GlaxoSmithKline

Environmental sustainability

Environmental sustainability

GSK is committed to integrating environmental sustainability into our business. We have a responsibility to contribute to meeting environmental challenges, but we also see this as an opportunity. There is a compelling business case for saving energy, water and materials, and it aligns with GSK's strategic priority of simplification.

In 2010 we developed a revised environmental sustainability strategy with ambitious goals, not just for our own operations but also for our value chain, from raw materials to product disposal. Our long-term goal is for our value chain to be carbon neutral by 2050. In the short and medium term, we have set demanding targets for reducing our carbon footprint, material use and other impacts, including a 20% reduction in water use across the value chain, and zero waste to landfill by 2020.

We have continued to make progress in all our previous target areas. We have reduced the amount of water we use by 16% since 2006, exceeding our 2% annual reduction target. We also exceeded the five-year targets for wastewater quality, waste, mass efficiency and emissions of volatile organic compounds. We met our 2010 targets for 5% reductions in energy and greenhouse gases. However, missed our cumulative energy and greenhouse gas emissions targets for 2006 to 2010, but the investments made in the early part of the five-year period are now starting to deliver benefits. The final small amounts of ozone-damaging CFCs in a few pieces of cooling and ancillary equipment will be removed in 2011 to meet our goal of 100% elimination. See the Performance pages of this report, the Targets and Progress summary and the summary data table.

Highlights in 2010

- We revised our environmental strategy to focus on carbon, water and environmental stewardship across the value chain, with ambitious new targets
- We developed a global carbon footprint the first time for GSK’s entire value chain
- We carried out life cycle assessments of several products, technologies and packaging options to identify more sustainable alternatives
- We developed a framework for procurement teams to integrate sustainability and began measuring suppliers’ performance
- We annnounced an important partnership with the Singapore Economic Development Board, committing S$50 million (£24 million) in funding to support research in **green and sustainable manufacturing**
- GSK became the first company to achieve global certification to the Carbon Trust Standard

Environmental sustainability strategy

We revised our environmental sustainability strategy in 2010, building on the strategy originally introduced in 2001 and setting ambitious goals for GSK's impact across the entire value chain. Our objective is to significantly benefit the environment, to engage employees in tackling key issues and to benefit GSK financially. We believe we can reduce our annual costs by & £100million by 2020 through reduced energy, materials and distribution costs.

Analysis of GSK's impacts, including the first carbon footprint of our value chain, shows that we need to concentrate on three main areas: carbon dioxide and other emissions that contribute to climate change; water use; and environmental stewardship, which covers the impacts of our products, the use of materials and the generation of waste.

We need to act beyond our own operations because 40% of our carbon footprint results from our supply chain and a further 40% derives from propellants when customers use our inhalers. We will have a much greater impact by working across the life cycle of our products rather than simply concentrating only on our direct impacts.

Our long-term vision is for our operations and products to be carbon neutral by 2050. This very ambitious target means that there will be no net greenhouse gas emissions from manufacturing, distributing, using and disposing of our products, including the sourcing of raw materials.

To support this vision we have set specific goals for key impacts over the next ten years, including a 25% cut in carbon dioxide (CO_2) emissions by 2020.

We do not have all the answers to how we will achieve these goals but some projects that will contribute to this are already underway, such as the Jurong 'factory of the future' in Singapore (see the feature box below) and the solar power installation in York, Pennsylvania.

Jurong – factory of the future

A comprehensive environmental sustainability strategy is turning our site at Jurong, Singapore, into a 'factory of the future'. The site's strategic objectives include achieving tangible benefits from investment in 'green chemistry'.

Jurong appointed a Director for Operational Excellence and Sustainability in 2009. He leads the site team, working closely with GSK's Sustainable Manufacturing Centre of Excellence. They are targeting step changes in environmental performance on energy, water, mass efficiency, chemical oxygen demand in wastewater and volatile organic compound releases to air.

The site has already identified major improvements in manufacturing lamivudine, the active ingredient in many HIV combination therapies. A new process will increase mass efficiency, reduce the water used in a solvent recovery operation from 60 to 15 litres per kg of lamivudine, and will cut the chemical oxygen demand in wastewater to less than a third of the previous level.

