

ESRS E1 – Climate Change – An Approach

Diogo Silva
Rui Ribeiro
Pedro Vidal
Adalmiro Pereira
Tânia Teixeira

ISCAP-P Porto
ISCAP-P Porto teacher; CEOS member

Abstract

The industrial sector faces the challenge of reconciling large-scale production with the planet's limits, with the cement industry being a major focus due to its high carbon footprint. At the heart of this transformation is the ESRS E1 standard, which obliges companies to transition from a "good intentions" model to a management system based on auditable data on Scope 1, 2, and 3 emissions. This regulation allows for the assessment of "dual materiality," analyzing both the company's impact on the climate and the financial risks that climate change poses to the viability of the business.

Cement production entails severe environmental and health costs, accounting for a substantial share of global greenhouse gas emissions. The problem is exacerbated by the chemical calcination process, which releases carbon dioxide as an unavoidable byproduct, and by the release of heavy metals and dust that cause respiratory diseases such as silicosis.

In the case of CIMPOR, the company has sought to align its industrial heritage with decarbonization goals, committing to achieving carbon neutrality by 2050. Its strategy focuses on the circular economy, using waste as an alternative fuel, and on technological innovation, exemplified by the development of concrete supports for solar panels. This digital and sustainable transition, supported by the Cimpor Online platform and the reduction of the clinker ratio in its products, aims to ensure the organization's competitiveness in a market where transparency and low carbon emissions are the new metrics of efficiency.

Keywords: CIMPOR; Sustainability; ESRS E1; Decarbonization; Cement Industry; Innovation.

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I. Introduction

The industrial sector today faces what is probably its greatest challenge since the Industrial Revolution: the need to reconcile large-scale production with the planet's regenerative limits. This pressure is felt particularly intensely in the cement industry, a pillar of modern construction, but also one of the most significant sources of greenhouse gas emissions. This is not merely a matter of image or social responsibility; what is at stake is the very economic viability of a sector forced to reinvent its fundamental processes. This work stems from the need to understand how the new European reporting rules are shaping this transformation in practice.

At the heart of this regulatory framework lies the ESRS E1 standard, focused on Climate Change. It is important to view this standard not as a simple mandatory form to fill out, but as a new management model. By requiring transparency regarding Scope 1, 2, and 3 emissions, and by obliging companies to quantify the financial risks of climate change, the European Union is changing the rules of the game. ESRS E1 removes sustainability from the realm of "good intentions" and places it in the realm of auditable data. The objective is clear: to ensure that investors and society know exactly which companies are prepared for a decarbonized economy and which ones risk becoming obsolete.

To bring this discussion closer to reality, this study focuses on CIMPOR. Through its 2024 Sustainability Report, we can observe how a historic company, now part of TCC Group Holdings, is attempting to translate the requirements of the ESRS E1 standard into actions on the ground. CIMPOR emerges here as a privileged object of study, as it operates in a sector where decarbonization is technically difficult and expensive. Analyzing how the company is investing in the modernization of its Alhandra and Souselas factories, in the use of new fuels, and in research into alternative materials such as hydrogen and calcined clays, allows us to understand the gap that still exists between what the standard requires and what current technology allows.

The problem this work proposes to explore is, therefore, the effectiveness of this relationship in discovering to what extent such rigorous reporting standards as ESRS E1 can effectively accelerate technological

change in the industry. Over the following pages, we will seek to analyze whether the indicators presented by CIMPOR are merely a formal response to the law or whether they represent a real change in the organization's culture and strategy. The aim is to evaluate the path of an industry that, having committed to achieving carbon neutrality by 2050, now finds itself obliged to expose all its stages, difficulties, and progress before unprecedented public and regulatory scrutiny.

II. Summary Of The Standard

The ESRS E1 standard, dedicated to Climate Change, is not just a welcome guide for addressing climate change; it is a cornerstone of environmental sustainability.

The fundamental objective of this standard is to enable users of sustainability statements to understand the dual materiality of the company in relation to climate.

On the one hand, the analysis examines how the company affects climate change through positive and negative material impacts, past, present, and future.

