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OPERATIONS MANAGEMENT FOR SUSTAINABLE DEVELOPMENT IN EUROPE'S CERAMICS SECTOR: FIELD LAB IN PARTNERSHIP WITH VISTA ALEGRE

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Abstract

Amid intense international competition, escalating costs, and strict environmental regulations, Vista Alegre's Flex 360 initiative modernized the Aveiro stoneware facility, symbolizing a key milestone in its journey toward long-term sustainable growth. This thesis investigates the sustainable operations management dimensions of the Flex 360 case, offering complementary teaching insights. As part of a broader strategic challenge, it examines how the 200-year-old Portuguese ceramics manufacturer can achieve sustainable leadership in the European ceramic sector by 2030, particularly under the new CSRD regulations. By combining macro and micro market analysis with a competitor ESG benchmark, the study identifies the company’s current standing and develops prioritized recommendations.

Keywords: Automation, Ceramic Industry, Circular Economy, Digital Transformation, Energy Efficiency, ESG, Industry 4.0, Operational Efficiency, Operations Management, SDGs, Sustainability Benchmark, Sustainable Development Goals, Triple Bottom Line

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PART 1: CASE STUDY

VISTA ALEGRE'S FLEX 360 PROJECT

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Abbreviations

CAGR	Compound Annual Growth Rate
COMPETE	Operational Programme for Competitiveness and Internationalisation 2030 (Portugal)
ECP	Ecocerâmica e Cristalaria de Portugal
HoReCa	Hotels, Restaurants, and Cafés
IoT	Internet of Things
RFID	Radio-Frequency Identification
SAP MII	Manufacturing Integration and Intelligence Software
SDG	Sustainable Development Goal
SME	Small and Medium-sized Enterprises

Vista Alegre's Flex 360 Project

December 17th 2024

A Case Study

Daniel Pinto, Industrial Director at Vista Alegre's Aveiro stoneware factory, faces growing pressure in late 2021. Vista Alegre, a nearly 200-year-old symbol of Portuguese tableware, is challenged by a rapidly shifting global market. Rising competition, energy costs, and strict regulations threaten its position, further intensified by the pandemic, exposing supply chain vulnerabilities and leading to a significant drop in turnover. The company's long-term growth faces a decline, pressing the need for an urgent strategic solution. To secure Vista Alegre's future, the Industrial Director introduces Flex 360, a €9.7 million initiative co-financed by the EU. The project aims to increase flexibility, production by 30%, cut energy use by 20%, and enhance circularity, all while supporting international growth. At a crucial crossroads, Daniel Pinto must decide if Flex 360 is the right strategy to meet its ambitious goals despite significant challenges. Pending final approval, instant decision-making is required to ensure the ceramic maker remains competitive in a modern, sustainability-driven market and continues its legacy.

Portugal's Oldest Ceramic Manufacturer

Vista Alegre established itself as one of the oldest ceramic manufacturers worldwide and is recognized for its distinctive, luxurious, and high-quality products. While enjoying a strong domestic brand awareness, it is also growing international prestige, driven by a strategic plan focused on commercial expansion, operational efficiency, and partnerships with artists.

Founded in 1824, with a detailed historical timeline provided in *Appendix 1*, Vista Alegre expanded internationally in the 1980s, went public in 1987, and became the sixth-largest tableware group through mergers around 2000. To enhance competitiveness, the company reoriented its strategy, introducing a dedicated factory for private label production in 2014 and consolidating product lines by 2018 (Vista Alegre Atlantis, SGPS, S.A. 2022a).

Since its acquisition by Grupo Visabeira in 2009, Vista Alegre has demonstrated financial resilience and rapid expansion, achieving a CAGR of 10% from 2010 to 2019. That year, Visabeira held an 85.6% stake, with turnover reaching €120 million and an EBITDA of €25.6 million. Growth was disrupted in 2020, dropping turnover to €110 million, and EBITDA to €16 million, as visualized in *Appendix 2*. Recovery began in 2021, with turnover reaching €117 million and EBITDA rising 41.7% to €22.7 million. (Vista Alegre Atlantis, SGPS, S.A. 2022a).

International markets are crucial for Vista Alegre, with *Appendix 3* highlighting key export destinations and *Appendix 4* mapping its global presence. In 2021, exports accounted for 85% of revenue, with products sold in 82 countries. Operating across Europe and beyond, key markets include the Netherlands, France, and Spain, with emerging destinations like Mexico City and Cape Town. Plans for further growth include partnerships to launch stores in Casablanca and Riyadh (Vista Alegre Atlantis, SGPS, S.A. 2022a).

Vista Alegre's diverse product lines are manufactured in six factories in Portugal, detailed in *Appendix 5*, with 60% of sales generated by private label production, 33% by retail, and 6% by the HoReCa sector. The company operates three brands: Vista Alegre, Bordallo Pinheiro, and Casa Alegre. Porcelain is the largest product category with 36% of 2021 sales, followed by stoneware at 24%, generating a 35% EBITDA margin and key for private label production. Oven-to-table stoneware makes up 19% of sales, earthenware 11%, and crystal and glass 10%. Award-winning designs, museum exhibitions, and prestigious collaborations complement Vista Alegre's market position (Vista Alegre Atlantis, SGPS, S.A. 2022a).

A Breakout into the Ceramic Tableware Industry

Tableware, originating 8,000 years ago in ancient Asia and Mesopotamia (Rice 1987), became a European luxury in the 16th century and rose with 19th-century mass production, marking the rise of legacy brands like Vista Alegre (Staatliche Porzellan-Manufaktur Meissen GmbH n.d.). Nowadays the industry has shifted towards sustainable and high-tech manufacturing practices.

In 2021, the global market for ceramic tableware reached €57.12 billion, with a CAGR of 6,1% expected until 2031 (Data Bridge Market Research 2024). Europe leads with a 35% market share, while Asia-Pacific is the fastest-growing region. Private households and the HoReCa sector drive revenue, supported by rising incomes and urbanization. (Grand View Research, Inc. 2019). Global tableware trends like biodegradable materials and advanced technology integration underline Flex 360's growing market relevance (Future Market Insights Inc. 2023).

In 2021, the Portuguese ceramics industry generated a turnover of €1.12 billion, (IAPMEI - Agência para a Competitividade e Inovação, I. P. 2023) including €348.33 million from tableware, amounting to 31% of the market volume (Associação Portuguesa das Indústrias de Cerâmica e Cristalaria n.d.a.). The industry relies heavily on exports, ranking second globally behind China in 2022, with estimated exports of €287 million. The USA is Portugal's largest customer, accounting for 21.3% of exports, while Germany is the fastest-growing importer of Portuguese ceramics (Observatory of Economic Complexity 2022a). The national ceramic market is highly fragmented, dominated by SMEs with 10–60 employees, and few firms exceeding more than 250 workers (Gazeta das Caldas 2020). Porcelain exports total €58.14 million, making Portugal the 14th largest exporter globally, with key markets being Spain, the United States and Italy (Observatory of Economic Complexity 2022b).

Challenges at the Crossroads of Tradition and Innovation

Despite its growth, the ceramic tableware industry faces challenges that Daniel Pinto must confront with Flex 360. Globalization has expanded opportunities but intensified competition from low-cost producers like China, which accounts for 36.9% of global exports (Observatory of Economic Complexity 2022c). In response, the EU imposed anti-dumping regulations in 2019, aiming to protect local industries from these unfairly priced imports (European Union 2019). Consumer demand for more varied products pushes manufacturers towards versatility and frequent new collections, demanding greater production flexibility (Vista Alegre Atlantis,

SGPS, S.A. 2024a). Moreover, the industry's energy-intensive production is costly, especially during energy price volatility seen during COVID-19, which also increased raw material prices (Vista Alegre Atlantis, SGPS, S.A. 2022b). In addition, about 30% of materials are wasted in production, creating excess clay and glaze that are hard to recycle without advanced machinery and the high consumption of raw materials, coupled with the use of harmful chemicals in glazes, has drawn increasing criticism (Zimbili, Salim, Ndambuki 2014; Princeton University n.d.).

While the Portuguese ceramic tableware industry experiences outlined global challenges, several issues are especially acute in the local context. Energy consumption is significant for the SME-driven industry, with costs surging to 55% of expenses during the pandemic in Portugal (Soares 2022). Unlike large competitors, SMEs lack resources for energy-efficient technology, making them vulnerable to rising costs further squeezing their profit margins. Another local issue is the fragmentation of the industry, with many small, family-run companies, which limits economies of scale and holds back modernization. Worsening the situation, Portugal faces a gradually troubling shortage of skilled artisans. As older generations retire, attracting and training new talent has become challenging with legislation preventing the rehiring of retired experts (Gazeta das Caldas 2020). Finally, sustainability pressures add complexity, as Portugal's traditional, labour-intensive production, tied to strict regulations like the EU Emissions Trading System and Industrial Emissions Directive 2.0, struggles to meet eco-friendly demands (European Commission 2024a; European Commission n.d.a). Flex 360 is designed to tackle these challenges by improving efficiency, flexibility and sustainability.

Portugal’s Role in Driving Sustainability and Innovation

Today, the tableware industry continues to innovate, with Portuguese manufacturers leading in eco-friendly solutions and digitalization. APICER, the Portuguese Association of the Ceramic and Crystal Industry, supports sustainable and technological advancements in the ceramic sector. In 2022, the ECP project will be launched to boost efficiency and competitiveness in the

industry through energy sustainability, digital transformation, and circular economy principles. (Ecocerâmica e Cristalaria de Portugal n.d.). Another initiative, CeramicLowCO_2, offers a roadmap to carbon neutrality by 2050 (Associação Portuguesa das Indústrias de Cerâmica e Cristalaria n.d.b). As EU-funded programs, COMPETE 2020 and 2030 encourage energy efficiency and digital transformation - options Daniel Pinto considers to finance Flex 360. (COMPETE 2030 2024a). Finally, The Shift 2 Future roadmap, provides a framework to promote digital transition in ceramics by adopting low-carbon technologies and resource-efficient production (IAPMEI - Agência para a Competitividade e Inovação, I.P. n.d.).

The future of the tableware industry centres around sustainability and Industry 5.0 technologies like robotics and AI integration. According to José Luís Sequeira, president of APICER, the Portuguese ceramics industry shines globally, led by locally developed technologies, advanced automation, and sustainable practices. These innovations will continue to make Portuguese ceramics highly attractive to international markets and investors, combining unique design and quality with sustainability (Portal da Liderança 2015).

An Introduction to the Stoneware Factory in Aveiro

The stoneware factory in Taboeira, Aveiro is central for producing Vista Alegre's oven-to-table stoneware products for the Casa Alegre brand and major clients like IKEA and Villeroy & Boch. The factory, covering 13,360 sqm, employs 200 workers and produces 5.5 million pieces annually. Stoneware, a versatile and durable ceramic, is made through a sintering process[1]. Initially, ceramic clays and kaolin are processed according to specific moulding methods and delivered by suppliers. In the factory three moulding techniques are applied: high-pressure moulding with a liquid slip at 25-30 bars for 300 seconds, static pressing with atomized dust at 300 bars in 15 seconds, and plastic moulding with soft clay. Next, only high-pressure and clay-

[1]A high-temperature process where ceramic powders are heated to facilitate particle bonding through diffusion, reducing porosity, increasing density, and enhancing mechanical strength and durability of the final product.

moulded pieces require a drying phase, as static pressing uses dry dust. After drying, glaze is typically applied by spraying, though dipping is used in other productions (Sistema de Gestão dos Consumos Intensivos de Energia 2019). The glaze enhances durability and gives the stoneware a smooth finish. Lastly, in one of the factory's two kilns, the pieces are fired at extremely high temperatures (1200°C - 1500°C). Vitrification[2] hardens the material, making it durable, non-porous, and liquid-resistant (Vista Alegre Atlantis, SGPS, S.A. n.d.a).

Flex 360 and the Pursuit of Sustainable Growth

While the Aveiro factory was initially designed for oven-to-table stoneware, the identified industry challenges are now driving Vista Alegre to increase its tableware production, requiring greater flexibility and capacity, due to the product's more complex characteristics, delicate shapes and a broader range of colours. Flex 360 tackles these challenges by integrating automation to enhance productivity, with details of the new machinery provided in *Appendix 6*. It also includes reconfiguring factory layouts to optimize workflow, with the redesigned layout presented in *Appendix 7*. In addition, it implements digital systems for monitoring operations and advances sustainability initiatives to reduce the ecological footprint.

Automation and Layout Overhaul

Under Flex 360, automation upgrades will include the introduction of a new high-pressure mould for mugs and a new static press for plates, complementing existing machinery that handles larger plates and ovenware. These new presses will provide the flexibility to manufacture various product lines simultaneously. Furthermore, a major modernisation of the firing process will replace the existing two kilns with a single, high-tech kiln capable of firing products with a higher throughput. This kiln will feature an automated loading and unloading system to minimize handling time and increase production capacity.

[2] During firing, specific low-melting-point components in the ceramic mixture melt, forming a glassy phase that fills pores. This creates a dense, non-porous, and durable structure while the bulk of the material remains solid.

The factory layout will be redesigned to streamline workflow and increase production cycles. Flexible areas, such as the mould cleaning section, will be relocated closer to the moulding area, improving proximity and shortening transportation routes. The drying area will be repositioned between the moulding and glazing sections, facilitating transitions between production stages and directing product flow in a linear direction. Expanded storage areas near critical production points will be added to minimize product transit times. Two additional packaging lines and an automated pallet stacking system will be installed to facilitate packaging and increase throughput. The warehouse will be redesigned with narrower corridors to maximize storage capacity, supported by new vertical forklifts designed for these tighter spaces. Finally, a new loading dock will be constructed to allow simultaneous loading of two trucks, enhancing logistics capacity and accelerating shipping processes. The new modular design will allow Vista Alegre to eliminate unnecessary transport routes, reducing transfer times between workstations and optimizing product flow by exploiting area synergies. This streamlines production processes and reduces lead times, enabling the factory to operate at a higher capacity.

Technology Integration and Digitization

Flex 360 will integrate cutting-edge technology and digital systems to enhance monitoring, precision, and product quality across the production line. A new glaze mixing area with custom scales and barcode scanners will ensure precise component identification and accurate glaze formulations, improving consistency and resource efficiency. Two new three-cabin glazing machines, designed to handle complex colour designs, will operate at lower pressures, with one featuring an automatic start/stop function to save energy and increase production capacity. A 3D printer will enable unique design techniques, expanding creative product options. IoT sensors at key stages will monitor real-time data like temperature and energy use, maximizing resource efficiency and allowing flexible adjustments. In the kiln, these sensors will assist in monitoring multiple heat zones, allowing dynamic energy adjustments for specific batch needs.

RFID tags on kiln wagons will improve traceability, optimizing firing cycle length and data collection. The kiln, developed in cooperation with a Portuguese ceramic specialist, will also pave the way for future technology cooperation. New SAP MII software will enhance real-time production and downtime monitoring, reducing manual errors and simplifying data processes. Collectively, these integrations will expand capacity, reduce costs, and improve oversight.

Energy Efficiency and Sustainability

Energy efficiency and sustainability are central to Flex 360. A key component of installing the new kiln is the expected energy consumption reduction by 20%. It will operate on a gas-hydrogen mix, with plans to transition to 100% clean hydrogen, practically eliminating carbon emissions Energy recovery systems will capture and reuse kiln heat, minimizing excess while maintaining high temperatures. Integrated into the firing cycle, the new automatic loading system will stack and unstack kiln carriages, improving workplace ergonomics and employee well-being. To lower health hazards, a dust collection system will be installed to recover dust generated during the moulding and glazing processes. This dust, with other excess materials and scrap, will be returned to raw material suppliers for reintegration into the production cycle, promoting a circular economy. The project will also include trials for glaze recovery from glazing machine wastewater, contributing to a more responsible water consumption. These measures will reduce the need for new raw materials, lower production costs, and contribute to the company's broader environmental goals. (Vista Alegre Atlantis, SGPS, S.A. 2024a).

Synchronizing Goals with the UN Sustainable Development Agenda

To secure board approval and ensure seamless project implementation, aligning Flex 360’s goals with Vista Alegre's three strategic pillars and the UN SDGs is commendable. The project’s operational efficiency directly contributes to SDG 12 (Responsible Consumption and Production) and SDG 9 (Industry, Innovation, and Infrastructure) (United Nations 2015)**.** The energy-efficient kiln is a cornerstone for this goal, significantly reducing energy consumption

and allowing higher throughput. The redesigned modular factory layout enhances material flow, cutting down transport times and resource waste, while increased automation in key production areas minimizes manual labour, increasing both output and efficiency. This optimized and streamlined workflow maximizes resource efficiency and production capacity, directly aligning with Vista Alegre's responsibility for a more sustainable industry.

Under the second pillar, commercial expansion, Flex 360 strengthens Vista Alegre's responsiveness to market demands, supporting SDG 8 (Decent Work and Economic Growth)**.** The dual-purpose production system offers flexibility to produce both ovenware and tableware, enabling Vista Alegre to swiftly adapt to client needs and stay competitive in volatile international markets. This increases the company's ability to fulfil multiple orders without sacrificing capacity, growing its reputation in private label production, fostering economic growth, attracting international shareholders, and opening potential new markets.

Finally, Flex 360 upholds Vista Alegre's strategy of promoting partnerships, aligning with SDG 17 (Partnerships for the Goals) and SDG 7 (Affordable and Clean Energy)**.** The introduction of the new regionally developed kiln is proof of sustainable partnerships and supports Portuguese technological innovation. Its hydrogen-ready capabilities support the company's long-term emission reduction goals and open doors for future partnerships with hydrogen suppliers as renewable energy options can be explored. Also, integrating new glazing and 3D printing technologies supports collaborations with renowned artists and designers, allowing Vista Alegre to create exclusive products with complex designs. These partnerships, therefore, advance resilience and business cooperation, supporting sustainable growth and innovation.

Flex 360 wide strategic scope aligns Vista Alegre's operational objectives with sustainable development priorities. Each strategic pillar within the project - whether in operational efficiency, commercial expansion, or partnerships - advances Vista Alegre's broader corporate strategy and actively supports specific UN SDGs. For Daniel Pinto, a central question is

whether the necessary investments in sustainability and flexibility can coexist with immediate resource requirements. To fully realize the strategic value of Flex 360, balancing these considerations with the commitment to sustainable growth will be decisive.