Enabling sustainability

The environmental sustainability strategy is led from the Corporate Executive Team (CET), and the Senior Vice President, Human Resources, has overall accountability. From 2011 this is through a new GSK Sustainability Steering Team of senior executives. Each member of the CET will identify a sustainability-related target or include a specific sustainability goal in their business plan.

Our Environmental Sustainability Centre of Excellence supports the businesses in driving improvement. It will work with each business, providing specialist expertise and support for individual programmes as well as identifying step changes that will achieve our sustainability goals. Central funds are available, in addition to normal spending, to increase capability in the businesses and share the financial risk in environmental sustainability investments.

Singapore partnership

We created the GSK-Singapore Partnership for Green and Sustainable Manufacture in 2010. This ten-year programme aims to foster innovation in ‘green chemistry’ and manufacturing. This partnership is part of the S$50 million fund that GSK has set up with the Singapore Economic Development Board for education and research in green manufacturing and chemistry and public health policy research. In 2010 we awarded the first eight grants to Singaporean researchers. Four grants were awarded in the area of chemical transformations, two in physical transformations and two in the area of biotransformations

Managing environmental sustainability

In 2010 we reviewed how we organise to achieve our broad environmental sustainability goals as well as continuing to improve direct impacts such as energy and water use.

Our Environmental Sustainability Centre of Excellence (CoE) is responsible for developing strategy, setting standards and providing expert support to the businesses. It will work with executives with responsibility for sustainability in each business, providing expertise and programme and data management and helping to identify step changes towards sustainability.

Each business, as well as R&D and functional areas such as Procurement and Packaging, is responding appropriately to make its own contribution to GSK's goals and sustainability priorities. For example:

- Pharmaceutical manufacturing has set up a Sustainable Manufacturing Centre of Excellence which is providing support and direction to improve sites' processes and reduce waste
- The vaccines business has created a Sustainability Council of senior managers with climate change as its top environmental priority
- R&D has a Platform Technology and Science (PTS) group which has developed a sustainability strategy for R&D
- Consumer Healthcare has developed a 'Bright Green' strategy covering six key environmental sustainability areas
- US Pharmaceuticals is piloting a recycling scheme for our respiratory product inhalers and a similar pilot is starting in the UK in 2011.

Governance

Overall responsibility for sustainability and environment rests with the Corporate Executive Team (CET) which from 2011 will formally review sustainability performance each year.

A new Sustainability Steering Team of senior executives will oversee GSK's sustainability plans and programmes from 2011. It will meet quarterly to review progress against targets, identify emergent issues and opportunities, prioritise allocation of funding and revise detailed objectives.

Board subcommittees have oversight respectively of risk and compliance, audit, and corporate responsibility and regularly review performance.

Policy

Environmental sustainability is a key part of our environment, health, safety and sustainability (EHSS) policy, which defines our aspiration to global leadership and excellence. The current policy was approved by the CET in 2008. It covers EHSS fundamentals such as the approach to risk management, our ambition for sustainability and our commitment to transparency.

GSK's EHSS Policy

Our EHSS policy defines our aspiration to global leadership and excellence. It outlines the broad scope of our plans and how they will be achieved. This revised policy was approved by the CET in 2008:

We will be leaders in EHSS performance, protecting the environment and the communities in which we work and enabling healthy motivated employees to be fully engaged with our success. We will maintain a culture of continuous improvement.

EHS fundamentals, risk and impacts

We will embed EHS fundamentals into the fabric of the business by implementing management systems, EHS governance and risk management practices to address risks and impacts from our facilities, processes, contract research and manufacturing organisations, and suppliers.

Sustainability

We will integrate sustainability principles into all aspects of our healthcare business by working with our stakeholders, operating within environmentally sustainable limits, lowering our ecological footprint, enhancing social equity and addressing future issues.

Open EHSS communication

We will be open and transparent with all stakeholders about our efforts to address our EHSS responsibilities and our EHSS performance.

