Creating a better tomorrow

SR2023

VESUVIUS PLC

Sustainability Report
2023

Welcome

As a global leader in molten metal flow engineering and technology we work closely with the most advanced steel-makers to develop refractory products for the green steel-making and casting processes of the future.

Forward-looking statements

This Sustainability Report contains certain forward-looking statements with respect to the operations, strategy, performance, financial condition and growth opportunities of the Vesuvius Group. By their nature, these statements involve uncertainty and are based on assumptions and involve risks, uncertainties and other factors that could cause actual results and developments to differ materially from those anticipated.

The forward-looking statements reflect knowledge and information available at the date of preparation of this Sustainability Report and, other than in accordance with its legal and regulatory obligations, the Company undertakes no obligation to update these forward-looking statements. Nothing in this Sustainability Report should be construed as a profit forecast.

Find out more in our Annual Report

Including more detailed information on what we do, our plans for the future, financial performance and how we run our business.

Download the full report

Visit our website at www.vesuvius.com

Visit our online annual report at report2023.vesuvius.com

We think beyond today's solutions and shape the future through innovation.

Our purpose

Vesuvius is a global leader in molten metal flow engineering and technology, serving process industries operating in challenging high-temperature conditions.

We think beyond today to create the innovative solutions that will shape the future, delivering products and services that help our customers make their industrial processes safer, more efficient and more sustainable.

In turn, we provide our employees with a safe workplace where they are recognised, developed and properly rewarded, and aim to deliver sustainable, profitable growth to provide our shareholders with a superior return on their investment.

We create innovative solutions that help our customers improve their safety and quality performance, reduce their environmental footprint, become more efficient in their processes and reduce costs.

We work in close partnership with the most advanced steel-makers to develop the refractory products for the green steel-making and casting processes of the future.

Our sustainability initiative sets out the Group's formal objectives and targets for supporting our customers, our employees and our communities, and for protecting our planet for future generations. It is embedded in the Group's overall strategy and informs how we deliver on our strategic priorities.

Our sustainability strategy: Towards a better tomorrow

The key objectives and priorities of our sustainability initiative are outlined here. They were defined following the identification and analysis of the Group's most important and material sustainability risks and opportunities.

Our planet

Our objectives

- To tackle climate change by reducing our CO_2e emissions and helping our customers reduce theirs with our products and services. We are committed to reaching a net zero carbon footprint at the latest by 2050
- To engage in the circular economy by reducing our waste, recovering more of our products after they have been used and increasing the usage of recycled materials

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Our customers

Our objectives

- To support our customers' efforts to improve safety on the shop floor, especially exposure to hot metal
- To help customers improve their operational performance and thereby reduce their environmental footprint, and especially their CO_2 emissions

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Our people

Our objectives

- To ensure the safety of our people and everyone else who accesses our sites. This is our first priority. We take safety very seriously and are constantly striving to improve
- To offer growth opportunities to all our employees through training and career progression to develop diverse, engaged and high-performing teams

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Our communities

Our objectives

- To support the communities in which we operate, with a focus on promoting and supporting women's education in scientific fields
- To ensure ethical business conduct both internally and with our trading partners
- To extend our sustainability commitment to our suppliers and encourage them to progress

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Introduction: Progress on our sustainability roadmap

Alexander Laugier-Werth
VP Sustainability, HSE & Quality

Welcome to our fourth Sustainability Report. I thank you very much for your interest in Vesuvius' journey.

The fight against climate change requires the steel and foundry industries to decarbonise their production processes whilst developing higher-performance metals, and larger and more complex castings.

Vesuvius helps address these challenges through our refractory products and engineering solutions designed to:

- Improve the operational performance of casting processes
- Reduce energy and resources wastage
- Allow customers to produce more advanced steel grades

These elements are essential to help our customers and downstream industries become more sustainable.

Parallel to this, we need to improve our own sustainability performance.

The Vesuvius sustainability strategy brings together all our environmental, social and governance initiatives into a single coordinated programme, fully integrated in the Group's business strategy. The sustainability strategy is built on four pillars: our planet, our customers, our people and our communities.

We have set out four key sustainability strategic priorities. Targets for three of these are embedded into our management incentive arrangements.

- Become a zero-accident company
- Reach net zero CO_2e emissions by 2050 (Scope 1 and Scope 2)
- Help our customers reduce their CO_2 emissions
- Improve gender diversity at every level of the Company

We are signatories to the UN Global Compact and report annually on our sustainability activities, commitments and progress. We are very proud of our progress to date and of the recognition we have received from leading rating agencies.

Since 2020, our MSCI ESG rating has progressed from BBB to AA, and our EcoVadis rating from Silver to Gold. Our first CDP report submitted in 2022 received a B grade and was enhanced to A- in 2023.

We have come a long way in our sustainability journey, particularly in setting up the organisation, building our roadmap to net zero, and, more recently, updating our materiality assessment and focusing on execution and delivery. In 2024 we plan to work on the selection of Key Performance Indicators and 2030 targets for all of our sustainability priorities.

We are committed to transparent and thorough reporting on our sustainability performance.

2023 reporting parameters

During 2023, our production of dolime was considerably reduced, following an incident which incapacitated one of our rotary kilns in January. As dolime production is the largest contributor to the Group's CO_2 emissions, the change in product mix skews environmental performance comparisons with prior years and with the 2025 target.

In this Report, we have therefore reported some pro forma numbers (as if the dolime process had been operating normally) to preserve meaningful comparability.

We are monitoring the introduction of ISSB standards in the UK and going forward our reporting will reflect changes in the regulatory landscape. We have also started work on ensuring we have systems in place to comply with the European Union's Corporate Sustainability Reporting Directive (CSRD) requirements, which will be applicable to Vesuvius plc in 2029 and applicable to a number of our European subsidiaries in 2026. In 2024, we intend to carry out a gap assessment between our 2023 sustainability disclosures and the CSRD requirements and build adequate plans.

We would welcome any input or feedback to: sustainability@vesuvius.com.

Alexander Laugier-Werth
VP Sustainability, HSE & Quality

Note: The content of this Sustainability Report is primarily based on our materiality analysis, feedback from our internal and external stakeholders, and the requirements of the UN Global Compact. It covers 100% of our operations (owned and joint ventures).

Waste and recycling data contained in this Report as well as the energy and Scope 1 and Scope 2 GHG emissions data are re-baselined from 2019 onwards using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) at the end of 2021 and BMC (Yingkou YingWei Magnesium Co., Ltd) acquired late in 2022.

Scope 1, Scope 2 and Scope 3 carbon footprint reporting and supporting evidence contained herein for the period 1 January 2019 to 31 December 2023 covering GHG emissions as CO_2e in metric tonnes , CO_2e intensity in metric tonnes of CO_2e per metric tonne of product packed for shipment, energy consumption in kWh and energy intensity in kWh of energy per metric tonne of product packed for shipment, location based and market based, were verified by Carbon Footprint Ltd in accordance with the ISO 14064 Part 3 (2019): Greenhouse Gases: Specification with guidance for the verification and validation of greenhouse gas statements. The report has not been externally assured in its entirety. Senior management are involved in the ongoing review of the collection, management, verification and assurance of reporting information.

A copy of the limited assurance statement can be found on our website: www.vesuvius.com.

Highlights

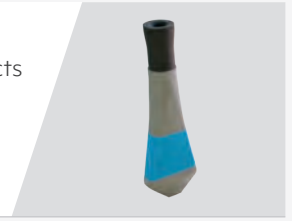
Our 2023 performance

0.6

Lost Time Injuries per million hours worked

£12.4m

R&D spend dedicated to the development of products contributing to the fight against climate change by reducing CO_2 emissions



83%

Percentage of ongoing new product development projects that were dedicated to market-leading sustainable products

20.2%

Pro forma reduction of Scope 1 and Scope 2 CO_2e emission intensity per metric tonne of product packed for shipment vs 2019[1,2]

20%

Female representation in the Senior Leadership Group

Our external recognitions and ESG ratings

AA

According to MSCI we lead in managing the most significant ESG risks and opportunities[3]

MSCI

GOLD 2023 ecovadis Sustainability Rating

We are in the top 3% of the more than 100,000 companies rated by this platform

ecovadis

A-

CDP recognised our leadership in disclosures and fighting against climate change

CDP

1. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co., Ltd).
2. Pro forma: performance as if the dolime process had been operating normally in 2023.
3. Source: https://www.msci.com/our-solutions/esg-investing/esg-ratings.

At a glance

Our world-leading R&D supports the consistent delivery of our high-tech consumables. Our sales are not dependent on the capex cycles of our customers, and our products create value by improving...

Safety
Improved safety at customer plants

Quality
Better steel, better castings

Efficiency
Cheaper steel, cheaper castings

Sustainability
Less energy usage and fewer CO_2 emissions in steel and foundry processes

Vesuvius is a specialist provider of high technology products and solutions to industrial customers who operate in challenging high-temperature conditions

Our customers are predominantly in the steel and foundry industries which we serve from our two Divisions. Our technology-led products allow our customers to tackle some of the most complex problems in their production processes.

Sales by customer activity

At a glance

OUR DIVISIONS

Steel

Vesuvius is a world leader in the supply of refractory products, systems and solutions to steel producers and other high-temperature industries. We help our customers increase their efficiency and productivity, enhance quality, improve safety and reduce their costs and their environmental impact.

Flow Control

Revenue: £793m

Supplies the global steel industry with consumable ceramic products, systems, robotics, digital services and technical products for the continuous casting process

Advanced Refractories

Revenue: £568m

Supplies specialist refractory products designed to enable steel-making equipment, such as Electric Arc Furnaces and Basic Oxygen Furnaces, to hold the molten metal

Sensors & Probes

Revenue: £39m

Provides a range of products that enhance the control and monitoring of our customers' production processes

What we do for our Steel customers

1. We supply refractory products, flow control systems and process measurement solutions to our Steel Division customers
2. We combine these with robotics and mechatronic installations to increase their efficiency, lower their costs and improve their safety and consistency
3. Our solutions address the key challenges of our customers in the steel industry, such as maintaining steel quality and reducing energy usage during the casting process
4. Our products and their applications preserve the purity of the steel as it moves through the production process, from initial refining to the cast steel slab, bar or ingot

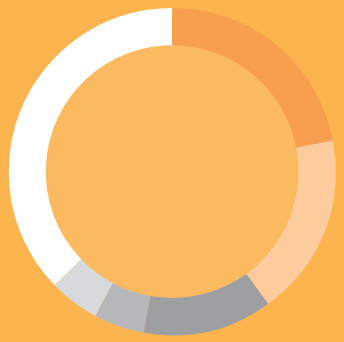
Revenue £1,400m

At a glance

Diversified end-markets

Product demand in the Foundry Division is driven by higher sophistication, demanding higher quality metal and more complex casting across increasingly diversified end-markets

- Light vehicles
- Railway and marine
- Mining and construction equipment
- Power generation
- Medium and heavy vehicles
- General engineering/ other



OUR DIVISIONS

Foundry

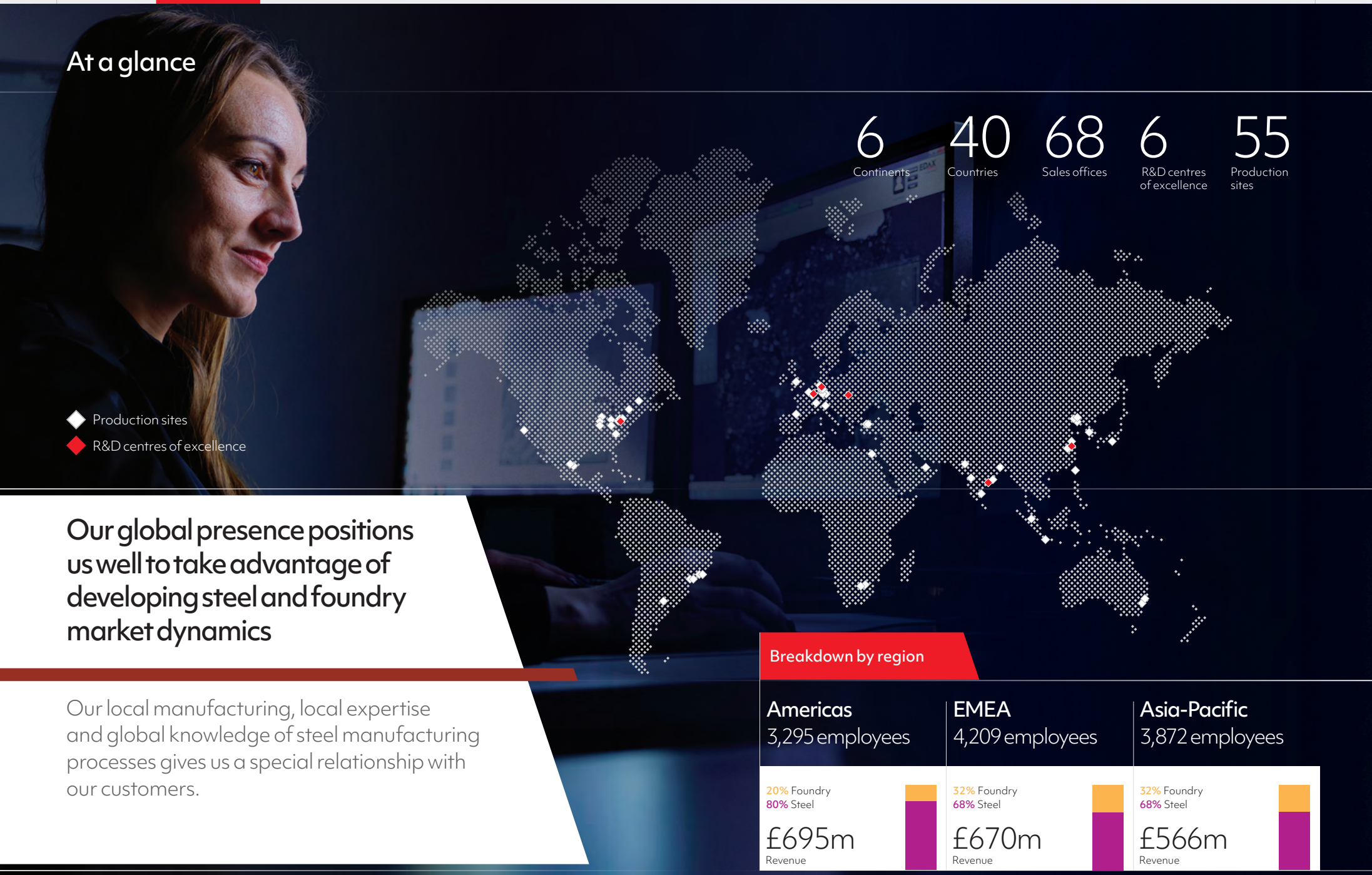
Vesuvius, operating under the Foseco brand, is a world leader in the supply of consumable products, technical advice and application support to the global foundry industry, improving casting quality and foundry efficiency. Our primary customers are ferrous and non-ferrous foundries serving various end-markets, from large bespoke castings to high-volume automotive pieces.

What we do for our Foundry customers

1. We provide customisable products and process technology to foundries that improve the quality of their castings
2. We combine this with technical advice, application engineering and computer modelling to improve process outcomes
3. Our solutions address our foundry customers' key challenges of casting quality and production efficiency
4. Our products and solutions clean the molten metal, improve the solidification of that metal, and reduce wastage in the final casting

Revenue £530m

At a glance



Our global presence positions us well to take advantage of developing steel and foundry market dynamics

Our local manufacturing, local expertise and global knowledge of steel manufacturing processes gives us a special relationship with our customers.

Breakdown by region

Americas
3,295 employees

20% Foundry
80% Steel

£695m
Revenue

EMEA
4,209 employees

32% Foundry
68% Steel

£670m
Revenue

Asia-Pacific
3,872 employees

32% Foundry
68% Steel

£566m
Revenue

Our sustainability journey

Evolution of our MSCI, CDP and EcoVadis ratings reflects the progress made in the deployment of our sustainability strategy and disclosure.

2020

- Sustainability Charter
- Sustainability Council
- Vesuvius adheres to the UN Global Compact
- Internal price of carbon
- Supplier assessment programme

2021

- Scope 1 and Scope 2 emissions externally verified
- Scope 3 emissions evaluated
- Sustainable Procurement Policy
- Sustainability scorecard
- First Sustainability Report
- Task Force on Climate-related Financial Disclosures (TCFD)

2022

- Roadmap to net zero
- First CDP questionnaire
- Sustainability Report Global Reporting Initiative (GRI) aligned

2023

- Launch of Scope 3 data collection (raw material suppliers, upstream and downstream transportation)
- Launch of Product Carbon Footprint project
- Commencement of double impact materiality assessment

	2020	2021	2022	2023
MSCI	BBB	A	AA	AA
ecovadis				
CDP			B	A-

Progress on our sustainability targets

The Board has identified nine significant non-financial KPIs for the business, covering the Group's main sustainability objectives. These KPIs were defined when the sustainability strategy was launched in 2020. Most targets associated with the KPIs have a deadline in 2025. Focus on these KPIs has been maintained in the following years. In 2024, we will begin work on selecting the 2030 targets and KPIs. We have set stretching targets for the Group's sustainability KPIs to reach within set time frames. These are set out in the table below. In view of the progress made, the reduction of Scope 1 and Scope 2 CO_2e emissions target was increased in 2022 from 10% to 20% and its coverage increased from Energy CO_2e to all CO_2e emissions.

KPI	Measure	Target	2023 progress vs plan[1]	2023 progress	Main domain	UN Sustainable Development Goals
Safety	Lost Time Injury Frequency Rate	<1	Ahead of schedule	0.6	Our people	
Energy intensity	By 2025, reduce energy intensity per metric tonne of product packed for shipment (vs 2019)	-10%	On plan	-7.2%[1,2,3]	Our planet	
CO_2e emission intensity	By 2025, reduce Scope 1 and Scope 2 CO_2e emission intensity per metric tonne of product packed for shipment (vs 2019)	-20%	Ahead of schedule	-20.2%[1,2,3]	Our planet	
Wastewater	By 2025, reduce wastewater per metric tonne of product packed for shipment (vs 2019)	-25%	Behind plan	-11.6%[1,2,3]	Our planet	
Solid waste	By 2025, reduce solid waste (hazardous and sent to landfill) per metric tonne of product packed for shipment (vs 2019)	-25%	Ahead of schedule	-19.7%[1,2,3]	Our planet	
Recycled material	By 2025, increase the proportion of recycled materials from external sources used in production	7%	Behind plan	5.7%[1,2,3]	Our customers	
Gender diversity	By 2025, increase female representation in the Senior Leadership Group (approx. 150 top managers)	25%	On plan	20%	Our people	
Compliance training	Increase the percentage of targeted staff who complete anti-bribery and corruption training annually	90%	Ahead of schedule	100%	Our communities	
Supply chain	By the end of 2023, conduct sustainability assessments of our raw materials suppliers (as a percentage of Group raw material spend)	50%	Target achieved	52%	Our communities	

During 2023, our production of dolime was considerably reduced, following an incident in January which incapacitated one of our rotary kilns. As dolime production is a major contributor to the Group's tonnage and CO_2 emissions, the change in product mix skews environmental performance comparisons both with prior years and with the 2025 target. The table above therefore contains pro forma performance figures as if the dolime process had been operating normally to preserve meaningful comparability. The actual figures are set out in a footnote to the table.

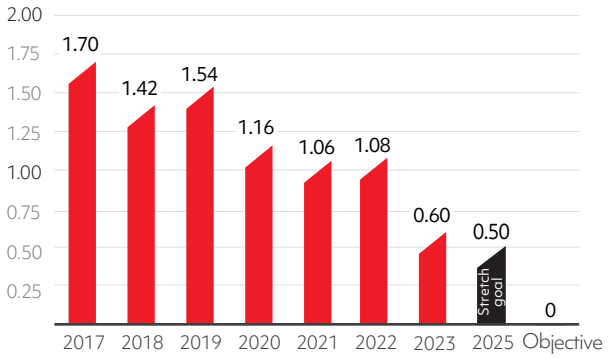
1. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation), and BMC (Yingkou YingWei Magnesium Co., Ltd).
2. Pro forma: performance as if the dolime process had been operating normally in 2023.
3. Actual Group performance for 2023, with actual dolime production: Energy intensity -14.6%, CO_2e emission intensity -45.5%, Wastewater -4.0%, Solid waste -13.4%, Recycled material 6.5%.

Our priorities

Become a zero-accident company

The number one priority at Vesuvius is to provide our employees with a safe place to work.

Group safety performance
Lost Time Injury Frequency Rate



We were pleased to see continued progress with the reduction of our Lost Time Injury Frequency Rate (LTIFR) in 2023, recording a rate of 0.6 per million hours worked in 2023 which was significantly lower than 2022 (1.1).

However, there were two serious incidents involving not directly supervised contractors in 2023, and the LTIFR for not directly supervised contractors and visitors increased to 1.6 in 2023 (versus 1.0 in 2022). The safety of contractors working on Vesuvius' sites remains a key area of focus for the Group.

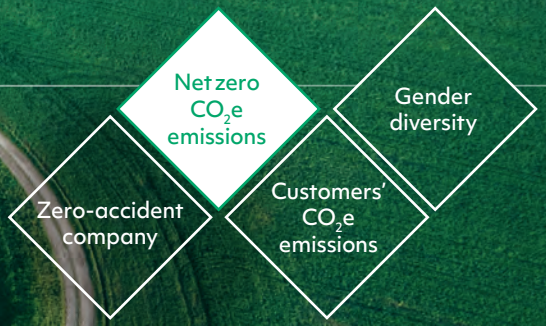
Learn more P75–76

Our priorities

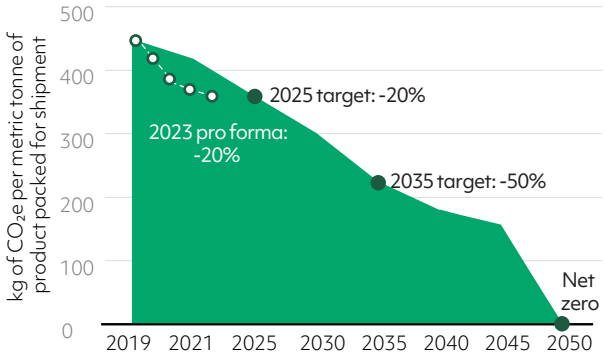
Reach net zero CO_2e emissions by 2050

(Scope 1 and Scope 2)

We have made considerable progress in energy conservation, with our conservation plan now in its third cycle of improvement.



Target emission intensity (Scope 1 and Scope 2)



During 2024, we will continue to focus on further improvements, including:

- Modernising and upgrading installed equipment to reduce our energy consumption
- Investing to renew equipment to the best available technologies and converting to less CO_2 intensive energy sources
- Generating clean energy
- When possible, replacing high CO_2e emission electricity (generated from coal) with greener electricity or other sources of energy
- Reducing our energy wastage, recovering heat to feed processes and heat water

Between 2019 and 2023, our overall CO_2e emission intensity metric (CO_2e emissions per metric tonne of product packed for shipment, Scope 1 and Scope 2, market-based) reduced by 45.5%.

However, this number is skewed by the Group's reduction in the production of dolime during 2023, as a result of the temporary closure of one of our rotary kilns. If the kiln had been operating normally throughout the year, the pro forma 2023 CO_2e emission intensity would have been 20.2% lower than in 2019, versus a target of 20% by 2025.

Learn more P36–40

Our priorities

Help our customers reduce their CO_2 emissions

According to estimates from the World Steel Association (WSA), the steel industry generates between 7% and 9% of global direct emissions from the use of fossil fuels.

We help our customers improve their casting operations' performance, thereby increasing the energy efficiency of their entire process.

In 2023, 83% of ongoing new product development projects were dedicated to market-leading sustainable products.

Areas of expertise:

- Materials science
- Application engineering
- Digital solutions
- Mechatronics

Benefits for customers:

- Reduce exposure to hot metal
- Reduce CO_2 emissions per tonne of steel produced
- Reduce consumption of refractory material per tonne of steel
- Improve metal yield (tonne of finished product per tonne of molten metal) and quality
- Reduce weight of metal parts in vehicles

Learn more P65–66

Our priorities

Improve gender diversity at every level of the Company

Vesuvius recognises the value of a diverse and skilled workforce. We operate in 40 countries, employing people from 71 nationalities.

Women now represent 20% of our Senior Leadership Group (2022: 20%) which is a level that we consider is still too low, but which represents a significant improvement as compared with the level of 15% in 2019.

% of women	2023	2025 ambition
Board & Group Executive Committee	31%	
Senior Leadership Group	20%	25%
Workforce	15%	

Our ambition remains to reach 25% by the end of 2025, though we see this as a challenging target given the relatively low attractiveness of our industry to female entrants. To meet this challenge, we are placing greater emphasis on developing an internal pipeline of female talent. We are also seeking to improve gender diversity throughout the organisation and we encourage managers throughout our business to leverage our decentralised entrepreneurial culture to drive programmes suited to local needs.

Vesuvius companies have implemented various programmes and initiatives which address the following:

- Flexible working arrangements
- A diversity ambassadors and training programme
- Supporting the education of women and girls in STEM

Learn more P91

Our sustainability governance

In 2023, the governance structure for the oversight of sustainability and climate change matters, and their associated areas of focus, remained the same as in previous years.

Chief Executive

Is ultimately responsible for the delivery of the sustainability initiative

Board

- Holds accountability and oversight for all matters related to sustainability
- Oversees the definition of the sustainability strategy and initiatives
- Sets the main targets, reviews performance and progress

Oversight and accountability:

- Culture and values
- Human rights
- Health and safety
- Climate change
- Product safety and quality performance
- Diversity and equality
- Anti-bribery and corruption

Audit Committee

- Supports the Board in ensuring climate-related issues are integrated into the Group's risk management process
- Reviews the Group's TCFD Reporting and Confirmation of target assessment

Remuneration Committee

- Supports the sustainability objectives through the alignment of the Group's remuneration strategy

Group Executive Committee

Chief Executive, Chief Financial Officer, General Counsel and Company Secretary, Chief HR Officer, Business Unit Presidents

- Approves Group sustainability-related policies
- Receives reports from the VP Sustainability on the sustainability initiative
- Is responsible for the progress of the Group against its sustainability objectives

Oversight and accountability:

- Environmental matters
- Biodiversity
- Talent management
- Supply chain/responsible sourcing
- Conflict minerals

BU Presidents

- Incorporate Group sustainability strategy into their BU strategy
- Communicate targets inside their organisations
- Allocate resources, define and implement plans

Sustainability Council

Group Executive Committee, VP Sustainability, Head of Communication and Employee Engagement, Head of Investor Relations, Head of Strategy, Vice Presidents Operations, three Regional Business Unit VPs

- Oversees the Group's sustainability activity
- Monitors progress on metrics and targets
- Assists the Group in assessing the implications of long-term climate-related risks and opportunities, elaborating strategy and setting priorities

VP Sustainability

- Leads the Group's sustainability activities, coordinating the work of the Sustainability Council
- Ensures the Group has a clear set of KPIs and collates data
- Organises Group-wide communication
- Leads external reporting and disclosures

Vesuvius materiality assessment

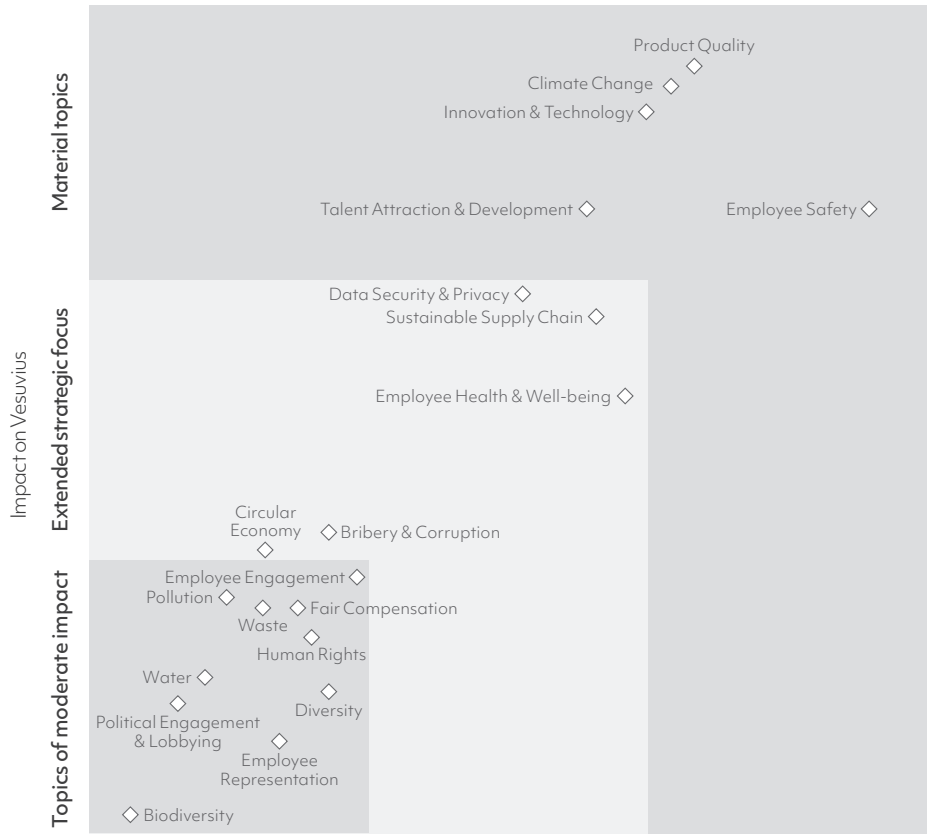
We focus on our most significant sustainability issues and opportunities.

In 2023, we commenced a review of our materiality assessment, adopting the double materiality methodology laid out in the European Sustainability Reporting Standard (ESRS), which identifies and prioritises issues based on two dimensions: the impact or likely impact of Vesuvius on society and the environment, and the impact on Vesuvius' business, creating financial risks and opportunities for Vesuvius.

In 2024, we plan to use the outcome of this exercise to carry out a gap analysis between our current disclosures and the requirements of the ESRS, which will be completed in 2024. Vesuvius will then define actions to meet the disclosure requirements of the European Corporate Sustainability Reporting Directive (CSRD) and ESRS disclosure in 2029 (reporting for the 2028 year).

In 2024, we also plan to review the Group's selection of Sustainability Key Performance Indicators, and set 2030 targets, using the results of the materiality assessment as an input.

Materiality matrix



Five topics are retained as material:

- Product quality
- Climate change
- Innovation and technology
- Employee safety
- Talent attraction and development

Five topics were also identified that are in the extended strategic focus but not subject to formal reporting requirements:

- Sustainable supply chain
- Employee health and well-being
- Data security and privacy
- Bribery and corruption
- Circular economy

More details on our materiality assessment process P112–113

Vesuvius recognises the urgency of tackling climate change, the finite nature of most natural resources, and the obligation we have to preserve the environment for future generations.

Our planet

Environmental Policy

We will operate all work and business activities in a manner which ensures appropriate care and protection of the environment.

We will comply with all applicable legal and other local environmental obligations. We will be proactive in preventing negative effects to the environment and will continuously improve our environmental management systems and performance.

Organisation and responsibilities

- We regard all environmental matters – including climate change – as a mainstream management responsibility. Executives and line managers are directly responsible for environmental matters in operations under their control. Management is accountable for environmental performance against objectives
- Each and every employee is responsible and accountable for environmental matters in activities under their control
- We will encourage our suppliers to adhere to the same environmental standards as we do
- We expect everyone to participate positively in achieving our environmental aims

Our beliefs

- Preserving the environment is good business
- All employees must contribute to protect the environment
- All environmental incidents are preventable

Our commitments

- Minimise direct and indirect CO_2 and other greenhouse gas emissions, by reducing the energy intensity of our business and using cleaner energy sources
- Minimise the consumption of water and other resources
- Reduce waste at source and during production
- Increase the usage of recycled materials and promote the development of the circular economy
- Minimise any pollution or releases of substances which could adversely affect humans or the environment
- Avoid negative impacts on biodiversity

Our actions

- We will raise environmental issues at all levels, openly consult with stakeholders to address them and report regularly on them
- We will build environmental protection into our products and processes
- Environmental risk assessments will be undertaken to identify hazards, prioritise any deficiencies and correct them in an appropriate way, as well as to develop appropriate procedures
- We will set targets and implement action plans to improve our environmental performance
- All our investment decisions will include an analysis of their environmental impact. An internal price for CO_2 emissions will be included for the calculation of payback for all investments reaching the threshold for approval by the BU Presidents or Chief Executive
- We will provide training to all employees and contractors to ensure that they understand their responsibilities and are able to act accordingly
- Every business facility will have an appointed Environmental Manager
- Every manufacturing site will implement an environmental management system that is aligned with ISO 14001

Tackling climate change

We are committed to reducing our environmental footprint by reaching net zero greenhouse gas emissions by 2050 at the latest and helping our customers reduce their emissions through improvements in the efficiency of their operations.

Reducing our impact

Vesuvius actively participates in measures to tackle climate change by working to reduce the CO_2e emissions of all of our operations and the quantity of raw materials used, alongside helping our customers to reduce their own CO_2 footprint through the use of our products and services. Vesuvius also embraces society's expectations for greater transparency around environmental reporting.

Supporting our customers

According to estimates from the World Steel Association (WSA), the steel industry generates between 7% and 9% of global direct emissions from the use of fossil fuels, and it estimates that on average, 1.91 metric tonnes of CO_2 are emitted for every tonne of steel produced.

The iron and steel industries are taking action to address the decarbonisation challenge, and we are supporting them, working in partnership with them to develop more sustainable solutions.

With around 10kg of refractory material required per tonne of steel produced, the careful selection and use of energy-saving refractories can beneficially impact the net emission of CO_2 in the steel manufacturing process. In the foundry process, the amount of metal melted versus the amount sold as finished castings is the critical factor impacting a foundry's environmental efficiency. Vesuvius continuously works with its customers to increase this metal yield.

Supporting policy development

Vesuvius supports the Paris Agreement's central aim: to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2°C above pre-industrial levels, and pursuing efforts to limit the temperature increase even further to 1.5°C, via the implementation of its Roadmap to Net Zero.

As the world transitions to a low-carbon global economy, Vesuvius supports the call for policymakers to:

- Build a level global playing field, including carbon border adjustment mechanisms, and robust and predictable carbon pricing for companies. This will strengthen incentives to invest in sustainable technologies and to change behaviours
- Develop the necessary energy production and distribution infrastructure to provide access to abundant and affordable clean energy

Tackling climate change

Climate change-related risks and opportunities

The actions being taken by governments and societies around the world to mitigate climate change, and the changes in temperature and weather patterns resulting from it, present both opportunities and risks to Vesuvius. In its broadest context, we believe that the need for climate change initiatives will create ever greater opportunities for the Group to support our customers – to improve their efficiency and reduce their environmental impact.

The fight against climate change continues to require higher-technology steel and larger, more complex castings. Wind and solar energy production capacity are both considerably more steel-intensive than fossil fuel power stations, and these are both set to grow considerably. Allied to this, the steel-making process is itself decarbonising thanks to efforts to improve the performance of existing assets, and the shift from blast furnaces to electric arc furnaces.

Our products are useful for low-carbon applications as well as the more traditional ones. No alternative to iron and steel, with the ability to offer the same range of properties and applications at comparable scales and costs, is envisaged in the foreseeable future. The technology transition required to decarbonise the iron and steel industry will not render our products obsolete. More than 70% of our revenue in steel is generated at the ladle and caster stages of the steel-making process, which will be unaffected by the changes. Other steps of the iron and steel-making process will continue to require refractory materials.

Our assessment of climate change-related risks and opportunities covers 100% of Vesuvius' operations.

Methodology

Each year the Group undertakes a robust assessment of the principal and emerging risks which could have a material impact on the Group; this assessment covers all of Vesuvius' operations. A number of sustainability risks are recorded in this analysis (see the Risk, viability and going concern section on pages 72–78 of our Annual Report).

In line with the recommendations of TCFD, Vesuvius also undertakes a review of the key climate-related opportunities and risks that we foresee impacting the Group over the short, medium and long term.

The Board has considered the significance of climate-related risks in relation to risks identified in the standard risk management process. Climate-related risks are reviewed every six months by the GEC, and subsequently by the Board, as part of the Group's standard risk management process, to ensure the register reflects any material changes in the operating environment and business strategy, and to ensure that the management of climate-related risks is integrated into our overall principal risk management framework.

The Business Units factor climate-change risks and opportunities into their business planning processes, assessing the long-term impacts on profitability of both the risks and opportunities.

Tackling climate change

Physical risks and business continuity

Thanks to significant restructuring carried out over the past six years, Vesuvius now operates in a resilient and optimised global footprint. Proximity with customers limits transportation and associated CO_2 emissions, ensures higher flexibility and reactivity, and reduces working capital. None of our manufacturing sites contribute directly or indirectly to more than 10% of our revenue and a significant amount of redundancy for most product lines remains, providing backup in case of local disruption and ensuring continuity of supply for our customers.

Vesuvius operates in 55 manufacturing sites located in 26 countries, with six R&D centres of excellence. From time to time, our operations can be subject to physical damage driven by weather events, such as severe storms and flooding, water shortages or wildfires, whose frequency and intensity may be exacerbated by climate change. Such events may also impact the manufacturing capabilities of our customers and suppliers, and impact our supply chain logistics.

Sites are routinely audited by our insurers and our external risk specialist. Their reports are combined with water stress analyses (based on the Aqueduct Water Risk Atlas) and our history of events, to create a physical and weather event risks map, indicating our manufacturing and R&D sites' susceptibility to physical risks arising from climate change.

In 2023, we continued updating our risk map based on professional risk engineering surveys. Thirty sites were identified as being high risk for at least one type of weather event (flooding, hailstorm, lightning, storms, tornadoes and wildfires), and four are located in areas of very high water stress. None of our sites were materially affected by any major weather event in 2023 (no disruption to customers and no insurance claims made).

We anticipate that the occurrence of adverse weather events will continue to increase, and we therefore manage our business to prepare for them and mitigate their impact when they do occur.

As the Group has restructured and concentrated its manufacturing footprint on a reduced number of locations, our strategy to address short-term risks has transitioned from a focus on redundant capacity to improved prevention and risk management.

Local and product line business continuity plans are maintained by our manufacturing sites and are regularly reviewed.

Vesuvius sites maintain and exercise emergency plans to deal with such events as part of their normal risk management and business continuity processes.

Exercises and drills are organised covering IT disaster recovery, fire, explosion, weather and geophysical events, and our processes are improved based on the lessons learned.

The assessment of physical risks and business continuity has been focused primarily on our footprint. In coming years, we will seek to extend this assessment to our customer and supplier base.

Tackling climate change

Sites with the highest exposure to water stress and weather events

Country	Site	Water stress (very high)	Flood – water bodies	Flood – precipitation	Hailstorm	Lightning	Wind – tropical storms	Wind – extra tropical storms	Tornado	Wildfire
Australia	Port Kembla					●				●
Belgium	Ostend							●		
Brazil	Piedade				●	●				
	Resende		●	●		●				
	São Paulo				●	●				
China	Anshan	●								
	Changshu		●							
	Wuhan				●					
	Yingkou BMC			●						
	Yingkou BRC			●						
Czech Republic	Trinec		●							
India	Kolkata		●	●			●			
	Mehsana	●								
	Puducherry	●								
	Pune	●								
	Vizag (VP, VS)						●			
Indonesia	Jakarta Timur		●			●	●			
Italy	Muggio				●					
Japan	Toyokawa						●	●		
Malaysia	Pelabuhan Klang		●	●		●	●			
Mexico	Monterrey		●							
	Ramos Arizpe		●							
Netherlands	Hengelo		●							
Poland	Skawina		●							
South Africa	Johannesburg		●		●	●				
Taiwan	Ping Tung					●	●			
United Kingdom	Tamworth		●							
USA	Champaign					●			●	
	Charleston								●	
	Chicago Heights					●			●	
	Conneaut		●			●			●	
	Coraopolis		●			●				
	Wampum		●			●				
	Wurtland					●				

Highest exposure to weather events based on risk evaluations by insurance and Aqueduct Water Risk Atlas.

Transition risks

We believe that the main climate change transition risks facing the Group relate to:

1. The potential for carbon taxing or emissions rights trading schemes to be introduced or increased, in Europe and the USA, but not uniformly in other regions, without effective border adjustment mechanisms to accompany them; and
2. The rapid transition from iron to aluminium for light vehicle castings.

An increase in the cost of carbon emissions would affect our manufacturing costs. We are addressing this through our energy efficiency improvement initiatives and conversion to non-fossil fuels wherever possible. Long-lasting energy price increases and significant differences between Europe and other regions would further exacerbate this risk, affecting our customers' manufacturing footprint and our own.

A very rapid transition from iron to aluminium for light vehicle castings would affect our revenue in the iron castings market. We expect this to be compensated for by increased sales for aluminium castings, growing sales of products for thin-section automotive component iron castings and turbo-charger castings for hybrid vehicles.

Tackling climate change

Climate-related risks and opportunities analysis

Vesuvius considers the key climate-related opportunities and risks that we foresee impacting the Group over the following short-, medium- and long-term time horizons.

