

Environmental sustainability

Our approach

Minimising impacts across the product life cycle

Reducing our carbon footprint

Reducing impacts on natural resources

A responsible approach to waste

Protecting biodiversity

Environmental product stewardship

Environmental sustainability

Environmental sustainability is about operating our business in a manner that respects and protects our climate and natural resources. Our approach spans the entire product life-cycle and our science-based focus drives continuous improvement across our value chain.

2015 highlights



21%

carbon footprint reduction since 2010



18%

reduction in total waste since 2010



14%

reduction in water consumption since 2010

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Our approach

We are committed to minimising the environmental impacts of our business and our products by reducing our carbon footprint, using resources efficiently and ensuring the environmental safety of our products as this is one of our key material issues. This year, we launched a new Safety, Health and Environment (SHE) Strategy, which will drive our continuous improvement up to 2025.





We face two key challenges when it comes to improving our environmental impact: firstly, the need to conserve natural resources and protect the environment as we develop, produce and transport our products, and, secondly, the need to ensure our products are safe for the environment at all stages in their life cycle.

As we develop more innovative medicines and technologies, we constantly face new challenges and opportunities. We take a pragmatic approach, balancing the benefits we can deliver for patients with the need to protect the environment, conserve natural resources and create shareholder value.

Reaching the end of our 2011–15 commitments

In 2015, we came to the end of our 2011–15 commitments on environmental sustainability. Our performance is summarised in the table below:

What we have achieved

Our aims	Goals	Progress highlights	Target Progress
Enhancing our competitiveness through resource conservation and efficiency across our business and supply chain	By 2015, reduce operational greenhouse gas footprint (excluding emissions from patients' use of inhaler therapies) by 20% from 2010 levels	Achieved a 21.2% cut in our greenhouse gas footprint from 2010 levels	
	By 2015, reduce hazardous waste by 15% indexed to sales and reduce non-hazardous waste by 15% indexed to the number of employees	Hazardous waste generation indexed to sales increased 5% against the 2010 baseline, while non-hazardous waste indexed to employees increased 11%	
	By 2015, reduce water use by 25% against 2010 levels	Despite indexed waste reduction targets not being met, we reduced our total waste by 18% from 2010	
		Water use was 3.9 million m ³ . Though we were not able to achieve our ambitious target, we made substantial progress with a reduction of 14% against our 2010 baseline	

Key

Target exceeded



Full target achieved



Ongoing progress



Target not achieved, some progress



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Case study: Striving for BREEAM 'excellent' at our new UK headquarters

Cambridge City Council granted planning permission for our new purpose-built facility on the Cambridge Biomedical Campus, which homes our UK-based global research and development centre and corporate headquarters, along with 2,000 employees. We are working closely with our construction partners to achieve Building Research Establishment Environmental Assessment Methodology (BREEAM) 'excellent' ratings for sustainability performance.

Steps we are taking include:

- Using optimal heat differentials in cooling technology to minimise energy consumption
- Optimising the use of natural light in place of artificial light
- Installing a combined heat and power station to meet our energy needs on site
- Installing rainwater recovery systems throughout the site.

Setting targets for 2025

In 2015, we finalised our new Safety, Health and Environment (SHE) Strategy. It will drive our continued improvement and commitment up to 2025. You can read more about our SHE Strategy in [Sustainability at AstraZeneca](#).

In setting our new carbon reduction target in 2015, we followed the Science-Based Target Setting

methodology developed by the World Resources Institute (WRI), World Wildlife Fund (WWF) and Carbon Disclosure Project (CDP). The initiative promotes science-based emission-reduction targets that are founded not only on the carbon reduction projects in a company's pipeline, but also on the fair, sector-specific contribution it can make to help avoid the worst impacts of climate change.

Our new environmental impact strategy and commitments**Commitments:****Carbon**

Limit 2025 extended operational footprint¹ to 2015 level and reduce overall value chain carbon intensity² by 30% against a 2015 baseline

Carbon sub-targets:

- Reduce absolute Scope 1 and Scope 2 non-electricity emissions 20% by 2025³, excluding patients' use of inhalers
- Source 100% of renewable power by 2025, reducing imported electricity emissions to zero
- Reduce absolute Scope 3 emissions from all sources within extended operational footprint by 2025⁴, excluding patients' use of inhalers
- Improve primary data collection within Scope 3 value chain greenhouse gas accounting to cover vast majority of impacts by 2020

**Waste**

10% absolute reduction against a 2015 baseline

**Water**

Maintain usage at 2015 level as our business grows

**Resource efficiency**

90% of small molecule active pharmaceutical ingredients (API) syntheses meet resource efficiency targets at launch

Establish equivalent resource efficiency targets for biologics (drugs that are manufactured in a living system, such as plant or animal cells, as opposed to chemical synthesis)

Commitment:

Ensure effective environmental management of our products from pre-launch through to product end-of-life

Note: For scope and boundaries of our carbon monitoring and reporting see footnotes.

Over the coming year, we will use the outcomes of our refreshed materiality assessment as we continue to develop and deliver our environmental sustainability approach and commitments. The current list of 27 material issues, which is now undergoing validation with stakeholders, includes: climate change; resource efficiency; biodiversity; and pharmaceuticals in the environment.

¹ Extended operational footprint includes: Scope 1, Scope 2 and some material Scope 3 emissions. It covers energy use, road fleet, process emissions, waste incineration, business air travel, primary distribution (freight and logistics), first tier outsourced supply of API and formulation and packing (90% spend, 2014 data, energy emissions only), and patient use of pressurised metered dose inhalers (pMDIs), measured in tonnes carbon dioxide equivalent (tCO₂e).

² Overall value chain footprint includes all sources of emissions: Scope 1, Scope 2 and all 15 Scope 3 value chain categories as defined by the Greenhouse Gas Protocol, measured in tonnes carbon dioxide equivalent per million USD of sales (tCO₂e/\$m).

³ Direct emissions from on-site energy, process emissions, AstraZeneca road fleet, and imported energy excluding imported electricity, which is captured through the renewable power commitment.