Overcoming Obstacles in Flex 360

A project like Flex 360 brings substantial challenges that the Industrial Director must weigh carefully, falling into various categories: financial, operational, and social. Financially, the burden is considerable, with a total project cost of €9.7 million (Portugal 2020 2023), of which Vista Alegre will cover €8.2 million - approximately 90%. This substantial investment creates immediate financial strain and adds significant risk if the project does not quickly yield anticipated returns. Given the company's recent financial constraints following COVID-19, any delay in realizing Flex 360's targets could intensify these short-term financial pressures. Furthermore, as an EU-funded initiative under COMPETE 2020, the initiative enforces strict regulatory requirements regarding transparency, reporting, and deadlines. Delaying project milestones could result in penalties and increased financial pressure due to high public interest and negative publicity (Vista Alegre Atlantis, SGPS, S.A. 2022a).

Flex 360 encounters major operational challenges, particularly with factory reorganization and the relocation of heavy machinery, some of which may be immovable and require specialized staff and mechanics, all while ensuring the factory remains fully operational. This may lead to project delays, interrupted workflows or safety concerns. Replacing the existing two kilns with a single, advanced one - though more efficient - creates a bottleneck risk, as any maintenance or malfunction could severely disrupt production. The kiln's hydrogen-ready feature offers sustainability potential, but high costs and limited green hydrogen supply could affect functionality, supply chain resilience, and expenses.

On the social side, Flex 360's implementation will require ongoing production to continue, adding pressure on the workforce to adapt to new routines, habits, and equipment setups.

Retraining staff is crucial for integrating technology upgrades, though resistance or poor instruction could initially limit productivity. Plus, the introduction of automated machinery could lead to workforce reductions, requiring cautious and thoughtful management of the transition to maintain employee morale and retention in an already challenging labour market. Daniel Pinto must proactively balance Flex 360's limitations and obstacles with operational and financial realities while managing potential company-wide long-term risks.

Assessing Flex 360's Risks

The identified challenges linked to Flex 360 could have substantial implications for Vista Alegre, potentially threatening its broader organizational framework. Financially, delayed returns could harm ongoing projects, shareholder confidence, and EU funding prospects. Unmet financial targets can undermine Vista Alegre's reputation for reliability and quality and weaken the company's market position. Operationally, the newly introduced bottleneck risks interrupting production and delayed orders, potentially damaging customer relationships and putting major contract values at stake. This is particularly concerning given Vista Alegre's high dependency on private label production and exportation, where such disruptions could quickly translate into broader financial challenges. Moreover, the reliance on green hydrogen increases supply chain vulnerability, possibly escalating operational energy costs. Socially, workforce reduction may reduce morale and productivity, negatively impacting the company's image.

Strategic Decisions in a High-Stakes Environment

Given the short- and long-term risks of Flex 360, Vista Alegre is currently in the planning stage, evaluating the feasibility of this ambitious project. Initially driven by a shift in the ceramic tableware market, indicated by higher and more varied demand from key customers, this growth has led to increasing order volume and a broader range of products requested by clients. Observing these market changes, Daniel Pinto recognized the urgent need for greater flexibility and efficiency within the production processes. Therefore, key areas for improvement were

identified: expanding production capacity to support anticipated international growth and enhancing flexibility to accommodate diverse orders. In response, the comprehensive project blueprint, as outlined earlier, was developed and is now awaiting final approval.

If approved, Flex 360 would advance with a detailed project presentation to the board, outlining SMART goals, a financial plan, an implementation roadmap, a timeline, risk assessment, and resource allocation. After evaluating the challenges and aligning with Vista Alegre's corporate strategy, a project team, led by the Production Manager, would oversee phased implementation to reduce operational disruptions. Staff would be trained on new machinery, raising the learning curve. Progress would be monitored and reported, with flexible adjustments if needed, while transparent communication would ensure stakeholder confidence in the company's direction.

If the board considers Flex 360 too risky, Vista Alegre could draw inspiration from past initiatives to explore alternative projects to expand capacity and improve flexibility. These undertakings provide a practical way to achieve similar goals while avoiding the challenges and risks of Flex 360. Minimizing the investment, Projeto nº 705 focused on expanding production capacity by over 27% at the Ílhavo factory. By investing in specific equipment, such as a new kiln and advanced glazing facilities, Vista Alegre met market demands for the hospitality sector without reorganizing the factory layout, demonstrating how targeted investments can enhance operational efficiency (Vista Alegre Atlantis, SGPS, S.A. n.d.b). Alternatively, mergers, such as the August 2018 acquisition of Cerutil - Cerâmicas Utilitárias, SA for €48.5 million, represent a substantially higher and riskier investment but can be an effective strategy for capacity expansion. Resulting in a significant and immediate increase in production volume, it enabled Vista Alegre to meet rising market demand (Jornal de Negócios 2018).

Evaluating the Impact of Flex 360 on Vista Alegre's Future

Daniel Pinto faces a critical decision regarding whether to proceed with Flex 360 or explore other options that might better align with Vista Alegre's strategic objectives and carry fewer

risks. The Portuguese ceramic tableware industry is undergoing rapid changes, driven by global competition from low-cost producers, alongside increased demand for sustainability, energy-intensive production, and the financial strain on raw materials. Additionally, difficulties such as workforce shortages and strict EU regulations further pressure the domestic industry. Flex 360 aims to address these challenges by enhancing production capacity and flexibility, reducing energy consumption, advancing circular principles, and boosting international competitiveness through advanced automation and a redesigned factory layout. However, the project involves substantial hurdles, like the considerable financial investment required. Although partially supported by EU funding, the financial burden on Vista Alegre's capital remains considerable. The transition to a single modern kiln presents operational risks, particularly regarding the use of hydrogen fuel, while adherence to stringent EU procedures introduces additional public and regulatory pressures. If not managed carefully, these challenges could escalate into broader, company-wide complications for Vista Alegre.

Ultimately, Flex 360, represents more than an operational upgrade; it is a step toward sustainability and innovation in an industry increasingly shaped by eco-conscious consumers and technological advancement. Daniel Pinto's decision will shape not only Vista Alegre's financial future but also its reputation as an innovative legacy company. If executed effectively, it could position the company as a sustainability leader by capitalizing on emerging opportunities in the green economy. This decision raises critical questions: Can Flex 360 operational changes deliver the expected improvements, or is it an excessive risk? Will it address industry challenges while aligning with Vista Alegre's sustainability goals, or should the company explore alternative strategies? If Flex 360 is successful, what next steps should Vista Alegre consider to further solidify its competitive position?

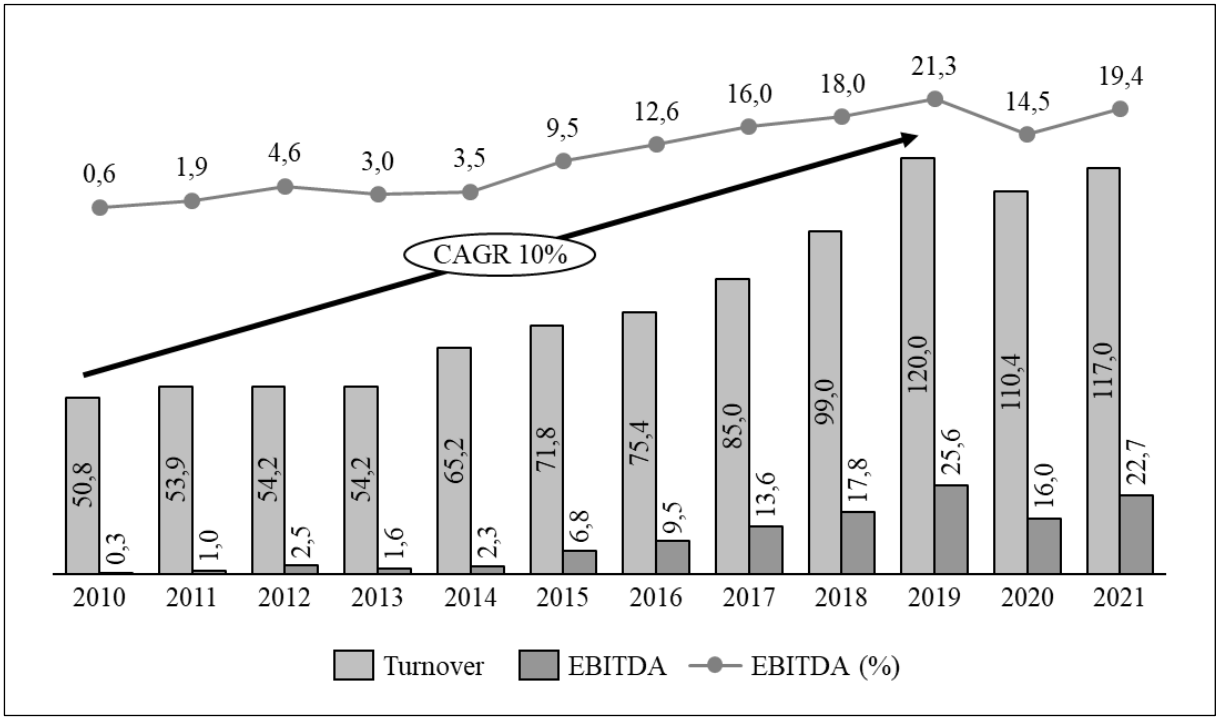
Appendix – Part 1: Case Study

Appendix 1 – Historical Timeline of Vista Alegre Atlantis, SGPS (1824-2019)

Year	Description
1824	Founded by José Ferreira Pinto Basto for porcelain and glass.
1867	Won an award at the Paris Universal Expo for ceramics.
1880	Glass activity paused until the Atlantis merger in 2001.
1947-1968	Modernized and expanded production with European partnerships.
1986	Started international expansion with a branch in Spain.
1987	Listed on the Lisbon and Porto stock exchanges.
1990s	Expanded capacity, enabling international growth.
1997	Merged with Cerexport, entering the German market.
2001	Merged with Atlantis, becoming a major global tableware group.
2009	Visabeira Group acquired an 81.78% stake in VAA.
2014	Boosted private label production for IKEA with Ria Stone factory.
2018	Reorganized to consolidate product lines for competitiveness.
2019	Completed €50 million bond placement, raising free float to 12%.

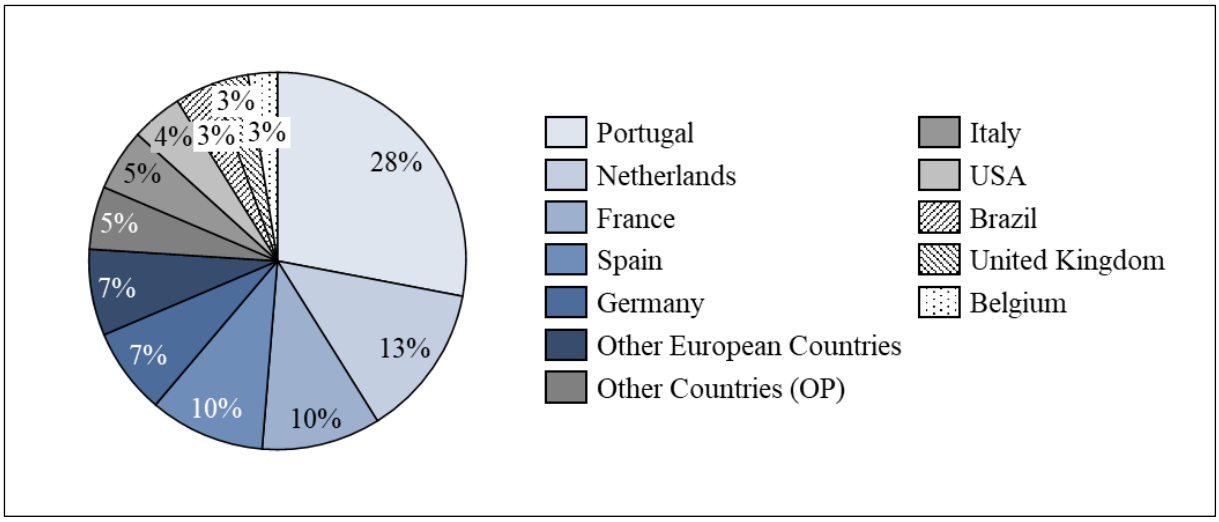
(Vista Alegre Atlantis, SGPS, S.A. 2022a)

Appendix 2 – Financial Performance of Vista Alegre Atlantis, SGPS (2010- 2021) [€M]



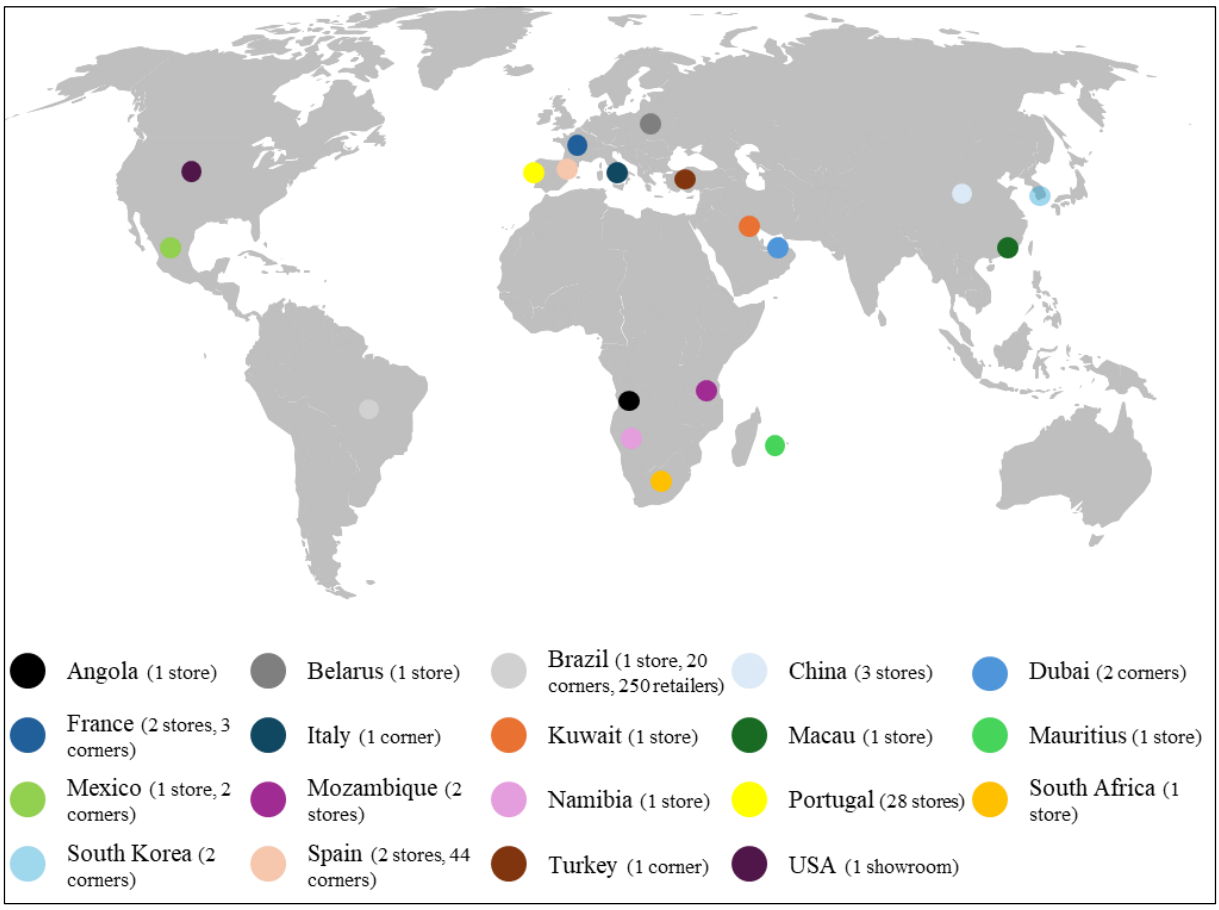
(Vista Alegre Atlantis, SGPS, S.A. 2022a)

Appendix 3 – Export Destinations of Vista Alegre Atlantis, SGPS (2022e)



(Vista Alegre Atlantis, SGPS, S.A. 2022a)

Appendix 4 – International Presence of Vista Alegre Atlantis, SGPS (2020)



(Vista Alegre Atlantis, SGPS, S.A. 2022a)

Appendix 5 – Vista Alegre Atlantis, SGPS Factories Categorized by Product Lines

Product Line	Location	Size [sqm]	Capacity [M]	Brands and Clients	Additional Information
Porcelain & Complements	Vista Alegre, Ílhavo	37,370	12.5	Vista Alegre	Founded in 1824, Vista Alegre Heritage, wide range of products
Stoneware/ Oven-to-Tableware	Taboeira, Aveiro	13,360	5.5	Casa Alegre, IKEA, Clients	Single-firing production for oven-ware and tableware in one facility
	Satão, Viseu	13,000	5.0	William Sonoma, Crate & Barrel	Capacity increase of 30% planned to be online from May 2019
Stoneware/ Tableware	Ílhavo, Riastone	27,700	48.5	IKEA	Automated, operating at full capacity, +60% increase since 2019.
Earthenware	Caldas da Rainha	12,800	1.8	Bordalo	Established in 1884, specializing in artistic and handmade products.
Crystal & Glass	Alcobaça	17,580	1.5	Vista Alegre, Casa Alegre, Clients,	Handmade and high-end crystal products, Technical products