Short term (2025)

Our current strategic plans operate within this time frame. Most of the intermediate sustainability targets approved by the Board were set with 2025 as a deadline. This horizon encompasses our capital expenditure cycle, allowing time to decide, implement and measure the progress of actions.

Medium term (2035)

This is the most likely horizon for the regulatory frameworks (such as the EU Emissions Trading System and Carbon Border Adjustment Mechanism) currently being defined in many regions to reach their full effect. We anticipate that the major adjustments to customers' footprints and technology investments will be in full swing by then.

Long term (2050)

This deadline has been retained by the UN and many policy-making bodies to set decarbonisation goals. We are committed to reaching net zero by 2050 at the latest.

The opportunities we have identified are integrated into the Group's business strategy and are being pursued by the relevant Business Units. See pages 1–23 in our Strategic Report in the 2023 Annual Report.

Impact categories (trading profit)

We have assessed our risks and opportunities, and sorted them according to the following classification:

Very high (>£25m)		High (£10–15m)		Minor (£1–5m)	
Major (£15–25m)		Moderate (£5–10m)		Insignificant (£0–1m)	

Opportunities

Opportunity	Description	Impact	Potential annual impact on trading profit in the short, medium and long term		
			Short term 2025	Medium term 2035	Long term 2050
Products and services					
Ability to diversify business activities	Commercialise refractory solutions for low-CO_2 emitting processes in the production of aluminium to replace carbon-based products	Increased revenue and trading profit	Minor	Minor to moderate	Minor to major
	Commercialise refractory solutions for hydrogen-based Direct Reduction Iron (DRI) production and steel to replace traditional refractory products		Insignificant	Insignificant to minor	Insignificant to high
Markets					
Access to new markets	Accelerated growth of the wind turbine market leading to increased sales to foundries serving this market	Increased revenue and trading profit	Minor	Minor	Minor to high
	Accelerated growth of the aluminium castings market for electric vehicles and light-weighting leading to increased sales to foundries serving this market		Minor	Minor	Moderate to high
	Accelerated growth of ferrous castings for hybrid vehicles (turbo-chargers) and thin-section castings for internal combustion engines leading to increased sales to foundries serving this market		Insignificant to minor	Insignificant to minor	Insignificant
	Accelerated growth of the high-technology steel segment		Minor	Minor to high	High to very high

Tackling climate change

Impact categories (trading profit)

We have assessed our risks and opportunities, and sorted them according to the following classification , which used the same thresholds as for the assessment of principal risks:

Very high (>£25m)	High (£10–15m)	Minor (£1–5m)
Major (£15–25m)	Moderate (£5–10m)	Insignificant (£0–1m)

Risks

Risks	Description	Impact	Mitigating actions being undertaken	Potential annual impact on trading profit in the short, medium and long term		
				Short term 2025	Medium term 2035	Long term 2050
Physical risks						
Increased frequency and severity of extreme weather events (heatwaves, rain and river flooding, cyclones, snow)	Physical damage to Vesuvius locations and people Business disruption due to natural disasters	Increased cost due to physical damage Reduced revenue from business interruption	Mitigating actions for severe weather events and the associated risks are included in the business continuity plans of plants, and insurance is purchased	Minor	Minor	Minor
Transition risks – Policy and legal						
Carbon taxing/emissions rights trading/border adjustment mechanisms introduced or extended	Increase in manufacturing costs	Increased operating costs (main risk in Europe)	Capex to improve energy efficiency and conversion to non-fossil fuels to eliminate CO_2 emissions. Relocation of manufacturing to reflect movements in customer base	Minor	Insignificant to moderate	Insignificant to high
Transition risks – Market						
Rapid growth of aluminium casting processes for light vehicle castings at the expense of traditional ferrous and other non-ferrous processes (due to conversion to electric vehicles)	Shift from castings using a high level of consumables to low consumable processes creates risk of revenue loss for the Foundry Division	Reduced revenue from shrinking market as some traditional castings will disappear or be converted to alternative processes	In ferrous, push to develop sales of Feedex and coatings for thin-section automotive components, and products for turbo-charger casting. Invest in R&D, marketing and sales force. In non-ferrous, develop products for HPDC and LPDC processes and increase penetration in markets with lower usage of refractories	Minor	Moderate to high	Moderate to major
Transition from internal combustion engines to electric vehicles will lead to the decline of sand and gravity castings	Reduced volume of aluminium power train components	Reduced revenue from shrinking market of consumables for sand and gravity castings	Adapt product portfolio, focusing on HPDC and LPDC	Minor	Minor to moderate	Moderate
Transition from Blast Furnaces – Basic Oxygen Furnaces converted to Direct Reduction Iron or Electric Arc Furnaces (EAF) for iron and steel making	Share of EAF in total steel production increases	Reduced size of market where Vesuvius is strongest, leading to weaker positions in the steel market	Adjust R&D and product development priorities. Redeploy sales force, focusing on EAF market	Insignificant	Minor to moderate	Minor to moderate

Tackling climate change

Climate change scenario analysis

Vesuvius has undertaken scenario analysis to seek to quantify the likely impact of climate change on the business and to test the resilience of the Group's strategy to the changes that lie ahead.

We considered three scenarios, modelling the potential financial impact of 2°C, 3°C and 4°C temperature increases on our business.

Best case scenario

In formulating our scenarios, we took as our 'best case' a 2°C scenario. This was based on the premise that despite the tremendous acceleration of public awareness, regulation, technology development and capital allocation in recent years, we doubt that there is sufficient time for the 1.5°C target to be achieved. We therefore identified our most optimistic scenario as 2°C.

Our assumption is that any further acceleration which would allow the planet to get back onto a 1.5°C course would reinforce the main characteristics and accelerate the timeline of our 2°C scenario, without fundamentally changing its features.

From assumptions to strategy

The scenarios take as their starting point the regulatory and macroeconomic assumptions underpinned by the International Energy Agency's WEO 2020 Stated Policies Scenario and Sustainable Development Scenario.

Supplementing this we have identified, for each scenario, the areas of our business in which changes may occur, such as:

- The evolution of end-markets;
- Our customer footprint;
- The pace and breadth of technology transition in iron and steel making;
- The pace of conversion from fossil fuels to clean electricity and hydrogen; and
- The evolution of the aluminium market.

We then evaluated the potential magnitude of the risks and opportunities in each scenario, and analysed the implications for Vesuvius. We considered our strategic response in terms of:

- Our manufacturing and commercial footprint;
- Our portfolio of products and services;
- The conversion of our manufacturing processes to clean energy; and
- The prospects for our aluminium casting business.

With this approach, the impacts on all key areas of the business were covered (sales, R&D, manufacturing and procurement).

The outcomes of the scenario analyses have been taken into account in formulating plans for achieving the Group's strategy.

Three long-term scenarios

4°C warming scenario 'Good intentions hampered by fear of economic war'	3°C warming scenario 'Closed doors'	2°C warming scenario 'Global accord'
Incomplete policy and fiscal packages distort competition, slowing down technology development and leading to geographic shifts in steel supply	Regional/national self-interest drives economic policy, competition wins over cooperation, regulatory framework and technologies evolve differently	High cooperation and commitment to limit emissions facilitates technology development and the transition to a low-carbon world

Tackling climate change

	4°C warming scenario 'Good intentions hampered by fear of economic war'	3°C warming scenario 'Closed doors'	2°C warming scenario 'Global accord'
1 Regulatory and macroeconomic environment	The European Union and United States implement carbon pricing mechanisms (taxation or cap on trade), but no Carbon Border Adjustment Mechanism or Tariffs (or insufficient to prevent the transfer of manufacturing away from these regions)	The European Union and United States implement carbon pricing mechanisms (taxation or cap on trade), and Carbon Border Adjustment Mechanisms or Tariffs to protect their industries from delocalisation	All major economies implement carbon pricing mechanisms. The cost of CO_2 increases in all regions at a comparable pace
2 Conversion of power generation from fossil fuels to clean electricity and hydrogen	– Fast growth of non-CO_2 emitting electricity sources (nuclear and renewable) in Europe – The cost of fossil fuels increases significantly in Europe – Energy prices differ greatly between Europe and the rest of the world over a long period of time – Coal reduces progressively, but does not disappear. – Natural gas continues to grow outside Europe – Hydrogen does not become available on a wide scale and economically competitive until well after 2040	– Fast growth of non-CO_2 emitting energy sources (nuclear and renewable) in Europe – The cost of fossil fuels increases significantly in Europe Coal reduces progressively, but does not disappear, natural gas continues to grow outside Europe – Energy prices in Europe and the rest of the world realign progressively – Hydrogen becomes available on a wide scale in the USA and Europe and economically competitive between 2030 and 2040	– Fast growth of non-CO_2 emitting energy sources (nuclear and renewable) in all regions – The cost of fossil fuels increases significantly (taxation), coal as a source of energy disappears, natural gas starts to reduce – Energy prices in Europe and the rest of the world realign progressively – Hydrogen becomes available on a wide scale and economically competitive between 2030 and 2040 – Fast electrification of the automotive industry – Fast growth of hydrogen-fuelled heavy vehicles
3 Technology transition – iron and steel making	– The transition in blast furnaces to clean processes (e.g. DRI, hydrogen, Carbon Capture and Storage (CCS), Carbon Capture, Utilisation and Storage (CCUS)) does not happen on a large scale – US steel producers convert blast furnaces to DRI and EAF to benefit from the low cost and high availability of natural gas	– European iron making transitions to clean processes (e.g. hydrogen, DRI, CCS, CCUS). The speed of the transition is dictated by the availability of green hydrogen in large quantities – Some US blast furnaces are converted to hydrogen, others to DRI and EAF – Chinese steel plants convert to clean iron and steel-making processes, albeit at a slower pace – Little or no transition outside China, the EU and USA	– Fast transition of iron making to clean processes in all regions; blast furnaces are revamped ahead of their normal schedule – European and Chinese integrated steel making grows primarily in hydrogen-based iron production, implementing CCS and CCUS technologies as well – DRI and EAF grow in the USA (benefiting from the availability of low-cost shale gas), and Europe – Customers also invest to increase the performance of furnaces, including downstream of casting
4 High-technology steel market	High-technology steel market grows at 0.9% per year	High-technology steel market grows at 1.2% per year (light-weighting and material efficiency efforts by downstream industries accelerate shift from lower to higher performance grades)	High-technology steel market grows at 1.6% per year (light-weighting and material efficiency efforts by downstream industries accelerate shift from lower to higher performance grades)
5 Aluminium market	Aluminium market grows at 3% per year, especially High Pressure Die Casting (HPDC) and Low Pressure Die Casting (LPDC) processes	Aluminium market grows at 5% per year (driven by the demand for transportation, construction and packaging) until 2030. Growth of HPDC/LPDC at a higher pace in the US and EU markets. Moderate development of secondary aluminium casting	Aluminium market grows at 7% per year (driven by the demand for transportation, construction and packaging) until 2025. Growth of HPDC/LPDC at a higher pace in the US and EU markets. Rapid development of secondary aluminium casting
Potential financial impact by 2035 (profit before tax)	-£5m to £0m	£5m to £10m	£15m to £20m

Tackling climate change

Key factors impacting Vesuvius' three climate change scenarios

1

Regulatory and macroeconomic drivers differentiate our scenarios

Firstly, effective border adjustment mechanisms to accompany carbon taxation, or cap and trade systems in regions with ambitious emissions reduction objectives, will greatly support the implementation of technologies required to decarbonise steel making (including the development of hydrogen as the reducing agent). Conversely, the absence or ineffective implementation of border adjustments would lead to significant delocalisation of the steel industry and a displacement of CO_2 emissions to other countries rather than a significant reduction on a worldwide scale. The energy crisis which started in late 2021 and was particularly acute in Europe, has resulted in additional costs and loss of competitiveness for the European steel industry. In the short term, this was addressed by the temporary stoppage of steel plants. If the energy cost gap with other regions remains over several years, this could result in the permanent closure of steel plants and delocalisation of production to other regions. This shift in our customer footprint would lead to the need to adapt our own manufacturing footprint.

Secondly, public policy will significantly affect the relative cost and availability of non-CO_2 emitting energy sources versus fossil fuels and their associated infrastructures. These will greatly influence the pace of deployment of selected technologies and industries (electric vehicles, carbon-free hydrogen and decarbonised steel making). Infrastructure, construction and other downstream markets will also be incentivised to reduce steel consumption, accelerating the shift towards high-technology steel. Rising energy costs, as experienced since the end of 2021, will positively affect the growth rate of investment in renewable energies and penetration of electric vehicles in the automotive markets.

Finally, the level of international cooperation to encourage and support less developed economies to engage in the technology transition will also affect our customer manufacturing footprint. Regulatory and macroeconomic drivers may affect our climate change scenarios in the short, medium and long term.

2

The future of steel

All three scenarios assume that the strong connection between world GDP and world steel output will continue, supported by urbanisation and rising living standards, as there is no significant substitute for steel. The fight against climate change is expected to have a far-reaching impact on many different industries translating into the accelerated growth of the high-technology steel segment in which Vesuvius has a key presence. For example, solar and wind power plants, where investment is growing fast, are far more steel-intensive per kWh of installed capacity than their fossil fuel equivalents. Likewise, hydrogen transportation, another area of rapid growth, also requires considerable amounts of special grades of steel for new pipelines and ships. With evolutions occurring over many years, this driver will have a stronger impact over the medium and long term than the short term.

3

Technology transition

Our scenarios consider the pace and extent of the technology transition in iron and steel making. The Blast Furnace – Basic Oxygen Furnace (BF–BOF) route for steel making is significantly more CO_2 intensive than the Electric Arc Furnace EAF route. However, EAFs cannot always be used to produce all higher quality steel grades and they rely on the availability of scrap steel (itself a function of the level of economic development). Going forward, quality levels produced by EAFs will continue to improve.

Various technologies to decarbonise the BF–BOF route are being developed, including solutions which seek to capture the carbon as it is emitted and either store it or use the carbon in other processes. Alternatively the BF–BOF route may be replaced by a combination of DRI and EAF.

Hydrogen-based DRI associated with EAFs has the potential to be nearly carbon-free if carbon-free electricity and hydrogen are available. We anticipate that there will be a gradual reduction in steel production via the BF–BOF route and growth in the EAF route. The extent and pace of this change will depend on technologies coming to maturity, the availability of infrastructure (carbon-free electricity and hydrogen), and regulatory frameworks.

These technologies will require many years to mature and be deployed on a large scale. This driver is therefore expected not to have any impact over the short term, and to reach its maximum impact in the long term.

Tackling climate change

Climate-change-related metrics

We routinely monitor a large number of metrics, both internal and external, to assess the ongoing validity of our assumptions and identified risks and opportunities, and monitor the progress of actions. Some of the main metrics are listed in the table below:

External metrics	
– Projected compound annual growth rate ('CAGR') of the high-technology steel segment	+2.7% between 2022 and 2032 (vs 0.5% for commodity steel)
– Projected CAGR of the wind turbine market	13% (between 2023 and 2030)
– Projected CAGR of the electric vehicle market	24% (between 2020 and 2030)
– Projected CAGR of the hybrid vehicle market	14% (between 2020 and 2030)
– Projected CAGR of the internal combustion engine vehicle market	-4% (between 2020 and 2030)
– Projected CAGR of the EAF market	3.6% (between 2022 and 2028)

Internal metrics	
– Steel sales into the EAF market	29% in 2023
– Percentage of Flow Control sales from high-technology steel	58% in 2023
– Percentage of Foundry sales into non-ferrous markets	19% in 2023
– Percentage of sales realised with products which didn't exist five years ago	18% in 2023
– Energy intensity (kWh per kg product packed for shipment)	7.2% reduction in 2023 vs 2019 baseline
– R&D spend	+8% p.a. from 2020 to 2023
– Number of sites at high risk of water stress or at least one type of weather event	34 in 2023
– Number of sites with negative or poor risk ratings from the insurance loss prevention risk evaluation	8 in 2023

Tackling climate change

Conclusion on strategic resilience

Sustainability has always been at the heart of Vesuvius' business and the Group's analysis concludes that the opportunities for the Group manifested by the global pressure to mitigate climate change outweigh the risks. Our technology helps our customers improve their process efficiency and their environmental footprint.

We estimate the financial impact of the opportunities and risks on the Group will be most adverse under a 4°C scenario and most positive under a 2°C scenario. Under all three scenarios, we expect to benefit from the continuing growth in the production of steel in line with GDP, along with the accelerating shift towards higher performance iron and steel castings, as we support customers to maximise the efficiency and quality of their production. With our technological expertise, strong customer relationships and broad manufacturing footprint, we expect to play a key role in supporting our customers' efforts to decarbonise their operations.

We also believe there is a low downside for Vesuvius in all three scenarios as more than 70% of our business in steel is in the steel casting part of the operation which, as a stand-alone process, is low CO_2 emitting (1% to 3% of a steel plant's CO_2 emissions), and which we do not expect to be affected by technology shifts that the decarbonisation of iron and steel making will require.

Whilst the electrification of light vehicles and ongoing light-weighting efforts are expected to translate into a shrinking of the market for certain iron castings, it is anticipated that this will be more than compensated for by the growth in other markets such as wind turbines and aluminium castings.

We do not anticipate that climate change will lead to any significant changes in our access to capital or require the impairment of assets on a material scale.

Our roadmap to net zero

Energy conservation and CO_2e emissions reduction

Our ambitions

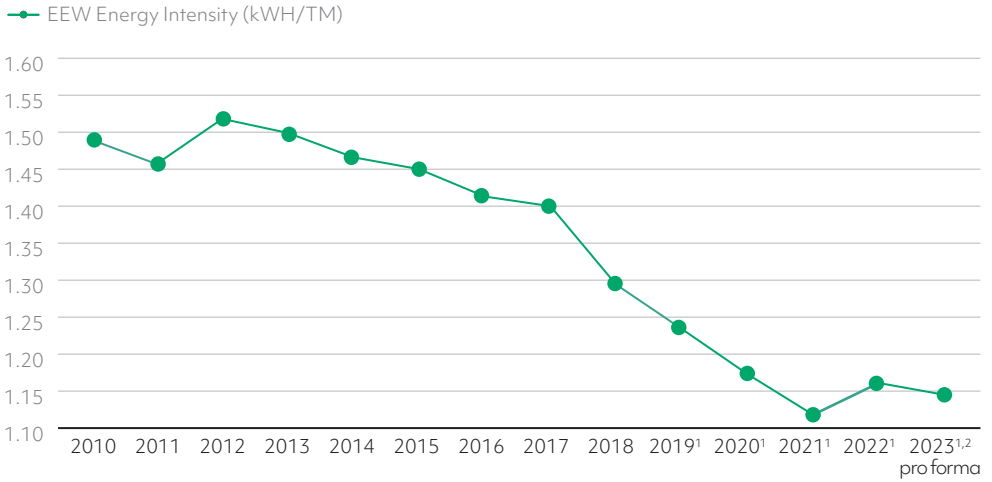
Vesuvius is committed to minimising direct and indirect CO_2, and other greenhouse gas emissions, by reducing the energy intensity of our business and using cleaner energy sources.

We support the Paris Agreement and have committed to reach net zero CO_2e emissions by 2050 (Scope 1 and Scope 2).

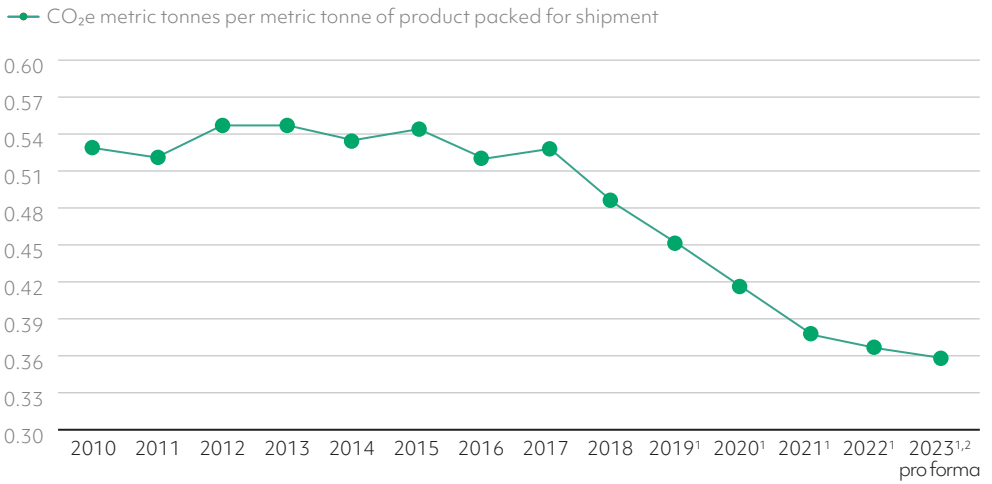
Our history

Our first commitment to reducing energy consumption and GHG emissions dates back to 2011 and the launch of Vesuvius' Energy Conservation Plan. In 2023, our pro forma energy consumption per tonne of product packed for shipment was 27% lower than in 2013. In addition to improving our energy efficiency, we have been transitioning to cleaner sources of energy. We have eliminated coal, coke, and diesel as energy sources from nearly all our industrial processes, replacing these fuels with lower carbon-intensive alternatives such as biomass, natural gas, or electricity. Since 2019, we have started converting to non-CO_2 emitting sources of electricity. As a result, our pro forma CO_2e emissions in 2023 were 37% lower than in 2013.

kWh of energy per metric tonne of product packed for shipment (pro forma)



Metric tonnes of CO_2e per metric tonne of product packed for shipment (pro forma)



1. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co.,Ltd) from 2019 onwards.
2. Pro forma: performance as if the dolime process had been operating normally in 2023 (based on the average output and performance of 2019 to 2022).

Our roadmap to net zero

Our metrics and targets

Our approach to climate change covers 100% of our operations. We have set intermediate targets in our journey to reach net zero CO_2e emissions by 2050 (Scope 1 and Scope 2), in line with the Paris Agreement and the UK's commitment in the Climate Change Act 2008 (2050 Target Amendment) Order 2019. These emissions encompass the seven GHGs listed by the Intergovernmental Panel on Climate Change in the Kyoto Protocol (CO_2, CH_4, N_2O, HFCs, PFCs, SF_6 and NF_3).

Our preferred metrics to monitor progress with our journey to net zero are energy and CO_2e emission intensity (energy consumption and CO_2e emissions per tonne of product packed for shipment). These reflect the progress made in our operations better than absolute metrics. Managing this energy intensity not only has environmental benefits but it is also part of our long-term strategy to enhance our cost competitiveness.

Our targets

Our targets cover 100% of Vesuvius' operations. 2019 was selected as the baseline for all energy and GHG emissions data and targets, absolute and relative, as this was the last year of normal trading prior to the COVID-19 pandemic.

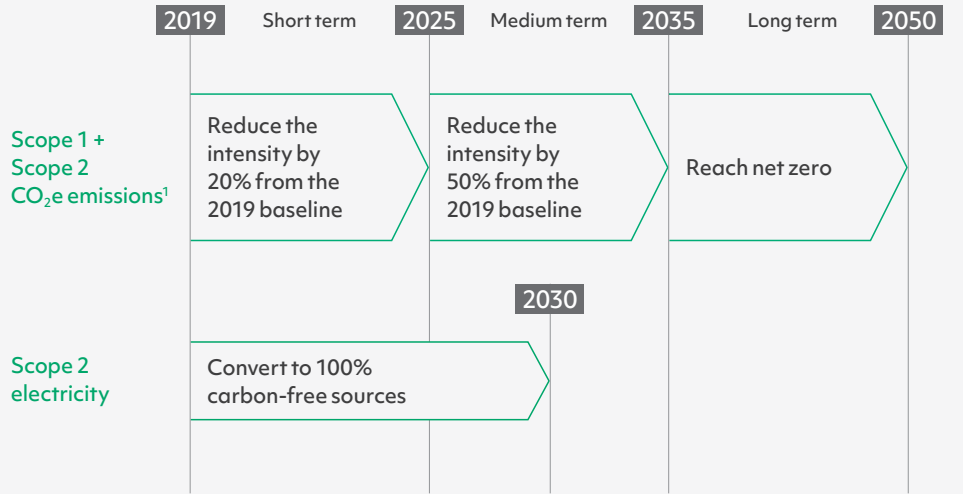
- 10% improvement in the Group's energy intensity between 2019 and 2025
- 20% reduction in CO_2e emission intensity normalised per metric tonne of product packed for shipment (Scope 1 and Scope 2) by 2025 (vs 2019 baseline)
- 100% carbon-free electricity by 2030
- A reduction in total Scope 1 and Scope 2 CO_2e emission intensity of 50% by 2035 (vs 2019 baseline)
- Zero Scope 1 and Scope 2 emissions by 2050

We aim to achieve our decarbonisation goals without the use of any carbon offsets (or only to address residual emissions).

The Group Energy CO_2e emissions reduction targets have been cascaded to all Business Units, which have built action plans accordingly. Portions of the Group Executive Committee's Long-Term Incentive Plan and senior management annual variable compensation are linked to the achievement of CO_2e emissions reduction targets.

In 2024, we plan to establish 2030 intermediary goals for energy intensity and for Scope 1 and Scope 2 emissions intensity.

Our journey to net zero



1. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co.,Ltd) from 2019 onwards.

Our roadmap to net zero

Our plan

Some significant assumptions underpin our net zero plan, including:

- The availability of the necessary technologies, at an affordable level and at a scale appropriate for our industry, especially for the firing of refractory ceramics and carbon capture
- The development of additional production capacity and distribution infrastructure for renewable energy and hydrogen, and their cost competitiveness
- Adequate policy support to foster innovation and ensure the cost of CO_2 emissions will increase the attractiveness of carbon-free processes
- No significant change to our business model and product portfolio

Our roadmap to net zero is based on five key areas of focus:

- **Modernising** and upgrading installed equipment to reduce our energy consumption
- **Investing** to renew equipment to the best available technologies and converting to less CO_2 intensive energy sources
- When possible, **replacing** high CO_2e emission electricity (generated from coal) with greener electricity or other sources of energy
- **Reducing** our energy wastage, recovering heat to feed processes and heat water
- **Generating** clean energy

It is estimated that we will need to invest c.£60m of incremental capital expenditure between 2023 and 2035 to support our roadmap.

The achievement of our CO_2e emissions targets will also be sensitive to:

- The growth of revenue, organically, and from acquisitions and divestitures
- Product mix evolution (especially driven by dolime volume, which is the most CO_2 intensive product line)
- Macroeconomic conditions and the capex cycle impacting plant loading (and thereby the energy efficiency of continuous processes)

Our organisation

We have undertaken a Group-wide programme of energy efficiency and established formal efficiency programmes in all Business Units and regions. Each Business Unit has nominated dedicated leaders to oversee and coordinate the efforts to improve energy efficiency and reduce GHG emissions. They coordinate with the Regional Business Unit Vice Presidents and the engineering teams in each plant. Their role is to benchmark performance across locations, support the identification and selection of the most valuable projects, assist in the preparation and implementation of capital expenditure projects, and monitor progress and KPIs. Each site manager is responsible for elaborating and leading the action plans for their site.

Progress is reviewed by the Sustainability Council and the Board every quarter.

In parallel with this, the Central engineering team is working in collaboration with external research institutions and equipment manufacturers to develop and test novel manufacturing technologies that will emit far less GHGs than the existing processes. These programmes typically have a five to ten-year horizon.

Our roadmap to net zero

Next steps to achieve our net zero plan

Our plan to reach net zero covers 100% of our operations. We aim to achieve our decarbonisation goals without the use of any carbon offsets (or only to address residual emissions).

Scope 1, 2 and 3 CO_2 and CO_2e emissions

Scope 1 covers emissions from fuels used in our factories and offices, fugitive emissions and non-fuel process emissions.

Scope 2 relates to the indirect emissions resulting from the generation of electricity, heat, steam and hot water we purchase to supply our offices and factories.

Scope 3 includes all other indirect emissions that occur in the Company's value chain.

Short term (2025)

A wide variety of projects have been initiated and more are being considered, to help us deliver our energy efficiency and CO_2e emissions reduction targets, including:

- Optimisation of process parameters
- Introduction of new refractory furniture
- Retrofitting of ovens and kilns
- Replacement of older and less efficient units
- Upgrades of compressors
- Replacement of light sources with LED lights
- Replacement of diesel-powered forklift trucks with electric forklift trucks
- Installation of heat recovery systems in ovens and kilns
- Burner setting optimisation and loading and cycle optimisation
- Continued conversion of electricity supplies to carbon-free sources
- Installation of solar panels

We endeavour to use the best available technologies to reduce CO_2 emissions in all our major capital expenditure projects.

Medium term (2035)

We anticipate that further emissions reduction will be possible through further energy efficiency measures (continuation of the short-term actions).

Technological developments currently in preparation with our partners will allow us to reduce GHG emissions even further.

Projects have been launched across a range of activities including:

- Electrification of high-temperature manufacturing processes that currently rely on natural gas or LPG. The first investments to replace natural gas-powered ovens with electric ovens were in preparation at the end of 2023
- The use of a combination of natural gas and renewable energy such as carbon-free hydrogen to fire refractory materials. We have already started R&D trials with a blend of hydrogen and natural gas
- The use of bio-fuels instead of natural gas. The first trials to convert industrial installations are planned for 2024

We estimate the incremental capital commitment required by our decarbonisation roadmap until 2035 will be approximately £70m (approx. £7m per year). We do not expect the useful economic lives of our existing assets to be materially affected by our plans until 2035. Precise capital expenditure project lists have been defined for the 2025 horizon. We will continue using the internal price of carbon to assess the relative benefit and prioritise projects.

We also anticipate that changes in our product portfolio towards less energy-intensive products (such as resin-bonded and unshaped refractories) will continue.

Long term (2050)

Beyond 2035, the short term and medium term programmes will continue to deliver opportunities.

We are regularly monitoring the emergence and readiness of new technologies, through our network of suppliers of capital goods, universities and trade associations. In the longer term (2050), various technologies are promising candidates for the near zero emissions curing and firing of refractory products (electricity, carbon-free hydrogen, synthetic gas, biomass).

We currently foresee that carbon capture solutions will be available for our industrial application during the 2035–2050 period, though most will probably not be available sooner.

We are progressively adapting our product and process R&D programmes to explore such opportunities.

Capital expenditure requirements and the useful economic lives of our existing assets will depend on the evolution of technologies currently in development.

Our roadmap to net zero

Return to our Net zero CO_2e emissions priority

Our progress

Since 2019, we have undertaken a number of major projects to significantly reduce the Scope 1 CO_2e emissions of the Group by addressing some of its most CO_2e intensive installations.

We closed the Skawina brick plant, eliminated dirty coke oven gas as a fuel in Wuhan, replacing it with a new natural gas-fired tunnel kiln, transferred the Tyler plant activity to Monterrey, and replaced the burner system of the Olifantsfontein rotary kiln. We also took advantage of the closure of our Chinese plant at Kuatang and the relocation of its activity to replace all drying ovens and kilns with new ones, with an energy efficiency improvement target of 20%.

In 2022, the Board approved major capacity expansion capital expenditure projects totalling more than £20m. Available technologies and their impacts in terms of energy efficiency and CO_2e emissions were systematically considered for these projects, and the most efficient technologies for the purpose selected.

1

Carbon-free energy sources

The Group supports the transition towards renewable energy sources and cleaner carbon-free technology when possible. Our energy strategy includes an ongoing effort to convert to carbon-free electricity contracts whenever practical and economically manageable, investment in solar panels, and the conversion of processes to electricity as soon as the technology is cost-effective.

In 2023, nine sites converted to carbon-free electricity contracts, taking the total number to 45, representing 74% of our manufacturing sites and R&D centres of excellence.

In 2023, 71% of the grid electricity consumed in our sites was generated from renewable sources, and 75% using processes that did not emit CO_2e (renewable and nuclear).

In 2023, two of our plants became carbon-free and capital expenditure projects for solar panels with a value of £0.9m were approved. Nine sites are equipped with photovoltaic solar panels and 20 sites are investigating solar panel projects.

2

Capital commitments and internal CO_2 pricing

We include an environmental impact analysis in the evaluation of each of our capital expenditure projects as these are the key decisions that drive long-term future sustainability performance, and CO_2 emissions in particular.

Our Environmental Policy, which is the responsibility of the Chief Executive and the Group Executive Committee, covers all our operations and states that all our investment decisions will include an analysis of their environmental impact. An internal price for CO_2 emissions (Scope 1 and Scope 2) is included in the calculation of payback for all investments reaching the threshold for approval by the Business Unit Presidents or Chief Executive.

Vesuvius views this shadow pricing mechanism as a key tool to ensure that the environmental impact of long-term investment decisions is understood. It seeks to ensure that the best available technology is adopted, even in locations where no external cost for carbon is in place or foreseen.

The internal price of CO_2 was introduced in 2020. It is reviewed annually by the Sustainability Council and is applicable across all Business Units in all regions.

The price is adjusted, taking into consideration both the previous year's price and the evolution of the European Union Emissions Trading System (EU-ETS) carbon pricing. In 2020, it was initially set at €30 per tonne of CO_2. It was raised to €90 per tonne in 2021. The Sustainability Council decided to maintain the internal price of CO_2 emissions at €90 per tonne of CO_2 for 2023.

75%

of our electricity is from carbon-free sources

2

of our plants became carbon-free in 2023

Our roadmap to net zero

Return to our Net zero CO_2e emissions priority

Our progress continued

3

Improving our energy efficiency

All Vesuvius plants have targets to reduce energy intensity. We have implemented a structured approach across the Company. We collect and analyse data from the sites, identify gaps and opportunities and eventually target our engineering projects. We select the processes and sites that are the most energy-intensive or have the greatest impact, and coordinate the projects centrally. We also share best practices across locations. For example, in one of the most energy-consuming sites, we will improve our process by installing additional nozzles in the spray towers, building on the experience from another Vesuvius site. Many additional initiatives are managed locally.

-20.2%

Pro forma reduction of Scope 1 and Scope 2 CO_2e emission intensity per metric tonne of product packed for shipment vs 2019

In 2023, we strengthened the resources available to oversee our energy efficiency improvement programmes across all locations.

We rolled out plans to install meters on all energy-intensive equipment (32 sites are fully equipped) and undertook comparison studies across locations.

We are encouraging sites to carry out energy audits and pursue ISO 50001 certification. 13 sites carried out energy audits in 2023, and more than 30 have planned audits in 2024 and 2025. One site has already obtained ISO 50001 certification. This combination of initiatives allows us to better identify and analyse opportunities and target investments on projects with the largest impact.

More than 4,400 employees have received training on energy conservation and greenhouse gas emissions reduction.

In 2023, as a result of thermal processes optimisation and the installation of retrofit solutions, we have reduced energy consumption per year by around 11 GWh and CO_2e emissions by 2,720 tonnes versus 2022.

New capital expenditure worth c.£6m, dedicated to 123 projects with energy efficiency and CO_2 emissions reduction as one of their prime objectives, were approved in 2023.

Our results

Whilst Vesuvius' products differ significantly in the energy intensity of their manufacture, most of our manufacturing processes are not energy-intensive nor do they produce significant quantities of waste and emissions. Dolime production, which uses coal to calcine dolomite, is our major emitter of CO_2. Dolime and the next six of our 39 main manufacturing processes account for 58% of our energy consumption and 62% of our location-based CO_2e emissions. These continue to be a clear focus for our investment to reduce CO_2e emissions.

In January 2023, an incident incapacitated one of our dolime rotary kilns, which resulted in it being out of service for the remainder of the year. As a consequence, the tonnage of dolime produced by the Group in 2023 was considerably lower than in prior years and the Group's product mix was very different. The Group's absolute energy consumption, CO_2e emissions, energy intensity and CO_2e emission intensity reduction were therefore affected by the lower output of dolime as well as performance improvement.

As performance comparisons with 2022 and previous years are therefore not meaningful when considering Vesuvius' operations, we are reporting our energy and GHG emissions intensity and performance improvement metrics in two ways:

- Covering 100% of Vesuvius' operations, as this offers the complete view of Vesuvius' emissions (absolute and relative)
- Pro forma, including the dolime product line, as if it had been operating normally throughout the year (based on the average output and performance of 2019 to 2022)

When the dolime installation resumes production, energy and CO_2e emissions intensity comparisons with 2022 and prior years, and with the pro forma 2023 figures will be meaningful.

Our roadmap to net zero

Return to our Net zero CO_2e emissions priority

Our results continued

The Group's progress in reducing our CO_2e emission intensity was adversely affected in 2023 by lower volumes resulting in lower fill rates for continuous processes and lower energy efficiency. Between 2019 and 2023 the Group achieved an overall reduction in energy intensity (normalised to per metric tonne of product packed for shipment) of 14.6%. The pro forma energy intensity reduction, assuming the Group had produced dolime at the normal rate, was 7.2% vs a target of 10% by 2025.

During the same period, our overall CO_2e emission intensity metric (CO_2e emissions per metric tonne of product packed for shipment, Scope 1 and Scope 2, market-based) reduced by 45.5%. This includes a 38.4% reduction in Energy CO_2e intensity, and a 68.1% reduction in Process CO_2e intensity, per metric tonne of product packed for shipment. Excluding dolime, the CO_2e emission intensity reduction between 2019 and 2023 was 33.2%.

If the dolime installation had been operating normally throughout the year, the pro forma 2023 CO_2e emission intensity would have been 20.2% lower than in 2019, vs a target of 20% by 2025.

The conversion by many of our sites to carbon-free electricity contracts has helped our CO_2e emissions reduce at a faster pace than our energy efficiency improvements. Vesuvius' total energy costs in 2023 were £48.5m, c.2.5% of revenue (£54.6m in 2022, c.2.8% of revenue). South Africa is the only country where we exceed the threshold to be submitted to a carbon tax or an emissions trading scheme. The carbon tax cost in 2023 was c.£0.2m (£0.2m in 2022), based on emissions in the prior year.

CO_2e emissions intensity evolution – 2023 actual and pro forma performance (as if the dolime process had been operating normally)[1,2]

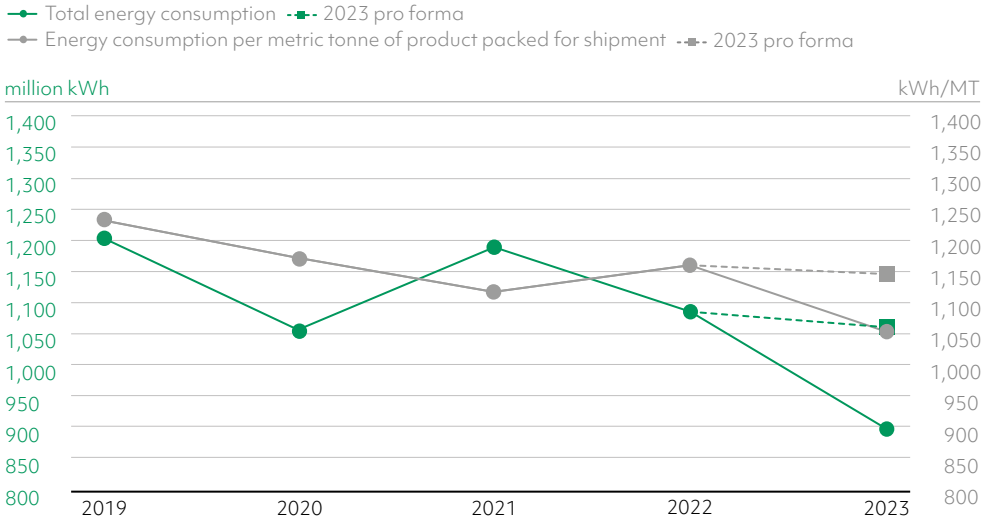
	2023 pro forma	2023	2022	2021	2020	2019
CO_2e metric tonnes per metric tonne of product packed for shipment	**0.358**	**0.245**	0.366	0.377	0.413	0.449

1. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co.,Ltd) from 2019 onwards.
2. Pro forma: performance as if the dolime process had been operating normally in 2023 (based on the average output and performance of 2019 to 2022).

Vesuvius plc long-term energy consumption and energy intensity (aggregate of Scope 1 and Scope 2)[1,2,3]

	2023 pro forma vs 2019[2]	Actual 2023 vs 2019	2023 pro forma	2023	2022	2021	2020	2019
Total energy consumption (million kWh)			**1,057**	**896**	1,085	1,189	1,056	1,205
Energy consumption per metric tonne of product packed for shipment (kWh/MT)	**-7.2%**	**-14.6%**	**1,145**	**1,054**	1,161	1,118	1,173	1,234

Energy consumption and energy intensity evolution (actual and pro forma)[1,2,3]



1. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co.,Ltd) from 2019 onwards.
2. Pro forma: performance if the dolime process had been operating normally throughout 2023 and re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co., Ltd) from 2019 onwards.
3. The numbers are collated from entities within the Group's Operational Control Boundary.