⁴ Ibid footnote 1

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Incorporating external perspectives

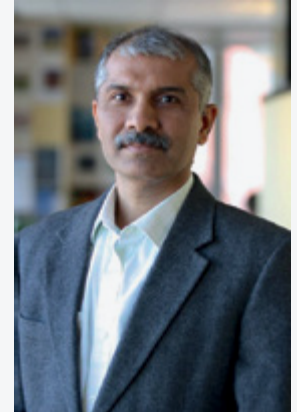
Our aim is to remain at the forefront of our sector for environmental performance, so we involve and take the advice of renowned external sustainability experts. In 2014, we established an Environmental Sustainability Advisory Board, which is made up of four leading global experts on sustainability to advise us on all aspects of our environmental strategy. The Advisory Board actively championed ‘fair share’ principles as we worked with them throughout 2015 to identify our new strategy and commitments. Members were also pivotal in encouraging us to expand the remit and membership of the Advisory Board to incorporate a broader sustainability agenda in 2016.

You can find out more about the new Sustainability Advisory Board's role and membership in [Sustainability at AstraZeneca](#).



We are pleased to see AstraZeneca pursuing development of science-based greenhouse gas targets and applying it to guide its strategy. This is a key step in AstraZeneca demonstrating its leadership on climate change and how it is doing its part to keep global warming below the dangerous threshold of 2 degrees Celsius.”

Pankaj Bhatia,
Deputy Director,
World Resources
Institute, and member
of the AstraZeneca
Sustainability
Advisory Board

**What we include in environmental sustainability reporting**

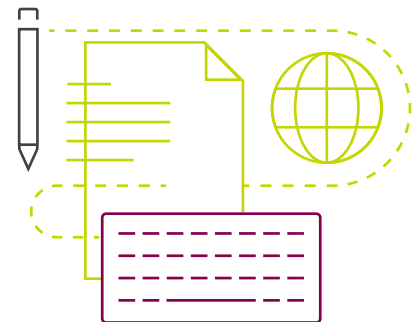
Our Global SHE department receives SHE data from all across the organisation every quarter. Each facility is required to report its performance against a set of criteria, as defined in our global reporting procedure.

Unless otherwise stated, we include data from recent acquisitions in our reporting. For the purposes of this report:

- Data from Ardea is included from first quarter of 2013
- Amylin (former BMS sites) data is included from the date they joined the company
- Pearl and Almirall data is included from the first quarter of 2015
- Sites and businesses divested from the company are included up to the date of divestment.

We regularly review data to ensure accuracy and consistency. This has led to slight changes in the figures produced for previous years. The figures quoted in this report are generated from the revised data, but none of these changes are statistically significant.

We treat baseline, target and reported data in accordance with Greenhouse Gas Protocol guidance (WRI/WBCSD, 2004 Revised Edition, Chapter 5 – Tracking Emissions Over Time).

**Measuring the impacts of outsourced manufacturing**

Because we outsource a significant proportion of our manufacturing, some of our impacts arise through the activities of third parties. Measuring and reporting on these impacts are key priorities as we strive to improve transparency and take full responsibility for our environmental performance.

We work with suppliers to set appropriate environmental standards and targets, and to collect environmental performance data. We have now captured environmental performance data for over 90% (based on spend) of our global outsourced manufacturing of active pharmaceutical ingredients (APIs) and formulation and packaging (F&P) suppliers across our established brands. Data currently collected covers CO₂ emissions from energy use only, waste generated and water use. Understanding and managing our external supplier environmental footprint will continue to be a major focus of our SHE improvement efforts.

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Minimising impacts across the product life cycle

We take a whole life-cycle approach to minimising the environmental impacts of our products, working with all those involved in the lifespan of a product – from discovery and development through to patient use and end-of-life disposal.

Our approach to environmental stewardship involves a wide range of activities, including:

- Life Cycle Analysis of key products to understand impacts and opportunities
- Developing environmental risk management plans for all new products
- Applying sustainable chemistry principles to our manufacturing processes
- Continual improvement of environmentally sustainable packaging
- Ongoing commitment to the safety of medicines in the environment.

Once our medicines are on the market, we provide healthcare professionals with clear information on their appropriate use. We also work with authorities and industry partners to guide patients on how to safely dispose of unused medicines.

Understanding the life-cycle impacts of a medicine

It is vital we understand the environmental impacts of our products across the entire range of our activities – from cradle to grave and including external outsourced activities.

What we consider: the different stages of the product life cycle

1

Discovery and early development

Ensuring studies are completed in a timely way before regulatory submission, while at the same time avoiding unnecessary animal testing

2

Green chemistry

Environmental impact at this stage relates directly to our consumption of natural resources. If we develop effective manufacturing processes, we will use fewer chemicals and fewer natural resources

3

Emissions during manufacturing

At this stage, the environmental impact is potentially harmful to the local aquatic life if not properly controlled

4

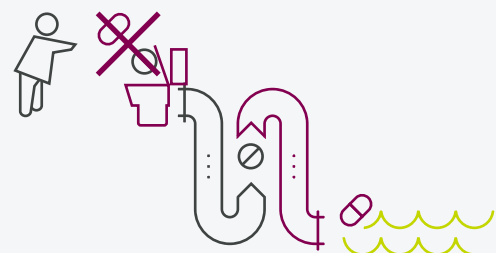
Emissions from patient use

We undertake environmental risk assessments as part of product approval to assess if environmental impacts occur due to continuous low-level exposure. We also conduct product-focused environmental research and we ensure that our risk assessments are updated in light of the latest scientific findings

5

Unused medicines

Improper disposal adds unnecessarily to the environmental exposure to pharmaceuticals