The Corporate Executive Team (CET) will ensure risks are tracked until mitigated and that communication of the more significant risks is escalated within the business management structure, as commensurate with the risks and impacts involved. The CET will ensure effective management and involvement of staff with clearly assigned accountability and responsibility.

Management systems

GSK has a comprehensive set of internal standards on environment and sustainability issues which are accessible to all operations via the intranet.

We use a management system aligned with recognised international standards such as ISO 14001. It is based on a structured framework building on the vision and policies and supported by standards, guidance materials, tools, training, recognition and audits that help the businesses to manage these issues.

Targets have been set for five-year periods, originally to 2005 and then 2010. We are currently developing detailed targets to support the revised environmental sustainability strategy.

We use internal audit teams to assess systems for managing risks and impacts, compliance with legislation and performance against our standards. Audits also assess whether appropriate management systems are in use.

Integration in business processes

Our scientists use the Environment, Health and Safety Milestone Aligned Process (EHS MAP) to integrate sustainability in everyday activity. It helps to identify and address issues during new product development and supply activities. The EHS MAP helps scientists understand the principles and impacts and how to manage them and can identify opportunities to improve EHS impacts.

Procurement and acquisitions

GSK procurement activities support our sustainability and environmental goals by choosing energy-efficient equipment and renewable and recycled materials, and working with suppliers to manage sustainability and environmental risks in our supply chain.

Our due diligence process for acquiring and divesting businesses ensures that sustainability and environmental issues are considered in contract negotiations and that adequate management systems are in place. We work with acquired companies to align their sustainability and environmental, health and safety practices with GSK's.

Emergency response and crisis management

The discovery, development and manufacture of pharmaceutical and consumer products involve the use of hazardous materials and processes. All sites incorporate emergency response and crisis management programmes in their management plans. These programmes ensure that accidents are effectively managed when they occur and that any impact on our business, the local community and the environment is minimised. Each site conducts an annual review of its internal emergency response programmes and technical capabilities and develops plans to address any areas needing improvement. Find out more on Health and Safety.

Compliance

We remain vigilant to stay in full compliance with all environmental laws and regulations but incurred three environmental fines in 2010.

The largest of these was $16,708 for exceeding acidity limits and failure to notify the local authority in Upper Merion, US, of a sludge discharge associated with new production activities. The other fines were for $500 and $250 for sites in the US.

Plans and targets

Approach

During 2010 we completed the first five years of our EHS Plan for Excellence, including the five-year targets set in 2006 (see the Performance page).

Our revised strategy, developed during 2010, has an increased focus on sustainability which translates into ambitious goals for the priority areas: carbon footprint, water and environmental stewardship. It also requires measurement of our overall value chain, especially for carbon footprint.

Targets

In 2011 we will meet our obligations as a downstream user of chemicals registered by suppliers in 2010. This will include reviewing extended safety data sheets and implementing any necessary changes in our risk management measures. Read our public position paper on REACH regulation.

Sustainability targets to 2015 and 2020

	Target	2015	2020
Carbon	Reduction in GSK's overall carbon footprint across the value chain	10%	25%
Water	Reduction in GSK's operational water consumption	20%	–
	Reduction in water consumption across the value chain	–	20%
Environmental stewardship	Mass efficiency of new pharmaceutical processes	2.5%	5%
	Reduction in waste to landfill from our operations	25%	100%
	Reduction in waste generated from our operations (hazardous and non-hazardous)	25%	50%
	Paper packaging from sustainable sources	50%	90%

Note: reduction targets are for absolute % change compared to 2010, with the exception of mass efficiency and packaging.

Performance

The Plan for Excellence included Group-wide targets to improve environmental performance, as shown in the table.

We exceeded the five-year targets for water, wastewater quality, waste, mass efficiency and emissions of volatile organic compounds. We met our annual 2010 targets for a 5% reduction in energy consumption and greenhouse gas emissions but missed our cumulative targets for 2006 to 2010. The final small amounts of ozone-damaging CFCs in a few pieces of cooling and ancillary equipment will be removed in 2011 to meet our goal of 100% elimination.

