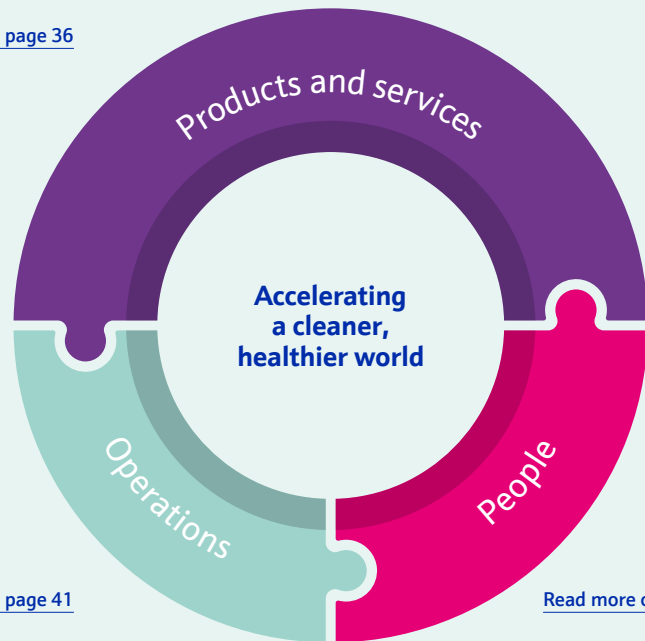# Sustainability

Our products and services are the clearest demonstration of our vision for a cleaner, healthier world. And their biggest positive impact occurs when our customers use them in their products. But we also want to ensure we make them in ways that minimise our impact on the planet and our local communities. We rely on our talented employees and supply chain partners to help us do that. To reflect our commitment in these areas and support our target to reach net zero by 2040, we organise our sustainability priorities around three pillars:

Accelerating a cleaner, healthier world

Products and services

Operations

People

Our three sustainability pillars are underpinned by a series of 11 goals and 17 targets, 14 of which we announced in June 2021. During 2021/22, we defined our remaining three targets, which seek to quantify the unique societal value of the products and technologies that form our business strategy. We also began to develop our net zero roadmap. To continue strengthening our sustainability governance, we set up a new board-level Societal Value Committee in May 2021 (see page 98 for more information about this committee), and recruited our first Chief Sustainability Officer who joined JM in May 2022.

Our approach to reporting

This report has been prepared in accordance with Global Reporting Initiative (GRI) reporting standard, Core option. More information about our materiality assessment of which sustainability issues are important to our business and the full GRI index disclosure can be found at matthey.com/GRI-2022. This year's report also aligns with the Sustainability Accounting Standards Board (SASB) chemical sector reporting requirements (version 2018-10). Our Task Force on Climate-related Financial Disclosures (TCFD) report is included within this section of the report, where we provide a summary report on the progress made during the year against each of the four pillars of the TCFD framework. The numbers included in this section cover the entire Johnson Matthey group, including Health, which is reported as a discontinued operation.

Sustainability ratings

During 2021/22, we were pleased to receive several validations of our environmental, social and governance (ESG) performance:

EcoVadis: Platinum rating, putting JM in the top 1% of all companies rated by the organisation.

MSCI: AAA, is the highest possible rating, placing us above our speciality chemicals industry peers.

We retained our membership of the **Dow Jones Sustainability Index (Europe)**, which places us in the top six European chemical companies and 92nd percentile globally.

A high score of 4.1 out of 5 on the **FTSE4Good Europe Index**, which recognises leading all-round ESG performance.

	Our goal	2030 target	Performance in 2021/22	
Products and services We use our expertise in PGM chemistry, catalysis and process design to make products and services that create a cleaner, healthier world, lower emissions and support the circular economy.	Produce and innovate for a cleaner, healthier world	More than 95% of sales contributing to four priority UN SDGs	83.8%	See our Products and services section on pages 36-40 for more on our progress against these targets.
		More than 95% of R&D spend supporting four priority UN SDGs	88.1%	
	Drive lower global greenhouse gas (GHG) emissions	50 million tonnes of GHG emissions avoided per year using technologies enabled by JM's products and solutions, compared to conventional offerings	489,000 tonnes	
	Enable less harmful air pollution globally	700,000 additional tonnes of NOx removed from vehicle tailpipes per year using technologies enabled by JM's products, compared to regulated baseline levels	63,000 tonnes	
	Conserve scarce resources	Increase recycled PGM content in JM's manufactured products to at least 75%	71 %	
Operations As well as helping our customers achieve their sustainability goals, we aim to lower the environmental impact of our own operations. Note: performance and targets relate to a 2019/20 baseline	Achieve net zero by 2040	33% reduction in Scope 1 and Scope 2 GHG emissions	2% increase	See our Operations section on pages 41-48 for more on our progress against these targets.
		20% reduction in Scope 3 emissions from purchased goods and services	8% reduction	
	Reduce water consumption and waste	25% reduction in net water usage	4% reduction	
		50% reduction in total hazardous waste produced	6% increase	
	Minimise environmental footprint	40% reduction in NOx emissions from our operations	5% increase	
		Make cradle-to-gate life cycle analysis (LCA) information available for more than 95% of our products	Recruited a small team of LCA specialists to begin making progress in 2022/23	
People We value difference and are committed to ensuring that everyone who works with us can do so in a safe, welcoming environment. We support high ethical standards in our value chain and are proud of our long-standing connections with our local communities.	Keep people safe	Achieve a total recordable injury and illness rate for employees and contractors below 0.25	0.59	See our People section on pages 49-59 for more on our progress against these targets.
		Reduce our ICCA process safety severity rate to 0.4	1.37	
	Create a diverse, inclusive and engaged company	Achieve an employee engagement score of more than 75%	65%	
		Achieve more than 40% of female representation across all management levels	27%	
	Uphold human rights in our value chain	100% of value chain partners assessed for human rights risks and remedial plans in place where high risks identified	Worked with KPMG to develop a robust human rights risk framework	
	Invest in our local communities	More than 6,000 days of corporate volunteering annually	1,322	

Our calculation methodologies for these targets can be found in the Basis of Reporting section on pages 214-220.

Products and services

In this section

We use our expertise in platinum group metal (PGM) chemistry, catalysis and process design to research, design and make products, services and solutions that support our vision for a cleaner, healthier world. From automotive catalysts that prevent harmful pollutants entering the atmosphere, to catalysts that help turn household waste into sustainable fuels, and from technologies that help make clean hydrogen to world-class recycling skills that help recover and reuse scarce precious metals. And we use our science and innovation skills to maintain a pipeline of new and improved products that will help the world accelerate towards net zero.

This year, we set important new 2030 targets to measure how much our products benefit society as they address global greenhouse gas emissions and air pollution, and to advance the circular economy as we increase the amount of recycled PGMs in our technologies.

1. Produce and innovate for a cleaner, healthier world

While we are proud of our legacy, we keep looking forward and using our skills to create the next generation of products and services that will help the world tread a more sustainable path. Over the past five years, we have tracked our progress by assessing our products and services against the United Nations Sustainable Development Goals (SDGs). In 2021, we refined our approach to concentrate on the four UN SDGs where we can have the most material impact because they are closely aligned with our purpose and business strategy.

We have set ourselves two 2030 targets to increase sales and our R&D investment against these four priority UN SDGs:

UN SDG	Examples of JM products and services that support each goal
3. Good health and wellbeing	• Emission control technologies that remove harmful oxides of nitrogen (NOx) and particulates from vehicle tailpipes and stationary engines • Purification technologies that remove harmful contaminants, such as mercury, from industrial processes • Refinery additives to mitigate NOx and oxides of sulphur (SOx) emissions • Catalysts used to make pharmaceutical ingredients
7. Affordable and clean energy	• Blue hydrogen technologies that are available today to help make low-carbon hydrogen at scale • Green hydrogen technologies that will support the drive to zero-carbon hydrogen production using renewable energy and electrolysis
12. Responsible consumption and production	• PGM recycling to recover and reuse scarce natural resources
13. Climate action	• Technologies that turn high sources of carbon, such as household waste, into sustainable aviation fuels • Fuel cell components for low-carbon transportation and distributed power units

Progress against our priority UN SDGs

Setting targets for sales of sustainable products that are aligned with our strategic aim to support four priority UN SDGs is only part of the journey. To deliver this, we must also make sure that our R&D and innovation activities are aligned with those UN SDGs in order to deliver our sales target by the end of the decade. At the same time, we must continue to focus on innovation – both in-house and in partnership with others – to ensure that we maintain a steady pipeline of new and improved products to support our growth businesses beyond 2030, as the pace picks up globally to reach net zero.

Progress against our 2030 targets
Sales[1] contributing to our four priority UN SDGs

2030 target	2021/22	2020/21
>95%	83.8%	84.7%

% sales from products contributing to priority UN SDGs (2021/22)[1]

	% sales from products contributing to priority UN SDGs
SDG 3	72.7%
SDG 7	0.0%
SDG 12	6.1%
SDG 13	5.0%
Not assigned to priority SDGs	16.2%

We saw a slight fall in sales against our priority UN SDGs this year, primarily because of proportionally higher sales in Catalyst Technologies, which is where most of our unassigned sales reside. However, we are encouraged that a higher percentage of our R&D budget was aligned with our priority UN SDGs, particularly SDG 7 and SDG 13 where we have worked to align our spend within our strategic growth platforms of decarbonisation, circularity and hydrogen technologies.

Progress against our priority UN SDGs – R&D spend
% R&D spend contributing to four priority UN SDGs

2030 target	2021/22	2020/21
>95%	88.1%	87.3%

% R&D spend from products contributing to priority UN SDGs (2021/22)

	% R&D spend assigned
SDG 3	58.5%
SDG 7	3.4%
SDG 12	6.8%
SDG 13	19.4%
Not assigned to priority SDGs	11.9%

To achieve this, we spent £215 million on R&D in 2021/22, which includes £33 million of capitalised R&D. We employ a corporate R&D team of around 400 employees to work alongside our customer-facing R&D and commercial teams to create a balanced portfolio of short-, medium- and long-term research opportunities and a pipeline of new and improved products and technologies for our customers.

We have also identified our revenues that align with the SASB Chemicals Sustainability Accounting Standard's definition of products that, when used, improve energy efficiency, eliminate or reduce GHG emissions, reduce raw materials consumption, lower water consumption and / or increase product life. In 2021/22, those sales were £812 million.

Our methodology is described in Basis for Reporting, on pages 214-220.

1. Sales excluding precious metals. See Note 2 for more information.

2. Drive lower global greenhouse gas emissions

The world will need a range of low-carbon solutions if we are to decarbonise our transport, energy and industrial systems and reach net zero. Our products and services already help our customers avoid GHG emissions every year and, over the next decade, we aim to increase our impact considerably. During the year, we finalised our methodology to quantify these benefits. We set ourselves the target for 2030 that JM technologies operating globally will contribute towards avoiding 50 million tonnes of greenhouse gases entering the earth's atmosphere per year, compared to conventional technologies in 2020. This is equivalent to preventing half of all UK GHG emissions from road transport in 2019.

Since there are no 'off-the-shelf' methodologies available for setting this target, we developed our own. We based our methodology on guidelines for calculating and reporting avoided GHG emissions developed by the World Resources Institute, as well as by the World Business Council for Sustainable Development and the International Council of Chemical Associations.

We also appointed EcoAct to review and validate our GHG-avoidance methodology for all our product families that are contributing towards our target. EcoAct concluded that our approach complied with recognised public guidelines, and considered our calculations to be both fairly stated and representative of a balanced view of our contribution in enabling avoided emissions through relevant technologies. EcoAct also determined that our calculations follow industry best practice for measurement.

In 2020/21, our technologies helped avoid 211,000 tonnes carbon dioxide (CO_2) equivalent entering the atmosphere compared to conventional technologies. This mostly arose from the sale of fuel cell components for hydrogen-powered distributed power generation systems. Given this is the baseline year for our target, it only captures the operational impact of our technologies sold in 2020/21. Our 2021/22 result represents the impact from all technologies sold since the start of our baseline year, that are still operating in 2021/22. This year's figure is more than double that of the previous year because we sold more fuel cell components for distributed power systems this year versus 2020/21.

Innovating to help the world transition to net zero

In the coming years, we expect to be adding many new product lines to our 'avoided GHG emissions' target, with the majority connected to the growing hydrogen economy. Producing low-carbon hydrogen will be key to a net zero future, but to make that future a reality, the world will need eight times more hydrogen by 2050, than is produced today. For example, the UK's HyNet project will use our LCH™ technology to produce low-carbon 'blue' hydrogen at scale, while capturing up to 98% of the associated CO_2 emissions. Once online, the facility will capture the same amount of CO_2 every year as taking more than 250,000 petrol or diesel cars off the road.

We are also aiming to become the number one supplier of the highly efficient catalyst-coated membranes that are essential to the workings of 'green' hydrogen electrolysers. We're working with companies such as Plug Power, a leading provider of green hydrogen solutions, to accelerate the development and scale-up of electrolyser technology to make green hydrogen using renewable energy.

JM is already an established, leading provider of process technology and catalysts to the chemicals and energy sectors especially in synthesis gas (a mixture of hydrogen and carbon monoxide, also known as syngas). Our new HyCOgen™ technology, launched in January 2022, is one of the best examples of this. This catalyst technology converts green hydrogen and CO_2 into carbon monoxide, which is then combined with additional hydrogen to create syngas. When used alongside our award-winning Fischer Tropsch catalyst technology (FT CANS™), developed in collaboration with bp, HyCOgen creates a highly efficient, scalable process that can turn most of the CO_2 into high-quality synthetic crude oil. This can then be processed in a refinery to make more sustainable fuels, including renewable diesel, naphtha and aviation fuels – key to helping governments and airlines tackle emissions in the aviation industry.

Our new target for 2030

Greenhouse gas emissions avoided during year by our customers using technologies enabled by our products and solutions, compared to conventional offerings

2030 target	2021/22	2020/21
50 million tonnes	**489,000** tonnes	**211,000** tonnes

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3. Enable less harmful air pollution globally

We have worked with automotive manufacturers for decades, using our catalyst expertise to design emission control systems that help them meet strict air quality regulations. For the past four decades, those systems have helped prevent millions of tonnes of harmful emissions, such as carbon monoxide, NOx and particulates, from entering the atmosphere, improving the health of millions of people living and working in cities around the world. Today, around one-third of all new cars in the world are fitted with one of our catalytic converters, and we believe that they are collectively removing around seven million tonnes of NOx from the atmosphere.