For additional details on energy consumption and GHG emissions, see Further information P118–124

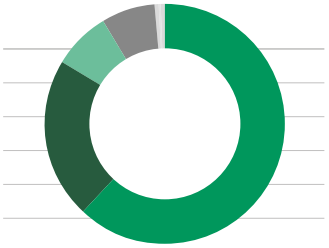
Our roadmap to net zero

Return to our Net zero CO_2e emissions priority

Our results continued

2023 energy consumption by fuel type %

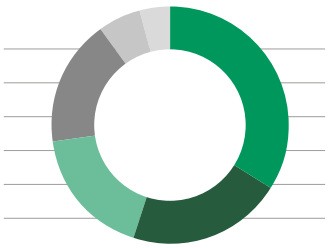
Energy consumption	2023 '000 kWh	2023 %
Natural gas	556,204	62.1
Electricity	194,295	21.7
LPG	68,324	7.6
Coal	66,659	7.4
Other fuels	5,331	0.6
Solar PV	2,493	0.3
External heat	2,317	0.3



Notes:
– 2023 includes the business of Universal Refractories Inc (Vesuvius Penn Corporation) which was acquired in 2021 and BMC (Yingkou YingWei Magnesium Co.,Ltd), which was acquired late 2022.
– Operational Control Boundary.

2023 Scope 1 and Scope 2 CO_2e emissions per region (market-based) %

Metric tonnes CO_2e	2023 Metric tonnes	2023 %
Africa	70,261	34
Europe and Middle East	43,486	21
USA, Mexico, Canada	38,433	18
China & NA	36,361	17
India & SA	11,670	6
South America	7,663	4



Notes:
– 2023 includes the business of Universal Refractories Inc (Vesuvius Penn Corporation) which was acquired in 2021 and BMC (Yingkou YingWei Magnesium Co.,Ltd), which was acquired late 2022.
– Operational Control Boundary.

Vesuvius plc long-term CO_2e emissions and CO_2e emissions intensity (market-based), aggregate of Scope 1 and Scope 2[1,2,3]

	2023 pro forma vs 2019	Actual 2023 vs 2019	2023 pro forma	2023	2022	2021	2020	2019
Total Scope 1 and Scope 2 CO_2e emissions (MT)				207,875	341,499	401,216	371,919	438,403
Scope 1 and Scope 2 CO_2e emissions per metric tonne of product packed for shipment (MT/MT)	-20.20%	-45.50%	0.358	0.245	0.366	0.377	0.413	0.449
Total Scope 1 and Scope 2 CO_2e emissions per million pounds of revenue (MT/M£)	-36.30%	-59.90%	171.4	107.7	171.4	240.1	262.4	268.9

1. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co.,Ltd) from 2019 onwards.
2. Operational Control Boundary.
3. Pro forma: performance as if the dolime process had been operating normally in 2023 (based on the average output and performance of 2019 to 2022).

-7.2%

Energy intensity reduction between 2019 and 2023 (pro forma)

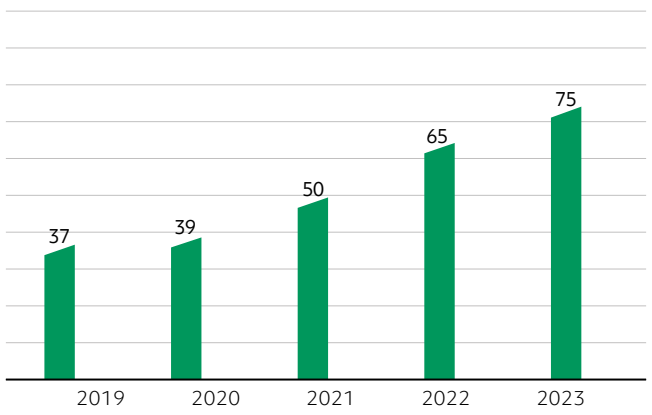
For additional details on energy consumption and GHG emissions, see Further information P118–124

Our roadmap to net zero

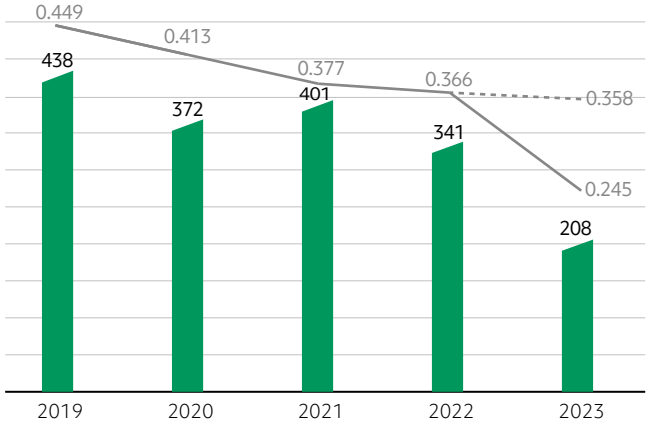
Return to our Net zero CO_2e emissions priority

Our results continued

Electricity from non-CO_2 emitting sources (% of total)



Evolution of CO_2e emissions (Scope 1 and Scope 2)

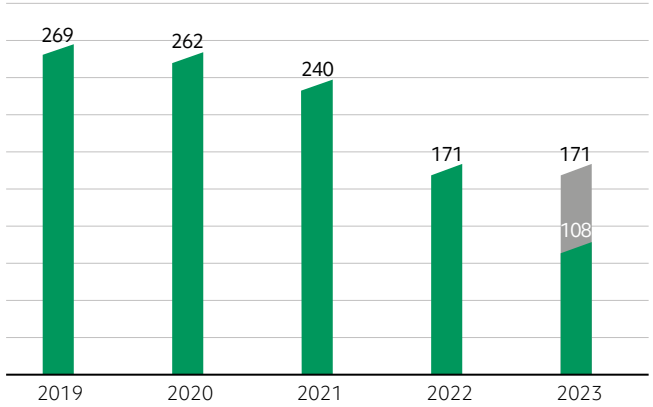


- CO_2e '000 metric tonnes
- CO_2e metric tonnes per metric tonne of product packed for shipment
- CO_2e metric tonnes per metric tonne of product packed for shipment (pro forma)

Notes:

- Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co.,Ltd) from 2019 onwards.
- Operational Control Boundary.
- Pro forma: performance as if the dolime process had been operating normally in 2023 (based on the average output and performance of 2019 to 2022).

Evolution of CO_2e emissions per million £ revenue



- CO_2e metric tonnes per million £ revenue (Scope 1 and Scope 2)
- CO_2e metric tonnes per million £ revenue (Scope 1 and Scope 2) (pro forma)

For additional details on energy consumption and GHG emissions, see Further information P118–124

Our roadmap to net zero

Our results continued

Scope 3 emissions

Vesuvius' Scope 3 CO_2e emissions, mainly upstream, contribute to a greater part of our total CO_2e emissions than our Scope 1 and Scope 2 emissions. Our products are used by customers whose processes emit significant amounts of CO_2.

They serve to contain and protect liquid metal and manage its flow, but do not participate in the heating operations or chemical reactions that lead to CO_2 emissions. Emissions associated with the processing or use of our products are hence very limited. More specifically:

- Some products require drying or pre heating prior to use by our customers. Emissions generated during these operations are included in the Processing of Sold Products category
- Refractory materials do not require energy during their use; having undergone high-temperature processes during their manufacturing, they are inert and do not release any greenhouse gases during their use
- Some non-refractory products contain chemicals, which will be partially burnt during usage by our customers. Emissions due to the combustion of chemicals are included in the Use of Sold Products category

Since 2021, we have undertaken a focused evaluation of emissions associated with raw materials, using publicly available average CO_2 emissions factors. We have also collected information on energy source, CO_2 emissions data and reduction plans from our raw materials suppliers as part of our request for quotation process.

In 2023, we concentrated on the four raw material categories that account for an estimated half of our Scope 3 emissions from acquired products and services. We provided our suppliers with training and evaluation tools to help them assess their Scope 1 and Scope 2 emissions. In China our workshop on 'Sustainability and CO_2 emissions' had 55 attendees representing 35 suppliers. Suppliers representing 54% of our raw material spend have provided disclosures to date.

We have also started collecting CO_2 emissions data relating to transportation from our forwarders in all regions. In 2023, the CO_2 emissions data that we received from our forwarders covered 45% of our transportation spend (upstream and downstream), and we were able to evaluate CO_2 emissions covering a further 43% of our transportation spend using operational data and Defra conversion factors.

The remainder of our CO_2 emissions from upstream and downstream transportation (12%) was estimated based on spend and Defra conversion factors.

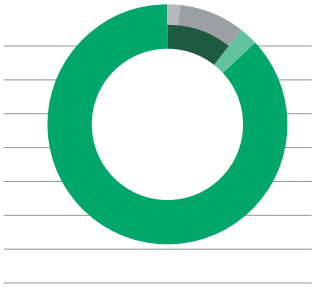
Various initiatives have been launched to reduce our Scope 3 CO_2 emissions, including:

1. Returnable packaging solutions being implemented both with suppliers and customers
2. Electrification of Company fleet vehicles being deployed in various countries
3. The encouragement of commuting to work by bus or other forms of collective transportation services. 18 Vesuvius sites organise such services for nearly 1,000 Vesuvius employees
4. Encouraging the suppliers to switch to renewable energy sources
5. The CO_2 emissions awareness sessions for more than 200 key suppliers

Scope 1, Scope 2 and Scope 3 emissions (market-based)[1,2]

In 2023, Vesuvius' total Scope 1, Scope 2 and Scope 3 CO_2e emissions were 1,589,332 metric tonnes. This represented 824 metric tonnes per million £ revenue.

	2023	
Metric tonnes CO_2e	Metric tonnes	%
Scope 1 CO_2e emissions	**169,914**	**10.69**
– Scope 1 Process CO_2e emissions	29,637	1.86
– Scope 1 Energy CO_2e emissions[2]	139,241	8.76
– Scope 1 Fugitive Emissions	1,037	0.07
Scope 2 CO_2e emissions (market-based)	**37,961**	**2.39**
Scope 3 CO_2e emissions	**1,381,457**	**86.92**
Total	**1,589,332**	**100.00**



1. 2023 includes the business of Universal Refractories Inc (Vesuvius Penn Corporation) which was acquired in 2021 and BMC (Yingkou YingWei Magnesium Co.,Ltd), which was acquired late 2022.
2. Operational Control Boundary.

Our roadmap to net zero

Our results continued

Scope 3 emissions[1,2,3,4,5,6]

Metric tonnes CO_2e	2023[2] Metric tonnes	2023[2] %	2022[2] Metric tonnes	2022[2] %	2021 Metric tonnes	2021 %	2020 Metric tonnes	2020 %	2019 Metric tonnes	2019 %
Purchased goods and services	**1,066,129**	**77**	1,038,969	79	1,342,387	84	1,104,823	84	1,127,065	84
Capital goods	**39,992**	**3**	33,369	3	22,007	1	19,818	2	25,087	2
Fuel- and energy-related activities (not included in Scope 1 or 2)	**37,088**	**3**	45,551	3	50,931	3	36,845	3	42,332	3
Upstream transportation and distribution	**39,086**	**3**	45,572	3	39,887	2	23,946	2	26,104	2
Waste generated in operations	**15,228**	**1**	15,364	1	14,428	1	11,961	1	3,632	0
Business travel	**11,443**	**1**	9,578	1	5,128	0	4,670	0	10,724	1
Employee commuting	**20,374**	**1**	21,253	2	21,653	1	21,561	2	22,303	2
Upstream leased assets	**0**	**0**	0	0	0	0	0	0	0	0
Downstream transportation and distribution	**80,896**	**6**	38,899	3	34,912	2	23,529	2	25,700	2
Processing of sold products	**14,924**	**1**	15,779	1	14,078	1	13,902	1	14,371	1
Use of sold products	**34,194**	**2**	32,914	2	37,460	2	31,834	2	39,645	3
End-of-life treatment of sold products	**22,103**	**2**	20,959	2	23,002	1	18,918	1	4,535	0
Downstream leased assets	**0**	**0**	0	0	0	0	0	0	0	0
Franchises	**0**	**0**	0	0	0	0	0	0	0	0
Investments	**0**	**0**	0	0	0	0	0	0	0	0
Total Scope 3 CO_2e emissions	**1,381,457**	**100**	1,318,207	100	1,605,873	100	1,311,807	100	1,341,498	100

1. In 2023, the GHG Protocol managed Quantis Scope 3 evaluator tool was withdrawn, so Vesuvius now utilises the Sustrax platform, which offers the possibility to evaluate Scope 3 emissions at a greater level of detail. The Sustrax tool relies on the UK Government Defra methodology, categories, and emission conversion factors. Wherever possible we used activity data which relies on information that is specific to the organisation, and therefore is much more accurate than the spend base method. Our Scope 3 emissions for the 2019 to 2022 period were re-evaluated using the improved new approach to ensure comparability over time.
2. The business of Universal Refractories Inc (Vesuvius Penn Corporation) which was acquired in 2021, is included in 2022 and onwards. BMC (Yingkou YingWei Magnesium Co., Ltd), which was acquired late 2022 is included in 2023 and onwards.
3. The numbers are collated from entities within the Group's Operational Control Boundary.
4. Conversion factors for GHG emissions and energy used the 2023 UK Government GHG Conversion Factors for Company Reporting. Conversion factors for GHG emissions for electricity globally used the IEA Emission Factors 2023.
5. Calculation of Scope 3 GHG emissions used the Carbon Footprint Limited Sustrax system for years 2019–2023.
6. Scope 3 2023 Upstream subtotal 1,229,340 Metric Tonnes (89%) Downstream subtotal Metric Tonnes 152,117 (11%).

For additional details on energy consumption and GHG emissions, see Further information P118–124

Our roadmap to net zero

Vesuvius plc long-term CO_2e emissions and CO_2e emissions intensity (market-based), aggregate of Scope 1, Scope 2, and Scope 3[1,2,3,4]

	2023 pro forma vs 2019	Actual 2023 vs 2019	2023 pro forma	2023	2022	2021	2020	2019
Total Scope 1, Scope 2, and Scope 3 CO_2e emissions (MT)				**1,589,332**	1,659,707	2,007,089	1,683,726	1,779,901
Total Scope 1, Scope 2, and Scope 3 CO_2e emissions per million pounds of revenue (MT/M£)	**-18.7%**	**-24.6%**	**887**	**824**	833	1,201	1,188	1,092

1. Scope 1 and Scope 2 re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co.,Ltd) from 2019 onwards.
2. Operational Control Boundary.
3. Pro forma: performance as if the dolime process had been operating normally in 2023 (based on the average output and performance of 2019 to 2022).
4. Scope 3 using historic data.

Vesuvius plc statement of verification

Scope 1, Scope 2 and Scope 3 carbon footprint reporting and supporting evidence contained herein for the period 1 January 2019 to 31 December 2023 covering GHG emissions as CO_2e in metric tonnes , CO_2e intensity in metric tonnes of CO_2e per metric tonne of product packed for shipment, energy consumption in kWh and energy intensity in kWh of energy per metric tonne of product packed for shipment, location based and market based, were verified by Carbon Footprint Ltd in accordance with the ISO 14064 Part 3 (2019): Greenhouse Gases: Specification with guidance for the verification and validation of greenhouse gas statements.

A copy of the limited assurance statement can be found on our website: www.vesuvius.com.

Details of the methodology used for GHG data collection and reporting can be found in Further information on page 117.

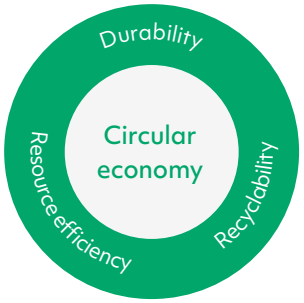
For additional details on energy consumption and GHG emissions, see Further information P118–124

Using fewer resources

Contributing to the circular economy

The drive to improve the sustainability performance of Vesuvius and the refractory industry's products was initiated many decades ago. Continuous improvements have led to considerable reductions in both the raw materials used and the quantity of product shipped to landfill. As the amount of refractory material consumed per tonne of steel cast levels off, the purpose and value of the use of refractory materials will move from delivering insulation to an even greater emphasis on helping to improve steel quality and process efficiency.

As stated in our Environmental Policy, we aim to promote the development of the circular economy. The Vesuvius product strategy combines multiple approaches.



Product durability

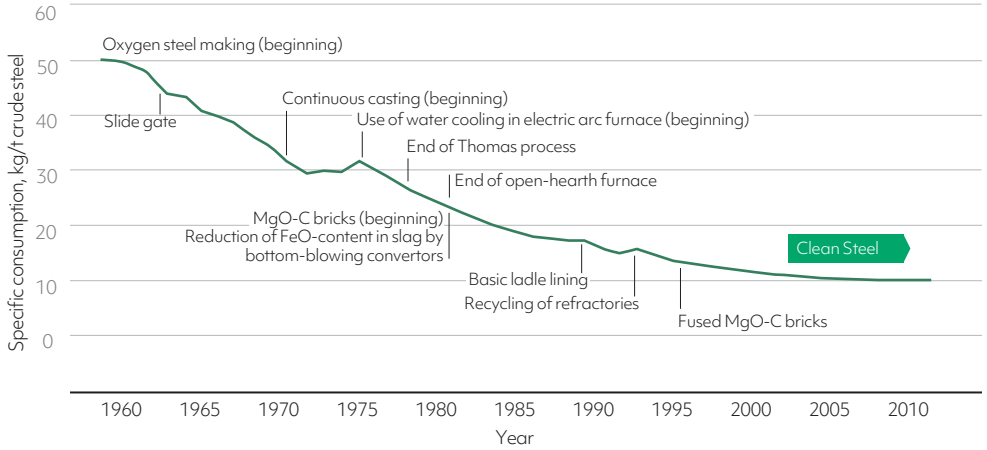
Our first, and preferred, strategy to reduce the depletion of resources is the extension of product durability. The amount of refractory material required per tonne of steel cast has been reduced by 80% since 1960, and the average product lifetime multiplied by as much. Approximately 10kg of refractory material are now consumed per tonne of steel cast, with some customers requiring as little as 7kg.

We are continuously working to extend the lifetime of our consumable products. Strategies include the development of advanced materials, the design of shapes that allow dual usage of products, and product repair and remanufacture. For mechanisms and equipment, we also offer wear monitoring and maintenance services to our customers to ensure their optimum performance and extend their lifetime.

We have introduced innovative refractory lining monitoring, to enable repairs to be made only where needed. Our i-GVARD* system automates the monitoring of slide-gate wear, providing decision-makers with critical data to choose when to renew refractory plates. We have developed longer life Duraflex* ladle shrouds, DuraSleeve* sub-entry nozzles, and methodologies to reuse bottom slide-gate plates as top plates. Each of these systems and processes drives production efficiency – thereby reducing energy wastage and reducing our customers' CO_2 emissions – and reduces refractory volumes.

Any failure of the refractory lining of furnaces or ladles can lead to uncontrolled spillage of liquid metal, potentially resulting in serious safety incidents or extensive equipment damage. The laser technologies we have developed allow customers to monitor the wear of refractory linings, and improve the timeliness of repair or replacement decisions. This technology, when used in conjunction with artificial intelligence software, allows the prediction of failures and the further extension of lining lifetimes.

Amount of refractory consumed per tonne of steel cast in Germany



* Trademark of the Vesuvius Group of companies, unregistered or registered in certain countries, used under licence.

Source: Statistisches Jahrbuch der Stahlindustrie.

Using fewer resources

Product recyclability

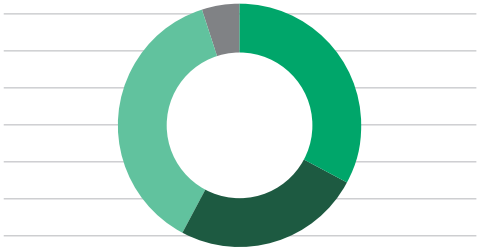
At the same time as reducing the quantity of raw materials required for each casting, technical solutions have emerged to enable the recycling of refractory materials after usage in the production of iron and steel. Whereas in the early 1970s nearly all refractory materials were disposed of after use, it is estimated that more than half are now recycled. In Europe, as little as 5% of refractory materials now go to landfill. A large portion of this is open loop recycling, with spent refractories used in low value-adding applications such as aggregates for roadbed materials.

Closed loop recycling will allow greater substitution of virgin material by secondary material, with a positive impact on Scope 3 CO_2 emissions. It is estimated that only 7% of spent refractories currently enter closed loop recycling.

Many factors, such as consistency of material quality, cost of sorting and mineral processing, transportation costs, and the administrative burden associated with the transportation of waste, have prevented the wide adoption and investment in closed loop recycling. We therefore support initiatives being pursued by authorities to improve the regulatory framework for the circulation of waste materials across borders, making it easier for them to be recovered and recycled in different countries.

Distribution of refractory material after use in the steel industry in Europe %

- **33%** Dissolution in hot metal, steel or slags
- **25%** Internal recycling
- **37%** External recycling
- **5%** Landfilling



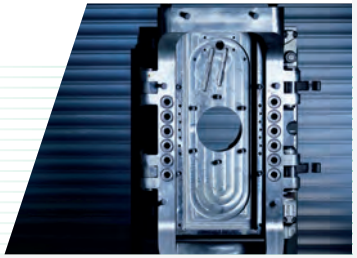
Source: A review of recycling of refractories for the iron and steel industry, Researchgate November 2017.

End-of-life management

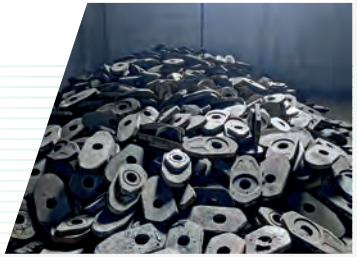
As part of our product end-of-life management programme, we are developing selected initiatives with customers, tailored to each product family, such as:

Recovery and remanufacture of products after usage

Recycling of mechanisms as scrap steel (applicable to 100%)



Recovery and recycling of refractory materials after usage



Refurbishment of lasers and redeployment or entire disassembly and recycling of components (applicable to 100%)

Using fewer resources

Product resource efficiency

Product technology

Similar to the clear environmental advantages solar and wind offer over fossil fuel energy sources, or electric vehicles over internal combustion engines, certain applications can be served by alternative product technologies that are far less CO_2 intensive.

For some uses, it is possible to replace bricks or other products requiring high-temperature firing with resin-bonded refractories, with significantly lower CO_2 emissions. Other applications can be fulfilled by unshaped refractories, which in addition to not requiring high-temperature firing, can be repaired between campaigns, thereby extending their lifetime and reducing the quantity of material to recycle or dispose of after usage.

Vesuvius also offers powder coatings to its foundry customers. These are mixed with water at the customer's premises rather than in our plants. This offers significant environmental benefits, through the reduced consumption of plastic packaging, reduced weight and volume transported and associated CO_2 emissions, and increased shelf life.

Recovered and recycled materials

Vesuvius is determined to increase the usage of recovered and recycled materials in its product formulations.

A comprehensive quarterly reporting system for the use of recovered and recycled materials by all manufacturing sites was launched in 2019. It includes the reporting of recovered and recycled materials from sources external to Vesuvius and throughout Vesuvius' facilities. In 2020, the Board set a target for 7% of the raw materials used by the Group in production to be recycled materials from external sources by 2025 (measured by weight of materials).

Increasing the share of recovered and recycled materials in product formulations poses multiple challenges, in terms of availability, consistency of quality, competitiveness versus virgin materials whose prices fluctuate, regulatory frameworks for the transportation of end-of-life waste materials, and validations to ensure that product performance and reliability remain unaffected. 2023 performance was adversely affected by these factors, which remain a concern going forwards.

Cross-functional teams incorporating experts from R&D, Purchasing, and Manufacturing are working to identify and analyse opportunities in order to increase the share of recovered and recycled materials.

In 2023, we improved the recycled materials data collection process and created a central data storage system. The calculation of revenue from products including recycled materials was also refined to better account for inter-company movements. Figures from 2019 to 2022 were restated using the new method, thus ensuring comparability with 2023.

In 2023, 65,497 metric tonnes of recycled materials were used in our products. The percentage of recovered or recycled materials from external sources used in production was 6.5% (5.8% in 2022). 20.7% of our revenue was generated from products that include recycled materials (20.4% in 2022). We estimate that more than 49,000 metric tonnes of Scope 3 CO_2e emissions were avoided by using recycled materials in lieu of virgin materials in 2023.

Recycled material usage[1,2]

	2023 pro forma[3]	2023	2022	2021	2020	2019
Amount of recycled materials used in Vesuvius products (metric tonnes)		**65,497**	66,137	76,482	57,035	68,373
Amount of recovered materials that are not recycled used in Vesuvius products (metric tonnes)[4]		**0**	0	0	0	0
Percentage of recycled materials in Vesuvius products from total materials	**5.7%**	**6.5%**	5.8%	5.9%	5.3%	5.7%
Percentage of revenue from products including recycled materials		**20.7%**	20.4%	21.0%	19.6%	18.7%

1. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co., Ltd) from 2019 onwards.
2. The numbers are collated from entities within the Group's Operational Control Boundary.
3. Pro forma: performance as if the dolime process had been operating normally in 2023 (based on the average output and performance of 2019 to 2022).
4. All recovered materials undergo some processing before their usage in our products. Therefore, they are all included in the recycled materials category, and the recovered materials category is empty.

Using fewer resources

Bio-based raw materials

Vesuvius uses and has used for many years eco-friendly or bio-based input materials in products including:

- Calcined waste from rice agriculture biomass
- Furfural and furfuryl alcohol from corn cobs biomass
- Sulphite lye/calcium lignosulphonate from paper manufacture waste
- Wood flour from wood waste
- Bioethanol-based solvents

8,877 tonnes

of bio-based raw materials were included in our products in 2023 (8,000 in 2022)

20.7%

of our revenue is from products including recycled materials

Reducing consumption

We believe that preserving the environment is good business. We strive to improve our material efficiency by reducing waste at source and during production, and minimising consumption.

Material waste

A quarterly reporting system for material waste from all manufacturing sites was implemented in 2019. This was enhanced in 2020 by introducing the separate reporting of toxic and other hazardous waste.

Our system now includes the reporting of waste to landfill, toxic and other hazardous waste, waste for recycling, waste to sewers and by-products (materials recovered and recycled outside the site where they were generated).

100% of our manufacturing sites report the various categories of waste and by-products they generate (waste coming from construction and demolition projects is not included, as it stems from exceptional projects and would distort the measure of progress in operations).

The Board has set a target of a 25% reduction of our solid waste (hazardous and sent to landfill) per metric tonne of product packed for shipment by 2025 (vs the 2019 baseline).

Manufacturing sites have started building action plans covering both hazardous and non-hazardous waste to eliminate, reduce and recycle. A wide range of actions have been initiated to reduce the amount of waste, such as closed conveyor and dust extraction systems, process improvements to reduce scrap and process waste generation, re-engineering of product recipes to include internally recycled material, and identification of recycling opportunities in other industries for by-products.

In 2023, the ratio of solid waste (hazardous and sent to landfill) per metric tonne of product packed for shipment reduced by 13.4% vs 2019, (2022: reduced by 9.1%). The 2023 performance was notably affected by the partial interruption to dolime production in 2023. During the year a few sites also disposed of waste material that had been accumulated over a long period of time. Waste material quantities were reassigned to the year during which they were generated, and waste figures adjusted accordingly.

Many sites are also implementing systems to recirculate the dust captured in extractions systems; others are filtering wastewater in order to separate solids which will be reincorporated with the raw materials and water which is recirculated in the manufacturing process.

In 2023, our manufacturing sites and R&D centres of excellence engaged in many activities to improve the handling of waste and reduce its quantity:

- 42 had mapped their waste streams
- 38 recovered and treated hydraulic fluids or oil waste
- 50 recovered at least part of the process waste and scrap to reuse it in products
- 58 were segregating waste for ease of disposal
- More than 5,000 employees and directly supervised contractors received training on waste reduction and sorting

In January 2023, an incident incapacitated one of the rotary kilns used in the production of dolime. As a consequence, the tonnage of dolime produced in 2023 was considerably lower, and the Group's product mix was very different to prior years. The Group's waste reduction ratios are therefore affected by the lower output of dolime and performance improvement.

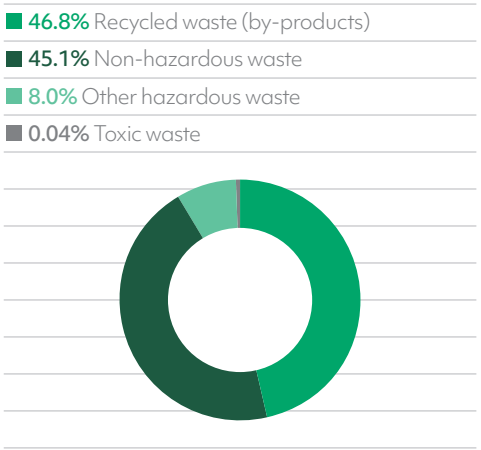
Using fewer resources

As performance comparisons with 2022 and prior years are therefore not meaningful when considering Vesuvius' operations, we have reported our waste ratios and performance improvement metrics in two ways:

- Covering 100% of Vesuvius' operations, as this offers the complete view of Vesuvius emissions (absolute and relative)
- Pro forma, including the dolime product line, as if it had been operating normally throughout the year

When the dolime installation resumes production, waste ratio comparisons with 2022 and prior years, and with the pro forma 2023 figures will be meaningful.

Breakdown of 2023 solid waste %



Raw materials and waste

Manufacturing site raw materials & waste/(metric tonnes)[1]	2023 pro forma[2] vs 2019	2023 vs 2019	2023 pro forma[2]	2023	2022	2021	2020	2019
Ratio of solid waste and by-products in metric tonnes per tonne of product packed for shipment	-11.4%	-23.0%	0.073	0.063	0.073	0.057	0.068	0.082
Ratio of solid waste per tonne of product packed for shipment (in metric tonnes)	-19.7%	-13.4%	0.031	0.034	0.035	0.030	0.031	0.039
Ratio of by-products per tonne of product packed for shipment (in metric tonnes)	-3.7%	-31.6%	0.042	0.030	0.037	0.027	0.037	0.043

1. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co.,Ltd) from 2019 onwards.
2. Pro forma: performance as if the dolime process had been operating normally in 2023 (based on the average output and performance of 2019 to 2022).

Hazardous and toxic waste

We are committed to the reduction of toxic and other hazardous waste.

Whenever relevant, action plans to reduce hazardous waste are incorporated by manufacturing sites into their solid waste reduction action plans.

Manufacturing sites ensure that hazardous and toxic materials, and waste, are stored in protected containers and kept in delineated storage areas, with sufficient retention capability to prevent any release in case of accidental spillage.

Where we handle hazardous or toxic substances, employees receive specific training on how to handle them. In 2023, more than 4,100 employees and directly supervised contractors in 50 sites participated in such training sessions.

Specific procedures are implemented to ensure the specialised treatment and safe disposal of hazardous and toxic waste.

A variety of initiatives have been launched to reduce the amount of hazardous and toxic waste generated.

In 2023, we started studying industrial application opportunities for some of our waste, converting it into a value-adding product for customers.

In 2023, 41 manufacturing sites reported generating hazardous waste and two reported generating toxic waste.
In 2023, 15.0% of our solid waste (excluding recycled waste) was classified as hazardous (2022: 14.5%), whilst toxic waste represents 0.078% of solid waste (excluding recycled waste) (2022: 0.061%).

By the end of 2023, 56 of our manufacturing sites and R&D centres of excellence had defined emergency plans including provisions relating to toxic and hazardous waste and materials.
44 have tested them through simulation exercises in 2023.

-19.7%

Reduction of solid waste (hazardous and sent to landfill) per metric tonne of product packed for shipment from 2019 to 2023 (pro forma)[2]

For additional details on raw materials, waste, and water, see Further information P131–132

Using fewer resources

Water consumption

We aim to reduce both the amount of fresh water consumed in our manufacturing process and social water consumption. The main area of focus is the reduction of wastewater. Vesuvius works to reduce the consumption of water in its manufacturing operations by recycling and improving water management processes. No salt water or cooling water is abstracted, with no related outflow. Various technological solutions have been implemented to reduce our water consumption and wastewater.

Most noteworthy, in the past five years:

- 30 sites have implemented measures to minimise water consumption in grinding, cleaning, degreasing, and rinsing processes;
- 18 sites have upgraded technology or equipment to significantly reduce water consumption; and
- Ten sites have implemented rainwater harvesting systems.

Other examples of solutions to reduce water consumption include the use of high-pressure rinse pumps for the cleaning of batching tanks, water dosing systems, water treatment and recirculation. A typical example is the cleaning and closed loop recirculation of the cooling water used in grinding machines. Dry filter installations for particulate removal also allow far lower water consumption than wet scrubbers.

In 2023, total water consumption was 744,531 cubic metres or 744 megalitres. 725 thousand metric tonnes (97.3%) were consumed in our manufacturing sites, the remaining 20 thousand tonnes (2.7%) in our R&D centres of excellence, offices and warehouses. 31,711 metric tonnes were incorporated into our finished products (4.3% of total fresh water), the balance being consumed as part of our manufacturing processes and social water (95.7%).

In 2023, our overall fresh water consumption per tonne of product packed for shipment decreased by 0.6% vs our baseline of 2019. As with energy use, normalised consumption of water varies with product mix.

Wastewater

The Board has set a target for the Group to reduce the amount of wastewater per metric tonne of product packed for shipment by 25% by 2025 (vs the 2019 baseline).

We are focused on reducing water consumption and the volume of wastewater discharged. Manufacturing sites and R&D centres of excellence have implemented various technological solutions to reduce water consumption and the volume of wastewater discharged. 31 sites reclaim and reuse some water after usage and 30 sites have made investments in wastewater treatment installations. We have action plans in place to reduce our wastewater generation globally, including:

- Recovering and recirculating water after usage within the same process or another
- Investing in more water-efficient technologies such as replacing wet scrubbing systems for particulate removal with dry filter systems
- Optimising cleaning processes
- Detecting and addressing water leakages above and underground, and implementing preventative maintenance programmes
- Optimising production schedules to reduce the need for cleaning between recipes

In 2023, we opted to replace the wet scrubber with a particulate removal system with a dry filter, at the site with the largest discharge of wastewater. This investment should have a sizeable impact on the Group wastewater performance starting in 2024.

75% of manufacturing sites and R&D centres of excellence perform regular (at least annual) wastewater quality tests or monitoring.

(Metric tonnes)	2023 pro forma vs 2019	2023 vs 2019	2023 pro forma	2023	2022	2021	2020	2019
Ratio of wastewater per tonne of product packed for shipment	**-11.6%**	**-4.0%**	**0.242**	**0.263**	0.258	0.251	0.273	0.274

Notes:

– Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co.,Ltd) from 2019 onwards.

– Pro forma: performance as if the dolime process had been operating normally in 2023 (based on the average output and performance of 2019 to 2022).

– Some of Vesuvius' sites include social water in the wastewater reporting.

Using fewer resources

All wastewater is within regulatory permit limits, except for discharges from one site. Action plans are in place, and investments approved to rectify this by the end of April 2024. No substances of concern are recorded. Discharges in areas with water stress are not significant. All wastewater is discharged to municipal sewer systems.

Our wastewater performance has been adversely affected by investments in regenerative thermal oxidisers. Such installations allow far more efficient reduction of air emissions than water-based processes. As a result, wastewater which was formerly transformed into steam in the cleaning of air emissions is now released in liquid form and included in our wastewater emissions.

Water stress

An assessment of all Vesuvius manufacturing sites was carried out using the Aqueduct Water Risk Atlas. A small number of the areas in which Vesuvius operates are water stressed. In these areas, we make strenuous efforts to reclaim, recycle and minimise the overall consumption of water.

Emissions into the air

Whilst measurements have confirmed that these do not represent a material topic, some Vesuvius manufacturing processes can lead to low levels of emissions into the air. These include post thermal treatment residual Volatile Organic Compounds (VOCs) (from the curing and firing of products including solvents and resin binders, or pitch impregnation), residual GHGs from the combustion of fuels and process emissions, and residual dusts post capture and filtration.

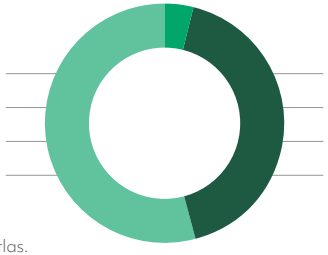
Vesuvius' emissions of VOCs, residual GHGs, and residual dusts are at levels too low to warrant any form of continuous measurement and reporting of quantities emitted, but manufacturing plants with identified potential exposure monitor their levels of emissions into the air through regular sampling, and actively work to reduce them.

Vesuvius is committed to working towards the complete elimination of emissions into the air. Various programmes have been developed over the years, including the upgrade of equipment to the best available technologies, and the implementation of filtration, vapour extraction and regenerative thermal oxidiser systems.

-11.6%

Reduction of wastewater per metric tonne of product packed for shipment from 2019 to 2023 (pro forma)[1]

Location of manufacturing sites	Number of main manufacturing sites	Percentage of revenue 2023
Very high water stress	4	4%
Moderate to high water stress	20	42%
Low to moderate water stress	31	54%



Notes:
– This data covers 100% of our manufacturing sites.
– Water stress classification based on World Resources Institute Aqueduct Water Risk Atlas.
– Revenue from manufactured products.

1. Pro forma: performance as if the dolime process had been operating normally in 2023 (based on the average output and performance of 2019 to 2022).

For additional details on raw materials, waste, and water, see Further information P131–132

Using fewer resources

Biodiversity and greenery

As an integral part of its commitment to operate all work and business activities in a manner which ensures appropriate care and protection of the environment, Vesuvius is committed to not contribute to any net loss of biodiversity.

The very limited footprint of Vesuvius' sites contributes significantly to limiting our Company's impact on biodiversity. We undertake routine surveys of all manufacturing sites and monitor the evolution of regulations related to biodiversity. We do not have any sites located within high conservation value areas, critical biodiversity areas, or biodiversity-sensitive areas. Seven sites are located near (within approximately 1.5km) of critical biodiversity areas or biodiversity-sensitive areas.

Biodiversity risk assessment of manufacturing and R&D sites (www.riskfilter.org)

	Very low risk	Low risk	Medium risk	High risk	Very high risk
Environmental factors	0	41	19	1	0
Pressures on biodiversity	1	28	32	0	0

We have reviewed the location of all of our manufacturing and R&D sites against the WWF Biodiversity Risk Filter (www.riskfilter.org) to evaluate each site's exposure to:

- Environmental factors: protected/ conserved areas, key biodiversity areas, other important delineated areas, ecosystem condition, and range rarity
- Pressures on biodiversity: land, freshwater and sea use change, tree cover loss, invasives, and pollution

We have not identified any biodiversity risks from our ongoing operations, other than accidental environmental releases and emissions into the air as detailed elsewhere in this report.

Actions have been taken in various manufacturing sites to increase greenery and biodiversity on their grounds and in neighbouring communities, including planting trees.

The Vesuvius biodiversity policy is available to view at: www.vesuvius.com.

Using fewer resources

Environmental monitoring and environmental regulation

Vesuvius operates sites in some developing markets where environmental concerns have become politically significant as air quality deteriorates, and residential expansion takes people closer to areas historically reserved for manufacturing.

All our factory emissions to air, ground and water, as well as waste are proactively managed in accordance with local regulations. All our manufacturing operations monitor key environmental indicators.

Regular analysis

Regular analysis enables us to act to reduce our emissions where possible and to operate more efficiently. Environmental performance records are kept for the period of time required to comply with local regulations.

Manufacturing plants maintain and test emergency plans to ensure compliance with local regulations and Vesuvius standards in the event of an accidental release.

Environmental inspections and audits

Many of our sites are subject to routine audits and inspections by external authorities. Reports from external inspections, including those with findings, are centrally stored and shared internally with executive and senior management. In 2023, 78 external audits and inspections were recorded. Where local authorities carry out routine inspections, observations, recommendations, and actions are recorded and acted upon appropriately, to prevent reoccurrence and continuously improve our environmental management systems.

Environmental issues are also within the scope of the Group Safety Audit. In 2023, 68 audits were conducted. Major findings are escalated to senior management, and action plans built to address them.

Environmental exceedances

Vesuvius is committed to addressing environmental exceedances and complying with local regulations. All exceedances are reported in a central database. Any significant exceedance or environmental incident is reported to the Group Executive Committee.

In 2023, Vesuvius recorded 70 mostly minor environmental incidents. Of these, two related to emissions to air, six to emissions to water and 62 to ground. Seven manufacturing sites were engaged in discussions with neighbours over environmental issues, mostly due to noise or smell. Five sites were engaged in discussions over minor environmental compliance issues with local authorities.

Total environmental releases across the Group in 2023 are estimated to have totalled 44.4 metric tonnes (including 30.9 metric tonnes of water-based materials) and 12.4 m3 of hydrocarbons, with the balance being solids and powders (1.1 metric tonnes).

All 2023 reported releases to water and all but three to the ground were fully contained. One release to ground involving hydrocarbons required remedial work, the other two were water-based and were also cleaned up.

Where incidents occur, they are managed via Vesuvius' site environmental response plans and reported through the Vesuvius incident reporting system. We comply with local reporting requirements in respect of such incidents. Two regulatory actions issued in 2021 against Vesuvius in Belgium remain open; action plans to address them are being implemented. No action was taken by any authority in relation to an environmental incident in 2023 which resulted in financial penalties against Vesuvius.