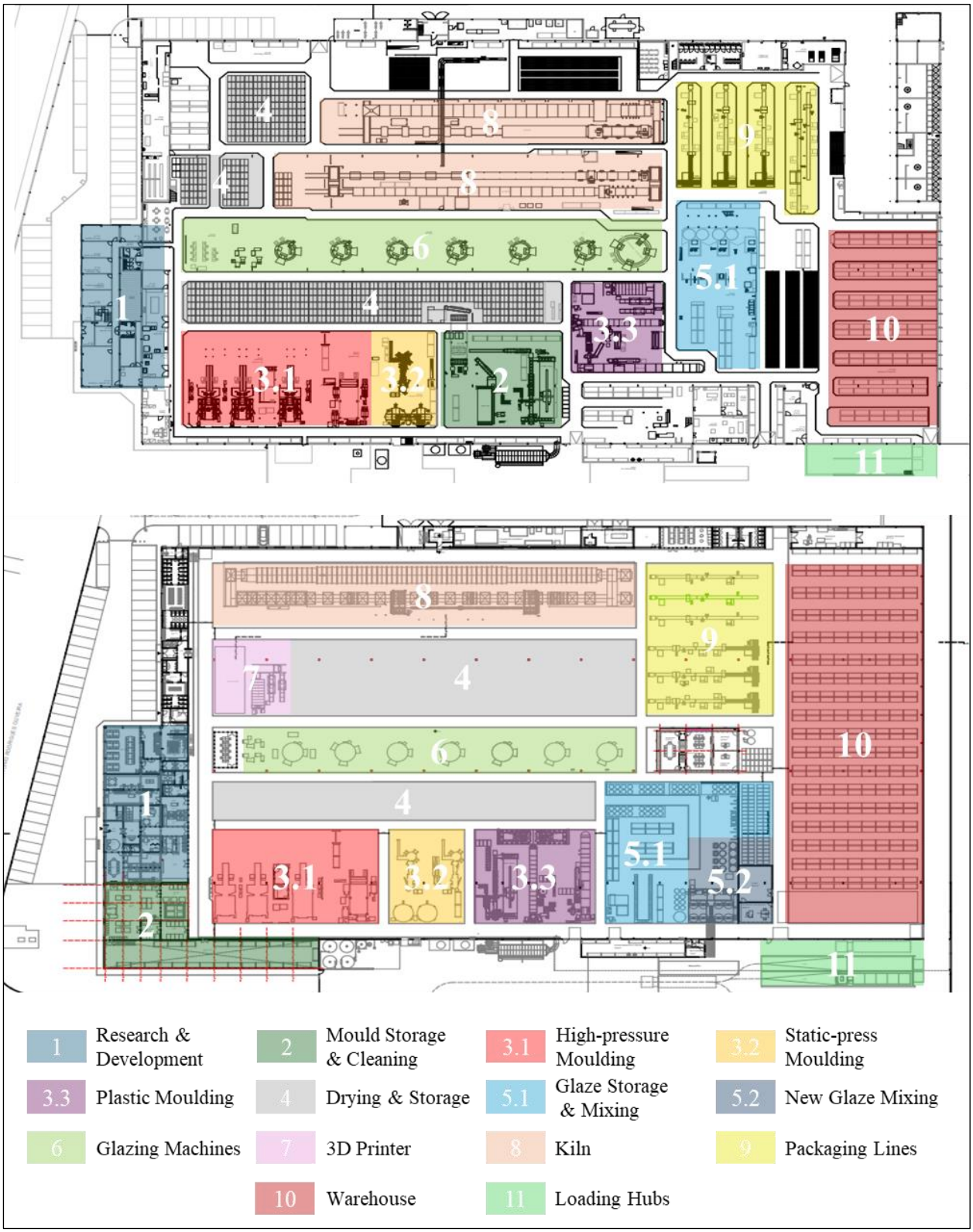
(Vista Alegre Atlantis, SGPS, S.A. 2022a)

Appendix 6 – Detailed Overview of New Machinery at the Aveiro Stoneware Factory

New Machinery		Improvements
New Kiln	RFID on the kiln cars Loading/Unloading system Refractory materials (slabs, pins)	Reduced physical strain for workers, Simplified loading and fewer defects, RFID-equipped wagons for better traceability.
Glazing Preparation		Reduced physical strain for workers, Precise component weighing and mixing.
Digital Printing Machine		Enhanced productivity, efficiency, and design capabilities with new technology.
Slip Casting & Isostatic Pressing	High-pressure slip casting system for mugs	Simplified mug molding, reducing breakage from handle gluing, Improved productivity, efficiency, and flexibility in plate production.
	Isostatic press for plates.	
Glazing	2 glazing machines with 3 cabins, with an intermittent glazing system. 1 with spray interruption	Lower air and glass consumption with better productivity for multi-glaze pieces.
Glazing dedusting		Reduced noise and dust levels.
Packaging Lines	5 Lifting Platforms	Better ergonomics in feeding and palletizing operations.
Industry 4.0	SAP MII	Real-time production visibility, fewer errors, and process digitization.

(Vista Alegre Atlantis, SGPS, S.A. 2024a)

Appendix 7 – Aveiro Stoneware Factory Layout Changes: Old (Top) vs. New (Bottom)



(Vista Alegre Atlantis, SGPS, S.A. 2024a)

This redesigned factory layout under Flex 360, features key upgrades: advanced moulding sections (3.1, 3.2, 3.3), centralized drying areas (4,) automated glazing areas (5.1, 5.2, 6), the energy-efficient kiln (8), upgraded logistic spaces (9, 11), and an expanded warehouse storage area (10). These changes improve workflow, cut energy use, and increase production capacity, aligning with sustainability and efficiency goals

PART 2: TEACHING NOTE

SUSTAINABLE OPERATIONS MANAGEMENT PRINCIPLES IN VISTA ALEGRE'S FLEX 360 PROJECT

NIK BARTEL

Part 1 - Case Overview and Teaching Background

This section offers a brief synopsis of the "Vista Alegre's Flex 360 Project" case study, outlining key educational objectives such as understanding operational management in a sustainable context, exploring the performance benefits of sustainability initiatives, and applying effective management frameworks. Additionally, it discusses the research methodology and presents preparation exercises to facilitate in-class discussions.

Case Synopsis

In 2021, Vista Alegre launched the €9.7 million Flex 360 project to modernize its Aveiro stoneware factory, enhancing competitiveness amid post-pandemic challenges. Facing low-cost competitors, rising energy costs, and strict environmental regulations, Flex 360 aims to increase flexibility, production capacity by 30%, cut energy use by 20%, and contribute to sustainable practices by redesigning its factory layout and integrating advanced automation technologies. This initiative reinforces Vista Alegre's commitment to sustainability and positions the brand to compete in a rapidly evolving global market, ensuring its legacy as a leader in ceramics.

Case Usage and Objectives

This case study is designed for business and management students, particularly those specializing in operations management, sustainability, or strategy, and is adaptable for courses in industrial engineering and materials with an emphasis on ceramics technology. Students will benefit from basic knowledge of business strategy, digital transformation, and sustainability when approaching the case. Vista Alegre's Flex 360 project examines the intersection of operations management, sustainability, and competitive strategy in the ceramic tableware industry. It encourages students to apply the Transformation Model, Porter's Five Forces, and lean management principles to evaluate strategic initiatives, operational efficiency, and sustainability efforts. By doing so, students will learn how a legacy company can leverage

modern operations management to address global challenges and competitive pressures, assess the influence of sustainability on production efficiency, and formulate strategic recommendations. Ultimately, the case will enhance understanding of how balancing operational efficiency with sustainability can yield long-term benefits for corporations.

Methodology

Information and data for this case were sourced from Vista Alegre's annual reports and investor presentations, interviews and questionnaires with key personnel, and a site visit to the Aveiro factory, providing real-time insights into the Flex 360 initiative's operational impact.

Part 2 - Teaching Plan

The following section serves as a complete guide for the teaching staff in preparing and reviewing the case study, both before and during class discussions. It provides a range of materials, questions, thought-provoking prompts, and insights to support the development of an engaging and insightful case analysis. To prepare students for the in-class discussion and to broaden their understanding of how well-executed operations management can impact an organization's sustainability performance, the exercises outlined in *Appendix 1* should be shared before the class. To facilitate a more prepared in-class discussion, the instructor may distribute the list of discussion questions and exercises in *Appendix 2* in advance and familiarize themselves with the exemplary scheduling timetable provided in *Appendix 3*.

Case Introduction

The case should be introduced by highlighting the major trends reshaping the modern manufacturing industry, focussing on technology-driven changes like Industry 4.0, automation, and robotization. These innovations are transforming production processes, reshaping how goods are produced, and driving the need for more efficient operations management. Several factors are driving these changes: rising international competition is pressuring domestic

markets, increasing energy costs are squeezing profit margins, and stricter regulations and growing customer demands are calling for higher sustainability standards. The Vista Alegre case exemplifies the complex challenges driving change within a craftmanship-based industry. By balancing mass production with sustainable growth, Vista Alegre leads innovation, solidifying its status as a key player in Portugal's ceramics industry. It serves as a case study for students on how a legacy company leverages modern operations management and sustainable practices to boost efficiency and execute its strategy in a competitive market.

Class Discussion

Once the context and the case study are introduced, the class will dive into the specifics of sustainable operations management. The first set of questions will review the key elements of the case, operations management, and sustainability. Subsequently, the class will move into a deeper analysis, engaging with various models and concepts.

1. Industry Dynamics: Consider the current competitive landscape of the Portuguese ceramics industry. How do the forces outlined in Porter's model apply to Vista Alegre?

Understanding the competitive dynamics in the ceramics industry is essential for analysing Vista Alegre's sustainable operations management and industry-shaping forces. After introducing Porter's Five Forces framework (Porter M. E. 1979), divide the class into five groups, assigning each group a specific force to analyse in the context of Vista Alegre: the threats and opportunities from new entrants, suppliers, buyers, substitutes, and industry rivalry. Each group then presents how their assigned force impacts the company's positioning.

Competitive Rivalry: Vista Alegre operates in a highly competitive ceramics industry, facing challenges from established brands like Villeroy & Boch and low-cost Asian producers. With competitors ranging from SMEs to global conglomerates, the Portuguese manufacturer relies on innovation, internationalization, and private label production to maintain market share and

customer loyalty. Supplier Power: Bargaining power among suppliers is generally low for basic materials like clay but higher for specialized inputs such as advanced glazes and high-tech equipment (García-Ten et al. 2024) Vista Alegre should build strong supplier relationships and diversify sourcing strategies, to mitigate risks from price fluctuations and supply chain disruptions. Buyer Power: Large B2C retailers, including major clients like IKEA, account for 60% of Vista Alegre's manufacturing and have substantial bargaining power. These buyers influence pricing and product requirements, pressuring the company to balance quality with cost management. To address this, Vista Alegre should strengthen customer engagement, customize its offerings, and foster strong partnerships to increase satisfaction and loyalty. Threat of Substitution: Substitution risk is moderate, driven by the growing appeal of eco-friendly and biodegradable tableware (Grand View Research, Inc. 2019). While these alternatives do not directly compete with ceramics, they reflect changing consumer preferences. Vista Alegre can mitigate this threat by emphasizing its products' unique qualities and innovative sustainable product lines. Threat of New Entry: Moderate barriers to entry, such as high investment in production facilities and advanced machinery, limit new entrants but do not prevent them entirely due to the relative simplicity of ceramic production principles. Vista Alegre should monitor potential entrants and concentrate on innovation and marketing to reinforce its competitive advantage in brand identity, to protect and solidify its position.

2. Industry Challenges: What industry challenges did Vista Alegre face at the time and what were the underlying goals behind Flex 360?

This introductory question encourages students to reflect on the primary challenges faced by the company and identify them as driving forces behind the Flex 360 project. They should be able to draw connections between industry-specific challenges and the objectives set by Vista Alegre for the project. Here to mention are several industry-specific challenges: (1) Global competition from low-cost producers, particularly in Asia, threatens market share, (2) changing

consumer expectations for a broader and versatile product range, (3) excessive energy costs significantly impact production sustainability, (4) high levels of waste in production processes contribute to operational inefficiencies, and a (5) surge in raw material prices exposed (6) supply chain vulnerability during the COVID-19 pandemic. Additionally, Portugal-specific challenges include (7) a shortage of skilled artisans, hindering traditional craftsmanship, (8) SME competitiveness, as local SMEs lack economies of scale and financial resources, and (9) EU sustainability regulations requiring reductions in energy use, waste, and emissions, increasing pressure on manufacturers to modernize.

Flex 360 is introduced with several main objectives in mind: (1) Increase production capacity by 30% through the optimization of factory layout and automation of processes, (2) allow flexible simultaneous production of different product lines to meet versatile market demands (3) reduce energy consumption by 20%, addressing rising energy costs and meeting environmental regulations, (4) enhance circularity by promoting the recycling of raw materials like clay and glaze, minimizing waste, (5) strengthen Vista Alegre's international presence by improving operational efficiency and global competitiveness. Additionally (6) adaptation to eco-conscious consumers by adapting sustainable practices into production could be mentioned.

***3. Stoneware Production Process*:** Reflect on the inputs and outputs in the stoneware production. How can the Transformation Model identify areas for operational improvements?

In this section, students should be encouraged to apply the Transformation Model (Robbins and Coulter 2005) to the Aveiro stoneware factory as in seen *Appendix 4*. This question helps students understand the stoneware factory's processes and where operational management changes can be applied, identifying how model components interact within the production. Answers should detail input materials, such as transformed resources (ceramic clays, kaolin, sand, water for mixing and forming, and glaze for durability and aesthetics) and transforming resources like staff, production facilities, and machinery, which are complemented by energy

sources (electricity, gas for firing, and hydrogen for cleaner energy). The transformation process at Vista Alegre involves macro- and micro-operations converting inputs into outputs. The macro-operation covers the physical formation of stoneware goods, while micro-operations break down specific steps: grinding and mixing raw materials (extern), moulding (using various techniques), drying, glazing, and firing in kilns. Students should analyse output resources, including finished products like plates, mugs, bowls or roasters and generated byproducts such as waste, excess materials or emissions, with a feedback loop ensuring continuous improvement. The class should think critically about how the Flex 360 initiative aims to enhance each micro-operations in detail.

***4. Flex 360 Operations Management Characteristics*:** How does Flex 360 utilize the four pillars of operations management to enhance both operational performance and sustainability?

Bridging an operations management model with sustainability, this question familiarizes the class with foundational operational principles. It outlines operations management's four sub-pillars, helping students to develop a clear understanding of each component and how they interact with each other within Flex 360.

a. *Design*: What design changes were made in the moulding area? The layout redesign improves workflow by relocating the mould cleaning section closer to the moulding area, reducing the distance materials must travel and minimizing handling times. Additionally, new static and high-pressure moulds have been introduced, allowing for greater production flexibility and the simultaneous creation of various product types, such as mugs and plates. This strategy enhances operational efficiency, enabling Vista Alegre to respond quickly to changing market demands.

b. *Efficiency*: How does the new efficient kiln improve operational efficiency? The new hybrid kiln reduces energy consumption by 20% and allows a 30% capacity increase. The system features automated loading and unloading systems that minimize manual labour, significantly speeding up firing cycles and allowing higher throughput. IoT integrations enable optimized

energy usage. These enhancements lead to lower operational costs and greater productivity, aligning with Vista Alegre's sustainability goals while maintaining high output levels.

c. *Resources*: How is resource use optimized during the glazing process? The glaze mixing area is equipped with advanced technology, including custom weight scales and barcode scanners, ensuring precise measurements for consistent glaze formulations and reducing material waste. The new glazing machines introduced in the glazing area feature automatic start/stop functions, which help conserve energy and glaze during downtimes. Furthermore, a dust recovery system has been implemented to capture glaze dust, allowing these materials to be recycled, optimizing resource utilization and promoting circular principles.

d. *Value*: What additional value is created for employees? Automation in the moulding, glazing firing and logistic areas reduces the demand for manual labour, allowing employees to focus on skilled tasks, which minimizes health risks and improves job satisfaction. Additionally, reskilling and training programs equip workers with new capabilities, fostering career development. This commitment to employee safety and growth increases morale, loyalty, and engagement, ultimately contributing to the company's overall market performance.

5. Flex 360 Goal Alignment Evaluation: How well are the Triple-Bottom-Line goals aligned within Flex 360, is there room for improvement or are they even conflicting? (Elkington 1994)

Economically, the initiative aims to improve operational efficiency and increase production capacity, directly supporting profitability and market competitiveness. However, the push for automation may lead to job losses or shifts in job roles, creating potential tension between enhancing profitability and ensuring employee retention. Concerns about job security and the potential displacement of workers underscore the need to manage this transition carefully (*Option 1*: Breakout discussion on balancing automation with workforce preservation). From an environmental perspective, Flex 360 targets a reduction in energy consumption and promotes circularity by recycling raw materials, demonstrating a commitment to minimizing the

ecological footprint. While these goals contribute to long-term sustainability, the high upfront costs of new machinery may strain short-term financial performance, especially if expected returns do not materialize quickly (*Option 2*: Breakout discussion on justifying the costs of sustainable machinery through long-term savings). Although social considerations are not the primary focus, the initiative does improve physical working conditions by reducing the labour intensity of certain tasks, thereby enhancing employee well-being. In light of these potential conflicts within the Triple-Bottom-Line framework, engaging students in discussions helps to identify trade-offs and brainstorm practical solutions Vista Alegre could implement.

6. Sustainable Management Practices: Beyond technology, what other managerial tools can help Vista Alegre achieve higher sustainability?

This question serves as an open invitation for students to brainstorm about various non-technological managerial tools that contribute to sustainability, extending beyond the solutions addressed in the Flex 360 case. One important management tool is (1) resource pooling, which involves sharing or consolidating resources such as raw materials, labour, or equipment across departments or different companies. This approach maximizes synergies, ultimately achieving cost benefits through lower resource consumption. Another key tool is (2) material substitution (R&D), which involves replacing environmentally harmful materials with more sustainable, renewable, or biodegradable alternatives. This shift lowers the overall environmental impact of production, as demonstrated by competitors like Grestel with EcoGrés, a product line made from recycled materials (Grestel, Produtos Cerâmicos S.A., n.d.a). Additionally, (3) lean management principles are vital for sustainability by streamlining processes to reduce material waste, transportation waste, and overproduction, thereby enhancing operational efficiency (Womack and Jones, 1996). This raises the question: how can these lean principles be applied in a craftsmanship-based industry like ceramics, where artisanal value is essential? (4) Just-in-time production is also crucial, as it emphasizes producing only what is ordered, thereby

minimizing excess inventory and overproduction, lowering material and resource usage. Furthermore, effective (5) sustainable sourcing principles, like a supplier code of conduct, are vital for encouraging the use of responsibly sourced materials and promoting sustainability throughout the supply chain. Companies can benefit by collaborating with suppliers who stick to sustainable practices, such as ethically sourcing raw materials or using environmentally friendly production methods. Implementing a (6) closed-loop supply chain approach can significantly shrink the ecological footprint by integrating byproducts into the production cycle. This practice allows organizations to reuse materials and components from returned products and waste to create new items, reducing raw material consumption. (7) Stakeholder engagement is essential for fostering a sustainability-driven culture. Involving employees, customers, and suppliers in sustainability initiatives helps build a shared commitment to sustainable practices. Lastly, (8) employee training, equips the workforce with the necessary skills to inhabit these practices effectively, creating a conscious and environmentally friendly work culture.