Targets and progress 2010

	Group target	Progress in 2010
Energy for operations and transport	20% reduction per unit of sales from 2006 baseline by 2010	Reduced 5.5 % per £ sales. Cumulative 9.1 % since 2006
Climate change impact from energy for operations and transport	20% reduction per unit of sales from 2006 baseline by 2010	Reduced 5.8 % per £ sales. Cumulative 10.7 % since 2006
Mass efficiency of new processes	2% average for transferred products for the period 2006-2010 3% for new products in manufacturing launched between 2007 and 2012	Average mass efficiency of 3.3% achieved by 2010 for transferred products
Water	2% annual reduction from 2006 baseline per unit of sales	Reduced 1.6 % per £ sales. Cumulative 15.7 % since 2006
Wastewater (chemical oxygen demand)	3% annual reduction from 2006 baseline per unit of sales	Reduced 6.9 % per £ sales Cumulative 24.8 % since 2006
Solid waste disposed (non hazardous)	1% annual reduction from 2006 baseline per unit of sales	Reduced 5.9 % per £ sales Cumulative 22.4 % since 2006
Ozone depletion	100% elimination of CFCs from processes and equipment by 2010	Eliminated 99.4%[1]
Air emissions (volatile organic emissions)	2% annual reduction from 2006 baseline per unit of sales	Reduced 12.8 % per £ sales Cumulative 35.8% since 2006
EHS audit scores	Average: 82% by 2010. Minimum: 70% by 2010	Average 81% achieved in 2009 No longer a requirement in 2010[2]

Table Notes: All figures per unit sales are calculated at constant exchange rates (CER).

1. A few pieces of equipment containing CFC remain in operation but will be replaced during 2011
2. In 2010 we introduced a new Corporate Audit process across GSK including for risks and impacts related to EHSS (see Data, audits and assurance for more information). The new audit process included an approach for providing an overall audit opinion (star rating) based on the adequacy of risk control and related management systems, replacing the previous audit scoring approach.

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Stakeholder engagement

We have an Environment, Health and Safety Stakeholder Panel in the UK which has provided independent feedback on company-wide plans and performance since 2005.

The panel is drawn from customers, suppliers, regulators, public interest groups, environmental organisations and investors. Two senior EHSS representatives from GSK regularly participate and other GSK managers attend discussions on specific topics. The panel is facilitated by the Environment Council, an independent charity.

We use feedback from the stakeholder panel to inform our environmental sustainability and health and safety programmes. In 2010 the panel reviewed and commented on progress on climate change, water, sustainable procurement and life cycle analysis.

Engagement also takes place nationally and includes the partnership created in 2010 with the Singapore Economic Development Board. We also participate in issue-specific engagement, through the CEO Water Mandate and other initiatives. Many sites engage with stakeholders locally through activities such as open days, newsletters and community projects.

Awareness and recognition

It is essential for our environmental sustainability goals to engage employees at all levels of the organisation. The new strategy provides a framework through which each individual can clearly see how they can act and make a contribution.

We provide training and orientation to our business leaders so they understand the issues and how best to respond. Specific sustainability and environmental training is managed by individual sites and is relevant to job roles. Sustainability and environment professionals receive induction training and undertake regular updates to ensure they are aware of the latest technical information in their fields, but we need to continue to upgrade the level of competence of our site environmental staff.

The CEO's Sustainability Award programme (see below) recognises employees who have furthered GSK's environmental sustainability agenda.

Awareness

We raise employee awareness of environmental sustainability through the intranet, regular internal publications and events. We publish articles on sustainability and environment in Spirit, our internal magazine, and brief news stories on internal web pages. A number of site bulletins and functional newsletters also carry articles on sustainability. However, this has been passive communication and we need to develop more interactive communications to engage employees.

In 2009 we launched a climate change microsite called Climate Change, GSK and You. The site explains the importance of climate change, why everyone needs to act, what GSK is doing and what individuals can do. It includes items that report action to cut carbon dioxide emissions across the business, and celebrates successes.