(£m)	2023	2022	2021	2020
Total cost of environmental fines and penalties levied	**0**	0	0	0

Using fewer resources

Environmental management/ certifications

External annual compliance audits are carried out primarily by the global assurance provider, LRQA. 100% of our ISO 14001: 2015 certifications cover the handling of waste and hazardous materials, including regular environmental impact audits and implemented risk prevention procedures (including emergency planning and testing) relating to waste and hazardous materials handling.

7,600

employees and directly supervised contractors received environmental awareness training in 2023

Where previously the decision to pursue ISO 14001 certification was taken at a local level, Group policy is now for production sites representing c.96.3% of Vesuvius' revenue to seek ISO 14001 certification. Six production sites in which no significant amounts of chemical materials are used, and representing c.3.5% of revenue, will be requested to complete environmental risk assessments. Three production sites (representing c.0.2% of revenue) with no chemical materials are excluded.

We have 21 manufacturing sites certified to ISO 14001: 2015, representing 38% of sites controlled by Vesuvius and c.49% of revenue (office spaces, customer locations, and warehouses are out of scope as waste and hazardous materials are not material at these locations). 41% of sites reporting hazardous and toxic waste, representing 48% of the hazardous and toxic waste tonnage, have ISO 14001: 2015 certifications.

A list of certified sites can be found on page 133. The current list may also be viewed elsewhere on Vesuvius's website.

Environmental award and recognition

We are very proud of the external recognition received by our teams for putting sustainability and climate change at the centre of our work.

Green Factory: In 2023, the Liaoning Provincial Government awarded the Vesuvius site in Bayuquan, China, the honour of Green Factory status for its results in sustainable development and environmental protection.

Environment Awards: Two of our sites, Skawina (Poland) and Grossalmerode (Germany), were awarded the '2023 PRE Environment Awards' by the European Refractories Producers Federation (PRE).

Green Champion of the Year: Foseco India was honoured with the 'Green Champion of the Year' award from Dun & Bradstreet, a provider of business information and insights. This recognition highlights the Company's unwavering efforts in reducing its environmental impact, championing eco-friendly initiatives, and adopting responsible practices across its operations.

Environmental awareness training

Environmental protection requires efforts from all parts of society, including governments, companies and individuals. Vesuvius employees need to understand the main environmental risks in their site, and how to prevent and react in the case of an incident. We also believe that it is important to foster the right behaviours inside and outside the workplace. Environmental awareness training programmes are therefore being developed in many of our sites, covering a wide range of topics, such as:

- Types and sources of pollution
- Scope 1, 2, and 3 CO_2 emissions
- Vesuvius policies and procedures
- Different categories of waste and how they should be handled
- Good behaviours to adopt inside and outside the Company

In 2023, more than 7,600 employees and directly supervised contractors received environmental awareness training, lasting on average 1.3 hours.

Sustainability in action

We reduce emissions by investing in major equipment and process improvements.

Reducing the use of CO_2 intense fuels

Challenge: The plant in Wuhan, China, used coke oven gas as a fuel. Coke oven gas is formed by heating coal to 1,100°C. It generates large amounts of CO_2 and other greenhouse gases in its production and use.

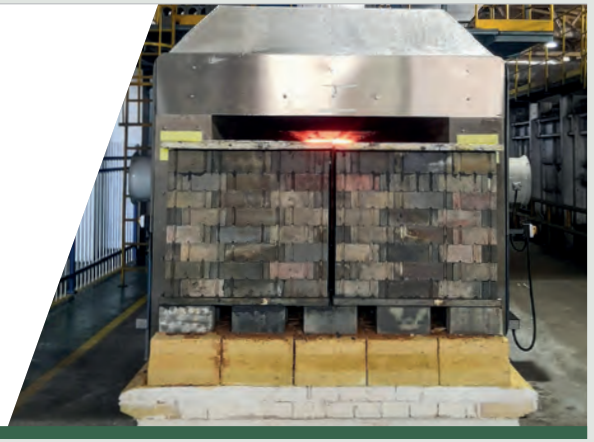
Solution: Natural gas, whilst not carbon-free, is a much cleaner alternative. The Wuhan plant converted their kiln and the second preheating kiln from coal to natural gas fuel, dramatically reducing greenhouse gas emissions. Waste heat from the high-temperature kiln is also recovered and used for heating and to produce warm water for the staff washrooms.

Outcomes

CO_2 emissions reduced by

69%

(6,000 tonnes)



Thermal process optimisation

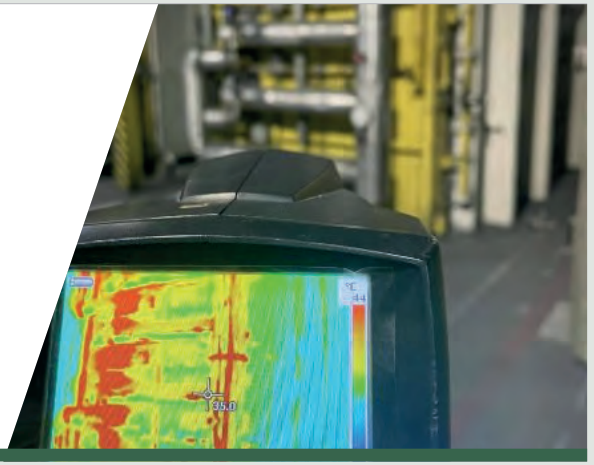
Challenge: Minimise the energy intensity and CO_2 emissions per tonne of product produced in the Trinec factory.

Solution: To determine the most energy-intense installations, a metering system and analytic tools were used to track each product's energy consumption and, eventually, optimise burner settings and kiln load.

Outcomes

-19%

Total CO_2 emissions reduction per tonne of product in 2023, compared to 2021 reference value



Sustainability in action

We reduce emissions by improving our processes and increasing efficiency.

Reducing gas consumption with smart management

Challenge: Reducing the gas consumption required to fire specific products by using a more efficient kiln and with lower maximum temperatures in Feignies, France.

Solution: The firing cycle was improved by reducing soak temperature and changing burner settings without any impact on the final product quality.

Outcomes

This has allowed the operation to reduce the equivalent gas consumption by around

1GWh

and CO_2 emissions by 184 tonnes

Solid waste recycling

Challenge: The Foseco Puducherry site in India needed to improve its solid waste recycling to reduce its environmental impact and cut costs.

Solution: The site started by reducing its raw material consumption and took a number of other measures including reusing spent oil in power production, reusing garden waste as manure, recycling dust extraction power, recycling slurry and putting rejected sleeves back into raw materials.

Outcomes

The site now recycles

100%

of its non-hazardous waste resulting in significant environmental improvements and reduced costs

Our technology helps our customers improve the operational performance of their processes and their environmental footprint.

Our customers

Supporting our customers' journey to net zero

Vesuvius is committed to growing its contribution to a sustainable world, through products and services that improve safety, maximise environmental performance, reduce greenhouse gas emissions and contribute to the circular economy.

Sustainable solutions

Our products have the potential to help customers reduce and avoid greenhouse gas emissions when compared with their current practices, by amounts that far exceed the emissions required to manufacture and distribute them.

We actively cooperate with customers to help them evaluate the CO_2 emissions reduction our products bring to their complete value chain.

Our customers in the iron, steel and aluminium industries are embracing the challenge of dramatically reducing their CO_2 emissions. Many have pledged to reach net zero by 2050. They are investing heavily to transform their manufacturing technologies for the long term, working on a range of initiatives including the direct reduction of iron with carbon-free hydrogen and the replacement of carbon anodes in aluminium smelting.

We contribute to their efforts through technology partnerships and developing new products for the next generation zero emissions aluminium, iron and steel-making processes. We help them to evaluate the CO_2 emissions reduction our products bring to their complete value chain.

- Reduce heat losses
- Minimise casting temperature
- Extend production sequence length, reduce downtime
- Increase metal yield in castings
- Reduce downgrading, remelting of scrap and repair of defects
- Improve metal performance
- Maximise casting speed and throughput

Reduce and avoid greenhouse gas emissions

Supporting our customers' journey to net zero

Product life cycle assessments/ assessing our portfolio

We have created a Product Sustainability Benefits Scorecard to evaluate the sustainability benefit of our products over their full product life cycle (raw materials, manufacturing, transportation, use phase and end of life), rating our products against standard market products.
We rate our products considering their performance in terms of health and safety, environmental impact, greenhouse gas emissions and end-of-life processing. All criteria are assigned a weighting. In line with our objectives to reduce both our own CO_2 emissions and to help our customers reduce their CO_2 emissions, we give these criteria a significantly higher weighting. Our methodology also allows us to rate our products specifically on their superior performance in terms of CO_2 emissions.

Performing this analysis supports our objective to develop and supply products that provide our customers with a superior overall sustainability performance against the market standard.

By the end of 2023, we had assessed 97% of our revenue from consumable products using this internal scorecard. Of our 2023 sales, 18.2% were generated from products with superior sustainability characteristics (17.7% in 2022). 15.6% of 2023 sales were generated from products with superior performance in terms of customer CO_2 emissions. Our objective is to continue growing this share of our product portfolio year after year.

Product Sustainability Benefits Scorecard

Improves users' comfort, health and safety	Safety in manufacturing and transportation
	Safety during usage
	Exposure to health hazards
Limits our impact on natural resources	Product weight
	Product lifetime
	Recycled materials
Minimises energy consumption and emissions	Cradle to grave greenhouse gas emissions
	Reduced and avoided CO_2 emissions for the customer
	Volatile compounds emissions
Reduces waste, avoids landfill and increases recycling	Waste generation during manufacturing and usage
	Recyclability after usage

Product Carbon Footprint

In 2023, we also started developing Product Carbon Footprint studies, in line with the principles of the ISO 14067 norm. Our goal will be to deploy Product Carbon Footprint studies to 100% of our product portfolio.

We championed the creation of a working group within the World Refractories Association to harmonise the methodology and assumptions for product carbon footprint studies across all companies within our industry. In 2023, the World Refractories Association decided to initiate a working group which Vesuvius will participate in.

Supporting our customers' journey to net zero

Sustainable R&D

Vesuvius invests significantly in new product development, working closely with customers through our network of account managers and service teams, and holding regular technical and R&D meetings, to offer optimised solutions for their specific needs. We have a unique combination of expertise covering a wide range of fields including metallurgy, refractory ceramics, robotics and mechatronics, and IT.

When designing new products, we look at our customers' current and future challenges, needs and expectations, combine this with information we have collected from our analysis of past issues, and seek to achieve both incremental improvements and breakthrough innovations in safety, robustness, reliability and performance to steer the development of next-generation products and services.

We have formally integrated sustainability considerations into product R&D. Using the Product Sustainability Benefits Scorecard, we have undertaken a complete assessment of the pipeline of R&D and new product development projects, to check from the design stage that the projects are aligned with our sustainability ambitions and more specifically contributing to the fight against climate change by reducing CO_2 emissions. We use this information to adjust priorities and allocate resources. We consider products that have better sustainability characteristics than those already on the market, to be 'market-leading sustainable products'. R&D covers a wide range of activities ranging from fundamental research and front-end innovation to the evaluation of alternative material sources and support to operations.

The challenge of decarbonising iron and steel making, and aluminium smelting, requires the development and industrialisation of radically new technologies. We complement our internal efforts with partnerships with over a dozen research institutions, universities and strategic customers, working to develop the refractory solutions that will support these novel processes.

The scope of work of the Group's central functions and processes R&D teams covers fundamental research, new product development projects, the evaluation of raw materials and support to operations. In 2023, the Group spent £12.4m, representing 34% of the Group's central functions and processes R&D spend, on the development of market-leading sustainable products (vs £8.1m, 23% in 2022). These constituted 83% of our New Product Development projects. Our objective is to reach 100% of such products in the development pipeline. £10.3m, representing 28% of the Group's central functions and processes R&D spend, was devoted to the development of products contributing to the fight against climate change by reducing CO_2 emissions.

18.2%

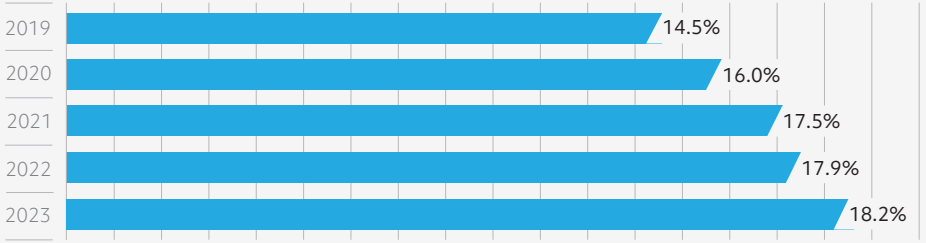
of sales generated by market-leading sustainable products

Supporting our customers' journey to net zero

Vesuvius' investment in innovation and sustainability[1]

	2023	2022	2021
R&D spend	**37**	36	31
R&D spend dedicated to the development of market-leading sustainable products[2]	**12.4**	8.1	9.7
%	**34%**	23%	31%
R&D spend dedicated to the development of products contributing to the fight against climate change by reducing CO_2 emissions[2]	**10.3**		
%	**28%**		

% of sales generated by market-leading sustainable products[2]



R&D spend (£m)[1]

1. At constant 2023 currency.
2. Using Vesuvius' internal scorecard.

In 2024–25, we plan to launch 52 new products (2023: 19), of which 38 (73%) will allow customers to achieve superior sustainability performance (2023: 15).

83%

of ongoing new product development projects were dedicated to market-leading sustainable products

Product safety and quality

At the core of our business is the desire to help our customers improve their operational performance and efficiency. Customers rely on the quality of our products, and their structural integrity, to ensure the safety of their employees by controlling the flow of molten metal in their operations.

The reliability and performance of our products are critical to our customers in terms of safety on the shop floor, overall equipment effectiveness, labour productivity and metal yield, and their environmental impact (reducing energy consumption, CO_2 emissions and refractory material waste).

Many of our products allow our customers to achieve improved metallurgical properties in their products, for example, allowing the production of better wind turbine components or the light-weighting of vehicles.

Product safety and quality

Policy and governance

The Board oversees the Group's product safety and quality performance. Quality performance figures, along with all material product safety issues, are reported to the Board.

Responsibility for the safety and quality performance of our products lies with the Group Executive Committee. Product safety issues and quality performance are reported and discussed during each Group Executive Committee meeting.

As stated in our Quality Policy, we operate all work and business activities to ensure that the quality of our products and services consistently meets the requirements of our internal and external customers. We seek to be proactive in preventing customer issues, and to continuously improve our quality management systems and performance.

Customer satisfaction surveys

Our Business Units and regional Business Units routinely carry out Customer Satisfaction Surveys. Their purpose is to obtain feedback on our performance relative to the competition and customer expectations. Survey results are valuable inputs when selecting priorities, setting improvement objectives and building action plans. Customer satisfaction surveys were conducted in all regions in 2022.

New product development

Product safety is paramount to us. We have implemented a wide range of practices to optimise the safety and quality performance of our products in use, reduce failures and increase their lifetime.

We follow a strict stage-gate process for the development of new products, ensuring that safety performance objectives are defined from the initial stages and progressively completed up to the product launch. Key deliverables include risk assessments, preparation of user and maintenance documentation, manufacturing control plans, and Vesuvius and customer operator training. We undertake extensive testing through rigorous alpha and beta trials, with systematic trial reports to confirm that targeted performance and robustness objectives are met and to allow for fine-tuning before product launch. Safety data sheets are available for all consumable products.

Our automated and robotic systems are fully customised and embedded into our customers' processes. Their design and implementation require additional precautions to ensure optimum safety during the project phase and in operations.

Teams working on their development and installation at customers' sites therefore receive targeted safety training focused on the specific risks at various project stages.

The development of human-centred robotic solutions for steel shops reduces the ergonomic strain on our customers' operators together with their exposure to high temperatures. Development projects follow the ISO 10218-2 norm (Safety requirements for industrial robots). External expert consultancy support is provided along with regular audits, and all follow the rules required for CE conformity or equivalent regulation.

Safety and quality in use – product feedback

Our constant performance monitoring develops deep and lasting relationships with our customers.

After product launch, whenever a safety-related incident (an injury or a dangerous occurrence) occurs at one of our customers that may have involved a Vesuvius product or service, it is systematically reported and investigated. Likewise, all quality and performance issues raised by the Vesuvius field teams or by customers are systematically reported, documented and classified, based on their nature and severity.

Product safety and quality

Our traceability systems cover 100% of manufacturing sites and products. As soon as Vesuvius is notified of any safety or quality issue, these allow immediate containment actions to be implemented. All suspicious products are quarantined, in our sites, in our warehouses and distribution channels, and at customers. If necessary, they can be recalled for investigation, rework or disposal.

Issues and incidents are dealt with through a rigorous problem-solving methodology and in-depth investigation using the 8D practical problem-solving methodology. This ensures we identify root causes, implement corrective actions, and prevent them recurring. The outcome of the investigation, including root causes and corrective actions, is shared with the customer and lessons learned are incorporated into the design of following generations of products.

Each of our product managers is tasked with responsibility for collecting feedback on our products and managing improvements. Routine debriefing is organised after projects are completed. Field trial reports and incident reports are routinely reviewed to collect information on failures and improvement opportunities.

Regional Business Unit management teams are responsible for organising problem-solving teams to address issues and lead routine reviews of ongoing product safety and quality performance.

Along with our focus on the completeness and quality of reporting, a strong emphasis is placed on the effectiveness of our problem-solving. Our cross-functional teams involve sales, R&D and manufacturing experts, who work collaboratively to address the most challenging technical issues.

Whenever relevant, subsequent changes made to the design of products are deployed to installations in service at other customers and lessons learned are incorporated into the design of following generations of products. We monitor the number of Customer Corrective Action Requests (CCARs), severity 1 CCARs (safety-related incidents or quality issues affecting the customer of our customer), and repeat CCARs.

These processes allow us to learn from problems, provide feedback for the development of future products and constantly evolve and update our services in line with changing customer expectations and technological developments.

Product safety and quality targets

Our goal is to reach zero product safety-related issues (injuries and dangerous occurrences). Product safety and quality targets are set by the Group Executive Committee on an annual basis.

Product safety and quality performance, including the number of customer complaints, the number of repeat complaints for the same issue and their severity, is reported to the Board on a regular basis, and reviewed during each Group Executive Committee meeting. The most serious issues and those that affect, or could potentially affect, multiple customers are reviewed in detail during these meetings. Adverse trends result in prompt, clearly defined initiatives to permanently solve issues and prevent repeats.

Product safety and quality results

In 2023, no product failures led to customer employee Lost Time Injuries (LTIs). In 2023, our teams recorded, reported, and investigated 22 (2022: 14) customer health and safety-related issues: three minor injuries (two incidents involving burns, one dust in the eye) and 19 dangerous occurrences. These were fully investigated, and corrective actions implemented.

We were not notified of any non-compliance with regulations and/or voluntary codes concerning the health and safety impacts of products and services in 2023. The total amount of monetary losses incurred as a result of legal proceedings associated with defect- and safety-related incidents during the year was zero.

£m	2023	2022	2021	2020	2019
Monetary losses incurred as a result of legal proceedings associated with defect- and safety-related incidents	**0**	0	0	0	0

Product safety and quality

Excellence in problem-solving

Training

The 8D methodology is implemented as the primary problem-solving tool across the Group. It is a consistent approach designed to identify root causes and ensure appropriate corrective action is taken. The Group has developed its problem-solving capabilities through training and coaching in the correct use of the 8D practical problem-solving methodology. On a yearly basis, more than 2,000 problems are addressed using this technique.

Since 2020, to spread the quality breakthrough practices and tools, we have been continuously reinforcing our problem-solving capabilities. Their deployment has continued in 2023, with the reinforcing of our quality organisation and over 200 employees receiving the four-day 8D practical problem-solving training.

8D – The eight disciplines of practical problem-solving

- D1 Clarify the problem
- D2 Grasp the current situation
- D3 Contain & set target
- D4 Analyse causes
- D5 Define countermeasures
- D6 Execute & track progress
- D7 Check results
- D8 Standardise & establish controls

Recognition

An annual 8D Awards Competition is organised to recognise the best teams and projects. This competition is organised across all Business Units, in each region, with a jury composed of senior managers and sponsored by members of the Group Executive Committee.

In 2023, more than 100 projects were presented in the Regional 8D Competitions. In addition to recognising the best problem-solving and projects, these events are an opportunity to recognise talent and disseminate knowledge.

Product safety and quality

Regulatory compliance

Quality management system – ISO 9001 certification

Vesuvius places a high value on ISO 9001: 2015 certification and the business assurance that this quality management system brings. We have 64 certified Vesuvius and customer sites, employing quality professionals to maintain and develop quality systems under our Quality Policy. 100% of the management systems used to make our products are covered by ISO 9001: 2015. A current list of certified sites is available to view on the Vesuvius website: www.vesuvius.com.

REACH regulation

For the development and production of consumable products, we have implemented R&D screening of raw materials and chemicals to avoid introducing unwanted substances into the recipes and processes. Where potentially hazardous substances are nonetheless required, strict validation checklists have been defined to ensure adequate protection measures are taken at every step of the process. We document regulatory compliance through Safety Data Sheets for all raw materials consumed and all products manufactured and share these with customers.

Our objective is to remain fully compliant with our registration obligations under the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) regulation.

Since 2007, Vesuvius has appointed REACH managers for its Steel and Foundry Divisions, implementing an ongoing process to identify the REACH-impacted raw materials based on their Safety Data Sheets. These substances are then monitored throughout the production process in Vesuvius.

This also allows us to track the quantities consumed and verify that these remain within the limits of our registrations. Results are documented in a central database. We routinely organise training sessions for employees in the R&D, sales, and purchasing organisations to ensure that any new substance included in a new product recipe or otherwise purchased, will be incorporated into our monitoring and registration process.

Updates to the lists of substances under REACH regulation issued by the European Chemicals Agency (ECHA) are continuously reviewed and our internal monitoring adapted whenever necessary. Vesuvius also monitors projected changes to the list of substances under REACH regulation, to proactively incorporate future developments in our product development processes.

Whenever relevant, we also participate in the consultations led by ECHA to define the most appropriate status for substances.

98.7%

of Vesuvius manufactured products (by revenue) are covered by our ISO 9001: 2015 internationally certified quality management system

We launched a programme of formal assessments of our suppliers, with an objective to assess all relevant suppliers of raw materials. Since 2021, 200 suppliers have been contacted, of which 130 (65%) have already answered. All but three are already complying with the UK and EU REACH regulations or have initiated the registration process.

Following the UK's departure from the EU in 2021, we adapted our registrations and purchasing organisation and systems to ensure that we remain fully compliant with our obligations both in the UK and EU.

Sustainability in action

Return to our Customers' CO_2e emissions priority

We help our customers to reduce CO_2 emissions: Solutions for Foundry customers

Redesigned gearbox casting system

Challenge: A European foundry wanted to reduce energy consumption, and improve workers' safety, whilst increasing productivity and maintaining its industry leadership.

Solution: Vesuvius redesigned the gearbox casting system's pattern, added special exothermic feeders and eliminated the need to use exothermic rising powders. This way, less metal is used in the process and the operators don't need to get so close to the hot metal. As a result, our customer improved safety and metal yield, reducing the amount of metal melted throughout the process by around 30%. Eventually, the foundry reduced time, energy and emissions whilst casting the gearboxes.

Outcomes

Operators' safety improved and customer CO_2e emissions are reduced by

21%

SEMCO coatings indicating the drying progress

Challenge: A customer wanted to reduce moisture-related defects and optimise the drying time and temperature.

Solution: SEMCO fast-drying and colour-change coatings cut drying times compared to traditional water-based coatings, resulting in lower energy consumption for drying, whilst optimising mould line productivity. These coatings include an indicator that shows the progress of the drying process by changing colour, allowing customers to avoid unnecessary heating and reduce energy consumption and carbon emissions associated with drying and rework.

Outcomes

20%

Energy savings reached and gas-related defects and rework can be eliminated

Sustainability in action

Return to our Customers' CO_2e emissions priority

We help our customers to reduce CO_2 emissions: Solutions for Steel customers

Increasing refractory lining lifetime, increasing output and reducing CO_2 emissions intensity

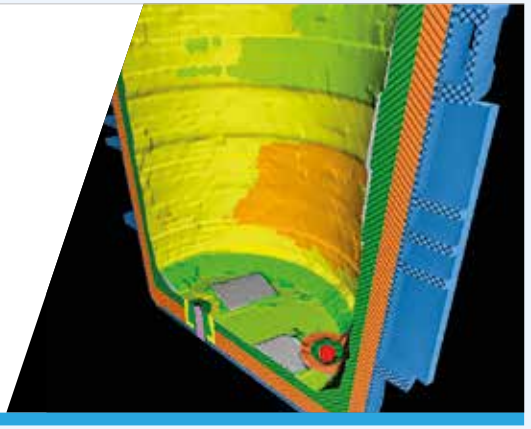
Challenge: Our customer, an Electric Arc Furnace steel plant, wanted to optimise costs by extending their ladle refractory lining lifetime.

Solution: Our Process Metrix lasers allowed our customer to monitor the wear of their ladle refractory lining after each heat and determine how many more heats could be safely processed before repair or replacement was necessary. As the ladle fleet was the bottleneck of their production process, they could create further value by using wear measurement data to recalculate the available volume in each ladle after each heat, to maximise the quantity of steel per ladle.

Outcomes

6,500 tonnes

of CO_2 saved per year thanks to energy efficiency improvements and lower consumption of refractory materials



Extending tundish sequence length with DuraSleeve*

Challenge: An Electric Arc Furnace steel plant, a single-strand Thin Slab caster, wanted to increase productivity and reduce carbon footprint by extending their casting sequence. One of the main factors limiting sequence length during the steel-making process is slagline erosion.

Solution: Vesuvius DuraSleeve technology reduces erosion of the slagline sleeve and extends the casting sequence length by 20%, generating energy and CO_2 savings out of the following factors:

- Lower energy consumption to preheat tundishes, caster metal yield improvement, less downgraded steel requiring remelting (Customer Scope 1&2)
- Lower consumption of tundish refractory materials (Customer Scope 3)

Outcomes

2,600 tonnes

of CO_2 avoided per year

* Trademark of the Vesuvius Group of companies, unregistered or registered in certain countries, used under licence.

We provide our employees with a safe workplace, where they are recognised, developed and properly rewarded

Our people

Health and Safety Policy

Safety is our top priority and our overriding commitment to health and safety is embedded throughout the organisation.

Our approach is to identify, eliminate, reduce or control all workplace risks, and an ongoing system of training, assessment and improvement is in place to focus on achieving this. We remain fundamentally committed to protecting the health and safety of employees, contractors, visitors, customers and any other persons affected by our activities.

We want to become a zero-accident company and are striving to become a best-in-class organisation for safety performance and leadership.

- We will operate all work and business activities in a manner which ensures the physical and mental health and safety of employees, contractors, visitors, customers and any other persons affected by these activities.
- We will comply with the legal health and safety obligations
- We will be proactive in preventing injuries and ill-health, and continuously improve our health and safety systems and performance

Organisation and responsibilities

- We regard health and safety matters as a mainstream management responsibility. Executives and line managers are directly responsible for health and safety matters in operations under their control. Management is accountable for health and safety performance against objectives
- All employees have a responsibility to take care of themselves and others whilst at work. We expect everyone to participate positively in the task of preserving workplace health and safety
- We will encourage our suppliers to adhere to the same health and safety standards as we do

Our beliefs

- Good health and safety is good business
- Safety is everybody's responsibility
- Working safely is a condition of employment
- All work-related injuries and work-related ill-health are preventable

Our aims

- No accidents
- No repeat injuries
- No harm to people

Our commitments

- We will abide by simple and non-negotiable standards
- We will report transparently and thoroughly investigate any incident to learn, share and avoid repeats
- Risk assessments will be undertaken to identify hazards, prioritise any deficiencies and correct them in an appropriate way, as well as to develop appropriate safe work procedures
- Every business facility will follow the agreed health and safety plans, committing to reduce the frequency and severity of injuries, improve workstation ergonomics, prevent exposure to hazardous substances and minimise the risk of occupational diseases
- We will ensure awareness about health and safety issues and provide training for all new employees and contractors, and then at least annually, to ensure that they understand their responsibilities and are able to act accordingly
- Every business facility will have an appointed health and safety manager

Health, safety and well-being at work

Health and safety governance

The Board has overall responsibility for health and safety-related matters and delegates authority for the management of the health and safety performance of the business to the Chief Executive. The Health and Safety Policy is signed by all members of the Group Executive Committee and the Business Unit Presidents are responsible for its deployment.

The Board receives regular information on every Lost Time Injury (LTI) and key safety performance indicators and overall Company safety strategy. In addition, the Board carries out a biannual review of health and safety performance. Annual presentations of Business Unit strategy include health and safety.

The results of our Group safety audits are presented to the Board twice per year.

Safety performance remains the priority item on the agenda at all our Group Executive Committee and management meetings. The Group Executive Committee reviews all the more serious health and safety incidents, including all LTIs, and the responses to these from local management.

The Group VP Sustainability, HSE & Quality is responsible for setting the Group's policies for health and safety and controlling their application.

The Business Units are responsible for the implementation of these policies and are directly accountable for the health and safety performance of their operations, with each Business Unit determining its own priorities and resource allocations, aligned with Group-wide targets on safety performance.

The majority of senior managers have a portion of their variable compensation tied to the achievement of safety performance targets.

Health and safety governance

The Board
Overall responsibility for health and safety-related matters, approves targets

Chief Executive
Takes responsibility and is accountable for the safety performance of the Company, sets targets

Vice President Health and Safety
Defines standards, organises Group safety audits and benchmarks and guides strategy

Business Unit Presidents
Are responsible for resources, training, action plans and performance

Health, safety and well-being at work

Safety leadership

Since 2018, Business Unit Presidents and Regional Business Unit Vice Presidents have been made fully accountable for their safety performance. At a Group level, policies and standards are regularly reviewed and refreshed whilst Group safety audits are made against the policies and standards with the close involvement of the Site Managers. To enhance behavioural safety, executive safety tours, safety tours by senior management and local safety audits are carried out and performance is measured and reported monthly.

Safety tours are also undertaken in customer locations including both those where Vesuvius has employees and others where requested by customers, who recognise the benefit of a third-party perspective on safety.

83%

of all Vesuvius employees and directly supervised contractors participated in safety audits every month

All site management teams must develop and implement site safety improvement plans, incorporating the identification and reduction of the site's main risks, compliance with the Group safety standards, deployment of shop floor safety leadership practices and resolution of issues highlighted during Group safety audits. Improvement plans are now in place for all production sites, with implementation being the direct responsibility of local managers.

Any site experiencing a severe incident, an LTI, a medically treated injury, or a serious dangerous occurrence is required to investigate the incident. Vesuvius' investigation procedures are based on the 8D practical problem-solving tool, which aims to identify the true root causes of incidents to prevent a repeat. Results are formally presented to management, with details of the 8D-based root causes. The site then incorporates the findings into their site safety improvement plans and shares its incident investigation so that improvement actions can be cascaded throughout the organisation.

Every business facility has an appointed health and safety manager, who works with management and all employees to review site health and safety, assess training needs and develop and implement site safety improvement plans.

These local health and safety managers are assisted by central experts who not only identify adverse trends and respond to them, but also enable the sharing of best practice across Vesuvius.

The LTI frequency charts prepared monthly for each Business Unit and site show where injuries have been reduced and where further effort is required, through a combination of a behaviour-based approach to safety and the implementation of physical safeguards. We focus on the safety of all personnel, whether they are employees, contractors (directly supervised or not) and visitors.

Based on the analysis of the type of accident, type of injury and parts of the body affected, the businesses develop risk-based action plans that consider both the frequency and severity of incidents and track progress. Every site management team receives a monthly dashboard of health and safety-related performance indicators, covering both lagging and leading metrics.

Employee participation in safety leadership is key. It is evidenced through the participation in safety audits, and involvement in joint management worker health and safety committees. In 2023, on average, 83% of all Vesuvius employees and directly supervised contractors participated in safety audits every month.

Approximately 9,700 Vesuvius employees in manufacturing sites and customer locations (representing 72% of the total workforce across all locations) were represented in formal joint management–worker health and safety committees.

Our employees are highly supportive of the Group's efforts to improve workplace safety and acknowledge how seriously we take this issue. In the 2023 I-Engage employee engagement survey, 86% agreed that the Company would address safety concerns if they were raised, which was consistent with 2022.

In 2023, we organised our first Group-wide Safety Day. Events were organised in all our manufacturing sites, with more than 10,000 employees worldwide participating. The activities, which combined training, simulations, practices and hazard-hunting, were instrumental in strongly reinforcing the commitment to safety at all levels of the Company.

Health, safety and well-being at work

Occupational health and diseases

Vesuvius has developed and implemented a variety of programmes to ensure that we provide our employees with work conditions that are not detrimental to their health. These include the routine monitoring of noise, dust levels and volatile organic compounds emissions.

Occupational health and personal safety management is blended at all of our sites. Occupational health hazards are covered in risk assessments. We provide occupational health services that are relevant to hazards and risks to which employees and others are exposed at our operations (e.g. forklift drivers), such as routine health check-ups.

In line with our values, and our commitment to employee engagement, benefits including access to healthcare and medical support are managed locally in accordance with local laws.

Directly supervised contractors are treated the same as Vesuvius employees.

72%

of the total workforce are represented in formal joint management–worker health and safety committees

Employee well-being

We recognise that ensuring the well-being of our employees goes beyond the provision of safe working conditions and the prevention of occupational diseases. In line with our decentralised organisational principles, individual sites are encouraged to provide their staff with healthcare insurance, routine health checks, and additional mental health and well-being support.

In 2023, 89% of Vesuvius employees were covered by a healthcare programme. 78% underwent a routine health check.

Various healthcare programmes were initiated or continued in many Vesuvius entities depending on the local needs. The examples include:

- Mental resilience and work-life balance sessions
- Wellness and well-being programme
- Life coach for new hired employees
- Mental Health First Aiders programme
- Stress management lectures
- Flexible work arrangements
- Occasional leave opportunities to cope with various personal situations, special health insurance

Safety standards

Over the years, Vesuvius has developed a set of 34 Safety Policies and Standards. These are regularly reviewed and updated, based on the best practices implemented in sites and learnings from incidents. The Group Safety Audit checklist is designed to cover the essential points of the Group Safety Policies and Standards.

The list of Standards can be found in Further information on page 135.

Risk assessments and high-risk activities

We routinely carry out risk assessments to identify and rate hazards and implement protective measures to minimise exposure.

These include:

- Engineering solutions to eliminate or minimise risks
- Procedural measures, such as training and auditing
- Work instructions, written with the involvement of the employees who carry out the tasks, with illustrations and in local languages
- Providing personal protective equipment to employees free of charge

Emergency preparedness

Using risk assessments as a basis to identify and rate possible risks, our manufacturing sites build procedures, covering a variety of incidents (injury, fire, weather events, earthquake etc.) and train teams to respond optimally in case of emergency. Emergency procedures are routinely tested via drills and exercises, sometimes organised jointly with the local fire departments.

Almost 1,300 Vesuvius employees are trained first aiders (to address injuries and health issues) and more than 2,300 are first responders (in case of fire, chemical spill, confined space rescue, foreseeable emergency scenarios).

Health, safety and well-being at work

Control of contractors

Contractor management is a particularly important area of attention, as it involves employees of third-party companies working on our premises to perform various types of project work. Vesuvius has defined strict rules which are outlined in the Control of Contractors Standard. These rules include operating guidelines such as a pre-screening for safety performance and risks before a contract is signed, a commitment to respecting the same safety standards as Vesuvius employees and a safety induction for all contractor employees on Vesuvius sites. The presence of all contractors on site is registered. All activities subject to a Permit to Work are audited on a daily basis.

Safety performance targets for contractors are set at the same level as for Vesuvius employees. Contractor safety management and performance is monitored and reported with employee safety performance.

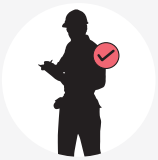
Eight Core Safety Rules

1. I always wear mandated personal protective equipment

2. I only operate equipment or vehicles if trained and authorised

3. I do not remove, bypass or tamper with machine guarding and safety devices

4. I lock, tag and try before any intervention on a machine



5. I make sure all high-risk activities are covered by a daily Permit to Work

6. I always ensure my fall protection is secure before working at height

7. Before entering a confined space, I check that I will be able to breathe and escape

8. I only perform electrical work if certified and authorised

Core Safety Rules

In 2019, we launched the Vesuvius eight Core Safety Rules that outline our employees' basic safety responsibilities. These were rolled out across the organisation as the mandated practices for employee and manager conduct. In conjunction with this, the Group has implemented procedures to ensure the rules are followed. The rules were incorporated into the contractual terms of all relevant employees, and all employees are expected to report breaches and violations of the rules, with appropriate sanctions imposed whenever required. Failure to do so is a disciplinary issue.

Customer locations

In line with our safety priority, we have spent decades improving systems, processes and technology at our sites to protect our people at work. We also apply the same safety standards for our teams working at customer locations.

Our Customer Location standard addresses the specific risks faced by our employees whilst operating in customer locations and applies to approximately 3,100 Vesuvius employees worldwide. The standard focuses on structuring cooperation between our customers' management teams and our own to ensure health and safety issues are jointly identified and addressed.

Health, safety and well-being at work

For new contracts in customer locations, we use a formal risk assessment which aims to identify significant risks to our employees and contractors. This enables appropriate control measures to be agreed and implemented with the support of our customers in advance of work commencing. These are then formally included in the contractual conditions we impose when working at a customer site.

Process Safety initiative

In 2020, Vesuvius launched a new Process Safety initiative, starting with an analysis of the high-risk processes in the Company, the elaboration of a global process safety framework and a first technical standard covering high-pressure isostatic presses.

In 2021, whilst this standard was being rolled out, we developed our second process safety standard, covering dust and explosive powders, whose deployment was initiated in 2022 and continued throughout 2023.

Housekeeping

The continuing use of 5S, the workplace organisation method, throughout the Group has driven significant improvements in our workplace environment. Employees are encouraged to develop ownership of their working areas and take pride in their cleanliness and organisation. The added support of our lean specialists has been key to improving plant safety by removing hazards for employees and offering a clean, bright and safe working environment. Regular 5S audits led by team leaders ensure continuous improvement of working conditions and promote a safer workplace.

Occupational health

Whilst occupational health is already widely developed throughout the Group, in 2023 we developed our Occupational Health standard, which defines the group's requirements in terms of the monitoring of exposure on health. It standardises across the group the frequency of controls, thresholds and required control measures. Based on the activities of the group, priority is being given to noise, dust, and volatile organic compounds. Roll-out will begin in 2024.

Safety training

Our proprietary TurboS training is a part of the Group's Safety Breakthrough initiative, which was instigated in 2008. It pulls together all of our safety management practices and includes a strong focus on the standardisation of all of our repetitive activities. TurboS also integrates good management practices in the workplace, with a strong emphasis on developing an organisation that enables everybody to work to the same high standards in safety performance.

Using a train-the-trainer approach, TurboS training sessions are tailored to the audience and their activities. For example, there is a special training course developed for employees at customer locations that focuses on the specific risks faced by these individuals.

We regard the understanding and application of the Group Safety Standards by management and all employees as essential to ensure their proper implementation on the shop floor and ongoing adherence. We therefore expect our managers to carry out compliance self-assessments for their sites based on the Group Safety Audit checklist and invest in the training of employees on the HSE standards. In 2023, more than 9,700 Vesuvius employees (representing 72% of the total workforce) received more than 136,000 hours of training on safety standards, representing on average, more than 11.5 hours per person. In addition to training on Group Safety Standards, Business Units and sites develop and offer safety leadership programmes (TurboS) and courses addressing the specific processes and risks. Communication and training on hand safety and ergonomic practices have been major areas of recent focus.

The list of safety training programmes can be found in Further information on page 136.

11.5 hours
of safety training per person in 2023

Health, safety and well-being at work

Safety auditing

Executive Safety Tours

It is a requirement for all senior managers, irrespective of discipline, to perform Executive Safety Tours, report on their findings to local operations management and follow up on improvement requirements. In this structure, all employees understand that they have a responsibility to take care of themselves and others whilst at work. Through this process, we expect everyone to participate positively in the task of preserving workplace health and safety. The tours encourage dialogue with staff, setting action points for discussion and implementation. In this way, these tours provide visible safety leadership on the shop floor in our sites and at our customer locations. Along with our daily safety audits, they are a central pillar of our Safety Breakthrough initiative.

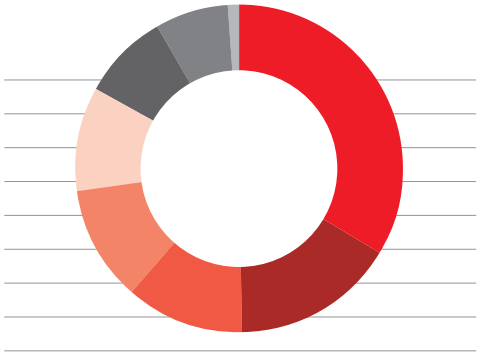
195

Executive Safety Tours carried out by senior management (Group Executive Committee and their direct reports)

2023 Executive Safety Tours

- Europe: 66
- NAFTA: 31
- China: 23
- South America: 22
- India: 20
- North Asia: 17
- Australia & New Zealand: 14
- Southeast Asia: 2

Total: 195



In 2023, 195 Executive Safety Tours were carried out by members of the Group Executive Committee and their direct reports. (2022:190). In 2023, seven Executive Safety Tours were conducted at customer locations (2022:14).