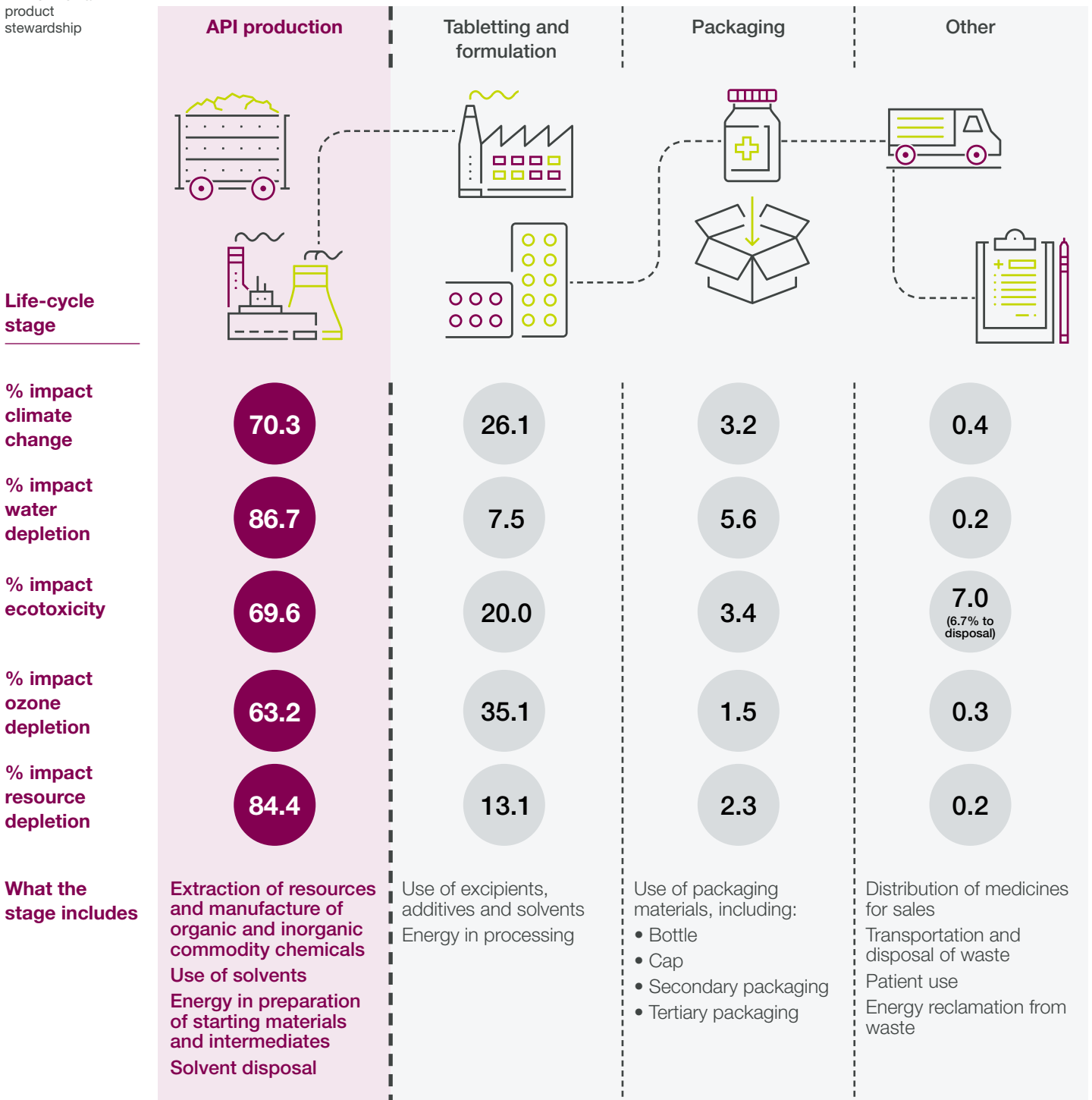


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Life Cycle Analysis in action

In 2015, we selected five products for full Life Cycle Analysis that we believe provide a useful representation of the breadth of our portfolio. We focused on five key impact areas – climate change, water depletion, ecotoxicity, ozone depletion and resource depletion. The results of these assessments are now informing where we should focus our efforts to have the biggest effect in reducing our environmental impact.

Assessing the environmental impact of Crestor, our prescription drug for lowering cholesterol



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Climate change has important consequences for the health of society and for the pharmaceutical industry. We believe that the only effective response can be through a united global effort that involves business, governments, non-governmental organisations (NGOs) and communities working together and doing their fair share to tackle the problem.

As a business built on cutting-edge science, we make it a priority to ensure our environmental commitments, targets and monitoring are based on sound science and represent our fair share of the collective effort needed by industry to protect the environment.

We disclose our carbon performance and targets to external indices, including the CDP. In the build-up to COP 21, the 2015 Paris Climate Conference, we

signed up to the CDP commitments for science-based targets and public disclosure of information associated with climate change performance. As climate-related science and public policy develops, we will continue to be flexible in adjusting our commitments and our approach appropriately. We have since committed to the RE100 campaign and set a target to achieve 100% renewable power use globally by 2025.

Our progress

What we set out to achieve

Our aim by 2015 was to:

- Reduce our operational greenhouse gas footprint by 20% against 2010 levels (excluding emissions from patients' use of inhaler therapy products)

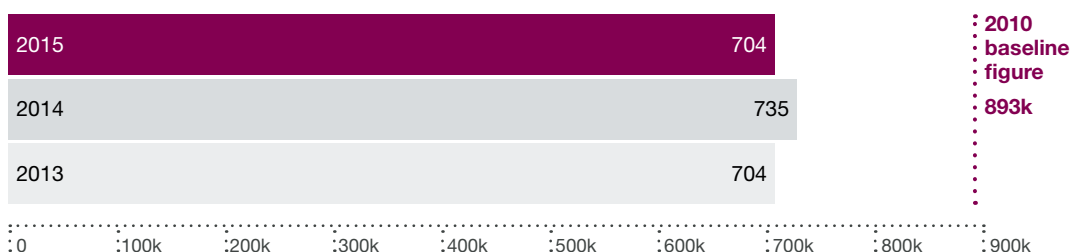
Our approach

- Energy efficiency improvements
- Pursuing lower-carbon alternatives to fossil fuels and procuring green energy
- Improving the fuel efficiency of our sales and marketing vehicle fleet
- Moving our global freight transport from air to sea
- Managing our business air travel
- Absorb some major acquisitions in 2014/15 into target without re-baselining