Several other areas of the GSK intranet support sustainability and environment, including the Sustainability and Environment Community site. It shares news on sustainability and environmental programmes within the Group, holds supporting materials for the EHSS Framework, such as the policy, standards and guidelines, and for training materials and other documents. We also use it to collect data for measuring performance and reporting results.

Many of our sites celebrate Earthweek to raise awareness of environmental issues and to encourage integrating environmental concerns into the GSK culture and personal lifestyles.

Sustainability awards

The CEO's Sustainability Awards programme recognises GSK teams for innovation that creates benefits for society, the environment and our business – creativity that achieves a genuine step change towards sustainability. We publicise the innovative practices that win awards on a dedicated intranet site.

Any team in GSK may be considered for this award, except from the Sustainability and Environment Centre of Excellence which administers the scheme. An internal review committee agrees a shortlist and winners are chosen by a panel that includes experts from academia, government and public interest groups. Each winner receives a trophy and selects a charity to receive a donation from GSK.

In 2010 there were 69 entries from 19 countries and nine projects were honoured. The winners in the three categories

were:

Sustainable Science & Technology – R&D Chemical Development at Stevenage in the UK for a project improving the sustainability of darapladib manufacturing.

Developing a new process route for manufacturing this heart disease treatment, currently in development, has achieved a mass efficiency of 6.1% compared to the original 1.7%, saving emissions of about 80,000 tonnes of CO_2 equivalent a year, as well as reducing costs and eliminating hazardous zinc waste streams.

Environmental Sustainability – Global Manufacturing and Supply Production Procurement, for embedding sustainability in production procurement ways of working.

The Procurement team developed tools to help staff select suppliers whose production processes are more sustainable. The tool identifies suppliers that are using sustainable materials, are efficient at manufacturing our products, have sustainability at the heart of their organisation and understand the impact of their carbon footprint in relation to the products or processes they use. A training programme has raised awareness and understanding of the issues, stimulating changes to culture, behaviours and perspectives.

Workforce Sustainability – Global Manufacturing and Supply in Gurgaon, India for its project Nurturing Life, which achieved substantial improvements in sickness and safety at our *Horlicks* plants. See more in the feature box in the Health, Safety and Wellbeing section.

Life cycle assessment and supply chain

GSK is committed to introducing sustainability concepts across the full product life cycle from the supply chain to the disposal of the product. We have begun to develop a sustainable supply chain strategy aligning with our new environmental sustainability strategy.

Life cycle assessment

GSK is committed to assessing and minimising the cumulative environmental impact or 'footprint' of our activities across the entire life cycle of the product, including the supply chain, use and disposal. In 2010 we carried out life cycle assessments (LCAs) of several key products and a carbon footprint of the entire value chain (see climate and energy) for the first time.

LCA evaluates environmental impacts including climate change, ozone depletion and water pollution, through raw material extraction, manufacturing, transport, product use, and disposal or recycling.

In 2010 we performed several LCAs, including assessing the footprint of products comparing packaging options and technology alternatives. The findings from the studies were integrated into product, device and packaging development to reduce their environmental impacts.

In 2010 we developed packaging and device life cycle tools and simplified our webtool known as Fast Life Cycle Assessment for Synthetic Chemistry (FLASC), to be used by chemists and engineers in GSK.

Supply chain

In 2010 we developed a framework for procurement teams to integrate sustainability in line with our objectives for carbon, water and material sourcing. We developed an educational programme for procurement staff and provided new tools, systems and processes. This programme won the CEO's Sustainability Award for Environmental Sustainability in 2010.

We have begun to measure some of our suppliers' performance to identify areas for improvement. Collecting data on the different materials we buy has been challenging, especially for materials that we do not buy directly and for which there are numerous supplier tiers.

All existing and new suppliers will be required to complete a Request for Information that will provide a greater understanding and awareness of the environmental and social impacts of our supply chain, helping to identify potential risks and opportunities for improvement.

In 2010 we surveyed 200 of our larger suppliers, asking about their resource use and material sourcing policies. We have used this information to help us better understand the life cycle impacts associated with several GSK products. In 2011 we aim to establish a set of sustainable sourcing targets and to share sustainable sourcing best practice with suppliers.

