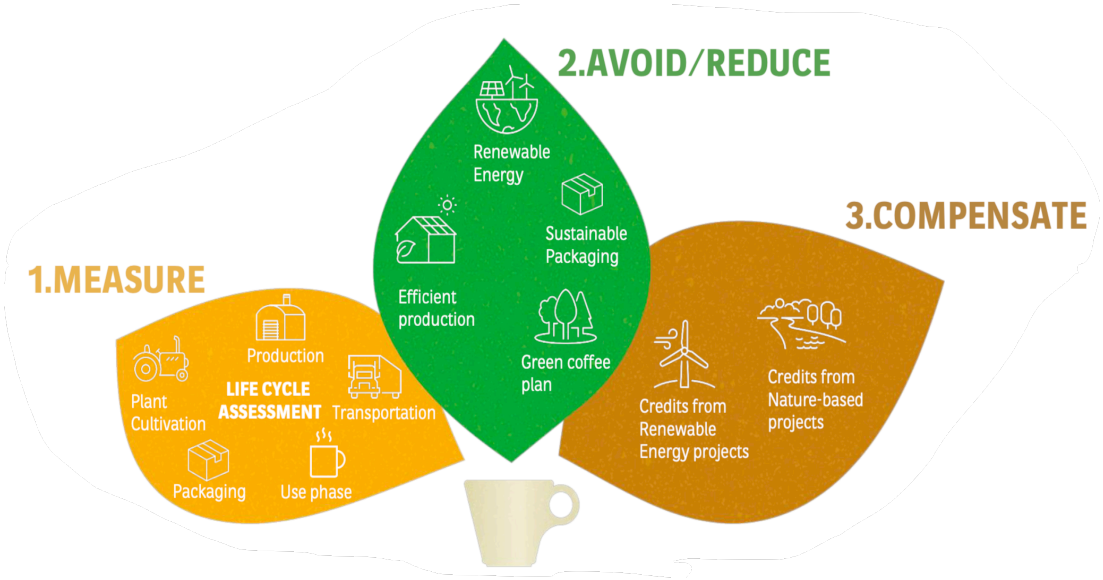


Figure 28. *The pillars of the Group's strategy to achive the Carbon Neutrality*

5.1.1 Measurement

5.1.1.1 Group's approach to GHG Measurement

Managing and mitigating the environmental impact of business operations benefits from a standardised methodology for quantifying and reporting GHG emissions. The Greenhouse Gas Protocol (GHG Protocol), a collaborative initiative of the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD), has developed a widely recognised framework to address this need. This framework establishes three distinct categories, termed "Scopes," for classifying GHG emissions, thereby facilitating a comprehensive understanding of an organisation's direct and indirect contributions to climate change (GHG Protocol, 2024). These three scopes are further divided into GHG Inventory Categories under ISO 14064-1, providing a structured approach to emissions management and reporting. This categorisation is crucial for enabling businesses to identify key emission sources within their operational boundaries and across their value chains, thus informing targeted interventions aimed at emissions reduction and enhanced sustainability performance (Figure 29).

- Scope 1 (Direct GHG Emissions): emissions directly generated and controlled by the organisation, for which the Group has a high margin of action and direct control (LSR, 2023).
    - Category 1 (C1): Direct GHG emissions and removals

- Scope 2 (Indirect GHG Emissions from Purchased Energy): emissions indirectly generated from the use of energy, in relation to which the Group has a high margin of action and indirect control (LSR, 2023).
    - Category 2 (C2): Indirect GHG emissions from imported energy

- Scope 3 (Other Indirect GHG Emissions): emissions generated indirectly by the activities along the value chain, both upstream and downstream the business, in relation to which the Group has a limited margin of action and indirect control (LSR, 2023).
    - Category 3 (C3): Indirect GHG emissions from transportation
    - Category 4 (C4): Indirect GHG emissions from products used by an organisation
    - Category 5 (C5): Indirect GHG emissions associated with the use of products from the organisation

- Category 6 (C6): Indirect GHG emissions from other sources

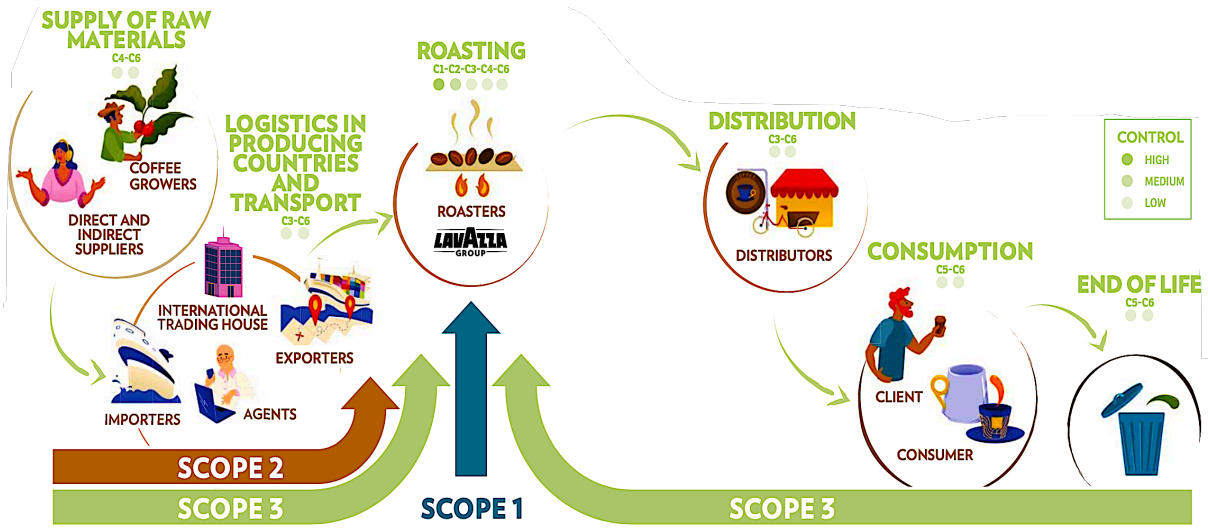


Figure 29. *Scope 1, 2 and 3 emissions across the entire value chain. LSR, 2022. https://www.lavazzagroup.com/en/sustainability/the-sustainability-report.html%3f*

Environmental impacts stemming from operational activities, encompassing the consumption of energy resources (natural gas, electricity, and fuels) and the generation of process-related materials (waste, scrap, water, and packaging), are systematically measured and monitored. This monitoring is documented through the annual compilation of a greenhouse gas (GHG) emission inventory (LSR, 2023). Since 2015, the Group has used Life Cycle Assessment (LCA) methodologies to assess the environmental impact of its products throughout their life cycle (Figure 30).

Analysis of data derived from these LCA studies, in conjunction with the value chain emission inventory, enables the Group to identify areas for potential improvement and to develop targeted mitigation projects. The emission inventory is filled in accordance with the UNI ISO 14064-1 standard and is subject to independent third-party verification by an accredited organisation (LSR, 2023).

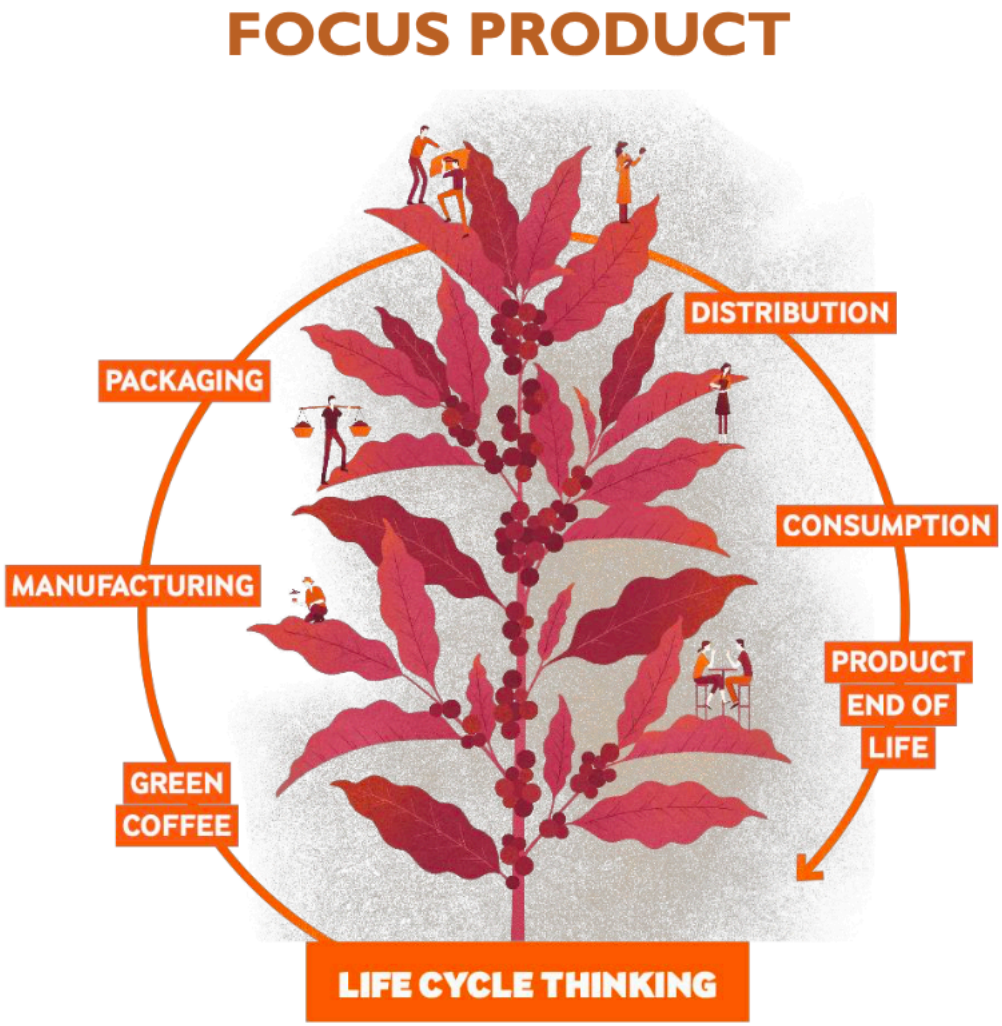


Figure 30. *Group's Life Cycle Thinking, focus product*

5.1.1.2 Examination of GHG Emissions Reporting

According to the last published Sustainability Report (2024), in 2023, the Group's total GHG emissions reached 2,812,503 tonnes of CO_{2eq} (market-based approach), distributed as follows: 1.4% (40,062 tCO_{2eq}) constituted direct emissions (Scope 1); 0.8% (21,887 tCO_{2eq}) comprised indirect emissions from purchased electricity (Scope 2); and 97.8% (2,750,555 tCO_{2eq}) represented other indirect emissions (Scope 3) (Figure 31). This overall figure reflects a 2.5% increase compared to the emissions recorded in 2022 (Table 3).

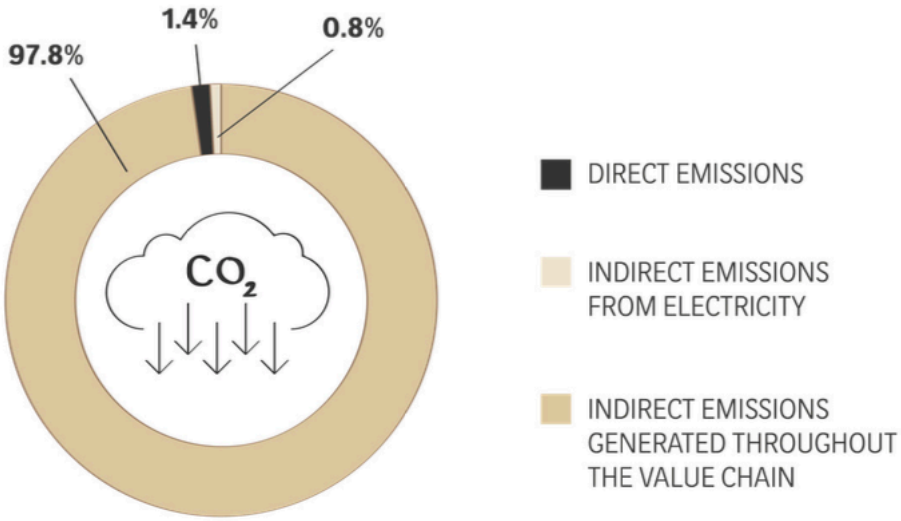


Figure 31. *Breakdown of the 2023 GHG inventory by emission category. LSR, 2023. https://www.lavazzagroup.com/en/sustainability/the-sustainability-report.html%3f*

The distinction between the location-based and market-based methods for calculating Scope 2 greenhouse gas (GHG) emissions lies in how they account for the organisation's electricity consumption and its associated emissions (GHG Protocol, 2015). Both methodologies aim to quantify the indirect emissions resulting from purchased energy (primarily electricity, but also including heat, steam, and cooling), but they differ in their approach to attributing emissions from electricity generation.

