



# Operations

Our vision for a cleaner, healthier world demands us to operate our business responsibly and with a relentless focus on efficiency and excellence. This cuts across everything we do: from common systems and core processes to the way we manage and drive the environmental performance of our assets.

## Sustainable business goals

Low carbon operations

3

Responsible sourcing

4

# Driving responsible and effective operations

As a global group, we seek to maximise synergies across our businesses so we put in place standard processes and ways of working where it makes sense for us to do so.

Our focus is end-to-end operational efficiency; it's not cost-cutting and it's not a project. Through this we are driving sustained improvements across every aspect of how we run our business, and therefore the benefits are broader than cost.

This approach has two main themes. Firstly, we're simplifying and automating common processes. It doesn't deliver monetary savings per se, but it frees up our people to target them against our biggest business opportunities.

Secondly, we are ensuring common standards and ways of working across JM. This will improve our performance by accelerating the best of JM around the group rapidly.

## Simplifying and automating

This year we have continued to invest in upgrading our core IT systems to reduce complexity across the group and make us more agile and responsive to our customers. We are introducing a global business solution to standardise and simplify business processes, data and systems across JM. The single groupwide platform supports all our global operations, giving us a full view of all our businesses. Implementation is on track and we will start our roll out during 2018/19. We expect to be complete by end 2021/22.

## Common standards and ways of working

Group led excellence programmes are in place to target specific areas where we see an opportunity to rapidly make efficiency gains by ensuring common standards and ways of working across JM. A group led approach enables us to deploy best practice quickly and effectively across our operations.

**Manufacturing Excellence**, which has been in place since 2012, encourages a continuous improvement culture to enhance the efficiency and long term profitability of our manufacturing operations. Progress is measured against ten criteria. The highest performing

sites can work towards Silver, Gold or Platinum levels of status. Since 2012, over £100 million in savings have been delivered collectively by sites that have achieved those levels.

**Procurement** is a key global activity and by managing it with a strategic and category led approach, significant savings can be achieved. Professionalising procurement within JM not only reduces cost, but it also means that we manage our suppliers better, which has many additional benefits, including reducing supply chain risk. We purchase state of the art equipment which meets the latest environmental, health and safety standards.

We have activated a Procurement Excellence programme with the goal of saving more than £60 million over the next three years. Our annual purchases, excluding precious metal and substrate, are about £1.5 billion. These purchases are made across 118 sites, historically with each site accountable, for the most part, for its own purchases. This has, in the past, limited our ability to consolidate our understanding of purchases across the group.

Over the last year we have begun to move to a global procurement strategy and have started to capture this data on a consistent basis to fully understand where the procurement opportunity lies. We have begun to execute against this opportunity and have made excellent early progress in bringing together our existing procurement community and in building new capability to ensure that we capture it in full. We will continue to roll out our global procurement function during 2018/19 to realise savings and enhance our supply chain performance.

## Responsible operations

Our technology is used by customers every day to create products that have a direct benefit on the environment, preventing millions of tonnes of pollutants from entering the atmosphere. We also have a responsibility to ensure the way we make these technologies is responsible and environmentally conscious too.

In the course of our now completed ten-year strategy, Sustainability 2017, we halved our operational carbon footprint and our use of energy and water per unit of sales. These efforts, combined with those in our Manufacturing Excellence programme, delivered bottom line savings of £142 million.

But now we want to go further. Building on the impressive achievements of Sustainability 2017, we have set ourselves more stringent targets to 2025 and are incorporating a stronger external focus.

In developing our six goals for sustainable business to 2025, we defined two goals that are linked to our operations, both at group and site level. One is our goal to reduce our greenhouse gas emissions by 25% per unit of production output (goal 3), an ambition that forms part of our approach to low carbon operations. The second is to improve sustainable business practices in our supply chains (goal 4).

Three of our four other goals – covering health and safety (goal 1), employee engagement (goal 2) and volunteering in the community (goal 6) – are explained in the People section of this report on pages 48 to 59. Goal 5, which aims to increase the positive contribution of our products to a cleaner, healthier world, is explained in the Customers section of this report on page 35.

## 3 Climate change action through reducing greenhouse gas emissions

We have set ourselves a new carbon intensity goal in which we aim to reduce our greenhouse gas (GHG) emissions per unit of production output by 25% (sustainable business goal 3). Monitoring our emissions as a function of production output, rather than sales, will allow us to capture any operational efficiency improvements more authentically. The new carbon intensity goal also reflects the type that companies are setting in order to qualify as a Science Based Target using the Sectoral Decarbonisation Approach.

## Strategic Report

Our ambitious target was based on an assessment of potential installations and energy procurement opportunities across our sites and a consideration of the targets being set by peer companies.

We are including Scope 1 and 2 (direct and indirect) emissions in our goal, which covers our entire use of fossil fuels, electricity from all sources and emissions of all major GHGs. To improve our data collection and help drive improvements, we have installed a groupwide environmental data reporting tool to our sustainability management platform, Enablon. The tool was operational from 1st April 2018 and enables us to increase the frequency of our internal reporting.