On the other hand, it assesses how climate change affects the company, generating financial risks and opportunities that influence its position and performance in the short, medium and long term.

The standard is intrinsically aligned with international agreements and EU legislation, requiring companies to demonstrate how their mitigation efforts align with the Paris Agreement and the goal of limiting global warming to 1.5°C.

III. Strategy And Business Model

The strategic focus of ESRS E1 lies in the Disclosure Requirement, which mandates the presentation of a transition plan for mitigating climate change. Theoretically, this represents a paradigm shift: companies no longer need to simply report on what they have done, but must now create reports on how they will survive and thrive in a low-carbon economy.

This transition plan must be robust and compatible with climate neutrality by 2050. The standard requires a detailed explanation of the identified decarbonization levers and planned key actions, including changes to the product and service portfolio and the adoption of new technologies.

A critical aspect introduced is the concept of locked emissions. The company must conduct a qualitative assessment of the potential for locked GHG emissions in its key assets and products. This is vital to understanding whether the company's current infrastructure could compromise future reduction targets or create transition risks, such as obsolete assets. Furthermore, the plan should explain how it is integrated into the overall financial strategy, quantifying the investments required for its implementation.

Additionally, within the framework of the strategy's resilience, the company should describe the resilience of its business model to climate change, using climate scenario analyses. This analysis should clearly distinguish between physical risks (acute and chronic) and transition risks, assessing how these impact the company over time.

Risk and Opportunity Management (IRO)

Proactive management is a central pillar. The IRO-1 requirement calls for a detailed description of the processes used to identify and assess climate-related impacts, risks, and opportunities.

The identification of physical risks should consider climate hazards (such as floods, thermal stress, or wind) and the exposure of company assets to these hazards, using high-emission scenarios to test the most adverse conditions. For transition risks, the analysis focuses on events such as regulatory, technological, or market changes, and should consider scenarios compatible with limiting warming to 1.5°C.

Once the risks have been identified, the company needs to disclose the policies it has adopted to manage them. This is not just about listing intentions, but about demonstrating how these policies address mitigation, adaptation, energy efficiency, and the implementation of renewable energies.

To operationalize these policies, the standard requires the disclosure of actions and resources. Companies must present mitigation actions through "decarbonization leverage" and quantify the expected results in terms of GHG reduction. There must also be a financial link; companies must relate the significant amounts of Capex and Opex needed to implement these actions to the relevant line items in the financial statements.

Metrics and Goals: Quantifying Performance

The metrics section is where theory translates into quantifiable and comparable data. The ESRS E1 standard establishes rigorous requirements to ensure transparency and prevent environmental fraud.

Climate Goals

Greenhouse gas (GHG) emission reduction targets must be disclosed in absolute value (tonnes of CO₂eq) and, if relevant, in intensity value. The standard is explicit: these must be gross targets, meaning the company

cannot use carbon credits or avoided emissions to achieve these targets. The targets must cover Scopes 1, 2, and 3 and include target values for 2030 and, if available, for 2050, updated every five years. The company must also state whether these targets are based on science and compatible with the 1.5°C scenario.

Recognizing that energy is the main source of emissions, the standard requires the disclosure of total energy consumption, broken down by fossil fuels, nuclear energy, and renewable sources.

For companies in sectors with a high climate impact, even greater disaggregation of fossil fuels (coal, oil, gas) is required. Furthermore, energy intensity based on data providing a measure of the economic efficiency of energy use must be reported.

Gross GHG Emissions (E1-6)

This is the most critical indicator. The company must disclose gross emissions of:

Scope 1: Direct emissions from own or controlled sources.

Scope 2: Indirect emissions from purchased energy generation. The standard requires the presentation of these emissions using both the location-based method (grid averages) and the market-based method (specific energy contracts).

Scope 3: Indirect emissions from the value chain (upstream and downstream). These often constitute the largest part of a company's inventory and are a crucial driver of transition risks.

The standard also requires the disclosure of GHG intensity, calculated as total GHG emissions per net revenue, thus creating an indicator that allows comparisons between a wide variety of companies of different sizes.