The Location-Based Approach calculates Scope 2 emissions based on the average GHG emissions intensity of the electricity grid from which the organisation draws its power (GHG Protocol, 2015). This intensity, known as the emission factor, represents the average amount of GHG emissions emitted per unit of electricity, generated within a specific geographic boundary. The emission factors are typically derived from national or regional statistics on electricity generation and fuel mix, often published by government environmental agencies or grid operators. The location-based method reflects the emissions associated with the physical

generation of electricity consumed by the organisation. It provides a consistent measure of the impact on the local environment where the electricity is produced (GHG Protocol, 2015).

The Market-Based Approach calculates Scope 2 emissions based on the specific emission factors associated with the electricity products an organisation chooses to purchase (GHG Protocol, 2015). It considers contractual instruments, such as Renewable Energy Certificates (RECs) or Guarantees of Origin (GOs), that represent the environmental attributes of specific electricity generation sources.

An analysis of the data in Figure 32, Figure 33 and Table 3 shows:

- Scope 1 emissions, encompassing direct GHG emissions from sources owned or controlled by Lavazza Group, remained relatively stable over the three-year period 2021-2023. Emissions from Category 1 (Direct GHG emissions and removals), which include consumption for production, workplace heating, and the corporate vehicle fleet, were 40,552 tCO_{2eq} in 2021, 42,767 tCO_{2eq} in 2022, and 40,062 tCO_{2eq} in 2023. A slight increase is observed between 2021 and 2022 followed by a return to a similar emission level in 2023 as in 2021 (LSR, 2023), (Figure 32).

- Scope 2 emissions, representing indirect GHG emissions from purchased electricity and thermal energy, are presented using both market-based and location-based methodologies. Using the market-based approach, emissions increased from 17,938 tCO_{2eq} in 2021 to 19,189 tCO_{2eq} in 2022 and further to 21,887 tCO_{2eq} in 2023 (Figure 32). The location-based approach, available only for 2022 and 2023, shows a similar upward trend, with emissions of 50,156 tCO_{2eq} in 2022 and 51,114 tCO_{2eq} in 2023 (LSR, 2023), (Table 3).

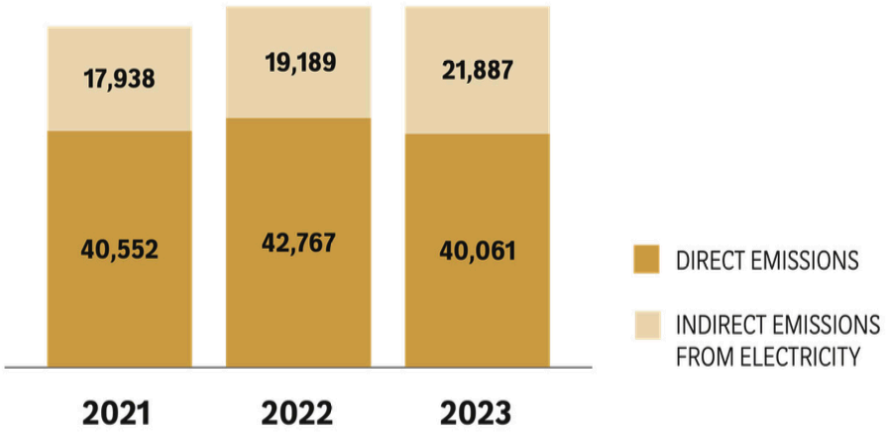


Figure 32. *Direct emissions and indirect emissions from electricity (market-based) in tCO_{2eq} in the three-year period 2021-2023. LSR, 2023. https://www.lavazzagroup.com/en/sustainability/the-sustainability-report.html%3f*

- Scope 3 emissions (Other Indirect Emissions) (Figure 33), encompassing emissions generated both upstream and downstream of the organisation (Categories 3, 4, 5, and 6 of Scope 3), constituted 97.8% of the total GHG inventory in 2023, totaling 2,750,555 tCO_{2eq} (LSR, 2023). These emissions span various phases of the supply chain, from green coffee production (the most significant category) to transport, distribution, consumption, and disposal. The indirect impact arising from the Group's use of products in the production process (Category 4) is substantial, representing 77.3% of the total in 2023. This impact primarily stems from green coffee production methods, other food raw materials, packaging materials, coffee machine production, water resources, and the generation and management of waste from business activities. In 2023, indirect emissions from resources used for production amounted to 2,174,277 tCO_{2eq}, a 3.7% increase compared to the previous year (LSR, 2023). According to the data present in the company reports, this increase is attributed mainly to a refinement of the underlying calculation model and the natural variation of blends from year to year. Within this category, green coffee pre-processing phases alone accounted for 71% of the entire inventory, underscoring the Group's focus on mitigation actions within the agricultural phase. Emissions generated from the use of products sold by the organisation (Category 5) represented 16.2% of the GHG inventory in 2023, primarily dependent on consumer coffee brewing methods and associated energy consumption. In 2023, these emissions totaled 454,131 tCO_{2eq}, a 7.8% decrease compared to the previous year mainly due to the update of data related to machine end-of-life and sold packaging (LSR, 2023). In 2023 indirect emissions from transportation (Category 3), accounting for 4.3% of total emissions, pertain to logistics and distribution activities both upstream and downstream of the supply chain (including inbound and outbound logistics), as well as employee business travel. In 2023, these emissions reached 122,148 tCO_{2eq}, a 29.1% increase compared to the previous year. This increase is attributed to the use of primary and non-literature data in calculating inbound logistics (from port of origin to port of destination) (LSR, 2023).

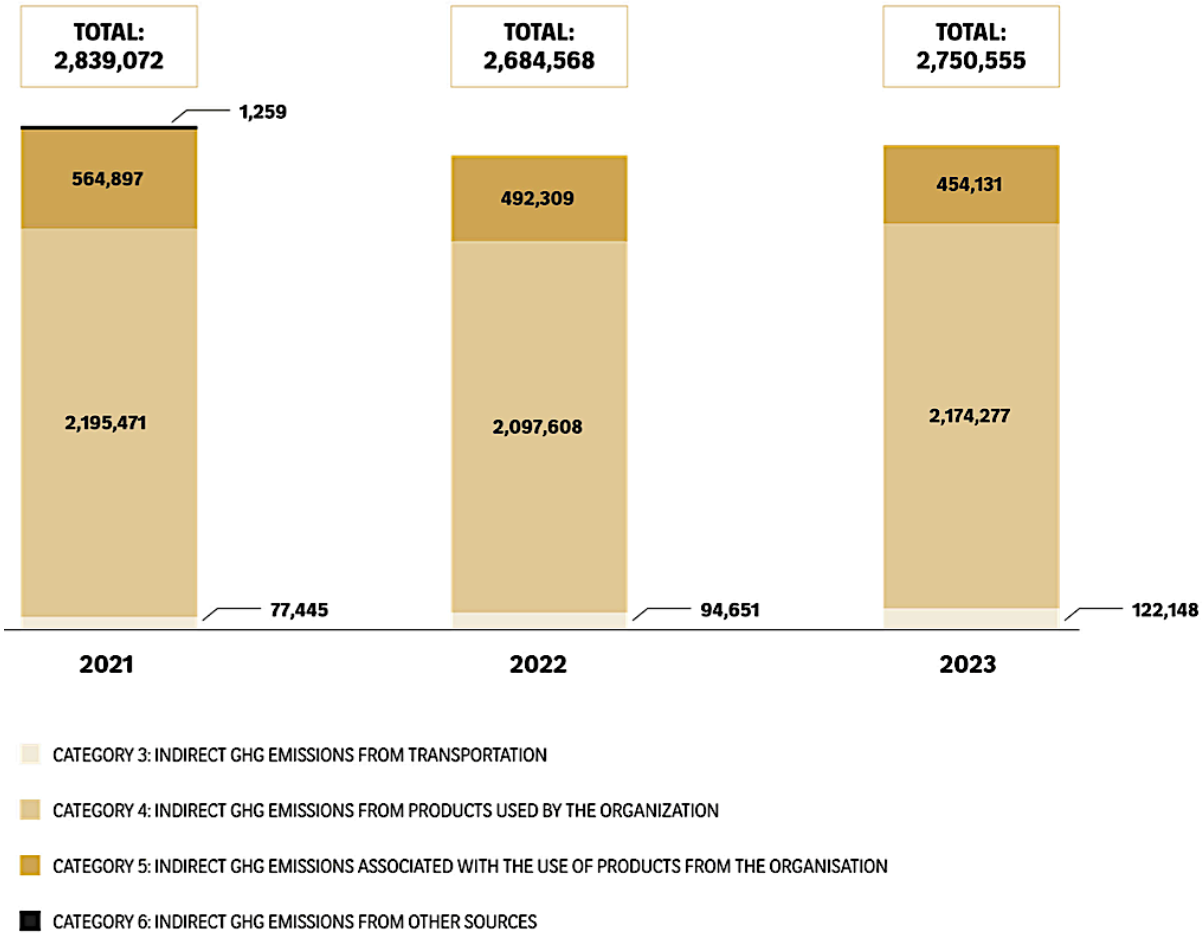


Figure 33. *Total indirect emissions generated along the value chain in the three-year period 2021-2023 in tCO_{2eq}. LSR, 2023. https://www.lavazzagroup.com/en/sustainability/the-sustainability-report.html%3f*

Table 3. *Emissions generated by Lavazza Group in the three-year period 2021-2023 in tCO_{2eq}. LSR, 2023. https://www.lavazzagroup.com/en/sustainability/the-sustainability-report.html%3f*

CONTROL BY LAVAZZA GROUP	SCOPE (GHG PROTOCOL)	GHG INVENTORY CATEGORY (ISO 14064-1)	ELEMENTS INCLUDED	2021	2022	2023
Direct emissions: emissions directly generated and controlled by the organisation, for which the Group has a high margin of action and direct control	**Scope 1**	**Category 1 (C1):** Direct GHG emissions and removals	• Consumption for production • Workplace heating • Corporate vehicle fleet	40,552	42,767	**40,062**
Indirect emissions from electricity: emissions indirectly generated from the use of energy, in relation to which the Group has a high margin of action and indirect control	**Scope 2** (Market-based)	**Category 2 (C2):** Indirect GHG emissions from imported energy (Market-based)	• Electrical energy • Thermal energy	17,938	19,189	**21,887**
	Scope 2 (Location-based)	**Category 2 (C2):** Indirect GHG emissions from imported energy (Location-based)		n.a.	50,156	**51,114**

CONTROL BY LAVAZZA GROUP	SCOPE (GHG PROTOCOL)	GHG INVENTORY CATEGORY (ISO 14064-1)	ELEMENTS INCLUDED	2021	2022	2023
Indirect emissions generated along the value chain: emissions generated indirectly by the activities along the value chain, both upstream and downstream the business, in relation to which the Group has a limited margin of action and indirect control	**Scope 3**	**Category 3 (C3):** Indirect GHG emissions from transportation	• Inbound and outbound logistics • Employee business travel and commuting	77,445	94,651	**122,149**
		Category 4 (C4): Indirect GHG emissions from products used by an organization	• Green coffee • Food raw materials • Packaging • Machines • Water consumption • Production waste	2,195,471	2,097,608	**2,174,277**
		Category 5 (C5): Indirect GHG emissions associated with the use of products from the organisation	• Usage • Packaging end-of-life • Coffee end-of-life • Machine end-of-life	564,897	492,309	**454,131**
		Category 6 (C6): Indirect GHG emissions from other sources	• Other	1,259	n.a.	**n.a.**
Total emissions (Market-based)				**2,897,562**	**2,746,525**	**2,812,503**
Total emissions (Location-based)				**n.a.**	**2,777,491**	**2,841,730**

5.1.2 Reduction

5.1.2.1 Value Chain Approach to Emissions Reduction

Based on the results of environmental impact measurement and ongoing monitoring, the Group formulates its reduction strategy across the entire value chain through targeted improvement plans. These plans address several key areas of intervention, including green coffee (5.1.2.8.1), coffee machines (5.1.2.4), production and packaging (5.1.2.5). This strategy prioritises areas where the company's business activities generate the most significant direct and indirect impacts. An analysis of data from the company's sustainability reports, as detailed in the subsequent sections, identifies several initiatives aimed at reducing GHG emissions. These include collaborative projects with suppliers focused on mitigating the environmental impact of green coffee production, specifically targeting direct mitigation actions within the agricultural phase (5.1.2.8). Further initiatives involve projects centered on enhancing energy efficiency and incorporating alternative energy sources and materials within production facilities (5.1.2.2, 5.1.2.3) (LSR, 2023).