In recent years, we have increased our use of renewable energy on our sites. For example, at our pgm refinery and chemicals plant at West Deptford, New Jersey, USA, we source 17% of our electricity from an adjacent photovoltaic plant, saving 861 tonnes of GHG emissions in 2017/18. Also in the US, all our sites in the Philadelphia region will be purchasing zero carbon electricity from grid suppliers from April 2018; this is expected to reduce the group's carbon footprint by 7% over the next year. And five of our UK sites (Royston, Brimsdown, Sonning, Swindon and Edinburgh) have been purchasing renewable electricity (wind power) from the National Grid since April 2016, making CO<sub>2</sub> equivalent emissions savings of over 40,000 tonnes in 2017/18. This has been achieved through an agreement with Ørsted, who supply Renewable Energy Guarantee of Origin (REGO) certified wind power from the West of Duddon Sands Offshore Wind Farm near Blackpool and the London Array Offshore Windfarm in the River Thames estuary.

In Skopje, Macedonia, our site installed a new waste water treatment plant in 2017. The factory first opened in November 2013 and had been growing. Consequently, the previous waste water treatment plant was unable to meet the demands of the site in terms of quantity and type of waste water handled – it could only treat sanitary water. This left the site having to send over 300 m<sup>3</sup> of effluent to neighbouring Serbia every month – a distance of 450 km.

The Skopje site worked with waste water specialist EnviroChemie to create a treatment facility specific to the site's needs. In the first year of operation (July 2017 to March 2018), the new plant has achieved 162 tonnes of CO<sub>2</sub> savings and cost savings of over €900,000.

Other examples of our work to reduce energy use and emissions include our platinum group metal fabricated products plant in Royston, UK, where we have made a 655 MWh reduction in energy use. This was achieved through a comprehensive package of measures including installing solar photovoltaic panels, replacing a furnace and upgrading the lighting and pump scheduling. We are also making good use of solar energy at five sites, while at our Royston, UK site we are linking solar panels to our air conditioning systems to reduce energy consumption. One of our sites has a wind turbine and we have also refurbished office buildings increasing insulation, installing LED lighting and replacing the windows to improve working conditions whilst saving energy.

 Page 45: More on our greenhouse gas performance

### Understanding potential impacts of climate change on our business

We disclose our environment, social and governance (ESG) performance through the CDP climate change programme, which looks at risks and opportunities of climate from the world's largest companies on behalf of institutional investors.

 [matthey.com/cpd-investor](http://matthey.com/cpd-investor)

We also participate in benchmarking studies to deepen our knowledge and compare our progress against our peers. A changing global climate brings with it a number of risks and opportunities for Johnson Matthey, which we continually consider and review annually as part of our CDP disclosure. The most significant of these continue to be environmental legislation and water availability.

Johnson Matthey is also a signatory of L'Appel de Paris (the Paris Pledge for Action), committing us to play our part in delivering the agreement's ambition to limit global temperature rise to 2°C. Our sustainable business goal 3 supports this.

### Water risk

Water is an essential resource. The World Resource Institute (WRI) reported in June 2016 that in the industrialised world, fresh water is becoming scarcer due to increased demand and higher pollution levels. Availability is often transient, dependent on changing weather patterns.

A reliable supply of fresh water is required by all our manufacturing sites and, often in considerably greater quantities, by our strategic suppliers. To examine our exposure, we periodically undertake water stress surveys of our business. We also report our principal water risk publicly through the annual CDP Water survey.

 [matthey.com/cdp-water](http://matthey.com/cdp-water)

In 2016/17 we conducted a survey using the World Business Council for Sustainable Development (WBCSD) Global Water Tool™ (version 1.3). Of the 66 principal sites surveyed, 15 were identified as being in regions of extreme water stress. Our water usage in most of these locations is very low. However, there are four where we are close to using the locally available freshwater supply per capita: Taloja, India; Yantai, China; New Mexico, USA; Brimsdown, UK. We are using the data from the survey to prioritise water conservation projects for the sites that are at the greatest risk of an interruption to supply.

Our facility in Taloja, India was assessed by the WBCSD Water Tool survey to be our highest water stressed manufacturing plant. To meet the ever increasing demands of the local waste water treatment facility that treats all waste water on the industrial park in which our facility is located, we are in the early stages of installing a water treatment / recycling plant with the aim of making the plant 'zero liquid discharge' (ZLD).

Our largest risk to water is in our supply chain, where we are exposed to industries that are significant water users, such as mining and agriculture. The next step is to gather the exact locations of our strategic suppliers' facilities and evaluate them with the WBCSD tool.