7. Circularity Challenges: What are the challenges in fully closing the loop and guaranteeing complete circularity?

Vista Alegre claims that Flex 360 will improve circularity, with the in-detail processes shown in *Appendix 5*. Achieving circularity, often referred to as cradle-to-cradle (C2C), involves creating systems where materials are continuously reused and recycled to reduce waste and the need for new raw materials. However, several challenges complicate this goal. Many companies, particularly larger ones, adhere to linear models, hindering circular innovation and commitment to sustainable practices. Additionally, aligning incentives with suppliers is crucial to forming effective partnerships and promoting the tangible benefits of participating in circular initiatives. Consumer perceptions also pose a significant barrier, as many individuals may be sceptical about the quality and safety of recycled or upcycled products, impacting market acceptance. Finally, reverse logistics introduces logistical challenges in returning products to

manufacturers for recycling or upcycling. Managing this process is key to reclaiming materials effectively and vital for businesses to successfully implement circular systems.

8. Sustainable Operations Management's Future: What operational management changes do future developments like Industry 5.0 bring, and how can these drive sustainability?

As a creative brain teaser, students should explore how developments such as Industry 5.0 bring operational management changes that enhance sustainability. Industry 5.0, a human-centric approach, prioritizes worker well-being and promotes collaboration between humans and machines. For example, integrating collaborative robots (cobots) allows employees to focus on higher-value tasks, improving employee well-being, job satisfaction, and engagement. It also loops back to the prior question, by fostering practices like reusing and recycling materials. Establishing holistic closed-loop systems for recycling can significantly reduce the need for new raw materials**.** Technologically**,** implementing connected smart factory systems enables real-time monitoring of resource usage, throughput, and lead times, resulting in energy savings and reduced emissions. Heightened resilience and adaptability equip industries to handle global disruptions like geopolitical or natural crises. Data-driven decision-making helps forecast demand and adjust production, reducing overproduction (European Commission n.d.b).

To conclude, the instructor should invite students to reflect on and summarize the main takeaways from the discussion. The class should understand why and how operational measures were implemented in Flex 360 and assess their impact. The key learning is that when economic, environmental, and social dimensions are balanced and aligned, well-executed operations management can significantly enhance a company's sustainability performance. To facilitate the general overview the Flex 360 case study and the teaching note a key insights summary is attached in *Appendix 6.*

Appendix – Part 2.2: Teaching Note

Appendix 1 – Preparing Exercises

To effectively contribute to the in-class discussion, students should be able to answer the questions provided below. Each student should prepare responses and review the suggested literature, which offers a crucial knowledge base for understanding the case study's context.

- Research Task: Conduct a brief study of the ceramics market in Europe, with a particular focus on the tableware sector. Identify the key challenges the market currently faces.
- Analysis Task: Explore how effective operations management can enhance a company's sustainability efforts. Consider specific strategies or practices that can positively impact environmental and social outcomes within the ceramics industry.

Suggested literature:

European Commission. 2023. "Ceramics." Single Market Economy. https://single-market-economy.ec.europa.eu/sectors/raw-materials/related-industries/non-metallic-products-and-industries/ceramics_en.

Furszyfer Del Rio, D. D., Sovacool, B. K., Foley, A. M., Griffiths, S., Bazilian, M., Kim, J., & Rooney, D. 2022. "Energy Use, Carbon Emissions, and Environmental Concerns Associated with Ceramics." In Decarbonizing the Ceramics Industry: A Systematic and Critical Review of Policy Options, Developments and Sociotechnical Systems. Renewable and Sustainable Energy Reviews 157: 112081. https://doi.org/10.1016/j.rser.2022.112081.

McKinsey & Company. 2023. "Operations-Driven Sustainability." McKinsey & Company. https://www.mckinsey.com/capabilities/operations/our-insights/operations-driven-sustainability.

Appendix 2 – List of Questions

Depending on the instructor's preference, this list can be shared with students before class to promote comprehensive preparation and a more engaging discussion. This way, the instructor can ensure that students contribute with varied and meaningful perspectives.

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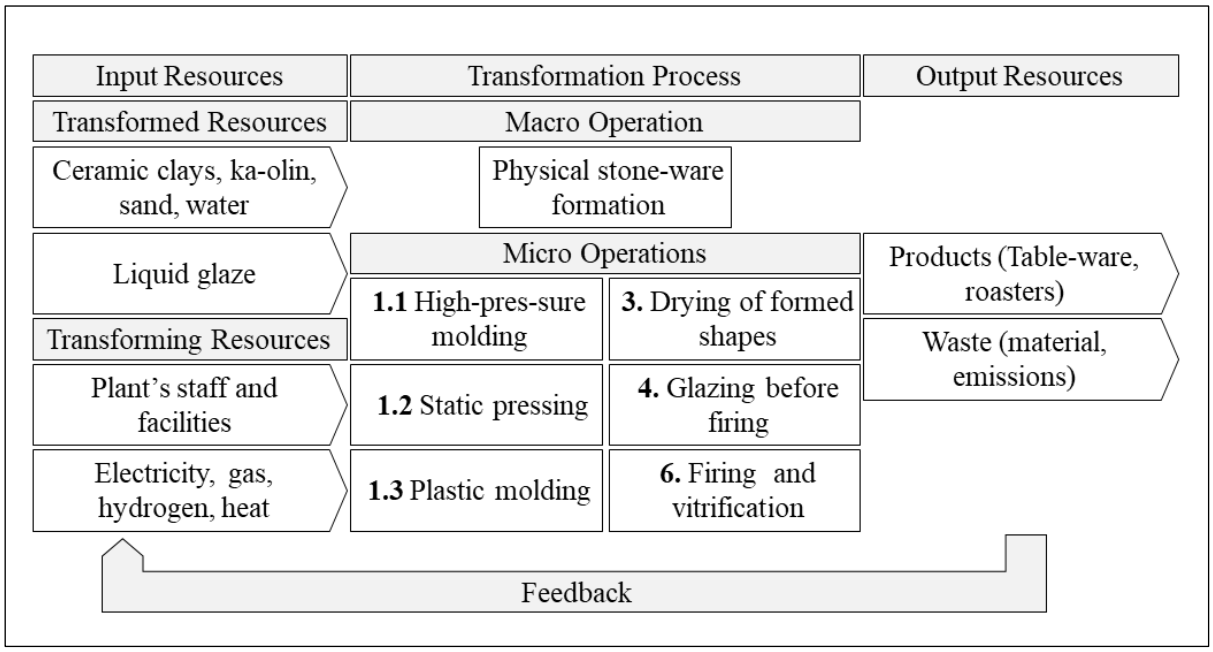
1. Consider the current competitive landscape of the Portuguese ceramics industry. How do the forces outlined in Porter's model apply to Vista Alegre?
2. What industry challenges did Vista Alegre face at the time and what were the underlying goals behind Flex 360?
3. Reflect on the inputs and outputs in the stoneware production. How can the Transformation Model identify areas for operational improvements?
4. How does Flex 360 utilize the four pillars of operations management to enhance both operational performance and sustainability?
    a. Design: What design changes were made in the moulding area?
    b. Efficiency: How does the new efficient kiln improve operational efficiency?
    c. Resources: How is resource use optimized during the glazing process?
    d. Value: What additional value is created for employees?
5. How well are the Triple-Bottom-Line goals aligned within Flex 360, is there room for improvement or are they even conflicting?
6. Beyond technology, what other managerial tools can help Vista Alegre achieve higher sustainability?
7. What are the challenges in fully closing the loop and guaranteeing complete circularity?
8. What operational management changes do future developments like Industry 5.0 bring, and how can these drive sustainability?

Appendix 3 – Exemplary Scheduling Timetable

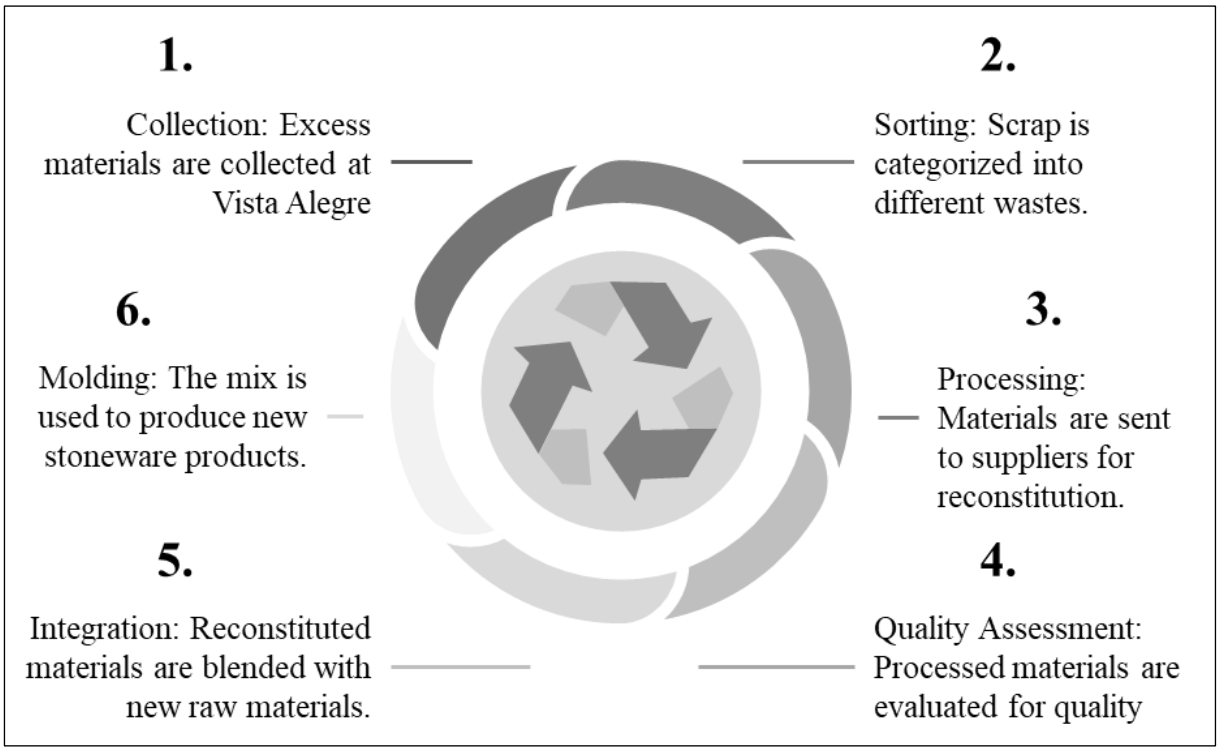
Tailored for a two-hour session, this suggested timetable outlines time allocations for each discussion part. It can be adjusted according to the instructor's needs or class focus. The activities correspond with the question structure in the preceding teaching plan.

Activity	**Duration**
Case introduction	10 min
1. Analyse Vista Alegre using Porter's Five Forces	15 min
2. Discuss challenges and Flex 360's introduction	15 min
3. Apply the Transformation Model to Aveiro factory	10 min
4. Evaluate Flex 360 through design, efficiency, resources, and value	20 min
5. Alignment of Flex 360's economic, environmental, and social goals	15 min
Option 1: Discussion on balancing automation with workforce preservation	2,5 min
Option 2 Discussion on justifying the costs of sustainable machinery through long-term savings:	2,5 min
6. Suggest non-technological tools for sustainability	15 min
7. Explore challenges in achieving complete circularity	10 min
8. Discuss sustainability as a competitive advantage	10 min
Conclusion	2,5 min

Appendix 4 – Transformation Model at Vista Alegre's Aveiro Stoneware Factory



Appendix 5 – Circular Economy at Vista Alegre's Aveiro Stoneware Factory



Appendix 6 – Key Insights Summary for Instructors

Case Overview

- Context: The €9.7 million Flex 360 project modernizes Vista Alegre's Aveiro stoneware factory, tackling global competition, higher customer demands, rising energy costs, and EU sustainability regulations through a layout overhaul and digitisation.
- Strategic Goals: Increase production capacity by 30%, improve operational flexibility and cut energy use by 20%.
- Relevance: Illustrates how legacy companies adapt through operational efficiency and sustainability.

Educational Objectives

1. Explore the interplay of operations management, sustainability, and strategy.

2. Apply frameworks like Porter's Five Forces, the Transformation Model, the Triple-Bottom-Line and the C2C Model.
3. Analyse the alignment of economic, environmental, and social goals within operations.

Teaching Highlights

1. Industry Dynamics: High competition, moderate substitution threat, and significant buyer power challenge Vista Alegre's market position.
2. Challenges and Goals: Address competition, energy costs, and EU regulations with increased efficiency, circularity, and resilience.
3. Transformation Model: Inputs (clay, energy), processes (moulding, glazing, firing, …), and outputs (stoneware) highlight areas for improvement.
4. Operations Management: Redesigned factory layout, energy-efficient kilns, optimized glaze usage, and improved workforce training.
5. Triple-Bottom-Line: Economic benefits align with environmental goals; social considerations require careful workforce management.
6. Sustainability Tools: Lean management, resource pooling, closed-loop supply chains, and stakeholder engagement.
7. Circularity Challenges: Aligning suppliers, overcoming consumer scepticism, and optimizing reverse logistics.
8. Future Outlook: Industry 5.0 integrates human-centric, collaborative technologies to enhance efficiency and sustainability.

PART 3: EVALUATION REPORT

HOW CAN VISTA ALEGRE BECOME A LEADER IN SUSTAINABILITY IN THE EUROPEAN CERAMICS SECTOR BY 2030, IN THE BACKDROP OF THE NEW CSRD REGULATIONS?

JOÃO PEDRO F. PEREIRA MELO GRANJEIA

NIK BARTEL

Abbreviations

AEuCC	Association of European Ceramic Centers
CSRD	Corporate Sustainability Reporting Directive
ECP	Eco-Ceramics and Glassware of Portugal
EMAS II	Eco-Management and Audit Scheme II
EPA	Economic Partnership Agreement
ERASMUS+	European Region Action Scheme for the Mobility of University Students
ESG	Environmental, Social, and Governance
ESRS 2	European Sustainability Reporting Standards 2
ETI	Ethical Trade Initiative
EUCERMAT	European Ceramic Materials Association
GRI	Global Reporting Initiative
INOV.AM	Innovation in Additive Manufacturing
MALENA	Machine Learning ESG Assessment Tool
NGS	New Generation Storage
PESTEL	Political, Economic, Social, Technological, Environmental, and Legal
RRP	Recovery and Resilience Plan
SDG	Sustainable Development Goals
SMETA	Sedex Members Ethical Trade Audit
TDI	Trade Defence Instrument

Case Study Synthesis

Completed in September 2023, Flex 360 streamlined Vista Alegre's stoneware production processes with €11 million in phased factory modifications, surpassing its initial €9.7 million budget. As the ceramics sector's most flexible and efficient system, it enables simultaneous production of oven-to-table and table stoneware. The project increased annual output by 30%, from 5.5 to 7.15 million pieces, fulfilling rising global demand for versatile ceramics, and met the anticipated 20% energy reduction goal (Vista Alegre Atlantis, SGPS, S.A. 2024a).

Building on Flex 360's success, Vista Alegre has launched further RRP-funded projects to enhance operational and environmental performance. Descarbonização No. 539 aims to cut 3,236 tons of CO_2 annually, capping emissions at 18,543 tons by 2025 through electrification and renewable energy. Contributing to the European ceramic sector's 1% share of industrial emissions, Vista Alegre's alignment with EU guidelines like the CSRD is foundational. This emphasizes the sector's responsibility to lead in sustainability, by balancing shifting environmental and regulatory demands with international competitiveness (Cerame-Unie n.d.).

Vista Alegre's Next Challenge

While the Aveiro factory transformation marked a major milestone for Vista Alegre, it represents just one element of a broader strategic challenge. The ceramic manufacturer faces the critical undertaking of securing sustainable, long-term growth in an intensely competitive international market, facing regulatory hurdles. European manufacturers, in particular, operate in a challenging environment: Asian low-cost competitors enjoy soft regulations, while strict environmental standards force European producers into costly investments for a green transition into carbon neutrality (Cerame-Unie 2023). A prime example is the new CSRD guideline, which came into force on January 5, 2023, and Vista Alegre must comply with for the fiscal year 2024, requiring a shift toward more extensive and precise sustainability reporting practices (European Commission 2023a). This shift offers Vista Alegre, Portugal's first ceramic

manufacturer subject to these regulations, an opportunity to set industrywide ESG reporting standards and seek sustainable leadership in ceramics. Subsequently, recommendations are guided by sustainability terminology, market analysis, and an in-depth ESG benchmark to answer the research question: *How can Vista Alegre become a leader in sustainability in the European ceramics sector by 2030, in the backdrop of the new CSRD regulations?*

Methodology

This report follows a collaboratively developed methodology that systematically addresses the research question utilizing quantitative and qualitative research. The primary objective is to identify Vista Alegre's current sustainability standing in the European ceramics industry. Aligned with the new CSRD guidelines, the report benchmarks competitors' practices to support Vista Alegre's ongoing sustainability reporting efforts. The goal is to develop recommendations for Vista Alegre to achieve sustainable leadership in European ceramics by 2030.

Existing literature, annual reports, and European guidelines were reviewed to build a sustainability knowledge base. A detailed exploration of CSRD regulations clarified their relevance for Vista Alegre. Interviews with Vista Alegre and industry peers provided insights into diverse sustainability understandings, contextualizing sustainable leadership in ceramics. Building on the ceramic tableware market insights from Flex 360 and a factory visit in Aveiro, a PESTEL analysis helps to understand the sustainability levers in the European industry's macroenvironment. Six companies, selected with Vista Alegre during a workshop, were profiled to map the competitive landscape. Each company was then analysed with the World Bank Group's machine learning ESG tool, MALENA, to identify microenvironmental risks, providing a company-specific scope of sustainability challenges. To benchmark ESG performance, a custom-developed Excel tool facilitated the analysis of Vista Alegre's and its peers' impact using publicly available data. The framework evaluated ESG criteria selected for their relevance to the ceramics industry, aligning with standards like GRI and ESRS 2.

Companies were scored across specific subcategories on a standardized scale (high: 80%-100%; moderate: 65%-79%; low: 50%-64%), focusing on the specificity, scope, relevance, and measurable impact in each field. Adjustments for company scale ensured fair comparisons, guiding prioritized recommendations for sustainable ceramic leadership by 2030.