The number of Safety Tours conducted by middle management increased significantly in 2023 to 1,201, of which 252 were in customer locations, (2022: 581, of which 90 were in customer locations), assisted by the introduction of a mobile app to enhance the process and a Company-wide training programme.

Group safety audits

The Group operates a central safety auditing team of three auditors, each with more than ten years' experience, who report to the VP Sustainability. The team's main purpose is to verify the deployment and ongoing application of the Group's standards and policies in our locations, including our manufacturing sites, R&D facilities and the customer locations in which a significant number of our employees operate daily. Each audit also includes an assessment of the site's HSE leadership. During 2023, the team conducted 66 audits (2022: 65).

Following each audit, action plans are created by the site management teams to address any issues identified and work on completing these is assessed on a regular basis. The observations made during audits are used to improve the Group's training programmes and to enhance the Group's health and safety standards. The results of the Group HSE audits, as well as the progress of action plans addressing the most critical issues, are reported to the Board twice a year.

Sites are also encouraged to carry out self-assessments, based on the Group safety audit compliance checklist, to monitor their progress.

Safety audits and improvement opportunities

In 2023, 83% (2022: 82%) of our working population performed routine safety audits every month. This generated an average of nine (2022: nine) implemented safety improvement opportunities per person, resulting in an improvement in worker safety. Actual Safety improvement opportunity permanent action (SIOPA) resulting in an improvement in worker safety count in 2023: 128,235 (2022: 113,840).

The audit programme involves employees at all levels – from the Group Executive Committee and safety specialists, through to local site management, employees and directly supervised contractors.

For additional details on our safety performance, see Further information P137–138

Health, safety and well-being at work

Return to our Zero-accident company priority

Our safety targets

Our long-term objective is to become a zero-accident company. This ambition applies to all employees (permanent and temporary), contractors and visitors.

The Group's 2023 LTIFR target was set at <1 per million hours worked. Having outperformed our target in 2023, we have set ourselves a stretch goal of 0.5 by the end of 2025. These targets cover 100% of operations and include employees, contractors, and visitors (and are the same for all categories).

2023 safety performance

Our LTIFR of 0.6 per million hours worked in 2023 was significantly lower than 2022 (1.08), but we recognise that there is more work left to do. The LTIFR for not directly supervised contractors and visitors was 1.6 in 2023 (2022: 1.02), and this remains an area of focus for our efforts.

Fatalities and severe injuries

There were no work-related fatalities in 2023, but sadly one of our colleagues was killed in a road traffic accident whilst commuting. Vesuvius provided support to his family.

During 2023, there were a number of severe injuries, including an external contractor who fell from a height resulting in leg and jaw fractures, two incidents involving finger amputations and two incidents involving a few days' hospitalisation.

We are actively taking steps to learn from these severe injuries and to improve our systems and procedures to prevent any similar occurrences.

Lost time and medically treated injuries

Vesuvius operates a robust and comprehensive process for the timely reporting of incidents. In our internal standards, contractors who are not directly supervised are included, and we use more stringent definitions for LTIs and 'severe accidents' than the definitions used by many regulatory bodies. All sites are required to report on all Recordable Injuries (aligned with the OSHA definition), to maintain the focus on safety. As an illustration of the precautionary preventative approach taken by Vesuvius in accident investigation, all LTIs and Recordables require a full 8D report.

2023 safety performance

Performance indicators	Employees and directly supervised contractors 2023	Not directly supervised contractors and visitors 2023	All employees, not directly supervised contractors and visitors 2023
Work-related deaths	0	0	0
Severe injuries	3	2	5
Lost Time Injuries (LTIs)	15	2	17
LTI Frequency Rate (LTIFR) per million hours	0.6	1.6	0.6
Total Recordable Injuries (TRIs)	91	4	95
Total Recordable Frequency Rate (TRFR) per million hours	3.4	3.2	3.4
Safety audits (number)	135,805	0	135,805
Safety audits per 20 employees per month	17	0	17

In 2023, 17 LTIs were reported (2022: 30) which resulted in 1,512 lost days (2022: 1,673) giving the LTI frequency rate for the year of 0.6 (2022: 1.08) per million hours, and a severity frequency rate of 54 days lost per million hours (2022: 60). In 2023, 95 Recordable injuries were reported (2022: 113), resulting in a Total Recordable Injury frequency rate of 3.4 (2022: 4.0) per million hours. In 2023, 158 Medically Treated Injuries (MTIs) were reported (2022: 184) out of a total of 412 injuries reported (2022: 513), resulting in an MTI frequency rate of 5.6, (2022: 6.6) per million hours. Vesuvius includes not directly supervised contractors and visitors in reporting (2023: 696, 2022: 535).

Whilst 2020–2022 were unusual years because of the COVID-19 pandemic and associated changes in working, we believe that the long-term improvements, including the significant improvement in 2023 in the LTI frequency rate, reflect a broader trend of underlying improvement for the Group and result from a strong management commitment to change. Shifting the focus to the globally recognised OSHA Recordables for medically treated injuries supports the continued downward pressure on frequency rates.

For additional details on our safety performance, see Further information P137–138

Health, safety and well-being at work

Return to our Zero-accident company priority

Main types of work-related injury

In 2023, the main causes of work-related injuries were, in descending order of frequency:

- Injured whilst handling, lifting, or carrying
- Struck by moving, including flying/falling, object
- Slips, trips or falls on same level
- Strike against something fixed or stationary

The main injuries suffered were, in descending order of frequency:

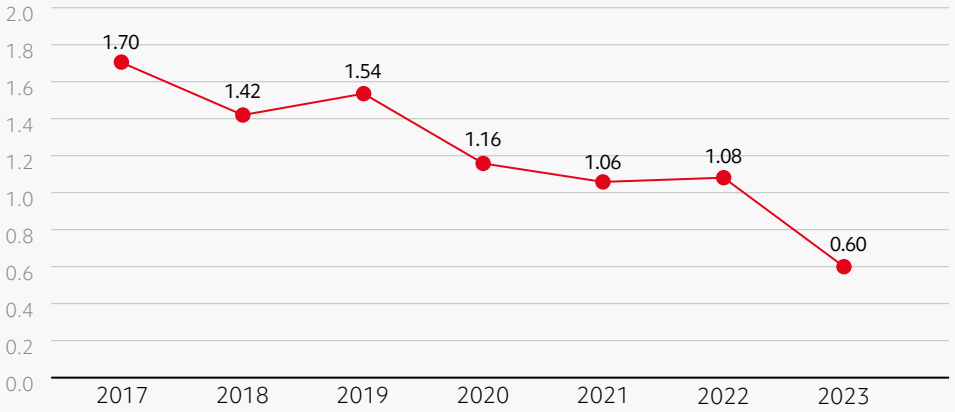
- Contusion
- Bruise or wound where skin is not broken
- Laceration, cut or open wound
- Sprains and strains
- Superficial injuries
- Fractures

The main body parts affected were, in descending order of frequency:

- Hands and fingers
- Upper limbs
- Feet and backs

Based on this incident data, targeted campaigns are being launched by the Business Units.

Lost time injuries per million hours worked



Dangerous Occurrences

Vesuvius Dangerous Occurrences include all non-lost time and non-medically treated injury incidents and incidents with and without actual damage whether work-related or not. Since 2021, there has been renewed emphasis on the reporting of Dangerous Occurrences and injuries so that root cause analysis can be undertaken, and preventative action plans implemented to prevent future occurrences. Consequently, there was an increase in the number of Dangerous Occurrences reported in 2023 to 2,925 (2022: 2,545; 2021: 1200, 2020: 779; 2019: 734).

Out of the Dangerous Occurrences occurring in 2023, the more serious 6% (2022: 10%; 2021: 26%, 2020: 27%; 2019: 35%) that could have resulted in a severe accident also required a full 8D report, the remainder being dealt with via line PPS (Practical Problem Solving).

0.6

Lost Time Injuries per million hours worked

Looking forward

We are determined to continue our journey to zero accidents. Learning from past incidents, we will strive to reduce the number and severity of injuries by focusing on two pillars:

People development and behaviours

- Training and auditing
- Core Safety Rules
- Safety days

Equipment and activities

- Lifting and handling
- Machine guarding
- Process safety

ISO 45001: 2018 certification

We have six manufacturing sites (representing 11% of our manufacturing sites), one warehouse and four Vesuvius operations located at a customer site, certified to ISO 45001: 2018, covering 8.5% of Vesuvius' employees. Vesuvius sites choose to certify based on local regulatory and customer requirements. A current list of certified sites is available elsewhere on the website.

Health, safety and well-being at work

Safety awards and recognition

In addition to our efforts to keep our employees and contractors safe, we take pride in sharing our safety management practices with our customers. We are very proud of the external recognition received by our teams for their safety leadership and achievements. Some of the awards received in 2023 included:

World Refractories Association (WRA) Safety Recognition Awards 2023

Five years – no LTIs

85 Vesuvius sites and customer locations have been awarded certificates of recognition from the World Refractories Association for achieving five years without any LTIs. Furthermore, the Bhilai customer location was awarded the gold award, and the Kolkata Plant received a silver award, for the best safety improvement success stories.

Czech Safe Enterprise award

Eighth safety award

Our Trinec team was honoured with its eighth award as a Safe Enterprise by the Ministry of Labour of the Czech Republic for demonstrating the safety of their working environment.

Pledge award for the safety innovation

The Vesuvius team based at British Steel Scunthorpe received a safety award for the Open Category at the 2023 British Ceramic Confederation Health & Safety Pledge Conference. The award was for 'Teamwork to Develop a Tundish Access and Egress System'.

Gold Award for Safety Improvement Project

Our colleagues from Pune, India won the Gold Award for their project on 'Kettle Pulling Mechanism'. The contest was organised by the Quality Circle Forum of India during the National Safety Week.

Safe Supplier Award

Our teams in three customer locations and one manufacturing site in South America were recognised by our customers for the excellence of their safety management.

Vesuvius Safety Awards

14 districts granted Safety Awards for their 2023 performance

Vesuvius has also created internal Safety Awards, to recognise its best performing locations. In 2023, 14 of the 44 districts were awarded Safety Awards as recognition of their outstanding safety performance in the year. These regions each completed 2023 without any LTIs, recorded a participation of more than 80% of employees in monthly Safety Audits and implemented more than ten improvement opportunities per person per year.

People and culture

Our People and Culture strategy aims to build an outstanding business by ensuring we have the individuals, skills and capabilities critical to the delivery of our strategy.

It focuses on delivering value for our businesses, a positive employee experience and functional excellence, through our culture of diversity and innovation. Our long-, mid- and short-term plans are organised around two key areas:

- **Building an outstanding business**: with the critical skills and capabilities to win
- **Developing outstanding people**: in diverse, engaged, and high-performing teams

The underlying foundation for our People and Culture strategy is our strong culture of delivering results in a diverse, entrepreneurial, decentralised organisation, where everyone is empowered to take action, working with like-minded people in a non-matrix environment.

Vesuvius is for ambitious, self-motivated people who thrive on challenges and solving problems. It is for people who are never satisfied, always raise the bar and dare to make difficult decisions and win.

Our strength comes from our CORE Values: Courage, Ownership, Respect and Energy. These Values guide and inspire us, shaping our behaviours and decisions.

Our principles and approach

Vesuvius is a geographically and culturally diverse group, employing more than 11,000 people of more than 70 nationalities in 40 countries.

Our geographical diversity places us close to our customers around the globe. It also highlights the importance of maintaining and applying strong and consistent values and ethical principles in our worldwide approach to business.

Our employees' engagement with our values and culture is vital to our success and the sustainable delivery of the Group's strategy. We communicate openly and transparently within the organisation, through 'town hall' meetings, Board and senior management visits, management feedback, performance evaluation, measuring employee engagement and responding to the feedback we receive. Critically, there is ongoing and consistent communication of our CORE Values and the principles of our Code of Conduct. This is underpinned by engaging staff across the Group in both general and targeted training, to ensure a consistent understanding of our policies and procedures.

People and culture

We seek to foster a working environment that is inclusive and diverse, where people can be themselves without fear of harassment, bullying or discrimination.

We aim to maintain the highest level of knowledge and understanding of all our stakeholders. We do this through internal and external reporting, and transparent and meaningful disclosure. Our Sustainability Report is a key part of this.

Our CORE Values

The Group's CORE Values actively support the Group's priorities, encouraging consistent behaviours across the Group to sustain our business success in the future.

These Values, and the behaviours underpinning them, convey the mindset and attitudes we expect each employee to show every day. They are at the heart of the culture of the Group, promoting our image to external stakeholders, and underpinning the commercial promise we provide to our customers.

The Values are reinforced through our performance management systems and are celebrated each year through our Living the Values Awards (LTVA) which select regional and global winners for each Value.

In December 2023, the 2023 LTVA Winners were selected by the Senior Leadership Group, in a special online event broadcast to all employees. The Chief Executive, Patrick André, paid tribute to all the finalists, noting that they each provided a remarkable example of what can be achieved by being true to the CORE Values.

In September 2023, on the fifth anniversary of their first introduction, the CORE Values were one of the key themes of our Global Leadership Conference 'SPARK' in Rome. The 150 senior leaders in our organisation discussed the meaning and the impact of each value on their teams and themselves, with a strong emphasis on the specific behaviours.

In 2023 the Global Living The Values Awards went to:

Global Living The Values Awards winner:

Courage

Vivi Wang
Controller, China

Vivi was nominated for showing courage in collecting a substantial and long overdue payment from a customer.

Global Living The Values Awards winner:

Ownership

Sujay Chakraborty
Engineering Manager, India

Sujay led a project team to restart production at the Kolkata site after a cyber incident.

Global Living The Values Awards winner:

Respect

Agnieszka Koszek
HR director, Poland

Agnieszka was nominated for her respectful approach to her colleagues in everything she does, particularly in ensuring everyone has a voice in decision-making at meetings.

Global Living The Values Awards winner:

Energy

Crystallin Oeianto Huang Shili
Sales Engineer, Malaysia

Crystallin's energy and commitment helped our important customer to achieve outstanding outcomes and success.

People and culture

Vesuvius' Values

Courage

- I systematically say, decide and do what is right for Vesuvius including when it is difficult, unpopular, or not consensual
- I express my opinions openly during discussions, but I also defend Group decisions once they've been taken, even if they do not correspond to my initial position
- I proactively take leadership responsibility on difficult projects and topics that are important to the Group's performance, motivated by the perspective of success rather than paralysed by the risk of personal failure

Respect

- I demonstrate respect for other people's ideas and opinions even if I disagree with them
- I welcome open debate. I listen to others, and foster esteem and fairness with customers, suppliers, co-workers, shareholders and the communities where we operate
- I communicate my objectives clearly and take time to explain all decisions. I behave with the highest level of integrity. I promote diversity at all levels of the Company

Ownership

- I am personally accountable for the consequences of my actions and for the performance of the Group in my area of responsibility or oversight, without blaming external circumstances or the actions of others
- I demonstrate an entrepreneurial spirit, looking for and seizing business opportunities and I immediately address problems that come up as soon as I become aware of them
- I manage the Group's money and resources as though they were my own

Energy

- I work hard and professionally in pursuit of excellence
- I constantly raise the bar and challenge the status quo. For me, the sky is the limit
- I lead by example, inspiring and motivating my team to go the extra mile. I promote a positive and energising work environment
- I continuously deliver outstanding customer experience and innovative solutions
- I never underestimate competitors and permanently strive to reinforce the Group's leadership position

People and culture

Code of Conduct

Our Code of Conduct sets out the standards of conduct expected, without exception, of everyone who works for Vesuvius in any of our worldwide operations.

The Code of Conduct emphasises our commitment to ethics and compliance with the law, and covers every aspect of our approach to business, from the way that we engage with customers, employees, the markets and other stakeholders, to the safety of our employees and workplaces.

Everyone within Vesuvius is individually accountable for upholding its requirements. We recognise that lasting business success is measured not only in our financial performance, but in the way we deal with our customers, business associates, suppliers, employees, investors and local communities.

The Code of Conduct is displayed prominently at all our sites and is published in our 29 major functional languages. It is available to view at: www.vesuvius.com.

We continue to enhance the policies that underpin the principles set out in the Code of Conduct. These assist employees to comply with our ethical standards and the legal requirements of the jurisdictions in which we conduct our business. They also give practical guidance on how this can be achieved.

The Code of Conduct covers eight key areas:

Eight key areas

1. Health, safety and the environment
2. Trading, customers, products and services
3. Anti-bribery and corruption
4. Employees and human rights
5. Disclosure and investors
6. Government, society and local communities
7. Conflict of interests
8. Competitors

Headcount reporting

Vesuvius activity is not seasonal, so the year-end headcount figures included in this report are representative of the average headcount throughout the year.

In 2023 we have changed the scope of our reporting of total headcount, to align with the ESRS requirements. We are now including directly supervised contractors in customer locations.

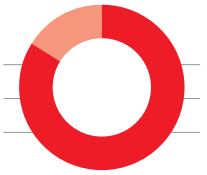
Evolution of Vesuvius employees and directly supervised contractors – impact of change of reporting method

	2023	2022	2021
Vesuvius employees	**11,376**	10,837	10,657
Directly supervised contractors – former perimeter	**208**	297	419
Directly supervised contractors – expanded perimeter	**1,927**	2,034	1,520
Directly supervised contractors – total	**2,135**	2,331	1,939
Vesuvius employees and directly supervised contractors (restated, new reporting method)	**13,511**	13,168	12,596

In addition to the headcount figures above, Vesuvius used the services of 134 contractors and consultants in 2021, 222 in 2022 and 166 in 2023 to work on specific short-term projects.

Distribution of Vesuvius employees by category

	2023	2023 (%)
Vesuvius employees	**11,376**	**84%**
Directly supervised contractors	**2,135**	**16%**



People and culture

A flexible workforce

Our activity level can fluctuate based on customer demand. A variety of measures have been implemented to ensure our workforce is equally flexible. These include the employment of agency workers, overtime and flexitime agreements and suspended employment.

A significant proportion of our headcount is employed in customer locations. The length of their employment with Vesuvius is dependent on the continuation or renewal of contracts, or on the market share allocated to Vesuvius by customers. In many countries, we employ workers via professional agencies. Whenever business is transferred by a customer from one supplier to another, this employment via agencies rather than direct employment provides workers with employment continuity, as it permits them to continue working for the customer whilst their services are transferred from one supplier to another.

Employee engagement

Vesuvius recognises that companies with highly engaged employees deliver better business outcomes. They have lower absenteeism, lower employee turnover, fewer safety incidents, better product quality, and higher productivity, sales and profitability. At Vesuvius, we regard engagement as critical to our ongoing success and we work hard to listen to our people and act when issues impacting engagement are identified.

Employee engagement action plans

Engagement is a collective responsibility, particularly amongst our management community. We conduct an annual employee engagement survey, I-Engage, in partnership with Mercer, to measure our employees' attitudes to Vesuvius and their work. The survey generates reports of team responses to the survey. Managers then share the results openly with their teams and, working together, develop action plans to address issues.

In 2023, thanks to a tremendous effort by local management, supported by an effective communication campaign, we maintained a very high participation level with 92% of all Vesuvius employees responding to 34 questions.

Our engagement levels remained broadly stable compared with 2022. Positive perceptions on safety continue to be a core strength, together with our overall employee experience, and understanding of our Company purpose and strategy, and of our approach to sustainability.

Whilst the results in key areas were flat or up slightly, managers across the Group will be engaging in conversations to discuss what can be done to further improve.

2023 distribution of Vesuvius employees – full-time versus part- time

	Full-time employees	Full-time employees (%)	Part-time employees	Part-time employees (%)	Vesuvius employees total	Vesuvius employees total (%)
Permanent salaried	4,642	41%	53	<1%	4,695	41%
Permanent hourly	6,290	55%	16	<1%	6,306	55%
Total permanent	**10,932**	**96%**	**69**	**1%**	**11,001**	**97%**
Temporary salaried	43	<1%	2	<1%	45	0%
Temporary hourly	327	3%	3	<1%	330	3%
Total temporary	**370**	**3%**	**5**	**0%**	**375**	**3%**
Vesuvius employees	**11,302**	**99%**	**74**	**1%**	**11,376**	**100%**

Permanent Vesuvius employee turnover per region

	2023 turnover (%)	2023 voluntary turnover (%)	2022 turnover (%)	2022 voluntary turnover (%)	2021 turnover (%)	2021 voluntary turnover (%)	2020 turnover (%)	2020 voluntary turnover (%)
Americas	**24%**	**23%**	20%	10%	20%	10%	18%	6%
Asia-Pacific	**13%**	**13%**	11%	9%	26%	14%	12%	10%
EMEA	**10%**	**9%**	11%	7%	12%	9%	14%	6%
Total	**15%**	**15%**	**14%**	**9%**	**16%**	**11%**	**14%**	**7%**

People and culture

Internal communications

We continue to develop our internal communications programme to ensure we have a strong mix of channels to reach our diverse population. The Chief Executive regularly addresses the whole Group via Company-wide email and video, delivering strategic messages, and in 2023 held 13 interactive virtual sessions with the Senior Leadership Group to share business updates. Company news and announcements are regularly shared on the Group intranet and employee news app, whilst screen savers are used to support major communication campaigns. We also utilise posters and site 'town hall' meetings for on-site communications.

The Company Senior Leaders Conference, 'SPARK', was held in Rome in September, with 150 delegates discussing Company strategy, our CORE Values, digital transformation and sustainability. Whenever possible, face-to-face communication is conducted at different levels of the organisation, providing the necessary opportunities for interactive Q&A sessions with business leaders.

Working conditions

Our organisation remains dedicated to ensuring that our workplaces are not only productive but also conducive to the well-being of our employees. In addition to respecting local labour legislation, we have introduced numerous family-friendly programmes, flexible working arrangements and healthcare programmes.

At Vesuvius, we recognise the importance of supporting our employees in their various life stages; examples of some specific programmes include parental leave, bonus allowance for childbirth, children's education monetary support, long-term service award, childcare support, and flexible scheduling options to empower their professional and personal responsibilities seamlessly.

The health and well-being of our employees are paramount. In this regard, we have implemented a comprehensive healthcare programme beyond traditional benefits. This includes employee annual health check-ups including family, employee assistance programmes, medical mental health counselling, additional support including coverage of private medical healthcare, webinars and awareness sessions, to name a few.

From preventative care initiatives to mental health support, our commitment is to foster a culture of well-being in every aspect of our employees' lives.

People and culture

Employee consultation and industrial relations

Vesuvius supports freedom of association and the right to collective bargaining. In all of the countries in which we operate, the Group informs and consults local works councils and trade unions on matters concerning the Vesuvius business as required. These processes and procedures are regulated by local law and generate constructive dialogue between employee representatives and management, which provides benefits to our business. In 2023, 77% of permanent employees were represented by Collective Agreements that include working conditions such as local works councils, trade unions or other bodies.

In addition to local employee representation, the Group operates a European Works Council (EWC) with elected representatives from each of the EU countries in which Vesuvius has employees. Following the UK's departure from the EU, the previous EWC Agreement was terminated and on completion of the negotiation of a new EWC Agreement, the elected representatives met and constituted the EWC in November 2023.

Talent attraction and development

Talent management

The Group Executive Committee holds direct responsibility for the roles and development of our senior leaders, jointly reviewing capability needs and deciding on succession and cross-organisational moves for the leadership group. This illustrates the strong commitment at the highest level of our organisation to growing the Group using its Company-wide resources.

We employ individuals with an entrepreneurial mindset and an international outlook. Whether they are recent graduates or seasoned professionals, everybody who wants to leave their mark in a dynamic, rapidly developing business environment has a chance to succeed. Special attention is paid to building strong, diverse teams that bring different backgrounds and experiences to our daily work.

Leadership pipeline

Strengthening the leadership pipeline and facilitating people development throughout the organisation remain key areas of focus for Vesuvius. We continue to work hard to ensure that we have the right capability in every part of the organisation to drive our strategy and realise market opportunities. As a result, we have built high-calibre leadership teams, many of whom are relatively new to their roles and to Vesuvius. We empower our people to drive the business with an entrepreneurial spirit, and to develop a performance-oriented culture.

We aim to adopt a balance between external hires and internal promotions, fuelled by a strong process of backup and succession planning, especially for management positions.

77%

of employees represented by Collective Agreements

People and culture

Training and development

Our leaders take responsibility for managing and developing their teams.

They are provided with access to a central resource, offering expertise in global rewards and mobility, talent and performance management, and culture and learning, and supported by Group-wide processes and information systems. We encourage and reward high performance, foster talent and aim to create an environment where all can realise their individual potential. To meet the demands of the business and add rigour to our employee value proposition, we have launched training programmes to assist our employees to develop their skills and progress their careers.

Our Learning Management System (LMS) provides a global hub for Vesuvius online training courses. Mandatory training courses are automatically assigned to new joiners and completion statistics are easily reportable. Targeted training courses can also be allocated to employees in specific roles, e.g. modern slavery training for specific people in purchasing.

Compliance, data protection and cyber security training are all accessible via the LMS. In 2023, we continued to expand the available courses held on the LMS.

During the course of our activities, we may collect, store and process personal data about our staff, customers, suppliers and other third parties and our Data Protection Policy recognises our commitment to treating this data in an appropriate and compliant manner. Specific data protection training through e-learning is a mandatory training course for all employees with email access.

Mentoring programme

In 2023, Vesuvius continued its mentoring programme focused on leadership and talent development. There are currently 45 mentees taking part in the 12-month programme, of which 24 are women.

Mentees learn from the experience and perspectives of a more senior person in Vesuvius, creating an individual personal development plan to enhance their careers and leadership capabilities. The programme ensures internal knowledge transfer and builds a broader, deeper and more ready talent pool.

In 2023, personal development plans were in place for most salaried permanent employees.

Technical training

HeaTt training is aimed at the continuous technical development of Vesuvius employees. Courses range from entry to expert levels and are continuously updated to keep pace with developing technology and delivery methods, thereby guaranteeing that Vesuvius experts are at the forefront of technical innovation. They are a great way for our hugely experienced technical experts to pass on their knowledge to the next generation and ensure the sustainability of our know-how. The first introductory module is mandatory for all new employees and is available on the LMS, allowing participants to access learning at anytime, anywhere.

HeaTt Module 2, Iron & Steel, was launched on the LMS in October 2022, comprising 23 chapters of training material. The course is divided into three sections; the first explains the process of producing iron and steel, the second explains the different refractory products and the third section details how these products are applied in the iron and steel manufacturing processes. Module 2 encompasses products from Advanced Refractories, Flow Control, and Sensors & Probes.

This module is open to every employee and was recommended for employees from the Steel Division. In 2023, 46 people went through the whole three sections of this Module 2.

There are several online HeaTt M3 modules for Flow Control. They are organised by product line and are much more technical. Customer-facing and Marketing and Technologies employees are enrolled based on their technical needs. In 2023, people who completed the modules that were assigned to them spent over 3,845 hours in M3 training.

People and culture

Commercial Excellence programme

We have undertaken the ambitious task of upskilling all sales representatives in the Steel Division through a comprehensive six-month blended training programme known as ComPro2.0. The primary objective of this programme is to elevate sales effectiveness by focusing on value selling methodologies. By equipping our salesforce with advanced techniques and strategies, we aim to generate better top-line results for our business, better partnerships with existing clients and increase new client relationships, thus improving our market share. Additionally, this initiative aims to empower our sales teams with the knowledge and skills necessary to navigate and excel in competitive market landscapes.

4,381

employees, representing 100% of the targeted staff of the total full- and part-time Vesuvius employees, completed the 2023 anti-bribery and corruption training

Furthermore, the Commercial Excellence project includes enhancements to the HeaTt product training platform. This enhancement initiative involves improving the availability of online training resources and upgrading digital learning tools for sales, marketing, technical staff, and support function employees, and improving our live workshops where trouble shooting and addressing clients' challenges will enhance our employees' ability to differentiate our services from those of our competitors.

By enhancing the accessibility and functionality of our digital learning ecosystem, we foster a culture of innovation and excellence across all facets of our organisation.

Overall, the Commercial Excellence project represents a concerted effort to equip our client facing employees with the necessary skills, knowledge, and tools to drive sustainable growth, enhance market competitiveness, and achieve our strategic objectives. Through these initiatives, we are poised to capitalise on emerging opportunities, overcome challenges and deliver exceptional value to our customers and stakeholders.

Compliance training

During the year, we continued to embed our training portfolio. This is based on the principles contained in the Vesuvius Code of Conduct and associated anti-bribery, corruption and other compliance policies and procedures. Compliance training gives our employees a clearer understanding of the scope of risks that exist as we conduct our business and gives context to how the Group expects each employee to respond to those risks.

Compliance training provided in 2023 included:

- An annual mandatory e-learning module for anti-bribery and corruption, available in 22 of our functional languages for targeted staff, which is linked to the Vesuvius AB&C policy
- Webinar and face-to-face training provided by the Compliance team to staff at several sites covering anti-bribery and corruption, the Speak Up Policy and trade sanctions
- Updated face-to-face training made available for senior management on the overall compliance framework and process for policy and procedure implementation and monitoring
- New senior manager compliance induction training – new senior leaders receive dedicated training from the Compliance team. This induction contains training and guidance on all relevant Compliance policies and procedures, and further explains to participants their role in effective risk management

The Board has set a target of at least 90% of targeted staff completing the annual anti-bribery and corruption training. 4,381 employees, representing 100% of the targeted staff of the total full- and part-time Vesuvius employees, completed the 2023 anti-bribery and corruption training.

Mandatory online training courses – 2023 participation	% of targeted audience completing course
Anti-Bribery and Corruption (annual)	100
Gifts, Hospitality and Entertainment (onboarding)	83
Modern Slavery	83
Anti-Tax Evasion	79
Data Protection	81
Cyber Security Awareness – 7 Basic Modules	88
Total training hours	**20,023**

People and culture

Global reward

Reward and recognition are integral components of our employee value proposition, enabling us to attract, engage and retain key talent and highly qualified employees.

Our systems and processes are designed to create a market-competitive and rewarding environment for all our employees and to reinforce the vision, strategy and expectations set by the Board.

We seek to create a culture that champions performance, building a strong link between individual performance and pay. Supported by our online people management platform, 'myVesuvius', annual performance reviews and subsequent reward decisions are based not only on how employees have performed against their individual objectives but also on assessments of behaviour and commitment to our CORE Values.

Our global job grading framework, based on a structured, market-leading evaluation methodology, enables us to compare roles and ensure internal consistency throughout the organisation.

We are committed to creating reward and performance management systems which are transparent and objective, where employees receive equal pay for work of equal value, regardless of their age, race, disability, sexual orientation, gender, marital, civil partnership or parental status, religion, or beliefs. Our management Annual Incentive Plan (AIP) is measured against both Vesuvius' financial targets and personal performance, an incentive structure consistent with that of our Executive Directors. The Vesuvius Share Plan for Executive Directors and Group Executive Committee members encourages robust decision-making based on long-term goals rather than short-term gains and works to align the interests of participants with those of shareholders.

99%

of Vesuvius' permanent salaried employees undertook an annual performance review

In 2023, 99% of our salaried permanent employees undertook an annual performance review with their line manager. This compared with 98% in 2022, 93% in 2021, 95% in 2020 and 92% in 2019.

Our managers and senior employees participate in the global AIP. Eligibility for participation is based on job grade and role in the organisation. Managers are rewarded for company performance (80%) and personal performance (20%). In addition, 60% of these employees participate in a share-based incentive plan.

More than half of Vesuvius' permanent employees worldwide, both salaried and hourly, have a variable performance-based component to their pay through various local incentive schemes.

Non-compensation benefits including retirement benefits are managed locally in accordance with local laws.

People and culture

Global mobility

Vesuvius operates worldwide. We believe that our companies should be managed and staffed by local personnel. However, we also provide selected groups of employees with a range of international assignments. These assignments are usually for a limited period, most often three years.

International assignees do not come from one or two countries alone. We have a truly international mix of nationalities in our mobile population. Individuals move not only within a region, but also between regions. Our mobility programme shows that our assignee population is as diverse as our Group.

Vesuvius operates international assignment policies which support the varying nature and circumstances of these assignments – whether they be short-term, longer-term or require extended commuting. In addition, we do actively support, where appropriate, localisation of employees upon international assignment and provide comprehensive support to aid integration, settlement and localisation in the new environment. These policies are supplemented with clearly identified benefits, delivering support appropriate to the nature of the assignment. We manage international assignments with flexibility, catering to changing expectations and demands from employees, whilst meeting the needs of the business at the same time.

Key rationale behind international assignments

Vesuvius considers individuals for international assignment for three primary reasons:

- Providing Vesuvius companies with skills that are not locally available and that are required at short notice. This typically occurs in countries where we are establishing or developing our presence. The number of assignees working on this basis diminishes over time as the organisation matures and we recruit, train and develop local talent to step into management positions
- Career development. We believe that the personal development plan of any employee being developed for a senior management or senior expert position should include a posting outside their home country. This encourages them to develop the skills necessary to function successfully in an international environment. These postings are tailored to the needs of the organisation and the needs of the individual
- Enhancing diversity. Management teams benefit from having a mix of gender and cultures. In specific cases, we use international assignments to support this goal

Talent and know-how retention

Excessive staff turnover and loss of know-how represents a possible risk to the business. Actions have been implemented across the Company to identify and mitigate this specific risk. Most notably, all entities routinely monitor their turnover to detect any issues and exit interviews are conducted to understand the reasons that people leave our company. In addition to the specific actions defined locally, Company-wide processes help identify and mitigate risks of excessive staff turnover. As part of the annual people review process, all key personnel are assessed for career development opportunities, risk of resignation, succession planning and backup. Individual development plans are discussed and developed so the company can enjoy a healthy pipeline of talent.

People and culture

Diversity and inclusion

As an organisation, Vesuvius has a global, operational and customer base, which we wish to reflect inside our organisation with a multicultural, diverse community of excellent professionals from all backgrounds. This starts by focusing on broad diversity of gender and nationality, with an aim to ensure that all employees and job applicants are given equal opportunity and that our organisation is representative of all sections of society where we operate. Vesuvius operates in 40 countries around the world, employing people with more than 70 nationalities, making us a truly diverse business.

We regard this diversity as a critical aspect of our success and future growth, as it allows us to access the widest range of skills and experience. Each employee is respected and valued, and as a result they are all able to give their best.

All employees are given help, training and encouragement to develop their full potential and utilise their unique talents.

Overall responsibility for implementing the Group's Diversity and Equality Policy rests with the Executive Directors. The Nomination Committee monitors progress with meeting its objectives. At the end of 2023, the Senior Leadership Group (comprising c.150 senior managers) consisted of 24 nationalities located in 23 countries. 15% of our overall workforce were women, which was stable versus 2022.

Over the past three years we have made visible progress in gender diversity. Women now represent 20% of our Senior Leadership Group, a level that we consider is still too low, but which represents a significant improvement as compared with the level of 15% in 2019. Our ambition remains to reach 25% women in this tier by the end of 2025.

The Board has noted the recommendation of the Parker Review that each FTSE 350 company should set a percentage target, by December 2023, for senior management positions that will be occupied by ethnic minority executives in December 2027. The Company currently analyses management on the basis of nationality, which indicates a great deal of diversity in the senior management group, but not ethnicity. The Board has resolved that a survey of ethnicity should be conducted, but that no ethnicity target should be set at this time.

Copies of the Board Diversity Policy and Group Policy on Diversity and Equality are available to view on the Vesuvius website: www.vesuvius.com. Further information on the Group's approach to promoting diversity can be found on page 91.

Diversity – 31 December 2023

	Female	Male	Gender not available[1]	Total	Female	Male
Board	3	6		9	33%	67%
Group Executive Committee members	2	5		7	29%	71%
Leadership roles reporting to members of the GEC	12	36		48	25%	75%
Directors of subsidiaries included in consolidation[2]	21	76		97	22%	78%
Senior managers[3]	**35**	**117**		**152**	**23%**	**77%**
Other employees	1,718	9,506		11,224	15%	85%
Vesuvius employees	**1,753**	**9,623**		**11,376**	**15%**	**85%**
Directly supervised contractors[1]	43	165	1,927	2,135		
Vesuvius employees and directly supervised contractors	**1,796**	**9,788**	**1,927**	**13,511**		

1. The Group had 1,927 directly supervised contractors who were contracted through third parties and for whom the Group does not hold detailed employment records.
2. Of the 97 employees who are directors of Group subsidiaries but not members of the GEC or direct reports of the GEC, 22% are women. This disclosure is made to comply with regulatory requirements. It includes directors of dormant companies. Some individuals hold multiple directorships.
3. Senior managers as defined for the purposes of Section 414C(8)(c) include directors of the Company's subsidiaries.

	Women	Men	Women	Men
Americas	537	2,758	16%	84%
Asia-Pacific	389	3,483	10%	90%
EMEA	827	3,382	20%	80%
Total	**1,753**	**9,623**	**15%**	**85%**

20%

Women now represent 20% of our Senior Leadership Group compared with 15% in 2019. We aim to reach 25% by the end of 2025

People and culture

2023 distribution of Vesuvius employees by gender

Distribution of Vesuvius employees by gender	Full-time employees	Full-time employees (%)	Part-time employees	Part-time employees (%)	Vesuvius employees total	Vesuvius employees total
Permanent women	1,616	14%	39	0%	1,655	15%
Permanent men	9,316	82%	30	0%	9,346	82%
Total permanent	**10,932**	**96%**	**69**	**1%**	**11,001**	**97%**
Temporary women	97	1%	1	0%	98	1%
Temporary men	273	2%	4	0%	277	2%
Total temporary	**370**	**3%**	5	**0%**	**375**	**3%**
Total women	**1,713**	**15%**	**40**	**0%**	**1,753**	**15%**
Total men	**9,589**	**84%**	**34**	**0%**	**9,623**	**85%**
Vesuvius employees	**11,302**	**99%**	**74**	**1%**	**11,376**	**100%**

Vesuvius' Diversity and Equality Policy

- We are dedicated to encouraging a supportive and inclusive culture amongst our global workforce
- We aim to ensure that all employees and job applicants are given equal opportunity and that our organisation is representative of all sections of society where we operate. Each employee will be respected and valued and able to give their best as a result
- We are committed to providing equality and fairness to all in our employment and not providing less favourable reward, facilities or treatment on the ground of age, disability, gender, marital or civil partner status, pregnancy or maternity, race, colour, nationality, ethnic or national origin, religion or belief, or sex, or gender reassignment, or sexual orientation
- We are opposed to all forms of unlawful and unfair discrimination

See the full policy on www.vesuvius.com for further details.

People and culture

Return to our Gender diversity priority

Programmes and initiatives supporting a diverse workforce

As part of a decentralised group, Vesuvius' entities are empowered to implement local initiatives to support the Group's objectives to foster diversity and inclusion. Alongside local requirements such as the implementation of equal pay audits and provision of diversity training, Vesuvius' entities use opportunities such as International Women's Day to promote inclusion, alongside career development initiatives such as women's leadership circles, mentorship and sponsorship of women students, and working with specialist agencies to support the recruitment of people with disabilities.

100%

of Vesuvius' companies have implemented some programmes and initiatives to support a diverse workforce

3,344

permanent employees who received training on diversity, discrimination, and/or harassment in 2023

Preventing discrimination and harassment and promoting gender diversity

Our entities have identified key areas and processes to ensure diversity, equal opportunities for everyone, and anti-discrimination in the recruitment process and during work. In addition to respecting local labour legislation, the Vesuvius Code of Conduct and the Group Diversity and Equality policy, initiatives include:

Promoting gender diversity and preventing discrimination:

- A specific collective agreement on diversity, discrimination and harassment
- Equal pay audits, as well as regular remuneration review and analysis using Willis Towers Watson's Global Grading System and consultations with the external agencies
- Training on assertive communication and anti-harassment training; sexual harassment awareness sessions; unconscious bias; diversity, equality, and inclusion training; targeted sessions for managers to support inclusive team management and hiring processes
- Promotion of gender diversity through International Women's Day Celebrations and Men's Health Day
- Women's affinity groups, diversity ambassadors and committees supporting minorities and vulnerable groups
- Equal Opportunities Officer function; a life coach for newly hired employees
- Helplines and assistance programmes
- Improved ergonomics of some workstations in many manufacturing sites, so that they require less physical effort and as result can be operated by any employee, regardless of gender
- Competencies and skill-based job descriptions and hiring processes to prevent discrimination during the recruitment; anonymisation of the resume screening process
- Male and female representatives in the recruiters' panel
- Competence-based promotion with multiple levels of approval and a performance management toolkit to ensure equal development opportunities
- Career development initiatives such as women's leadership circles or mentorship initiatives providing advocacy for women's career development and sponsorship for women students
- Family-friendly programmes facilitating the combination of parental responsibilities and work, such as flexible work arrangements, improved maternity and paternity leave provision, childcare allowances and occasional leaves

Including people with disabilities:

- Working with specialised agencies to support recruiting people with disabilities
- Adaptations of the facility buildings to make them accessible for disabled employees
- Equal Opportunities Officer function: a life coach for newly hired employees and dedicated colleagues supporting the mentally unwell
- Training on disability and mental resilience

Sustainability in action

Sustainability in action

Supporting women and girls in STEM (Science, Technology, Engineering and Mathematics)

Vesuvius is focused on supporting women and girls to advance in engineering, technology, and other highly technical fields. In 2023, we continued the programmes that were started in 2022 as well as launching new initiatives.