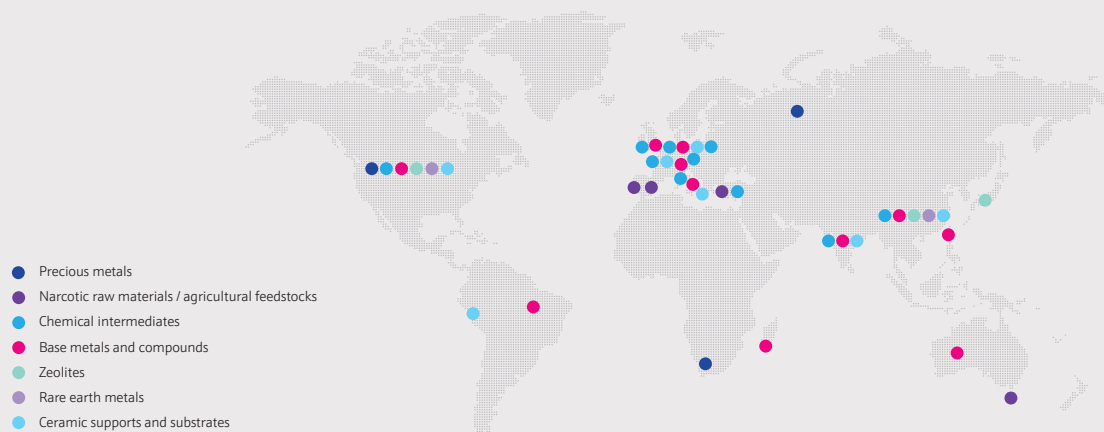
## 4 Responsible sourcing

The second part of our operational sustainable business goals concerns responsible sourcing. Under goal 4, we aim to improve sustainable business practices in our supply chains. Through collaboration, we will ensure full compliance with our minimum standards from strategic Tier 1 suppliers.

This due diligence is not new to us but it is the first time we have framed it as a formal sustainability goal, with clear measures to show our progress. Our goal is to achieve compliance among 100% of our Tier 1 strategic suppliers by 2025.

### Where we source strategic raw materials

We procure goods and services globally and our supply chains are multi-tiered. Sourcing of strategic materials is a principal risk (see page 79) and monitoring and understanding the risk is challenging but essential. Some of our strategic raw materials are available from only a limited number of countries. The countries we rely on for these materials are highlighted in the map below.



Several factors have led us to select responsible sourcing as a goal. Regulation of supply chains is increasing, for example in the areas of conflict minerals and modern slavery. And we are aware that some of our suppliers are located in high risk countries. We launched our Supplier Code of Conduct in September 2017; it is available on our website in English, German, Japanese, Polish and Mandarin. We will report annually on the numbers of strategic Tier 1 suppliers assessed and of those, how many meet our responsible supplier compliance criteria. We have put in place a Supplier Sustainable Development Programme (SSDP). This business tool enables us to classify risk in our suppliers, determine what level of due diligence is required, identify corrective actions and follow up on progress. We will track the number of suppliers that have signed up to the code and the number assessed during the last three years.

In 2017/18, 97 supplier sustainability assessments were undertaken across our sectors. These comprised formal on-site audits, desktop assessments and supplier

self-assessments. These assessments represent approximately 30% of JM's direct materials spend with suppliers. The table below represents the responses from JM's sectors. We have not identified any incidences of child labour or forced labour in our value chain.

In 2017/18, 26 strategic Tier 1 supplier assessments were undertaken to check compliance against the JM Supplier Code of Conduct. This represents approximately 11% of suppliers classified in this way. Of those assessed, 73% were in compliance with the expectations of JM's code.

#### Modern slavery

Research from the Walk Free Foundation shows that over 40 million people worldwide are trapped in some form of modern slavery, including forced labour. This is an important social issue and JM is proactively taking steps to ensure high ethical standards throughout our value chain, including through our sustainable business goal 4 on responsible sourcing.

We support the principles set out in the UN Universal Declaration of Human Rights and the International Labour Organisation Core Conventions, including the conventions on child labour, forced labour, non-discrimination, freedom of association and collective bargaining.

We also support the principles endorsed under the UN Global Compact and the UN Guiding Principles on Business and Human Rights (the 'Ruggie' Principles). We are working to embed them throughout our operations and whenever we enter into business in a new territory, make an acquisition or enter a joint venture. There were no human rights grievance reports made against Johnson Matthey during the year.

The UK Modern Slavery Act 2015 requires UK listed companies to make an annual statement describing the steps they have taken during the year to ensure that slavery and human trafficking are not taking place, either in their businesses or their supply chains.

Our annual statement is posted on our website and details the steps we are taking. They include our policies and codes (including our code of ethics and confidential 'speak up' line), details of our supply chain governance team and the Supplier Sustainable Development Programme. In order to improve standards in our supply chains, in 2017/18, we have undertaken a risk mapping exercise and identified suppliers where we need to focus our attention.

Sustainable business topic of concern	Number of suppliers assessed for this concern	Number of new non-conformances identified in 2017/18	Total number of non-conformances open at 31st March 2018
Child labour	97	–	–
Forced labour	97	–	–
Wages and working hours	97	3	3
Discrimination	97	–	–
Freedom of association	82	–	–
Health and safety	97	45	25
Environmental	82	5	2
Other – anti-bribery and corruption, supply chain standards	35	5	2

## Strategic Report

The criteria considered in the assessment included industries that are considered high risk, country corruption risk and country modern slavery risk. By undertaking this due diligence, we can understand and address potential impacts on human rights and ensure that there is no enslaved labour within our supply chains.