While diesel and gasoline vehicles won't be around forever, most vehicles on our roads will continue to run on an internal combustion or hybrid engine for some years to come. That's why regions like Europe, the USA and China are introducing their toughest air quality regulations yet. We believe that NOx emissions standards can go even lower, and our R&D scientists have been working hard to create the catalysts to enable this.

Our new target for 2030

Additional NOx removed from tailpipes by JM technology during year compared to that achievable with 2020 technology

2030 target	2021/22
700,000 tonnes	**63,000** tonnes

Our new target for continuing to reduce NOx emissions globally over the next decade takes the additional NOx removed from tailpipes by JM technology compared to that achievable with 2020 technology. In other words, we take the combined tailpipe emissions of vehicles containing JM technology operating at 2020 regulatory standards as a baseline, and then count all additional NOx emissions removed by using JM automotive catalysts, where they meet tighter emission regulations in subsequent years.

Continuing to drive innovation to reduce vehicle air pollution

Our target to remove an additional 700,000 tonnes of NOx specifically captures the impact of the scientific advances we expect to make over the next decade to meet tightening tailpipe emissions regulations. This is equivalent to 2.5 times the NOx emissions from UK road transport in 2019.

For example, we designed our latest emission control catalyst for heavy duty vehicles so that customers were ready for the new China VI-a emission standards introduced in July 2021. This standard slashed China's NOx limit from 2,000 milligrams per kilowatt hour (mg/kWh) to 460 mg/kWh. Our calculations show that for every heavy duty vehicle in China that is fitted with one of our latest emission control catalysts, we help remove more than 180 kg of additional NOx in the first year of use.

We also expect Europe to introduce its latest level of regulation in the next four years, so we're already at work designing a new generation of automotive catalysts to comply with the new Euro 7 regulations as soon as they are launched.

Using an externally verified calculation, we estimate that an additional 700,000 tonnes of NOx removed will help to avoid 5,800 additional premature deaths, demonstrating the impact our emission control technologies have on UN SDG 3 – Good health and wellbeing.[1]

Our emission control catalysts can also be used to help remove harmful emissions in stationary applications, such as data storage centres, waste incinerators, as well as in shipping, agriculture and mining operations.

1. Adapted from the ICCT paper Comments and Technical Recommendations on Future Euro 7/VII Emission Standards, 2021, in which 4.2 million tonnes of NOx is approximately equal to 35,000 premature deaths.

4. Conserve scarce resources

Many of our technologies rely on PGMs. Yet these metals are hard to extract from the earth's crust, only being present in concentrations of more than 10 ppm. Studies show that the carbon footprint associated with recycled (or 'secondary') PGMs is an order of magnitude lower than that of newly mined virgin metals.[2]

JM is already the world's largest recycler of secondary PGMs, so this expertise is one of the most important ways we can help the world to create more circular economies for scarce resources. As part of our role in the PGM industry we want to encourage all stakeholders to consider the carbon footprint and circularity of their PGM supply. So we are setting a target for recycled content for the PGMs in the products that we make. While additional new supply of PGMs may be necessary to support growing uses of these important materials in the transition to net zero for some years, we aim to have at least 75% of all the PGMs that we use in manufacturing to have come from recycled sources by 2030, with the majority of this secondary material purified in our own refineries. This reflects the need to focus on bringing important resources, such as PGMs, back around the loop, while recognising that these unique metals have an important role as the transition occurs, a role that may not be completely fulfilled by the available recycled supply.

We see this new target as a step in our journey. It encourages the use of secondary supply, and designing this into our products from the outset. It also encourages industry dialogue on where PGMs come from and the relevant sustainability considerations for those sources. To support this increased dialogue, we're also looking at how provenance could be digitally traced and are working with our customers to understand what their needs are for PGM provenance so that we can continue to encourage greater sustainability in PGM supply. And our industry-leading market research team are helping us forecast what future recycling flows will look like over the next two decades. This will help us focus both our innovation work and investment plans.

Our new target for 2030
Average % of recycled PGM content in products manufactured by JM during year.*

2030 target	2021/22 result
>75%	**71%**

* Average across all use of five PGMs in JM manufacturing: platinum, palladium, rhodium, iridium and ruthenium.

#1 global refined PGM supplier	**#1** secondary recycler	**c.2x** capacity of nearest competitor

Palladium · Platinum · Rhodium · Iridium · Ruthenium

JM At the heart of the PGM market

Autocatalysts · Industrial applications · Fuel cells · Green hydrogen technologies

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2. See International Platinum Group Metals Association, Life cycle assessment, Second IPA LCA Study (2017 data).

Operations

While our products can help deliver our vision for a cleaner, healthier world, we must ensure we make them in ways that lower our own environmental impact. Last year, we committed to reaching net zero by 2040 and developed a series of 2030 targets to set us on our way. We also joined the UN Global Compact's Business Ambition for 1.5°C.

In this section

Managing our environmental performance

Our Sustainability Council is responsible for agreeing our overall approach to environmental performance.

We have group policies, processes and systems that help us achieve a high level of environmental performance. We also have a number of corporate standards that cover the following environmental aspects:

- Waste
- Energy
- Emissions to atmosphere
- Discharge to surface and ground waters
- Protection of waste water discharge systems

We assess our sites against these standards as part of our ongoing audit work. All our sites are assessed by our centralised internal audit team at least once every three years.

In all, 86% of our manufacturing sites use environmental management systems that meet ISO 14001. Many of our operations are covered by environmental permits or licences and, as a minimum, we ensure we comply with all regulations in the locations where we operate.

We expect all our sites to report any incident that affects the environment to their local authorities. We classify any spills that occur on unmade ground or near drinking water sources as significant. We reported no significant spills during 2021/22. We had one reportable environmental fine of £12,000 in China.

We measure progress against our key performance indicators (KPIs) monthly and use the data to improve performance. The details behind the methodologies used for our KPIs and the third-party assurance certificate can be found at the end of this report at page 221.

1. Achieve net zero by 2040

In June 2021, we publicly committed to achieve net zero by 2040 and, in October, our intermediate targets to reduce Scope 1, 2 and 3 emissions by 2030 were validated by the Science Based Targets initiative (SBTi), providing important confirmation that they are in line with the 'well-below 2°C trajectory' of the UN Paris Agreement.

Our Scope 1 and 2 GHG emissions come from our manufacturing operations and represent the part of our footprint that we can directly influence by changing the way we use energy in our facilities. Our Scope 1 and 2 GHG emissions data is verified to ISAE3000 standard by a third party – see page 221. The full assurance statement can be found online at: matthey.com/assurance-statement-2022.

Scope 3 GHG emissions represent 90% of our footprint and mostly result from the raw materials we buy.

Progress against our 2030 targets

Reduce Scope 1 and 2 GHG emissions by 33% from 2019/20 baseline	Reduce Scope 3 emissions from purchased goods and services by 20% from 2019/20 baseline
2021/22	**2021/22**
399,906	**3,008,648**
tonnes	**tonnes**
2% increase from baseline	8% decrease from baseline

Our performance in 2021/22

We use various energy sources, from renewable electricity to power our plants, to natural gas to generate heat for triggering chemical reactions. This year, we saw a 5% rise in our use of energy and 4% rise in our Scope 1 and 2 GHG emissions, and a 3% rise in our carbon intensity as our manufacturing output rose at a lower rate. Our energy efficiency performance shows a similar trend. This decline in performance occurred because we brought two new large facilities online in our Clean Air business. It is normal, at start-up, to operate at reduced throughput as you start to validate parts and finish commissioning equipment. As the sites move to full production, we expect our efficiency will improve again.
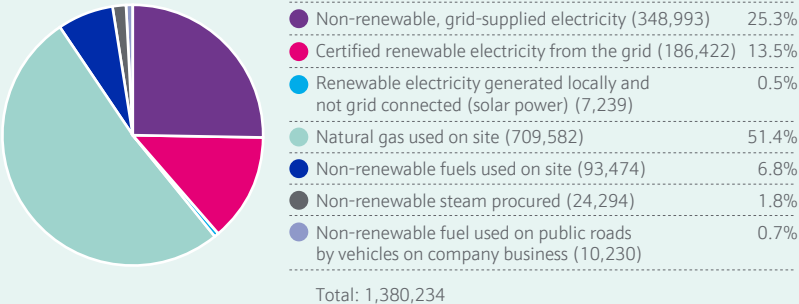
This year, 14% of our energy consumption came from certified renewable sources. Four of our largest manufacturing sites also make electricity using combined heat and power plants (CHPs). Although these run off natural gas, they are a more climate-friendly way of generating electricity, if the heat is also used in the manufacturing facility. In 2021/22, our CHPs generated 28,825 MWh of electricity.

Our Scope 1 emissions rose broadly in line with the increase in natural gas use. Meanwhile, our Scope 2 emissions remained broadly flat because the impact on our carbon emissions from using more electricity was offset by the strides we have made to increase the amount of renewable electricity our facilities use. This year, we purchased 18% more renewable electricity than last year.

Overall, our Scope 3 GHG emissions rose 7.7% in 2021/22 versus the previous year because we procured more raw materials, although this is still 8% lower than our 2019/20 baseline. Some 86% of our Scope 3 footprint comes from our purchased goods and services category. These emissions rose more slowly than our volumes of procured raw material, as we have started to see the carbon intensity of the operations of some of our strategic suppliers fall. While Scope 3 GHG emissions from business travel emissions have also gone up, our employee commuting emissions are significantly lower, because more of our employees have worked flexibly from home since the start of the COVID-19 pandemic.

We have made some adjustments to our calculation methodology during the year to strengthen the quality of our data, and on the advice of the SBTi assessors. Details can be found in the Basis for Reporting section on pages 214-220.

Energy mix (MWh)

● Non-renewable, grid-supplied electricity (348,993)	25.3%
● Certified renewable electricity from the grid (186,422)	13.5%
● Renewable electricity generated locally and not grid connected (solar power) (7,239)	0.5%
● Natural gas used on site (709,582)	51.4%
● Non-renewable fuels used on site (93,474)	6.8%
● Non-renewable steam procured (24,294)	1.8%
● Non-renewable fuel used on public roads by vehicles on company business (10,230)	0.7%

Total: 1,380,234

Sustainable business *continued*
Operations continued

Scope 1 and 2 greenhouse gas (GHG) footprint and energy efficiency

	2020/21 Global	2020/21 UK only	2020/21 Global (excl UK)	2021/22 Global	2021/22 UK only	2021/22 Global (excl UK)	% change (global)
Scope 1 (tonnes CO_2 eq)	203,930	66,634	137,296	**219,846**	**68,282**	**151,564**	+7.8%
Scope 2 – market based method (tonnes CO_2 eq)	181,525*	3,969	181,005	**180,060**	**1,488**	**178,572**	-0.8%
Scope 2 – location based method (tonnes CO_2 eq)	227,381	34,871	192,510	**240,897**	**29,768**	**211,129**	+5.9%
Total operational carbon footprint – Scope 1 and 2 market based method (tonnes CO_2 eq)	385,455*	70,603	318,301	**399,906**	**69,770**	**330,136**	+3.8%
Total operational carbon footprint – Scope 1 and 2 location based method (tonnes CO_2 eq)	431,311	101,505	329,806	**460,742**	**98,049**	**362,693**	+6.8%
Total Scope 1 and 2 carbon intensity – market based (tonnes CO_2 eq/tonnes sales)	3.4	7.1	3.1	**3.5**	**13.0**	**3.0**	+2.9%

	2020/21 Global	2020/21 UK only	2020/21 Global (excl UK)	2021/22 Global	2021/22 UK only	2021/22 Global (excl UK)	% change (global)
Total energy consumption (MWh)	1,312,084	431,466	880,618	**1,380,234**	**422,225**	**958,009**	+5.2%
Total energy efficiency (MWh/tonne)	11.5	43.4	8.5	**12.1**	**78.7**	**8.8**	+2.5%

Scope 3 GHG emissions by category

(tonnes of CO_2 equivalent)

Category	Category number	2021/22	2020/21	2019/20
Purchased goods and services	1	**3,008,648**	2,851,616	3,282,096
Capital goods	2	**349,214**	308,835	399,630
Fuel and energy-related activities	3	**46,990**	39,725	41,425
Upstream transportation and distribution	4	**168,750**	102,552	102,552
Waste generated in operations	5	**5,775**	5,257	5,303
Business travel	6	**1,336**	67	9,202
Employee commuting	7	**15,718**	29,957	29,957
Upstream leased assets	8	**698**	602	5,094
Use of sold products*	11	**0**	0	0
Investments**	14	**16**	665	10,997
Total		**3,597,145**	**3,339,276**	**3,886,256**

*   We have removed Use of sold products from our footprint by agreement with SBTi, as it determined that the emissions we reported in this category were 'indirect' and should not, therefore, be included.
** Investments category accounts for JM's Joint Ventures only.

Five-year performance table

	2021/22	2020/21	2019/20	2018/19	2017/18
Total energy consumption (MWh)	1,380,234	1,312,084	1,355,295	1,444,890	1,431,360
Total Scope 1 and Scope 2 (market based) GHG emission (tonnes CO_2 eq)	399,906	385,455	391,459	423,130	445,509
Total Scope 3 GHG emission (tonnes CO_2 eq)	3,597,145	3,339,276	3,886,256	–	–

Developing our net zero roadmap

To realise our net zero ambition, each of our businesses is developing a roadmap to prioritise the work we'll need to do to improve energy efficiency, switch to lower-carbon forms of energy and eliminate or abate the GHG emissions that our chemical processes generate. It is important we tackle these challenges in a cost-effective way, so we aim to manage large equipment replacements as part of our ongoing capital renewal programme.

Our roadmaps help us identify the short-, medium- and long-term steps we need to take to meet our 2030 targets. In the coming year, we will be working with our supply chain partners to extend it to include tackling our scope 3 GHG emissions as well.

Managing our energy mix, switching to more low-carbon power and improving energy efficiency are all key ways we can realise our net zero ambition in the near term.