What we achieved

- 21.2% carbon reduction against the 2010 baseline
- Energy-related emissions down 28% from 2010 baseline
- Air-to-sea conversion of 54%, by tonne per km moved
- Road travel emissions down 16% from 2010 baseline, an efficiency improvement of 15% (grams CO₂ per kilometre)
- Business air travel emissions reduced by 12% since 2010
- 6.1% of total energy consumption from certified renewable sources in 2015, achieving our ambition to increase supply by 50% from the 2010 baseline
- CDP overall score of 97B

Operational greenhouse gas emissions (thousand tonnes CO₂ (tCO₂))



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Understanding our carbon impacts

Our main operational greenhouse gas (GHG) emissions arise from the energy we use, travel and transport, process emissions at our facilities and, indirectly, through the activities of our first tier suppliers. However, the greatest single source of GHG emissions that we currently monitor comes during patient use of our pMDI inhaler therapy products,

which rely on hydrofluoroalkane (HFA) propellants, see page 9.

New guidance released by the Greenhouse Gas Protocol requires dual reporting of emissions associated with electricity consumption. This has been calculated for 2015 consumption as follows:

Location-based emissions from electricity (tCO₂)⁵

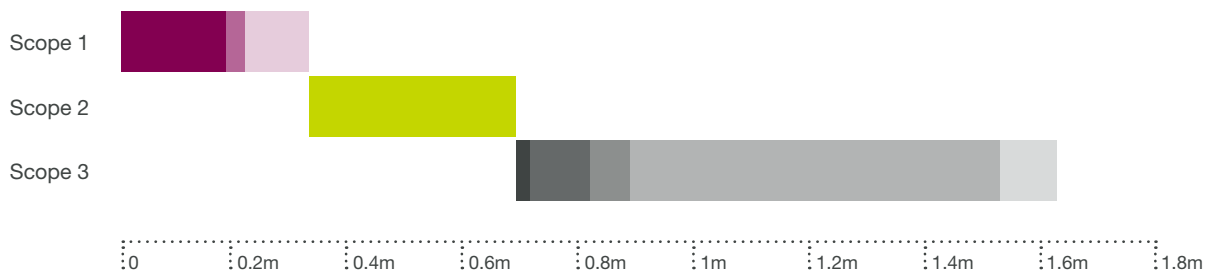
277,270

Market-based emissions from electricity, including market instruments (tCO₂)⁶

325,679

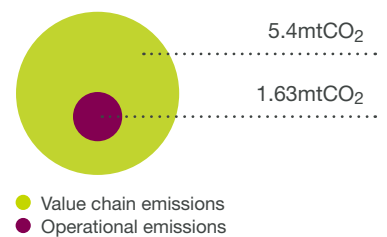
Breakdown of our carbon emissions:

greenhouse gas emissions by source 2015: 1,632ktCO₂e (scope: 2016–25 Strategy)



- Key
- Direct energy (on-site production)
 - Processes and engineering
 - Business road travel (AstraZeneca fleet)
 - Indirect energy (off-site production)
 - Waste incineration
 - Business air travel
 - Primary distribution (goods transport)
 - Use of inhalation medicine products (pMDIs)
 - First tier API, F&P supplier energy (90% spend, 2014)

Carbon emissions across our value chain



We recognise, through life-cycle investigations and quantification of our entire value chain GHG emissions, that our wider footprint is significantly greater than the boundary of our operational carbon target. While we seek to reduce emissions from sources for which we have a degree of control, we also continue to improve our understanding of our value chain and product life-cycle impacts. In 2015, we undertook further work to quantify AstraZeneca’s full value chain GHG impact, which, for 2014, amounted to 4.8 million tonnes CO₂e.

Carbon emissions from outsourced manufacturing

Carbon emissions from outsourced manufacturing of APIs, and formulation and packing activity amounted to 98,000 tonnes in 2014. We continue to work with our suppliers to encourage the setting of appropriate environmental improvement targets, particularly in the area of energy use. We have included this portion of our carbon footprint within the scope of the new commitments and strategy period of 2016–25.

5 Location-based factors sourced from US Environmental Protection Agency eGrid (sub-regions) for US sites and International Energy Agency (IEA) for all other sites.

6 Market-based factors sourced from multiple sources as follows: Sweden – billing data; rest of EU – REDISS II report 2015; US – billing data or where not available from 2015 Green-e Energy Residual Mix Emissions Rates; rest of world – location-based factors used.

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2014 CO₂ from outsourced manufacturing (thousand metric tonnes)

	2012	2013	2014
AstraZeneca sites	431	417	408
API category	70	57	31
F&P category	25	32	67

Note: Outsourced manufacturing data is collected after the year end, so data presented here is for 2014. 2015 data will be available towards the end of 2016.

Case study: From air to sea transport

The emissions produced by transporting our products around the world account for almost 5% of AstraZeneca's total operational greenhouse gas footprint (9% of the 2011–15 Strategy scope). This provides a clear opportunity to improve the carbon efficiency of our business.

In 2015, our Sweden operations completed an ambitious Air2Sea project that saw sea freight established to 13 countries. Switching to the transport of goods by sea achieves a massive 97% CO₂ saving compared with air transport. The project, which accounted for 80% of local exports, supported our overall goods transport emissions reduction of 7% in 2015 (-17% from our 2010 baseline) and delivered wider business benefits, including improved product security and temperature regulation, and cost savings of around \$9 million.

**Towards lower impact respiratory therapies**

The propellants released when our pressurised metered-dose inhalers (pMDIs) are used represent 40% of our operational carbon footprint. Typically used in the treatment of respiratory conditions such as asthma, pMDIs rely on hydrofluoroalkane (HFA) propellants to deliver the medicine to a patient's airways. While HFAs (often referred to as HFCs) have no ozone depletion potential and a third or less of the global warming potential of the chlorofluorocarbons (CFCs) they replace, they are still potent greenhouse gases and are a major contributor to our carbon footprint.