Sustainability Terminology

Pioneering the term sustainability, The Brundtland Commission defined sustainable development as “development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development 1987). Elkington’s Triple Bottom Line expands on this by framing sustainability as the importance of balancing social, environmental, and economic factors- often referred to as People, Planet, and Profit (Elkington 1994). Porter emphasizes that investing in sustainable strategies across these dimensions not only delivers short-term economic returns but also positions companies as leaders in aligning business success with societal progress (Porter and Kramer 2019). This sustainable advantage builds resilience, strengthens differentiation, and supports long-term profitability by developing unique, hard-to-replicate capabilities (Ghemawat 1986). These principles resonate in EU governance, where sustainability's three pillars serve as a foundation for policy development (European Commission n.d.c).

In alignment with these regulatory frameworks, the European Ceramic Industry Association launched a 2050 Sustainability Roadmap, aligning with EU goals and presenting strategies to advance carbon neutrality. It offers key insights into the sector's sustainability efforts and policy recommendations tailored to its challenges (Cerame-Unie 2021). In the Portuguese ceramics sector, APICER defines sustainability as “balancing economic viability with accessible sustainable energy sources” (COMPETE 2030 2024b). Meanwhile, Vista Alegre stresses the importance of inclusivity, community engagement, and transparency, forming the backbone of the company's commitment to meet new reporting standards for its future sustainability report.

The CSRD helps EU companies report their sustainability efforts more effectively and consistently, focussing on ESG governance to reduce environmental harm, support social well-being, and ensure ethical management. It applies to large companies meeting at least two of these criteria: over 250 employees, net turnover above €40 million, or total assets over €20 million. Listed SMEs have an extended timeline, while non-EU companies with over €150 million in EU revenue are included only if they maintain operations in the EU. (Hobbs 2022). Vista Alegre qualifies under the CSRD for the fiscal year of 2024 by meeting all criteria: 2,467 employees, €129.6 million net turnover, and €238.4 million total assets. Implementing ESRS 2 requires resource allocation for transparent ESG reporting and investments in monitoring systems, meeting double materiality requirements, and addressing data collection challenges.

European Ceramic Tableware Industry

To address challenges associated with the CSRD, a macroenvironmental analysis identifies key influences and sustainability drivers within the European ceramics industry. Followed by a brief competitive landscape, outlining the six main competitors of Vista Alegre, and complemented by a microenvironmental analysis assessing frequent ESG risks within the outlined players.

Macroenvironmental Analysis

Political*:* The EU improves market access for ceramic manufacturers through trade agreements like the EU-Japan EPA, which removes tariffs of up to 3.3%, and the new EU-Mercosur deal to diversify value chains (European Commission 2019a; Cerame-Unie 2024a). In addition, public research and development funds support the sector to maintain competitiveness and promote sustainability (Cerame-Unie 2024b). The EU applies TDIs, with tariffs of up to 69.7% on ceramics from China, India, and Turkey, to contain unfair trade practices (Cerame-Unie 2024c). Yet, challenges persist, including Brexit-driven shifts in British imports and disruptions to kaolin supply from Ukraine, which accounts for 8% of global production (Centre for the Promotion of Imports from Developing Countries 2023a; World Economic Forum 2024).

***Economic**:* Europe's post-pandemic recovery has lifted consumer confidence, with rising disposable incomes driving a 5.7% increase in demand for higher-quality goods like ceramics from 2019 to 2022 (European Commission 2024b; European Commission 2023b). Reflecting this, the Euro area's inflation rate stabilized at 2% in October 2024 for the first time since July 2021, raising purchasing power (European Central Bank 2024). Nevertheless, European manufacturers face intense competition from low-cost imports, with €1.1 billion worth of ceramics entering from countries like China (Centre for the Promotion of Imports from Developing Countries 2023b). The industry also struggles with volatile raw material and energy costs, with gas expenses tripling to 60% of production costs in 2022 (Cerame-Unie 2022).

***Social**:* The COVID-19 pandemic increased demand for quality ceramic tableware as consumers enriched at-home dining (GlobalWebIndex 2020). Northern Europe's "master chef" trend and wellness movements further drive interest in stylish, high-quality dinnerware for social and mindful dining. A growing appreciation for craftsmanship also benefits design-oriented brands (Centre for the Promotion of Imports from Developing Countries 2023a). Meanwhile, 18% of consumers in 2023 identified as Minimalist Seekers, favouring conscious consumption and fewer possessions (Euromonitor 2023). Sustainability, especially important to younger consumers, increases demand for eco-friendly ceramicware, challenging the energy-intensive industry (Centre for the Promotion of Imports from Developing Countries 2023b).

***Technological**:* Innovations in manufacturing technology, including automation and robotics, boost efficiency and production rates in ceramics (Barata, Silva, Almeida 2019). European B2C e-commerce, growing by 3% in 2023, offers manufacturers direct customer access, improving margins and enabling personalized marketing (Amsterdam University of Applied Sciences, Ecommerce Europe 2024). Advances in design and materials have also led to innovative ceramic products with enhanced functionality and aesthetics (Cerame-Unie 2024b). Yet, adapting to new technology demands significant investment, poses cybersecurity risks, and

increases reliance on high-tech equipment, which can disrupt production during maintenance or supply chain complications (Deloitte 2020).

***Environmental**:* Consumers increasingly prefer eco-friendly products, positioning ceramics as durable, sustainable alternatives, especially among younger buyers, who are 27% more likely to choose such options (Reichheld, Peto, Ritthaler 2023). The European Green Deal drives lower emissions and circular practices, urging manufacturers to adopt greener production practices (European Commission 2019b). Investments in energy-efficient kilns and waste recycling align with these goals while cutting long-term costs (Cerame-Unie 2024b). Simultaneously, compliance with strict regulations like the Industrial Emissions Directive requires significant upfront costs, increasing financial pressure (European Environmental Bureau 2024). The sector must also avoid greenwashing, as false claims risk violating EU laws on unfair practices (Centre for the Promotion of Imports from Developing Countries 2023).

***Legal**:* The EU's strong intellectual property laws protect ceramic designs, while harmonized standards ensure consistent quality and facilitate trade (European Union Intellectual Property Office n.d.; European Committee for Standardization n.d.). Navigating the complex EU legislative environment on food contact materials, product safety, chemical restrictions, and packaging legislation increases operational burdens and costs due to related processes (Centre for the Promotion of Imports from Developing Countries 2023b). Strict labour laws regarding wages and working conditions increase these costs compared to countries with more moderate regulations (European Parliament 2024). Liability under the Product Liability Directive further necessitates stringent quality control and higher insurance costs (Covington 2024).

Competitive Landscape

In collaboration with Vista Alegre, six key competitors in the European ceramics industry were identified, including two Portuguese and four other European companies. Portuguese Grestel, operating under the Costa Nova and Casafina brands, offers high-quality stoneware products

such as tableware, ovenware, and serving accessories, combining traditional craftsmanship with sustainable practices. Grestel exports 93% of its products primarily to the United States, and in 2023 achieved a turnover of €42.5 million with an EBITDA margin of 19.8% (Jornal de Negócios 2024). Specializing in porcelain tableware, Costa Verde serves the hospitality industry with innovative, customizable solutions, generating 70% of its revenue internationally and reporting a turnover of €19.5 million and an EBITDA margin of 10.8% in 2023 (Porcelanas Da Costa Verde S.A. n.d.). Steelite, headquartered in the UK, focuses on high-performance tableware for the catering and hospitality sectors, serving dinnerware, glassware and cutlery, achieving a turnover of €90.9 million with an EBITDA margin of 9.5% in 2023 (Steelite International Lmtd. 2024). Established in 1748, German Villeroy & Boch offers premium products including bathroom fixtures and tableware, reporting a 2023 turnover of €901.9 million with an EBITDA margin of 14.3 (Villeroy&Boch AG n.d.). The Finnish Fiskars Group, parent to brands like Iittala and Royal Copenhagen, provides a broad portfolio of outdoor tools and indoor accessories, reporting a 2023 turnover of €1,129.8 million and an EBITDA margin of 15.6% (Fiskars Oyj Abp 2024a). Lastly, the Italian Arcturus Group, owning luxury brands Rosenthal and Sambonet, specializes in high-end porcelain and stainless-steel tableware with a focus on craftsmanship and design, achieving a 2023 turnover of €88.8 million for Rosenthal and €112 million for Sambonet with EBITDA margins of 4.7% and 12.7%, respectively. (Sambonet Paderno Industrie S.p.A n.d.). A more comprehensive performance overview is provided in the data sheet in *Appendix 1,* outlining the competitive diversity and strategic priorities to build a basic understanding prior to the microenvironmental ESG risk analysis.

Microenvironmental Analysis

An analysis of 52 Vista Alegre and competitor documents identified 13,737 ESG risk-related terms, mirroring the industry-wide macroeconomic risks. The top 15 terms are visualized in *Appendices 2* and *3*, with colour-coded improvements in green and deteriorations in red.

Indicating advancements, environmental terms like “Greenhouse Gases” (83 occurrences) and “Energy Consumption” (64) draw attention to emissions reduction and elevated energy efficiency, showcasing a focus on decarbonization and renewable efforts. Socially, terms such as “Suppliers” (388) and “Waste” (277) reflect undertakings to strengthen supply chain resilience and minimize excess waste, critical in managing volatile raw material markets and by-products. Also, social initiatives on “Diversity” (75) point out growing attention to inclusivity and personality in organizations. Governmentally, mentions of “Risk Management” (167) and “Ethical” (72) practices demonstrate heightened resilience and transparency.

Regionally and by company, the ceramic producers expressed negative sentiments towards distinct ESG challenges. Portuguese manufacturers struggle with labour issues - attracting and retaining talent (“labour” 9, “employment” 8, “recruitment” 8) - and are vulnerable to crisis and fluctuating raw material prices due to limited SME resources (“armed conflicts” 8). Additionally, security concerns (8), hazardous material exposure (6), and accidents (4) reflect the risks of labour-intensive production. The Italian Arcturus Group also highlights community health risks, caused by silica dust exposure (“community diseases” 2, “carcinogens” 1). Finnish Fiskars Group encounters significant regulatory challenges (“non-compliance” 44), job hazards (38), and environmental threats like global warming (22), wildfires (11), and greenhouse gases (8), emphasizing their eco-conscious accountability. German Villeroy & Boch faces environmental issues related to wastewater (5) and water consumption (2), alongside supply chain vulnerability (“suppliers” 4, “supply chain” 4). Building on these insights, the next section will further focus on the ESG perfomances relevant to the European ceramic industry, providing a framework for evaluating and enhancing sustainability practices across the sector.

Sustainability Benchmark

The ESG radar charts in *Appendix 4* along with the heatmap in *Appendix 5* serve as an entry point into the benchmark, offering a structured overview of the 15 ESG subcategories.

Visualizing and overlapping strengths and weaknesses of individual competitors, the tools facilitate the identification of leading and underperforming companies within the sector.

Environmental: Fiskars (90%) leads in carbon reduction with a 25% cut in Scope 1 and 2 emissions since 2022, aiming for a 60% reduction by 2030 (Fiskars Oyj Abp 2024b). Villeroy & Boch (85%) follows, achieving an annual reduction of 4,200 tons of CO_2 at its ceramicware factory through kiln improvements and targeting climate neutrality by 2040 (Villeroy&Boch AG 2019). These efforts highlight the value of energy-efficient technologies in reducing emissions, an approach Vista Alegre (80%) has adopted with a 12% reduction since 2019, yet failing to set shorter-term milestones, aiming for net zero by 2050.(Vista Alegre Atlantis, SGPS, S.A. n.d.c). In responsible sourcing, strict supplier codes of conduct are standard. Fiskars (95%) stands out with science-based targets reducing value chain emissions through supplier collaboration. Villeroy & Boch (90%) extends its code with sustainability goals and permanent risk management (Villeroy&Boch AG 2024). Vista Alegre (80%) performs SMETA-certified audits but lacks a supplier code, offering room to adopt peers' structured approaches. Raw material optimization remains a key differentiator in ceramics. Grestel (95%) dominates with its EcoGrés factory, integrating 90% of byproducts into its innovative ceramic paste (Grestel, Produtos Cerâmicos S.A. 2024). Villeroy & Boch (95%) achieved a measurable 8.1% raw material reduction in 2023. Vista Alegre (85%) drives efforts in locally sourced clays, and recycled material projects, outpacing Costa Verde (80%) and Steelite (70%), which rely on smaller-scale initiatives. In circular economy efforts, Grestel (95%) remains the leader, processing waste from other companies into its new ceramic product line, driving industry-wide circularity. Steelite (80%) follows with its Lamella system recovering 350 tons of clay waste annually and a centrifuge system recycling 100 tons of glaze, valorizing 98% of total waste (Steelite International Lmtd. n.d.a). Vista Alegre, Villeroy & Boch, and Fiskars (75%) share strengths, with Fiskars standing out for its circular cookware series featuring a 92% lower

carbon footprint. Ultimately, renewable energy and efficiency remain a strong category across all competitors, driven by the industry's energy-intensive nature. Arcturus and Grestel (95% each) achieve a 100% renewable energy use (Sambonet Paderno Industrie S.p.A 2023), followed by Fiskars (90%), which sources 25% of its energy from renewables and achieved a reduction of 10,426 MWh in 2023. In third place, Vista Alegre, Costa Verde, and Villeroy & Boch (85% each) drive projects, including solar panel installations, advanced kiln technologies, heat recovery systems, and automation. Steelite (60%) is behind in sharing information about its energy-saving efforts, mostly referring to its old Green Initiative. The company also faced significant profit losses in 2022 due to changes in gas and energy prices (Hiles 2024).

***Social**:* Arcturus and Grestel lead fair working conditions with 90% scores, offering comprehensive employee benefits. Arcturus achieves 50% women in leadership and 96% permanent contracts (Sambonet Paderno Industrie S.p.A 2023), while Grestel promotes inclusivity with 48% women in leadership and actively hires disabled workers and refugees through its Envolver Project (Grestel, Produtos Cerâmicos S.A. 2024). These practices emphasize social initiatives that could inspire Vista Alegre to broaden its diversity goals and outreach to underrepresented groups. Scoring 80%, the company ranks fourth behind Villeroy & Boch, demonstrating progress through one-third of women in management, a gender equality plan, and foreign worker inclusion. Steelite (80%) publishes gender pay gap reports and runs anti-harassment campaigns (Steelite International Lmtd. n.d.b), providing a policy to promote a protected work environment. Talent development and retention thrive through strong university and school partnerships for internships and apprenticeships. Arcturus (95%) and Fiskars (90%) complement this by internal programs offering structured onboarding, training platforms, and mentoring. Grestel (90%) stands out with its ESCOLA facility, a training hub that develops technical skills within the ceramics industry (Grestel, Produtos Cerâmicos S.A. n.d.b), serving as a benchmark for how Vista Alegre (80%) could amplify its ID Pool program

for broader skill training (Vista Alegre Atlantis, SGPS, S.A. n.d.d). Costa Verde (80%) supports international talent exchange through the EUCERMAT program under ERASMUS+ (EUCERMAT team n.d.). In community engagement, Villeroy & Boch (95%) leads with €1.2 million in 2023 donations, funding refugee aid and skill-building initiatives (Villeroy&Boch AG 2024). Fiskars (90%) follows with €625,000, blending environmental and community initiatives (Fiskars Oyj Abp 2024b). Arcturus (85%) provides innovative solutions such as beehive maintenance, while Vista Alegre (80%) focuses on cultural heritage preservation through its museum and festival sponsorships but could enhance its impact by increasing contributions and broadening its initiatives' scope. (Vista Alegre Atlantis, SGPS, S.A. 2024b). Smaller peers contribute through localized efforts like tree planting, and beach cleanups. Stakeholder involvement thrives in companies using double materiality assessments in sustainability reporting. Fiskars (90%) acts on this through consumer surveys, investor dialogues, employee initiatives, and NGO collaborations. Grestel (90%) demonstrates leadership in this area by spearheading industry waste collaborations, a practice that Vista Alegre (85%) could emulate to strengthen stakeholder relationships despite performing well in industry leadership, as in the ECP consortium. Arcturus, Fiskars, and Villeroy & Boch (95%) pioneer in communication and transparency with sustainability reporting initiated between 2015 and 2017 using GRI standards or the German Commercial Code. To further align with leaders, Vista Alegre (85%) could expand its reporting to include more detailed impact metrics and engage in proactive communication campaigns. Marked by a big gap, lower-tier companies like Steelite (65%) lag far behind in offering transparency and public reporting.

***Governance**:* While Fiskars leads with a 95% score due to its complete and strict code of conduct, battling, corruption, data misusage, and other issues, the field remains competitive in moral and ethical practices (Fiskars Oyj Abp 2023). Vista Alegre accomplishes an 85% score, between peers like Villeroy & Boch (85%) and Costa Verde (80%), relying on its gender

equality plan and sustainability-linked bonds (Vista Alegre Atlantis, SGPS, S.A. 2024b), yet, it could benefit from Fiskars' comprehensive code of conduct, which incorporates rigorous enforcement mechanisms to prevent ethical breaches. Even the lowest scorer, Steelite, maintains a respectable 75%, through strong policies on fair working conditions and pay equity (Steelite International Lmtd. 2024). In research and innovation, Vista Alegre outshines the field, peering with Villeroy & Boch (90%). The company's current investments range from material innovation projects like INOV.AM, over technological endeavours like NGS to industry consortiums like ECP (Vista Alegre Atlantis, SGPS, S.A. n.d.e). Grestel and Steelite for example have made significant innovations in robotization and water reuse technologies, achieving scores of 85% each. Overall, all competitors perform strongly, with every company scoring above 80%. In EU and national sustainability alignment Fiskars and Arcturus, scoring 95%, exemplify leadership through their adoption of European Green Deal objectives (Sambonet Paderno Industrie S.p.A 2023). Vista Alegre, at 85%, prioritizes corporate and national objectives like productivity and competitiveness, showcasing a distinctive strategic focus. The Portuguese manufacturer could further draw inspiration from Fiskars' and Arcturus' targeted integration of EU directives to deepen regulatory compliance. The Finnish and Italian producers also demonstrate strong integration of UN SDGs, achieving a 95% score alongside Grestel, demonstrating alignment in their sustainability reports in detail (Grestel, Produtos Cerâmicos S.A. 2024). This trend highlights a strong collective alignment within the ceramics sector. Vista Alegre, with 85% stresses its commitment to key SDGs but would benefit from a broader coverage of singular goals. Certifications present a more ranked field. Vista Alegre's (85%) adherence to basic ISO certification proofs regulatory and economic management standards, though it scores below top performers like Fiskars, Arcturus Group and Villeroy & Boch (95%), which distinguish themselves with comprehensive certifications and recognitions such as a top 1% EcoVadis score (Fiskars and Arcturus) and EMAS III (Villeroy).