Net zero roadmap for Scope 1 & 2 GHGs

Baseline	Target: 60% renewable power	Target: -33% GHGs	Target: -100% GHGs

Five principles for net zero

2020	2025	2030	2040

Energy efficiency

- Pilot SMART metering pilots at key sites → ISO50001 accreditation at top energy-using sites **-10%**
- Energy efficiency improvements through continuous improvement and equipment upgrades
- Footprint rationalisation to scale down old and less efficient assets **-5%**
- Energy efficiency improvements continued
  - Continuous improvement optimisation and equipment upgrades **-10%**

Renewable electricity

- Switch to renewable electricity in the USA and Europe → Switch plants to renewable electricity in India and China **-25%**
- Switch to low carbon fuel or switch off gas-fired CHP generators **-5%**
- Renewable electricity sourcing in remaining locations **-5%**

Abate process GHG emissions

- N_2O abatement technical studies → N_2O process emissions abatement projects **-5%**
- Carbon capture and storage 'discovery' work
  - CO_2 emissions data profiling on key sites
  - Partner to establish appropriate CCS technology solutions at JM strategic locations
  - Switch to alternative process chemistry
- CO_2 process emissions
  - Eliminate through process chemistry change or capture (CCS) **-10%**

Natural gas replacement

- Assess equipment-level gas usage and suitability for conversion to sustainable fuel sources → Develop natural gas replacement roadmap
  - Overlay green energy developments and asset replacement / upgrade plans
- Phase out use of other fossil fuels in India and CA test facilities **-10%**
- Natural gas replacement projects
  - CapEx – Electricifcation of lower-grade heat ovens at high-usage sites
  - Conversion to biomethane / hydrogen or add carbon capture technology **-15%**

Net zero growth

- Grow manufacturing footprint for Hydrogen Technologies and other new businesses on 100% renewable energy **0%**

Underpinning work | Delivery

Using energy more efficiently

It is important that we continually improve the efficiency of all manufacturing facilities, and recent global energy price rises have made this even more urgent. To accelerate our progress, during the year, we have assessed our top 20 energy-consuming sites against the following criteria to better understand how they are working to reduce energy consumption:

- Energy management systems
- Metering, forecasting and monitoring
- Key performance indicators, goals and targets
- Energy saving programmes
- Employee communications.

Many sites scored well in monitoring, energy saving, metering and goals. We also identified areas for improvement, including use of energy management systems. Currently, 20% of our top 20 sites are certified with the ISO 50001 energy management standard, which provides the best framework for evaluating and measuring energy management. The remaining 80% of these sites plan to work towards certification, and we will be training our operational teams globally during the next year to achieve this.

In 2021, our procurement team ran a UK pilot project on mitigating commodity energy price risks, which insulated our UK businesses from around 80% of the rapid price rises seen in the global energy market during the year. We have since used lessons learned from the pilot to develop new energy procurement methodology, which we are now rolling out across JM globally. We spent £85 million on energy versus £64 million in 2020/21.

In addition, in our Clean Air business, we have continued to find ways to improve our production cycle times and run equipment at optimal temperatures for maximum efficiency at existing plants. And we are improving our 'right first time' rate to maintain high product standards while reducing the quantity of raw materials we use. Similarly, in Catalyst Technologies, we have carried out operational assessments to identify projects to drive greater efficiency. For example, some sites are carrying out feasibility studies to see how we could better integrate sources of heat to reduce the amount of energy we use.

Making progress towards our renewable electricity target

We are making good progress towards our target to buy 60% of our electricity from certified renewable sources by 2025. In 2021/22, we reached 34% from sources with a renewable energy guarantee of origin, up from 30% last year. A total of four sites switched to grid-supplied renewable electricity contracts this year, including our new Clean Air manufacturing site in Poland.

To accelerate our progress to source renewable electricity in countries where it is not so readily available in the market, we employee third-party specialists, South Pole Group. So far, they have worked with our sites that use the most energy in Europe, the USA and India to identify new low-carbon energy opportunities. These include power purchase agreements, electricity from certified renewable sources and on-site electricity generation, with particular focus on sites that could have the most impact on our 2030 target.

2. Reduce water consumption and waste

Climate change and a growing population are set to put more stress on global consumption and the security of the water supply, which is why we have set a target to use less by 2030. We use water to make some of our products and for heating and cooling. We aim to use it responsibly and we look for ways to recycle and reuse it wherever possible.

Meanwhile, our operations create waste, which must be treated in line with local regulations. But beyond that we are committed to disposing of it responsibly, particularly important given that 63% contains hazardous materials. Here, too, we have set ourselves a target to reduce this type of waste. And we work with specialist treatment companies to ensure this waste is managed safely, and we look for ways to reduce and recycle waste.

Performance on water

We source 93% from mains supplies, extracting the rest from groundwater sources. In 2021/22, we used 6% more water than the previous year and our water efficiency declined slightly to 19.5 m³ of water per tonne of product sold. This was an accumulation of a number of local effects. For example, one of our sites in India operated a specific manufacturing process more frequently this year, which requires more water to work efficiently. At another of our sites, in Malaysia, a fire hydrant leak led to a rise in water use. However, our water use remains 4.2% lower than our 2020 baseline.

Progress against our 2030 target

Reduce net water use by 25%

2021/22

2,160,000 m³

4.2% reduction from 2019/20 baseline

We discharged 1.64 million wastewater, 92% to municipal treatment plants and the remainder back to its original source after treatment. Our waste water had an average chemical oxygen demand (COD) of 182 mg/L. We treated 1.167 million m³ of waste water onsite, of which we recycled 22.4% back into our manufacturing processes instead of discharging.

Net fresh water consumption	000's m³
2021/22	2,160
2020/21	2,039
2019/20	2,254

Water stress analysis to identify our priorities

To understand where we need to act most quickly for most benefit, we used the World Resource Institute's (WRI) Water Risk Atlas tool to analyse usage at our sites. The tool identified 16 facilities that are located in regions with a high or extremely high baseline water stress level, which means that they are at higher risk of declining water availability or increased cost in the future due to drought or groundwater table decline. They represent 24% of total water consumption.

From this analysis, we have developed group-wide guidance to help sites adopt effective water management plans, improve measurement and reduce water consumption. We are rolling this out to all our sites during 2022 and plan to run awareness sessions to help employees understand the role they play in driving towards our water target.

This work is part of our broader climate risk assessment work aligned with the Taskforce for Climate-related Financial Disclosures (TCFD) framework. See pages 60-69 for our full TCFD report.

Performance on waste

In 2021/22, the total amount of waste we produced and sent for treatment by third parties rose to 96,286 tonnes. Within this number, we saw rises in both our hazardous waste and our total waste sent to landfill categories, which we are keen to address. These rises are due in large part to the fact that we brought two new sites online that began producing waste, but it is also a result of changes in our product mix at some of our other sites.

Of this hazardous waste, we recycled and reused 47% this year. That is a 74% increase on 2020/21, thanks to a waste vendor recycling a particular liquid hazardous waste stream from one of our effluent treatment plants in Royston, UK.

Progress against our 2030 target

Reduce total hazardous waste sent offsite for third-party treatment by 50%

2021/22

60,470 tonnes

6.5% increase from 2019/20 baseline

Type of waste

Type of waste (tonnes)	2021/22	2020/21	% change
Liquid hazardous waste	57,478	54,171	+6.1
Solid hazardous waste	2,992	3,042	-1.6
Liquid non-hazardous waste	19,367	18,166	+6.6
Solid non-hazardous waste	16,448	12,167	+35.2
Total waste	96,286	87,546	+10

Waste treatment

Type of treatment (tonnes)	2021/22	2020/21	% change
Reuse	1,692	1,895	-10.7
Recycling	40,526	25,845	+56.8
Offsite incineration with energy recovery	4,380	3,314	+32.2
Incineration or other offsite treatment	45,446	52,891	-14.1
Landfill	4,242	3,601	+17.8
Total	96,286	87,546	+10

3. Minimise environmental footprint

Other operational air emissions

Some of our operations produce other air emissions as by-products of chemical reactions, including nitrogen oxides (NOx), sulphur oxides (SOx) and volatile organic compounds (VOCs). All our permitted sites monitor these emissions to ensure they comply with local regulations. When we design and build new facilities, we carry out an environmental impact assessment, which highlights the emissions abatement technology that we need to install.

Progress against our 2030 target

Reduce NOx emissions from our operations by 40%

2021/22

379
tonnes

5% increase from 2019/20 baseline

Performance

In 2021/22, we saw a small increase in our year-on-year NOx emissions, in line with our new sites coming online and the associated rise in production levels.

Our VOCs and SOx emissions both increased this year as well. We do not emit VOCs and SOx at every site, and our product mix at the sites that do produce these emissions has a large effect on our reported numbers.

We are investigating how best to monitor and report on other hazardous air pollutants (HAP) and hope to include a fuller report on our HAP emissions next year.

	2021/22[1]	2020/21[2]	2019/20[1]
NOx (tonnes)	**379**	375	360
SOx (tonnes)	**79**	49	28
VOCs (tonnes)	**92**	83	99
% sites covered for NOx reporting	**79%**	74%	67%

1. 2% sites not included are those due to divest or close in 2022.
2. Restated as explained below.
   For example, at one US site we are installing 'selective catalytic reduction' technology, which uses ammonia and a catalyst to reduce NOx emissions. We expect the new system to come online later in 2022.

Improving our management of NOx

Our foundational work towards achieving our 2030 target has been to ensure we are measuring all the NOx that our manufacturing plants produce globally in a standard manner. Measuring and reporting our NOx emissions has always been a challenge, because of the complex chemistries in the products we make. This programme to standardise our NOx reporting has led us to restate our last three years of data (see opposite) and the only sites not yet covered are those that have been announced as earmarked for divestment in the near future. We believe this now gives us a firm foundation on which to prioritise where to add specialist equipment to help reduce NOx emissions.

Product life cycle management

To realise our vision for a cleaner, healthier world our products must be made in ways that are as safe as possible for people and the planet. Some of the materials we use and the products we make are inherently hazardous, so our licence to operate depends on high standards of product stewardship. As well as supporting our Environment, Health and Safety teams to identify and manage the chemical risks in our own operations, we consider a product's full life cycle to ensure the risks are addressed at every stage.

Our Innovation team also works with our businesses to ensure new products are designed with safety and sustainability in mind. Together, they use key questions, such as 'are there any elements of the product that cannot be recycled or degraded?' or 'are any substances in the product included on substances of concern lists?' to determine whether product development should continue.

Our product stewardship policies define our key requirements, processes and responsibilities to ensure we comply with relevant laws and regulations. They also support our commitment to Responsible Care®, a voluntary industry-wide initiative to support safe chemicals management.

Maintaining high standards to meet changing regulation

We work in several highly regulated industries, which means we must adhere to strict requirements, such as notifying or registering products and following certain rules on manufacture and use. Our Product Stewardship Centre of Expertise works with our businesses to ensure we comply with these rules. The team is also designing a new IT tool to help assess the potential impact that proposed regulatory changes or new hazard information could have on our portfolio.

Our product stewards also monitor changes around the world and assess their potential impact on our supply chain. This year, we prepared for new chemicals regulation in Turkey, India, South Korea, Latin America and the Eurasian Economic Union. For example, in advance of India's widely anticipated Chemicals Management and Safety Rule, we prepared a substance inventory check for chemicals we make and import into the country.

We have also continued to work on our compliance programmes in China. And in the UK, we are working with the government, directly and through the Chemicals Industry Association (CIA), on potential revisions to the UK's Registration, Evaluation, Authorisation and Restriction of Chemicals (UK REACH) regulation.

Our product stewardship reporting programme helps us track operational and product performance every year. This year, the programme found no reports of significant health effects from the use of our products. It also confirmed we continue to comply with health and safety, labelling and marketing regulations, and voluntary codes. There were no transportation incidents with significant impact on the environment reported either.

Reassuring customers on product safety

We assess all the potential chemical hazards in our products and provide customers with legally compliant safety data sheets. These contain information on the chemical and its hazards, along with guidelines on safe handling and what to do in the event of a spill or emergency. We also submit this information to national poison centres around the world.

We work closely with our customers to understand how they use our products to see if we can further control or minimise risks and to better understand any adverse effects on human or animal health, or on the environment. For example, this year JM assisted customers in Oman to obtain trans-frontier shipment notifications to enable the safe and appropriate treatment and disposal of mercury waste.

Working with industry bodies to meet regulations

As well as ensuring we maintain the highest standards of product stewardship in our business, we work with our industry to foster sound product safety assessments and support proportionate government regulation.

For example, we belong to voluntary European industry initiatives such as the Cefic/ECHA REACH Dossier Improvement Action Plan, designed to improve the quality of hazard and risk management information that chemicals companies like JM must submit under the EU REACH regulation. This year, we re-evaluated, and where necessary, updated almost 90 EU registration documents, six of which JM is the sole or lead registrant.

We also belong to a variety of industry bodies so that we can make our voice heard in discussions about new regulation, and to help us better understand, and plan for, potential changes. For example, in the UK, we belong to the CIA, and in Europe we are members of the European Chemical Industry Council (Cefic) and Eurometaux. We are also members of the European Precious Metals Federation (EPMF) and the Cobalt Institute.

In 2021, JM ranked fifth in the non-governmental organisation ChemSec's latest Chemscore report. The report assessed the world's 50 largest chemicals companies against several criteria, including toxicity of product portfolio and transparency. While our overall score is the same as 2020, we were pleased to retain our top five ranking despite the report expanding from 35 to 50 companies.

Finding safer alternatives and reducing risk

Where possible (and always where legally required), we strive to replace 'high hazard' substances – chemicals that may pose a significant risk to human health or the environment – with safer and economic alternatives. In cases where we need to use these substances in new products or technology projects, a senior site or operations leader must approve a risk assessment. Approvals are time-limited (varying by project) to ensure our R&D team continues work to identify less hazardous alternatives.

Where replacement in existing products isn't possible, we conduct detailed safety assessments for each use and ensure that our operations and customers have robust risk management processes in place. This may include site visits, co-developing site-specific exposure scenarios to ensure appropriate risk management measures are in place, or requiring written confirmation of conformance.

The number of substances we use that are regulated[1] or are considered to be of international concern[2] is limited. Approximately 5% of our sales come from products that are made using or containing such substances.