In 2015, our Life Cycle Analysis work investigated pMDIs and confirmed our expectation that the vast majority of life-cycle GHG emissions are associated with the HFC propellants discharged during use and released after disposal.

Finding suitable alternatives is challenging as any device must use a propellant that is safe, inert, non-toxic, non-flammable, tasteless and odourless. It must also possess the right aerosol characteristics to make it effective. In 2014, AstraZeneca acquired two companies, Almirall and Pearl, both of which have technologies that could potentially lower the impact of our own inhaler technologies. Research is ongoing to assess the feasibility of utilising these technologies with our existing therapies.

In 2016, we included emissions from patients' use of pMDI inhaler therapy products in our carbon commitments as we believe we should account for these emissions and find innovative ways to minimise and mitigate them (see page 8).

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Responsible use of water

By 2050, at least one in four people is likely to live in a country affected by chronic or recurring shortages of fresh water. We recognise the need to use water responsibly and we are working to minimise water use across our operations and ensure the water we do use is treated to the highest standards before it is returned to the natural environment.

While all our facilities use water, our sites with the largest water footprints are located in the UK, Sweden and the US. Some of our sites are situated in water-stressed areas, such as our site in San Diego, US, where the vast majority of our water use on site is either recycled or reclaimed. We are working to ensure all sites in water-stressed areas are taking extra steps to mitigate their water risk and will report on this in more detail in 2016.

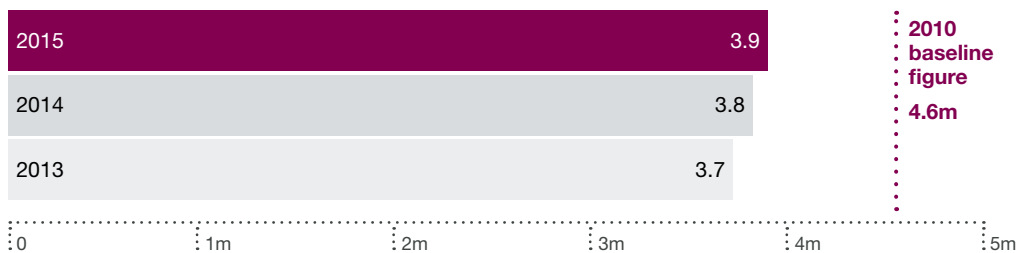
Our progress

Our company-wide target for 2015 was to reduce absolute water use by 25% compared with 2010 levels.

To achieve it, we initiated water conservation plans at our largest manufacturing, and research and development sites, with a particular focus on those using significant quantities of water or located in a water-stressed area.

In 2015, our water use was 3.9 million m³, a reduction of 14% from our 2010 baseline. This was a 4% increase on 2014, largely due to integration of newly acquired sites. When indexed to revenue, our water use was 159m³/\$million, up 16% since 2010 due to falling revenues over the target period.

Water used (million m³)



Note: Significant site purchases in 2014 and 2015 have been absorbed into the annual data without historical rebasing of data.

2014 water use from outsourced manufacturing

The water used in our outsourced manufacturing is much less than that used in our own activities; some 55% of water used on AstraZeneca's own sites. In 2014, we saw an increase in our outsourced water

footprint due to AstraZeneca's diabetes portfolio acquisition from Bristol-Myers Squibb and the increase in manufacture of one of our key growth platforms, Brilinta.

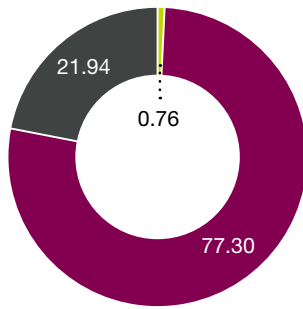
Water used (million m³)

	2012	2013	2014
AstraZeneca sites	3.6	3.7	3.8
API category	0.2	0.6	1.2
F&P category	0.4	0.6	0.9

Note: Outsourced manufacturing data is collected after the year end, so data presented here is for 2014. 2015 data will be available towards the end of 2016.

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Wastewater treatment/discharge (%)



Key

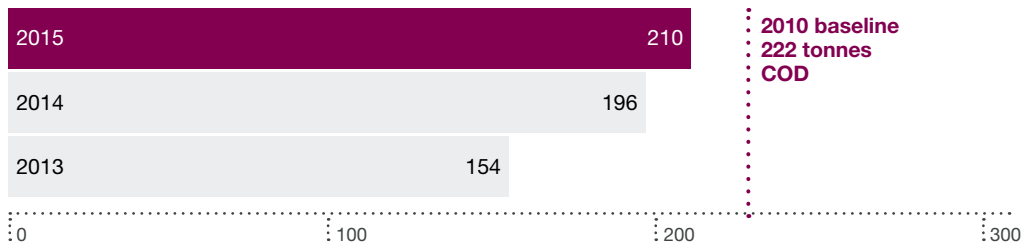
- Direct to surface water
- Off-site wastewater treatment
- On-site wastewater treatment

Chemical oxygen demand of discharged water

We track and report our total effluent emissions using the standard chemical oxygen demand (COD) parameter. This figure represents the COD of wastewater as it leaves our sites. A number of our sites have their own on-site wastewater treatment

facilities, while the majority work with downstream municipal wastewater treatment plants, both of which are designed to remove most of the COD before the wastewater is discharged to the environment.

(tonnes COD)



Safe discharges of active pharmaceutical ingredients (APIs)

Since 2006, it has been a regulatory requirement to complete a comprehensive environmental risk assessment (ERA) prior to the launch of any new drug. As well as implementing this requirement, we have introduced Environmental Reference Concentrations (ERCs) and Maximum Tolerable Concentrations (MTCs), which must not be exceeded for our manufacturing discharges to the aquatic environment.