### Conflict minerals

The term 'conflict minerals' refers to tin, tungsten, tantalum and gold which originated from the Democratic Republic of Congo (DRC) and surrounding countries, in particular from areas of military conflict where most mining is artisanal and linked to serious human rights abuses.

We have established a process for due diligence of all conflict minerals based on the Organisation for Economic Co-operation and Development (OECD) Guidelines which includes keeping records that enable us to track the suppliers of all the raw materials we use and identify which smelter the conflict minerals came from. We are working towards being compliant with the new European Union Conflict mineral regulation, which was enacted in July 2017, ahead of the January 2021 deadline.

Of the smelters identified throughout all tiers of our supply chain, 89% are listed as conformant with the Responsible Minerals Assurance Process (RMAP) assessment protocols on the RMI (Responsible Minerals Initiative) database and we expect this to increase as more refiners and smelters join the programme and become RMAP-conformant. We use our in-house database to respond to customer requests for information on conflict minerals in our products and to provide them with a tailored answer to any query they have. This year we have responded to around 70 customer requests for information.

We are also extending our minerals supply chain due diligence activity to include cobalt. Cobalt is used in a range of applications from battery technology, industrial catalyst to health care. At present the Democratic Republic of the Congo (DRC) holds about 50% of the global reserves of cobalt. Although there are some mining companies which are operating ethically in the country, there is a significant amount of illegal artisanal mining in uncontrolled conditions leading to a number of human rights concerns.

A number of voluntary responsible supply chain schemes for cobalt are springing up but they are not yet harmonised or universally applied; we are currently evaluating participating actively in the Responsible Cobalt Initiative.

 [matthey.com/conflict-minerals](https://matthey.com/conflict-minerals)

### The pgm supply chain

One example where we are taking a proactive approach is in the platinum group metal (pgm) supply chain. We have worked closely with some of our automotive customers to address concerns that they raised relating to the pgm supply chain in South Africa. A collaborative visit facilitated by JM, resulted in direct dialogue between the pgm mining companies, JM and these key customers. This allowed our customers to see and hear first hand the challenges of operating within that industry and in the complex South African economic, social and political context. A clear action plan has been agreed.

In addition, we have worked with peer pgm fabricator companies to develop a single consistent due diligence approach to be taken by all when assessing pgm supply from South Africa. This fabricator working group, liaising through the International Platinum Group Metals Association (IPA), is establishing a systemic 'one mine, one audit' approach from late 2018. This will ensure supply chain partners are assessed and audited in a more consistent, efficient and effective manner. Ultimately, this will lead to improvements in standards of business conduct throughout the value chain.

Our business is highly diverse, both in the range of our manufactured products and the markets we serve. Our supply chains are correspondingly complex and we are aware that we still have a significant amount of work to do in improving sustainable business practices in those supply chains. Our supply chain governance team, which is integrated into our Procurement Excellence programme, is driving this forward.

### Product lifecycle management

The products we sell to our customers often form an important part of the end product supplied to the user. For example, we supply catalytic coated substrate as a component for engine emission control systems for car manufacturers.

The catalyst is incorporated into the catalytic converter in the exhaust system of a car which is bought by the end user who drives it. We do not manufacture the car, but we are concerned with the whole life of the catalyst until the end of its life, and beyond, e.g. to recovery of components for subsequent reuse.

This 'whole life' responsibility is what we call product lifecycle management, also known as product stewardship. We set ourselves high standards: our customers want to see evidence that we understand any hazards inherent in our products and that, through understanding their uses, we can, in turn, help them manage any consequent risks. Equally, our external stakeholders want assurance that the potential impacts – on the environment, our employees and downstream users – are well managed. Some stakeholders are starting to demand that chemical companies like ourselves move towards safer chemistries.

Internally, our product lifecycle management supports our value of protecting people and the planet. More pragmatically, it is essential to our business that we identify and mitigate any risk to our portfolio. Our social licence to operate depends on our compliance with safety regulations and, of powerful importance, our voluntary stewardship of our products all the way down the value chain.

It is important we design in green chemistries at the start of a product's life. Recently we have developed a sustainability checklist as part of our New Product Introduction (NPI) process. The checklist contains a series of questions about health and safety, environmental, social and financial issues which must be answered before the project can progress to the next stage of the NPI process. The checklist is now being evaluated by teams in JM's sectors.

### Our management systems

We implement our product lifecycle management through well established systems to ensure the sound management of our products throughout their lifecycle. We have groupwide policies and guidance which align our approach with the global framework set by the Strategic Approach to International Chemicals Management (SAICM) to promote chemical safety around the world. The Strategic Approach, begun in 2006, is hosted by the UN Environment Programme.