Working with genetically engineered microorganisms

Genetically engineered microorganisms in our biocatalysts (enzymes) represent just 0.01% of our sales. These products do not contain live organisms at the point of supply. Biocatalysts are important because they can help us make more of a desired chemical product with fewer undesirable by-products.

Our policy on animal testing

As a chemicals company, we must comply with international legislation to provide toxicity information to assure the safety of our products for humans, wildlife and the environment. Sometimes, this means we have to use animal testing. We are committed to ethical principles of animal protection and always look for other options first, such as computer modelling and non-animal testing methods.

Where no data or alternative methods exist, and a study is required by law, we seek to limit new testing and avoid duplication by working in collaboration with industrial partners with the same data needs. We only use fully accredited contract research organisations and we do not carry out in-house testing.

We also look for opportunities to use non-animal testing where regulation allows. For example, we are currently working with SenzaGen AB to assess the use of its non-animal testing methods to identify hazardous properties of difficult-to-test metallic products.

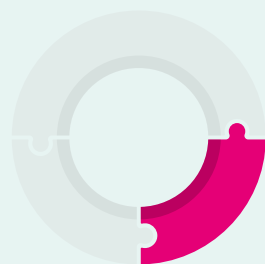For more information on our animal testing policy, visit: matthey.com/product-stewardship

Developing life cycle analysis for our products

Product life cycle analysis (LCA) is an important way in which we can demonstrate how the environmental benefits of our products outweigh the impact of making them in the first place.

We have also set ourselves a 2030 target to make cradle-to-gate LCA information available for more than 95% of our product families, and in 2022 we recruited a small, dedicated LCA team to help us get to work.

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1. Such as substances of very high concern under REACH and the EU's Restriction of Hazardous Substances Directive or substances listed under California Prop 65.
2. Such as substances controlled by the Montreal Protocol, Stockholm and Rotterdam Conventions, GHS category 1A/1B carcinogens, mutagens or reprotoxins.

People

In this section

1. Keep people safe

Everyone in JM is responsible for keeping themselves and each other safe. We also rely on the skills and diligence of our operational and safety teams to keep our plants and sites running safely and efficiently.

Our approach to health and safety

To keep our people, plants and sites safe, we focus on:

- Occupational health and safety to track, report and address more frequent, but typically less severe incidents, such as slips, trips and falls.
- Process safety – to manage our most hazardous processes and ensure we design, operate and maintain safe factories.

Our Group Environment, Health and Safety (EHS) policy, available in local languages, guides everything we do and is underpinned by eight lifesaving policies, such as working in confined spaces. We give our sites guidance on how to implement these policies and put local processes in place to meet them. We also monitor compliance through EHS audits.

We recognise that the changes we're making in our portfolio have created uncertainty for employees this year. And we know that uncertainty can make it harder to stay vigilant. As a result, we have seen a higher number of incidents in some areas. To combat this and get everyone back on track, we have launched our 'Take 5' programme to help employees carry out simple safety checks to identify hazards and controls before starting any activity.

Nonetheless, our people continued to demonstrate care for one another throughout the ongoing challenges of COVID-19. We continued to monitor the site measures and controls we have in place to protect our operational employees and rolled out regular lateral flow testing at our UK sites. We are pleased to say that we have had no fatalities of employees or contractors in the last seven years.

Progress against our 2030 targets

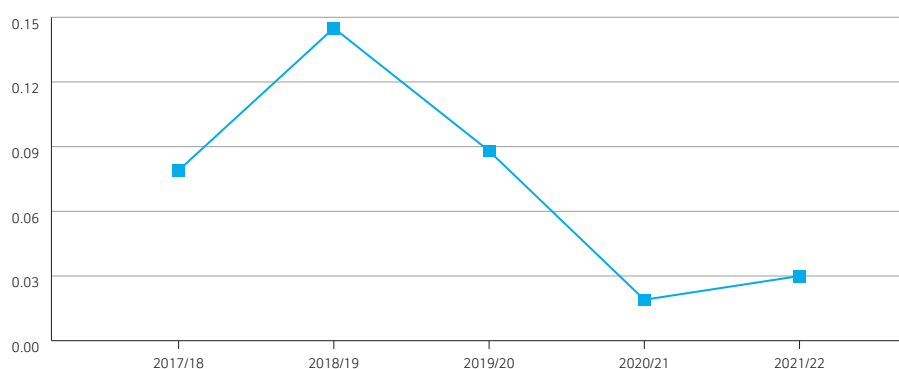| Total recordable injury and illness rate – employees and contractors (per 200,000 hours worked)	ICCA process severity rate (per 200,000 hours worked)
2030 target	2030 target
below 0.25	0.4
2021/22	2021/22
0.59	1.37

Occupational health and safety performance

We want everyone to go home safe and well at the end of every day. We use several leading and lagging indicators, such as lost time injury and illness rates (LTIIR), to help us track performance and make improvements.

Of our recordable injuries, 42% occurred in the USA, where some sites faced resourcing difficulties, leading to more overtime and fatigue. A couple of our sites also had more ergonomic injuries related to old equipment that is not ergonomically designed. These sites now have plans to address the issues and, in 2022, most of our sites will have carried out gap assessments against our behaviour standard which we relaunched in 2021. While our overall recordable injury and illness rate deteriorated slightly this year, our severity rate improved by 29%. This means that those injuries were less serious and resulted in fewer lost working days.

Occupational illness incident cases per 200,000hrs worked

Recordable injury and illness rates for employees and contractors
Lost time injury and illness rate and total recordable injury and illness rate (all per 200,000 working hours in a rolling year)

	2021/22	2020/21	2019/20	2018/19	2017/18
All personnel - LTIIR	**0.29**	0.28	0.34	0.56	0.54
All personnel - TRIIR	**0.59**	0.55	0.79	0.97	0.99
Employees and temporary employees - LTIIR	**0.29**	0.29	0.35	0.57	0.52
Employees and temporary employees - TRIIR	**0.61**	0.56	0.79	1.01	0.96
Contractors - LTIIR	**0.27**	0.23	0.27	0.40	0.74
Contractors - TRIIR	**0.49**	0.45	0.80	0.53	1.29

* Note: all personnel above means employees, temporary employees, and contractors

During the year, we continued to embed new tools, including 'golden rules' to support our lifesaving policies. For example, when working at height one of our rules states: 'I will always wear a secured harness where the risk of a fall cannot be eliminated'.

Our 'Take 5' programme helps employees carry out simple safety checks to identify hazards and controls before starting any activity. We have also relaunched our behaviour standard as part of our ongoing Work Safe, Home Safe campaign. This helps sites assess safety culture between different employee levels, identifying why those differences exist and developing plans to close gaps.

In the coming year, we plan to introduce training to help improve the quality of safety observations and conversations at our sites. The training will help our people learn how to ask open ended questions, ask each other what could go wrong before carrying out an activity, and remind everyone of their responsibility to stop and report any unsafe practices.

Keeping our contracting community safe
This year, we continued work on several large capital investment projects across the group, which meant we had many more contractors on site than usual. With our contracting partners, we helped them to understand our EHS expectations and regularly monitored their compliance. This meant our contractor LTIIR for the past 12 months increased only slightly, from 0.23 to 0.27, as did our our total recordable injury and illness rate (TRIIR), from 0.45 to 0.49. Our five-year contractor LTIIR and TRIIR performance can be found in the table above.

Protecting our people from different types of risk

At JM, our EHS standard and guidelines help us assess, monitor and reduce employee and contractor exposure to hazardous materials. These cover a range of issues, including how to manage exposure to chemical, physical and biological risks.

Every site has its own monitoring plans to identify potential exposure against regulatory and internal JM limits, and to set out its control measures to either reduce or remove exposure.

Our group EHS team regularly audits sites against our EHS standard. It also shares good practice and tools to improve safety standards, and frequently reviews our industrial hygiene exposure risk evaluation and control programmes.

Our Group industrial hygiene and occupational health team also carries out regular site reviews to assess health management programmes and, when needed, support improvement plans.

In the next year, we will continue to focus on our ergonomics programme – one of our biggest occupational health challenges. And we plan to introduce a central database to record exposure risk assessments and exposure monitoring data. We also work through industry associations, such as the International Platinum Group Metals Association and European Precious Metals Association to support industry health studies.

Our central team continues to support new projects across JM with appropriate advice on health risk management, including risk assessment, containment and control, and ongoing health management.

Process safety

Keeping our plants and equipment in good working order helps reduce the risk of failures that could cause significant injury or harm the environment. Process safety relies on well-designed facilities, strong engineering skills, regular maintenance programmes and clear, consistent training.

Our performance in 2021/22

Our main lagging indicator for process safety is the severity score of loss of primary containment (LOPC) incidents, based on the International Council of Chemical Associations (ICCA) standard. Our performance declined this year. Two factors contributed to this year's results: two significant LOPC incidents, and more and accurate reporting from our sites. When compared with our pre-pandemic 2019/20 statistics, our figures for this year are broadly flat.

We investigate every process safety event to understand the root causes and put measures in place to correct the problem. In 2021/22, our most serious incident occurred when a road tanker carrying 50% caustic soda was accidentally offloaded to a storage tank that was out of service for maintenance. This resulted in the release of a small amount of corrosive liquid outside the containment area. The spill was contained on site and no one was harmed, since the area was empty. Our root cause analysis revealed failures in the tanker offloading procedure, including a process that meant a critical lock on the connection between the tanker and the storage tank was removed too early. We shared the lessons from this incident via a video presentation to our operations community. And we carried out a gap assessment at all sites that receive chemical bulk deliveries to ensure they are following good practice to prevent offloading errors.

We also completed a group-wide gap assessment on design for selected chemical processes that could cause excess flammable gas. The sites with these processes now have plans in place to address gaps.

Our Tier 1 process safety events increased from five in 2020/21 to 11 in 2021/22. This was partly due to better reporting of LOPC events from our sites. See Basis for Reporting on pages 214-220 for a definition of a Tier 1 event.

In 2021/22, 93% of operations-based staff completed our process safety training, designed to help employees understand their part in keeping our equipment in good working order. In addition, we launched a new process safety technical training website and ran 15 online courses for more than 200 participants on a range of process safety topics.

We relaunched our process safety performance indicators with clear requirements for lagging indicators, including our LOPC rate. These also look at leading indicators that focus on areas such as overdue inspections on safety-critical equipment and process safety-related near misses.

We also carried out individual process safety competency assessments for 150 managers and engineers in process safety-critical roles at facilities rated 'high hazard'. We will complete the remaining 37 assessments throughout 2022/23.

ICCA process safety severity rate (PSER)

PSER per 200,000 hours worked

Year	Rate
2021/22	1.37
2020/21	0.81
2019/20	1.20
2018/19	1.54

Strengthening our audit programme

Despite ongoing COVID-19 restrictions in the first half of the year, we audited eight of our sites across Europe and Asia during 2021/22, either in person or remotely. We also completed face-to-face audits at seven of our North American operating facilities, in line with our proposed schedule. Our audits in Europe and Asia identified gaps in our programmes to implement lifesaving policies. In North America, we found issues around contractor management, the control of hazardous energy and managing change programmes. All our audited facilities now have remedial action plans in place to address these gaps and we will track those plans until they are completed.

This year, we introduced a new audit rating to better illustrate a site's progress against its EHS risks, while our sector EHS leaders introduced more rigour for acting on audit findings and identifying work that requires capital investment.

Another key development was a new methodology for deep dive audits on risk management events that could lead to catastrophic incidents. This will help ensure we have the right controls to reduce the likelihood of an event happening. In 2021/22, we audited three sites and plan to audit the remainder in 2022.
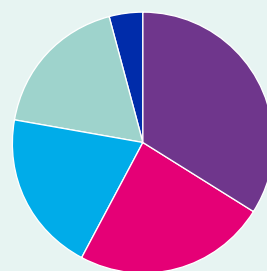
As we continue to transform, we know we must do even more to help our people stay safe. Continuing our programme of site process safety hazard reviews is key, and we have now assessed 74% of our high-hazard processes, all of which have plans to act on the recommendations. We're also working to reduce our LOPC statistics, including introducing more automated fail-safe instruments.

We are also planning further improvements over the next 18 months, including completing work to verify safety instrumented systems, such as trips and interlocks for high-hazard critical events. And we will continue to improve group support for incident investigations and sharing lessons learnt across JM from serious process safety incidents.

2. High-performing, inclusive and engaged company

We are proud of our talented people. They kept each other and our facilities safe throughout the ongoing COVID-19 pandemic, while showing determination to continue winning business and driving results. They also demonstrated resilience as we carry out important work to simplify our portfolio, while delivering our ongoing business.

JM people around the world
Total employees by region

Monthly average number of employees	14,421[1]
UK	34%
Rest of Europe	24%
North America	20%
Asia	18%
Rest of World	4%

1. This includes 924 agency staff.

Building skills and career paths for a successful future

We have deep technological expertise, particularly in platinum group metal (PGM) chemistry, catalysis and process design, and have leading positions in many of our chosen markets. To make the most of this competitive edge and unlock the greatest value for our customers and JM, we are focusing on strengthening our in-house commercial capabilities. During the year, we set up a Commercial Council to accelerate this work, making progress in several areas, including cross-sector accounts management, introducing a new customer relationship management approach and exploring the use of sales incentives. Our Sales Academy was core to this strong progress.

Supporting leaders throughout their career

Our 'Aspire' leadership development programmes are designed to support leaders at all levels of JM, from first-time team leaders to senior managers. Since launching the programmes, close to half of all JM leaders have taken training modules. Course evaluations were consistently positive, with scores well above 80% in all key categories, such as the relevance of content to people's jobs.

To support our leaders as we transform our business, we also launched several new global coaching programmes and leadership masterclasses on topics such as empowering teams. Our Boost programme, for example, has helped to embed a coaching culture at our manufacturing sites, while driving process and efficiency improvements. In 2022, we aim to establish new learning and development analytics to provide individuals and groups with more targeted development opportunities. And we established a new JM capability framework to give employees clarity on how to develop and manage their career at JM. In 2022, we aim to establish new learning and development analytics to provide individuals and groups with more targeted development opportunities.

Creating clear career paths

This year, we developed more detailed functional skills resources, particularly for our Commercial and Human Resources functions, and promoted our MyCareer digital career site. In 2022, we will also develop new skills and careers resources for our innovation and engineering functions to help them identify cross-sector opportunities and grow their JM career.