We are also examining the environmental footprint of contract manufacturers, initially targeting the manufacture of four outsourced active pharmaceutical ingredients and intermediates. We evaluated their resource consumption and waste generation, which has enabled us to make high-level estimates of the environmental profile of other suppliers where data are not available directly. The estimates will be refined as more information becomes available from the suppliers.

Climate change and energy

The pharmaceutical industry creates greenhouse gas emissions and must therefore contribute to the increasingly urgent global efforts to counter climate change. GSK supports efforts to agree an international treaty with legally binding targets because this will provide the clarity businesses need.

However, regardless of the outcome of global negotiations we are committed to reducing our own impact and have set challenging energy and carbon reduction targets which will also support our business by cutting energy costs. In 2011 GSK signed up to the UN Caring for Climate initiative, reflecting our commitment to take action on climate change.

The long-term goal included in our new environmental sustainability strategy is for our entire value chain to be carbon neutral by 2050 and the first step will be a 10% reduction in the carbon footprint by 2015.

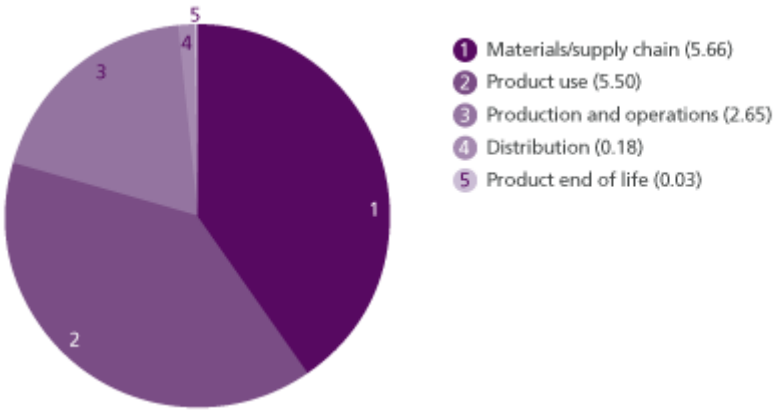
Value chain carbon footprint

We undertook a high-level, company-wide exercise to identify the main contributors to our carbon footprint by each stage in the value chain using data for 2009. The study estimated our total footprint at about 14 million tonnes of CO_2[1]. The main contributors are the materials we use in our processes and products and propellant releases during inhaler use.

This analysis, together with life cycle assessments of individual products, emphasises that we need to work with suppliers and others beyond our own sites.

1. Throughout this report 'carbon dioxide' and 'CO_2' refer to all greenhouse gases as CO_2 equivalents unless otherwise specified

GSK's carbon footprint in 2009 (million tonnes CO_2e per annum)



We have used the results of this high-level carbon footprint as input to our sustainability strategy to establish priorities and programmes.

In 2011 we plan to refine the carbon footprint of the vaccine business as better estimates of the footprint of the materials used in vaccines production become available. We are also piloting a carbon footprint of selected R&D and manufacturing sites to identify the major opportunities to reduce our operational impacts.

Our climate change programme

As well as programmes to reduce the climate change impacts from our propellants and our supply chain, we continue to drive substantial energy and emissions reductions in our own operations.

We expect to achieve substantial energy and emissions reductions by:

- Making our buildings and equipment more energy efficient
- Installing on-site renewable technologies, using biomass, wind turbines and photovoltaic panels (see the feature box below)
- Buying electricity produced from renewable sources
- Reducing the climate impact of travel and transport by switching from air to sea freight and from road to rail
- Encouraging the use of collaborative information technologies to reduce the need for business travel

We have created a central fund to help finance carbon reduction and energy-saving projects. This shares the financial risk with the businesses so we can unlock the greatest potential in energy and carbon-saving opportunities. For example, one of the first renewable energy projects supported by this fund was a rooftop solar array at our IT global data centre in the US. Read more below.

Since we introduced central financial support in 2007, projects supported by the fund have helped to avoid 148,000 tonnes of greenhouse gas emissions.