We have procedures in place at group and sector level to identify regulatory obligations, both future and current, and create the documentation necessary to ensure compliance. Our internal committees assess hazard and exposure data to identify opportunities for risk reduction in our operations. Potential new products are assessed at an early stage of their development against safety and regulatory criteria, with higher hazard products being put through more detailed assessments. Finally, business compliance with lifecycle management policies forms part of our environment, health and safety (EHS) audit.

### Our three areas of focus

As part of our work on product lifecycle management, we have three current areas of focus. The first is active horizon scanning which identifies proposed regulatory developments that could impact our sites and products and the raw materials we use. Linked to this is our second area of focus: early identification of new regulatory pressures for our customers that our existing or new technologies may be able to overcome.

Our third area of focus is 'high hazard' substances – chemicals with significant potential to harm human health or the environment and how we ensure appropriate investment in researching less hazardous alternatives. On the basis of elevated concern on a substance's hazards, regulators may require companies to generate extensive data packages to underpin detailed risk assessments. If a true risk is identified they could take action that effectively eliminates use of the substances in that market. All of our businesses could be affected by these changes and we follow developments closely.

Our policies, especially on NPI, emphasise the expectation that we actively investigate the availability of safer alternatives to our use of high hazard substances. For example, our Finnish business identified a risk to its portfolio as a critical component of its resin bead manufacturing process would face severe restriction in Europe due to it being considered a substance of very high concern (SVHC). Unlike our key competitors, rather than apply for authorisation to continue use of this hazardous substance, which would be an expensive and time consuming process with an uncertain and time-limited authorisation outcome, we decided to alter our manufacturing process.

The development work took time and money, but the project to move to a safer process gained financial support from the Finnish authorities. Customers were fully informed of the rationale for the change; we retained their orders and they in turn retained theirs.

### Pgm user guide

During the year JM provided significant input into a comprehensive user guide to pgms. 'Safe Use of Platinum Group Metals in the Workplace' was published by the IPA in December 2017 and is intended to advance awareness of the hazards and risks associated with occupational exposure to pgms and how to manage them effectively. This is an important and directly relevant piece of work, as many JM sites handle pgms, and one of the eight occupational illnesses reported in 2017/18 related to pgm exposure. The user guide provides practical advice on workplace monitoring, the medical surveillance of workers, control measures, training and regulatory controls. It is available on the IPA website and we have advised our sites to consider the new guidance in their pgm management programmes, subject to local law.

The IPA guide is the most visible of our recent efforts in this area, but we continue to work with peer companies in trade associations and consortia to develop best practice on stewardship.

### Priority substance management

We have set up a committee to review certain high hazard substances of relevance to JM in order to ensure there is appropriate recognition of the risks from developing new products using these substances. The PARS (Prior Approval Required Substances) Committee decides on whether the risks (i.e. EHS, sustainability, financial, reputational) are sufficiently high that a senior leader is required to issue a time-limited approval to use the substance in NPI projects. The committee has reviewed its first tranche of substances and has concluded that a small number of relevant substances either face regulatory pressures of sufficient magnitude in the foreseeable future, or are sufficiently hazardous that they should be PARS listed. Although focused on NPI, existing uses of a PARS substance will consequently face additional scrutiny.

We use or manufacture only a very limited number of substances considered regulated<sup>1</sup>, or of international concern<sup>2</sup>. As a proportion of our portfolio, approximately 5% of products consist of, or use in their production, such substances.

Looking ahead to the next year, we plan to improve our audit programme for product lifecycle management. At present, it forms part of the EHS audits of our sites. We are now reviewing how we manage our product lifecycle work across the group and will embed our findings in a more targeted audit programme on this specific issue. This will enable us to be proactive across all our sites and businesses and to provide more consistent information to our customers. And in the medium term, we recognise that we have more work to do on end of life solutions for our products, with, among other things, improved recycling.


As the UK prepares to leave the EU, we have made plans for Brexit and are in a good position to manage the effects on our European operations. We are actively supporting the UK government in understanding the potential impact of the various options being considered.

### Product lifecycle performance

We made good progress during 2017/18. We completed our 1 to 100 tonne per annum substance registrations for our operations in the EU in good time for the May 2018 deadline under the REACH requirements (the European Regulation on the registration, evaluation, authorisation and restriction of chemicals). Work is also progressing on preparing registrations for a small number of priority chemicals in South Korea. In the US, the US Toxic Substances Control Act (TSCA) was recently subject to a major update and we have responded to the resetting of the TSCA Inventory per the deadlines.

We use a systematic product responsibility reporting scheme to monitor the performance of our operations and maintain surveillance of the company's products and services.

In 2017/18, there were no notifications of significant end user health effects involving our products. We did not identify any non-compliance with regulations or voluntary codes concerning health and safety impacts of products and services or product and service information, labelling and marketing communications.

 Policy on animal testing: [matthey.com/stewardship-testing](http://matthey.com/stewardship-testing)

<sup>1</sup> e.g. SVHCs under REACH, RoHS or California Prop 65 listed substances.

<sup>2</sup> e.g. controlled by the Montreal Protocol, Stockholm and Rotterdam Conventions, GHS category 1A/1B carcinogens, mutagens or reprotoxins, etc.