Enabling our people to navigate change

The world is changing at an extraordinary rate and JM is adapting to ensure our business is fit for the future. In the past year, our portfolio review and ongoing transformation programme have caused short-term uncertainty for our people, including some roles being made redundant. We have, however, a re-deployment programme to help affected colleagues take up roles in other parts of JM. Where this is not possible, we provide financial and career support.

COVID-19 and a tightening labour market, particularly in the USA, have also affected our employee turnover this year. Our total turnover decreased slightly from 15.7% to 15.4% compared to last year. However, our voluntary turnover rate increased from 9.0% in 2021/22 to 11.6%.

We respect and promote the rights of people to freedom of association. In 2021/22, and 23% of our people globally were covered by collective bargaining agreements and represented by trade unions.

We work collaboratively with 10 trade unions across JM, focusing on a range of topics, such as safety, wellbeing and improving the way we work at our local sites. Together, we discuss site, sector and business performance, environment, health and safety issues, working practices, business change needs, employee training and reskilling. We also support engagement at regional and national levels where needed.

Change of any kind can be unsettling, and it is more important than ever that we help our people look after their health and wellbeing. During the year, we ran a number of sessions for all employees across the organisation.

Across JM, we also looked for ways to promote physical wellbeing in 2021. This included launching a global step challenge in July. More than 2,200 employees joined the challenge, taking more than one billion steps. We followed this with a global wellbeing festival, running more than 50 different sessions on a range of mental and physical wellbeing topics. We saw over 3,500 registrations and received positive feedback from employees.

The future of work – a more agile approach

As part of our ongoing transformation programme, we rolled out several global processes to simplify and standardise our business. We are also rolling out new digital tools and processes, including Workday. This HR platform will give us better quality data to help us run our businesses effectively, understand our talent and simplify how we do things.

We also introduced hybrid working policies at several offices around the world. This gives our people greater flexibility to choose where, when and how they do their jobs. In some locations we reconfigured our offices to make it easier for people to work together.

Diversity and inclusion

We continued to make progress in our diversity and inclusion agenda this year, introducing a new diversity, inclusion and belonging roadmap built on five pillars: leadership accountability; developing and attracting talent; engaging employees; supplier diversity; and community engagement.

It is underpinned by inclusive policies and procedures designed to create a fair workplace for all. It will also guide our actions as we work to build an organisation that realises the benefits of diverse thinking, as well as greater inclusion and belonging.

Progress against our 2030 target

Female representation across all management levels.

2030 target	2021/22
>40%	**27%**

Progress on gender diversity

As at 31st March 2022, women represented 33% of Board members (2020/21: 34%) and 37% of all senior managers.

However, female representation across all management levels has remained at the same as 2020/21 at 27%. Achieving our 2030 gender target for this group of employees is a long-term process that is both structural and behavioural. It all starts at the beginning of our people development pipeline and we are delighted that this year women made up 58% of our new graduates and 56% of our talent acceleration programme. In 2022/23, we will introduce a development programme for leaders and people managers to ensure they understand why diverse teams, supported by inclusive cultures, are essential for business.

Gender diversity statistics

As at 31st March 2022	Men	Women	Total	% men	% women
Board	6	3	9	67%	33%
GLT	6	2	8	75%	25%
Subsidiary Directors	100	17	117	85%	15%
Senior managers*	38	22	60	63%	37%
All management levels	1,303	487	1,789	73%	27%
New recruits	1,355	718	2,073	71%	35%
All employees	9,532	3,898	13,430	71%	29%

* Within JM our senior managers are defined as direct reports of the GLT. The UK Corporate Governance Code 2018 requires companies to disclose the gender balance of senior management, which is defined in the Code as a company's executive committee and the Company Secretary, the statistics for this are included in the GLT row above. Some individuals are included in more than one category.

Gender pay gap

We have made excellent progress. Our latest combined UK gender pay gap is 5.4%, an improvement on 6.7% in 2020/21. We continue to perform well against the national average of 15.4%.

Increasing diversity in all its forms

We want our teams to represent the communities in which we operate, which means going beyond gender.

This year, we have focused on building awareness and education among our employees to enable us to develop a culture of inclusion and belonging. This work is designed to increase our people's skills and confidence when talking about diversity and inclusion. In partnership with our Black Employee and Pride networks, we arranged 23 reverse mentoring relationships. This gave JM leaders the opportunity to be mentored by more junior colleagues and hear first-hand experiences from underrepresented communities while also providing their mentors with advice on career progression.

To support our HR colleagues and leaders, we ran training sessions on key diversity, inclusion and belonging topics. We also launched our first global, mandatory diversity and inclusion training for all employees, covering topics such as creating a respectful workplace and unconscious bias.

In 2021/22, we launched several new employee resource groups (ERGs), including a family group, a veterans' network and an Asian network – all sponsored by senior JM leaders, who champion and advocate for these groups in their businesses. As part of our ongoing employee engagement programme, we worked with our ERGs to run webinars on important topics ranging from autism to menopause to LGBTQ+ Pride month.

We remain committed to increasing racial diversity in senior leadership. In the UK, we participated in a cross-company talent acceleration programme, run by the Black British Business Awards.

We plan to focus more on ethnic diversity with our new Workday HR system, which will give us the opportunity to measure ethnic representation across the business and track future progress. From 2022/23, we will encourage employees to share diversity demographics in Workday, which will enable us to set UK and US ethnicity targets.

We also joined Valuable 500, which aims to encourage business leaders to address disability and inclusion, and have made several commitments to drive inclusion across the business.

During the year, we partnered with Microsoft to run a series of accessibility in IT webinars. These explored visible and invisible disabilities and demonstrated IT features and support for people with disabilities, as well as how others can work more inclusively.

Meanwhile, as part of our commitment to be recognised in global LGBTQ+ indices, we were delighted to receive a Silver Employer Award from Stonewall. Our score rose significantly from 2019, reflecting the work we have done in the past few years to help our employees feel they can be themselves at work.

Our equal opportunities policy

Johnson Matthey recruits, trains and develops employees who are best suited to the requirements of the job, regardless of gender, ethnic origin, age, religion or belief, marriage or civil partnership, pregnancy or maternity, sexual orientation, gender identity or disability.

Employee engagement

Progress against our 2030 target

Employee engagement

2030 target	2021/22
>75%	**65%**

For 2020/21, we did not complete a yourSay survey. The number included in the progress against our target is therefore from 2019/20.

As reported last year, we were pleased to see a rise in the number of employees who responded to our biennial yourSay survey in 2021. Later in 2022, we will use Workday to move to a continuous listening programme, pulse survey approach providing more frequent, detailed insights on the issues our employee face.

This year, we also ran structured leadership-led listening programmes, including regular sector and function-specific townhalls, to help leaders better understand their strengths and areas for improvement, and conducted several pulse surveys. And we introduced an engagement programme for our top 400 leaders giving them the chance to hear regularly from the GLT, discuss the challenges the company faces, ask questions about JM and help shape the company's future.

Our board held a number of employee engagement sessions across seven countries, focusing on sustainability with a very high level of employee engagement, see page 91 for more information.

Transforming our culture

Johnson Matthey's culture has evolved over the company's long history and we have tremendous strength that we will build on. However, we know that to successfully execute our strategy we need to transform elements of our culture. We are very excited about the next stage of our culture journey. We know there are many aspects of how we work that influence culture and we will be addressing all of these to help JM to be a truly high-performing organisation.

To do that, we intend to change the way we work based on three cultural principles:

1. **More efficient, less bureaucratic** – introduce simpler, more efficient ways of working and clearer internal accountabilities to help us work at pace.
2. **A high-performance, commercial mindset** – strengthen our commercial skills and set clearer business objectives to create a fast-paced, bolder culture focused on winning in our chosen markets.
3. **A more external outlook** – create new ventures and partnerships with customers, industry and governments to accelerate growth and the transition to net zero.

Ethics and compliance

We expect everyone who works with JM to live by our value to 'act with integrity'. That means upholding the highest ethical standards in everything we do – from how we treat one another to how we do business. Our Code of Ethics helps everyone to understand what doing the right thing means at JM.

Our progress this year

We have had an active year, rolling out a series of tools to give senior leaders better visibility of the ethics and compliance issues within their areas and across JM. This information will help drive greater business ownership and, where needed, support remedial plans that directly address their business issues.

For example, we:

- Share anonymised information and notable examples of Speak Ups and ethical dilemmas with the board, GLT and our Societal Value Committee. We also provide sector leaders with an annual or biannual breakdown of ethics and compliance issues and trends in their business (see 'Encouraging a speak up culture' on page 56).
- Introduced new tools (such as an ethical culture heat map) to help us strengthen the way we analyse and report ethics and compliance data back to the business.
- Regularly communicate with employees on compliance risks, including anti-bribery and corruption, competition, export controls and sanctions, data protection, conflicts of interest and supply chain compliance.
- Joined the UN Global Compact for Human Rights in January 2022 and supported Principle 10 (working against corruption in all its forms). We do this through training, encouraging teams to share 'ethics moments' at the start of meetings, updating our central bank of ethics scenarios and continued focus on the way in which we bring on board and monitor our third-party intermediaries.

Campaigns and training to strengthen employee engagement

In June 2021, we ran a four-week campaign to raise awareness of the impact that change and uncertainty can have on behaviour in the workplace. It aimed to remind employees about the importance of good, ethical decision-making and that we always encourage people to speak up and ask for help if faced with a problem.

In October, more than 50 sites took part in our annual Ethics Week celebrations, with employees around the world at all levels sharing videos about what ethics means to them. We also heard from a customer who discussed the importance of ethics in their supply chain. Feedback was positive, with participants telling us they liked the employee-led approach.

In 2021/22, 77.5% of our employees completed our Code of Ethics training. This is the third year in a row that we have seen a rise in our training statistics. In future, our new digital tools, including Workday, will help us roll out more tailored training.

Encouraging a 'speak-up' culture

It is essential that employees feel they can speak up when they have a concern. We encourage them to do this via their manager, ethics ambassador, HR or legal representative. Or, they can contact our independent 'Speak Up' helpline. Where local law permits, these conversations can be anonymous.

This year, we received 158 Speak Ups – our highest ever number. While an increase, the number is in line with external benchmarks. We see this as a positive sign that our people feel comfortable raising concerns in JM and have faith in our process. Our Ethics Panel oversees all Speak Ups and appropriate action is taken where necessary. The panel also reports back to the board.

Speak Up reports in 2021/22

Concern/allegation	Number of cases investigated
Bribery and corruption	12
Business and financial reporting	0
Competition / anti-trust	0
Confidential information and intellectual property	0
Conflict of interest	10
Discrimination, including harassment and retaliation	51
Employee rights	56
Enquiry	7
Environmental protection, product stewardship or health and safety	17
Insider trading	0
Misconduct or inappropriate behaviour	2
Physical assets	1
Theft	0
Violence or threats	0
Computer, email and internet use	1
Substance abuse	1
Total	**158**

3. Uphold human rights in our value chain

Progress against our 2030 target
- 2030 – assess 100% of our value chain partners for human rights risks and put remedial plans in place where high risks are identified
- 2021/22 – identified human rights risk areas of focus and developed a tailored risk assessment framework to segment our value chain and prioritise actions

We work in a global, multi-tiered supply chain and rely on our suppliers to provide raw materials, including PGMs, and goods and services like engineering support and process equipment, and utilities, catering and security for our facilities. We also buy transport services to move materials and products around the world and rely on corporate support, such as travel, IT and finance. As a result, our procurement teams work with thousands of suppliers, and in 2021/22 we spent £2.8 billion (excluding PGMs) with them.

In 2021/22, we had to manage additional supply chain complexity, including disruptions caused by the ongoing COVID-19 pandemic and logistical delays caused by bad weather events, such as Hurricane Ida, and the Suez Canal blockage. To help us move key materials in a more timely fashion in future, Procurement is developing new methodology to mitigate supply interruption from known weather events.

We are proud of our strong relationships with our suppliers and will rely on them even more as we work towards our sustainability targets while navigating the challenges of rising inflation and geopolitical tensions. Despite those challenges, we remain committed to working with our supply chain partners to uphold human rights and the highest standards in raw materials procurement.

Strengthening our commitment to human rights

To make progress against our 2030 target, we worked with a third-party specialist to identify the human rights risks that we will focus on, and developed a tailored risk assessment framework to segment our value chain and prioritise actions. As part of this process, we are also looking at risk in our own operations. We will begin to implement this framework during 2022/23.

As part of our people commitments, we also joined the UN Global Compact in January 2022, which demonstrates our support for internationally proclaimed human rights.

Our approach to human rights

We support the principles of the Universal Declaration of Human Rights and the International Labour Organization (ILO) Core Conventions, and align ourselves with key frameworks that define human rights principles for businesses. These include the UN Global Compact, UN Guiding Principles on Business and Human Rights and the Organisation for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises.

Our independent Speak Up helpline is available for anyone wishing to raise a human rights concern. See page 56 for more information on this helpline.

Modern Slavery Statement

We are committed to ensuring no modern slavery exists in our business and to identifying and resolving any issues we find in our value chain. We publish our Modern Slavery Statement annually to demonstrate our progress. Our full 2021 statement is online at matthey.com/modern-slavery

Our raw materials supply chain

We source raw materials from around the world, some of which are only available from a small number of countries. It is essential that we understand and manage the associated supply chain risks. As a result of changes in our portfolio, the quantity of some raw materials that we source will not grow as anticipated, such as cobalt and lithium. We also expect to stop sourcing narcotic raw materials in mid-2022.

Where we source strategic raw materials

Material	Country
Primary PGMs	Canada, USA, South Africa
Secondary PGMs	USA, Germany, UK, Singapore, Italy
Rare earth materials	Brazil, China
Zeolites	USA, China, Japan
Ceramic substrates	Peru, France, China, India
Narcotic raw materials	Spain, Australia

* We ceased sourcing from Russia in line with government sanctions from February 2022.

Responsible sourcing of PGMs

We work with our customers and with industry associations, such as the International Platinum Group Metals Association (IPA), to ensure we source our PGMs in an ethical way.

We expect our PGM suppliers and refining customers to adhere to equivalent practices such as those set out in our platinum and palladium supply chain policy statement and to carry out appropriate due diligence on the counterparties from whom they source PGM material.