Greenhouse Gas Removals and Carbon Credits

ESRS E1 introduces a fundamental theoretical and practical distinction between emissions reduction and carbon removal. The company must disclose separately the GHG removals and storage resulting from projects developed in its own operations or in its value chain.

Regarding carbon credits, the regulation mandates transparency on the financing of mitigation projects outside the value chain. It is essential to note that these credits cannot be subtracted from the company's GHG emissions for Scope 1, 2, and 3 reporting. If the company has a "Net-Zero" target or makes carbon neutrality claims, it must explain how residual emissions (after a reduction of approximately 90-95%) will be neutralized, ensuring the integrity and quality of the credits used.

Internal Carbon Price (E1-8)

To demonstrate how sustainability is integrated into economic decision-making, the standard asks whether the company applies internal carbon pricing schemes. This includes disclosing the type of scheme (e.g., shadow pricing for CapEx or internal carbon taxes), its scope and the prices used, as well as the methodology for its definition.

Anticipated Financial Effects (E1-9)

Finally, the regulation completes the cycle by linking climate to finance. Companies must disclose the anticipated financial effects of material physical and transition risks.

Physical Risks: The company must disclose the monetary amount and the proportion of assets (and net revenue) at material physical risk in the short, medium, and long term before considering adaptation actions.

Transition Risks: Similarly, the value of assets and revenues at risk of transition (e.g., assets that may become obsolete due to regulation) and potential liabilities, such as future costs related to emission allowances under emissions trading schemes (ETS), should be disclosed.

Additionally, the company can highlight the potential to benefit from climate opportunities, such as expected cost savings or an increase in the market size for low-carbon products.

IV. Climate Change And The Cement Industry

The cement industry is one of the fundamental pillars of modern development, supplying the most consumed material on the planet after water: concrete. However, this omnipresence has a severe environmental cost that, for a long time, remained outside the media radar, just like oil, due to its abundance and essential nature in our lives. The massive production of cement is essential to sustain rapid global urbanization and the development of new infrastructure, transforming this sector into one of the main drivers of climate change, with an environmental impact that rivals and surpasses that of sectors more frequently targeted, such as the recent controversies involving celebrities in private jets and yachts that are considered highly polluting.

The core of the environmental problem with cement lies not only in the enormous amount of fossil fuels needed to heat the kilns to temperatures exceeding 1400°C. The greater challenge is intrinsic to the chemical process itself. To produce clinker, the main active ingredient in cement, it is necessary to heat limestone (calcium carbonate). During this calcination process, the limestone decomposes, releasing carbon dioxide (CO₂) directly as an unavoidable chemical byproduct. This reaction accounts for about half of the sector's total emissions, making decarbonization a complex technological challenge that cannot be solved simply by switching to renewable energy.

The scale of emissions resulting from this process is alarming when analyzed in a global context. According to data presented by *Lemu Blog* (2019), the sector is responsible for a substantial share of greenhouse gases. To illustrate the magnitude of the problem, the author uses a striking comparison: "If the cement industry were a country, it would be the third largest emitter in the world, behind China and the United States" (El Santo, n.d.). These data underscore that, without profound intervention in this sector, international climate goals, such as those of the Paris Agreement, become virtually unattainable.

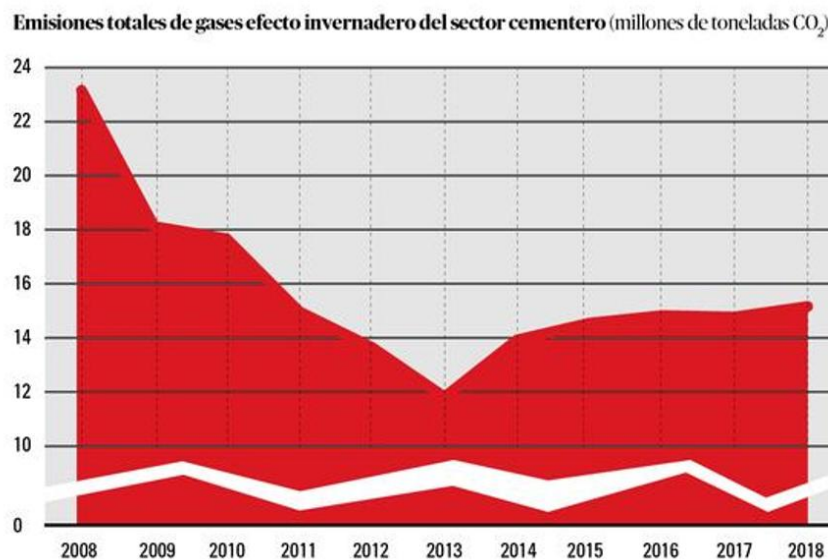


Figure 1 - Emissions from the Cement Sector
Source: Observatorio de Sostenibilidad