Sustainability Benchmark Results

The sustainability benchmark provides a comparative analysis of the strengths and weaknesses, starting with the evaluation of the environmental performance of the seven competitors. Grestel leads with an average score of 87%, outperforming peers in material innovation and green energy, while Vista Alegre ranks fourth with 81%, requiring greater circularity efforts. Steelite scores lowest at 64%, reflecting high environmental limitations. In the social dimension, Grestel, Villeroy & Boch, and Arcturus each scored 89%, with Grestel standing out in fair working conditions, Villeroy & Boch in community engagement, and Arcturus in social transparency. Vista Alegre secures fifth place with 82%, performing solidly but with room for improvement. Steelite and Costa Verde fall behind at 73%, particularly in community involvement. Fiskars takes leadership with 92% in governance, closely followed by Villeroy & Boch at 90%, both raising the regulatory bar. Vista Alegre achieves a solid 87%, positioning itself as an innovation leader but slightly below top performers. At the bottom, Steelite received a rating of 76%, which indicates underperformance in important governance areas.

Overall, Fiskars tops the benchmark with a total score of 89%, followed by Villeroy & Boch (88%), Grestel (87%) and Arcturus (86%) in fourth, presenting consistent strengths across all ESG dimensions. Vista Alegre secures fifth place with a performance score of 83%, positioning itself as a top player in Portugal while exposing opportunities for improvement in the inter-European comparison. Costa Verde ranks sixth with 76%, while Steelite, ends up last place with 71%, facing substantial difficulties across all ESG dimensions and limitations in data availability. For ease of comparison, the benchmarking results are presented in *Appendix 6*.

The outcomes reveal Vista Alegre's areas for improvement, including environmental impact, supplier and circularity efforts as well as social initiatives such as working conditions and talent retention, with overlaps in governance. To strengthen its European standing, it will be crucial to close the gap with sustainability leaders and achieve industry leadership in ceramics by 2030.

Recommendations

A prioritization matrix in *Appendix 7* groups recommendations into four subcategories: quick wins, major projects, fill-ins, and thankless tasks, based on resource requirements and sustainable impact generated, providing a comprehensive framework for managing initiatives effectively. Complementing this, a risk assessment tool in *Appendix 8* evaluates the proposed recommendations by sorting them into quadrants based on perceived risk, which is determined by severity and likelihood. Severity, defined by resource intensity, ranges from negligible to severe, while likelihood spans from very likely to unlikely. Consequently, resource-intensive major projects carry greater associated risks. This approach facilitates a clear risk evaluation and helps decision-making by balancing potential benefits with trade-offs.

***Quick Wins**:* To achieve quick wins that require minimal resources yet generate significant impact, Vista Alegre can focus on a series of targeted initiatives. To compensate for CO_2 emissions and contribute to reforestation, Vista Alegre can partner with NGOs like Quercus to launch a tree-planting campaign, with an in-depth project snapshot provided in *Appendix 9*. Planting trees through sales-linked initiatives or voluntary efforts offsets carbon emissions and showcases environmental responsibility. Enhancing supply chain sustainability and supporting Vista Alegre's in-development supplier code can be backed by procurement team training. Hosting internal workshops to verify sustainable practices and ensure adherence can empower sourcing teams to make environmentally conscious decisions. Complementing this, reduced transportation emissions and local economy support can be further enhanced by building robust partnerships with regional suppliers. Sourcing raw materials regionally shortens transportation routes and saves logistic costs - all achieved with relatively low resource investment. Enhancing personnel well-being can be accomplished through employee health benefits and on-site medical screenings. Wellness programs, gym memberships, and initiatives like therapeutic lifting courses or cancer screenings address industry-specific risks, boosting morale, reducing

sick rates, and contributing to a safer, more supportive workplace. To promote team building and reinforce company identity and brand loyalty, newly developed product-focused training, like cooking workshops utilizing Vista Alegre products, can be explored. Improving transparency and communication can be achieved by developing an online sustainability dashboard to track and visualize ESG metrics, inspired by the financial reporting graphics. Tracking data like energy use, diversity, and emissions, would showcase Vista Alegre's progress and strengthen stakeholder confidence. Moreover, deepening adherence to regulatory standards can be accomplished without substantial resource allocation: updating the company's code of conduct to align with international ethical guidelines, such as the UN SDGs.

***Major Projects**:* Major projects require significant resource allocation but deliver substantial long-term impact. Shifting to renewable energy sources marks a major environmental project, realized by implementing the energy transition plan with SMART goals, milestones, and timelines, supported by meticulous planning and departmental coordination for technical upgrades. Demonstrating commitment to innovation and eco-friendly practices, Vista Alegre could invest in a sustainable earthen- or stoneware product line using circular materials. While resource-intensive - potentially requiring a new facility and a significant R&D budget - it aligns with circular economy principles by incorporating recycled materials and industrial waste. Appealing to eco-conscious consumers, the new line would strengthen competitiveness, advance technology, and reinforce Vista Alegre's sustainable leadership. To close the talent gap, a conjointly developed dual study program with Universidade de Aveiro could combine academic education with hands-on training outlined in *Appendix 10*, offering scholarships to attract and develop skilled talent, and addressing recruitment challenges while building a sustainable workforce pipeline for long-term benefit. To ensure compliance with the CSRD, a new sustainability committee - comprising experts from various corporate departments - will serve as a strategic think tank, forwarding innovation, compliance, and sustainability.

***Fill-ins**:* Fill-ins are low-resource, low-impact projects that complement larger initiatives and add value in specific areas. Strengthening communal commitment through a sustainable community partnership with Agora Aveiro bridges environmental and social spheres. Activities such as beach cleanups, food banks, and regional culture preservation projects promote sustainable citizenship. While these initiatives may not yield immediate business benefits, they enhance the company's community ties and reinforce its role as a social player. From a governmental perspective, reinforcing the commitment to global sustainability principles, and aligning with the UN Global Compact - of which Vista Alegre's holding is already a member - requires minimal effort while advancing credibility and compliance with global standards.

***Thankless Tasks**:* Thankless tasks require substantial resources yet often yield limited impact, making them less significant but still worthwhile in certain contexts. Building cross-cultural expertise through participation in the EUCERMAT or AEuCC programs could benefit Vista Alegre by fostering partnerships with ceramics hubs across Europe. While these professional exchanges align with skill-building objectives, their tangible business returns may be modest compared to the effort required. Building customer trust and loyalty, by obtaining additional certifications like EMAS II serves as a long-term investment in stakeholder relationships.

The exemplary implementation timeline in *Appendix 11* defines a structured roadmap for the 16 ESG recommendations. Initiating in Q1 2025 with Quick Wins and Major Projects, the timeline spans until the last quarter of 2029, progressively addressing Fill-ins and Thankless Tasks as lower priorities. This phased approach facilitates continuous improvements, offering a clear and actionable framework to enhance sustainability performance until 2030.

Limitations

This report faced several limitations impacting its completeness and accuracy. Interview insights could carry personal biases rather than organizational positions, while data collection and analysis may include errors, reducing reliability. Dependence on secondary sources risks

using outdated or unverified information. Frameworks like PESTEL and MALENA have inherent gaps, possibly overlooking critical factors. Rapid market changes, including new entrants and technological advancements, may affect the competitive analysis's relevance. Reliance on public data may miss disclosed initiatives, skewing the benchmark. The self-developed benchmarking tool may reflect subjective judgments in selecting, weighting and oversimplifying ESG criteria, potentially affecting comparability. Recommendations may be limited due to financial constraints, resource availability, internal resistance, regulatory compliance challenges, and the complexity of coordinating cross-departmental and external stakeholder efforts, all of which may hinder feasibility and timely implementations.

Conclusion

Vista Alegre has achieved creditable progress on its journey toward sustainability. With the upcoming CSRD-compliant sustainability report, the company will achieve another key piece in its path toward achieving sustainable growth. While the European ceramics sector's macroenvironment is expected to change, sustainability will likely remain a critical competitive lever. The benchmark has shown that smaller competitors can outperform in sustainability efforts, proving that leadership in ESG is not tied to company size, while some well-established players continue to underperform.

For Vista Alegre, this presents both a challenge and an opportunity, drawing attention to the urgency of quickly closing the identified gaps. The recommended quick wins and major projects provide an actionable framework for the ceramic manufacturer to catch up with sustainability leaders and seize opportunities for sustainable leadership. By capitalizing on its legacy of innovation and implementing the developed initiatives, Vista Alegre is strategically well-positioned to improve its sustainability performance and become a leader in sustainability in the European ceramics sector by 2030.

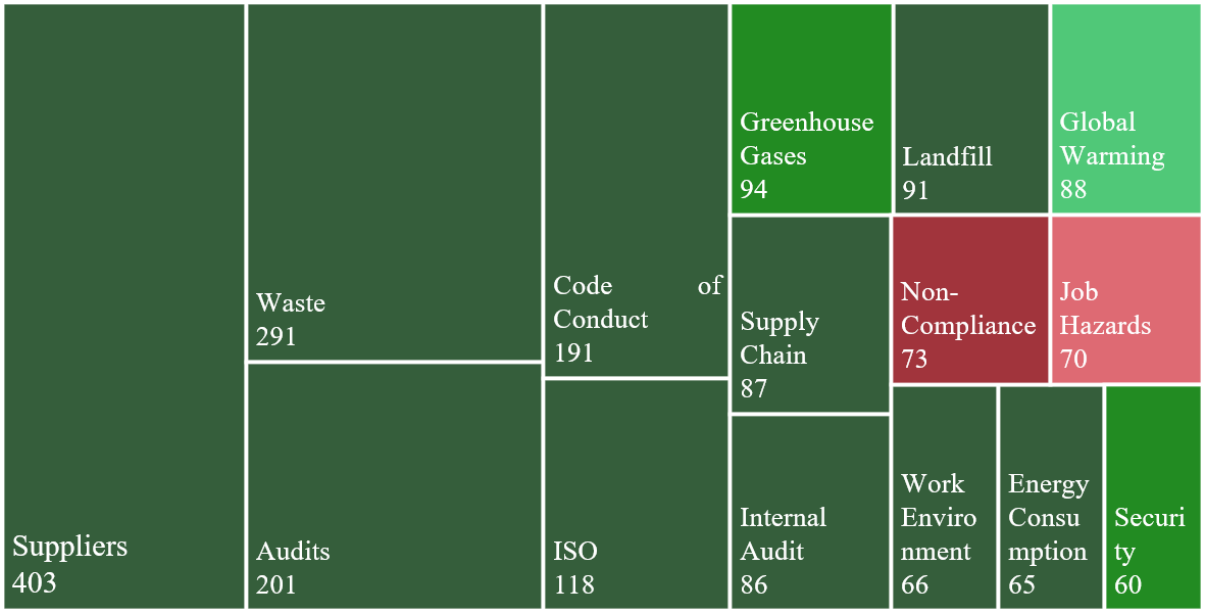
Appendix – Part 3: Evaluation Report

Appendix 1 – European Ceramic Tableware Industry Competitive Landscape Data Sheet

	Vista Alegre Atlantis, SGPS	**Grestel - Produtos Ceramicos S.A.**	**Porcelanas Da Costa Verde S.A.**	**Steelite International Lmtd.**	**Villeroy & Boch AG**	**Fiskars Oyj Abp**	**Arcturus Group**	
							Sambonet Paderno Industrie S.p.A.	**Rosenthal GmbH**
Origin	Aveiro, Portugal	Vagos, Portugal	Vagos, Portugal	Stoke-on-Trent, UK	Mettlach, Germany	Helsinki, Finland	Orfengo, Italy	Selb, Germany
Employees 23'	2,467	950	369	916	6,477	~7,000	306	693
Area of Expertise	Porcelain	Stoneware	Porcelain (HoReCa)	Ceramics (HoReCa)	Sanitary	Outdoor	Kitchen-ware (HoReCa)	Porcelain
Brands	3	2	1	9	12	14	8	
Markets	82	>60	>50	>140	125	>100	>80	
Factories	6	4	1	3	13	13	4	2
Revenue 23' [€M]	129.6	42.5	19.5 ▼	90.1	901.9	1,129.8 ▲	89.1	-
EBITDA 23' [€M]	28.3	9	2.1 ▼	8.6	129.2	175.8 ▲	17.6	-
EBITDA 23' [%]	21.8 ▲	21.2	10.8	9.5 ▼	14.3	15.6	19.8	-
Revenue 22' [€M]	143.3	39.7	17.5 ▼	82.3	994.5	1,248.4 ▲	87.8	88.8
EBITDA 22' [€M]	27.5	11.3	1.3	0.9 ▼	137.9	210.3 ▲	14.2	4.2
EBITDA 22' [%]	19.2	28.5 ▲	7.4	1.1 ▼	13.9	16.8	16.2	4.7
Turnover Change [%]	-9.6 ▼	7.1	11.4▲	9.5	-9.3	-9.5	1.5	-
EBITDA Change [%]	2.9	-20.4 ▼	61.5 ▲	855.6[1]	-6.3	-16.4	23.9	-

Data obtained from company annual reports, reputable news sources, and the Orbis database.
[1]Significantly higher profit due to stabilized energy costs, strong customer demand, and operational improvements

Appendix 2 – MALENA Top 15 Risk Terms – Environment and Social [# of occurrences]



This chart shows the 15 most frequently occurring Risk Terms. Risk Terms are coloured based on the level of negative sentiment: 0-10%: Dark Green, 10-20%: Medium Green, 20-30%: Light Green, 30-50%: Light Red, 50-75%: Medium Red, 75-100%: Dark Red (The World Bank Group n.d.)

Appendix 3 – MALENA Top 15 Risk Terms – Corporate Governance [# of occurrences]

This chart shows the 15 most frequently occurring Risk Terms. Risk Terms are coloured based on the level of negative sentiment: 0-10%: Dark Green, 10-20%: Medium Green, 20-30%: Light Green, 30-50%: Light Red, 50-75%: Medium Red, 75-100%: Dark Red (The World Bank Group n.d.)

Appendix 4 – European Ceramic Tableware Industry ESG Benchmark Radar Charts

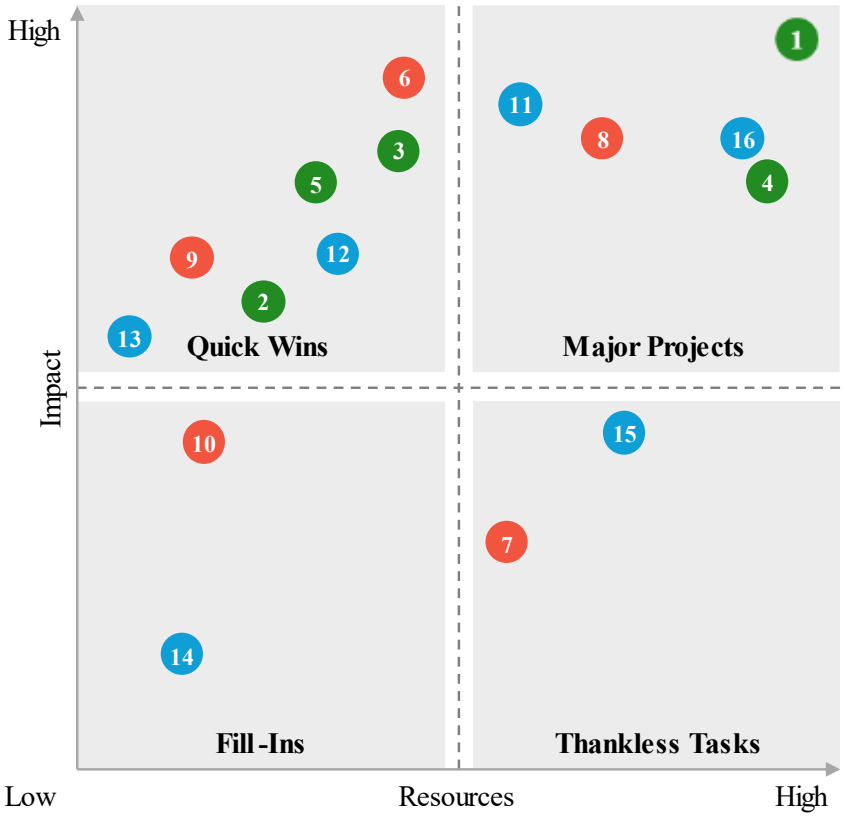
Appendix 5 – European Ceramic Tableware Industry ESG Benchmark Heatmap

		Vista Alegre Atlantis, SGPS	Grestel, Produtos Cerâmicos S.A.	Porcelanas Da Costa Verde S.A.	Steelite International Lmtd.	Villeroy & Boch AG	Fiskars Oyj Abp	Arcturus Group
Environment	Carbon Footprint	80%	70%	65%	50%	85%	90%	75%
	Conscious Choice of Suppliers	80%	80%	70%	70%	90%	95%	85%
	Raw Materials	85%	95%	80%	70%	95%	80%	75%
	Circular Economy	75%	95%	80%	80%	75%	75%	70%
	Renewable Energy & Efficiency	85%	95%	85%	50%	85%	90%	95%
Social	Fair Working Conditions	80%	90%	70%	80%	85%	75%	90%
	Talent Development & Retention	80%	90%	80%	70%	85%	90%	85%
	Community Engagement	80%	90%	65%	75%	95%	90%	85%
	Stakeholder Involvement	85%	90%	75%	75%	85%	90%	90%
	Communication & Transparency	85%	85%	75%	65%	95%	95%	95%
Governance	Morals & Ethics	85%	80%	80%	70%	85%	95%	90%
	Research & Innovation	90%	85%	80%	85%	90%	80%	80%
	EU/National Sustainability Policies	90%	90%	80%	80%	90%	95%	95%
	SDG Alignment	85%	95%	80%	75%	90%	95%	95%
	Sustainability Certifications	85%	70%	80%	70%	95%	95%	90%