We have shared our ERC and MTC methodology with key relevant suppliers so they can risk assess and manage emissions associated with the APIs they manufacture or formulate on our behalf. In 2015, we completed 98 ERC assessments with our suppliers (2014: 72). We run annual training for suppliers to explain our approach and methodology.

We have now established ERCs and MTCs for 45 of our APIs (2014: 42) and we have a rolling programme to confirm compliance. In 2015, all our worldwide manufacturing sites met our ERC and MTC criteria for these products.



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Waste management is central to our SHE Strategy. We characterise waste as either hazardous⁷ (such as chemical waste) or non-hazardous waste. The majority of our hazardous waste consists of solvent and aqueous streams from our manufacturing activities. Non-hazardous waste includes general waste, such as paper and plastics from our facilities around the world.

Waste prevention is our primary goal. Where this is not practical, we concentrate on waste minimisation followed by appropriate treatment or disposal to maximise reuse and recycling, and reduce disposal to landfill.

We aim to reduce the amount of waste we produce during our production processes, as well as integrating waste-minimisation considerations into purchasing decisions and engaging our employees to reduce waste.

Our progress

What we set out to achieve

Our aim by 2015 was to:

- Reduce hazardous and non-hazardous waste by 15% from 2010 levels indexed against revenue and number of employees



Our approach

- Waste audits and employee engagement at sites worldwide
- Investing in the reuse and recycling of solvent wastes
- Promoting responsible end-of-use disposal of our medicines



What we achieved

- We achieved a 22% reduction in hazardous waste against the 2010 baseline
- When indexed against revenue, hazardous waste increased 5%, missing our 2015 target
- We reduced non-hazardous waste by 14% against the 2010 baseline
- Indexed against staff numbers, volumes of non-hazardous waste increased 11%
- In 2015, our total waste was 38,452 metric tonnes with a tonnes/\$m index of 1.56

Reducing hazardous waste through solvent recovery

Our Avlon site near Bristol in the UK is the manufacturing home of the active pharmaceutical ingredients (APIs) for two of our key medicines. In 2012, we embarked on a £4.7 million investment in a major new facility for the recovery of solvents used in the production process of one of these APIs. Solvents are a significant hazardous waste stream of the API manufacturing process.

Now, three years on, we are reaping the benefits. The recovery unit processed 480,000 litres of solvent waste in 2015 and generated savings of

£437,000. During 2015, it contributed a 3.4% reduction in our total hazardous waste generation, and, for the drug in question, a 4.5% reduction in production costs by avoiding 85% of previous virgin solvent use. The project has also significantly reduced road haulage for the transport of virgin and waste solvents, and generated significant CO₂ benefits. Savings are projected to increase to £695,000 in 2016, with payback of the original capital investment expected after seven years.

⁷ As defined by national legislation in each country.

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Sustainable packaging

Packaging plays a critical role in protecting our products as they transit through the supply chain – improving product security and avoiding unnecessary waste. We are constantly looking at ways to improve the sustainability of our packaging, reducing resource consumption and waste, and improving the efficiency of transporting our products.

We focus on:

- Minimising the amount of material used
- Using materials from recycled or renewable sources
- Using materials that can be recycled.

Our SHE Triggers model ensures we consider environmental considerations at the earliest possible stage of packaging and device development. We also continuously review our packaging requirements and identify improvements for existing products.

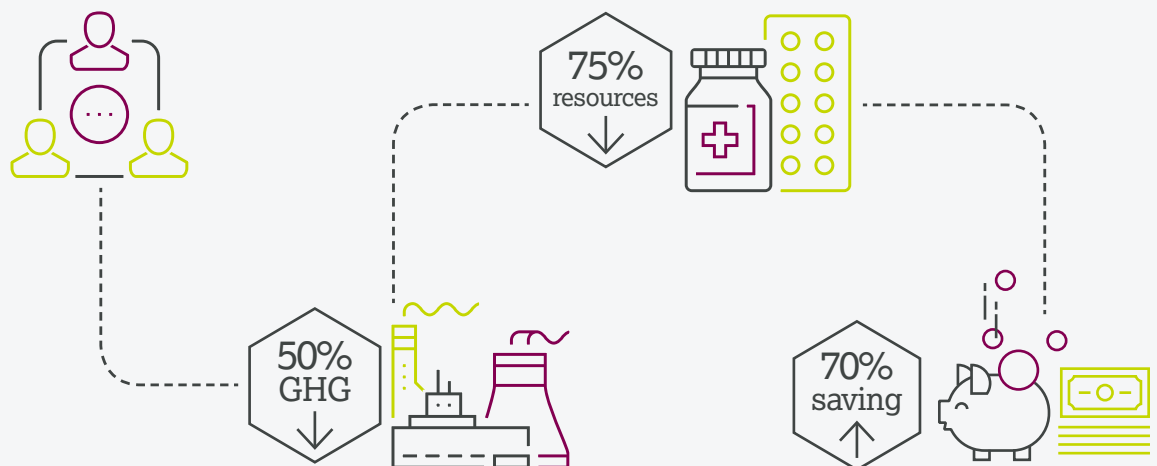
In 2015, we updated our global Packing Strategy to include new and improved standards. By the end of the year, 90% of sites were aligned to the new global Pack Standards. We also consolidated our packaging solutions across the business to reduce and simplify our standard packaging sizes.

Case study: Optimising blister packs in Japan

In 2010, our Japan operation responded to patient feedback and competition with generics by launching an investigation into the optimum size, barrier material and packing line processes for tablet blisters produced for the Japanese market.

As a result, this year sees the launch of new packaging that delivers significant environmental

benefits – including 50% reduced GHG emissions and 75% reduced resource use. As well as delivering packing line efficiencies. The new packaging also offers a 70% financial saving and is predicted to save \$21 million in packaging material costs in its first six years.