# Environmental performance

## Environmental performance summary

		2018	2017	% change
Operational carbon footprint (Scope 1 and 2 market method)	thousand tonnes CO <sub>2</sub> equivalent	<b>445</b>	469 <sup>1</sup>	-5
Energy consumption	thousands GJ	<b>5,104</b>	5,147 <sup>2</sup>	-1
Electricity consumption	thousands GJ	<b>2,055</b>	1,955	+5
Natural gas consumption	thousands GJ	<b>2,722</b>	2,872 <sup>2</sup>	-5
Total waste sent off site	tonnes	<b>71,787</b>	70,200 <sup>3,4</sup>	+2
Total hazardous waste sent off site <sup>5</sup>	tonnes	<b>44,020</b>	43,542	+1
Waste to landfill	tonnes	<b>6,271</b>	6,894 <sup>3</sup>	-9
Water withdrawal	thousands m <sup>3</sup>	<b>2,729</b>	2,643	+3

<sup>1</sup> Carbon footprint data for 2016/17 has been restated using updated methodology to be used to 2025, see further details on page 201.

<sup>2</sup> Restated to reflect updated conversion factors.

<sup>3</sup> Excludes 17,682 tonnes of uncontaminated soil from a construction project in Redwitz, Germany in 2016/17 which was classified as non-hazardous waste to landfill under local law.

<sup>4</sup> Restated to include additional waste stream omitted last year.

<sup>5</sup> Excludes hazardous waste sent for beneficial reuse.

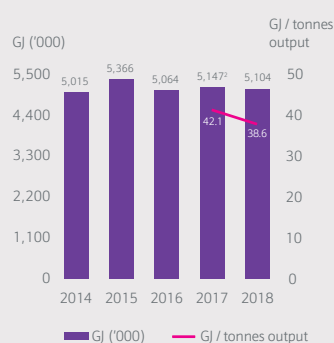
All percentages and ratios in this section are calculated on unrounded numbers.

We have group policies, processes and systems in place to manage our environmental performance and help us realise continuous improvement. In addition to process improvement efforts, the efficiency and longevity of equipment are considered in purchasing decisions and for large capital expenditure projects.

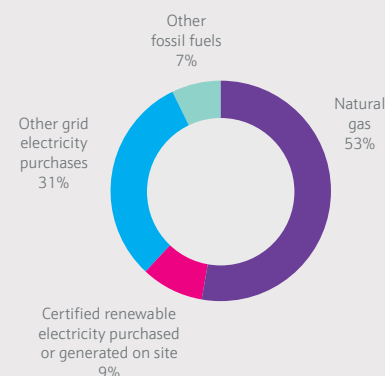
The company also provides environmental policies on areas including emissions to atmosphere, energy management, waste management, protection of waste water discharge systems and discharges to surface and ground water. These policies provide the guiding principles necessary to ensure that high standards are achieved at all our sites around the world.

All our major manufacturing sites are required to maintain certification to the ISO 14001 environmental management system as a means of setting, maintaining and improving standards. The group also requires new or acquired sites to achieve ISO 14001 certification within two years of beneficial operation or acquisition; 89% of such sites are ISO 14001 compliant.

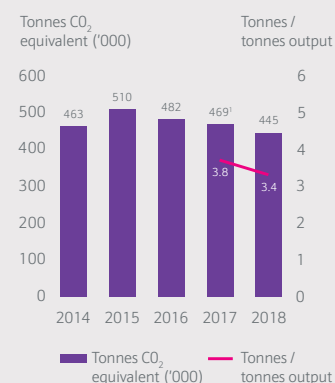
### Energy consumption



### Energy consumption



### Carbon footprint



<sup>2</sup> Restated to reflect updated conversion factors.

<sup>1</sup> Restated using updated methodology to be used to 2025, see further details on page 201.

Going beyond this, 12% of our manufacturing sites are also ISO 50001 compliant. ISO 50001 builds on ISO 14001 and looks specifically at the development of energy management systems to systematically and continuously improve energy efficiency. Our manufacturing sites in Macedonia, South Africa and our major sites in Germany have all achieved this standard.

Every year we undertake a comprehensive review of group environmental performance across all our manufacturing, R&D facilities and large offices that are under our financial control.

### Energy consumption

Group product output grew by 8% in the year. By contrast we recorded a 1% absolute decrease in energy usage within our facilities this year.

The make-up of our energy purchases changed in 2017/18 as our combined heat and power (CHP) plant in Royston, UK was out of service for much of the year as we are replacing it with a new CHP. Electricity usage across the group rose by 5% whilst gas usage declined by a similar amount. 0.2% of our electricity came from local solar power facilities that are not grid connected, a 14% rise on last year (see further details on page 40). In total, 467,960 GJ (21%) of the electricity we consumed during the year came from certified renewable energy sources for which JM is in possession of the associated Renewable Energy Certificates.