The future scenario shows no signs of a natural slowdown in demand. The need for cement continues to grow exponentially, driven by accelerated urbanization and the development of basic infrastructure in emerging economies, particularly in Asia and Africa. This continued demand creates a difficult paradox to resolve: the world needs to build housing and infrastructure for billions of people, but current construction methods are accelerating the climate collapse that threatens those same populations.

In conclusion, the cement industry faces an existential challenge. Being a historically conservative sector with high capital costs and tight profit margins, adaptation has been slow. Despite this, Cimpor strives to be an example, being one of the few with real and acknowledged ambitions for decarbonization, committing to being carbon neutral by 2050. The pressure for decarbonization now demands not only incremental adjustments, but a true technological revolution. Without the rapid adoption of large-scale carbon capture technologies, or the development of new chemicals that do not depend on limestone, it will be impossible to mitigate the profound impact this essential material has on global warming.

The Hidden Weight of Concrete - Impacts on Health and the Ecosystem

The cement industry plays an ambiguous role in modern society: while it is the foundation of urban development, it also represents a significant source of biological and chemical risks. According to a study released by...Fiocruz News Agency (2012), The environmental impacts of this activity are not limited to dust emissions, but extend to complex contamination affecting soil, water, and air. The research presented in this article highlights that cement production is one of the most aggressive industrial activities due to the release of toxic substances during various manufacturing phases, especially in clinker production.

The environmental contamination described in the study is widespread and persistent. The dispersion of particulate matter and heavy metals, such as mercury and lead, compromises air quality around the factories, subsequently depositing in the soil and waterways. As stated by...Fiocruz News Agency (2012) This waste can

enter the food chain, affecting both local wildlife and populations that depend on these natural resources. Air pollution, exacerbated by the burning of fossil fuels in furnaces, creates an impact radius that extends beyond the physical boundaries of the factory, making the surrounding environment hostile to public health.

With regard to workers' health, the risks are direct and often irreversible. The study points out that continuous exposure to mineral dust and toxic chemicals is the main cause of chronic respiratory diseases, such as silicosis. Furthermore, the Fiocruz News Agency (2012) It emphasizes that handling hazardous waste in the manufacturing process introduces risks of poisoning by heavy metals and other organic compounds. Frontline workers are the most vulnerable, facing a work environment where the pollutant load can lead to serious pathologies affecting not only the respiratory system, but also the nervous and renal systems.

A critical point addressed in Fiocruz's analysis is the phenomenon of co-processing, with the use of industrial and hazardous waste as fuel for cement kilns. Although this practice is presented as a circular economy solution, it carries significant risks if not strictly controlled. Fiocruz News Agency (2012) It also warns that the combustion of these materials can result in the emission of dioxins and furans, highly carcinogenic and persistent substances in the environment. This practice transforms cement plants into veritable waste incinerators, which requires much more rigorous health and environmental monitoring than is currently applied.

In conclusion, the data presented by Fiocruz News Agency (2012) These findings reinforce the urgent need to rethink the monitoring model for this industry. It is not enough to focus on the economic efficiency of production; it is imperative that public policies exist to guarantee the effective protection of ecosystems and the health of communities and workers. The study serves as a warning that environmental regulations must keep pace with the chemical complexity of current emissions, ensuring that progress in the construction industry is not made at the expense of the biological and human degradation of the regions where these factories operate.