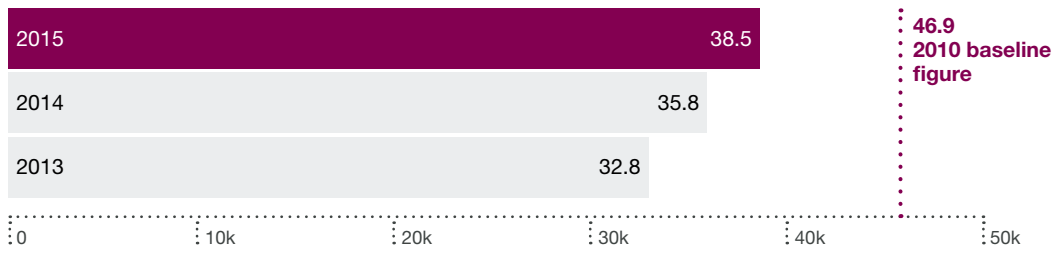
Responsible disposal of medicines

We work with authorities and industry partners to raise public awareness of the safe disposal of medicines. In 2015, we supported a new social media campaign, [medsdisposal](#), a joint initiative involving European healthcare, industry and student organisations designed to raise awareness of how to dispose of unused or expired medicines across European countries.

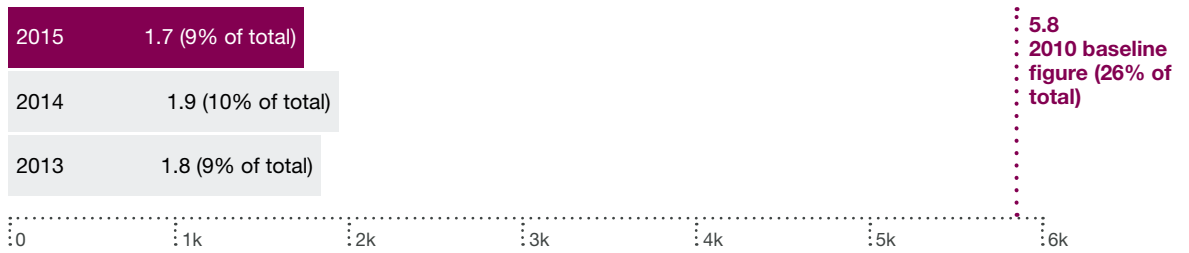


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Total waste (thousand tonnes)

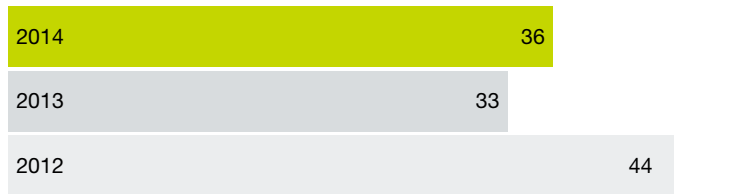


Non-hazardous waste sent to landfill (thousand tonnes)

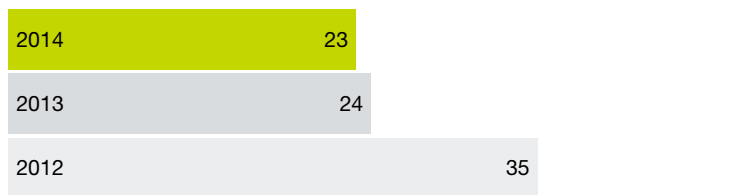


Waste from outsourced manufacturing (thousand tonnes)

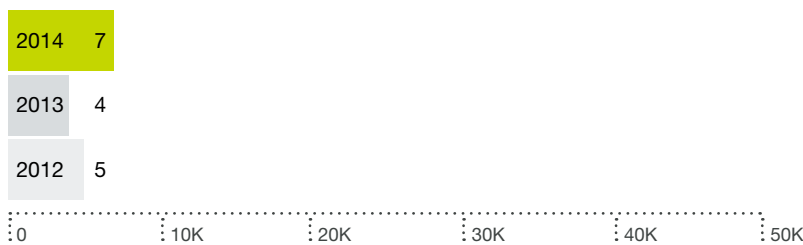
AstraZeneca sites



API (active pharmaceutical ingredients) category



F&P (formulation and packing) category



Note: Outsourced manufacturing data is collected after the year end, so data presented here is for 2014. 2015 data will be available towards the end of 2016.

Environmental sustainability

Our approach

Minimising impacts across the product life cycle

Reducing our carbon footprint

Reducing impacts on natural resources

A responsible approach to waste

Protecting biodiversity

Environmental product stewardship

Protecting biodiversity

We are committed to managing our impact on biodiversity – both on our own sites and when we use natural biological resources in our product development.

Protecting biodiversity on our sites

We actively support the principles of the Convention on Biological Diversity and we continue to apply best practice on our sites through the development and implementation of local biodiversity action plans.

These plans set out locally specific actions to conserve and enhance native habitats on our sites, create and maintain refuges for flora and fauna, and preserve links with the surrounding environment via green corridors of uninterrupted habitat.

We have now assessed our potential local biodiversity impacts at 38 of our major sites. As a result, 25 sites are implementing bespoke biodiversity action plans (BAPs), including all major fully operating sites of over five hectares.



Nagoya Protocol and use of resources in product research

We believe in fair and equitable sharing of the benefits arising from the use of biological resources and associated traditional knowledge. This benefit sharing helps ensure a more measured and transparent approach to the use of natural resources and protects the biological diversity that society and our business depends on.

Where we use natural biological resources (such as plant or fish extracts), we acknowledge our responsibilities under the Nagoya Protocol, an international treaty which aims to ensure fair reward is given to the country that originally supplied the biological material.

We are currently developing a governance structure, toolkit and standards to assist researchers across the company when using certain biological resources around the world. These processes are designed to ensure we carry out due diligence during the sourcing of all biological materials that fall under the scope of the Protocol, and that any required consents or agreements are in place to enable the fair sharing of access and benefits associated with their use.



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Improving the environmental performance of our product pipeline involves a delicate balance between meeting patient needs, while reducing environmental impacts and other sustainability considerations. Drug design is extremely complex and the needs of the patient will always come first. But we are committed to the proactive development of more environmentally friendly drugs – an area with significant opportunities to develop our understanding and reduce our environmental impact.