### 3 Greenhouse gas emissions


We report greenhouse gas emissions from our manufacturing processes and energy usage in accordance with the 2015 revision of the Greenhouse Gas Protocol ([www.ghgprotocol.org](http://www.ghgprotocol.org)). Our total operational carbon footprint is based on:

- Scope 1 emissions – generated by the direct burning of fuel (predominantly natural gas) and process derived greenhouse gas emissions (CO<sub>2</sub>, N<sub>2</sub>O, CH<sub>4</sub> and refrigerants).
- Scope 2 emissions – generated from grid electricity and steam use at our facilities.

Although we dual report our Scope 2 emissions, in 2017/18 we have switched to using Scope 2 calculated by a market based method. This reflects the emissions of the electricity we are actually buying more accurately than using location based emissions factors. Market data is available for 57% of our sites and is obtained from local suppliers, energy contractual documents and website declarations. At 80% of sites where competitive electricity purchasing markets are operational, the carbon intensity of electricity we purchased was lower than the national or regional average. Thus, Scope 2 carbon footprint calculated by the market method is 10% lower than the location based method.

21% of grid electricity was purchased on zero carbon tariffs in 2017/18. We expect this percentage to increase in 2018/19 as several of our Pennsylvania area sites switch suppliers.

Our absolute carbon footprint using the market method decreased by 5% in 2017/18. Using less gas and processing cleaner feeds in our pgm refinery yielded a 6% reduction in our Scope 1 carbon footprint. We purchase zero carbon electricity at many of our UK sites. A reduction in the carbon intensity of our electricity purchases around the globe led to a 4% drop in Scope 2 emissions, despite a 5% increase in electricity usage. Relative to production output, our carbon footprint decreased by 12%.

 Pages 39 and 40: Details of our actions to reduce greenhouse gas emissions

### Carbon footprint

	2018 thousand tonnes CO <sub>2</sub> equivalent	2018 % of total carbon footprint	2017 thousand tonnes CO <sub>2</sub> equivalent <sup>1</sup>	2017 % of total carbon footprint
Scope 1	215	48%	229	49%
Scope 2 (market based method)	230	52%	240	51%
Scope 2 (location based method)	279	56%	286	56%
Scope 3 (from electricity transmission and distribution)	20	n/a	22	n/a
<b>Total operational carbon footprint (Scope 1 and 2 market based method)</b>	<b>445</b>	<b>100%</b>	<b>469</b>	<b>100%</b>
<b>Total operational carbon footprint (Scope 1 and 2 location based method)</b>	<b>494</b>	<b>100%</b>	<b>515</b>	<b>100%</b>

<sup>1</sup> Restated using updated methodology to be used to 2025, see further details on page 201.



Strategic Report

Other emissions to air

Emissions from our operations are typically licensed by local regulations and are generated from a number of sources including combustion processes, materials handling and chemical reactions. All sites monitor emissions to ensure compliance with local regulations and set their own absolute targets aimed at reducing significant emissions as part of their local environment, health and safety improvement plans.

Significant developments were made in systems to abate emissions to air. In Germany, new ammonia abatement systems were installed and in China both oxides of nitrogen (NOx) and volatile organic compound (VOC) abatement systems are being installed. The total investment for these systems is around £6.4 million. The VOC abatement system in China was our Clean Air Sector's first VOC abatement system, which allows JM to go beyond compliance and protect the local atmosphere. New government legislation in China means that all our sites in Shanghai will be subject to mandatory NOx, oxides of sulphur (SOx) and VOC reporting going forward.

In 2017/18, our reported NOx (NO + NO<sub>2</sub>) emissions were 383 tonnes, up 10% on the previous year due to an increase in production in our Catalyst Technologies business. Our total SO<sub>2</sub> emissions decreased by 13% to 44 tonnes due to change in the type of material processed through our pgm refinery in Brimsdown, UK.

Our emissions of VOCs decreased by 24% to 101 tonnes. This mainly resulted from a review of the efficiency of the vacuum pumps scrubbing the emissions at our Health Sector's sites.

Our emissions to air data disclosed here are comprised of data from 39% of our manufacturing sites. Within these numbers, we believe we have captured our material emissions across the group but will be working to increase coverage of our emissions to air reporting over the coming year to confirm this.

Waste

In 2016/17 we introduced a more detailed reporting system for waste disposal across the group, allowing us to better track and report the considerable efforts our sites are making in minimising their waste streams and disposing of waste in the most responsible way. We continued to focus on better waste reporting this year and have needed to restate our 2016/17 data to include some waste streams that were previously omitted. We have had our reporting of total solid waste and total hazardous waste data externally assured for the first time in 2017/18.

We disposed of 71,787 tonnes of waste via third parties in 2017/18. Of this 79% is liquid waste, largely dilute aqueous waste coming from our UK pgm refineries. 65% of our total waste sent off site was classified as hazardous waste. 96% of our hazardous waste is very dilute aqueous waste, 65% of which comes from our pgm refinery in the UK and is tankered off site for treatment by third parties; we are actively investigating alternative ways to deal with this waste stream in future years. Only 1,822 tonnes of our hazardous waste is solid material that is not reused or recycled after it has been sent off site. 2% of our hazardous waste was shipped internationally for disposal. This is a 33% drop on last year due to less waste being shipped internationally, mainly from our Clitheroe, UK site.