Appendix 6– European Ceramic Tableware Industry Sustainability Benchmark Results

	Vista Alegre Atlantis, SGPS	Grestel - Produtos Cerâmicos S.A.	Porcelanas Da Costa Verde S.A.	Steelite International Lmtd.	Villeroy & Boch AG	Fiskars Oyj Abp	Arcturus Group
Environment $\bar{x}$	81%	87%	76%	64%	86%	86%	80%
Social $\bar{x}$	82%	89%	73%	73%	89%	88%	89%
Governance $\bar{x}$	87%	84%	80%	76%	90%	92%	90%
Total $\bar{x}$	83%	87%	76%	71%	88%	89%	86%
Rank	5th	3rd	6th	7th	2nd	1st	4th

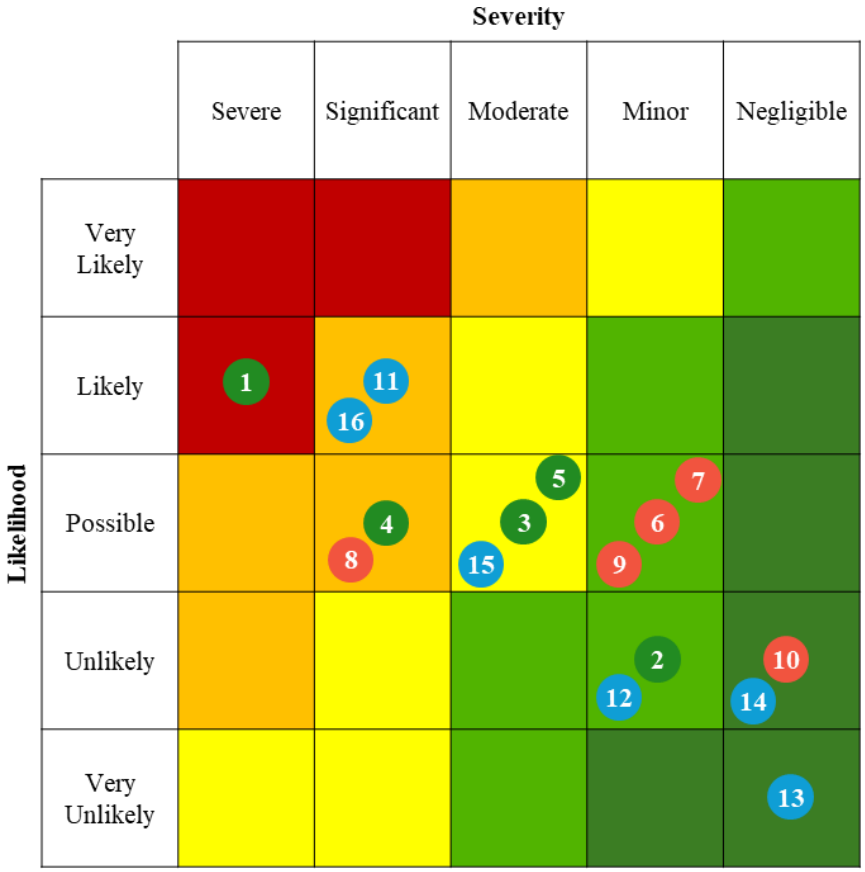
Appendix 7 – ESG Recommendation Prioritization Matrix



1	Implement Energy Transition Plan	2	Forestation Efforts in Partnership with Quercus
3	Prioritize Regional Supplier Partnerships	4	Ecological / Sustainable Product Line
5	Procurement Sustainability Training (Enforce Supplier Code of Conduct)	6	Employee Health / Medical Benefits
7	EUCERMAT / AEuCC Programs	8	Universidade de Aveiro Dual Study Program
9	Product-Focused Training Sessions	10	Community Engagement in Partnership with Agora Aveiro
11	CSRD Sustainability Committee	12	Sustainability Metrics Dashboard
13	Adapt Code of Conduct to UN SDGs, …	14	Adapt UN Global Compact Policies
15	Expand Sustainability Certifications	16	Digital / Sustainability Innovation

Environment	Social	Governance

Appendix 8 – ESG Recommendation Risk Assessment



Likelihood: Probability of a risk occurring. Severity: Impact if the risk occurs. Likelihood x Severity = Risk Level

Appendix 9 – Vista Alegre Forestation Partnership Program Snapshot

Forestation Program: Partnership to compensate CO_2 emissions

Innovating the path toward decarbonized ecosystems.

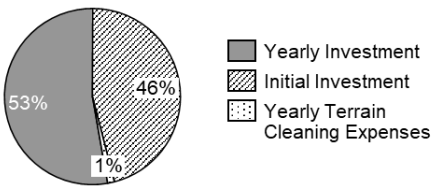
Description	Key Features:
Partnership with a Portuguese environmental Association to start the plantation of an autochthonous forest in Portugal. The goal is to compensate CO_2 emissions from production with an investment in trees, as the main producers of oxygen. A creative and innovative way of expanding the group's sustainability.	• Symbolic cost endeavour; • Marketable feature; • Community engagement booster; • Pioneer in Portugal; • Can be applied to VAA's spare land in Alcobaça
Potential Partners	
Quercus; Plantar uma Árvore, Agora Aveiro, Zero Association	

KPI 1: Trees to CO_2kg ratio – Allows to assess the impact of the tree plantation in comparison to the CO_2kg emitted through the manufacturing process
KPI 2: Trees to 200 units sold – For each 200 units sold, VAA should fund the acquisition a bag of seeds. On the current capacity of the factory, this assures the operations economic viability and a sizeable scale to the project.

Year	Milestones
2025	Partnership formalized, Funding parameters and KPIs put into place. First plantation at the end of the year. First location settled.
2026	First project evaluation. Consider expanding the project to other associations and locations. Another acquisition of seeds and plantation
2027, 2028	Continuation of the project. Assess its marketing potential.
2029	Comprehensive program review, and recommendations for future growth. Potential opening of a Vista Alegre Sustainable Garden to the public.

Budget Estimation (€43 thousand yearly):

- Initial Investment (based on 2023 numbers): €37,400
- Projected Yearly Investment: €43,010
- Cost of Bag of Pine Seeds: approx. €4
- Total Production Capacity: 74,800,000 pieces
- Terrain cleaning expenses per year: max. €1000



Disclaimer: The details presented in this snapshot, including partnerships, KPIs, budget estimates, and milestones, are purely illustrative. They serve as an exemplary framework for a potential forestation project and are subject to change based on feasibility studies, stakeholder feedback, and evolving priorities. Actual implementation may differ significantly from these projections.

Appendix 10 – Vista Alegre x Universidade de Aveiro Dual Study Program Snapshot

Dual Study Program: Ceramic Engineering with University of Aveiro

Blending Academic Excellence with Industry Expertise in Ceramics.

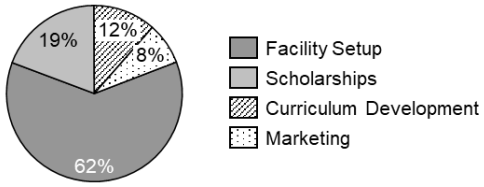
Description	Key Features
This dual-study program blends theoretical knowledge with practical industry experience in ceramics. Students alternate between coursework at the University of Aveiro's Department of Materials and Ceramic Engineering (DEMaC) and hands-on training at Vista Alegre, equipping them with academic and professional skills.	• Dual-study format: Academic learning integrated with professional training. • Industry mentorship: Personalized guidance from Vista Alegre experts. • Hands-on projects: Real-world applications of ceramics engineering
Degree Name	
Bachelor's Degree in Dual Ceramic Engineering and Industrial Practices	

KPIs focus on talent development, retention, and medium-term growth.:
KPI 1: Enrollment Target - Achieve an initial enrollment of 25 students per academic year within the first two years of program implementation.
KPI 2: Employment Rate - Target 70% of graduates employed at Vista Alegre and 85% in the broader ceramics industry or related fields within six months post-graduation.

Year	Milestones
2025	Partnership formalized, curriculum approved, faculty recruited, and Vista Alegre facilities upgraded.
2026	Marketing launched, first cohort of 25 students enrolled, and program initiated with evaluations.
2027, 2028	Annual intakes expanded, internships introduced, quality assessments conducted, and industry R&D collaboration.
2029	Comprehensive program review, accreditation evaluation, and recommendations for future growth.

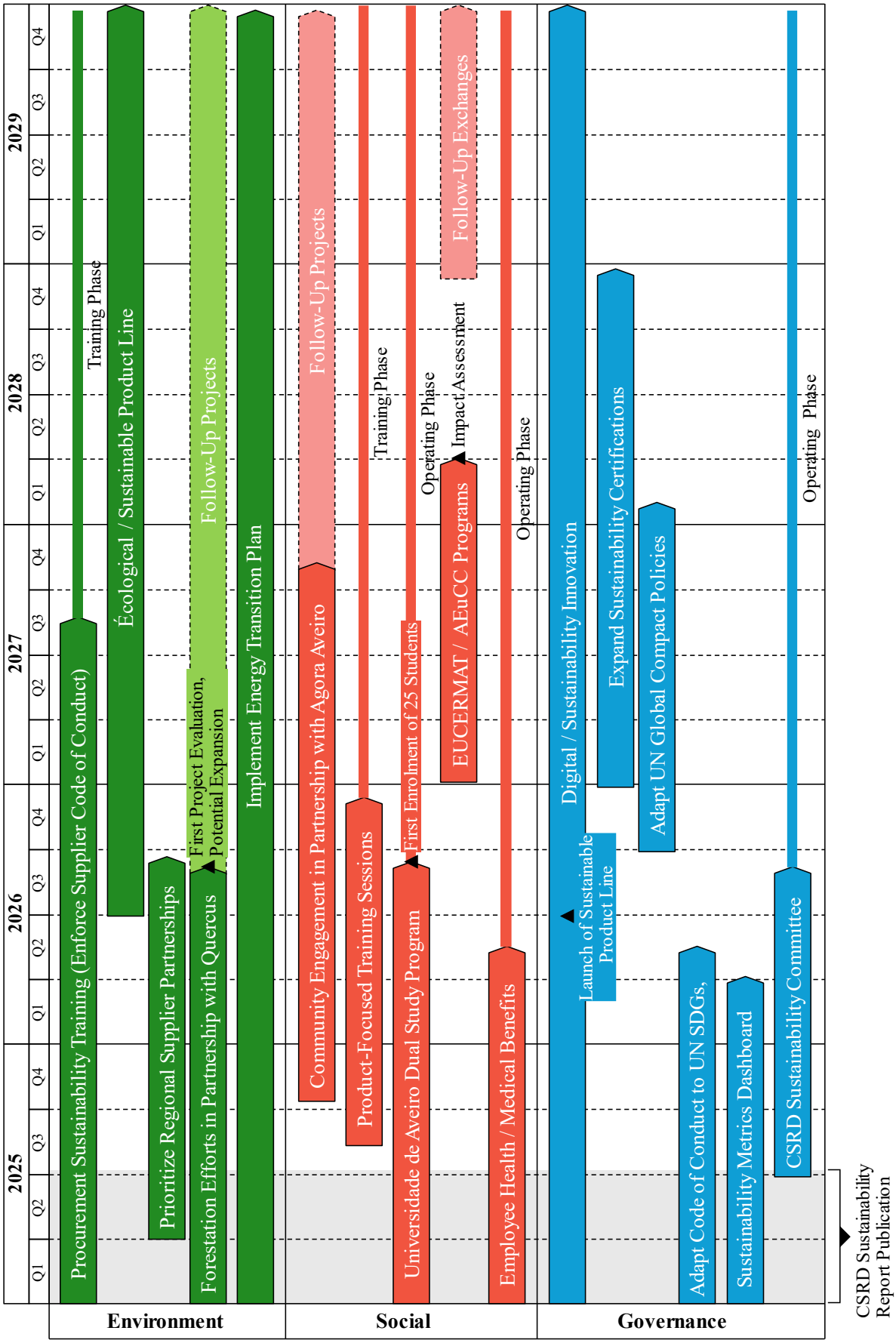
Budget Estimation (€650 thousand over 5 years):

- Curriculum Development: €75,000
- Facility Setup: €400,000
- Marketing: €50,000
- Scholarships: €125,000



Disclaimer: The information provided in this snapshot, including program structure, milestones, and budget estimates, is for illustrative purposes only. It is an exemplary proposal for a potential dual-study program and is subject to further refinement based on feasibility assessments, academic partnerships, and organizational priorities. Final implementation may differ significantly from these initial concepts.

Appendix 11 – ESG Recommendation Implementation Timeline (Q1 2025 Q1 – Q4 2029)



Appendix 12 – Vista Alegre Sustainability Perception Survey Template

Vista Alegre Sustainability Questionnaire

We are graduate students from NOVA University conducting research with Vista Alegre for our master's project. This survey explores customer views on sustainability and willingness to support eco-friendly ceramic products. Your insights will greatly assist our study and help shape Vista Alegre's sustainability strategies. Thank you for your time.

Are you familiar with Vista Alegre's ceramic products??

☐ Yes | ☐ No (If "No," please end the survey here. Thank you for your time!)

Brand Sustainability Perception

When you think of "sustainability," what comes to mind? (Select all that apply)

☐ Protecting and preserving natural resources

☐ Reducing carbon emissions and combating climate change

☐ Supporting fair labor practices and worker well-being

☐ Promoting ethical business practices and community impact

☐ Creating lasting, high-quality products that minimize waste

☐ Ensuring business profitability without harming the planet

Do you perceive Vista Alegre as a sustainable brand?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Strongly disagree Strongly agree

How familiar are you with Vista Alegre's sustainability efforts?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Not at all familiar Extremely familiar

Are you aware of challenges in the ceramic industry related to energy use, emissions, and raw material sourcing?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Not aware at all Very aware

Are you aware of challenges in the ceramic industry related to fair labor practices, workers health or equal pay?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Not aware at all Very aware

Willingness to Pay a Premium for Sustainability

How important is sustainability when choosing ceramic products?

☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

Not at all important Extremely important

What Specific sustainable practice would make you more willing to pay a premium (Select all that apply)

☐ Eco-friendly materials ☐ Carbon-neutral production

☐ Recyclable packaging ☐ Fair labor practices

☐ Energy-efficiency ☐ Other (comment below)

Would you be willing to pay a higher price for sustainably produced ceramics? If so, how much more?

☐ No, I would not pay more ☐ Yes, up to 5% more

☐ Yes, up to 10% more ☐ Yes, up to 15% more

☐ Yes, 20% or more

Demographic Information

Age Group

☐ Under 18 ☐ 18-24

☐ 25-34 ☐ 35-44

☐ 45-54 ☐ 55 or older

Gender

☐ Male | ☐ Female | ☐ non-binary | ☐ Prefer not to say

Monthly income

☐ Under €600 ☐ €600 - €1.199

☐ €1.200 - €1.799 ☐ €1.800 - €2.499

☐ €2.500 - €3.499 ☐ €3.500 or more

Primary purpose for purchasing ceramic products

☐ Personal use ☐ Gift-giving

☐ Business/decorating ☐ Other:

Please share any additional comments or suggestions.

Vista Alegre Sustainability Questionnaire

Store
Date

This questionnaire, developed with Vista Alegre for supplementary research purposes, explores customer sustainability perceptions. It was excluded from the consulting report due to its focus on marketing and consumer insights, which did not align with the report's operational and industry-focused scope. Yet, it remains a valuable tool for Vista Alegre to understand customer attitudes and inform future strategies.

References

Amsterdam University of Applied Sciences, Ecommerce Europe. 2024. *European E-commerce Report 2024.* Amsterdam: Ecommerce Europe.

Associação Portuguesa das Indústrias de Cerâmica e Cristalaria. n.d.a. *Documento de referência: Setor da indústria ceramica.* Accessed October 16, 2024. https://www.apicer.pt/apicer/media/60643dfdea39e.pdf.

Associação Portuguesa das Indústrias de Cerâmica e Cristalaria. n.d.b. *CeramicLowCO2*. Accessed October 24, 2024. https://www.apicer.pt/apicer/media/65f03f95379eb.pdf.

Barata, J., Silva, F., Almeida, M. 2019. „Ceramic Industry 4.0: Paths of Revolution in Traditional Products.“ *Technological Developments in Industry 4.0 for Business Applications* 278-303.

Centre for the Promotion of Imports from Developing Countries. 2023a. *The European market potential for ceramic dinnerware.* Accessed November 14, 2024. https://www.cbi.eu/market-information/home-decoration-home-textiles/ceramic-dinnerware/market-potential.

Centre for the Promotion of Imports from Developing Countries. 2023b. *Entering the European market for ceramic dinnerware*. Accessed November 20, 2024. https://www.cbi.eu/market-information/home-decoration-home-textiles/ceramic-dinnerware/market-entry.

Cerame-Unie. 2021. *CERAMIC ROADMAP TO 2050 | CONTINUING OUR PATH TOWARDS CLIMATE NEUTRALITY*. Accessed October 26, 2024. https://cerameunie.eu/topics/cerame-unie-sectors/cerame-unie/ceramic-roadmap-to-2050-continuing-our-path-towards-climate-neutrality/.

Cerame-Unie. 2022. *CERAME-UNIE PRESS RELEASE ON ENERGY PRICES*. Accessed November 9, 2024. https://cerameunie.eu/media/5imjwnj2/22-09-08-press-release-energy-crisis.pdf.

Cerame-Unie. 2023. *EUROPEAN CERAMIC DAYS | LAUNCH OF THE CERAMIC MANIFESTO 2024-2029*. Accessed November 20, 2024. https://www.cerameunie.eu/media/li4nqrnx/final-digital-long-version-for-website-ceramunie-manifesto_6ptriptych_v11-blueurllink-17112023-_pbp.pdf.

Cerame-Unie. 2024a. J*OINT INDUSTRY COALITION STATEMENT IN SUPPORT OF THE EU-MERCOSUR FTA*. Accessed November 21, 2024. https://www.cerameunie.eu/media/suyjcpqm/2024-01-11-joint-industry-coalition-statement-in-support-of-the-eu-mercosur-fta.pdf.

Cerame-Unie. 2024b. *INVENTORY OF RESEARCH AND INNOVATION PROJECTS IN THE CERAMIC INDUSTRY*. https://cerameunie.eu/media/itcd0dxs/r-i-project-inventory-updated-sep-23.pdf.

Cerame-Unie. 2024c. *PUBLICATION OF THE 42th ANNUAL REPORT ON THE USE OF TRADE DEFENCE INSTRUMENTS*. Accessed November 21, 2024. https://www.cerameunie.eu/media/nizddohk/press-release-42nd-annual-report-on-tdi-final.pdf.