5.1.2.2 Renewable Energy

Since 2023, electricity powering seven of the Group's eight production plants, located in Italy, France, the United Kingdom and Canada, is sourced from renewable sources. This outcome stems from a plan initiated in 2012, which has resulted in 97% of the Group's total coffee production being processed using renewable electrical energy (LSR, 2023). Indirect emissions from electricity calculated according to the Market-based approach amounted to 21,887 tCO_{2eq} in 2023, up by 14.1% compared to the previous year, as a result of the energy mix used. The value calculated according to the Location-based approach is equal to 51,114 tCO_{2eq}: this indicates that, for the same level of consumption, the Group would have generated more than double the indirect emissions from electricity without the purchase of energy backed by Guarantees of Origin, which certify its renewable source and are issued by qualified plants such as those certified by the Energy Services Manager (GSE) in Italy. The discrepancy between the market-based and location-based figures is directly attributable to this procurement of certified renewable energy (LSR, 2023). According to the data provided, the Group's thermal energy for production and workplace heating derived from fossil fuels (natural gas, diesel, and LPG) amounted to 524,062.1 GJ in 2021, 563,288.8 GJ in 2022, and 525,653.8 GJ in 2023. During each of these years, natural gas represented the majority share of fossil fuel consumption, with smaller

contributions from diesel and LPG. By contrast, the biomass-based district heating system supplied 396.4 GJ in 2021, 344.2 GJ in 2022, and rose considerably to 27,595.5 GJ in 2023 (Table 4). The growing reliance on biomass-based district heating reflects the Group's broader shift towards more sustainable energy solutions in place of conventional fossil fuels and underscores the potential for renewable sources to reduce emissions associated with both production processes and workplace heating. Of the total electricity sourced from the grid, 90% is certified through Guarantees of Origin, ensuring its renewable origin (Table 4). Additionally, the photovoltaic systems installed at the Italian Gattinara plant and the Nuvola Headquarters in Turin contribute to energy self-production, generating approximately 2,000 GJ of renewable energy annually.

5.1.2.3 Energy Efficiency Initiatives

Lavazza's core activity is the roasting phase, which represents a crucial stage in the transformation of green coffee beans into the final product, ready for consumption. This process involves applying heat to the beans, which alters their chemical and physical characteristics, thereby unlocking a range of complex flavors and aromas that define the sensory profiles of the coffee. Upon reaching the desired roasting level, the beans are rapidly cooled, typically through air cooling methods, to halt the process and prevent further alteration of their properties (ICO, CDR 2022-2023). The roasting phase has significant environmental implications, with primary concerns regarding energy consumption and the resulting emissions. This phase is energy-intensive, often depending on gas or electricity, which contributes to the overall carbon footprint of coffee production through the release of carbon dioxide. The environmental impact is contingent upon the source of energy used, whether renewable or derived from fossil fuels (ICO, CDR 2022-2023). According to Franco and Bartl (2018), the roasting stage releases 0.318 kg CO_{2eq} per kilogram of roasted coffee when using solar energy, and 0.744 kg CO_{2eq} per kilogram when using grid electricity, highlighting significant variability based on the energy source.

Regarding the company's fleet mobility, the ongoing transition to a hybrid fleet, as evidenced in Table 4, has led to an increase in petrol and electricity consumption, accompanied by a corresponding decline in diesel usage. In 2023, the Group's Energy Management Team (EMT) continued its activities in this area. Since 2020, the EMT has been implementing an energy efficiency building strategy, initially launched at the Italian and French plants and subsequently extended to all global facilities. Over time, the EMT's remit has expanded to include a comprehensive analysis of production processes to rationalise and optimise energy utilisation. Key

initiatives include: heat recovery from compressor cooling at the Turin and Gattinara plants, repurposed for civil use; optimisation of engines and boilers; burner replacement; and revamping and efficiency improvements to compressed air distribution systems (LSR, 2023). Data indicate that energy consumption per tonne of coffee produced has gradually decreased (Table 5).

Table 4. *Total energy consumption of the group over the three-year period 2021-2023. LSR, 2023. https://www.lavazzagroup.com/en/sustainability/the-sustainability-report.html%3f*

ENERGY CONSUMPTION	UoM	2021	2022	2023
Consumption for production and workplace heating	**GJ**	**524,062.1**	**563,288.8**	**525,653.8**
Natural gas	GJ	495,498.3	530,019.7	498,142.1
Diesel	GJ	126.0	285.1	57.0
LPG	GJ	28,437.7	32,984.0	27,454.8
Consumption for the corporate vehicle fleet	**GJ**	**71,199.9**	**120,172.0**	**99,347.7**
Petrol	GJ	71,199.9	18,296.8	34,020.5
Diesel	GJ	-	101,871.7	65,228.3
LPG	GJ	-	0.8	11.0
Electricity for car fleet	GJ	-	2.8	87.9
Electricity consumption	**GJ**	**361,157.1**	**367,939.9**	**350,605.1**
Self-production and consumption of electricity from renewable sources	GJ	2,260.8	2,225.0	1,996.2
Electricity from renewable sources purchased from the grid	GJ	331,280.5	327,590.3	311,320.1
Electricity from non-renewable sources purchased from the grid	GJ	27,615.9	38,124.5	37,288.8
District heating	**GJ**	**396.4**	**344.2**	**27,595.5**
Total consumption	**GJ**	**956,815.5**	**1,051,744.7**	**1,003,202.2**

Total energy consumption in 2023 amounted to 1,003,202 GJ, a 4.6% decrease compared to 2022 (LSR, 2023). The emission reduction strategy also encompasses the Single Serve portfolio, including Blue, Firma, Flavia Freshpacks containing coffee (Alterra and Lavazza Brand), aluminum Lavazza A Modo Mio capsules compatible with Nespresso Original machines (NCC), and Soft Pods. These systems, which have been certified Carbon Neutral since 2021, are subject to annual emission reduction plans focusing on three key areas: optimisation of packaging materials, the impact of green coffee production, and energy efficiency (LSR, 2023). Based on the data presented in the Table 5, the total energy intensity

index decreased from 3.88 GJ/t in 2022 to 3.72 GJ/t in 2023, marking a 4.1% reduction. Compared to 2021, when the index was 3.81 GJ/t, this represents a cumulative improvement, indicating progress in energy efficiency over the period. An analysis reveals a consistent decline in the energy intensity of electricity consumption, which fell from 1.44 GJ/t in 2021 to 1.36 GJ/t in 2022, and further to 1.30 GJ/t in 2023. Likewise, the energy intensity related to fuel consumption (excluding the corporate vehicle fleet) decreased from 2.09 GJ/t in 2021 to 2.08 GJ/t in 2022, followed by a more substantial drop to 1.95 GJ/t in 2023. These reductions underscore the effectiveness of the Group's energy efficiency initiatives. The declining energy intensity indices suggest that operational improvements have contributed to more resource-efficient production processes over time.

Table 5. *Energy intensity GJ/tonne of coffee produced 2021-2023. LSR, 2023. https://www.lavazzagroup.com/en/sustainability/the-sustainability-report.html%3f*

ENERGY INTENSITY (GJ/t)	2021	2022	2023
Total energy intensity	3.81	3.88	3.72
Energy intensity - electricity	1.44	1.36	1.30
Energy intensity - fuels used in the process (excluding the corporate vehicle fleet)	2.09	2.08	1.95

5.1.2.4 Sustainable innovation for coffee machines

The Group's commitment to reducing its environmental impact is reflected in the design of its machines, as outlined in its sustainability reports (LSR, 2022 ;LSR, 2023). The approach emphasises the efficient use of natural resources and the development of coffee machines that meet high energy efficiency standards. According to the available data, none of the machines in the Group's product range are rated below energy class A, with 33% of the machines achieving an A+ rating (LSR, 2023). A notably example is the Tiny Eco model (Figure 34), commercially available since 2022, designed for the Lavazza A Modo Mio capsule system, is reported to be made from up to 61% recycled plastic and packaged using 100% recycled cardboard. Additionally, it operates with low energy consumption (Energy Class A+), contributing to an emission reduction of up to 20% compared to previous models (LSR, 2023).

The Group also reports ongoing efforts to enhance the durability of its domestic coffee machines, aiming to extend their useful life. Furthermore, the company continues to expand its professional repair services for coffee machines within the Food Service sector, specifically for the Away From Home consumption market (LSR, 2023).

Figure 34. *Tiny Eco Lavazza coffee machine.* Lavazza, 2025. https://www.lavazza.it/it/macchine-da-caffe/a-modo-mio-tiny-eco

5.1.2.5 The Sustainable Packaging Roadmap

An important challenge for the coffee industry is developing packaging that incorporates renewable and recycled materials, minimises material quantity and weight, and promotes end-of-life reuse, recycling, or composting. This challenge is particularly complex for coffee capsules, which have experienced rapid growth and present significant waste management concerns (ICO, CDR 2022-2023). Circularity should be a key design consideration for both products and packaging, ensuring material recovery and reuse. For these applications, the focus should be on minimising resource extraction and waste. Achieving sustainability in this context requires measurable KPIs to determine optimal eco-design strategies. Packaging must protect contents, convey product information, facilitate transportation, and minimise environmental impact through resource loop closure. Environmental performance must align with product protection, ensuring quality and hygiene without compromising machinability, aesthetics, or usability (ICO, CDR 2022-2023).

Roasted coffee requires high-barrier packaging to preserve quality, as it deteriorates when exposed to moisture, air, and light. Shelf life typically ranges from 12 to 24 months, depending on packaging type and storage. Aluminum is commonly used as a barrier layer in flexible packaging, cans, and capsules, often combined with plastic or paper in flexible bags for ground coffee or whole beans. While flexible packaging uses less material than metal cans or glass jars, its large-scale recycling is challenging (ICO, CDR 2022-2023).

The Sustainable Packaging Roadmap is integrated with Lavazza's broader sustainability commitments, including its Circular Economy Manifesto and its endorsement of the UN SDGs, notably SDG 12 (Responsible Consumption and Production). Initiated in 2020, this plan sets the objective of minimising the Group's environmental footprint by ensuring that its portfolio packaging becomes recyclable, reusable, or compostable by the end of 2025 (LSR, 2023). In 2023, the application of circular economy principles (Figure 35) has resulted in 76% of the product portfolio’s packaging being recyclable, representing a 10 percentage point increase compared to 2022 and a consequent reduction in packaging impact (LSR, 2022, 2023).

Investments have been made to upgrade production facilities to accommodate the manufacturing of new recyclable packaging formats. Based on data reported for 2023 a €25 million investment across three principal production sites (Turin and Gattinara in Italy, and Lavérune in France), responsible for 91% of total production, was allocated to upgrading 23 production lines (11 new and 12 converted) for this

purpose. This has supported the industrialisation of recyclable packaging for key product formats (Figure 36). Efforts are directed towards minimising the ratio of packaging weight to product weight: for instance, in 2023, the packaging weight for the 1 kg bean format was reduced by 18%, and a reduction in tin packaging weight resulted in a 7% decrease in CO_{2eq} emissions (LSR, 2023).

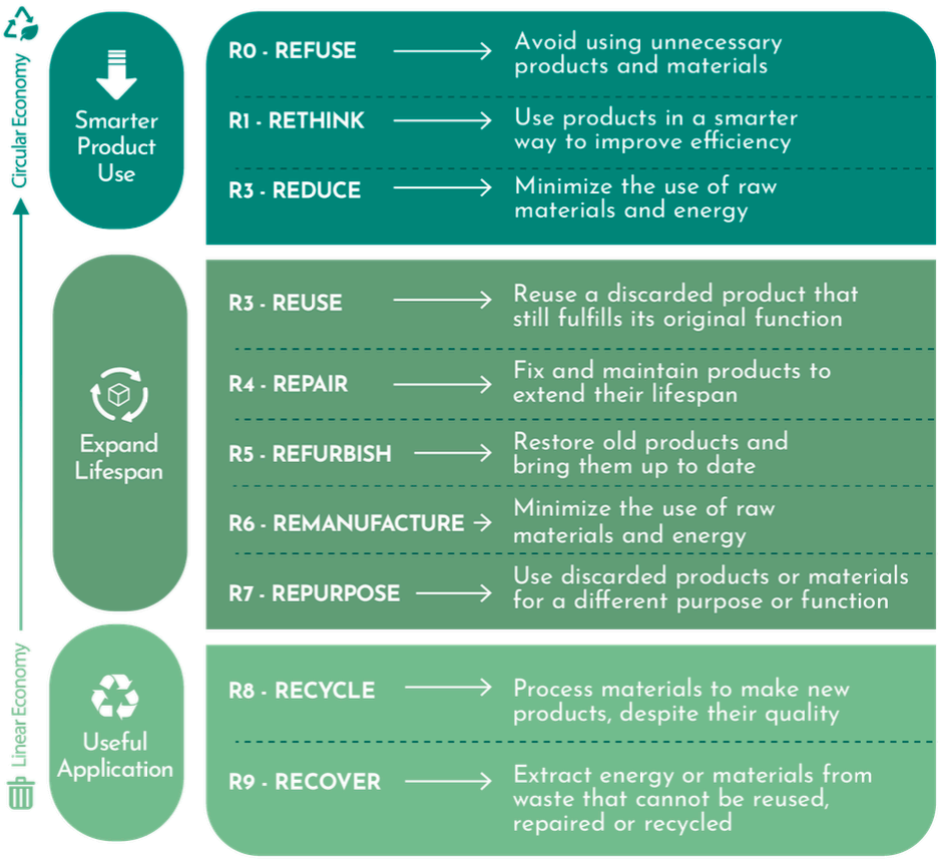


Figure 35. *Circular economy principles. International Coffee Organisation ICO. Coffee Development Report (CDR) 2022-23 (2024). https://ico.org/coffee-development-report-2/*