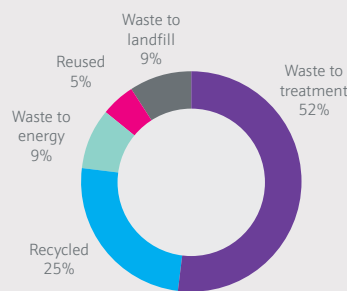
Of the total waste sent off site for treatment, 5% was sent for reuse by others, 25% for recycling, 9% for energy recovery and 9% was sent to landfill. The remainder was sent directly to third parties that offer a variety of treatment and incineration services.

We also incinerated 7,075 tonnes of waste within our own facilities, principally waste sent to our refineries for precious metal recovery.

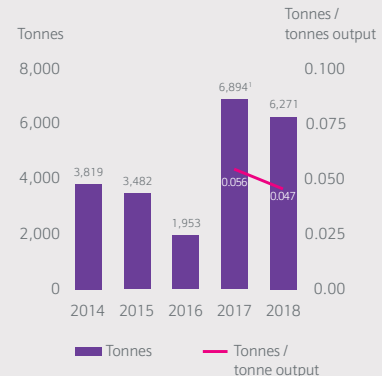
Other emissions to air

		2018	2017	% change
NOx	tonnes	383	348	+10
SOx	tonnes	44	51	-13
VOC	tonnes	101	132	-24

Where our waste goes



Total waste to landfill



<sup>1</sup> Excludes 17,682 tonnes of uncontaminated soil from a construction project in Redwitz, Germany which was classified as non-hazardous waste to landfill under local law.

### Water withdrawal

Water withdrawal increased slightly this year to 2.7 million m<sup>3</sup>, a 3% increase in absolute terms but a 5% decrease relative to production output. 91% was supplied by local municipal water authorities, 7% was abstracted from groundwater and 2% was abstracted from fresh surface water.

40% sites operate their own waste water treatment facilities treating 1.2 million m<sup>3</sup> of waste water per year, a 3% increase on last year. 27% of the water treated on site is recycled back into our processes rather than being discharged as effluent, reducing the sites' water demand. Our Clitheroe, UK site is leading our initiatives, recycling 64% of its water treated on site.

Our total effluent increased by 1% to 1.6 million m<sup>3</sup> in 2017/18 after data from 2016/17 was restated due to inaccurate billing to our Germiston, South Africa site by its local authority. 86% of our total effluent was discharged to local authority sewers after treatment and in accordance with local discharge consent agreements. The remainder was discharged to surface water courses after treatment and within quality limits set by local water authorities.

Our total consumption (water withdrawn less water discharged) was 1.1 million m<sup>3</sup>, a 7% increase on last year. More information is available on our website in our CDP disclosure.

 [matthey.com/cdp-water](http://matthey.com/cdp-water)

The chemical oxygen demand (COD) test is commonly used to indirectly measure the amount of organic compounds in water and is a useful measure of water quality. In 2017/18 the group discharged organic chemicals equivalent to an average COD of 197 mg/L into water courses, as regulated by local emission limits at each manufacturing facility.

This average COD was calculated from readings collected at sites representing 65% of our total water discharged. Some of our sites use a different measure of water quality which cannot be translated directly to a COD calculation and are therefore not included in this measurement.

### Environmental incidents

Johnson Matthey has a robust and effective management system that requires all sites to report environmental incidents to our Group EHS department. All spills that occur on unmade ground or near drinking water sources are classified as significant. One site (Royston, UK) has self-reported an incident to the local authorities in 2017/18 which is still under investigation.

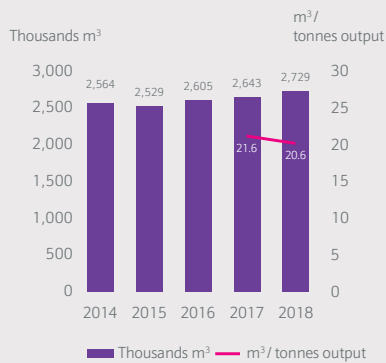
During 2017/18, we received one fine for an environmental permitting requirement breach, which had no environmental impact. This was at our Clean Air plant in Shanghai, where we had begun work to construct a new production line prior to receiving an environmental permit from the Environmental Protection Bureau. The permit was granted retrospectively but the business was fined RMB 1.998 million (approximately £220,000). The management error that led to the breach was subsequently investigated and actioned.

### Environmental performance – priorities for 2018/19

More regular reporting by sites throughout the year (using the recently launched Enablon reporting tool) will enable areas of improvement to be identified and implemented more quickly. It will also allow us to report data from a greater proportion of sites for some areas, such as other emissions to air.

Additionally, we will review and update some environmental policies and their associated guidance.

### Water withdrawal



### Environmental spills

Location	Volume (litres)	Material	Impact
Royston, UK	2,000	Chemicals	Under investigation