- Vesuvius India sponsored ten female students from the College of Engineering, Pune. It also continued a three-year scholarship programme for nine women to pursue a bachelor's degree in engineering from the National Institute of Technology. In addition, Vesuvius India supported the Women's Club at the College of Engineering, which enabled students to access technical learning through online courses and participation in hackathons and leadership events
- In the USA, Vesuvius employees participated in conferences organised by the Association for Iron and Steel Technology, and the Society of Woman Engineers, to understand the challenges for women better and to empower young female professionals to develop in the steel industry
- Vesuvius Vietnam partnered with the Material Technology Faculty of Ho Chi Minh University of Technology to host a Technical Day of Refractory Application in Steel Making to inspire students and highlight career opportunities for women in this field

Sustainability in action

Recognition

Our actions for promoting diversity and inclusion have been recognised through various awards, including:

- The receipt of an award for being the best employer for caring for female employees by our plant in Suzhou (China)
- The Rotary Foundation in India recognising our site in Pune for excellence in CSR activities and the Economic Times Future Ready Organisation recognising our business in India
- In 2023, eight of our sites in Brazil and India were recognised as a Great Place to Work (GPTW). GPTW is the global authority on workplace culture and this recognised our longstanding commitment to creating a workplace with a 'people-first approach' based on the principles of trust, collaboration, and innovation

We seek to establish strong relationships with key stakeholders and support the communities in which we operate.

Our communities

A responsible company

Vesuvius is committed to making a positive contribution to society. As part of this, we focus on operating an ethical business with appropriate policies in place to ensure compliance with the regulations and laws in all our markets.

Governance and policies

The Board is responsible for setting the culture and values of the organisation. The Group Executive Committee is responsible for implementing the culture and values, including ethics-related matters.

Vesuvius' compliance policies underpin the principles set out in our Code of Conduct. They are the practical representation of our status as a good corporate citizen, and they assist employees to understand and comply with our ethical standards and the legal requirements of the jurisdictions in which we conduct our business. They also give practical guidance on how this can be achieved.

Human rights and labour

The Group Human Rights and Labour Policy reflects the principles contained within the UN Universal Declaration of Human Rights, the International Labour Organization's Fundamental Conventions on Labour Standards and the UN Global Compact, to which the Group is a signatory. The Policy applies to all Group employees. The Policy sets out the principles for our actions and behaviour in conducting our business and provides guidance to those working for us on how we approach human rights issues. The Group commits not to discriminate in any of our employment practices and to offer equal opportunities to all. The Group respects the principles of freedom of association and the effective recognition of the right to collective bargaining, and opposes the use of, and will not use, forced, compulsory or child labour.

These principles have been integrated into the work of our procurement teams as we assess our suppliers and their business practices. The policy was reviewed and updated in 2022.

12 entities have completed a human rights review or impact assessment in 2023.

No child labour or forced labour issues were reported via the Vesuvius Human Resources organisation in 2023.

Child labour and forced labour were included in the Group Safety Audit team's scope in 2023. These inspections are carried out on site. If any breach is suspected, the VP HSE is immediately informed for further investigation. All manufacturing sites are included within the scope of these audits, with an aim to audit them once per year. 67 audits were carried out in 2023 (2022:65), with no breaches identified. 54 manufacturing and R&D sites (89%) and 13 customer locations were covered by these audits.

Three external inspections focusing on forced labour and child labour were also carried out, also without any breaches identified.

These audits, along with the feedback from the Speak Up whistleblowing process, inform the Group of potential human rights risks within its operations.

A responsible company

Analysing slavery and human trafficking risks in the supply chain

Vesuvius is committed to working only with suppliers that respect the UN Global Compact's ten principles, and in particular do not employ child labour and forced labour. Since the publication of our first statement, we have conducted a risk assessment of our purchasing activities, seeking to identify, by location and industry, where the potential risks of modern slavery are highest.

During 2023, we published our eighth transparency statement outlining the Group's approach to the prevention of slavery and human trafficking in our business and supply chain. A copy of our latest statement is available to view on our website: www.vesuvius.com.

Since the publication of our first statement we have conducted a risk assessment of our purchasing activities, seeking to identify, by location and industry, where the potential risks of modern slavery are highest. Our assessment identified the following four industries that pose a higher risk of modern slavery for Vesuvius:

1. Mining and extractive industries (raw materials)
2. Textiles (personal protective equipment and work clothing)
3. Transport and packaging
4. Maintenance, cleaning, agricultural work and food preparation (contracted workers)

As our spend with mining and extractive industry suppliers is far greater than the other three industries, and the number and diversity of suppliers is the greatest, we have been focusing our efforts on these industries. We have deepened our investigation of higher-risk raw materials, based on the studies carried out by Drive Sustainability and the Responsible Minerals Initiative on the responsible sourcing of materials in the automotive and electronics industries, with which our portfolio of raw materials shares many commonalities.

In 2023, 53% of our raw material spend was covered by this risk assessment. Four categories of raw materials were identified as presenting potentially higher risk: mica, graphite, bauxite and derived materials (aluminium, alumina), and platinum.

We provided webinar training on modern slavery to our key purchasing staff and continued to use an online e-learning module to upgrade the training given to all supplier-facing staff. It provides key guidance on the red flags associated with modern slavery to assist them in identifying these during supplier visits and accreditation. Since the launch of the modern slavery red flag training, we have trained 100% of the targeted staff.

See the Group's Statement on the Prevention of Slavery and Human Trafficking: www.vesuvius.com/en/sustainability/our-policies/statement-on-modern-slavery.html

A responsible company

Engaging with suppliers in higher-risk markets

We have engaged in a process of verifying our supplier base of mica and graphite as these industries have been widely recognised as a risk in this respect.

In 2021, we contacted all of our mica suppliers and requested formal proof that they did not use child labour. Following a study of their responses, we requested that suppliers undertake sustainability evaluations, with a heavy emphasis on human rights. By the end of 2023, 100% of our mica suppliers had certified that they did not use child labour and had completed, or were in the process of completing, a sustainability assessment. We have since ended our agreements with those suppliers who refused to participate in a sustainability assessment.

We began a similar approach with our graphite suppliers in 2022. By the end of 2023, we had established that suppliers representing 74% of our graphite spend did not use child labour and had finished, or were in the process of completing, a sustainability assessment.

Starting in 2024, we also plan to start engaging with our suppliers of bauxite, aluminium, alumina and platinum on this topic.

Training on child labour, slavery and/or human trafficking

In line with our modern slavery risk assessment, we provide webinar training to our key purchasing staff and we continue to use an online e-learning module to upgrade the training given to all supplier-facing staff. This provides key guidance on the red flags associated with modern slavery to assist them in identifying these during supplier visits and accreditation. Since the launch of the Modern Slavery red flag training we have trained 100% of the targeted staff.

See the Group's Statement on the Prevention of Slavery and Human Trafficking: www.vesuvius.com/en/sustainability/our-policies/statement-on-modern-slavery.html

Conflict minerals

European Union and United States legislation and OECD due diligence guidance generally define conflict minerals as minerals mined in countries either suffering from armed conflict, such as civil war or a fragile post-conflict state, or experiencing weak or non-existing governance and systematic violations of international law, including human rights abuses, and which directly or indirectly finance or benefit armed groups in the DRC or any adjoining country. The minerals currently included in the list of conflict minerals are cassiterite (tin), coltan (tantalum), wolframite (tungsten) and gold (collectively known as 3TG), as well as derivatives of these minerals.

As the consumable products manufactured by Vesuvius do not contain any 3TG in their recipes, Vesuvius' exposure to such risk is assessed as very low. In addition, it is Vesuvius' policy to prohibit the use of conflict minerals in its products. This policy, over which the Group Executive Committee has oversight, covers 100% of Vesuvius' operations. It is available to view at: www.vesuvius.com.

We routinely review our purchasing portfolio to check for conflict minerals. In 2023, we carried out a survey of 100% of our manufacturing sites to verify whether any conflict minerals had been purchased. All sites confirmed that no conflict minerals had been purchased (other than that potentially contained in electronic components). This was cross-checked with the review of our raw material spend, which similarly did not reveal any purchases of conflict minerals.

Supplier compliance with conflict minerals guidance is included in the scope of supplier sustainability assessments carried out by a third-party independent provider.

	2023	2022	2021
Total revenue (£) from products containing conflict minerals	0	0	0

A responsible company

Working hours

In accordance with our Human Rights Policy, the Group seeks to ensure that workers do not exceed reasonable working hours to ensure their physical and mental health and safety. We are committed to the elimination of excessive working hours and respect local regulations on working hours in every country in which we operate. Vesuvius maintains a working hours policy and monthly reporting of headcount and hours worked. This allows us to identify if maximum working hours are being exceeded which can then be investigated by management.

The verification of working hours is included in the scope of the Group Safety Audit. In 2022, verifications were carried out in 54 sites representing 89% of manufacturing and R&D locations, with no issues being reported.

Whistleblowing

In Vesuvius, we believe that 'doing the right thing' is as crucial to our business as 'doing things right'. We want to build our growth on the ethical principles which lie at the heart of our organisation. We promote a healthy Speak Up culture across the Group, with everyone playing an important part in raising concerns if they see things that aren't right in our business. The Speak Up process allows employees to escalate concerns on a range of issues when conventional channels have failed.

Vesuvius is implementing a software solution to support compliance with the legislation of the countries in which we operate. In response to the EU Whistleblower Directive, we are introducing internal channels for reporting violations locally if the reporter prefers. Vesuvius provides a whistleblowing channel (Speak Up) for all employees, customers, and suppliers of the Group. This third-party operated confidential helpline is available 365 days per year, 24 hours per day, to anyone wishing to raise concerns anonymously or in situations where they feel unable to report directly. This independent facility supports online reporting through a web portal and reporting by phone or by voicemail. To ensure global accessibility, employees can speak with operators in any one of our 29 functional languages. The Speak Up arrangement is overseen by the Board. Contact details are included in our Code of Conduct and are available on the internal and external Vesuvius websites. They are also communicated by local language posters in all our locations.

All reports received are reviewed and, where appropriate, investigated, and feedback is provided to the reporter via the helpline portal. Vesuvius' Speak Up helpline is highlighted during internal compliance training and new joiner inductions. No Vesuvius employee will ever be penalised or disadvantaged for reporting a legitimate concern in good faith. Reports received via Speak Up channels are managed by the General Counsel and Compliance Director. When received, reports are assessed for risk and category of concern. All reports are considered in line with a protocol for review, investigation, action, closure and feedback, independent of management lines where necessary, and involving senior Business Unit or HR management as appropriate. For complex issues, formal investigation plans are drawn up, and support from external experts is engaged where necessary. We acknowledge all cases within seven days and recognise that feedback to reporters is an important part of the process. Where possible we provide feedback on the outcome to the reporter following the conclusion of an investigation.

The Group monitors the volume, geographic distribution and range of reports made to the Speak Up facility to ascertain not only whether there are significant regional compliance concerns, but also whether there are countries where access to this facility is less well understood or publicised.

During 2023, the Board received updates on the nature and volume of reports received from the confidential Speak Up helpline, key themes emerging from these reports and the results of any investigations undertaken. Further details on specific issues were provided where requested. In 2023, the Group received 120 reports (2022: 141, 2021: 93) through the Speak Up facility and 16 walk-in reports (2022: 38, 2021: 94). Each one of these was reviewed and, where appropriate, investigated. Similar to previous years, a substantial majority of these reports related to HR issues which indicated no compliance concerns, nor serious breaches of the Code of Conduct. Of the small number of reports received that contained allegations of a breach of our Code of Conduct, thorough investigations were performed and, where appropriate, disciplinary action was taken.

A responsible company

Business ethics/anti-bribery and corruption and working with third parties

Vesuvius maintains high ethical standards globally through compliance with all applicable laws, the Vesuvius Code of Conduct and Vesuvius' Policies and Procedures.

Vesuvius' Code of Conduct affirms our commitment to competing vigorously, but honestly, and not seeking competitive advantage through unlawful means. We conduct ourselves ethically in all public affairs activities, in alignment with local laws and regulations. We do not engage in unfair competition, exchange commercially sensitive information with competitors or acquire information regarding a competitor by inappropriate means. When received for business purposes, we safeguard third-party confidential information and use it only for the purpose for which it was provided.

We engage with selected third-party representatives and intermediaries in our business. We recognise that they can present an increased bribery and corruption risk. Our procedure on working with third parties clearly outlines our zero-tolerance approach to bribery and provides practical guidance for our employees in identifying concerns and how to report them.

Bribery and corruption in any form (monetary or otherwise) is unacceptable and firmly fought against by Vesuvius.

Vesuvius engages with third-party sales agents, many of whom operate in countries where we do not have a physical presence. Our employees' use of, and interaction with, sales agents is supported by an ongoing training programme for those who have specific responsibility for these relationships.

As part of our communication around anti-bribery and ethics, employees are actively encouraged to consult on ethical issues. They have open access to the Compliance Director and Legal function who provide support on a regular basis.

Risks and applicable rules are outlined in our Anti-Bribery and Corruption Policy which is available to view at: www.vesuvius.com. The Group Executive Committee, together with the management of each Business Unit or Global Function, is responsible for the Policy, its implementation and day-to-day execution.

Feeling a responsibility to conduct business ethically and lawfully, we are committed to compliance with sanctions and trade restrictions.

Only by acting together with our customers, suppliers and other third parties can we ensure that our goods are not supplied to restricted parties.

During 2023, the Group continued the due diligence review of our third-party representatives and intermediaries. Following the prior years' enhanced reviews of sales agents, custom clearance agents, distributors and logistics providers, we conducted repeat due diligence. We also conducted due diligence on any new third parties introduced into the organisation.

We extended our use of a risk-based approach in our due diligence process and over the coming years we will expand its use to evaluate any new suppliers and other third parties introduced into the organisation. During 2023, we completed due diligence for more than 2,500 counterparties worldwide. As a result of this process, we terminated the relationship with 106 counterparties who did not meet our standards.

Vesuvius also recognises other risks related to money laundering, conflicts of interest and relationships with politically exposed persons. The company will not engage in any form of activity to help criminals legalise the proceeds of crime.

100%

of targeted employees received Anti-Bribery and Corruption training in 2023

A responsible company

Working with trade associations, lobbying and political expenses

Vesuvius does not allow contributions to political candidates or political parties and does not incur political expenditure. Vesuvius seeks to comply with all applicable laws that require reporting on lobbying and related activities. Similarly, Vesuvius does not have any direct political involvement and prohibits any direct lobbying expenditure or spend of any corporate funds on political advocacy.

Advocacy on non-political topics relevant to the business is permitted. These policies apply to all Vesuvius operations (owned and joint ventures).

Vesuvius is committed to openly declaring business interests and ensuring information provided is up-to-date, complete and not misleading. Vesuvius employees are prohibited from obtaining or trying to obtain information, or to make any decision dishonestly.

Around the world, we participate in government and industry working groups, are members of industry associations and engage in direct contact with independent bodies on key business issues. This ensures that we can help in shaping new policies, regulations and standards.

Vesuvius has established long-term relationships, either directly, or through some of its employees, with several national and international trade associations directly related to our activities and to those of our customers. These trade associations advocate on major public policy issues of importance to Vesuvius, and are helpful for networking, building industry skills, civic participation and monitoring of industry policies and trends. They also provide information and perspectives on legislative matters of significance to the Group and our lines of business. Vesuvius' participation as a member of these associations comes with the understanding that we may not always agree with all the positions of an association or its other members.

Vesuvius is a member of many industry associations, including the World Refractories Association, CerameUnie (Belgium), the European Refractory Association, the Association for Iron & Steel Technology (USA), the Confederation of Indian Industries, and the British Ceramics Association, the China Foundry Association, and Entreprises Pour l'Environnement (France). These industry associations have all made climate change a clear focus area, with a variety of resulting actions such as engaging with regulators and policymakers, awareness and capability building within the industry, promotion of best available practices and technologies, and management of collaborative research projects.

We are involved in various projects carried out by these associations such as:

- Product carbon footprint – Vesuvius is part of the working group set up by the World Refractory Association to harmonise methodology and assumptions across all companies within our industry
- Work on the Technical Screening Criteria definition for our sector to determine what products would be eligible and aligned under the EU taxonomy directive – a project led by the European Refractory Producers Association

Other topics we engage in include safety, the development of recycling, environmental regulations, training and upskilling of the workforce, and non-financial reporting and disclosures.

£	2023	2022	2021	2020
Political expenses	**0**	0	0	0

£'000	2023	2022	2021	2020
Industry associations expenses (membership fees)	**120**	109	99	105

Community engagement

Vesuvius wants to make a positive contribution to the communities in which we work by supporting a wide variety of fundraising and community-based programmes around the world.

We prefer participation in events, donations in kind to registered not-for-profit organisations and participation in community programmes, rather than cash donations.

Our entities have identified local needs and targeted their actions to support charities, foster education for future generations, integrate employees' family members or strengthen neighbourly relations with authorities.

Our Anti-Bribery and Corruption Policy defines rules for the proper handling of donations and sponsorship.

£'000	2023	2022	2021	2020
Cash donations to registered not-for-profit organisations	91	760[1]	189	248

1. Exceptional donation to Medecins sans Frontiers.

Below are some examples of the many community programmes and activities our colleagues were involved in throughout 2023.

Charity initiatives

- Vesuvius sites in Brazil, Mexico, the USA and Poland organised the collection of food, Christmas gifts, money and other donations to support the poorest members of our communities
- Vesuvius sites in France, India and Poland participated in sports and other types of events to raise funds for health programmes and not-for-profit organisations
- Our colleagues in Germany and Ukraine collected donations for the victims of war and natural disasters
- In India, our colleagues supported the provision of medical aid for people infected with HIV and AIDS, those affected by drug abuse and children with cerebral palsy

Supporting education

- Our sites in Mexico and India supported the development of school infrastructure with equipment donations
- In Brazil and India we gave donations and scholarships to support the education of underprivileged children
- In the USA we sponsored the Carnegie Science Center
- We supported education projects focused on health and STEM for young girls in India, safety in Australia, cultural heritage in China and sustainable mobility in Poland

Family programmes

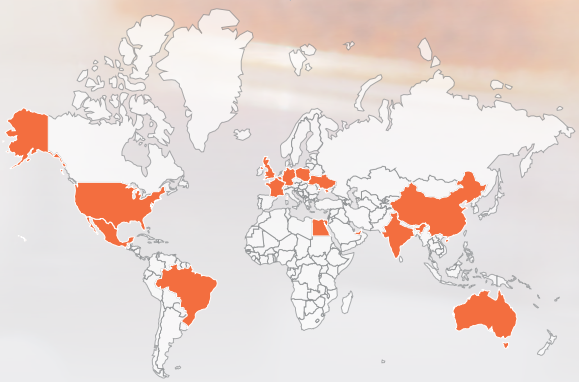
- Our sites in China, India, Poland and Mexico hosted family days and end-of-year celebrations, with food and entertainment for employees and their families
- A number of our sites also held occasional events for employees' children, including Sinterklaas in Belgium, activities and entertainment in our offices in Poland and factory visits organised on Children's Day in Brazil
- Competitions on safety and the environment were held for employees' children at our sites in Brazil, China, Egypt, Poland and the United Arab Emirates
- Scholarships are provided for the children of employees in Mexico

Cooperation with local authorities to develop Vesuvius employees

- In the United Arab Emirates, a Waste Management awareness session was held with the Waste Management Authority
- In the USA, a training session was held with the State Police Department on how to react and behave in case of dangerous situations with an active shooter
- At our sites in Germany, India and the USA, safety training and fire drill simulations were held with the local fire brigades
- In India a training session was organised in conjunction with the Directorate of Industrial Safety & Health
- Our plant in Belgium collaborated with local authorities on a speed reduction programme in the street in front of the plant and safer access to the plant for pedestrians and wheelchair users

Joint activities with local authorities undertaken for the benefit of our communities

- In India, consultations about environmental programmes were held by the government
- Visits to Vesuvius' manufacturing sites were organised for the County Industrial Association in China and the local members of parliament in Australia and the UK
- In India, we also supported the clean up of a public beach, and cooperated with the Education Department and Police authorities on projects to improve the education system and home safety



Responsible sourcing

Vesuvius recognises the crucial role that its suppliers play in creating value in the products and services that Vesuvius ultimately provides to its customers. In addition to the consistent and timely supply of materials, products and services which are of the highest quality, we expect our suppliers to operate in a manner that is appropriate, in terms of their ethical, legal, environmental and social responsibilities.

Vesuvius predominantly purchases raw materials, comprising unprocessed and processed mined materials, and chemicals. We source materials globally, with important sources in China, North America, Europe and India. Our supply chain also includes capital equipment and specialist services.

Principles

Overall, our objective is to encourage suppliers to implement a meaningful sustainability programme, embrace the UN Global Compact principles, evaluate and reduce our upstream CO_2 emissions and identify potential risks (and if necessary, address them) in our supply chain. The satisfaction of our customers' requirements, the safety and reliability of Vesuvius' products and the efficiency of Vesuvius' internal processes are dependent on the reliability of its network of suppliers.

Vesuvius is committed to ensuring that we utilise high-quality raw materials, secured through reliable and well-developed raw material suppliers. The principles of sustainable procurement are prescribed within the Vesuvius Sustainable Procurement Policy and supported by supplementary processes.

The Group Executive Committee has overall responsibility for supply chain management. Selected categories of raw materials requiring global coordination are managed by the Group Procurement organisation, which reports into the President Operations and Technology, whilst others are managed locally in the Business Units and Regions.

Supplier development programmes are coordinated between these functions and the Compliance Sustainability teams. These programmes include supplier training, assessments and auditing on various topics covered by the Sustainable Procurement Policy.

Sustainable Procurement Policy

The Policy applies to all suppliers of goods and/or services either used in our manufacturing processes and/or sold directly by us to customers, including tolling and resale suppliers. It applies to suppliers, their agents and their sub-contractors.

Once accepted, it is the responsibility of the supplier to verify and monitor compliance against this policy – both for their operations and those of any sub-contractors. Compliance with the requirements in the Policy is a key consideration in the selection of suppliers. The full policy is available on the Vesuvius website.

We operate a Sustainability Procurement Policy which outlines key criteria for suppliers. The policy uses the Group Procurement's 'Request for Quotation' (RFQ) process to engage a significant number of Vesuvius' suppliers and is provided in conjunction with the Vesuvius Terms and Conditions of Purchase.

For suppliers to participate in the RFQ, they are obliged to accept and agree to the terms of the Sustainability Procurement Policy, as it forms an addendum to Vesuvius' standard contract clauses.

Since its inception in 2021, 167 active vendors (74% of the targeted group participating in the RFQ process, 9% of the total number of active raw material suppliers), representing almost half of the raw material spend, have formally pledged to comply with the policy.

Vesuvius' Sustainable Procurement Policy

The policy covers all suppliers of goods and/or services either used in our manufacturing processes and/or sold directly by us to customers, including Tolling and Resale suppliers. It applies to suppliers, their agents and their sub-contractors.

The major elements of the Sustainability Procurement Policy are:

- Employees and human rights
- Conflict minerals
- Ethical and compliant business practices
- Environment
- Quality
- Business continuity

See the full policy on www.vesuvius.com for further details.

£232m

spend with suppliers having formally agreed to comply with our Sustainable Procurement Policy

Responsible sourcing

Supplier sustainability assessments methodology and criteria

As part of our sustainability agenda, Vesuvius has implemented a Supplier Sustainability Assessment programme, covering all suppliers of goods either used in our manufacturing processes and/or sold directly by us to customers, including Resale suppliers.

Vesuvius has partnered with an independent third-party service provider – EcoVadis – to rate our raw materials suppliers using a detailed set of criteria. These cover four themes and 21 criteria based on international standards: labour and human rights; ethics; environment; and sustainable procurement.

The supplier sustainability assessment methodology complies with international standards (e.g. ISO 26000, GRI, ILO, UN Global Compact). It includes the assessment of policies, measures, certifications and reporting, along with the endorsement of external CSR initiatives and principles.

Supplier assessments are carried out via a combination of questionnaires completed by suppliers, the collection of supporting documents and evidence, and the monitoring of a large number of sources (government agencies, compliance databases, sustainability networks, international organisations, NGOs, trade unions and specialised press).

In 2023, an additional eight (2022: 23) (total to date: 126) employees from our procurement teams received specific training on supplier sustainability assessments (100% of the target group).

The Board set a target to assess at least 50% of our raw material spend by the end of 2023. As the Group was on track to reach this target, the Sustainability Council set a new objective to assess at least 60% of our raw material spend by 2025. Selected criteria were chosen to select participating suppliers such as supplier size and risk metrics, including:

- Category of raw material
- Availability of alternative sources
- Share of supplier revenue with Vesuvius
- Grades in previous assessments
- New suppliers
- Supply chain incidents

Since its launch, 244 suppliers have joined the programme, representing 52% of the total raw material spend. Fewer than 1% of the suppliers assessed in 2023 did not reach Vesuvius' minimal EcoVadis score. We are requiring these suppliers to implement improvement actions within a three-year time frame. Progress will be monitored through routine evaluations and an annual reassessment. Across the crucial topics, the average total score of Vesuvius suppliers was 51.4, compared to an industry standard of 46.0.

52%

of the total raw material spend was with suppliers that have joined the Supplier Sustainability Assessment programme

Responsible sourcing

Supplier development

Vesuvius is very proud of the close relationships we have with our suppliers around the world. We work with them to ensure that the highest-quality materials and products enter our supply chain. The process entails an extremely comprehensive review, including research and development to ascertain the compatibility of suppliers' products.

Our leadership participated in regional conferences and sharing and learning sessions in India, China and Germany. These help us understand the industrial best practices being implemented, key challenges faced by the industry and solutions to overcome them.

Supplier sustainability assessment criteria

Environment

- Energy consumption and GHGs
- Water
- Biodiversity
- Local and accidental pollution
- Materials, chemicals and waste
- Product use
- Product end of life
- Customer health and safety
- Environmental services and advocacy

Labour and human rights

- Employee health and safety
- Working conditions
- Social dialogue
- Career management and training
- Child labour, forced labour and human trafficking
- Diversity, discrimination and harassment
- External stakeholder human rights

Ethics

- Corruption
- Anti-competitive practices
- Responsible information management

Sustainable procurement

- Supplier environmental practices
- Supplier social practices

21 criteria based on international standards

Responsible sourcing

Supplier CSR and quality audits

Vesuvius conducts an annual Supplier Audit programme targeting our Corporate Social Responsibility (CSR) practices, product quality and security of supply. The programme is led by the Group's purchasing and quality teams. The goal of the audits is to verify that our suppliers abide by fundamental principles regarding the environment and social practices, and reduce the number of quality issues that may affect our raw materials and consequently our operations and those of our customers.

As part of this, we carry out on-site inspections, share expectations with our suppliers, identify risks and adapt our internal controls accordingly. We encourage our suppliers to improve their own processes and help them prioritise actions to achieve this.

Areas of focus include:

Quality management rules:

Final inspection, controls at important process steps, management of incoming materials, data tracking, customer feedback and communication.

Management of non-conformities:

Reaction to non-conformities, protection of customers, problem resolution and application of lessons learned.

Sustainability criteria:

The main areas of attention are environmental and social practices. Particular emphasis is placed on child and forced labour, ground pollution, handling of hazardous waste, working conditions and personal protective equipment. Commencing in 2022, a number of 'red flag' items have been included in our on-site verification questionnaire, especially addressing human rights issues, such as child or forced labour, for which immediate escalation and investigation is required in case any breach is detected. The scope of the audit also covers working conditions.

This aligns the supplier audits as a second platform to drive and visibly verify supplier sustainability efforts and programmes, complementing the assessments carried out by our third-party partner.

In 2023, 157 (2022: 139) audits were conducted (100% on-site), 13 follow-ups and 144 regular audits (2022: 3 and 136). 100% of the planned audits were carried out. No cases of human rights breaches were detected as part of the supplier audit check. 5.7% of audited suppliers received grades below threshold (2022: 0.7%). Whenever suppliers fail to meet the required standards, either action is taken to support them to improve or our relationship with them is terminated.

Going forward, we plan to build supplier performance scorecards which will include CSR and quality audit results.

157

CSR and quality audits carried out at supplier facilities

Responsible sourcing

Supplier Corrective Action Requests

To ensure the integrity of our products, we have a rigorous approach to issues relating to the quality of raw materials and other inputs to our processes. When a supplier does not meet expectations, we issue a formal Supplier Corrective Action Request. Our proven 8D methodology is then used to investigate the root cause of the issues and define corrective actions. A web-based portal is available for suppliers to document the containment actions implemented and outcome of the investigation, to enable review by us.

In most cases, issues are identified and resolved quickly. Suppliers with repeat issues and poor problem-solving are required to undergo a Supplier Quality Audit.

Supplier CO_2 emissions

We are progressively building a more precise knowledge of these emissions, including data per raw material and supplier, to properly establish and drive improvement plans. We are using our RFQ process to gain a better understanding of these upstream CO_2 emissions and collect supporting data. This requires participating raw material suppliers to provide information on their energy sources, CO_2 emissions and improvement plans.

In 2023, Vesuvius stopped using the GHG Protocol managed Quantis Scope 3 evaluator tool as it was withdrawn, and the opportunity was taken to implement the more accurate Sustrax platform, which offers the possibility to evaluate Scope 3 emissions at a greater level of detail.

We evaluated the CO_2 emissions associated with our raw materials by splitting them into more than 70 categories, each with average CO_2e emissions factors derived from supplier data, databases or publicly available information. More than half of the emissions come from the three categories of materials that undergo high-temperature processes after mining (deadburned magnesia, fused magnesia, silicon carbide).

In 2022, we started engaging directly with the largest suppliers of some of our most CO_2 intensive and high-volume raw materials to provide training and further improve the quality of data collected. In 2023, Vesuvius organised a workshop on 'Sustainability assessment and CO_2 emission monitoring'. 50 representatives from 35 suppliers attended this training which enhanced their understanding of the GHG recording.

Since the launch of our programme in 2021, 209 supplier sites (representing a total spend of £136m in 2023) have responded to the request for information on their energy sources and CO_2 emissions. 92 (representing a total spend of £73m in 2023) reported that they had set emissions reductions targets and established action plans.

In 2023, it was estimated that the CO_2e emissions from purchased goods and services amounted to 1,066 thousand metric tonnes of CO_2e, representing 77% of Vesuvius' Scope 3 emissions and 67% of Vesuvius' total CO_2e emissions.

67%

of Vesuvius' total CO_2 emissions are from purchased goods and services

Further information

Sustainability governance structure

Board oversight

The Board holds overall accountability and oversight for all matters related to sustainability and the management of all risks and opportunities, including the impact of climate change on the Group. In setting the Group's strategy it ensures that sustainability is embedded at the heart of the Group and is reflected in the operational plans of each Business Unit. The Board formally reviews all significant sustainability programmes.

The Board's oversight of the Group's response to climate change is integrated into both its monitoring of the Group's broader sustainability strategy and initiatives, and its approach to significant capital and other investments. The Board formally discusses the Group's sustainability initiative at least twice per year.

It sets the Group's priorities and targets, and reviews the Group's performance and progress against them. It also monitors the Group's external ESG ratings.

The Board has undertaken a detailed assessment of the Group's climate-related risks and opportunities, including the Group's physical and transition risks. It has also considered the formulation of the three different climate-related scenarios constructed to assess the potential financial implications of climate change and assessed the impact of climate-related risks and opportunities on the Group's strategy. It is our policy for every capital expenditure above £5m requiring Board approval to include a sustainability assessment, which incorporates climate-related parameters.

The Group's Audit Committee supports the Board in ensuring climate-related issues are integrated into the Group's risk management process, and reviewing the Group's TCFD reporting and the assessment of performance against targets. As the Executive Director with key responsibility for the delivery of the Group's strategy, our Chief Executive, Patrick André, is ultimately responsible for the sustainability initiative.

The Remuneration Committee supports the Group's sustainability initiative and climate-change-related objectives, through the alignment of the Group's remuneration strategy. All Business Unit Presidents and each of the regional Business Unit Vice Presidents have a part of their annual incentive compensation tied to performance targets on CO_2e emissions reduction.

In addition, the Executive Directors and other members of the Group Executive Committee participate in the Group's Long-Term Incentive Plan, with the vesting of 20% of each award based on three ESG measures, focused on:

- Reduction of the LTIFR
- Reduction of the Group's Scope 1 and 2 CO_2e emissions
- Improvement in the gender representation in the Senior Leadership Group

Sustainability governance structure

Management oversight

In 2020, with the launch of the Group's new sustainability initiative, a new sustainability governance structure was established, comprising a Sustainability Council, supported by the new role of VP Sustainability, and a clear set of KPIs and targets were delineated.

The Vesuvius Sustainability Council is chaired by the Chief Executive, and comprises the Group Executive Committee, VP Sustainability, regional Vice Presidents from each Business Unit, Head of Strategy, Head of Communication and Employee Engagement, Head of Investor Relations and Vice Presidents of the Operations.

It meets on a quarterly basis and oversees the Group's sustainability activities, especially related to climate change, monitors progress against our targets, and assists the Board with identifying and assessing the implications of long-term climate-related risks and opportunities, elaborating sustainability strategy and setting priorities. The Council reports to the Board twice per year.

The VP Sustainability leads the Group's sustainability activities, coordinating the work of the Sustainability Council including the Group's assessment of climate change risks and opportunities and formulation of climate-related scenarios. He is also responsible for the collation of data to assess the Group's performance against its sustainability targets and KPIs, producing quarterly performance reports, managing Group-wide communications and leading external reporting and disclosures.

Responsibility for the progress of the Group against its sustainability objectives lies with the Group Executive Committee and, operationally, each Business Unit President. These BU Presidents, along with the Regional BU VPs, ensure the Group sustainability strategy is reflected in each BU's strategy, communicating the sustainability targets inside their organisations and implementing plans – including overseeing resources and capital allocation, and selecting R&D priorities – to achieve these targets and address the climate-related risks and opportunities.

The VP Sustainability is responsible for overseeing reporting on the Group's sustainability matters and metrics. Formal channels for reporting a range of data points are embedded in the organisation. Escalation mechanisms, routine reviews, and internal controls such as auditing and due diligence are in place to ensure transparency, consistency and completeness of information. For certain topics these are supported by independent third-party verification.

Our Sustainability Council and VP Sustainability ensure that we have a clear set of KPIs and targets to track the Group's progress.

United Nations Global Compact

United Nations Global Compact

In October 2020, Vesuvius became a signatory to the United Nations Global Compact. We have committed to base our business approach on its ten Principles, including its precepts on human rights, labour, environment and anti-corruption, and to engage in activities which advance the development of the UN Sustainable Development Goals (SDGs).

Communication on progress

Vesuvius reports annually on its sustainability activities, commitments and progress in the Annual Report and also in a separate Sustainability Report published each year. This covers the environmental, social and governance issues defined in the four dimensions of the Group's Sustainability Charter: our planet, our customers, our people, our communities. In particular, we include updates on KPIs and progress against targets. Vesuvius also reports progress in the United Nations Global Compact online platform.

Human rights

Principle 1

Businesses should support and respect the protection of internationally proclaimed human rights within the scope of their influence

Principle 2

Businesses should make sure that they are not complicit in human rights abuse

Labour standards

Principle 3

Businesses should uphold the freedom of association and the effective recognition of the right to collective bargaining

Principle 4

Businesses should uphold the elimination of all forms of forced and compulsory labour

Principle 5

Businesses should uphold the abolition of child labour

Principle 6

Businesses should uphold the elimination of discrimination in respect of employment and occupation

Environment

Principle 7

Businesses should support a precautionary approach to environmental challenges

Principle 8

Businesses should undertake initiatives to promote greater environmental responsibility

Principle 9

Businesses should encourage the development and diffusion of environmentally friendly technologies

Anti-corruption

Principle 10

Businesses should work against corruption in all its forms, including extortion and bribery

Sustainable Development Goals

Vesuvius has identified the practices within its operations that can directly or indirectly contribute to the SDGs. We focus our efforts on the following seven SDGs – four priority goals and four supporting goals – and targets which are particularly relevant to our business and where we believe we can make the most meaningful contribution.

Priority SDGs and targets

Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

8.2 Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including through a focus on high-value added and labour-intensive sectors

8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalisation and growth of micro-, small- and medium-sized enterprises, including through access to financial services

8.4 Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour to decouple economic growth from environmental degradation, in accordance with the 10-year framework of programmes on sustainable consumption and production, with developed countries taking the lead

8.5 By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value

8.8 Protect labour rights and promote safe and secure working environments for all workers, including migrant workers, in particular women migrants, and those in precarious employment

Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation

9.2 Promote inclusive and sustainable industrialisation and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries

9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities

9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending

Ensure sustainable consumption and production patterns

12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimise their adverse impacts on human health and the environment

12.5 By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse

12.6 Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle

Take urgent action to combat climate change and its impacts

13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries

13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

Supporting SDGs

Ensure healthy lives and promote well-being for all at all ages

3.6 By 2020, halve the number of global deaths and injuries from road traffic accidents

3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination

Achieve gender equality and empower all women and girls

5.1 End all forms of discrimination against all women and girls everywhere

5.5 Ensure women's full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life

5.b Enhance the use of enabling technology, in particular information and communications technology, to promote the empowerment of women

5.c Adopt and strengthen sound policies and enforceable legislation for the promotion of gender equality and the empowerment of all women and girls at all levels

Ensure availability and sustainable management of water and sanitation for all

6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimising release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally

6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity

Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

16.5 Substantially reduce corruption and bribery in all their forms

Vesuvius materiality assessment

Vesuvius materiality assessment

Our sustainability initiative focuses on our most significant sustainability issues and opportunities. These are defined by our materiality assessment, which identifies and prioritises issues. In 2023, we updated our materiality assessment. We adopted the double materiality methodology laid out in the ESRS, which identifies and prioritises issues based on two dimensions: the impact or likely impact of Vesuvius on society and the environment, and the impact on Vesuvius' business, creating financial risks and opportunities for Vesuvius.

Our materiality assessment is informed by our risk management processes, which not only consider immediate risks to the Group, but also longer-term emerging macro trends such as the electrification of light vehicles, accelerating growth in demand for renewable energies, technological developments in iron and steel making and policy changes impacting the cost of CO_2 emissions, all of which could profoundly affect our markets.

Our assessment is informed by the principles of reporting articulated within the Global Reporting Initiative (GRI) Standards 2021. The GRI content index can be found on pages 140–144 of this Report.

In preparing our assessment, and developing our sustainability initiative, we routinely engage with various internal and external stakeholders, formally and informally. Details of these engagements and the parties involved are described in our s172 disclosures on pages 68–71 of our 2023 Annual Report. We undertake regular surveys of Vesuvius' operational teams to collect data on management approaches, systems, and performance relating to environmental, safety and human resource management.

Routine interactions and information updates include meetings with customers, participation in industry events, discussions with Vesuvius experts and managers, meetings with industry associations, customer questionnaires, engagement with suppliers, the review of past assessments, recent events and trends, the monitoring of ESG standards and regulations, the review of agency ratings, benchmarking with assessments by industrial peers and business impact analysis (in the case of business interruption).

They have formed the basis for the selection of topics with the greatest importance to our internal and external stakeholders and potential impact to the business.

Over the years 2020 to 2022, these have guided the evolution of our disclosures. In 2023, we relied on these to complete a pre-assessment, shortlisting the 20 most material topics and sub-topics from the lists contained in the ESRS, to which we added two Vesuvius-specific topics. After this list was formally approved by the Sustainability Council, it was submitted to internal and external stakeholders, to rank topics in terms of:

- Impact of Vesuvius on society and the environment
- Financial risks and opportunities they present for Vesuvius

41 internal stakeholders, comprising employees from all regions, business units, and functions in the organisation, as well as 30 external stakeholders representing our customers, suppliers, investors, lenders and trade associations, participated in the survey.

This exercise will be the foundation for a gap analysis between our current disclosures and the requirements of the ESRS, which will be completed in 2024. Vesuvius will then define actions to meet the disclosure requirements of the European CSRD and ESRS disclosure in 2029 (reporting for the 2028 year).

The material topics have been validated as material by the Group Executive Committee and the Board; they apply in our own operations and to varying degrees in those of our suppliers. No change in the relative prioritisation of topics was recorded in 2023. The exclusion of topics from this list does not mean that they are not considered important to Vesuvius or are not being managed, but only that we have chosen not to address them in detail in this report. Where appropriate we have incorporated some commentary on these additional topics into our report. Details of water stress and water consumption, biodiversity, conflict minerals and environmental compliance are all included.