V. Company Presentation

In the current economic landscape, CIMPOR is positioned as the leading company in the production and marketing of cement in Portugal and Cape Verde. Recently integrated into the shareholder structure of TCC Group Holdings (Taiwan Cement Corporation), the organization has consolidated its industrial relevance, operating with a strategy focused on competitiveness, innovation, and corporate responsibility.

In terms of installed capacity and operational structure, the company presents a robust vertical integration of its business. Its industrial activity in mainland Portugal is based on three integrated cement production centers (located in Alhandra, Souselas and Loulé) complemented by grinding units in the autonomous regions. In addition to its core cement business, the Group has diversified its operations through subsidiaries covering the entire construction materials cycle: ready-mix concrete production (through the Betão Liz and IBERA brands, with 42 plants), aggregate extraction (Agregor), dry mortar production (Ciarga), and the manufacture of industrial packaging (Sacopor). This structure is supported by more than 1100 employees and specialized support services, such as an accredited Central Laboratory and an international trading unit.

Currently, CIMPOR's strategic focus is sustainability, aligned with global decarbonization goals and ESG (Environmental, Social, and Governance) criteria. The company has committed to carbon neutrality by 2050 and a 37% reduction in its emissions by 2030 (Jornal de Notícias, 2025), investing in energy transition technologies and the circular economy. Key aspects of this include its commitment to co-processing (using waste as an alternative energy source to replace fossil fuels) and the implementation of innovative projects, such as the new clay calcination line at the Souselas Production Center, aimed at significantly reducing the CO₂ footprint of its products. Recognition of these practices is reflected in the awarding of the "COTEC 2025 Innovator" status.

From a financial and market perspective, the most recent available financial year, 2024, demonstrated sustainable growth for the organization, registering a 10% increase in turnover in Portugal and 14% in international operations. In short, CIMPOR is not limited to the role of a supplier of construction materials, but has positioned itself as a vital company in the transformation of the construction sector, with goals aimed at modernizing the sector, combining its industrial heritage with a future-oriented vision focused on technological efficiency and environmental sustainability.



Figure 2 - Innovation by CIMPOR - reduction of GHG emissions

The innovation shown in the image above was conceived by Cimpor, in partnership with Presdouro. It consists of developing concrete supports for solar panels that replace the usual, inefficient metal structures. Located in São João de Ver, this solution stands out for its intelligent "half-moon" shaped design with toothed fittings, which allows for easy adjustment of the panel inclination between 5 and 30 degrees. By using concrete as a base, the structure gains natural stability, eliminating the need for foundations or extensive groundwork, making the assembly process faster and less invasive to the environment.

Beyond the technical aspects, the great value of this innovation lies in its durability and low environmental impact, since concrete is a material that does not require painting or special protection against corrosion over the years. As can be read in...news presented by the company "This concrete solution is the perfect complement to solar panels as it uses abundant raw materials produced nationally" (Cimpor, n.d.), which promotes a local economy and reduces the ecological footprint associated with transportation. This project is a practical example of how the company is reinventing the application of its products to support the energy transition and the reduction of greenhouse gas emissions.

Application

To speak of Cimpor is, in a way, to speak of the history of construction and development in Portugal over the last few decades. Founded in 1976, the company has ceased to be merely a traditional cement producer and has transformed itself into a global player that attempts to balance the weight of heavy industry with the demands of an increasingly green world. It is important to emphasize that Cimpor does not only sell cement; it sells the foundation for all the infrastructure we know and use, and this is naturally reflected in the company's culture and strategy.

The company's organizational culture is marked by a strong sense of resilience and technical pride. Those who work at Cimpor often speak of a "family" that has gone through several management phases, but which maintains its focus on safety and rigor. Today, this culture is being challenged to evolve: the absolute priority has become sustainability and workplace safety.

The motto "Zero Accidents" is not just a poster or a catchy phrase on the wall, but a real performance measure based on the respect and dedication of the company's employees, who are the company's priority, following the example of companies like Delta, from the Nabeiro Group. There is a visible effort to make the company more inclusive and digital, trying to attract young talent to a sector that, for a long time, was seen as "old-fashioned" and not very environmentally friendly.