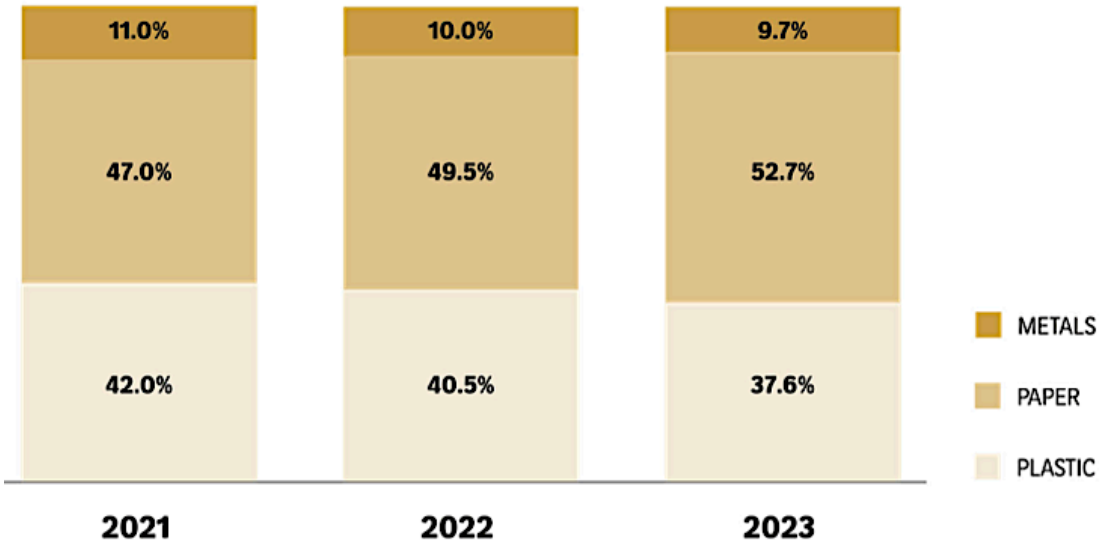


Figure 36. *Materials used in packaging by weight in the three-year period 2021-2023. LSR, 2023. https://www.lavazzagroup.com/en/sustainability/the-sustainability-report.html%3f*

- Plastic Usage: the proportion of plastic has declined, from 42% in 2021 to 37.6% in 2023. This downward trend aligns with the Group's objective to reduce the use of conventional plastics, as evidenced by a reported 10.4% reduction from 2021 levels. The shift toward alternative materials likely contributes to lowering the environmental footprint by decreasing reliance on petroleum-based resources and reducing associated CO_{2eq} emissions.

- Paper Usage: the proportion of paper has steadily increased, rising from 47% in 2021 to 52.7% in 2023. This shift indicates a prioritisation of paper-based solutions, which are often more recyclable and biodegradable compared to plastic.

- Metal Usage: the use of metals has remained relatively stable, showing a slight decline from 11% in 2021 to 9.7% in 2023. Although metals provide high-barrier properties crucial for preserving coffee quality, their environmental impact depends heavily on the efficiency of recycling systems.

5.1.2.6 Waste management

The production and treatment of industrial waste from coffee roasting are monitored and managed through the Integrated Management System for Health, Safety, Energy, and the Environment, in accordance with circular economy principles and with a focus on waste minimisation (LSR, 2023). During the production cycle, coffee waste and other waste types are generated and subsequently stored in designated areas for collection and reuse by third parties. The primary waste composition consists of: 37.3% compostable material from production; 28.8% paper and other packaging materials and 10.3% plastic. Compared to 2022, waste generation exhibited minimal change, with a slight 0.4% decrease. The Group predominantly generates non-hazardous waste, with hazardous waste constituting a minimal proportion of 2.5% (LSR, 2023). Monitoring of waste diversion is conducted in accordance with the objectives outlined in the Group's Environmental Policy.

- 89.5% of total waste is recovered or recycled, while the remaining 10.5% is directed to disposal methods such as energy recovery or wastewater purification (Table 6).
- 98% of vegetable waste from coffee processing at Italian plants, amounting to 3,900 tonnes annually, is transferred to a company specialising in organic fertiliser production (LSR, 2023).

Table 6. *Waste generated in the three-year period broken down by disposal method. LSR, 2023. https://www.lavazzagroup.com/en/sustainability/the-sustainability-report.html%3f*

		2021			2022			2023		
WASTE DISPOSAL	**UoM**	**HAZARDOUS**	**NON-HAZARDOUS**	**TOTAL**	**HAZARDOUS**	**NON-HAZARDOUS**	**TOTAL**	**HAZARDOUS**	**NON-HAZARDOUS**	**TOTAL**
Prepared for re-use	t	-	144.0	**144.0**	-	95.6	**95.6**	-	92.3	**92.3**
Recycling	t	136.6	4,851.8	**4,988.4**	147.1	5,779.7	**5,926.8**	118.4	4,704.7	**4,823.1**
Other recovery operations	t	28.6	6,593.9	**6,622.6**	39.9	6,045.0	**6,084.9**	26.2	7,164.4	**7,190.6**
Total waste diverted form disposal	**t**	**165.3**	**11,589.7**	**11,755.0**	**186.9**	**11,920.3**	**12,107.2**	**144.6**	**11,961.5**	**12,106.1**
Incineration with energy recovery	t	1.5	548.8	**550.3**	1.6	714.8	**716.4**	0.4	725.4	**725.8**
Incineration without energy recovery	t	1.7	-	**1.7**	-	7.8	**7.8**	-	7.3	**7.3**
Landfill	t	-	48.6	**48.6**	0.2	26.6	**26.8**	-	24.4	**24.4**
Other disposal operations	t	84.5	660.3	**744.7**	217.9	503.9	**721.8**	195.5	473.2	**668.7**
Total waste directed to disposal	**t**	**87.7**	**1,257.7**	**1,345.4**	**219.6**	**1,253.1**	**1,472.8**	**195.9**	**1,230.2**	**1,426.1**
Total waste generated	**t**	**253.0**	**12,847.4**	**13,100.4**	**406.6**	**13,173.4**	**13,580.0**	**340.5**	**13,191.7**	**13,532.3**

5.1.2.7 Water management

In the coffee sector, water usage for processes such as roasting and grinding is significantly lower than in the agricultural phase. Analogous to its approach to waste management, the Lavazza Group manages direct water usage (including consumption, withdrawals, and discharges) through its Management System. These parameters are monitored monthly to identify opportunities for enhanced efficiency and loss reduction. Water withdrawals are associated with civil hygienic-sanitary purposes and production requirements, specifically coffee roasting and decaffeination, as well as cooling of compressed air production machinery. Excluding the Pozzilli plant, where water is integral to the decaffeination process, the Turin Nuvola Lavazza Headquarters represents the second largest consumer of the Group's water resources (LSR, 2023).

An analysis of water withdrawal data reveals a substantial decrease in 2023 (Figure 37). Total water withdrawal registered a decline of over 26% compared to the preceding year (2022) and a significant reduction of approximately 36% when compared to 2021, dropping from 592.8 Ml in 2021 to 381.2 Ml in 2023.

This decrease can be attributed to the following factors: firstly, a reduction in aqueduct withdrawals was achieved through the implementation of rainwater storage systems for office use; secondly, a significant decrease in well water withdrawal for air conditioning systems was realised through interventions regulating refrigeration unit delivery and operation (LSR, 2023). It is pertinent to note that both the Pozzilli (Italy) and Basingstoke (UK) plants are located in regions classified as water stress zones, further emphasising the importance of these water conservation measures.

In terms of water consumption, a 15.2% reduction was observed in 2023 compared to 2022. When extending the analysis to 2021, the reduction in water consumption is approximately 4%, decreasing from 80.8 Ml in 2021 to 77.9 Ml in 2023. This improvement is correlated with ongoing enhancements in resource use efficiency, the continuation of the rainwater recovery project at the Turin Nuvola Headquarters, and the utilisation of recovered water from the Gattinara plant in cooling towers (LSR, 2023).

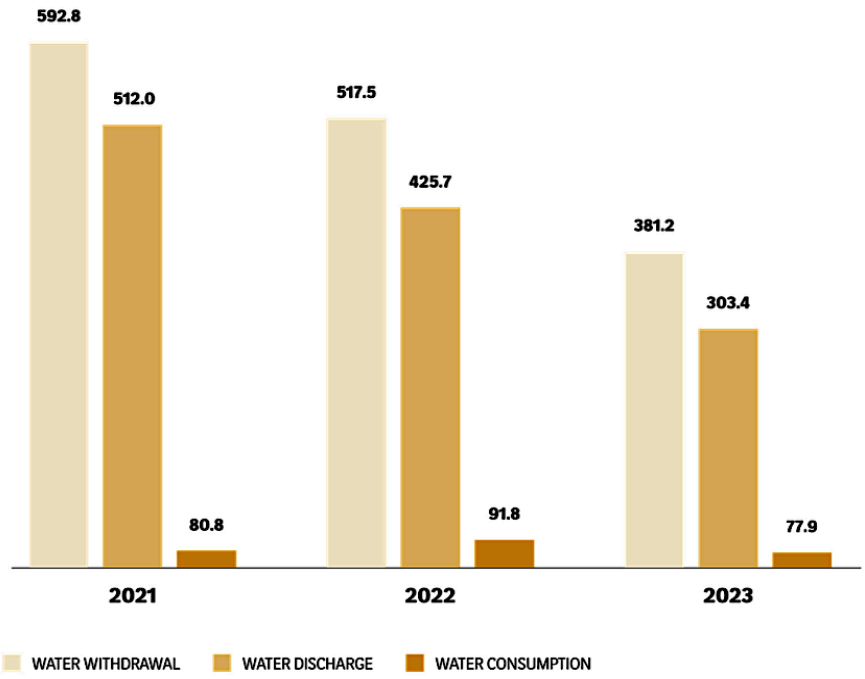


Figure 37. *Total water withdrawals, discharges and consumptions in Ml. LSR, 2023. https://www.lavazzagroup.com/en/sustainability/the-sustainability-report.html%3f*

5.1.2.8 Projects to mitigate the supply chain's impacts

5.1.2.8.1 Green coffee working group

The information provided in the Group's sustainability reports highlights a dual approach for reducing environmental impacts: targeting processes under its direct control while prioritising production phases with the highest emissions (LSR, 2023). In this context, the Green coffee working group aims to reduce emissions within the agricultural phase through collaboration with coffee suppliers, institutions, and local entities. Established in 2021 to address a category of emissions contributing to over half of the organisation's carbon footprint, this group involves key company departments engaged with raw materials, including Research and Development (R&D) and Coffee Buying Departments (CBD), and is overseen by the Sustainability Department (LSR, 2023).

In 2023, the collection and analysis of primary data from plantations within Lavazza's supply chain continued, aiming to calculate their carbon footprint through Life Cycle Assessment studies (LSR, 2023). Data collection was conducted in the field through the direct involvement of six recurring supplier traders and the indirect involvement of five others via pre-competitive projects. The geographical coverage of the analysis was extensive, encompassing over 20 data collection campaigns across more than 10 origins and involving over 5,000 farmers.

The latest Sustainability Report published by the Group reveals that a comparison of the collected primary data with existing secondary data from scientific literature indicated an overestimation of approximately 20% per kilogram of green coffee blend used in previous estimations of the environmental impact of coffee (LSR, 2023). Furthermore, the analysis identified the production processes with the highest initial emission impact, leading to the launch of three mitigation projects in 2023 in collaboration with three large traders, one in China and two in Uganda. These projects, with durations of three to five years, pursue several objectives, including assessing the effects of regenerative agriculture practices on biodiversity expansion and supporting coffee plant resilience to climate change (LSR, 2023). They also involve testing innovative solutions for improving soil quality and carbon sequestration through the use of *biochar*, a form of vegetable charcoal produced by pyrolysis of various plant biomass. When incorporated into the soil, biochar enhances water and nutrient retention, sequesters carbon, and significantly reduces nitrous oxide (N_2O) emissions associated with agricultural practices. These projects aim to deliver not only environmental benefits but also social benefits for communities and coffee farmers, including increased plantation productivity, income diversification through integrated agroforestry systems, enhanced skills in innovative practices that improve finished product quality, and healthier working environments due to reduced chemical use (LSR, 2023).