Our full policy statement is online at: matthey.com/responsible-sourcing-policy

Our primary and secondary metal needs are diversified in type and geography, so we have very little exposure to Russian PGM supply. However, we did ensure we had entirely ceased sourcing from Russia early in 2022.

Our UK and USA refineries are on the London Platinum and Palladium Market's (LPPM) 'Good Delivery' lists for platinum and palladium and are subject to its Responsible Platinum and Palladium Guidance (RPPG). We are audited annually and, following a successful second audit, we received new LPPM certificates in August 2021 confirming our ongoing compliance. Our annual LPPM compliance statement can be found at matthey.com/LPP-compliance

Conflict minerals

The term 'conflict minerals' refers to tin, tungsten, tantalum and gold (3TGs). They often originate in mines in parts of the world affected by conflict, particularly areas of military conflict where mining is often illegal and linked to serious human rights abuses, including modern slavery and child labour. We use small quantities of these metals in some of our products, most notably tungsten in some of our automotive catalysts, of which total expenditure is less than 0.1% of our procurement spend.

We are committed to sourcing these minerals to the highest standard, as outlined in our conflict minerals policy, which is aligned with the OECD's Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas. This includes keeping records that allow us to track the suppliers of all the raw materials we use that contain 3TGs and identify which refiners and smelters the 3TGs came from. We only use materials from refiners and smelters that meet the Responsible Minerals Assurance Process (RMAP) assessment protocols and that are listed on the Responsible Minerals Initiative database.

In September 2021, we published our first annual conflict minerals disclosure, outlining how we reviewed our 3TG suppliers against our policy commitments during the year.

Read our policy and statement on our website, matthey.com/sustainability-governance.

Doing business in higher-risk jurisdictions

Some of our customers, suppliers and other partners are based in parts of the world that represent a higher legal or reputational risk. Our policy, 'doing business in higher-risk jurisdictions', sets out how we manage these risks using enhanced due diligence. In 2021/22, we carried out this due diligence on 488 counterparties. While this figure is less than 1% of all our counterparties, they are the ones that present some of our highest risks from an ethics and compliance perspective. As a result, we put remedial measures in place and declined business in select instances.

Our Group Ethics and Compliance team actively monitors the geopolitical landscape to ensure we comply with all regulations, including international export control and sanctions regimes. For example, this year we actively managed the situation involving Russia, Belarus and Ukraine to ensure we comply with our legal obligations, act consistently with our values and minimise any impact on business continuity.

What we expect when working with our suppliers

Our Supplier Code of Conduct, sets out our expectations on key issues, including health and safety, environmental management and human rights.

During 2021/22, Procurement began a phased roll out of our due diligence framework to strengthen our supplier relationships and simplify the way we work with them. We now require all new suppliers to complete an online self-assessment to demonstrate their alignment with our Supplier Code. We review these assessments as part of our supplier onboarding process and follow up with additional actions, as appropriate. More than 300 new suppliers participated in this process this year.

We have also started assessing our existing suppliers using EcoVadis, the world's largest provider of business sustainability ratings. To date, 25% of our total procurement spend is with suppliers who have an active EcoVadis rating and good governance in all aspects of our Supplier Code. The nature of the concerns highlighted by the EcoVadis assessment are shown in the table below.

EcoVadis rating	% procurement spend
Spend with suppliers who have current EcoVadis medal	25%
Suppliers with a good score on alignment with our Supplier Code of Conduct but no medal due to adverse media in the past three years	1.5%
Suppliers with current rating but no medal	0.2%
Suppliers without an active EcoVadis rating or not yet requested	73%

Area of concern that led to low EcoVadis rating for JM suppliers due to lack of governance or regulatory fines reported in media in the past three years		Number of suppliers
Environmental	Environmental	6
Labour practices and human rights	Labour practices and workers' rights	3
	Health and safety	3
	Child labour	0
Ethics	Anti-bribery and corruption	2
	Anti-competition	4
	Inadequate ethics governance	3
Procurement practices	Lack of responsible sourcing governance	1

In early 2022, Procurement also began introducing a programme to support our commitment to work with more businesses that are owned and run by people from diverse and under-represented communities, as well as other companies that are committed to promoting diversity in their business. This includes a pilot project with more than 500 suppliers, primarily in professional services in the UK and USA, to strengthen our procurement process and ensure our sourcing processes are more inclusive. It will also help JM identify and address areas where we can make it easier for suppliers to work with us. We will continue to roll out this programme across JM during 2022. We are also working with MSD UK, which connects ethnic minority businesses with global corporations to widen our access to diverse suppliers.

4. Invest in our local communities

Community investment helps us connect with each other and our local communities, and we are proud of the connections we have made over the years via our global volunteering and match funding programmes.

> ### Progress against our 2030 targets
> 2030 target   2021/22 progress
> ## >6,000   ## 1,322
> days of corporate volunteering every year

Our performance in 2021/22

Our employees volunteered 1,322 days during 2021/22, significantly higher than last year, which is testament to their commitment to the organisations they care about. Research also shows that volunteering has a significant impact on mental wellbeing. That's why we focused our internal communications on the idea of reconnecting with our communities. Of course, some parts of the world kept their COVID-19 restrictions in place for longer, and some people have not felt as comfortable returning to in-person activities as quickly as others. This is why our number currently remains lower than our baseline.

We saw a strong response to our third annual International Volunteer Day campaign in December 2021, with around 500 employees donating time worth 430 days. During the summer in North Macedonia, more than 50% of employees helped to clean two local cities over two days.

We manage the bulk of our donation to charity via our Charities Aid Foundation (CAF) account. During the COVID-19 pandemic, we have donated to this account at a faster rate than we drew on it and so took the decision not to top it up this year. This year, we did use our CAF account to donate £302,612. Around £60,000 was used to match donations made by more than 400 employees to help the people of Ukraine, following Russia's invasion in February 2022. JM also set up a special fund to help our Ukrainian employees working in Poland cover accommodation and living costs for family and friends seeking refuge over the border.

Community investment summary

	Investment 2021/22 £'000	Investment 2020/21 £'000	% change
Direct expenditure	168	1,374	-88
Indirect expenditure	283	32	+790
Total	**451**	**1,406**	**-99**

Connecting young people with science through Science and Me

We gave grants to 12 new projects during the first full year of our Science and Me programme. For example, in North Macedonia we funded a project to build a chemistry lab for socially vulnerable primary and secondary school students. In the UK and USA, we supported a digital project that allows young people to talk to scientists directly about their careers. We also funded three projects that help Black and Asian minority students develop new skills to support science, technology, engineering and mathematics (STEM) careers.

In the UK, we ran another successful virtual work experience week involving around 80 students and 70 employees, including our former Chief Executive, Robert MacLeod, and our Chief Technology Officer, Maurits van Tol. In total, our employees spent 20 hours with the students over the week. In December, GLT members talked to students about their careers and what else businesses could do to create a more sustainable world.

We also took part in Green Skills Week, a campaign launched by the charity Speakers for Schools, welcoming 104 students to three days of online talks about green technology. Out of those students, 46 were selected to take part in a challenge to present their ideas on new green technologies linked to plastic, air pollution and carbon emissions. The students presented to a panel of internal and external judges, including our Director of Technology, Liz Rowsell.

Taskforce for Climate-related Financial Disclosures

In this section

Introduction

Climate change is one of the most pressing threats facing our planet today. It is affecting our environment and poses a growing risk for people and businesses alike. We recognise that what we do at JM has impacts – both positive and negative. Our products and services remove harmful air emissions and recycle scarce metals, and we are designing new technologies so that we can help accelerate the transition to a low-carbon future. But the manufacturing and chemical processes we use have their own environmental impact, creating greenhouse gas emissions, using water, and producing waste.

Our strategy is shaped, therefore, around the opportunities and the risks that our changing climate presents. And we have set ourselves the ambition of achieving net zero by 2040 with a series of challenging intermediate targets for 2030, to ensure we keep driving up the benefits of our products while reducing their environmental impact (see page 35 for a full table of targets).

The requirement to report using the framework of the Task Force on Climate-related Financial Disclosures (TCFD) is a useful tool in this process. It helps us think holistically about the future impact that climate change and the transition to a low-carbon world could have on us and, during the year, we continued to work with global sustainability consultancy Environmental Resources Management (ERM) to develop our approach. We have organised our report under the headings of the four pillars of TCFD framework because we believe that it's most useful for our stakeholders to include our response to TCFD as a standalone section within our annual report. In doing so, we have reported consistent with the framework, although we are still working on quantifying the climate-related impact of some of our risks.

Governance

Given the nature of our business, and how closely aligned our strategy is to a warming world, climate-related risks and opportunities have been on the board's agenda for many years. In May 2021, we announced the creation of a new board committee, the Societal Value Committee (SVC), to help the board focus more closely on the governance of sustainability matters including response to climate change. Nonetheless, the SVC is only part of the wider governance arrangements that support the board in discharging these responsibilities, as summarised in the diagram on page 61.

Role of the board and its committees

The board is responsible for setting and overseeing the implementation of the group's strategy, including the annual budget and detailed business plans. In doing so, it considers climate-related issues, including when approving requests for capital expenditure or new initiatives.

The SVC meets at least three times a year. It supports the board by overseeing the delivery of our sustainability strategy, and monitoring and overseeing progress against our sustainability goals and targets, with regular updates from the Chief EHS and Operations Officer. Jane Griffiths, the SVC Chair, reports to the board after each meeting, including bringing forward any recommendations from the committee. Given how fast society's response to climate change is developing, the SVC receives papers on emerging issues at each meeting, such as legislation and stakeholders' expectations. It also invites external experts to get an 'outside-in' view on our sustainability plans, and other emerging topics, which this year included diversity and inclusion, and human rights for more on the SVC's work, see page 98.

During the year, the wider board received an update on climate-related legislation and a training session on the implementation of TCFD recommendations.

Together with the Nomination Committee, the board ensures that, among the directors, it has the necessary sustainability and climate-related expertise. For more details of our non-executive directors' skills and experience, see pages 86-87.

As an initial step, the Audit Committee has this year reviewed the internal assurance in respect of TCFD. It will continue to assess the level of assurance over TCFD and climate-related issues as we continue to develop our reporting in this area. The Audit Committee is also responsible for reviewing the effectiveness of internal control and risk management, which includes climate-related risk.

This year, the Remuneration Committee reviewed the role of sustainability and climate-related targets within the group's remuneration approach. Measures will be included within the Performance Share Plan, reflecting our intent to contribute to an acceleration of the transition to a net zero world. For more details, see page 69.

As a result of our internal board effectiveness review, the responsibilities of the board and its committees in relation to climate-related issues and the broader sustainability agenda have been refined and clarified.

Role of management

The board delegates responsibility for running the business to the Chief Executive; this includes overall responsibility for climate-related issues, which resides with the Chief Executive, assisted by the Group Leadership Team (GLT). The Chief Executive is supported by the Chief EHS and Operations Officer who is responsible for day-to-day climate-related matters and provides updates to the GLT on the steps taken to develop or implement our sustainability strategy, including key metrics, risks and opportunities. The Chief EHS and Operations Officer is in turn supported by the Sustainability Council. The Sustainability Council is made up of managers from across our sectors and functions who, together, develop our sustainability vision, goals and targets. To prioritise driving our sustainability agenda and threading all elements into our business, we appointed a new Chief Sustainability Officer with effect from 16th May 2022. The Chief Sustainability Officer will report to the Chief Executive and be a member of the GLT.

Governance structure for climate-related issues

Board

Chief Executive

Responsible overall for climate-related issues

Chief EHS and Operations Officer

Responsible for day-to-day climate-related issues (from 16th May 2022, our new Chief Sustainability Officer will assume this responsibility)

Sustainability Council

Develops our sustainability vision, goals and targets

Members: representatives of all sectors and functions

Societal Value Committee

Assists the board in overseeing the sustainability strategy

Members:
full board

Chair:
Jane Griffiths

Meets at least three times a year

Audit Committee

Reviews the assurance process for TCFD

Members:
all independent non-executive directors

Chair:
Doug Webb

Meets five times a year

Remuneration Committee

Reviews climate-related targets for incorporation in incentive plans

Members:
all independent non-executive directors

Chair:
Chris Mottershead

Meets five times a year

Strategy

Our business strategy is based on addressing the world's need to transition to a low-carbon future through enabling the necessary transitions in transport, energy, industry and the circular economy. Climate change offers us many opportunities, while also requiring us to adapt our operations to ensure we are resilient. So that we properly understand and can plan for its potential impacts, this year we developed climate-change scenarios to frame the ambiguities of an increasingly volatile and complex environment. These scenarios, which project the impact of climate change on our operational and commercial performance, are essential in informing our strategic choices, such as how we invest in R&D, or which new products to develop. We also use climate scenarios to consider the resilience to changing weather patterns of our own operations, those of our strategic suppliers and our core supply routes.

Climate scenarios for evaluating transition risks and opportunities

Our climate scenarios are central to our plan to achieve net zero by 2040, and our nearer-term ten-year strategic planning. They are used by all our businesses as a common basis for planning, forecasting and stress testing their strategy and assumptions on growth.

To test the resilience of our strategy and portfolio, and our assumptions about growth, we have developed three transition scenarios that represent a wide range of outcomes.

- Rapid transition scenario (aligned to 1.5^0C) – net zero achieved globally by 2050, in line with the goal of the Paris Agreement to limit the world's temperature rise to well below 2^0C by 2100, and preferably no more than 1.5^0C. This reflects swift and decisive action with regard to policy interventions and decarbonisation commitments.
- Pragmatic evolution scenario (aligned to 2^0C) – net zero achieved globally by 2080, which reflects a step-up in policy interventions and decarbonisation commitments compared with today, but not as decisive as under the rapid transition scenario.
- Slow transition scenario (aligned to 3^0C) – net zero not achieved by 2100, reflecting a global lack of urgency on climate change with limited policy or legislative interventions.