This shift in mindset is driven by leadership that, since its integration into the Turkish OYAK group, has become more agile and focused on operational efficiency. The current business strategy rests on a fundamental pillar: decarbonization. Cimpor knows that its future depends on its ability to produce cement without destroying the planet. Therefore, its strategy involves a circular economy, where the kilns in its factories (such as Alhandra or Souselas) serve to valorize waste that would otherwise go to landfills. By burning refuse-derived fuels (RDF) and biomass, the company reduces its dependence on fossil fuels and lowers its environmental footprint.

Regarding product formulation, innovation happens in the laboratory. The main objective is to reduce the clinker ratio, the cement component that emits the most CO₂ during production. Through the incorporation of mineral additions and new chemical mixtures, Cimpor has developed ranges such as Actua, which offers specific cements for different technical needs. The focus here is "eco-efficiency": ensuring that the final concrete is as strong as traditional concrete, but with a much smaller carbon footprint. It is precision engineering that attempts to meet the goals of the European Green Deal.

The way Cimpor acquires and retains clients has also changed radically. It's no longer just about negotiating the price per ton. The company positions itself as a technical partner. They work with large construction companies and concrete plants, offering consulting on the best formula for each type of project. For retail clients (building materials stores), the focus is on the brand and the reliability of logistics. This is where digital transformation and the Cimpor Online application come in. This platform acts as a right-hand tool for the client, allowing them to place orders, manage stock, and track deliveries in real time, eliminating the bureaucracy of paper invoices and constant calls to customer support.

Finally, the sale itself is made through a capillary logistics network that utilizes trains, trucks, and ships. Cimpor doesn't just focus on the domestic market; its export capacity through port terminals is vital for moving production and maintaining the scale necessary to invest in cutting-edge technology. In short, Cimpor today strives to be a technology company disguised as a heavy industry, where the product is cement, but the true value lies in the logistical intelligence and environmental responsibility they put into every bag.

VI. Conclusion

In concluding this analysis, the main conclusion that emerges is not only technical, but strategic and, above all, existential for the industry. The intersection between the regulatory rigor of ESRS E1 and the operational reality of CIMPOR allows us to understand that sustainability has ceased to be an abstract concept and has become the new metric of efficiency and long-term viability. What was once seen as an additional cost or a "necessary evil" for compliance with regulations is now the engine of innovation that dictates who will remain relevant in the global market.

The ESRS E1 standard plays a fundamental role here, going far beyond mere bureaucracy. It acts as a mirror of transparency, forcing organizations to look inward and acknowledge their vulnerabilities. By requiring detailed disclosure of Scope 1, 2, and 3 emissions, the standard removes any room for vague communications or so-called "greenwashing." In the case of CIMPOR, this regulatory pressure seems to have been viewed not as an obstacle, but as a catalyst. Integration into TCC Group Holdings and alignment with European targets demonstrate that the company understands that its future market value will depend directly on its ability to decarbonize one of the most difficult production processes to change.

Analyzing CIMPOR's trajectory in 2024, it becomes evident that the theory of standards translates into concrete actions on the ground. The replacement of fossil fuels with biomass and waste, the investment in calcined clay technology, and the modernization of kilns are steps that demonstrate necessary industrial courage. However, it is important to note that this path is not without challenges. The transition requires a colossal financial investment and constant adaptation to new technologies that are still maturing, such as green hydrogen. The conclusion we reach is that the political and regulatory will of the European Union needs to find an echo in the execution capacity and resilience of companies.

Looking to the future, the lesson is that compliance with ESRS standards will only be the starting point. The real competitive advantage will lie in how quickly companies can implement the circular economy and reduce their dependence on finite natural resources. CIMPOR, by setting the goal of carbon neutrality by 2050, has charted an ambitious course that serves as an example for the sector in Portugal. It is a commitment that requires a change of mindset throughout the value chain, from suppliers to the end customer.

In short, this work has shown that we are facing a new era of industrial management. Sustainability is no longer an "add-on" to the financial report; it is the report itself. If CIMPOR continues down this path of transparency and technological investment, it will not only be fulfilling its ethical duty to the planet, but also ensuring the robustness of its business in a world where low carbon emissions are the only accepted currency. The road is long and complex, but the direction seems to be, finally, well defined.

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