Vesuvius materiality assessment

Materiality assessment process

Step 1: Preparation
- Analysis of ESRS
- Ongoing dialogue with internal and external stakeholders
- Review of past risk and materiality assessments, recent events and trends, business impact analysis, external agency ratings, TCFD report, group Strategic Plan
- Benchmark of materiality assessments by industrial peers, industry body documents

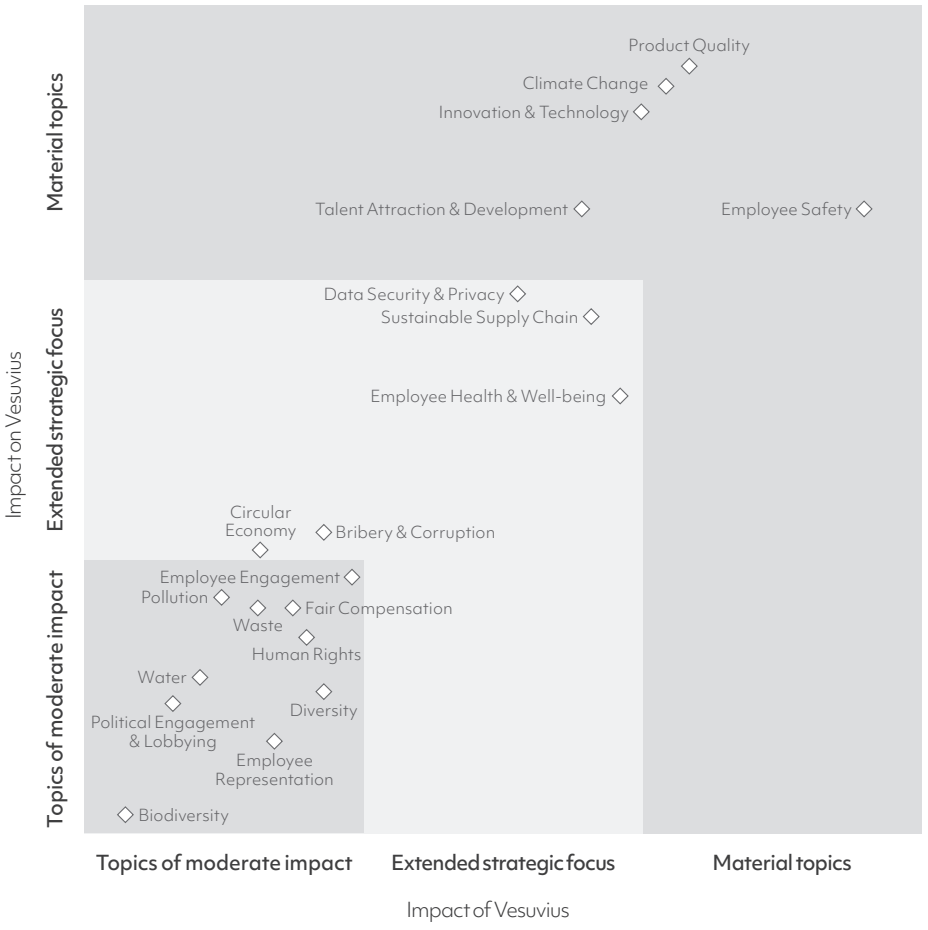
Step 2: Pre-assessment and shortlisting
- Selection of the shortlist of most relevant topics
- Validation by the Group Executive Committee

Step 3: Assessment by stakeholders
- Survey of key internal and external stakeholders
- Analysis of responses

Step 4: Validation
- Final ranking of topics
- Validation by the Group Executive Committee

Step 5: Approval by Board of Directors (February 2024)

Materiality matrix



Five topics are retained as material:
- Product quality
- Climate change
- Innovation and technology
- Employee safety
- Talent attraction and development

Five topics were also identified that are in the extended strategic focus but not subject to formal reporting requirements:
- Sustainable supply chain
- Employee health and well-being
- Data security and privacy
- Bribery and corruption
- Circular economy

Task Force on Climate-related Financial Disclosures (1/3)

The disclosures included in this report and in the 2023 Annual Report are consistent with the Task Force on Climate-related Financial Disclosures (TCFD) Recommendations and Recommended Disclosures, and have been prepared taking into account the Guidance for all sectors. The disclosure is also in accordance with FCA Listing Rule requirements.

This section provides the relevant disclosures or otherwise provides cross-references, in the following table, for where the disclosures are located elsewhere in this Report and in the 2023 Annual Report.

In preparing this TCFD disclosure we considered recent developments in global affairs and macro trends, such as:

- The acceleration of the growth of the electric vehicle market (and consequently the faster peak and decline of the hybrid vehicle market)
- The energy crisis and price gaps that appeared between regions, and, at the same time, the rapid reduction of the cost per installed kWh of renewable energy and associated massive investments plans
- The development and implementation of policies in all regions aimed at accelerating the transition to renewable sources of energy and the decarbonisation of industry

We concluded that the underlying assumptions and drivers of our scenario analysis, and the risks and opportunities that we have identified, do not require any significant modification this year.

We are aware of a growing acceptance that the 1.5°C global warming ambition will not be met, which supports the assumption in our scenario plans that the most optimistic scenario is a 2°C increase in global warming.

We are monitoring the introduction of ISSB standards in the UK and our reporting will reflect changes in the regulatory landscape.

Task Force on Climate-related Financial Disclosures (2/3)

The table sets out where you can find information on how we have applied each of the recommendations of the TCFD.

Topic		Disclosure summary	Vesuvius disclosure: Annual Report		Vesuvius disclosure: Sustainability Report	
Governance	Disclose the organisation's governance around climate-related risks and opportunities.	a Describe the Board's oversight of climate-related risks and opportunities.	*Risk, viability and going concern* *Directors' Remuneration Report*	p72–78 p108–135	*Sustainability governance*	p17, p108–109
		b Describe management's role in assessing and managing climate-related risks and opportunities.	*Risk, viability and going concern*	p72–78	*Sustainability governance*	p17, p22, p23, p108–109
Strategy	Disclose the actual and potential impacts of climate-related risks and opportunities on the organisation's businesses, strategy and financial planning where such information is material.	a Describe the climate-related risks and opportunities the organisation has identified over the short, medium and long term.			*Our planet*	p22–26
		b Describe the impact of climate-related risks and opportunities on the organisation's businesses, strategy and financial planning.	*Our external environment*	p10–13	*Our planet* *Our customers*	p21–43 p57–63, p65–66
		c Describe the resilience of the organisation's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.			*Our planet*	p27–31
Risk management	Disclose how the organisation identifies, assesses and manages climate-related risks.	a Describe the organisation's processes for identifying and assessing climate-related risks.	*Risk, viability and going concern*	p72–78	*Our planet*	p22–26
		b Describe the organisation's processes for managing climate-related risks.	*Risk, viability and going concern*	p74	*Our planet*	p22–26
		c Describe how processes for identifying, assessing and managing climate-related risks are integrated into the organisation's overall risk management.	*Risk, viability and going concern*	p72–78	*Our planet*	p22–26
Metrics and targets	Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.	a Disclose the metrics used by the organisation to assess climate-related risks and opportunities in line with its strategy and risk management process.			*Progress on our sustainability targets*	p12, p30
		b Disclose Scope 1, Scope 2 and, if appropriate, Scope 3 GHG emissions, and the related risks.			*Our planet* *Further information*	p38–43 p118–130
		c Describe the targets used by the organisation to manage climate-related risks and opportunities and performance against targets.			*Progress on our Sustainability targets* *Our planet* *Further information*	p12 p38–43, p46–50 p118–130

Task Force on Climate-related Financial Disclosures (3/3)

Climate-related risks and opportunities – methodology

Each year the Group undertakes a robust assessment of the principal and emerging risks which could have a material impact on the Group. A number of sustainability risks are recorded in this analysis (see the Risk, viability and going concern section on pages 72–76 of our Annual Report). In line with the recommendations of the TCFD, Vesuvius also undertakes a review of the key climate-related opportunities and risks that we foresee impacting the Group over the short, medium and long term. The assessment of risks and opportunities covers all Vesuvius' operations.

The Audit Committee has reviewed and approved our climate-related risk and opportunity register, and considered the significance of climate-related risks in relation to risks identified in the standard risk management process. Climate-related risks are reviewed every six months as part of the Group's standard risk management process, to ensure the register reflects any material changes in the operating environment and business strategy, and to ensure that the management of climate-related risks is integrated into our overall principal risk management framework.

The Business Units use the analysis of risks and opportunities to inform their business development priorities and focus their R&D project portfolios. They factor climate change risks and opportunities into their business planning processes, assessing the long-term impacts on profitability of both the risks and opportunities.

Greenhouse gas (GHG) reporting

We have reported to the extent reasonably practicable on all the emission sources required under Part 7 of the Accounting Regulations which fall within our Group Financial Statements.

Statutory reporting is location-based according to the GHG Protocol.

In reporting GHG emissions, we have used the GHG Protocol Corporate Accounting and Reporting Standard (revised edition) methodology to identify our location-based GHG inventory of Scope 1 (direct) and Scope 2 (indirect) CO_2e. We report in metric tonnes of CO_2 equivalent (CO_2e). We have used emission factors from the UK Government's (Defra) and the IEA GHG Conversion Factors for Company Reporting 2023 in the calculation of our GHG emissions.

Our energy-related greenhouse gas emissions, reported as carbon dioxide equivalents (CO_2e), include direct emissions of the three main GHGs (carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O)).

Process-related emissions of the following in CO_2 equivalent and in metric tonnes are not significant:

1. Direct methane CH_4 emissions
2. Direct nitrous oxide N_2O emissions

Emissions of the following in CO_2 equivalent and in metric tonnes are not significant:

1. Direct sulphur hexafluoride (SF_6) emissions
2. Direct HFC emissions
3. Direct PFC emissions

The Group also meets all its obligations in relation to the Producer Responsibility Packaging Waste regulations and the Energy Saving Opportunity Scheme by which the UK implemented the EU Energy Efficiency Directive.

All sites report their energy consumption and GHG emissions on a quarterly basis. Performance and variation are analysed, and improvement plans built accordingly.

Our energy and Scope 1 and Scope 2 GHG data covers 100% of Vesuvius' operations including the business acquired from Universal Refractories Inc in 2021, and BMC (acquired late in 2022), but excluding, for 2019 and earlier, the management joint venture with Anshan Angang Vesuvius Refractory Company Ltd which was outside of the operational control boundary.

2019 was selected as the baseline for all energy and GHG emissions data and targets, absolute and relative, as this was the last year of normal trading prior to the COVID-19 pandemic. Progress is measured against the 2019 performance.

Starting from 2022, two new sites acquired with the business of Universal Refractories in December 2021 are included. 2019 to 2021 figures were restated to include estimated energy consumption and GHG emissions of these two facilities.

In 2023, the business of BMC (Yingkou YingWei Magnesium Co.,Ltd) which was acquired late 2022 is included. 2019 to 2022 figures were restated to include estimated energy consumption and GHG emissions of this site.

Energy consumption and GHG emissions

Fuel consumption, emissions and normalised emissions for the main fuels consumed across the Group (location-based (Operational Control Boundary) statutory reporting)

The absolute values of the energy consumed and the location-based CO_2e emissions reduced in 2023, as well as energy intensity and emission intensity per metric tonne of product packed for shipment.

In 2023, the Group's normalised energy consumption decreased by 12.7% to 1,054 kWh per metric tonne (2022: 1,207). Location-based emissions decreased by 27.4% to 0.310 metric tonnes of CO_2e per metric tonne of product packed for shipment (2022: 0.426) and market-based emissions decreased by 35.5% to 0.245 metric tonnes of CO_2e per metric tonne of product packed for shipment (2022: 0.380).

A significant reduction in CO_2e resulted from reductions in the production of dolime following the incident in January 2023, which incapacitated one of our rotary kilns. The remaining decreases were primarily driven by changes in production volumes and product mix. Natural gas use decreased by 8%, electricity consumption by 4% and coal (a CO_2 intensive fuel) consumption by 67%, to 8,900 metric tonnes (2022: 27,231 metric tonnes).

During 2023, the Group also consumed 287 cubic metres of diesel (-1.8% on 2022: 292) primarily in the operation of forklift trucks on its sites, and 165 cubic metres of fuel oil, an increase of 0.2% (2022: 164.8). In total, 482 cubic metres of oil was used as fuel in 2023 (5.5% up on 2022: 457).

Location-based statutory reporting of global GHG emissions (metric tonnes CO_2e) and energy consumption ('000 kWh) by type of fuel and emission

Fuel and emission category	Energy used '000 kWh 2023	Energy used '000 kWh 2022	% change	CO_2e '000 metric tonnes 2023	CO_2e '000 metric tonnes 2022	% change	CO_2 metric tonne per metric tonne of product 2023	CO_2e metric tonnes per metric tonne of product 2022	% change
Coal	**66,659**	202,272	-67	**21.5**	65.7	-67	**0.025**	0.073	-65
Electricity	**194,295**	202,010	-4	**92.4**	96.6	-4	**0.109**	0.108	1
Ext. heat	**2,317**	3,849	-40	**0.7**	1.2	-42	**0.001**	0.001	-38
LPG	**68,324**	64,932	5	**14.7**	13.9	5	**0.017**	0.016	11
Natural gas	**556,204**	605,421	-8	**101.7**	110.5	-8	**0.120**	0.123	-3
Other fuels	**5,331.11**	5,131.91	4	**1.3**	1.3	3	**0.002**	0.001	9
Total fuels	**893,130**	1,083,616	-18	**232.4**	289.2	-20	**0.274**	0.322	-15
Non-fuel process emissions				**29.6**	91.3	-68	**0.035**	0.098	-64
Fugitive emissions				**1.0**	2.2	-53	**0.001**	0.002	-48
Total	**893,130**	1,083,616	-18	**263.0**	382.7	-31	**0.310**	0.422	-27

Notes:
– All fuel consumption is converted to '000 kWh for reporting.
– In 2023, the Group consumed 50,564 thousand m^3 of natural gas (2022: 50,038).
– Vesuvius does not use any alternative fuels (% used zero).
– Heat from biomass 0.02% (2022: 0.01%).
– Fugitive emissions are leaks of greenhouse gases, for example from refrigeration and air-conditioning units. See Further information for details.
– Location-based Statutory Reporting of Global GHG emissions (metric tonnes of CO_2e) and energy consumption ('000 kWh). (Operational Control Boundary).
– The business of Universal Refractories Inc (Vesuvius Penn Corporation) which was acquired in 2021, is included in 2022 and onwards. BMC (Yingkou YingWei Magnesium Co.,Ltd), which was acquired late 2022 is included in 2023 and onwards.

Energy consumption and GHG emissions

Energy consumption and energy intensity (re-baselined using pre-acquisition data for the business of Universal Refractories, Inc and BMC)[1,2]

	2023 vs 2019 pro forma	2023 vs 2019	2023 pro forma	2023	2022	2021	2020	2019
Total energy consumption (million kWh)				896	1,085	1,189	1,056	1,205
Energy intensity per metric tonne of product packed for shipment (kWh/MT)	-7.2%	-14.6%	1,145	1,054	1,161	1,118	1,173	1,234

1. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co.,Ltd) from 2019 onwards.
2. Pro forma: performance as if the dolime process had been operating normally in 2023 (based on the average output and performance of 2019 to 2022).

Vesuvius plc long-term energy consumption and energy intensity (aggregate of Scope 1 and Scope 2)[1,2,3]

	2023 pro forma	2023	2022	2021	2020	2019
Total energy consumption (million kWh)		896	1,084	1,159	1,026	1,176
Energy intensity per metric tonne of product packed for shipment (kWh/MT)	1,145	1,054	1,207	1,177	1,243	1,293

1. The business of Universal Refractories Inc (Vesuvius Penn Corporation) which was acquired in 2021, is included in 2022 and onwards. BMC (Yingkou YingWei Magnesium Co.,Ltd), which was acquired late 2022 is included in 2023 and onwards.
2. The numbers are collated from entities within the Group's Operational Control Boundary.
3. Pro forma: performance if the dolime process had been operating normally in 2023.

Global electricity and energy from renewable sources usage[1]

	2023	2022	2021	2020	2019
Total electricity consumption ('000 kWh)	194,295	203,251	214,709	201,963	221,406
Electricity from non-renewable sources ('000 kWh)	49,124	72,097	107,812	123,425	139,265
Electricity from non-renewable sources (% of total)	29%	42%	60%	71%	74%
Electricity from non-CO_2 emitting sources ('000 kWh)	145,171	131,154	106,897	78,538	82,141
Electricity from non-CO_2 emitting sources (% of total)	75%	65%	50%	39%	37%
Electricity from renewable sources ('000 kWh)	138,426	118,707	86,657	58,023	56,834
Electricity from renewable sources (% of total)	71%	58%	40%	29%	26%
Energy from renewable sources ('000 kWh)	138,520	118,863	86,812	58,161	57,010

1. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co., Ltd) from 2019 onwards.

Five-year evolution of Scope 1 and Scope 2 CO_2e emissions (market-based) – (re-baselined using pre-acquisition data for the business of Universal Refractories, Inc and BMC)[1,2]

	2023 pro forma vs 2019	2023 vs 2019	2023 pro forma	2023	2022	2021	2020	2019
CO_2e '000 metric tonnes				207,875	341,499	401,216	371,919	438,403
CO_2e metric tonnes per metric tonne of product packed for shipment	-20.2%	-45.5%	0.358	0.245	0.366	0.377	0.413	0.449
CO_2e metric tonnes per million £ revenue (Scope 1 & 2)	-36.3%	-59.9%	171.36	107.72	171.43	240.07	262.42	268.94

1. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co.,Ltd) from 2019 onwards.
2. Pro forma: performance as if the dolime process had been operating normally in 2023 (based on the average output and performance of 2019 to 2022).

Energy consumption and GHG emissions

Only 1.5% of the total energy requirements across the Group are consumed in the UK, producing 1.0% of the Group's CO_2e location-based emissions.

Global GHG emissions and energy consumption location-based statutory reporting (Operational Control Boundary)[1,2,3,4,5,6]

Emissions and energy sources	UK and Offshore CO_2e '000 metric tonnes 2023	Global CO_2e '000 metric tonnes 2023	Proportion relating to the UK and Offshore Area	UK and Offshore CO_2e '000 metric tonnes 2022	Global CO_2e '000 metric tonnes 2022	Proportion relating to the UK and Offshore Area	UK and Offshore energy used '000 kWh 2023	Global energy used '000 kWh 2023	Proportion relating to the UK and Offshore Area	UK and Offshore energy used '000 kWh 2022	Global energy used '000 kWh 2022	Proportion relating to the UK and Offshore Area
Combustion of fuel and operation of facilities including fugitive emissions (Scope 1)												
	2.150	170	1.3%	2.266	285	0.8%	11,343	699,011	1.6%	11,839	877,757	1.3%
Electricity, heat, steam and cooling purchased for own use (Scope 2)												
	0.385	93	0.4%	0.554	98	0.6%	1,905	196,612	1.0%	2,740	205,859	1.3%
Total GHG emissions and energy												
	2.535	263	1.0%	2.819	383	0.7%	13,248	895,622	1.5%	14,578	1,083,616	1.3%
Change												
	-10.1%	-31.3%					-9.1%	-17.3%				

Vesuvius' chosen intensity measurement (location-based statutory reporting)[1,2]	Metric tonnes CO_2e per metric tonne of product packed for shipment				kWh of energy per metric tonne of product packed for shipment			
	UK and Offshore 2023	Global 2023	UK and Offshore 2022	Global 2022	UK and Offshore 2023	Global 2023	UK and Offshore 2022	Global 2022
CO_2e emissions intensity and energy intensity	3.505	0.310	4.090	0.426	18,315	1,054	21,150	1,207
Change	-14.3%	-27.4%			-13.4%	-12.7%		

	Metric tonnes of CO_2e per £m revenue			
	UK and Offshore 2023	Global 2023	UK and Offshore 2022	Global 2022
Total GHG emissions as metric tonnes CO_2e per £m revenue (location-based)	20.6	136.3	22.2	192.1
Change	-7.0%	-29.0%		

1. Location-based Statutory Reporting of Global GHG emissions (metric tonnes of CO_2e) and energy consumption ('000 kWh). The numbers are collated from entities within the Group's Operational Control Boundary.
2. The business of Universal Refractories Inc (Vesuvius Penn Corporation) which was acquired in 2021, is included in 2022 and onwards. BMC (Yingkou YingWei Magnesium Co., Ltd), which was acquired in late 2022 is included in 2023 and onwards.
3. In reporting GHG emissions, we have used the GHG Protocol Corporate Accounting and Reporting Standard (revised edition) methodology to identify our location-based GHG inventory of Scope 1 (direct) and Scope 2 (indirect) CO_2e. We report in metric tonnes of CO_2 equivalent (CO_2e). We have used emission factors from the UK Government's (Defra) and the IEA GHG Conversion Factors for Company Reporting 2023 in the calculation of our GHG emissions.
4. Our energy-related greenhouse gas (GHG) emissions, reported as carbon dioxide equivalents (CO_2e), include direct emissions of the three main GHGs (carbon dioxide (CO_2), methane (CH_4) and nitrous oxide N_2O).
5. Process related emissions of the following in CO_2 equivalent and in metric tonnes are not significant: Direct methane CH_4 emissions and Direct nitrous oxide N_2O emissions.
6. Emissions of the following in CO_2 equivalent and in metric tonnes are not significant: Direct sulphur hexafluoride (SF_6) emissions; Direct HFC emissions; and Direct PFC emissions.

Energy consumption and GHG emissions

Scope 1, Scope 2 and Scope 3 emissions (market-based)[1,2]

In 2023, Vesuvius' total Scope 1, Scope 2 and Scope 3 CO_2e emissions were 1,589,332 metric tonnes.

	2023		2022		2021		2020		2019	
Metric tonnes CO_2e	Metric tonnes	%[1]	Metric tonnes	%[1]	Metric tonnes	%	Metric tonnes	%	Metric tonnes	%
Scope 1 process CO_2e emissions	**29,637**	**1.9**	91,276	5.5	101,121	5.1	88,516	5.3	106,737	6.0
Scope 1 energy CO_2e emissions	**139,241**	**8.8**	191,396	11.5	208,192	10.4	182,660	10.9	214,845	12.1
Scope 1 fugitive emissions	**1,037**	**0.1**	2,207	0.1	1,398	0.1	1,080	0.1	992	0.1
Scope 1 CO_2e emissions	**169,914**	**10.7**	284,879	17.2	310,710	15.5	272,257	16.2	322,573	18.2
Scope 2 CO_2e emissions (market-based)	**37,961**	**2.4**	55,861	3.4	83,175	4.2	92,360	5.5	108,631	6.1
Scope 3 CO_2e emissions	**1,381,457**	**86.9**	1,318,207	79.5	1,605,873	80.3	1,311,807	78.3	1,341,498	75.7
Total	**1,589,332**	**100**	1,658,947	100	1,999,759	100	1,676,424	100	1,772,702	100

1. The business of Universal Refractories Inc (Vesuvius Penn Corporation) which was acquired in 2021, is included in 2022 and onwards. BMC (Yingkou YingWei Magnesium Co., Ltd), which was acquired in late 2022 is included in 2023 and onwards.
2. The numbers are collated from entities within the Group's Operational Control Boundary.

Scope 1, Scope 2 and Scope 3 emissions market-based (re-baselined using pre-acquisition data for the business of Universal Refractories, Inc – Vesuvius Penn Corporation and BMC - Yingkou YingWei Magnesium Co.,Ltd)[1,2]

	2023		2022		2021		2020		2019	
Metric tonnes CO_2e	Metric tonnes	%	Metric tonnes	%	Metric tonnes	%	Metric tonnes	%	Metric tonnes	%
Scope 1 CO_2e emissions	**169,914**	**10.69**	284,898	17.17	314,843	15.69	276,403	16.42	326,718	18.36
Scope 1 process CO_2e emissions	**29,637**	**1.86**	91,276	5.50	101,121	5.04	88,516	5.26	106,737	6.00
Scope 1 energy CO_2e emissions[2]	**139,241**	**8.76**	191,415	11.53	212,324	10.58	186,806	11.09	218,989	12.30
Scope 1 fugitive emissions	**1,037**	**0.07**	2,207	0.13	1,398	0.07	1,080	0.06	992	0.06
Scope 2 CO_2e emissions (market-based)	**37,961**	**2.39**	56,602	3.41	86,374	4.30	95,516	5.67	111,685	6.27
Scope 3 CO_2e emissions	**1,381,457**	**86.92**	1,318,207	79.42	1,605,873	80.01	1,311,807	77.91	1,341,498	75.37
Total	**1,589,332**	**100.00**	1,659,707	100.00	2,007,089	100.00	1,683,726	100.00	1,779,901	100.00

1. Scope 1 and Scope 2 re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co.,Ltd) from 2019 onwards.
2. Scope 3 based on historic data.

Scope 1, Scope 2 CO_2e emissions and emissions intensity by type (market-based)[1,2]

	2023 vs 2019 pro forma	2023 vs 2019	2023 pro forma	2023	2022	2021	2020	2019
Total energy CO_2e emissions in metric tonnes				**207,875**	341,499	401,216	371,919	438,403
Energy CO_2e intensity in metric tonnes per metric tonne of product packed for shipment	**-25.40%**	**-38.40%**	**0.252**	**0.209**	0.265	0.281	0.314	0.339
Process CO_2e intensity in metric tonnes per metric tonne of product packed for shipment	**-4.10%**	**-68.10%**	**0.105**	**0.035**	0.098	0.095	0.098	0.109

1. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co.,Ltd) from 2019 onwards.
2. Pro forma: performance as if the dolime process had been operating normally in 2023 (based on the average output and performance of 2019 to 2022).

Energy consumption and GHG emissions

Scope 1 Direct emissions by GHG type (re-baselined using pre-acquisition data for the business of Universal Refractories, Inc – Vesuvius Penn Corporation and BMC – Yingkou YingWei Magnesium Co.,Ltd)[1]

Energy/emission type	Scope 1 emissions in metric tonnes CO_2e	2023	2022	2021	2020	2019
Industrial coal	Total	**21,506**	65,666	72,764	65,586	76,354
	of CO_2	**21,286**	64,961	71,981	64,884	75,553
	of CH_4	**69**	186	206	266	213
	of N_2O	**152**	518	576	435	588
Diesel (average biofuel blend)	Total	**721**	762	902	696	1,061
	of CO_2	**712**	751	888	686	1,047
	of CH_4	**0**	0	0	0	0
	of N_2O	**9**	11	13	10	14
Fuel oil	Total	**524**	523	498	393	559
	of CO_2	**522**	521	496	392	557
	of CH_4	**1**	1	1	1	1
	of N_2O	**1**	1	1	1	1
Light diesel oil	Total	**76**	–	–	–	–
	of CO_2	**75**	–	–	–	–
	of CH_4	**0**	–	–	–	–
	of N_2O	**1**	–	–	–	–
LPG	Total	**14,655**	13,932	16,728	13,344	14,336
	of CO_2	**14,634**	13,912	16,705	13,325	14,317
	of CH_4	**13**	11	13	10	9
	of N_2O	**8**	8	10	9	9
Natural gas	Total	**101,746**	110,514	121,419	106,784	121,927
	of CO_2	**101,541**	110,302	121,187	106,580	121,701
	of CH_4	**156**	151	166	145	159
	of N_2O	**49**	61	66	58	66
Petrol (average biofuel blend)	Total	**13**	18	13	4	7
	of CO_2	**13**	18	13	4	7
	of CH_4	**0**	0	0	0	0
	of N_2O	**0**	0	0	0	0
Coke oven gas	Total	**–**	–	–	–	4,745
	of CO_2	**–**	–	–	–	4,745
	of CH_4	**–**	–	–	–	–
	of N_2O	**–**	–	–	–	–
Process CO_2	Total	**29,637**	91,276	101,121	88,516	106,737
	of CO_2	**29,637**	91,276	101,121	88,516	106,737
	of CH_4	**–**	–	–	–	–
	of N_2O	**–**	–	–	–	–
Fugitive emissions	Total	**1,037**	2,207	1,398	1,080	992
	of CO_2	**1,037**	2,207	1,398	1,080	992
	of CH_4	**–**	–	–	–	–
	of N_2O	**–**	–	–	–	–
Total	Total	**169,914**	284,898	314,843	276,403	326,718
	of CO_2	**138,781**	190,466	211,271	185,872	217,927
	of CH_4	**238**	349	386	422	383
	of N_2O	**221**	600	667	513	679

1. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co., Ltd) from 2019 onwards.

Energy consumption and GHG emissions

Scope 1 Direct emissions by GHG type (location-based, statutory reporting)[1]

Energy/emission type	Scope 1 emissions in metric tonnes CO_2e	2023	2022	2021	2020	2019
Industrial coal	Total	**21,506**	65,666	72,764	65,586	76,354
	of CO_2	**21,286**	64,961	71,981	64,884	75,553
	of CH_4	**69**	186	206	266	213
	of N_2O	**152**	518	576	435	588
Diesel (average biofuel blend)	Total	**721**	747	883	679	1,045
	of CO_2	**712**	737	870	669	1,031
	of CH_4	**0**	0	0	0	0
	of N_2O	**9**	11	13	9	14
Fuel oil	Total	**524**	523	498	393	559
	of CO_2	**522**	521	496	392	557
	of CH_4	**1**	1	1	1	1
	of N_2O	**1**	1	1	1	1
Light diesel oil	Total	**76**	–	–	–	–
	of CO_2	**75**	–	–	–	–
	of CH_4	**0**	–	–	–	–
	of N_2O	**1**	–	–	–	–
LPG	Total	**14,655**	13,927	16,597	13,213	14,206
	of CO_2	**14,634**	13,908	16,574	13,194	14,187
	of CH_4	**13**	11	13	10	9
	of N_2O	**8**	8	10	9	9
Natural gas	Total	**101,746**	110,514	117,436	102,785	117,929
	of CO_2	**101,541**	110,302	117,212	102,590	117,711
	of CH_4	**156**	151	160	140	154
	of N_2O	**49**	61	64	56	64
Petrol (average biofuel blend)	Total	**13**	18	13	4	7
	of CO_2	**13**	18	13	4	7
	of CH_4	**0**	0	0	0	0
	of N_2O	**0**	0	0	0	0
Coke oven gas	Total	**–**	–	–	–	4,745
	of CO_2	**–**	–	–	–	4,745
	of CH_4	**–**	–	–	–	–
	of N_2O	**–**	–	–	–	–
Process CO_2	Total	**29,637**	91,276	101,121	88,516	106,737
	of CO_2	**29,637**	91,276	101,121	88,516	106,737
	of CH_4	**–**	–	–	–	–
	of N_2O	**–**	–	–	–	–
Fugitive emissions	Total	**1,037**	2,207	1,398	1,080	992
	of CO_2	**1,037**	2,207	1,398	1,080	992
	of CH_4	**–**	–	–	–	–
	of N_2O	**–**	–	–	–	–
Total	Total	**169,914**	284,879	310,710	272,257	322,573
	of CO_2	**138,781**	190,447	207,146	181,734	213,791
	of CH_4	**238**	349	381	416	378
	of N_2O	**221**	600	665	510	677

1. 2023 includes the business of Universal Refractories Inc (Vesuvius Penn Corporation) which was acquired in 2021 and BMC (Yingkou YingWei Magnesium Co.,Ltd), which was acquired late 2022.

Energy consumption and GHG emissions

Fugitive emissions – coolants and refrigerants[1,2]

Metric tonnes CO_2e	2023	2022	2021	2020	2019
HCFC-141b	4	–	–	–	39
HCFC-22/R22 = chlorodifluoromethane	674	1,108	814	579	653
HFC-134	1	2	1	–	38
HFC-134a	24	11	305	179	92
HFC-32	1	4	4	2	2
Nitrous oxide	–	–	–	–	5
R401A	67	31	–	–	–
R404A	16	46	27	68	53
R407A	72	4	4	–	–
R407C	82	160	37	12	20
R410A	95	398	149	128	90
R422B	–	442	59	111	–
Total	**1,037**	2,207	1,398	1,080	992

1. Emissions of the following in CO_2 equivalent and in metric tonnes are not significant:
   a. Direct sulphur hexafluoride (SF_6) emissions
   b. Direct HFC emissions
   c. Direct PFC emissions
2. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co.,Ltd) from 2019 onwards.

CO_2e emissions Scope 1, 2 and 3

CO_2e emissions Scope 1, 2 and 3 (market based)[1,2,3,4]

	2023		2022		2021		2020		2019	
Metric tonnes CO_2e	tCO_2e	%	tCO_2e	%	tCO_2e	%	tCO_2e	%	tCO_2e	%
Scope 1: natural gas, coal, LPG, company car travel, process emissions, fugitive emissions	**169,914**	**10.7%**	284,879	17.2%	310,710	15.5%	272,257	16.2%	322,573	18.2%
Scope 2: purchased electricity market based	**37,961**	**2.4%**	55,861	3.4%	83,175	4.2%	92,360	5.5%	108,631	6.1%
Scope 3: business travel, electricity transmission & distribution; waste, supply chain (purchased goods and services) and capital goods	**1,381,457**	**86.9%**	1,318,207	79.5%	1,605,873	80.3%	1,311,807	78.3%	1,341,498	75.7%
Total CO_2e emissions	**1,589,332**	**100.0%**	1,658,947	100.0%	1,999,759	100.0%	1,676,424	100.0%	1,772,702	100.0%

CO_2e emissions Scope 1, 2 and 3 (location based)[1,2,3,4]

	2023		2022		2021		2020		2019	
Metric tonnes CO_2e	tCO_2e	%	tCO_2e	%	tCO_2e	%	tCO_2e	%	tCO_2e	%
Scope 1: natural gas, coal, LPG, company car travel, process emissions, fugitive emissions	**169,914**	**10.3%**	284,879	16.7%	310,710	15.4%	272,257	16.2%	322,573	18.2%
Scope 2: purchased electricity location based	**93,134**	**5.7%**	97,843	5.8%	102,653	5.1%	93,447	5.6%	109,683	6.2%
Scope 3: business travel, electricity transmission & distribution; waste, supply chain (purchased goods and services) and capital goods	**1,381,457**	**84.0%**	1,318,207	77.5%	1,605,873	79.5%	1,311,807	78.2%	1,341,498	75.6%
Total CO_2e emissions	**1,644,504**	**100.0%**	1,700,929	100.0%	2,019,237	100.0%	1,677,511	100.0%	1,773,754	100.0%

1. The business of Universal Refractories Inc (Vesuvius Penn Corporation) which was acquired in 2021, is included in 2022 and onwards. BMC (Yingkou YingWei Magnesium Co.,Ltd), which was acquired late 2022 is included in 2023 and onwards.
2. Operational Control Boundary.
3. Conversion factors for GHG emissions and energy used the 2023 UK Government GHG Conversion Factors for Company Reporting. Conversion factors for GHG emissions for electricity globally used the IEA Emission Factors 2023.
4. Calculation of Scope 3 GHG emissions used the Carbon Footprint Limited Sustrax system for years 2019–2023.

CO_2e emissions Scope 1, 2

CO_2e emissions intensity (market based and location based)[1,2,3]

Metric tonnes of CO_2e per metric tonne of product packed for shipment	2023 MT/MT	2022 MT/MT	2021 MT/MT	2020 MT/MT	2019 MT/MT
CO_2e emissions intensity (market based)	**0.245**	0.380	0.400	0.442	0.474
CO_2e emissions intensity (location based)	**0.310**	0.426	0.420	0.443	0.475

Energy consumption Scope 1 and 2[1,2,3]

Energy consumption kWh	2023 kWh	2023 %	2022 kWh	2022 %	2021 kWh	2021 %	2020 kWh	2020 %	2019 kWh	2019 %
Scope 1: Energy consumption	**699,010,686**	**78.0%**	877,757,259	81.0%	949,035,812	81.9%	829,616,697	80.8%	958,190,599	81.5%
Scope 2: Energy consumption	**196,611,670**	**22.0%**	205,858,996	19.0%	210,414,774	18.1%	196,764,804	19.2%	217,718,707	18.5%
Total energy consumption	**895,622,356**	**100.0%**	1,083,616,256	100.0%	1,159,450,586	100.0%	1,026,381,501	100.0%	1,175,909,306	100.0%

Energy intensity Scope 1 and 2[1,2,3]

kWh of energy per metric tonne of product packed for shipment	2023 kWh/MT	2022 kWh/MT	2021 kWh/MT	2020 kWh/MT	2019 kWh/MT
Scope 1 and 2: Energy intensity	**1,054**	1,207	1,177	1,243	1,293

1. The business of Universal Refractories Inc (Vesuvius Penn Corporation) which was acquired in 2021, is included in 2022 and onwards. BMC (Yingkou YingWei Magnesium Co.,Ltd), which was acquired late 2022 is included in 2023 and onwards.
2. Operational Control Boundary.
3. Conversion factors for GHG emissions and energy used the 2023 UK Government GHG Conversion Factors for Company Reporting. Conversion factors for GHG emissions for electricity globally used the IEA Emission Factors 2023.

Energy consumption and GHG emissions

Scope 3 emissions[1,2,3,4,5,6]

	2023[2]		2022[2]		2021		2020		2019	
Metric tonnes CO_2e	Metric tonnes	%	Metric tonnes	%	Metric tonnes	%	Metric tonnes	%	Metric tonnes	%
Purchased goods and services	**1,066,129**	**77**	1,038,969	79	1,342,387	84	1,104,823	84	1,127,065	84
Capital goods	**39,992**	**3**	33,369	3	22,007	1	19,818	2	25,087	2
Fuel- and energy-related activities (not included in Scope 1 or 2)	**37,088**	**3**	45,551	3	50,931	3	36,845	3	42,332	3
Upstream transportation and distribution	**39,086**	**3**	45,572	3	39,887	2	23,946	2	26,104	2
Waste generated in operations	**15,228**	**1**	15,364	1	14,428	1	11,961	1	3,632	0
Business travel	**11,443**	**1**	9,578	1	5,128	0	4,670	0	10,724	1
Employee commuting	**20,374**	**1**	21,253	2	21,653	1	21,561	2	22,303	2
Upstream leased assets	**0**	**0**	0	0	0	0	0	0	0	0
Downstream transportation and distribution	**80,896**	**6**	38,899	3	34,912	2	23,529	2	25,700	2
Processing of sold products	**14,924**	**1**	15,779	1	14,078	1	13,902	1	14,371	1
Use of sold products	**34,194**	**2**	32,914	2	37,460	2	31,834	2	39,645	3
End-of-life treatment of sold products	**22,103**	**2**	20,959	2	23,002	1	18,918	1	4,535	0
Downstream leased assets	**0**	**0**	0	0	0	0	0	0	0	0
Franchises	**0**	**0**	0	0	0	0	0	0	0	0
Investments	**0**	**0**	0	0	0	0	0	0	0	0
Total Scope 3 CO_2e emissions	**1,381,457**	**100**	1,318,207	100	1,605,873	100	1,311,807	100	1,341,498	100

1. In 2023, the GHG Protocol managed Quantis Scope 3 evaluator tool was withdrawn, so Vesuvius now utilises the Sustrax platform, which offers the possibility to evaluate Scope 3 emissions at a greater level of detail. The Sustrax tool relies on the UK Government Defra methodology, categories, and emission conversion factors. Wherever possible we used activity data which relies on information that is specific to the organisation, and therefore is much more accurate than the spend base method. Our Scope 3 emissions for the 2019 to 2022 period were re-evaluated using the improved new approach to ensure comparability over time.
2. The business of Universal Refractories Inc (Vesuvius Penn Corporation) which was acquired in 2021, is included in 2022 and onwards. BMC (Yingkou YingWei Magnesium Co., Ltd), which was acquired late 2022 is included in 2023 and onwards.
3. The numbers are collated from entities within the Group's Operational Control Boundary.
4. Conversion factors for GHG emissions and energy used the 2023 UK Government GHG Conversion Factors for Company Reporting. Conversion factors for GHG emissions for electricity globally used the IEA Emission Factors 2023.
5. Calculation of Scope 3 GHG emissions used the Carbon Footprint Limited Sustrax system for years 2019–2023.
6. Scope 3 2023 Upstream subtotal 1,229,340 metric tonnes (89%) Downstream subtotal metric tonnes 152,117 (11%).

Energy consumption and GHG emissions

Scope 3 reporting – comments on methodology

In 2023, Vesuvius stopped using the GHG Protocol managed Quantis Scope 3 evaluator tool as it was withdrawn, and instead implemented the Sustrax platform, which we believe to be more accurate as it has the potential to evaluate Scope 3 emissions at a greater level of detail.

The Sustrax tool relies on the UK Government Defra (formerly DBEIS) methodology, categories, and emission conversion factors.

Wherever possible we used activity data which relies on information that is specific to the organisation, and therefore is much more accurate than the spend base method.

Our Scope 3 emissions of the 2019 to 2022 period were re-evaluated using the improved new approach to ensure comparability over time.