Sustainable chemistry

One of the areas we continue to invest considerable effort towards is sustainable chemistry. Our SHE Triggers model is designed to promote the sustainability of our design and manufacturing processes – including active pharmaceutical ingredients (APIs), products, devices and packaging. It flags potential safety, health and environmental issues at the earliest possible stage in development, allowing them to be investigated and, where possible, designed out of the process. The model incorporates an environmental risk assessment tool that enables our scientists to assess environmental risks and challenges in the products they are developing.

For over 10 years, our Green Chemistry Network has helped AstraZeneca's environmental specialists link up with pharmaceutical and medical chemists and chemical engineers to build shared understanding. Scientists in our Global Pharmaceutical Development function also have the opportunity to attend training courses on how they can minimise the environmental impact of manufacturing processes, including the application of green chemistry tools.

In 2015, we completed 14 environmental risk assessments covering hundreds of chemical transformations. The environmental risk assessment process highlights the use of Substances of Very High Concern and targets them for elimination or substitution aligned to green chemistry principles and as required by multiple legislations, including REACH.

Process Mass Intensity

We aim to achieve the highest levels of efficiency when it comes to developing manufacturing processes for new products – helping us to reduce the raw materials we use, the waste we generate and the financial costs incurred, as well as delivering other business benefits across the lifetime of a medicine.

Developed by the American Chemical Society Green Chemistry Institute Pharmaceutical Roundtable (ACS GCIPR) for the pharmaceutical industry, Process Mass Intensity (PMI) is a smart measure of the total quantity of raw material used in a product, against the quantity of product made. The aim is to strive for the lowest possible PMI in every development project in order to drive the right behaviours towards improved sustainability and efficiency.

In 2015, we achieved a 28% reduction on the PMI baseline from the start of the year, representing 35,964 tonnes of waste avoided at peak-year sales (2014: 22%).



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Case study: Reducing the environmental impact of Avibactam

Over the past four years, our scientists have worked with our partners at Forest Laboratories in the US (now a subsidiary of Allergan plc) to significantly improve the processes involved in the manufacturing of Avibactam, a new

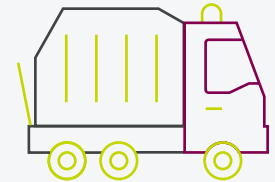
medicine used for treating complicated urinary tract and abdominal infections. Their work achieved considerable positive impact upon the environmental footprint of the drug, including:



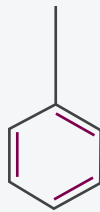
A reduced PMI from **6,480** to **526**



92% increase in materials efficiency



A predicted annual waste reduction of **89,310 tonnes**



Use of organic solvents reduced from **3,229kg** to **160kg** per kg of API



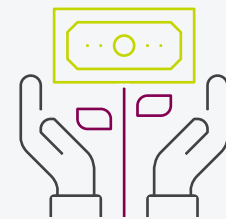
Avoidance of a number of hazardous chemicals



Water consumption reduced from **2,290kg** to **61kg** per kg of API



\$1.65 million in savings during development and \$8 million during the establishment and validation phase of the project



Estimated savings of **\$1 billion** over the product lifetime

Ensuring efficient product use

One of the most important things we can work on with our stakeholders is ensuring patients use our medicines effectively, efficiently, and avoid unnecessary waste. This is an increasing focus for our researchers

as we aim to develop a range of innovative solutions that will benefit both our environmental performance and the patients who use our medicines, as well as creating added value for health service providers.

Pharmaceuticals in the environment

Drugs taken by humans can eventually find their way into the environment – including rivers, lakes and even drinking water. The majority of pharmaceuticals get into the environment through patient excretion, but they can also enter the system during manufacture or through inappropriate disposal or discharge of wastewater effluent.

We aim to lead our industry in understanding and mitigating the effects of pharmaceuticals in the environment (PIE). We are investing significant financial resources and effort into understanding the fate and effects of our medicines in the environment so that we can identify risks and manage them effectively, while balancing these effects against the benefits our medicines bring for patients.

Our proactive environmental research programme involves collaboration with leading universities and academic scientists. At any one time, we co-sponsor over 20 PIE-related research projects that support around 14 PhD students and four post-doctoral scientists across a wide range of cutting-edge projects.

Together, we aim to:

- Identify the risks associated with the presence of PIE and potential mitigation
- Understand whether the therapeutic targets of our medicines are present in wildlife, and the potential impacts
- Reduce PIE-related uncertainties within our environmental risk assessments
- Address the global environmental risks posed by PIE, especially in emerging markets where there are different standards of water management and novel exposure scenarios
- Understand the relationship between the environmental dimension of antimicrobial resistance (AMR) and resistance in the clinic.

To maximise the benefits of our research, we publish around 10 peer-reviewed scientific manuscripts every year and provide numerous external scientific presentations.

For example, recognising the risks that AMR poses to society, and that the current environmental risk assessment frameworks do not consider AMR, we co-sponsored an expert workshop to address the environmental dimension of AMR. This workshop resulted in a series of strategic publications and recommendations that addressed issues including the environmental management of AMR and the development of appropriate environmental and human health protection goals. We are currently co-funding research aiming to develop and validate new regulatory protection goals for AMR development in the environment.

In 2015, we also hosted a PIE Symposium, which brought together external stakeholders and key opinion formers together with the students, post-doctoral scientists and academic supervisors involved in our environmental research programme. The Symposium was an opportunity to discuss key scientific concerns and uncertainties associated with PIE and identify research gaps and areas of consensus where further action is needed.



Intelligent Assessment of Pharmaceuticals in the Environment

At the start of 2015, we initiated a €10 million partnership with the European Commission under the Innovative Medicines Initiative (IMI). This project – called Intelligent Assessment of Pharmaceuticals in the Environment (iPiE) – aims to develop screening tools for identifying environmental risks both earlier on in drug development and for older medicines.