Cerame-Unie. n.d. *Continuing our Path towards Climate Neutrality*. Accessed November 3, 2024. https://www.ceramicroadmap2050.eu/chapters/continuing-our-path-towards-climate-neutrality/#:~:text=Producing%20ceramics%20is%20an%20energy, Emissions%20Trading%20System%20(ETS).

COMPETE 2030. 2024a. *Indústria Cerâmica Portuguesa: Uma evolução sustentável*. Accessed October 22, 2024. https://www.compete2030.gov.pt/comunicacao/industria-ceramica-portuguesa-uma-evolucao-sustentavel/.

COMPETE 2030. 2024b. *APICER apoia transição sustentável na indústria cerâmica*. Accessed November 3, 2024. https://www.compete2030.gov.pt/comunicacao/noticias-pt-informacao/apicer-apoia-transicao-sustentavel-na-industria-ceramica.

Covington. 2024. *What Can You Expect From the New Product Liability Directive.* Accessed November 14, 2024. https://www.cov.com/en/news-and-insights/insights/2024/10/what-can-you-expect-from-the-new-product-liability-directive.

Data Bridge Market Research. 2024. *Home FMCG Global Ceramic Tableware Market*. Accessed October 11, 2024. https://www.databridgemarketresearch.com/reports/global-ceramic-tableware-market#:~:text=Global%20Ceramic%20Tableware%20Market%20was,forecast%20period%20of%202022%2D2029.

Deloitte. 2020. *Cybersecurity for smart factories Tools for managing cyber threats to manufacturing.* Accessed November 24, 2024. https://www2.deloitte.com/us/en/pages/energy-and-resources/articles/smart-factory-cybersecurity-manufacturing-industry.html.

Ecocerâmica e Cristalaria de Portugal. n.d. *Ecocerâmica e Cristalaria de Portugal.* Accessed October 22, 2024. https://agendaecp.pt/pt.

Elkington, John. 1994. „Towards the Sustainable Corporation: Win-Win-Win Business Strategies for Sustainable Development.“ *California Management Review* 90-100.

EUCERMAT team. n.d. *Costa Verde*. Accessed November 25, 2024. http://www.eucermat.eu/eucermat/home/partners-2/companies/costa-verde/.

Euromonitor. 2023. *Global Consumer Types: Minimalist Seeker.* Accessed November 21, 2024. https://www.euromonitor.com/article/global-consumer-types-minimalist-seeker.

European Central Bank. 2024. *Inflation and consumer prices.* Accessed November 20, 2024. https://www.ecb.europa.eu/stats/macroeconomic_and_sectoral/hicp/html/index.en.html.

European Commission. 2019a. *EU-Japan Economic Partnership Agreement enters into force.* Accessed November 3, 2024. https://ec.europa.eu/commission/presscorner/detail/en/ip_19_785.

European Commission. 2019b. *The European Green Deal*. Accessed October 24, 2024. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en.

European Commission. 2023a. *Corporate sustainability reporting.* Accessed November 9, 2024. https://finance.ec.europa.eu/capital-markets-union-and-financial-markets/company-reporting-and-auditing/company-reporting/corporate-sustainability-reporting_en.

European Commission. 2023b. *2022 household spending exceeds pre-COVID levels.* Accessed November 16, 2024. https://ec.europa.eu/eurostat/web/products-eurostat-news/w/ddn-20231123-1.

European Commission. 2024a. *Industrial and Livestock Rearing Emissions Directive (IED 2.0).* Accessed October 24, 2024. https://environment.ec.europa.eu/news/revised-industrial-emissions-directive-comes-effect-2024-08-02_en.

European Commission. 2024b. *Latest business and consumer surveys.* Accessed November 12, 2024. https://economy-finance.ec.europa.eu/economic-forecast-and-surveys/business-and-consumer-surveys/latest-business-and-consumer-surveys_en.

European Commission. n.d.a. *EU Emissions Trading System (EU ETS).* Accessed November 6, 2024. https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets_en.

European Commission. n.d.b. *Industry 5.0*. Accessed October 14, 2024. https://research-and-innovation.ec.europa.eu/research-area/industrial-research-and-innovation/industry-50_en.

European Commission. n.d.c. *Sustainable development*. Accessed November 17, 2024. https://policy.trade.ec.europa.eu/development-and-sustainability/sustainable-development_en.

European Committee for Standardization. n.d. *Home.* Accessed November 22, 2024. https://standards.cencenelec.eu/dyn/www/f?p=CEN:6.

European Environmental Bureau. 2024. *Revised Industrial Emissions Directive and Regulation Establishing the Industrial Emissions Portal: outcomes and opportunities*. Accessed October 24, 2024. https://eeb.org/wp-content/uploads/2024/08/IED-and-IEP-R-assessement.pdf.

European Parliament. 2024. *How the EU improves workers' rights and working conditions*. Accessed November 20, 2024. https://www.europarl.europa.eu/topics/en/article/20190506STO44344/how-the-eu-improves-workers-rights-and-working-conditions.

European Union. 2019. *Document 32019R0464*. Accessed October 26, 2024. https://eur-lex.europa.eu/eli/reg_impl/2019/464/oj.

European Union. n.d. *European Union Intellectual Property Office.* Accessed November 26, 2024 https://www.euipo.europa.eu/en/about-us/governance.

Fiskars Oyj Abp. 2023. *Fiskars Group Supplier Code of Conduct.* Accessed November 25, 2024. https://fiskarsgroup.com/wp-content/uploads/2024/10/Fiskars-Group-Supplier-Code-of-Conduct-2023-visualized.pdf.

Fiskars Oyj Abp. 2024a. *Financial Statements 2023*. Accessed November 25, 2024. https://fiskarsgroup.com/investors/reports-and-presentations/annual-and-interim-reports/.

Fiskars Oyj Abp. 2024b. *Sustainability Report 2023*. Accessed November 25, 2024. https://fiskarsgroup.com/wp-content/uploads/2024/02/FiskarsGroup_Sustainability_Report_2023-1.pdf.

Future Market Insights Inc. 2023. *Tableware Market Outlook (2023 to 2033)*. Accessed October 5, 2024. https://www.futuremarketinsights.com/reports/tableware-market.

Gazeta das Caldas. 2020. *Portugal é o segundo maior produtor mundial na cerâmica decorativa e de mesa.* Accessed November 2, 2024. https://gazetadascaldas.pt/diversos/portugal-e-o-segundo-maior-produtor-mundial-na-ceramica-decorativa-e-de-mesa/.

Ghemawat, Pankaj. 1986. „Sustainable Advantage.“ *Harvard Business Review 64* 53-58.

GlobalWebIndex. 2020. *GWI Coronavirus Research | July 2020 Multi-market research wave.* Accessed November 23, 2024. https://www.gwi.com/hubfs/1.%20Coronavirus%20Research%20PDFs/GWI%20coronavirus%20findings%20July%202020%20-%20Multi-Market%20Research%20(Release%2011).pdf.

Grand View Research, Inc. 2019. *Tableware Market Size, Share Analysis Report, 2020-2025.* Accessed October 14, 2024. https://www.grandviewresearch.com/industry-analysis/tableware-market.

Grestel, Produtos Cerâmicos S.A. 2024. *Sustainability Report 2023.* Accessed November 25, 2024. https://issuu.com/costanova/docs/relatorio_sustentabilidade_2023.

Grestel, Produtos Cerâmicos S.A. n.d.a. *Projetos co-financiados - Ecogres.* Accessed October 25, 2024. https://grestel.pt/projetos-co-financiados/ecogres.

Grestel, Produtos Cerâmicos S.A. n.d.b. *Programa Operacional Competividade e Internacionalização, apoiada pelo FSE, nostermos do Aviso para Apresentação de Candidatura n.º 10/SI/2020*. Accessed November 19, 2024. https://grestel.pt/library/pdf-dinamico-do-projeto1.pdf.

Hiles, Hannah. 2024. *Steelite celebrates 'significant improvement' in performance in 2023.* Accessed November 18, 2024. https://daily-focus.co.uk/2024/10/steelite-celebrates-significant-improvement-in-performance-during-2023/.

Hobbs, Andrew. 2022. *How the EU's new sustainability directive is becoming a game changer*. Accessed November 9, 2024. https://www.ey.com/en_be/insights/assurance/how-the-eu-s-new-sustainability-directive-is-becoming-a-game-changer.

IAPMEI - Agência para a Competitividade e Inovação, I. P. 2023. *Cerâmica*. Accessed October 22, 2024. https://www.iapmei.pt/PRODUTOS-E-SERVICOS/Industria-e-Sustentabilidade/Regulamentacao-de-produto/Docs/2023-05-11_A4SetorCeramica.aspx.

IAPMEI - Agência para a Competitividade e Inovação, I.P. n.d. *Roadmap para a Transição Digital do Setor da Cerâmica*. Accessed November 21, 2024.

https://academiapme.iapmei.pt/pluginfile.php/24820/mod_page/content/161/Roadmap_setor%20Cer%C3%A2mica.pdf.

James P. Womack, Daniel T. Jones. 1996. „Lean Thinking : Banish Waste and Create Wealth in Your Corporation.“ *Journal of the Operational Research Society 48.*

Javier García-Ten, Michele Dondi, José Vítor M.B. Vieira Lisboa, Mónica Vicent Cabedo, Luis Pérez-Villarejo, Elisa Rambaldi, Chiara Zanelli,. 2024. „Critical raw materials in the global high-throughput ceramic industry.“ *Sustainable Materials and Technologies Volume 39* e00832.

Jornal de Negócios. 2018. *Vista Alegre compra Bordallo Pinheiro à Visabeira por 48,5 milhões*. Accessed October 19, 2024. https://www.jornaldenegocios.pt/empresas/detalhe/vista-alegre-compra-bordallo-pinheiro-a-visabeira-por-485-milhoes.

Jornal de Negócios. 2024. *Grestel: Costa Nova é marca e grupo.* Accessed November 22, 2024. https://www.jornaldenegocios.pt/negocios-iniciativas/premios-exportacao---internacionalizacao/detalhe/20241003-0931-grestel-costa-nova-e-marca-e-grupo.

Jornal Económico. 2024. *Vista Alegre está a usar Inteligência Artificial numa das suas fábricas.* Accessed October 16, 2024. https://jornaleconomico.sapo.pt/noticias/vista-alegre-esta-a-usar-inteligencia-artificial-numa-das-suas-fabricas/?webtoappExternalUrl=true.

Observatory of Economic Complexity. 2022a. *Ceramics Tableware in Portugal*. Accessed November 9, 2024. https://oec.world/en/profile/bilateral-product/ceramic-tableware/reporter/prt?tradeValueExport=tradeScale2&compareExports0=comparisonOption5.

Observatory of Economic Complexity. 2022b. *Porcelain Tabelware in Portugal.* Accessed November 7, 2024. https://oec.world/en/profile/bilateral-product/porcelain-tableware/reporter/prt.

Observatory of Economic Complexity. 2022c. *Ceramic Tableware.* Accessed November 7, 2024. https://oec.world/en/profile/hs/ceramic-tableware.

Porcelanas Da Costa Verde S.A. n.d. *About Us.* Accessed November 8, 2024. https://costa-verde.com/en/about-us/.

Portal da Liderança. 2015. *José Luís Sequeira: A cerâmica portuguesa não está no top mundial só por ser interessante: tem design, qualidade e é inovadora.*. Accessed November 11, 2024. https://www.portaldalideranca.pt/lideres/entrevistas/4519-jose-luis-sequeira-a-ceramica-portuguesa-nao-esta-no-top-mundial-so-por-ser-interessante-tem-design-tem-qualidade-e-e-inovadora.

Porter, Michael E. 1979. „How Competitive Forces Shape Strategy.“ *Harvard Business Review 57, no. 2 (March–April 1979)* 137-145.

Porter, Michael; Mark. Kramer. 2019. „Creating Shared Value.“ In *Managing Sustainable Business,* from G. Lenssen and N. Smith, 323-346. Dordrecht: Springer.

Portugal 2020. 2023. *FLEX 360' vai aumentar a capacidade produtiva da Vista Alegre em Aveiro*. Accessed October 4, 2024. https://portugal2020.pt/flex-360-vai-aumentar-a-capacidade-produtiva-da-vista-alegre-em-aveiro/#:~:text=O%20projeto%20FLEX%20360%20%C3%A9,internacionaliza%C3%A7%C3%A3o%20dos%20produtos%20Vista%20Alegre.

Princeton University. n.d. *Ceramics.* Accessed October 16, 2024. https://ehs.princeton.edu/health-safety-the-campus-community/art-theater-safety/art-safety/ceramics#g.

Reichheld Ashley, Peto John, Ritthaler Cory. 2023. *Consumers' Sustainability Demands Are Rising*. Accessed November 19, 2024.https://hbr.org/2023/09/research-consumers-sustainability-demands-are-rising.

Robbins, Stephen P., Mary Coulter. 2005. „Organization as an Open System." In *Management - Eleventh Edition*, from Stephen P. Robbins and Mary Coulter, 36. New Jersey: Pearson Education, Inc.

Sambonet Paderno Industrie S.p.A. 2023. *2022 Sustainability Report*. Accessed November 27, 2024. https://arcturusgroup.it/uploads/green/Sambonet-Paderno_Sustainability-Report-2022_ENG.pdf.

Sambonet Paderno Industrie S.p.A. n.d. *Company Profile.* Accessed November 27, 2024. https://arcturusgroup.it/en/Company-Profile.html.

Sistema de Gestão dos Consumos Intensivos de Energia. 2019. *CADERNOS SUBSETORIAIS; FABRICAÇÃO DE ARTIGOS DE USO DOMÉSTICO DE FAIANÇA, PORCELANA E GRÉS FINO.* Accessed November 8, 2024. https://sgcie.pt/wp-content/uploads/2019/10/23412-PORCELANA-E-GR%C3%89S-FINO-Caderno.pdf.

Soares, Filipa. 2022. *Portuguese ceramic industry takes a dent as energy crisis looms*. Accessed October 15, 2024. https://www.euronews.com/2022/09/13/portuguese-ceramic-industry-takes-a-dent-as-energy-crisis-looms.

Staatliche Porzellan-Manufaktur Meissen GmbH. n.d. G*eschichte.* Accessed November 5, 2024. https://www.meissen.com/de/geschichte.

Steelite International Lmtd. 2024. *Annual report and consolidated financial statements for they year ended 31 December 2023.* Stoke-on-Trent: Steelite International Lmtd.

Steelite International Lmtd. n.d.a. *Company Profile*. Accessed November 23, 2024. https://www.steelite.com/media/literature/brochures/0c66838519449e948ab8498918ab80cd_1401978114.pdf.

Steelite International Lmtd. n.d.b. *About Us.* Accessed November 23, 2024. https://www.steelite.com/about-us.

The World Bank Group. n.d. *MALENA, MAchine Learning ESG Analyst.* Accessed November 21, 2024. https://malena.ifc.org.

United Nations. 2015. *THE 17 GOALS*. Accessed October 19, 2024. https://sdgs.un.org/goals.

Villeroy&Boch AG. 2019. *Umwelterklärung 2019*. Accessed October 30, 2024. https://www.villeroyboch-group.com/fileadmin/user_upload/unterschr_2019_UWE_UB_TK.pdf.

Villeroy&Boch AG. 2024. *Sustainability Report 2023*. Accessed October 30, 2024. https://www.villeroyboch-group.com/fileadmin/user_upload/images/Investor_Relations/Publikationen/Nachhaltigkeitsbericht/E-VundB_Nachhaltigkeitsbericht_2023_RZ_sec.pdf.

Villeroy&Boch AG. n.d. *Unsere Marken im Überblick.* Accessed October 30, 2024. https://www.villeroyboch-group.com/de/unternehmen/unsere-marken.html.

Vista Alegre Atlantis, SGPS, S.A. 2022a. *2022- VAA Corporate Presentation*. Accessed October 2, 2024. https://investidores.vistaalegre.com/assets/vaa-corporate-presentation-2022.pdf.

Vista Alegre Atlantis, SGPS, S.A. 2022b. *Relatório e Contas 2021*. Accessed October 5, 2024. https://live.euronext.com/sites/default/files/company_press_releases/attachments/2022/05/13/Connect_08relatorioecontasvaasgps2021eng0.pdf.

Vista Alegre Atlantis, SGPS, S.A. 2023. *Relatório e Contas 2022*. Accessed October 7, 2024. https://cgov.pt/images/ficheiros/cgs-nacionais/pc85615.pdf.

Vista Alegre Atlantis, SGPS, S.A. 2024a. „Business Case Study - Project Questionnaire."

Vista Alegre Atlantis, SGPS, S.A. 2024b. *Relatório e Contas 2023.* Accessed October 8, 2024. https://investidores.vistaalegre.com/assets/rcfinalvaa2023.pdf.

Vista Alegre Atlantis, SGPS, S.A. n.d.a. *História.* Accessed October 2, 2024. https://vistaalegre.com/pt/t/vaa_AMarca_Historia-1?srsltid=AfmBOoow4IWHPmx_iOJQ4jJdOgcAwnGuMAjCXSc0i1I1wh_iVAaIk157.

Vista Alegre Atlantis, SGPS, S.A. n.d.b. *Projeto nº 705.* Accessed October 19, 2024. https://vistaalegre.com/pt/t/vaaapoios-1-1.

Vista Alegre Atlantis, SGPS, S.A. n.d.c. *Descarbonização Proj. N.º 539*. Accessed October 20, 2024. https://vistaalegre.com/pt/t/vaaapoios-2-5.

Vista Alegre Atlantis, SGPS, S.A. n.d.d. *Design Residency*. Accessed November 30, 2024. https://vistaalegre.com/idpool/?srsltid=AfmBOooZnEoRynNSKOTwWeSD4XfkB0LMQ1hzMi-ZdkX_Du65vLprSZSH.

Vista Alegre Atlantis, SGPS, S.A. n.d.e. *Apoios comunitarios.* Accessed October 2, 2024. https://vistaalegre.com/pt/t/apoios_comunitarios.

World Commission on Environment and Development. 1987. *Our Common Future.* Oxford: Oxford University Press.

World Economic Forum. 2024. *The future of critical raw materials: How Ukraine plays a strategic role in global supply chains*. Accessed November 5, 2024. https://www.weforum.org/stories/2024/07/the-future-of-critical-raw-materials-how-ukraine-plays-a-strategic-role-in-global-supply-chains/.

Zimbili O., Salim, W. Ndambuki M. 2014. „A review on the usage of ceramic wastes in concrete production.“ *International Journal of Civil, Architectural, Structural and Construction Engineering 8* 91-95.