Upstream / downstream	GHG Scope 3 category	Comments on the Scope 3 reporting category
Upstream	Purchased goods and services	Applies to raw materials split into more than 70 categories, each with average CO_2e emissions factors derived from supplier data, databases or publicly available information. More than half of the emissions come from the three categories of materials that undergo high-temperature processes after mining (deadburned magnesia, fused magnesia, silicon carbide).
	Capital goods	Spend based method.
	Fuel and energy-related activities, not included in Scope 1 and Scope 2	Defra Well To Tank (WTT) conversion factors applied to the quantity of energy and water consumed.
	Upstream transportation and distribution	For the 2019–2022 period, spend based method used in the absence of activity data. For 2023, CO_2 emissions data received from our forwarders covered 45% of our transportation spend; operational data and Defra conversion factors were used to evaluate CO_2 emissions covering 43% of our transportation spend; the remainder (12%) was estimated based on spend and Defra conversion factors.
	Waste generated in operations	Defra conversion factor for landfill applied to the waste tonnage reported by all manufacturing sites. Defra methodology and conversion factors were changed between 2019 and 2020.
	Business travel	Spend based method. Travel and entertainment spend extracted from financial systems, estimated to be 50% generated by travel and 50% by accommodation services.
	Employee commuting	Collective transportation of 1,000 employees and directly supervised contractors is organised by Vesuvius. Based on survey, the remainder assumed to commute 20 miles daily using petrol-fuelled medium-sized light vehicles.
	Upstream leased assets	None. All offices reported under Scope 1 and Scope 2.

Energy consumption and GHG emissions

Scope 3 reporting – comments on methodology

In 2023, Vesuvius stopped using the GHG Protocol managed Quantis Scope 3 evaluator tool as it was withdrawn, and instead implemented the Sustrax platform, which we believe to be more accurate as it has the potential to evaluate Scope 3 emissions at a greater level of detail.

The Sustrax tool relies on the UK Government Defra (formerly DBEIS) methodology, categories, and emission conversion factors.

Wherever possible we used activity data which relies on information that is specific to the organisation, and therefore is much more accurate than the spend base method.

Our Scope 3 emissions of the 2019 to 2022 period were re-evaluated using the improved new approach to ensure comparability over time.

Upstream / downstream	GHG Scope 3 category	Comments on the Scope 3 reporting category
Downstream	Downstream transportation	For the 2019–2022 period, spend based method used in the absence of activity data. For 2023, CO_2 emissions data received from our forwarders covered 45% of our transportation spend; operational data and Defra conversion factors were used to evaluate CO_2 emissions covering 43% of our transportation spend; the remainder (12%) was estimated based on spend and Defra conversion factors.
	Processing of sold products	Spend based method. Based on internal survey, covers products sold by Vesuvius requiring customer processing (preheating or drying) during installation or before usage by the customer. Total spend extrapolated from the actual energy consumption and spend measured at selected customers.
	Use of sold products	Our products are used by customers whose processes emit significant amounts of CO_2. They serve to contain and protect liquid metal and manage its flow, but do not participate in the heating operations or chemical reactions that lead to CO_2 emissions. Emissions associated with the processing or use of our products are hence very limited. More specifically: Refractory materials do not require energy during their use; having undergone high-temperature processes during their manufacturing, they are inert and do not release any greenhouse gases during their use. Some non-refractory products contain chemicals, which will be partially burnt during usage by our customers. Direct emissions from the partial burning of one family of non-refractory products was estimated. The calculated emission factor was applied to all non-refractory products.
	End of life of sold products	More than 95% of revenue is generated by the sale of consumable products. We estimate that 33% of the consumable products is consumed in the customers' process, 25% is recycled internally by customers, 37% is recycled externally, and 5% is disposed of in landfilling. The Defra emission factor for landfill is applied to this tonnage. Less than 5% of revenue is generated by the sale of capital goods which are disposed of as scrap steel or recycled.
	Downstream leased assets	None.
	Franchises	None.
	Investments	Minority share in one electronic and software company with fewer than ten employees is considered de minimus.

Energy consumption and GHG emissions

Scope 3 emissions comparison – Sustrax system and Quantis tool[1,2]

	2023	2022		2021		2020		2019	
Metric tonnes	Sustrax	Quantis	Sustrax	Quantis	Sustrax	Quantis	Sustrax	Metric tonnes	%
Purchased goods and services	**1,066,129**	1,038,969	1,137,416	1,342,387	1,159,810	1,104,823	871,993	1,127,065	1,039,766
Capital goods	**39,992**	33,369	87,043	22,007	62,004	19,818	53,736	25,087	68,461
Fuel- and energy-related activities (not included in Scope 1 or 2)	**37,088**	45,551	82,523	50,931	94,274	36,845	86,544	42,332	102,374
Upstream transportation and distribution	**39,086**	45,572	51,231	39,887	48,791	23,946	30,762	26,104	31,937
Waste generated in operations	**15,228**	15,364	7,926	14,428	5,833	11,961	5,660	3,632	6,312
Business travel	**11,443**	9,578	26,810	5,128	15,488	4,670	13,574	10,724	31,373
Employee commuting	**20,374**	21,253	20,400	21,653	20,400	21,561	20,400	22,303	20,400
Upstream leased assets	**–**	–	6,375	–	6,375	–	6,375	–	6,375
Downstream transportation and distribution	**80,896**	38,899	37,537	34,912	37,761	23,529	25,770	25,700	27,231
Processing of sold products	**14,924**	15,779	32,794	14,078	32,794	13,902	32,794	14,371	29,875
Use of sold products	**34,194**	32,914		37,460		31,834		39,645	
End-of-life treatment of sold products	**22,103**	20,959		23,002		18,918		4,535	
Downstream leased assets	**–**	–		–		–		–	
Franchises	**–**	–		–		–		–	
Investments	**–**	–		–		–		–	
Total	**1,381,457**	1,318,207	1,490,055	1,605,873	1,483,530	1,311,807	1,147,608	1,341,498	1,364,104

1. The business of Universal Refractories Inc (Vesuvius Penn Corporation) which was acquired in 2021, is included in 2022 and onwards. BMC (Yingkou YingWei Magnesium Co.,Ltd), which was acquired late 2022 is included in 2023 and onwards.
2. Operational Control Boundary.

Raw materials and waste

Raw materials and waste[1,2,3]

Manufacturing site raw materials & waste/(metric tonnes)	2023	2022	2021	2022 vs 2021	2020	2019	2023 vs 2019
Raw materials							
Recycled materials used (from external sources)	**65,497**	66,137	76,482	-1.0%	57,035	68,373	-4.2%
Recovered materials used (from external sources)	**0**	0	0	0.0%	0	0	0.0%
Raw materials and intermediates used excluding recycled (from external sources)	**931,970**	1,071,494	1,210,339	-13.0%	1,015,865	1,136,024	-18.0%
Total raw materials and intermediates used	**997,467**	1,137,631	1,286,821	-12.3%	1,072,900	1,204,398	-17.2%
% recycled materials (from external sources)	**6.5%**	5.8%	5.9%	12.8%	5.3%	5.7%	15.2%
% recovered materials (from external sources)	**0%**	0%	0%	0.0%	0%	0%	0.0%
Waste (solid waste, by-products and wastewater)							
Solid waste and by-products	**53,700**	67,937	60,722	-21.0%	60,788	80,209	-33.0%
Ratio of solid waste and by-products in metric tonnes per tonne of product packed for shipment	**0.063**	0.073	0.057	-13.1%	0.068	0.082	-23.0%
Total non-recycled waste (solid waste, hazardous and sent to landfill)	**28,543**	**32,954**	**32,399**	**-13.4%**	**27,604**	**37,894**	**-24.7%**
– Non-hazardous waste	**24,236**	28,179	28,377	-14.0%	23,997	33,089	-26.8%
– Tailings waste	**0**	0	0	0.0%	0	0	0.0%
– Hazardous waste	**4,307**	4,775	4,022	-9.8%	3,608	4,805	-10.4%
– Toxic waste	**22**	20	51	10.3%	32	7	203.7%
– Other hazardous waste	**4,284**	4,755	3,971	-9.9%	3,575	4,798	-10.7%
– Ratio of hazardous waste to total solid waste	**15.1%**	14.5%	12.4%	4.1%	13.1%	12.7%	19.0%
Ratio of solid waste per tonne of product packed for shipment (in metric tonnes)	**0.034**	0.035	0.030	-4.8%	0.031	0.039	-13.4%
By-products (recycled waste)	**25,158**	34,983	28,322	-28.1%	33,184	42,315	-40.5%
Ratio of by-products per tonne of product packed for shipment (in metric tonnes)	**0.030**	0.037	0.027	-20.9%	0.037	0.043	-31.6%
Wastewater[1]	**223,767**	240,605	266,944	-7.0%	245,906	267,922	-16.5%
Ratio of wastewater per tonne of product packed for shipment (in metric tonnes)	**0.263**	0.258	0.251	2.3%	0.273	0.274	-4.0%
Total solid waste, by-products and wastewater	**277,467**	**308,542**	**327,665**	**-10.1%**	**306,694**	**348,131**	**-20.3%**

1. 1 m^3 wastewater = 1 metric tonne.
2. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co.,Ltd) from 2019 onwards. For 2019 and earlier the management joint venture with Anshan Angang Vesuvius Refractory Company Ltd is not included as this was outside the operational control boundary.
3. Some of Vesuvius sites include social water in the wastewater reporting.

Water

Water stress[1,2]

Location of manufacturing sites	Number of main manufacturing sites	Percentage of revenue					Manufacturing sites fresh water use (m³)				
		2023	2022	2021	2020	2019	2023	2022	2021	2020	2019
Very high water stress	4	**4%**	4%	4%	4%	4%	**81,322**	65,643	56,393	48,529	58,507
Moderate to high water stress	20	**42%**	42%	41%	40%	38%	**327,774**	242,279	269,247	286,247	293,887
Low to moderate water stress	31	**54%**	54%	55%	56%	58%	**326,140**	366,527	379,384	366,524	425,676

1. This data covers 100% of our manufacturing sites. Water stress classification based on World Resources Institute Aqueduct Water Risk Atlas.
2. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co.,Ltd) from 2019 onwards.

Five-year evolution of fresh water consumption[1,2]

	% change 2023/2019	2023	2022	2021	2020	2019
Water in m³	**-13.6%**	**744,531**	683,485	755,366	756,522	861,556
Water in m³ used per metric tonne of product packed for shipment	**-0.6%**	**0.876**	0.732	0.710	0.840	0.882
Water in m³ consumed per £million revenue	**-27.0%**	**386**	343	452	534	529

1. Water storage does not have a significant impact. We provide data in cubic metres (1 cubic metre = 1,000 litres = 1 metric tonne = 0.001 megalitre). Data is collected quarterly in submissions from all operations globally under the operational control of Vesuvius.
2. Re-baselined using pre-acquisition data for the business acquired from Universal Refractories, Inc. (Vesuvius Penn Corporation) and BMC (Yingkou YingWei Magnesium Co.,Ltd) from 2019 onwards.

ISO 14001:2015 certifications

ISO 14001:2015 certifications

Country	Company name	Site
Australia	Foseco Pty Ltd	Sydney
Belgium	Vesuvius Belgium N.V.	Oostend
Brazil	Foseco Industrial e Comercial Ltda	São Paulo
China	Vesuvius Advanced Ceramic (China) Co., Ltd	Suzhou
China	Wuhan Wugang-Vesuvius Advanced CCR Co., Ltd.	Wuhan Site WG
China	Wuhan Wugang Vesuvius Advanced Ceramics Co., Ltd	Wuhan Site WV
Czech Republic	Vesuvius Česká Republika, a.s.	Trinec
Germany	SIR Feuerfestprodukte GmbH	Siegen
Germany	SIR Feuerfestprodukte GmbH	Kreuztal
Germany	Vesuvius Mülheim GmbH	Mülheim an der Ruhr
Germany	Vesuvius Europe GmbH	Mülheim an der Ruhr
Germany	Vesuvius GmbH	Grossalmerode
Germany	Vesuvius GmbH	Borken
India	Foseco India Limited	Puducherry
India	Foseco India Limited	Pune
India	Vesuvius India Limited	Visakhapatnam Site VP
India	Vesuvius India Limited	Visakhapatnam Site VS
Indonesia	P.T.Foseco Indonesia	Jakarta
Japan	Foseco Japan Limited	Toyokawa
Republic of Korea	Foseco Korea Limited	Gyeonggi-do
Malaysia	Vesuvius Malaysia Sdn Bhd	Pelabuhan Klang
Netherlands	Foseco Nederland BV	Hengelo
Poland	Vesuvius Poland Sp. z o.o.	Skawina
Republic of South Africa	Vesuvius South Africa (Pty) Limited	Olifantsfontein
Sweden	Vesuvius Scandinavia AB	Amal
Taiwan	Foseco Golden Gate Co. Limited	Ping Tung
United Kingdom	Vesuvius UK Limited	Tamworth

Vesuvius' current ISO 9001:2015 certifications are shown on www.vesuvius.com.

EU taxonomy

The European Regulation 2020/852 and the Delegated Act Climate of the Taxonomy Regulation 2021/2139 included no sector-specific guidance regarding the eligibility and technical screening criteria for the alignment for the refractory industry (NACE code '23.20 Manufacture of refractory products' is not listed in Annex I or Annex II of the Taxonomy regulation).

Vesuvius has therefore relied on the principles laid out in the Taxonomy Regulation and its own judgement to assess the eligibility of its activities.

The six environmental objectives were considered when defining the criteria applied in our assessment:

1. Climate change mitigation
2. Climate change adaptation
3. Sustainable use and protection of water and marine resources
4. Circular economy transition
5. Pollution and prevention control
6. Biodiversity and ecosystem protection and restoration

A portion of Vesuvius' economic activities falls into the category 'manufacture of other low carbon technologies' as defined by the Annex I and II of the Delegated Regulation (EU) 2021/2139, and in particular into the sub-category of 'Manufacture of technologies aimed at substantial GHG emission reductions in other sectors of the economy', and as such can be considered as eligible. Five main families of products and services were identified in the review of Vesuvius' activities:

- Products for usage in sustainable end-markets (e.g. solar, electric vehicles, windmills)
- Products sold to customers in downstream activities with processes recognised as eligible in the EU taxonomy (e.g. EAF steel making, DRI, secondary aluminium production, electric melting of grey iron
- Product ranges that offer significant sustainability performance advantages over alternative product ranges (e.g. unshaped refractories which do not require firing as an alternative to fired bricks)
- Recycled products (e.g. remanufactured slide gates)
- Enabling technologies and systems to help customers optimise their sustainability performance (e.g. lasers, gunning robots, smart degassing units)

Close to market research, development and innovation

Vesuvius R&D activities also satisfy the definition of 'research, applied research and experimental development of solutions, processes, technologies, business models and other products dedicated to the reduction, avoidance or removal of GHG emissions (RD&I) for which the ability to reduce, remove or avoid GHG emissions in the target economic activities has at least been demonstrated in a relevant environment, corresponding to at least Technology Readiness Level ("TRL") 6'.

Key performance indicators

The share of revenue, operating expenditure, and capital expenditure that can be assigned to taxonomy-eligible activities was evaluated. (100% of Vesuvius' activities were considered.) Whenever activities fell into multiple categories, data was removed from one of them, to avoid double-counting.

In the absence of Technical Screening Criteria, Vesuvius has been actively participating within the European Refractories Producers Association (PRE) to propose a set of criteria applicable to our industrial sector.

EU taxonomy disclosure table

		Revenue	Operating expenditure	Capital expenditure[2]
Manufacture of other low carbon technologies	£ million	460	78[1]	23
	%	24%	23%	26%
Close to market research, development and innovation	£ million		12	1
	%		4%	1%
Total	£ million	**460**	**91**	**24**
	%	**24%**	**26%**	**26%**

1. Non-R&D operating expenses is not allocated to specific activities. Instead, we manage our operating expenses by function across all activities, either globally, within the Business Units, or at regional Business Unit level. Consequently, they are broadly in proportion with the level of revenue of each activity.
2. Most of our capital expenditure will be utilised to manufacture both eligible and not eligible products under the EU taxonomy. All categories of capital expenditure were analysed to best evaluate the percentage that could be allocated to EU eligible activities.

Vesuvius Sustainability Policies and Standards

Vesuvius Sustainability Policies and Standards

Health and Safety Policies and Standards	
Accident & Incident Reporting	Reviewed 2023
Anti-Bribery and Corruption Policy	Issued 2018
Biodiversity Policy	Issued 2023
Business Continuity Planning	Issued 2018
Business Continuity Policy	Issued 2018
Code of Conduct	Reviewed 2020
Conflict Minerals Policy	Issued 2022
Control of Contractors	Reviewed 2022
Customer Location	Reviewed 2021
Crisis Management & Crisis Communication Policy	Issued 2019
Data Protection Privacy notice	Reviewed 2022
Data Protection Policy	Reviewed 2019
Diversity and Equality Policy	Issued 2020
Drug and Alcohol Policy	Reviewed 2023
Environmental Policy	Reviewed 2023
Ergonomics	Reviewed 2022
Executive Safety Tour	Reviewed 2020
Explosive Dust and Powder Process Safety	Issued 2022
Gas Safety	Issued 2015
Health and Safety Policy	Reviewed 2023
High-Risk Activities	Issued 2019
Housekeeping	Reviewed 2023
Human Rights and Labour Policy	Reviewed 2022

Health and Safety Policies and Standards	
Inspection, Maintenance and Testing of Fixed Electrical Installations	Reviewed 2018
Isolated and Lone Working	Reviewed 2023
Isostatic Presses	Reviewed 2020
Legionella	Reviewed 2021
Lifting and Handling	Reviewed 2023
Lock, Tag and Try	Reviewed 2020
Machine Safety	Reviewed 2020
On-site Vehicle Operations	Issued 2020
Overtime Policy	Issued 2014
Permit to Work	Issued 2019
Personal Protective Equipment	Reviewed 2021
Plant Colour Standard	Issued 2021
Process Safety	Issued 2020
Purchasing Policy	Issued 2018
Road Safety	Issued 2020
Risk Assessment	Reviewed 2023
Safe Storage of Bulk Bags and Pallets of 25kg Bags	Issued 2018
Speak Up Policy	Issued 2020
Sustainability Charter	Issued 2020
Sustainable Procurement Policy	Reviewed 2023
Warehousing and Racking	Issued 2019
Working with Third Parties Policy	Issued 2018
Working Safely with Fibres	Revised 2020

See also www.vesuvius.com for selected documents.

Vesuvius safety training programmes

Vesuvius safety training programmes

Training activities routinely undertaken for our employees and contractors include:

- Arc Flash Hazard
- Bike Safety
- Control of Contractors
- Crane Operation
- Defensive Driving
- Electrical Testing
- Environmental Waste Reporting
- Ergonomics
- Executive Safety Tour Leader
- Exoskeleton
- Explosive Powder and Dust Safety
- Fire Fighting
- First Aid
- Forklift Truck
- Gas Safety
- General Health and Safety and Refresher Training
- Hand Hazard and Protection
- Hazard Perception
- Hazardous Goods
- Health and Safety Representatives
- Human Organisational Performance Training
- Improving the Quality of Safety Audits
- ISO 45001:2018
- Legionella
- Lift Planning
- Lock, Tag and Try
- Incident and Performance Reporting
- Machine Safety
- Permit to Work
- Personal Protective Equipment Safety
- Project Management
- Practical Safety in Steel Customers
- Radiation
- Road Safety
- Safe Stacking
- Safety and Environmental Auditing
- Safety Culture and Behaviour Based Safety Training
- Safety Tour Training
- Safe Working on Roofs
- Steel Mill Orientation
- TurboS Safety and Safety Leadership
- Warehouse Material Stacking and Handling
- Welding Certification
- Working at Height

Safety performance

Safety performance five-year table with main performance indicators

All employees, contractors and visitors

Performance indicators	2023	2022	2021	2020	2019
Work-related deaths	**0**	1	0	0	0
Severe injuries	**5**	6	3	4	0
Lost Time Injuries (LTI)	**17**	30	29	28	40
LTI Frequency Rate (LTIFR) per million hours	**0.60**	1.08	1.06	1.16	1.54
Total Recordable Injuries (TRI)	**95**	113	123	126	144
Total Recordable Injury Frequency Rate (TRIFR) per million hours	**3.4**	4.0	4.5	5.2	5.5
Medically Treated Injuries (MTI)	**158**	184	200	164	198
MTI Frequency Rate (MTIFR) per million hours	**5.6**	6.6	7.3	6.8	7.6
Total number of injuries	**412**	513	627	419	520
Injury Frequency Rate (IFR) per million hours	**14.6**	18.4	23.0	17.3	20.0
LTI Lost Days	**1,512**	1,673	1,778	2,094	1,811
LTI Severity Frequency Rate (Lost Days) per million hours	**54**	60	65	86	70
Dangerous Occurrences (DO)	**2,925**	2,545	1,200	779	734
Dangerous Occurrence Frequency Rate (DOFR) per million hours	**104**	91	44	32	28
Safety audits (number)	**135,085**	120,670	109,176	95,290	113,438
Safety audits per 20 employees per month	**17**	16	14	14	16
Employees participating in monthly safety audits	**11,173**	10,500	10,047	8,559	8,804
Employees participating in monthly safety audits %	**83%**	82%	78%	73%	75%
SIOPA	**128,235**	113,840	94,698	81,017	92,073
Other IOPA	**24,361**	27,666	26,102	29,233	30,617
IOPA total	**152,596**	141,506	120,800	110,250	122,690
SIOPA per employee	**9**	9	7	7	8
Other IOPA per employee	**2**	2	2	2	3
IOPA total per employee	**11**	11	9	9	10
Hours worked (thousands)	**28,258**	27,902	27,317	24,211	26,053

Notes:
– All frequency rates (FR) are per million hours worked.
– Severity Rate Lost days are recorded against the month where to time was lost.
– There were no visitor injuries in 2019 to 2023.
– IOPA – Improvement Opportunities closed with a permanent corrective action.
– SIOPA – Safety Improvement Opportunities closed with a permanent corrective action.
– Minor restatements of safety statistics and environmental metrics have been made for past years, with no significant effect on reported outcomes. These are due to error corrections and final updates of estimated data.
– Includes all sites under Vesuvius' operational control including joint ventures.

Safety performance

Safety performance in 2023

Performance indicators	Employees and directly supervised contractors	Not directly supervised contractors and visitors	All employees, contractors and visitors
Work-related deaths	0	0	0
Severe injuries	3	2	5
Lost Time Injuries (LTI)	15	2	17
LTI Frequency Rate (LTIFR) per million hours	0.6	1.6	0.6
Total Recordable Injuries (TRI)	91	4	95
Total Recordable Injuries Frequency Rate (TRIFR) per million hours	3.4	3.2	3.4
Medically Treated Injuries (MTI)	152	6	158
MTI Frequency Rate (MTIFR) per million hours	5.6	4.8	5.6
Total number of injuries	398	13	412
Injury Frequency Rate (IFR) per million hours	14.7	10.5	14.6
LTI Lost Days	0	0	1,512
LTI Severity Frequency Rate (Lost Days) per million hours	0	0	54
Dangerous Occurrences (DO)	2,925	0	2,925
Dangerous Occurrence Frequency Rate (DOFR)	108	0	104
Safety audits (number)	135,085	0	135,085
Safety audits per 20 employees per month	17	0	17
Employees participating in monthly safety audits	11,173	0	11,173
Employees participating in monthly safety audits %	83%	0%	83%
SIOPA	128,235	0	128,235
Other IOPA	24,361	0	24,361
IOPA total	152,596	0	152,596
SIOPA per employee	9	0	9
Other IOPA per employee	2	0	2
IOPA total per employee	11	0	11
Hours worked (thousands)	27,016	1,242	28,258

Notes:
– All frequency rates (FR) are per million hours worked.
– Severity Rate Lost days are recorded against the month where to time was lost.
– There were no visitor injuries in 2019 to 2023.
– IOPA – Improvement Opportunities closed with a permanent corrective action.
– SIOPA – Safety Improvement Opportunities closed with a permanent corrective action.
– Minor restatements of safety statistics and environmental metrics have been made for past years, with no significant effect on reported outcomes. These are due to error corrections and final updates of estimated data.
– Includes all sites under Vesuvius' operational control including joint ventures.
– Not directly supervised contractors and visitors 2023: 696 (2022: 535).

Vesuvius employee distribution

Vesuvius employee distribution

	2023	2023 %	2022	2022 %	2021	2021 %
Vesuvius employees	11,376	84	10,837	84	10,657	85
Directly supervised contractors	2,135	16	2,331	16	1,939	15
Total	13,511	100	13,168	100	12,596	100

Notes:

– In addition to the headcount figures above, Vesuvius used the services of 134 contractors and consultants in 2021, 222 in 2022 and 166 in 2023 to work on specific short-term projects.

2023 distribution of Vesuvius employees – full-time versus part- time

	Full-time employees	Full-time employees (%)	Part-time employees	Part-time employees (%)	Vesuvius employees total	Vesuvius employees total (%)
Permanent salaried	4,642	41	53	<1	4,695	41
Permanent hourly	6,290	55	16	<1	6,306	55
Total permanent	10,932	96	69	1	11,001	97
Temporary salaried	43	<1	2	<1	45	0
Temporary hourly	327	3	3	<1	330	3
Total temporary	370	3	5	0	375	3
Total	11,302	99	74	1	11,376	100

2023 distribution of Vesuvius employees – full-time versus part- time

	2023				2022				2021				2020			
	Full-time employees	Full-time employees (%)	Part-time employees	Part-time employees (%)	Full-time employees	Full-time employees (%)	Part-time employees	Part-time employees (%)	Full-time employees	Full-time employees (%)	Part-time employees	Part-time employees (%)	Full-time employees	Full-time employees (%)	Part-time employees	Part-time employees (%)
Permanent salaried	4,642	40.8	53	0.5	4,391	39.4	48	0.4	4,086	36.9	43	0.4	3,905	37.7	53	0.5
Permanent hourly	6,290	55.3	16	0.1	5,939	53.3	12	0.1	5,878	53.1	6	0.1	5,647	54.5	7	0.1
Total permanent	10,932	96.0	69	0.6	10,330	92.8	60	0.5	9,964	90.0	49	0.4	9,552	92.3	60	0.6
Temporary salaried	43	0.4	2	0.0	86	0.8	3	0.0	90	0.8	1	0.0	64	0.6	2	0.0
Temporary hourly	327	2.9	3	0.0	649	5.8	6	0.1	966	8.7	6	0.1	674	6.5	2	0.0
Total temporary	370	3.3	5	0.0	735	6.6	9	0.1	1,056	9.5	7	0.1	738	7.1	4	0.0
Total	11,302	99.3	74	0.7	11,065	99.4	69	0.6	11,020	99.5	56	0.5	10,290	99.4	64	0.6

2023 distribution of Vesuvius employees by gender – full-time versus part-time

	Total				Male				Female			
	Full-time employees	Full-time employees (%)	Part-time employees	Part-time employees (%)	Full-time employees	Full-time employees (%)	Part-time employees	Part-time employees (%)	Full-time employees	Full-time employees (%)	Part-time employees	Part-time employees (%)
Permanent salaried	4,642	99	53	1	3,457	100	14	0	1,185	97.0	39	3
Permanent hourly	6,290	100	16	0	5,859	100	16	0	431	100	0	0
Total permanent	10,932	99	69	1	9,316	100	30	0	1,616	98	39	2
Temporary salaried	43	99	2	4	26	93	2	7	17	100	0	0
Temporary hourly	327	96	3	1	247	99	2	1	80	99	1	1
Total temporary	370	99	5	1	273	99	4	1	97	99	1	1
Total	11,302	99	74	1	9,589	100	34	0	1,713	98	40	2

GRI content index

Statement of use	Vesuvius plc has reported in accordance with the GRI Standards for the period January 1 2023 to 31 December 2023.
GRI 1 used	GRI 1: Foundation 2021
Applicable GRI Sector Standard(s)	None applicable

GRI Standard	Disclosure	Location
General disclosures		
GRI 2: General Disclosures 2021	2-1 Organisational details	Sustainability Report 2023 (SR), Back cover
	2-2 Entities included in the organisation's sustainability reporting	SR page 5
	2-3 Reporting period, frequency and contact point	SR page 5 Calendar year 2023, annual reporting cycle.
	2-4 Restatements of information	SR pages 5, 46, 48–49, 81, 117, 137–138
	2-5 External assurance	SR pages 5, 11, 43
	2-6 Activities, value chain and other business relationships	SR pages 7–11, 15–17, 21, 31, 34, 41–42, 52–53, 56–62, 64, 70, 72, 82, 92, 97, 99–106, 110, 112
	2-7 Employees	SR pages 78, 81–82, 89–90, 139 No significant fluctuations in headcount. Information unavailable/incomplete (GRI 2-7b.iii.): Vesuvius does not employ non-guaranteed hours employees.
	2-8 Workers who are not employees	SR pages 81–82, 89, 139 No significant fluctuations in worker numbers.
	2-9 Governance structure and composition	SR pages 17, 61, 69, 95, 108–109 Annual Report (AR) pages 80–89, 103 Information unavailable/incomplete (2-9b.vi.): No under-represented social groups included in governance processes to any significant degree.
	2-10 Nomination and selection of the highest governance body	AR pages 102–107
	2-11 Chair of the highest governance body	AR pages 80, 84, 87–88
	2-12 Role of the highest governance body in overseeing the management of impacts	SR pages 108–109 AR pages 34, 36–37, 68–74, 78, 85–87, 90
	2-13 Delegation of responsibility for managing impacts	SR pages 34, 64, 70, 108–109
	2-14 Role of the highest governance body in sustainability reporting	SR pages 109, 112–113
	2-15 Conflicts of interest	SR pages 81, 98–99 AR pages 61, 69, 75, 91, 96
	2-16 Communication of critical concerns	SR pages 95, 98, 108–109 AR pages 78, 86–87
	2-17 Collective knowledge of the highest governance body	AR pages 80-81, 93, 102–104
	2-18 Evaluation of the performance of the highest governance body	SR pages 79, 83-84 AR pages 80–81, 93, 102–104
	2-19 Remuneration policies	AR pages 108–122
	2-20 Process to determine remuneration	AR pages 108–114 Information on remuneration external views (2-20a.ii.) is Not Applicable, an external views are not used.
	2-21 Annual total compensation ratio	AR page 132

GRI content index

GRI Standard	Disclosure	Location
General disclosures continued		
GRI 2: General Disclosures 2021	2-22 Statement on sustainable development strategy	SR pages 3–5 AR page 34
	2-23 Policy commitments	SR pages 20, 61, 68, 95–97, 102, 108–111, 135
	2-24 Embedding policy commitments	SR pages 34, 64, 70, 108–111 AR pages 68, 74–75
	2-25 Processes to remediate negative impacts	SR pages 20, 61, 68, 86, 95–97, 102, 109, 133, 135
	2-26 Mechanisms for seeking advice and raising concerns	SR pages 61–62, 74, 82–85, 89, 95–98
	2-27 Compliance with laws and regulations	SR pages 52, 62 AR pages 55, 87, 150
	2-28 Membership associations	SR pages 92, 110–111
	2-29 Approach to stakeholder engagement	SR pages 20, 79, 97, 112–113 AR pages 68–71
	2-30 Collective bargaining agreements	SR pages 82, 84
Material topics		
GRI 3: Material Topics 2021	3-1 Process to determine material topics	SR pages 18, 112–113
	3-2 List of material topics	SR pages 18, 113 We identify material topics, supported by additional 'extended strategic focus' topics, and those with only moderate (insufficiently material) impacts. Strategic consideration and performance for all topics is formally governed, managed and measured. The topic of 'talent attraction and development' and its relevant impacts, risks and opportunities, are sufficiently significant to warrant greater attention compared to 2022–23.
Anti-corruption		
GRI 3: Material Topics 2021	3-3 Management of material topics	SR pages 12, 17–18, 81, 98–99, 101–102, 104, 108–109, 135
GRI 205: Anti-corruption 2016	205-1 Operations assessed for risks related to corruption	SR pages 86, 99, 101, 110–111 Information unavailable/incomplete (205-1a Total number and percentage): Data collected relate to certain higher-risk categories of intermediary in various locations, and are not expressed as a percentage of a total number of assets.
	205-2 Communication and training about anti-corruption policies and procedures	SR pages 86, 99 All employees, contractors receive communication; all and governance body members receive training on the related policies, across all regions. Information unavailable/incomplete (205-2 a. to e.): The Board set a target applicable to a specific group of permanent employees for the training; a regional breakdown is not available for this group. They comprised those with specific roles and interactions with third parties. Hourly workers are not included in the target group; data on geographic split is not collected. Percentages are unavailable – Vesuvius does not collect training data entirely in the breakdown required by this disclosure.
	205-3 Confirmed incidents of corruption and actions taken	SR pages 99, 105 AR pages 55, 87, 150 No bribery or corruption incidents recorded.
Materials		
GRI 3: Material Topics 2021	3-3 Management of material topics	SR pages 44, 46–47, 133
GRI 301: Materials 2016	301-1 Materials used by weight or volume	SR pages 44, 46, 48, 131
	301-2 Recycled input materials used	SR page 131
	301-3 Reclaimed products and their packaging materials	Not Applicable: Amounts of packaging are not significant, but we monitor if changes occur.

GRI content index

GRI Standard	Disclosure	Location
Energy		
GRI 3: Material Topics 2021	3-3 Management of material topics	SR pages 4–5, 12, 20–21, 27, 29–30, 32–35, 133
GRI 302: Energy 2016	302-1 Energy consumption within the organization	SR pages 36–40, 118–119 Disclosure requirement partly Not Applicable (302-1 c. iii. & iv. cooling & steam consumed, 302-1 d. iii. & iv. cooling & steam sold): no cooling or steam is purchased. No electricity, heat, cooling or steam is sold commercially. Electricity generated from our solar panels is exported to the network and re-imported where it is accounted for as electricity purchased; the amounts are insignificant, and not material.
	302-2 Energy consumption outside of the organization	SR pages 39–40, 118–120
	302-3 Energy intensity	SR pages 12, 32, 38, 118–120
	302-4 Reduction of energy consumption	SR pages 37–38, 54–55, 65
	302-5 Reductions in energy requirements of products and services	SR pages 15, 44, 54–55, 65
Emissions		
GRI 3: Material Topics 2021	3-3 Management of material topics	SR pages 20, 25–26, 28–29, 32–35, 41–43, 106, 128–129, 133, 135
GRI 305: Emissions 2016	305-1 Direct (Scope 1) GHG emissions	SR pages 117–126
	305-2 Energy indirect (Scope 2) GHG emissions	SR pages 117–126
	305-3 Other indirect (Scope 3) GHG emissions	SR pages 41–43, 106, 121, 125, 127–130
	305-4 GHG emissions intensity	SR pages 12, 14, 38-39, 43, 66, 120–121, 126
	305-5 Reduction of GHG emissions	SR pages 21, 25, 32, 34–35, 41, 44–46, 54–55, 57–60, 65–66
	305-6 Emissions of ozone-depleting substances (ODS)	SR page 124
	305-7 Nitrogen oxides (NOx), sulfur oxides (SOx), and other significant air emissions	GRI Standard 305-7 is Not Applicable
Supplier environmental assessment		
GRI 3: Material Topics 2021	3-3 Management of material topics	SR pages 12, 17, 102–106
GRI 308: Supplier Environmental Assessment 2016	308-1 New suppliers that were screened using environmental criteria	SR pages 99, 103
	308-2 Negative environmental impacts in the supply chain and actions taken	SR pages 96–97, 99, 103–106 Information partially unavailable/incomplete (c. d. & e. Significant negative impacts identified, with agreed improvements, and/or where relationships were terminated): We do not publish degree of significance of actual and potential negative environmental impacts.
Employment		
GRI 3: Material Topics 2021	3-3 Management of material topics	SR pages 78, 81–88, 135–136 AR page 72
GRI 401: Employment 2016	401-1 New employee hires and employee turnover	SR pages 81–82 Information partially unavailable/incomplete (401-1 a.): Whilst we provide data on employee numbers and rate year-on-year, we do not report new employee hires by age group, due to data availability across the regions where we operate in various contractual arrangements many of which rely on professional agencies. Information partially unavailable/incomplete (401-1 b.): We provide data on employee numbers but only percentage data on turnover, and only by region.
	401-2 Benefits provided to full-time employees that are not provided to temporary or part-time employees	SR pages 71, 83, 87–88 Information partially unavailable/incomplete (401-2 a. i, iii, v, or vi): we do not collect data on certain benefits listed in the Standard. Information unavailable/incomplete (401-2 b. on the definition used for 'significant locations of operation'): the working conditions listed in our report apply across all sites, there is no data to indicate that certain sites are excluded. Note: full-time and part-time permanent employees enjoy the same benefits at Vesuvius; temporary employee benefits are governed by the relevant agencies' employment contracts.

GRI content index

GRI Standard	Disclosure	Location
Occupational health and safety		
GRI 3: Material Topics 2021	3-3 Management of material topics	SR page 68–75, 135–136
GRI 403: Occupational Health and Safety 2018	403-1 Occupational health and safety management system	SR pages 71–72, 76 Supporting information on safety systems is available at www.vesuvius.com/en/sustainability/our-people/safety.html
	403-2 Hazard identification, risk assessment, and incident investigation	SR pages 70–74, 81, 98
	403-3 Occupational health services	SR pages 71–72, 81–82 As part of the delivery of our safety management system, we provide occupational health services that are relevant to hazards and risks to which employees and others are exposed at our operations. Directly supervised contractors are treated the same as employees. Occupational health impacts are covered in the safety management risk identification. Occupational health and personal safety management is blended at all of our sites.
	403-4 Worker participation, consultation, and communication on occupational health and safety	SR pages 70–73, 82
	403-5 Worker training on occupational health and safety	SR pages 71, 73
	403-6 Promotion of worker health	SR pages 71–72, 83 In line with our values, and our commitment to employee engagement, benefits including access to healthcare and medical support are managed locally in accordance with local laws. Directly supervised contractors are treated the same as employees. Also, site management are attuned to local impacts, and local approaches to worker health operate in accordance with the risk at a local level. Additional information is available at www.vesuvius.com/en/sustainability/our-people/safety-and-well-being.html
	403-7 Prevention and mitigation of occupational health and safety impacts directly linked by business relationships	SR pages 71–72, 98, 104
	403-8 Workers covered by an occupational health and safety management system	SR page 76
	403-9 Work-related injuries	SR pages 75–76, 137–138
	403-10 Work-related ill health	SR pages 75–76, 137–138 No employees or other workers were reported to be affected by recordable incidents or fatalities from work-related ill health.
Training and education		
GRI 3: Material Topics 2021	3-3 Management of material topics	SR pages 84–86, 88, 91–92, 136
GRI 404: Training and Education 2016	404-1 Average hours of training per year per employee	SR pages 75, 84–86 Information unavailable/incomplete (404-1 a. average hours by gender and employee category): the flexible and complex structure of employment at Vesuvius prevents any average of hours becoming a meaningful indicator of performance in terms of technical, personal and career advancement. On-the-job training is not quantifiable but it takes place throughout the organisation for essential knowledge transfer.
	404-3 Percentage of employees receiving regular performance and career development reviews	SR page 87 Information unavailable/incomplete (404-2 a. percentage breakdown by gender and employee category): the flexible and complex structure of employment at Vesuvius prevents any such breakdown becoming a meaningful indicator of performance in terms of technical appraisal or career development processes.
Diversity and equal opportunity		
GRI 3: Material Topics 2021	3-3 Management of material topics	SR pages 78–81, 83–84, 89–90, 135
GRI 405: Diversity and Equal Opportunity 2016	405-1 Diversity of governance bodies and employees	SR pages 89–90, 139 AR pages 80–82, 104–106 Information unavailable (405-1 a. ii. & b. ii. governance body/employee category broken down by age groups): we do not report this data. Such a breakdown is not a meaningful indicator of impact, risk or opportunity in a governance body; also, the varied extent of jurisdictional legislation around the world prevents access to certain employees' personal information: a percentage would not be meaningful or useful.
	405-2 Ratio of basic salary and remuneration of women to men	AR page 132 Information unavailable (405-2 a. ratio by gender): we do not report this data. Such a breakdown is not a meaningful indicator of impact, risk or opportunity at Vesuvius.

GRI content index

GRI Standard	Disclosure	Location
Non-discrimination		
GRI 3: Material Topics 2021	3-3 Management of material topics	SR pages 78–81, 83–84, 89–90, 135
GRI 405: Diversity and Equal Opportunity 2016	406-1 Incidents of discrimination and corrective actions taken	SR pages 98–99
Supplier social assessment		
GRI 3: Material Topics 2021	3-3 Management of material topics	SR pages 12, 17, 102–106 Modern Slavery Statement is available at www.vesuvius.com/en/sustainability/human-rights/statement-on-modern-slavery.html
GRI 414: Supplier Social Assessment 2016	414-1 New suppliers that were screened using social criteria	SR page 103 All new suppliers are screened in line with the Vesuvius Supplier Sustainability Assessment programme.
	414-2 Negative social impacts in the supply chain and actions taken	SR pages 103–106 No significant negative social impacts were recorded during the supplier CSR and quality audits.
Customer health and safety		
GRI 3: Material Topics 2021	3-3 Management of material topics	SR pages 61–62
GRI 416: Customer Health and Safety 2016	416-1 Assessment of the health and safety impacts of product and service categories	SR pages 61–62, 64 All product categories are assessed for health and safety impacts and improvement where applicable.
	416-2 Incidents of non-compliance concerning the health and safety impacts of products and services	SR page 62

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The imagery included in this Sustainability Report aims to capture the many different aspects of Vesuvius and our team around the world. The photographer Samuel Dhote shot most of these images.
www.samueldhote.com

Designed and produced by **Friend**
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