Regenerative agriculture is a systemic approach to land management that aims to restore and improve the health and functionality of natural, social, and economic systems associated with agricultural production, rather than simply mitigating negative environmental or social impacts (ICO, CDR 2022-2023). It provides a framework for agricultural practices that are aligned with natural processes, fostering sustainable and resilient agricultural systems. By prioritising soil fertility improvement through increased organic matter, this approach seeks to diminish the need for synthetic fertilisers and reduce farmers' reliance on volatile market conditions. In the context of coffee production, regenerative agriculture draws upon and adapts established knowledge and practices from diverse fields, including organic farming, permaculture, climate-smart agriculture, holistic farm management, agroecology, and traditional indigenous farming practices, tailoring these approaches to the specific ecological and social context of coffee cultivation (ICO, CDR 2022-2023). A central tenet of regenerative agriculture is diversification, which may involve increasing biodiversity through the introduction of cover crops and integrating livestock farming for both manure provision and supplemental income generation. This diversified approach aligns with principles of a circular economy by minimising waste, maximising resource efficiency, and promoting the

sustainable use and regeneration of natural resources within agricultural systems (ICO, CDR 2022-2023).

5.1.2.8.2 Fighting deforestation and protecting biodiversity

The Lavazza Group acknowledges that coffee production is intrinsically linked to the biodiversity of ecosystems in producing countries and faces considerable risks, given coffee's significant vulnerability to climate change and the widespread commercialisation of a limited range of varieties (LSR, 2023). Reforestation strategies and policies in coffee-producing regions have been supported by the Group, through partnerships involving private entities, foundations, and local and international organisations. These collaborations aim to promote sustainable development and foster international cooperation within the coffee supply chain (LSR, 2023). Since 2021, participation in the New York Declaration on Forests (NYDF) has facilitated engagement with a multi-stakeholder framework designed to consolidate various initiatives for forest protection, restoration, and sustainable land use. In alignment with these efforts, Lavazza Group collaborates with Tree-nation, a global platform that coordinates reforestation projects aimed at mitigating climate change and supporting local communities. As part of these initiatives, 50,488 trees were planted in 2023, resulting in the creation of 46.5 hectares of new forested areas (LSR, 2023).

5.1.2.8.3 A zero-deforestation coffee in Ecuador

The Lavazza Group has participated in the Deforestation-Free coffee project in Ecuador since 2019, working in conjunction with the United Nations Development Programme (UNDP) and Ecuadorian institutions. The Group, along with the Lavazza Foundation, has contributed to this initiative, which has resulted in the first "deforestation-free" certification of high-quality coffee production in Ecuador (LSR, 2023). Ecuadorian institutions, in cooperation with UNDP, developed the first national certification protocol dedicated to monitoring forest areas within coffee production. This protocol predates relevant European Union requirements and has been identified as a practice of international interest. The Lavazza Group and the Lavazza Foundation have provided technical assistance and training to over 50 participating coffee farmers, focusing on knowledge transfer related to market dynamics, quality standards, and preparation techniques (LSR, 2023).

5.1.2.8.4 La Reserva de ¡Tierra! Cuba

La Reserva de ¡Tierra! Cuba was introduced internationally in 2023. This product is derived from the company's engagement with activities related to environmental and social sustainability, with a focus on biodiversity protection, deforestation mitigation, and the pursuit of traceability and transparency (LSR, 2023). The coffee used in La Reserva de ¡Tierra! Cuba originates from the community involved in a collaborative project among the Lavazza Foundation, the Cuban Ministry of Agriculture, and the AICEC group (Agency for Cultural and Social Interchange with Cuba). A fully traceable, integrated blockchain system is utilised to provide supply chain and product information from the farmer to the consumer. Technologies, including plantation sensors for resource management and data collection on meteorological conditions (air temperature, rainfall, wind) and environmental conditions (air and soil humidity), have been implemented to support farmers in adapting to climate change (LSR, 2023; LFSR, 2022).

A total of 170 farmers from Santiago de Cuba and Granma areas have been engaged by the Foundation and its partners to enhance the quality of Cuban coffee by developing it into a premium local product. This initiative aims to promote sustainable development within local coffee-growing communities and to protect biodiversity and forests from deforestation and exploitation risks (Figure 38) (LSR, 2023; LFSR, 2022).

Five key areas of intervention have yielded the following outcomes:

- **Forest Protection**
  Forests have been safeguarded from the threat of deforestation.

- **Organic Certification and Training**
  Organic certification was achieved by the farmers involved in the project, and training courses on good agricultural practices were conducted, resulting in the establishment of 34 sustainable coffee farming schools.

- **Coffee Quality Improvement**
  Machinery was upgraded and sensors were installed to monitor environmental data, thereby enhancing the overall quality of the coffee.

- **Empowerment of Women and Youth**
  Targeted training and education initiatives were implemented to foster year-round employment opportunities.

- **Value Chain and Short Supply Chain Development**
  The Lavazza Foundation has focused on streamlining the coffee supply chain by reducing the number of intermediaries and strengthening key production activities, as well as the role of coffee growers.

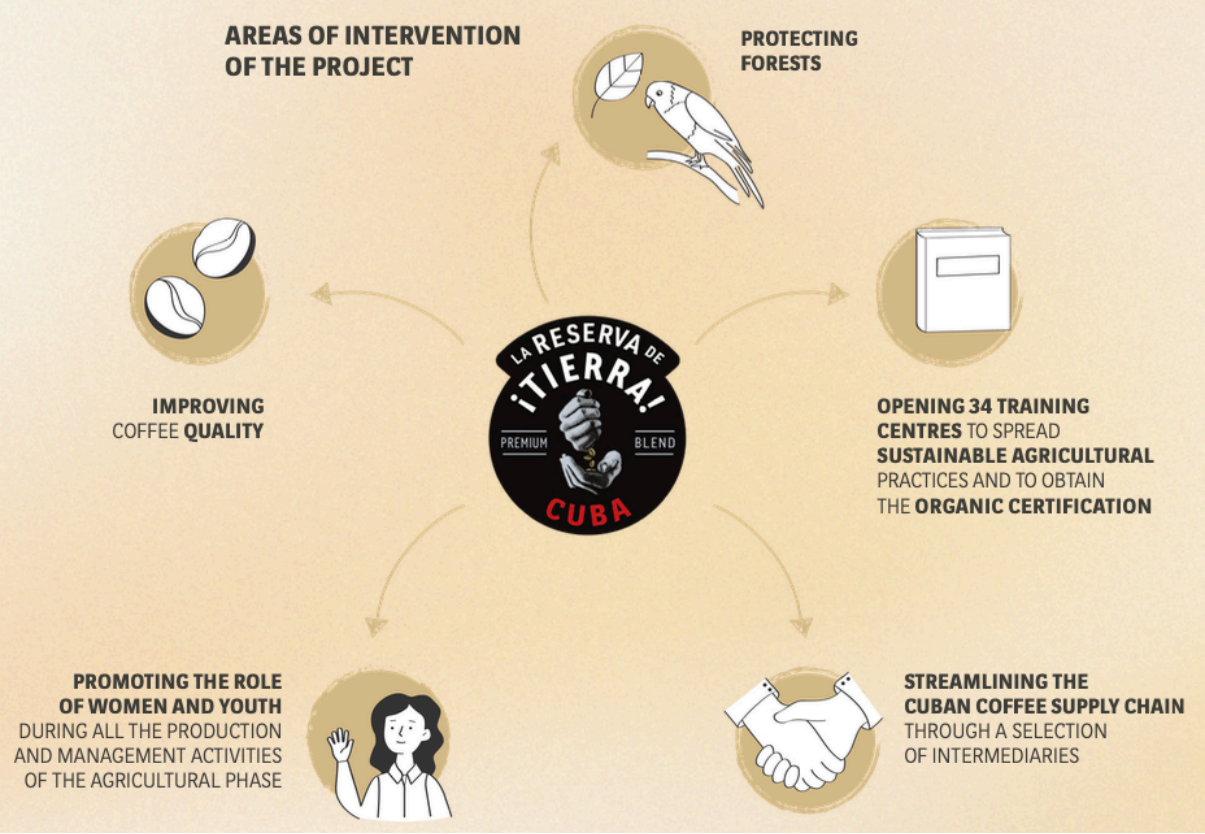


Figure 38. *Areas of intervention of the La Reserva de ¡Tierra! Cuba project. LSR, 2023. https://www.lavazzagroup.com/en/sustainability/the-sustainability-report.html%3f*

5.1.3 Compensation

5.1.3.1 Carbon Credits Mechanisms and Markets

To manage environmental impacts not directly related to core business operations, the Group utilises a strategy of compensating residual and non-reducible emissions through the acquisition of carbon credits (Lavazza Group, 2024; LSR, 2023), which are defined as tradable units generated through voluntarily implemented mitigation activities (World Bank, 2024).

These credits can represent either the reduction of greenhouse gas (GHG) emissions or the avoidance of such emissions. Carbon credits can originate from initiatives designed to mitigate emissions, such as the capture and destruction of methane from landfills or the substitution of conventional fossil fuel energy sources with advanced renewable energy systems, including solar or wind technologies, and initiatives that have avoided deforestation programs, which prevent greenhouse gas emissions through the conservation and sustainable management of existing forest ecosystems. Furthermore, carbon credits may also encapsulate the removal of greenhouse gases from the atmosphere, achieved through sophisticated methodologies such as afforestation or direct air capture technologies. Each credit corresponds to the reduction or removal of one metric ton of carbon dioxide equivalent (tCO_{2eq}) (World Bank, 2024).

The supply of carbon credits is sustained through three primary categories of crediting mechanisms:

1. **International crediting mechanisms** refer to those administered or managed by an international organisation, such as UN agencies (World Bank, 2024).
2. **Governmental crediting mechanisms**, which are administered by one or more national or subnational governments. Examples of such mechanisms include the Californian Compliance Offset Program and the Australian Carbon Credit Unit (ACCU) Scheme (World Bank, 2024).
3. **Independent crediting mechanisms**, which are overseen by non-governmental organisations, such as Verra and Gold Standard (World Bank, 2024).

Once carbon credits are utilised for either voluntary or compliance purposes, they are permanently retired, thereby precluding their use in subsequent transactions. This retirement serves as a key indicator of demand, which is driven by various factors across distinct market segments. Although individual sources of supply may cater to multiple demand drivers, the market can be broadly categorised into four primary segments (World Bank, 2024):

1. **International compliance**: this segment encompasses national governments voluntarily purchasing or utilising credits, referred to as "mitigation outcomes", to fulfill their GHG reduction commitments under international treaties, and airlines acquiring credits to meet their regulatory obligations under the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) (World Bank, 2024).

2. **Domestic compliance**: this segment includes corporations procuring credits to comply with obligations imposed by domestic regulatory frameworks, such as emissions trading systems or carbon taxation regimes. The credits used may derive from international, governmental, or independent mechanisms, contingent on the specific rules established within the jurisdiction (World Bank, 2024).

3. **Voluntary markets**: this category primarily involves private entities acquiring carbon credits to fulfill their self-imposed climate commitments. Buyers within this segment typically procure credits issued under independent standards, although some entities also acquire credits from international or governmental mechanisms (World Bank, 2024).

4. **Results-based finance**: within the context of the carbon market, it refers to the acquisition of carbon credits by governmental bodies or international organisations with the aim of incentivising climate change mitigation efforts or assisting host nations in achieving their national climate targets. Furthermore, results-based finance may also encompass broader financial transfers in exchange for the successful attainment of emission reductions or removals, even in the absence of the transfer of credits or other forms of ownership (World Bank, 2024).

5.1.3.2 Lavazza Group's Carbon Credits Strategy

The credits purchased by the Group derived from investments in carbon insetting and offsetting projects that prevent or remove CO_2 within (insetting) or outside (offsetting) the supply chain (Figure 39). As defined in the previous paragraph, each carbon credit represents the verified reduction or removal of one metric tonne of CO_2 equivalent (CO_{2eq}) from the atmosphere, aimed at counterbalancing emissions not reducible through operational adjustments, establishing an equilibrium between generated emissions and their absorption. The selection of these projects includes engagement with sustainable development initiatives that, according to the data in the Group's Sustainability Report (2023) and in the Lavazza Foundation's Social Report (2023), contribute to improvements in living conditions within local communities, generating social, economic, and environmental benefits (LSR, 2023).