We developed our climate scenarios internally with support from an external expert, reflecting the latest available research from internationally recognised sources such as the International Energy Agency (IEA). The IEA research we used included three scenarios: the Net Zero Emissions Scenario, the Sustainable Development Scenario, and the Stated Policies Scenario. Our methodology breaks down the different energy sources (electricity, hydrogen, gas, coal, oil, renewables, biomass and others) and considers forecasts for each source by demand type: transport, buildings, industry, power and heat, and feedstocks for materials. We developed in-house forecasts for specific source / demand combinations close to our areas of expertise in automotive, chemicals, hydrogen and other industries, while ensuring that, at a macro level, we remained within IEA's forecasts. This methodology allowed us to develop an economy-wide view, while also including enough detail about our key markets to inform our specific strategies for different parts of the business.
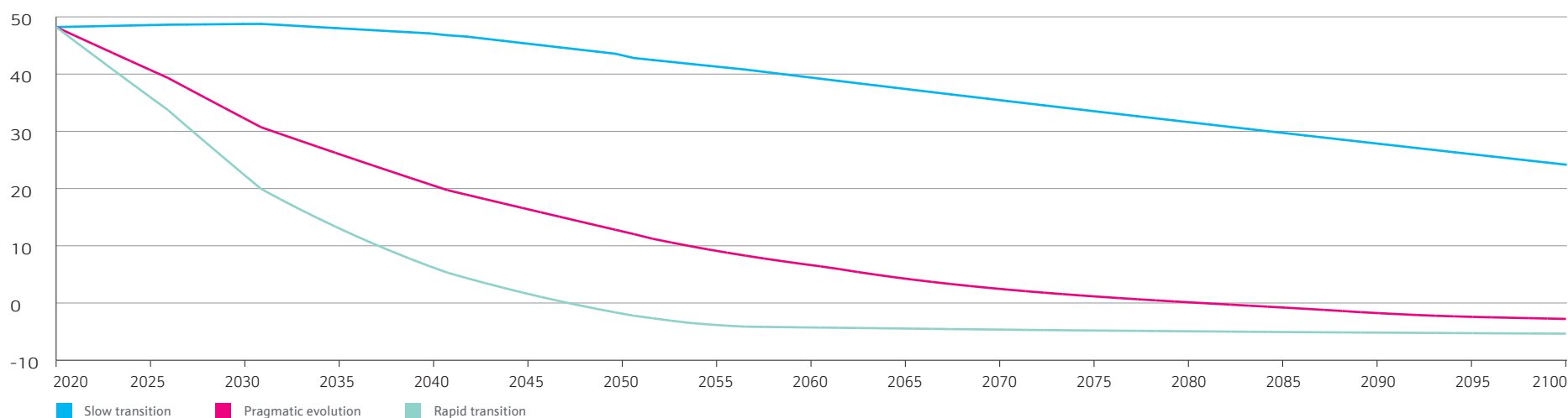
We update the scenarios at least annually to reflect any changes in external drivers. In these updates, we incorporate the latest from internationally recognised sources alongside our own forecasts, which take into account policy developments, technology evolution and the rate of public and private investment in new plants and infrastructure.

We model scenarios up to 2100 (see chart below), but look at shorter-term horizons, specifically 2030 and 2040, to inform our strategic and operational decisions. The table below details the main qualitative and quantitative assumptions we used for our 2040 scenarios, given that this is our target date to achieve net zero. We use the pragmatic evolution scenario as our base case for our strategic planning.

Market Sector	Metric (2040)	Unit	Rapid transition	Pragmatic evolution	Slow transition
Global	Total primary energy demand	EJ	500-550	550-600	690-740
	Renewables supply	% of total energy supply	c.55%	c. 40%	c. 25%
Automotive	Global sales of zero-emissions vehicles	% of total automotive sales	c. 90%	c. 70%	c. 40%
	Global sales of fuel cell electric vehicles	% of total automotive sales	c. 20%	c. 15%	c. 10%
Hydrogen	Global hydrogen production	Mt p.a	350-400	200-250	150-200

IEA's NZE and SDS scenarios are used to inform our rapid and pragmatic transition scenarios, respectively. Both rely on policy interventions beyond current pledges to reduce fossil fuel-related emissions. The NZE assumes a wider range of interventions and stronger implementation rates, including in terms of near-term support to early deployment of key innovative technologies and supporting infrastructure. The NZE also assumes substantial energy efficiency gains through stronger standards for appliances and fuel economy, among other levers.

Total anthropogenic emissions (GtCO$_2$/yr)

Legend: Slow transition — Pragmatic evolution — Rapid transition

Our transition risks and opportunities

Through our scenario work, we identified four distinct potential climate-related impacts, which represent both risks and opportunities for our business. We have added the first climate impact risk to our principal risks because it is of strategic importance to our business (see page 74).

	Climate impact	Description of the transition risk and opportunity
1	Changing customer and consumer demand for our products	Increasing awareness of the impacts of a warming climate is changing consumer habits, leading to lower demand for some of our existing products and higher demand for new products. We need to carefully match supply as demand changes, and to identify new markets for our solutions catalysing the net zero transition for our customers to avoid negative financial impacts and realise opportunities for our revenue, cash flow and profitability.
2	Increasing demand for low-carbon manufacturing and recycling of key materials	Customers and policy makers are increasingly interested in the carbon footprint of our products, demanding a lower carbon footprint and specifying recycled content for key raw materials. We need to make the right capital investment decisions to transition our operations to net-zero emissions in line with market demand, and use low-carbon raw materials to increase our competitive advantage and avoid the potential issue of stranded assets.
3	Increasing carbon taxation	An increasing number of governments are introducing or considering introducing a carbon tax or trading schemes. This could raise the costs of energy, water and waste both for us and our suppliers, and also the cost of transport and logistics, which may be affected by international border carbon tax mechanisms. If this results in higher prices for our products, our customers may be less willing to buy them.
4	Increasing stakeholder expectations of corporate climate policy and performance	Market expectations are rising and corporate policy / performance regarding climate-related targets are under increasing scrutiny. If we do not meet our stated net-zero commitments and strategy, or our commitments do not keep pace with societal / market expectations of net zero, we could suffer from a loss of stakeholder and / or shareholder confidence, loss of reputation, shareholder action and climate-related litigation. Conversely, if we outperform our competitors in how we adapt to climate change, we could attract new shareholders and customers.

We have used our climate scenarios to evaluate these risks and opportunities in the short (0–3 years), medium (3–10 years) and long term (10+ years), in line with our usual business planning timescales. We believe the pragmatic evolution climate scenario is most likely to occur, so have used it as the base case for assessing our transition impacts, and the other two scenarios to stress test the sensitivity and resilience of our business plans.

Climate transition impact	Primary driver of impact	Opportunities (with time horizons)	Risks (with time horizons)	Management of impacts	Financial impacts (after management)	KPIs to monitor impacts
1. Changing customer and consumer demand for products	**Regulation** • Emissions standards for vehicles • Emissions standards for energy production • Requirements for use of bio-based feedstocks **Markets** • Shifts in consumer preferences • Uncertainty over which technologies will prevail.	Sustained sales of existing products for internal combustion engine vehicles in the short and medium term, as tighter emissions standards demand state-of-the-art technology for exhaust pipe catalysts. Opportunities for new products in the medium and long term: • Lower carbon energy sources (blue and green hydrogen). • Hydrogen-powered vehicles (fuel cells) and sustainable aviation fuels. • Low-carbon solutions for the chemicals industry.	Without adaptation of our portfolio, there is a long-term risk that we may not have a financially viable future business model and / or capability as society transitions away from fossil fuels. • Reduced demand for existing autocatalyst products for light duty vehicles (long term). • Uncertainty in the rate of market evolution from existing to new technology options which could affect profitability (medium / long term). • Ability to scale up rapidly to manufacture new products for new markets (short / medium term).	We focus on managing our existing businesses effectively, while pivoting away from fossil fuels-based industries to ones based on sustainable chemicals, fuels and clean energy as markets develop. • We are closely monitoring the changing market environment, updating our climate scenarios at least once a year to inform our strategic decisions. • We keep investing in innovation to make sure we have products that differentiate us in all our markets. • For our maturing businesses, we have a plan to reduce our cost base to improve efficiency and cash flow • For some of our growth businesses, we plan to invest in production assets and to make sure our capital projects are implemented effectively through our capital expenditure control programme.	**Growth** Accelerating profit growth, with low double-digit growth rate towards end of decade[1] and c. 40% of profit coming from businesses related to the net zero transition by 2031/32. Clean Air remain a cash generative business of scale, with sales[2] c. £2bn in base case by end of decade. **Costs** c. £300m of cumulative capital expenditures dedicated to businesses related to the net zero transition over 2022/23-2024/25. £100m-£200m fixed cost savings from Clean Air by 2030/31. 1. At constant 2021/22 average PGM prices and FX rates 2. Sales excluding precious metals	Progress towards our 2030 sustainability targets for products and services: • Sales, R&D and revenues aligned with SDG7 and SDG13. • Tonnes of GHGs avoided by customers using our products. Economic activity aligned with EU taxonomy regulation - climate delegate act. **Market evolution forecasts** • Automotive emissions regulation changes • Market forecasts for vehicle sales by type and region • Governments' investments in hydrogen infrastructure • Evolution of the use of sustainable aviation fuels

Climate transition impact	Primary driver of impact	Opportunities (with time horizons)	Risks (with time horizons)	Management of impacts	Financial impacts (after management)	KPIs to monitor impacts
2. Increased demand for low-carbon manufacturing and recycling	**Markets** • Shift in consumer preferences towards products with a low-carbon footprint **Regulation** • Emerging rules on recycled content of consumer goods and the need for companies to declare the carbon footprint of their products	As the world's largest recycler of secondary PGMs, we could benefit from the increased demand for goods with low-carbon and / or recycled critical raw material content (short / medium term). Opportunity to expand our knowledge of metal recycling into new markets, particularly lithium, nickel and cobalt, which are required by the electric vehicle industry to meet the EU's directive on battery recycling (medium / long term). Commercial advantage if we adapt our manufacturing plants to low carbon operation faster than our competitors.	Medium-term risk that we cannot transition our operations for net zero at the correct pace to meet customer demand of low carbon products. • Loss of customers and failure to attract new customers (medium / long term). • Greater capital required to transition our assets to low-carbon manufacturing (medium / long term). • Inability to access the alternative renewable energy sources needed to decarbonise our operations (medium / long term).	• We have set challenging recycling, and net zero targets to decarbonise our manufacturing operations • We have established a cross-functional Sustainability Council to drive progress towards these targets • In 2022, we will introduce an internal carbon price for our capital investment decisions to help us make the right choices for decarbonising our operations for net zero in the long term • We are developing a roadmap to net zero by 2040, which we plan to publish in 2023	Work is under way to quantify the financial impact of our commitment to net zero manufacturing by 2040.	Progress towards our 2030 sustainability targets for products and services: • % recycled PGM content in our products. • % reduction in Scope 1, 2 and 3 GHG emissions % products with a cradle-to-gate LCA available to our customers • Number of customer requests for low-carbon and recycled content in products.
3. Increasing carbon taxation	**Regulation** • Carbon pricing mechanisms	Increasing regulations and the introduction of carbon taxes will accelerate growth in our new target markets – sustainable chemicals, sustainable fuels and clean energy (medium term).	Many jurisdictions are implementing carbon pricing mechanisms with rates increasing over time. • Increased costs to us and our suppliers of goods and logistics due to carbon taxation on raw materials and fossil-fuel derived energy (medium term). • Loss of competitive advantage due to the increasing price of our products (medium / long term). • Reputational damage if we do not transition fast enough to cleaner energy solutions in our operations (medium / long term).	We are tracking carbon price risks through: • An annual exercise with the help of outside experts to forecast the effect of long-term carbon prices on our portfolio. • Working to embed carbon prices within our three- and ten-year planning cycles going forwards. • In 2022, we will introduce an internal carbon price for our capital investment decisions to help us make the right choices for decarbonising our operations.	Work under way to quantify financial impacts to our portfolio.	Potential exposure to carbon taxation in 2030 by Scope 1, 2 and 3

Climate transition impact	Primary driver of impact	Opportunities (with time horizons)	Risks (with time horizons)	Management of impacts	Financial impacts (after management)	KPIs to monitor impacts
4. Increasing stakeholder expectations of corporate climate policy and performance	**Reputation** • Increased concerns or negative feedback from stakeholders **Legal** • Exposure to litigation	Developing and delivering robust climate policy will increase our long-term business resilience, attracting shareholders and employees aligned with our values. Delivering our net zero commitment and science based targets will help us demonstrate sustainability leadership, and increase our profile with new customers and shareholders.	Investors, employees and wider society are scrutinising companies' sustainability commitments ever more closely. Failing to meet their expectations could damage our reputation, losing us customers, making it difficult to attract and retain staff, and ultimately increasing the risk of shareholder action. (medium / long term) • Our climate policy, net zero ambitions and sustainability targets do not keep up with stakeholder expectations. • Our plans for meeting these commitments are not deemed sufficiently detailed or credible. • We fail to meet these commitments.	We continue to monitor and manage the expectations of our stakeholders as follows: • Formed SVC and Sustainability Council to enhance our governance of climate-related issues. • Close monitoring of the latest case law and developments in climate litigation. • Developing and monitoring net zero roadmaps to 2040. • Maintaining regular dialogue with investors. • Market scanning and benchmarking of targets to ensure our climate-related polices and commitments meet the highest expectations.	Reputation risk is not easily quantified.	Progress towards our 2030 sustainability targets: • % reduction in Scope 1, 2 and 3 emissions. How we score on leading ESG platforms: • CDP Investor score. • DJSI, Sustainalytics and MSCI climate sections. • Employee engagement score.

Climate scenarios for evaluating physical risks

Changing weather patterns as the climate warms may result in physical risks to our assets and supply chains. During the year, we worked with Zurich Resilience Solutions to evaluate the exposure of all our assets and those of our strategic suppliers to these risks. To support this work, we used the Shared Socio-economic Pathways (SSPs), the latest climate change modelling scenarios from the Intergovernmental Panel on Climate Change (IPCC). The SSPs produce forward-looking climate data by running climate models driven by assumptions about future global GHG emissions, together with plausible future socio-economic development metrics (economic growth / GDP, demographics, land use and urbanisation), and incorporating the likely implementation of adaptation and mitigation measures.