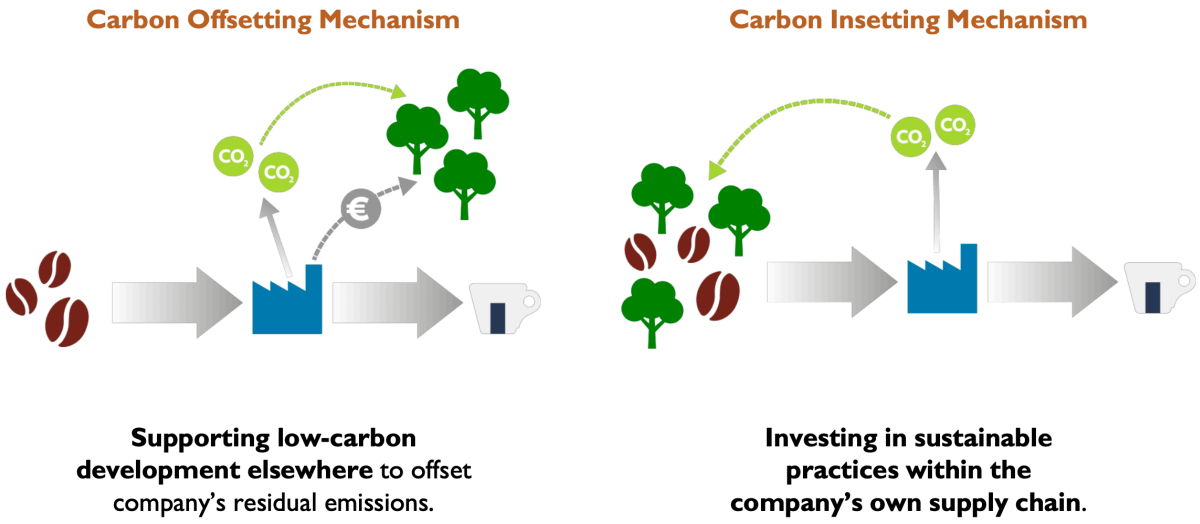


Figure 39. *Carbon Offsetting and Insetting mechanisms*

In 2022, **350,832 tCO_{2eq}** were offset on total (direct and indirect) emissions generated; in 2023, **359,860 tCO_{2eq}** were offset, addressing direct and indirect emissions from electricity consumption (Scope 1 and 2) and contributing to carbon neutrality for six product families, encompassing nearly all Single Serve products (NCC, A Modo Mio, Blue, Firma, Flavia Freshpack and Soft Pods) (LSR, 2023). The Carbon Footprint of these products has undergone annual third-party certification according to UNI EN ISO 14067 since 2021 (LSR, 2023).

The reforestation, sustainable agriculture, and renewable energy offsetting projects in developing countries, which are the basis for the Lavazza Group's carbon credits acquisitions, are certified by internationally recognised standards:

Verified Carbon Standard (VCS), Climate, Community & Biodiversity Standards (CCB), and Clean Development Mechanism (CDM).

- **Verified Carbon Standard (VCS)**
  The Verified Carbon Standard (VCS), administered by the non-profit organisation Verra, stands as the world's most widely used voluntary GHG emissions offset program. It establishes a framework for the certification and trading of carbon credits that are generated from projects demonstrably reducing or removing GHG emissions. The VCS program is characterised by its rigorous requirements encompassing project design, implementation, and ongoing monitoring. To ensure credibility and transparency, all projects undergo independent third-party validation and verification. Upon successful completion, Verified Carbon Units (VCUs) are issued, each representing one metric ton of CO_{2eq} that has been either reduced or removed. A publicly accessible registry tracks these VCUs, enhancing transparency and accountability within the VCS framework (Verra, 2025a).

- **Climate, Community & Biodiversity (CCB) Standards**
  Also under the administration of Verra, the Climate, Community & Biodiversity (CCB) Standards provide a set of stringent criteria specifically tailored for land-based carbon projects. These standards ensure that such projects deliver clear and measurable benefits not only in climate change mitigation but also in the enhancement of local communities and the safeguarding of biodiversity. Projects seeking CCB Standards certification are evaluated against specific requirements that address climate change mitigation, the well-being of local communities, and the conservation of biodiversity. Independent third-party auditors conduct thorough assessments of these projects, ensuring adherence to the CCB Standards (Verra, 2025b).

- **Clean Development Mechanism (CDM)**
  The Clean Development Mechanism (CDM), operating under the United Nations Framework Convention on Climate Change (UNFCCC), offers a structured approach for developed countries to offset their emissions. This is achieved through investments in emission reduction projects located in developing countries. The CDM facilitates the issuance of Certified Emission Reductions (CERs) for verified emission reductions. These CERs can then be utilised by developed countries to meet a portion of their emission

reduction targets as set forth under the Kyoto Protocol. Projects under the CDM must comply with specific requirements and receive approval from the CDM Executive Board (UNFCCC, 2024).

5.1.3.3 Insetting Project in Colombia

In 2023, Lavazza Group initiated the generation and purchase of Carbon Insetting credits, utilising the Acorn methodology. This programme, a collaboration between the Dutch multinational banking and financial services institution Rabobank and the organisation Solidaridad (Solidaridad Network, 2025), is being implemented within a Lavazza Foundation project in the Meta region of Colombia (LSR, 203). The Acorn methodology, developed by Rabobank, focuses on the quantification and verification of carbon sequestration through agroforestry and tree planting initiatives. It employs a standardised approach using remote sensing technologies and blockchain for transparency and scalability, ensuring accurate measurements of carbon capture and its subsequent certification (Rabobank, 2024).

The project, initiated in 2016, involving the Lavazza Foundation and the Carcafe Foundation (established by Volcafe's Colombian entity, Carcafe), has seen the addition of new learnings and partners, further enhancing its impact. The Tierra project initially engaged 100 coffee farmers who, while developing their coffee farms following a transition from other crops (including coca), also established biological corridors. These corridors aimed to contribute to nature conservation within a sensitive ecosystem located between two national parks: the Sumapaz Moor and La Macarena (Volcafe, 2024). In 2021, the German development agency GIZ joined the project as a partner, operating under its INCAS Global+ programme, with support provided by BMZ, the German Ministry for Economic Cooperation and Development. As the project has expanded, so too has the number of participating farmers. Currently, over 700 coffee farming families are involved in this initiative, which addresses a range of economic, social, and environmental challenges within the Meta region of southeastern Colombia. Through farming and conservation practices implemented across a total of 6,734 hectares, the participants are contributing to landscape preservation and livelihood improvement (Volcafe, 2024).

5.1.3.3.1 Re-establishing coffee-growing

The re-establishment of coffee cultivation in Meta presented several challenges. Unlike Colombia's traditional mountainous coffee zones, Meta's lower altitude and higher temperatures historically favored ranching. This trend was further exacerbated by a boom in illicit coca cultivation during the later decades of the country's conflict. Consequently, farmers embarking on coffee cultivation lacked established family traditions and local expertise (Volcafe, 2024). The region's low population density further complicated matters, as farms were geographically dispersed, limiting opportunities for peer-to-peer knowledge exchange. The warmer, wetter climate also increased susceptibility to pests and diseases affecting coffee plants (Volcafe, 2024).

To facilitate successful coffee cultivation in Meta, farmers required specialised guidance and training. Through the Tierra/INCAS project, farmer support technicians, utilising the “Volcafe Way” approach and drawing on expertise from Cenicafe (Colombia’s national coffee research centre), collaborated with farmers to disseminate knowledge of sound agricultural practices, aiming to enhance both coffee quality and farm productivity. Between 2016 and 2021, the project team dedicated 7,746 hours to training sessions with farmers, often employing one-on-one instruction due to farm distances and the individualised needs of each participant (Volcafe, 2024). The training curriculum encompassed topics ranging from appropriate fertiliser application and integrated pest management (IPM) strategies to nursery development, plant nutrition, and optimal harvest and storage techniques. The Tierra/INCAS project also invested in the establishment of new coffee plantations and the rejuvenation of existing ones. Since 2016, approximately 215 hectares of new coffee have been planted, and 280 hectares of existing coffee have been rejuvenated, resulting in the planting of 1,059,650 coffee trees and the rejuvenation of an additional 876,255 trees, totaling nearly 2 million coffee trees (Figure 40). These new practices and plantings have contributed to increased farm productivity. By 2021, average yields per hectare exceeded 990 kg of parchment, representing a 40 percent increase compared to the baseline value of 706 kg/ha recorded in previous years. Parchment coffee is defined as coffee beans that have undergone the complete wet processing sequence while remaining encased in a thin, papery husk known as the parchment. This intermediate stage, occurring prior to the final de-hulling and roasting processes, serves both as a protective mechanism during storage and transport and as a critical indicator of post-harvest processing quality. More recently, certain project farms have achieved yields surpassing 1,200 kg/ha (Volcafe, 2024).

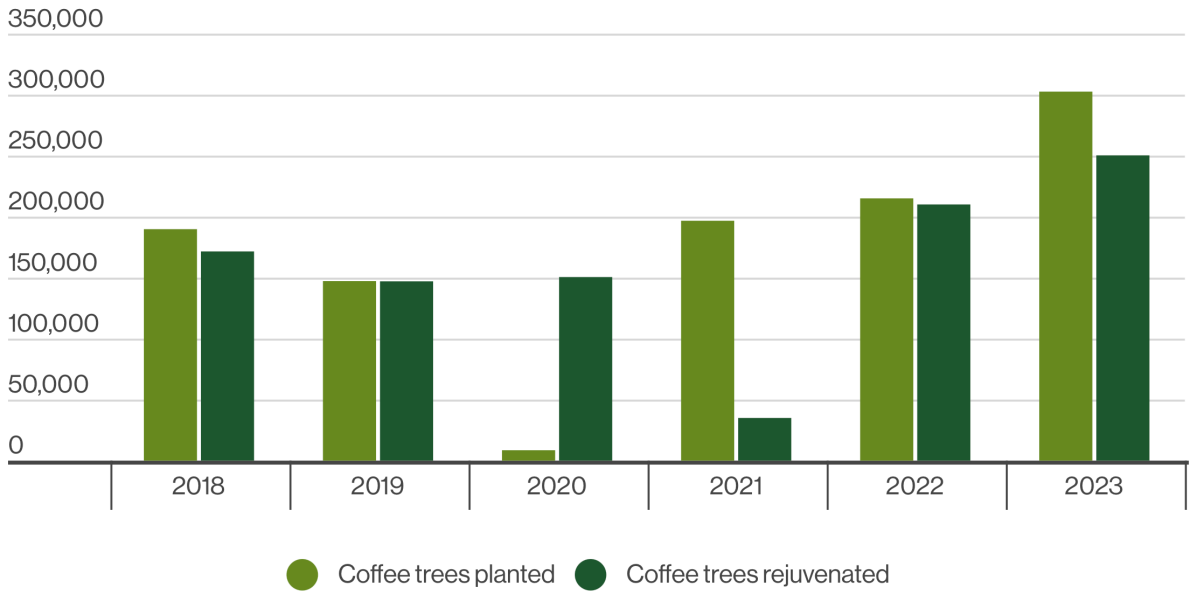


Figure 40. *Coffee trees planted and rejuvenated, 2018-2023. Volcafe, 2024. https://www.volcafe.com/news/coffee-and-agroforestry-alliance-regenerates-impact-colombia#agroforestry*

5.1.3.3.2 Agroforestry to restore nature and carbon credits generation

Given the Tierra/INCAS project's location within a region situated between two national parks and traversed by significant river systems, a carefully considered approach was necessary to mitigate past environmental impacts associated with farming and ranching. Agroforestry, including the replanting of native tree species on farms, offered multiple potential benefits, such as the creation of natural forest corridors for wildlife, improved coffee yields due to shade provided by trees (Figure 41), and enhanced food security through crop diversification (Volcafe, 2024).

Experts from the National University of Colombia provided guidance to Tierra/INCAS farmers on suitable forest protection and agroforestry strategies for the region, designing replicable systems. Subsequently, through a partnership with CATIE (a Costa Rican agricultural research institute), agronomists were trained on these agroforestry systems, enabling them to disseminate knowledge and facilitate implementation among the farmers (Volcafe, 2024).

Figure 41. *An aerial view of coffee and shade trees in an agroforestry system. Volcafe, 2024. https://www.volcafe.com/news/coffee-and-agroforestry-alliance-regenerates-impact-colombia#agroforestry*

The project partners developed four complementary agroforestry approaches for the Tierra/INCAS project area (Figure 42):

- An agroforestry and coffee system, integrating various tree species with coffee plants.
- A forest grazing system, establishing strips of grass for cattle grazing between rows of diverse tree species.
- A forestry-agriculture system, combining food crops (such as corn, squash, and beans) with rows of trees.
- Assisted natural regeneration (ANR), involving the planting of shade tree saplings near river and stream banks to create buffer zones contributing to water conservation.

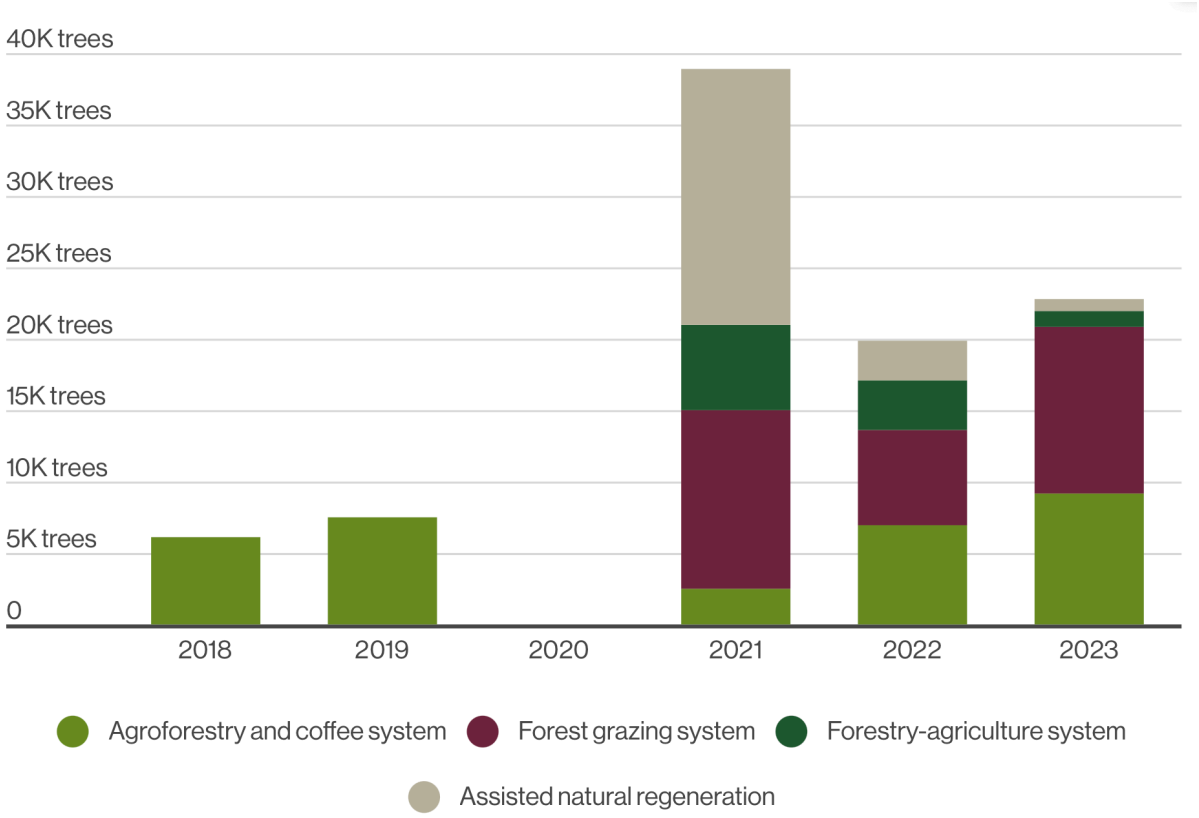


Figure 42. *Shade trees planted (by agroforestry system). Volcafe, 2024. https://www.volcafe.com/news/coffee-and-agroforestry-alliance-regenerates-impact-colombia#agroforestry*

Across the more than 700 farms involved in the project, over 95,000 shade trees have been planted alongside the nearly 2 million coffee plants established or rejuvenated. These agroforestry systems encompass 648 hectares of land, including 74 hectares dedicated to ANR. The implementation of agroforestry systems on each farm acts as a catalyst for broader ecological restoration (Volcafe, 2024). According to the Regenagri Impact Report (2023), regenerative agriculture in the coffee sector has resulted in an average annual reduction of GHG emissions of 5.34 tonnes of CO_{2eq} per hectare of land. Additionally, emissions have decreased by 1.99 tonnes of CO_{2eq} per tonne of coffee produced, considering both direct GHG reductions and biomass sequestration.

Cultivating coffee within an intercropped system alongside diverse plant species results in a diminished carbon footprint and augmented carbon stocks relative to monocultural practices (ICO, CDR 2022-2023). The incorporation of trees and varied vegetation into coffee plantations not only fosters biodiversity and enriches soil fertility but also generates supplementary income for cultivators. Coffee produced under polyculture arrangements exhibits a carbon emission range of 6.2

to 7.3 kg CO_{2eq} per kilogram of parchment coffee, compared with values between 9.0 and 10.8 kg CO_{2eq} per kilogram observed in monocultural systems. Furthermore, polycultures sequester substantially greater amounts of carbon in vegetation, with an average of 42.5 Mg per hectare, in contrast to only 10.5 Mg per hectare in unshaded monocultures. (ICO, CDR 2022-2023).

As the planted trees mature and these areas of biodiversity expand, they are expected to contribute to the extension of natural corridors across the region, effectively creating a reforested connection between the two national parks (Figure 43) (Volcafe, 2024).

Figure 43. *Agroforestry 'islands' form corridors through former grazing lands. Volcafe, 2024. https://www.volcafe.com/news/coffee-and-agroforestry-alliance-regenerates-impact-colombia#agroforestry*

Agroforestry systems have created opportunities for farmers to diversify their income streams. Since 2023, approximately 350 Tierra/INCAS farmers have enrolled their farms in ACORN. Through collaboration with Dutch partners Solidaridad and Rabobank, project farms utilising the agroforestry and coffee system are enabled to generate carbon credits corresponding to the carbon sequestered on their land. Lavazza Group, purchased these carbon credits in support of its own carbon reduction initiatives (Lavazza Group 2024; Volcafe, 2024). This collaboration represents a significant development toward compensating farmers for their provision of ecosystem services offering them the opportunity to access a new source of income and, through the enhancement of farm resilience to the effects of climate change, reduce the environmental impact within supply chain. In 2023, the Group procured a total of 1.125 Carbon Removal

Units from three distinct geographical areas: Colombia, Nicaragua, and Tanzania (LSR, 2023).

5.1.3.3.3 Supporting legal clarity on land use for farmers

The Tierra/INCAS project also provides support to coffee producers in clarifying the legal status of their farms. In certain instances, farms are located adjacent to buffer zones and waterways near protected nature reserves. Assessments of individual farms are conducted using a combination of satellite imagery and on-site inspections. The local environmental authority, CORMACARENA, uses this information to develop maps delineating legally permissible land uses for each farm. As example, a farm may have a designated zone of protected trees near a waterway and another area zoned for an agroforestry and coffee system. The specific details for each farm are documented in an agreement known as a ZARP, which is voluntarily signed by the farmer, the local mayor, and CORMACARENA (Volcafe, 2024).

Project partners GIZ, Lavazza, and Carcafe have all contributed to this initiative. In 2024, over 80 of the 250 affected farmers have formalised ZARP agreements with local authorities, committing to adherence to the designated zones, thereby contributing to both conservation and livelihood improvement efforts (Volcafe, 2024).

5.1.3.4 Offsetting projects

The Group's strategy of carbon offsetting involves investments in a portfolio of environmental projects situated in developing countries beyond the company's direct supply chain. The projects encompass a diverse range of initiatives including reforestation, sustainable agriculture, and renewable energy generation. Project selection is guided by the criteria of generating high-quality carbon credits, with strict adherence to internationally recognised standards such as the Verified Carbon Standard (VCS), the Climate, Community and Biodiversity (CCB) standard, and the Clean Development Mechanism (CDM) (LSR, 2023).

For the year 2024, the company supported the following projects (Lavazza Group, 2024):

- *Teles Pires Hydroelectric Plant, Brazil:* This project involves the operation of a hydroelectric power plant characterised by high energy efficiency, providing electricity to an estimated 13.5 million inhabitants. The plant achieves an annual reduction of 2.499.498 tCO_{2eq} (UNFCCC, 2025a). The project further encompasses a comprehensive suite of 44 socio-environmental programs, including initiatives focused on environmental education, forest restoration, land conservation, and the specific protection of indigenous communities within the region.
- *Run of River Hydroelectric Project, Chile:* The Chacayes Community Funds project, centered around a hydroelectric power plant situated in the Cachapoal Valley, has been operational since 2011. This project contributes to meeting the growing electricity demand within the nation fostering economic growth and sustainable development within the local communities. The Chacayes initiative facilitates a sustainable reduction in fossil fuel consumption, yielding an annual decrease of 340.000 tCO_{2eq} (Stantec, 2025).
- *Envira Amazonia Forest Conservation Project, Brazil:* This project safeguards a substantial area of tropical rainforest within the Amazon Basin, an area previously impacted by deforestation and conversion to agricultural land. Since 2009, 200.000 hectares of land have been transferred to the stewardship of forest management experts, with the principal objective of preserving 39.300 hectares of primary forest. The project results in an annual average reduction of 1.259.000 tCO_{2eq} emissions.

- *Yedeni Forest REDD+ Project, Ethiopia:* Situated within the Bale eco-region, this project prioritises the conservation of Africa's largest alpine forest, an area of exceptional biodiversity and ecological significance. Persistent poverty has driven extensive deforestation for firewood and agricultural expansion, facilitated by historically open access to forest land. The Yedeni project utilises a Participatory Forest Management framework, enabling local communities and government to share forest stewardship and benefit from carbon credits. Small forest-friendly businesses and cooperatives provide alternative income sources, while improved crop and livestock practices further reduce environmental pressure, reducing an average of 1.288.821 tCO_2 annually (Ecoact, 2023).
- *Windfarms Santa Clara, Brazil:* The project involves the development and operation of seven wind power generation facilities. It makes a substantial contribution to the host country's sustainable development by promoting local environmental sustainability, creating employment opportunities, and advancing technological innovation in the renewable energy sector. The project achieves an annual reduction of 149.358 metric tonnes of CO_2 equivalent (UNFCCC, 2025b).
- *Cerro de Hula Wind Project, Honduras:* This inititive constitutes the first wind farm to be connected to the Honduran national grid. It is projected to make a substantial contribution to the country's sustainable development by reducing greenhouse gas emissions, decreasing dependence on imported fossil fuels, and promoting local economic growth through strategic investments and job creation. The project achieves an annual reduction of 226.978 metric tonnes of CO_2 equivalent (UNFCCC, 2025c).
- *Oaxaca Wind Project, Mexico:* This project leverages clean energy generated by wind farms situated in Oaxaca to provide electricity to an estimated 700.000 Mexican households. This translates to an annual emission reduction of 670.000 tonnes of CO_{2eq}, equivalent to the carbon sequestration capacity of a forest encompassing 33.5 million trees. Furthermore, the project has invested over €500.000 in initiatives aimed at improving the quality of life for more than 12.000 individuals within the region.

Through the implementation of these projects, along with others selected on an annual basis, the company aims to achieve complete carbon neutrality by 2030. Additionally, by capitalising on the co-benefits generated by these initiatives, it seeks to support broader sustainability objectives, such as biodiversity conservation and the preservation of global forest resources (Lavazza Group, 2024).

6 Conclusions

This research addresses two key questions concerning carbon neutrality and supply chain sustainability in the coffee industry. It explores how manufacturing companies can achieve carbon neutrality (scopes 1 to 3) while mitigating climate-induced supply chain challenges, preserving biodiversity and stakeholder well-being. Carbon neutrality entails reducing, removing, or offsetting emissions across the entire value chain, necessitating a rigorous assessment aligned with international standards. A single case study methodology was adopted, focusing on sustainability initiatives. Data collection involved an in-depth analysis of Sustainability and Social Reports, supplemented by consultations with Lavazza's Sustainability Team and with the Project Coordinator of the insetting project in Colombia, which generates certified carbon credits within the Group's supply chain, demonstrating an integrated approach to emissions reduction and socioeconomic development. To ensure analytical consistency, the study examined data from 2021 to 2023, allowing for comparative assessment across environmental, social, and economic dimensions. Lavazza Group's Roadmap to Zero strategy outlines a comprehensive approach to mitigating environmental impact, focusing on energy efficiency, circular economy principles, waste and water management, and value chain engagement. In terms of energy transition, the company has made significant advancements, with 97% of its coffee production now processed using renewable electricity, reducing reliance on fossil fuels and lowering greenhouse gas emissions. The use of Guarantees of Origin for purchased electricity further reinforces Lavazza's commitment to renewable energy. The company's circular economy initiatives have resulted in substantial improvements in packaging sustainability. Investments of €25 million have upgraded 23 production lines across key sites, enabling the transition to recyclable packaging, covering 76% of the product portfolio in 2023, a 10% increase from 2022. Additionally, packaging weight reduction, contributes to lower material consumption and environmental impact. Waste management practices align with circular economy principles, achieving an 89.5% recovery and recycling rate, while 98% of vegetable waste from coffee processing (3,900 tonnes annually) is repurposed as organic fertiliser, effectively minimising landfill waste. Water conservation remains a priority, with rainwater harvesting systems and improved air conditioning efficiency leading to a 26% decrease in total water withdrawal and a 15.2% reduction in water consumption in 2023 compared to 2022. These measures are particularly critical for operations in water-stressed regions. Efforts to reduce agricultural emissions have also been impactful. The Green Coffee Working Group has launched three mitigation projects in China and Uganda, focusing on regenerative agriculture and biochar application to enhance soil

quality and biodiversity. Lavazza's commitment to biodiversity conservation includes participation in the New York Declaration on Forests and a partnership with Tree-nation, resulting in the planting of 50,488 trees in 2023, creating 46.5 hectares of new forest. Additionally, the company has contributed to Ecuador's first deforestation-free coffee certification. Lavazza has also advanced sustainable product development through *La Reserva de ¡Tierra! Cuba*, incorporating blockchain technology to enhance supply chain traceability and support farmers in adapting to climate change. Moreover, in 2023, the company offset 359,860 tCO_{2eq}, achieving carbon neutrality for six product families through certified reforestation, sustainable agriculture, and renewable energy projects, in alignment with international sustainability standards. These initiatives underscore Lavazza's commitment to long-term environmental responsibility and continuous progress in sustainable development.