We looked at three SSPs for the locations of all our own operations and those of our strategic suppliers. We considered four time horizons - 2020 (our baseline), 2030, 2040 and 2050 to identify the top hazards and how they are likely to change. SSP 1-2.6 assumes the lowest temperature rise, and therefore the least physical impact, disruption and adaptation costs; SSP 2-4.5 is the middle temperature rise; and SSP 5-8.5 assumes the highest temperature rise, and therefore the greatest physical impact, and disruption adaptation costs.

Given its potential severity, for scenario SSP 5-8.5, the resilience of our most critical sites. SSP5-8.5 is an extreme scenario that is unlikely to arise, but it is useful for stress testing. We then used it to test the resilience of our top 10 most critical sites. The site criticality ranking included financial criteria such as external sales and total asset value, as well as those climate-related perils ranked highly for increases in 2050. The ranking also took into account commercial factors and those sites considered to be of significant strategic importance to us. In looking at location-specific hazards, we also used various forward-looking climate data, including Jupiter Intelligence's Climate Score Global.

Scenario	Assumed temperature increase (relative to 1850-1900)
SSP 1-2.6	Best estimate of 1.7^{0}C warming by 2041-2060, and 1.8^{0}C by 2081-2100
SSP 2-4.5	Best estimate of 2.0^{0}C warming by 2041-2060, and 2.7^{0}C by 2081-2100
SSP 5-8.5	Best estimate of 2.4^{0}C warming by 2041-2060, and 4.4^{0}C by 2081-2100

Our physical risks

The physical risks of climate change can be grouped into two categories:

- **Acute**, which are extreme events such as tropical cyclones, severe flooding events, heatwaves and fires.
- **Chronic**, which are gradual changes like rising sea levels that damage coastal property, or sustained changes to temperature and rainfall.

In total, we investigated eight weather-related perils across these two types of risk: temperature, rainfall, thunderstorms, flood, drought, wind, wildfire and hail. We looked at them in two ways:

- **Risk to our own assets**, which could damage our sites and disrupt production, leading to loss of sales and increased costs, as well as posing risks to our employees.
- **Risk to our suppliers and value chain**, which could hamper our access to strategic raw materials (including metals) and products, and increase costs.

Analysis of our ten most critical locations shows that there is no material financial impact from climate change risks on the quantifiable hazards (flood and windstorm) on the medium time horizon (to 2030) in any of the scenarios. The most significant impact predicted by the models out to 2030, under the worst case scenario, was an additional 35% of our physical asset value to be subject to a high rainfall hazard. This includes our facilities in Skopje (N. Macedonia), Devon (USA), Manesar (India) and Royston (UK). Over time, drought may also become more significant. We have evaluated the impact this could have on water availability to our operations using the World Resource Institute's (WRI) Water Risk Atlas tool see page 46 for more information about this.

For risks to our supply chains, we concluded that our precious metal suppliers, on horizon of 2030 climate change under the worst case scenario of SSP5-8.5 could become subject to a high or very high rainfall hazard, and additionally a high or very high heat stress. This includes PGM mines and the processing operations in the Rustenburg region in South Africa, mines in Zimbabwe and some smelters in central USA.

For our other suppliers, on the shorter-term horizon of 2030, climate change under the worst case scenario of SSP5-8.5 is expected to cause a small number of our strategic suppliers' locations to be subject to a high rainfall hazard, heat stress or high or very high drought. In particular, this includes suppliers' locations in Vietnam, India, and USA.

Going forward into the next year, we will start to use this information to communicate with our strategic suppliers about their climate adaption plans and resilience.

Physical climate impact	Primary driver of impact	Opportunities (with time horizons)	Risks (with time horizons)	Management of impacts	Financial impacts (after management)	KPIs to monitor impacts
5. Disruption to our operations resulting in damage to or loss of assets, increased costs and harm to our employees.	Physical risks (acute and chronic). Increased frequency, severity and variability of extreme weather events and natural disasters.	Competitive advantage by improving our business resilience and controls through diligent climate-related screening of assets, and integration with business continuity plans. (medium term, three to ten years)	Damage to our key sites, equipment or stock from severe weather (wind, rain and drought) if any increased risk is not prioritised and there is no formal planning of climate-change mitigation and / or adaptation measures. (medium term) Insurance of our sites could become inadequate, more expensive or even unavailable, if a site is at very high risk of weather-related damage. (medium term)	Integration of weather-related risks in business continuity plans and follow-up action plans. (medium term) We regularly review the type and limit of insurance available for climate risks to our portfolio. See more in risk 8 Asset failure on page 77. (medium term) Climate change considered as part of new investments, including new sites with the business in transition e.g. China – fuel cell vehicles growth market, which reduces our operating costs. (medium term)	Zurich's analysis of our ten most critical locations shows that there is no material financial impact from climate change risks on the quantifiable hazards (flood and windstorm in the medium term). We are currently assessing whether we will need to do any mitigation to improve asset resilience in the medium term.	We use the WRI tool to monitor where clean water availability could be at risk in the long term (see page 46). Proportion of physical asset value exposed to a climate change related high or very high hazard levels by 2030: • Number of sites in water-stressed areas. • Amount of water consumed in areas or high or extremely high baseline water stress.
6. Disruption to our supply chain (upstream and downstream) hampering our access to strategic raw materials (including metals) and products, and increasing costs.	Physical risks (acute and chronic). Increased frequency, severity and variability of extreme weather events and natural disasters.	Engaging with our suppliers to help them manage climate risks to their sites could enhance our relationships with them and save us money. (medium term) Increase in business resilience through more diligent and frequent screening of our suppliers' assets (e.g. through integration with business continuity plans). (medium term)	Disruption of supply of key raw materials risks our ability to deliver goods on time to customers, resulting in loss of sales and future business and damage to our reputation. (medium term) Insurance cover of suppliers is inadequate, and uncertainty over the future level of increased risk responsibility that will be assumed by suppliers and / or JM relating to climate risks, or if physical risks should be transferred. (medium term, three to ten years)	We work with strategic suppliers to integrate specific climate mitigating actions for strategic and extreme cases. (medium term) We ensure that the type and limit of our suppliers' insurance is in line with our own risks and external obligations. (medium term) We work with suppliers to prioritise and integrate forward-looking potential climate risk actions and costs reductions in alignment with JM timeframe and ambitions. (medium term)	Not yet quantified. We are currently assessing whether we need to do any mitigation work in partnership with our strategic suppliers to improve their resilience or switch to alternative partners for high-risk delivery routes. (short / medium term)	We are working on developing these indicators as part of our broader supplier risk management (see principal risk 4 on page 75).

Next steps

- Our own assets – Building on the group-wide assessment, we will carry out local site assessments to determine their resilience and, if necessary, develop plans to mitigate their specific climate-related risks.

- Suppliers – We will continue to work with our suppliers, particularly those at highest risk from climate change, to develop plans to mitigate these risks.

Risk management

This year, we set up a cross-functional working group to help us identify, assess and manage the impact of climate on our business. The group includes representatives from our finance, strategy, sustainability and risk teams, and is supported by sustainability consultancy ERM.

Identifying climate-related risks

Through a series of workshops, the cross-functional working group identified six potentially significant climate-related risks, covering both the physical (extreme events, slow-onset hazards) and transitional (policy, legal, market, technology and reputation) aspects of climate change. We have yet to fully develop our monetary definition of material financial impact. However, in the context for our risk identification exercise, materiality was defined as a matter that in the short, medium or long term could significantly influence our ability to meet our strategic objectives.

As part of our work with ERM this year, they provided detailed guidance on how to carry out a thorough assessment of climate-change risk. During the identification stage of this process, we used a range of inputs, including:

- The TCFD risk taxonomy, including physical and transitional climate risks.
- Expert judgement within our TCFD working group, including technical experts from our finance, strategy, sustainability and risk teams.
- Consideration of risks in the context of our climate scenarios used for businesses strategic planning.
- An external review of risks disclosed by industry peers.

We documented what drives these risks, what their potential effects might be, and what mitigating actions we need to take to manage them. We also had the risks validated by ERM. We will continue to develop and refine our response to risk and target our mitigating actions towards the root causes of those risks.

Assessing those risks

JM's group risk framework provides guidance on the tools and processes required to manage and assess all risk types, including climate-related risks. During the year, with the help of EY, and approved for use by ERM, we developed a standardised group risk impact scoring methodology. We have since used this to conduct initial qualitative assessments of our transitional climate-related risks.

Our working group helps us assess climate-related risks across the whole organisation. The group manages each risk, making them part of our principal risk agenda, and drives meaningful discussion and actions around risk at all levels.

From our physical risk assessments, we can see that we need to put a time scale on specific risks that might affect our business – and we need to align those risks with the climate-change scenarios we consider in our strategic planning. To help us, Zurich Resilience

Solutions provided a detailed analysis of which locations and suppliers we should prioritise, in the short and long term, as discussed on page 66 – climate scenarios section. We will refine these first assessments with assessments on site, which will help us better understand what mitigating actions we need to consider and when.

We have also made significant progress in assessing future product demand and carbon taxation risks, and have begun quantifying the potential financial impacts of these risks and opportunities, aligned with our climate scenarios.

Integrating those risks

It is essential that we integrate climate-related risks and opportunities into our strategic decision making, and our risk management framework guides us on the tools and processes we need to manage all risk types, including those related to climate. We want considering climate change to be an everyday part of how we operate, so we've included climate in our bottom-up operational risk management process, giving us a clear view of climate-related risks across the organisation. We've aligned our climate change work with the TCFD risk taxonomy to make sure we're covering physical and transitional climate risks.

This focused climate-change work now sees us aligning strategic growth with the transition to a low-carbon economy and including this as a standalone principal risk. We're also embedding what we've learnt from our early assessments of physical climate risk into our principal risk of asset failure and supply failure. Prioritising climate by incorporating it into our principal risk process means it will be reviewed formally, twice a year, by the GLT and the board – on top of the more detailed and focused review already done by the SVC.

In the coming year, we aim to:

- Continue to integrate the six climate-related risks we've identified.
- Strengthen our overall governance of climate-related risks.
- Ensure we are properly monitoring the risks themselves, and how we are mitigating them, by tracking progress against the targets we have set.

Managing those risks

The board SVC committee oversees our sustainability strategy, including climate-related risks. Our climate risks may have a direct or indirect impact on our principal risks and are therefore managed alongside and integrated within our principal risk process. Each of our climate risks has been assigned a risk coordinator. These individuals are senior stakeholders who are accountable for reviewing, monitoring and assessing the magnitude of the risk as well as overseeing the implementation of appropriate mitigations to treat the risk.

But truly managing risk effectively throughout the business has to be a collective endeavour by all our people. We hold quarterly risk knowledge-sharing forums to raise awareness and understanding of risks throughout the business. Our Clean Air and ENR sectors have established sustainability steering committees to help drive our sustainability agenda and improve the governance of climate-related risks in their areas.

Metrics and targets

We have reflected on appropriate metrics and targets to help us manage our climate risks and opportunities effectively. They were identified in climate-impact tables on pages 63-65 and their values are summarised here. We are still considering additional metrics and targets that would be most useful in helping us monitor our physical risks. We have had our Scope 1, 2 and 3 GHG targets independently verified by the Science-based Targets initiative to ensure that our level of ambition is aligned with the UN Paris agreement on climate change's Well below 2°C scenario (WB2DS).

Metric description	Alignment	Target type	Baseline year	Baseline value	FY2029/30 target	2022 progress	More on page
Tonnes GHGs avoided by customers when using our technologies	1	Absolute	2020/21	211,000	50 million	489,000	38
% sales aligned with SDG7 and SDG13	1	Intensity	2020/21	6.1%	No target	5%	37
% R&D spend aligned with SDG7 and SDG13	1	Intensity	2020/21	22.3%	No target	22.8%	37
Scope 1 and Scope 2 GHG (tonnes)	2, 4	Absolute	2019/20	391,459	260,973	399,905	42
Scope 3 GHG purchased goods and services (tonnes)	2, 4	Absolute	2019/20	3,282,096	2,625,269	3,008,648	42
% recycled PGM content in our products	2	Intensity	2021/22	71%	75%	71%	40
Potential exposure to carbon taxation in 2030	3	Intensity	2021/22	Not disclosed	Not disclosed	Not disclosed	
CDP climate score	4	Absolute	2019/20	B	A	B	66
% physical asset value exposed to high weather-related hazard by 2030	5	Intensity	2020/21	35%	No target	35%	66
Water consumed in regions of high baseline water stress (m³)	5	Absolute	2020/21	531,000	No target	499,000	46

EU taxonomy eligibility

As supporting global decarbonisation is one our strategic aims, we have assessed how our portfolio is aligned with the EU Green Taxonomy Regulation (EU) 2020/852. The first delegated act to the Taxonomy Regulation, the 'Climate Delegated Act', was adopted in June 2021 and addresses the first two environmental objectives, Climate Change Mitigation and Climate Change Adaptation. Our activities in our growth businesses, particularly Hydrogen Technologies meet the eligibility criteria for this activity.

We have evaluated what percentage of our financial activity meets the eligibility criteria for these activities.

Another delegated act, the 'Environmental Delegated Act', addressing the remaining four environmental objectives of the EU Taxonomy Regulation, has not yet been adopted. Once the remaining four criteria are published, we expect our percentage alignment to increase substantially.

Remuneration Committee integration of targets into PSP

The Remuneration Committee has agreed to include a sustainability performance measure into its long-term Performance Share Plan (PSP) for the first time in 2022. This sustainability measure will represent 20% of the total award, with the balance of the award focused on financial performance measures. The sustainability measure will consist of a scorecard of quantitative measures that cover the three areas of our sustainability ambition, namely Products & Services, Operations, and People. Further details on the specific targets will be published on our website during June.

Introducing internal carbon pricing

In the next year, we will be introducing a shadow carbon price to our capital investment business case assessment process, as recommended by the Bank of England. This will incentivise us to reach net zero, by ensuring all investments are made for a low-carbon world where the price of carbon is higher than it is today. Although the ICP is not a real cost of the investment, it demonstrates what the impact would be of carbon taxation forecast for 2030 and beyond, and we will use it to evaluate and compare potential investments. At this stage, we plan to apply the ICP only to emissions related to the asset when operational (including raw material and supply chain impacts emissions). We do not plan to apply them to emissions related to the development of the project itself, such as equipment manufacture, or to construction-related emissions, since such emissions are both short term and generally minor in relation to the overall life of the assets.