6.1 Limitations of the research

The present study is subject to some limitations that may affect the overall comprehensiveness and generalisability of its findings. A primary constraint arises from the dynamic expansion of the Lavazza Group through successive acquisitions, which has led to an evolving reference perimeter. As a result, data collection was restricted to a defined three-year period (2021–2023) to maintain consistency and comparability of the results. Consequently, the restricted temporal window may limit the ability to capture broader cycles and long-term shifts in sustainability performance. While the study uses both quantitative and qualitative data to assess sustainability, fully quantifying intangible impacts remains challenging. These include community development, stakeholder engagement, and pre-competitive collaborations. Measuring indirect supply chain effects and integrating environmental, social, and economic variables adds complexity. Despite providing pertinent insights into Lavazza's sustainability interventions, these limitations suggest caution when generalising the results to other coffee companies, agri-food companies or timeframes.

6.2 Future research direction

Comparative analyses, including those of other agri-food companies, could establish benchmarks for this study. Further research should examine coffee cultivation and pre-processing in producing countries, the coffee supply chain's most polluting segment. This focus would facilitate the development and implementation of less environmentally impactful production methods. Future studies should investigate the socio-economic impact on communities where agri-

food companies operate. Such studies would provide insights into how corporate sustainability practices affect local livelihoods and contribute to broader social equity. The insetting and offsetting projects demonstrate a comprehensive strategy to neutralise emissions while supporting community development. Moreover, the role of the Lavazza Foundation is particularly noteworthy in this context. The Foundation exemplifies how companies can extend their influence beyond operational boundaries to achieve meaningful social impact. This comprehensive approach underscores the necessity of employing a variety of evaluation methods in sustainability research, thereby contributing to an enhanced understanding of corporate social responsibility practices. Research areas such as renewable energy integration, the application of circular economy principles, and supply chain resilience represent distinct yet interconnected dimensions that contribute to overall sustainability performance. Researchers can use rigorous techniques to explore causal relationships, assess synergistic effects, and contextualise these strategic elements in different industries and geographical settings. For instance, researchers may employ structural equation modeling (SEM); this technique allows to test complex causal pathways between multiple variables simultaneously. In the context of renewable energy integration, SEM can model how investments in solar power (as an independent variable) influence operational costs, carbon emissions, and community perception (as dependent variables), while accounting for mediating factors such as technological efficiency. To assess synergistic effects, interaction terms within SEM can be introduced to determine whether the combined effect of two or more variables, such as circular economy practices and supply chain resilience, is greater than the sum of their individual effects. However, while these quantitative approaches offer valuable statistical insights, they may not fully capture the lived experiences and contextual nuances of sustainability initiatives. To complement these methods, the Ethnographic Research provides a qualitative perspective that deepens the understanding of how corporate sustainability strategies impact communities on a social and cultural level. The Ethnographic Research is a qualitative methodology that entails an immersive engagement within the community or setting under investigation, thereby enabling the collection of detailed, first-hand data regarding the everyday experiences and practices of its members. Rather than relying exclusively on quantitative metrics, ethnographic methods, such as participant observation, in which the researcher actively engages in the community's routines, and in-depth interviews, facilitate the understanding of social behaviors and cultural contexts. For instance, when investigating the socio-economic impact of Lavazza's sustainability initiatives, researchers might conduct a prolonged field study within a local community where these programs are implemented. During

such a study, they would observe interactions between community members and the initiatives, attend local events, and conduct comprehensive interviews to ascertain residents' perceptions and experiences. This immersive approach is capable of revealing the effects of sustainability projects on everyday life, including alterations in employment opportunities, transformations in social relationships, and enhancements in overall quality of life. By elucidating these lived experiences, ethnographic research provides rich, contextual insights that complement quantitative data, thereby offering a more holistic understanding of the human dimension of corporate sustainability efforts. This approach would enable to capture the complex interplay of environmental, economic, and social factors in a rapidly changing market. Consequently, the resulting models not only advance academic understanding but also offer practical insights for policymakers and industry practitioners.

6.3 Contribution to practice

This study offers significant practical contributions to Lavazza Group, providing a comprehensive analysis of its sustainability profile, going beyond the scope of standard corporate reporting. Focusing on the period from 2021 to 2023, the research examines Lavazza's "Roadmap to Zero" through the lens of its three core pillars: measurement, reduction, and compensation. By leveraging data primarily from Lavazza's sustainability reports and Lavazza Foundation's social reports, this study analyses and quantifies the impact of key programs, such as renewable energy transition, the adoption of circular economy principles, energy efficiency initiatives, regenerative agriculture collaborations and the implementation of insetting-offsetting projects, offering insights not available in company publications. This detailed analysis allows to identify both strengths and weaknesses within Lavazza's current sustainability strategy. By identifying the areas for improvement in its strategy, several actionable measures can be introduced to improve it, thereby yielding enhanced environmental, economic, and social outcomes while concurrently improving the clarity and comprehensiveness of the sustainability reporting.

- While acknowledging the company's demonstrable attention to operational environmental impact, the complexity and scale of Scope 3 emissions, especially within its geographically dispersed and intricate agricultural supply chain, suggests the need for a more strategically defined response architecture. The analysis underscores the critical necessity of disaggregating Scope 3 emission sources into detailed categories to facilitate more effective and quantifiable reductions, particularly

considering that these emissions represent the majority of the total. Furthermore, the assessment of environmental co-benefits resulting from improved agricultural practices, as referenced in company disclosures, requires a more clearly defined and methodologically structured framework. This involves establishing precise metrics to measure the impact of sustainable farming initiatives on key environmental factors, such as carbon sequestration effectiveness, reductions in synthetic fertiliser and pesticide use, and improvements in water efficiency at the production level. These measurable improvements should then be translated into demonstrable reductions in overall Scope 3 emissions. The integration of circular economy principles across all stages of Lavazza's supply chain presents a key opportunity to advance its sustainability strategy. While internal circularity initiatives have been implemented, expanding these principles throughout sourcing, production, distribution, and end-of-life product management requires a more systemic and collaborative approach. Transitioning to a circular supply chain management system would involve optimising resource efficiency, reducing waste at each stage of production, and enhancing material recovery and reuse within operational processes. Strengthening collaboration with stakeholders is essential to achieving these objectives. Establishing closer partnerships with suppliers, farmers, logistics providers, and waste management companies would facilitate the adoption of regenerative agricultural practices, improve resource efficiency in manufacturing, and promote circular logistics strategies, such as reverse supply chains and closed-loop material flows. Concerning the carbon offsetting strategy, a more comprehensive description of Lavazza Group's projects is necessary to provide greater transparency and clarity regarding its compensation measures. While the company has implemented carbon offsetting initiatives to balance unavoidable emissions, stakeholders would benefit from a more detailed account of the specific projects supported, their environmental and social impacts, and the methodologies used to ensure their effectiveness. Providing detailed descriptions of each project, including its location, scope, and expected long-term benefits, would enable a more precise evaluation of its contribution to global carbon reduction efforts.

- In the context of economic sustainability, while Lavazza highlights investments in coffee-producing communities, a more detailed examination of the supply chain resilience is crucial. The reports could elaborate on strategies to mitigate risks associated with climate change, price volatility,

and geopolitical instability impacting coffee production. Although farmer support programs are described, a more detailed assessment of the long-term economic viability for smallholder farmers, including income diversification initiatives and access to financial resources beyond direct project funding, would strengthen the economic sustainability narrative. Furthermore, although investments in the value chain are mentioned, a more transparent methodology for measuring their economic impact on local communities, demonstrating tangible improvements in livelihoods and regional development beyond coffee production itself, would enable a more thorough assessment of their effectiveness and overall impact.

- Concerning social sustainability, the strategy, and consequently the Group's reports, could benefit from a more comprehensive framework for measuring broader social impact. This should include indicators related to fair labour practices throughout the value chain and community well-being beyond the direct project areas. Additionally, while initiatives aimed at improving farmer livelihoods are highlighted, a more in-depth discussion on addressing social challenges in coffee-producing regions, such as access to education, healthcare, and gender equality, would enhance the understanding of how Lavazza's actions contribute to broader societal improvements. This would demonstrate a more comprehensive and impactful approach to social responsibility. A more structured framework to stakeholder engagement, extending beyond farmers to include consumer perspectives and concerns from civil society organisations, would strengthen the social dimension of Lavazza's sustainability strategy. To ensure a more inclusive and responsive approach, the company should actively involve consumers in its sustainability initiatives, recognising their role as key stakeholders in driving demand for responsible business practices. Consumer engagement can take multiple forms, including educational campaigns that raise awareness about sustainable coffee sourcing, packaging recyclability, and ethical consumption. Additionally, the company could establish consumer advisory panels or conduct regular surveys to gather insights on evolving consumer expectations regarding sustainability. Such initiatives would not only inform product development and corporate decision-making but also strengthen consumer trust and brand loyalty. Beyond information-sharing, creating opportunities for active consumer participation in sustainability efforts would further enhance engagement. Initiatives such as incentivised recycling programs, loyalty rewards for sustainable product choices, or partnerships with local

communities for reforestation and environmental conservation projects could allow consumers to contribute directly to Lavazza's sustainability goals. Furthermore, incorporating consumer feedback into sustainability reporting, highlighting how consumer input has influenced corporate strategies, would demonstrate a commitment to transparency and continuous improvement.

Findings from the study identify key strategic intervention areas that yield significant environmental benefits, providing a basis for the optimal allocation of resources in future sustainability initiatives. The analysis highlights that sustainable sourcing programs, particularly the ¡Tierra! project, along with advancements in operational efficiency, contribute positively to sustainability efforts. Accordingly, resource allocation should prioritise the further development of sustainable sourcing models across the agricultural supply chain and continued investment in technological innovations to enhance operational efficiency.

Additional key investment areas for maximising environmental benefits include an integrated approach to packaging and resource management. In the context of packaging, a strong emphasis on circular economy principles, particularly the incorporation of recycled content and compostable materials, is crucial to reducing lifecycle environmental impacts and minimising waste streams. Efforts should therefore continue towards achieving 100% recyclable packaging while also advancing the integration of recycled materials across all company products.

Within coffee machines development, the study indicates a strong commitment to eco-design principles, reflected in ongoing research and development initiatives focused on energy-efficient technologies, the integration of sustainable materials in manufacturing processes, and considerations for product durability and end-of-life recyclability. Strengthening these efforts through targeted investment in sustainable design innovations will further enhance environmental performance in this sector.

Effective water management, particularly in coffee cultivation, necessitates the widespread adoption of efficient technologies and sustainable practices, especially in regions experiencing water stress. This underscores the need for continued investment in optimising water management processes within production facilities, as well as enhancing agricultural practices through research and the implementation of increasingly efficient techniques.

Similarly, positive results in waste management have been observed, in particular in the three-year period 2021-2023 almost 90% of total waste was recovered or

recycled. Building on these efforts, continued investment in innovative waste management solutions will be essential to further optimise resource efficiency.

The study highlights that Lavazza has made significant progress in expanding the use of renewable resources across its operations. This remains a key priority, with ongoing efforts directed towards enhancing on-site renewable energy generation and strategically procuring it to further reduce reliance on fossil fuels.

Furthermore, insetting projects aimed at carbon sequestration within the value chain, through agroforestry and broader landscape restoration initiatives, offer a viable approach to mitigating Scope 3 emissions while strengthening essential ecosystem services. These initiatives require carefully planned and rigorously evaluated investment strategies to ensure their effectiveness and long-term impact.

Finally, offsetting projects represent a key approach to mitigating unavoidable emissions. To ensure their effectiveness, future resource allocation should continue to support these initiatives, guaranteeing their compliance with transparent reporting standards and rigorous impact assessment methodologies.

Lavazza's engagement in sustainability provides a valuable model for other companies seeking to balance environmental stewardship with economic resilience. The Lavazza case study underscores the potential of corporate sustainability initiatives to drive transformative change, providing a roadmap for other enterprises aiming to navigate the complexities of sustainability in the face of climate change and increasingly demanding consumer expectations. These suggestions aim to foster innovation and integrate sustainability principles, advancing practice in the coffee industry.

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