Biggest solar roof array in the US at York facility

GSK Consumer Healthcare has installed North America's largest rooftop solar array at its regional distribution centre in York, Pennsylvania. Nearly 11,000 solar panels will generate approximately 3.4 million kWh of energy a year, enough to completely meet the building's energy needs. This will make it the first GSK facility in the world to be powered entirely by solar energy and will save 1,800 tonnes of CO_2 a year.

A number of other renewable energy projects are being investigated by GSK which collectively could save a further 1,400 tonnes CO_2 a year if they are completed.

Progress

GSK achieved Carbon Trust Standard Global certification in 2010, the first company to achieve this recognition of global excellence in carbon management.

We met our 2010 targets for a 5% reduction in energy consumption and greenhouse gas emissions. We are still behind our cumulative targets for 2006 to 2010 but the investments made in the early part of the five-year period are now starting to deliver benefits. Energy consumption and greenhouse gas emissions from operations and transport have fallen by 9.1% and 10.7% respectively since 2006 (relative to sales at constant exchange rates), but this is short of the 20% target.

See the Performance page for more information.

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Propellants

Propellants used in inhalers for asthma and chronic obstructive pulmonary disease represent approximately 40% of our total carbon footprint. Traditionally these products contained either hydrofluoroalkanes (HFAs) or chlorofluorocarbons (CFCs) which are potent greenhouse gases. CFCs also damage the ozone layer.

We have met our goal of eliminating the use of CFCs in our products by the end of 2010, replacing them with HFAs. This has reduced emissions associated with our inhaler products from 24 million tonnes CO2e in 1998 to approximately 4.7 million tonnes in 2010.

We increasingly supply dry powder inhalers which do not use a propellant, however some patients find them difficult to use

Research programmes to find effective ways to further reduce the impacts from these products include:

- Using different valves on metered dose inhalers that require less propellant and therefore release less gas
- Developing all new drug molecules only in dry powder formulations which do not require propellants
- Searching for alternative propellants with a lower global warming potential than HFAs
- Investing in programmes to recycle devices when the patient has finished taking their medication, including recovering residual propellant. Take-back schemes began in the US in 2010 and a pilot scheme will start in the UK in 2011.

Facilities

We aim to cut energy and emissions in our facilities by becoming more energy-efficient and using more renewable energy.

A central fund has been available since 2007 to help finance energy-saving investments. More than 1,400 projects have been selected. In 2010 we completed almost 200 projects with potential savings of more than 350,000 GJ and more than 52,000 tonnes of CO2 emissions. This continues the acceleration of investments since 2008, reflected in improved progress towards energy reduction targets.

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Energy use in manufacturing and supply

Our pharmaceutical and consumer product manufacturing function, Global Manufacturing and Supply (GMS), is the largest emitter of greenhouse gases in the Group and has been targeting a 35% reduction in energy use from 2006 to 2015. GMS has already achieved a 20% reduction.

Some of the most significant improvements come from heating, ventilation and air conditioning. GMS has used 'Kaizen' site-wide continuous improvement campaigns – an approach that originated in Japan – to identify energy efficiency measures. In 2010 GMS completed 17 Kaizen projects, identifying potential energy savings averaging 20%.

Combined heat and power systems, which generate electricity and steam more efficiently than grid supplies of electricity and gas, have been installed at five sites over the past 18 months.

Memphis cuts energy use by 30% in a year

Our Memphis Consumer Healthcare site in the US cut energy use by 30% in 2010, saving more than 4,000 tonnes of CO2 and $500,000 a year. Several projects contributed to this achievement, including improvements to heating, ventilation and air conditioning in the warehouse and lighting throughout the site, and using exhaust heat from air compressors as preheated combustion air for the boiler.

More savings are in the pipeline. Work started towards the end of 2010 on improved air dehumidification for the *Polident* denture cleaner manufacturing process by installing variable speed drives on the site's air conditioning system. Further lighting improvements, including LED lights, will also save energy in 2011 and solar power will be installed during this year.

Appointing a dedicated site energy manager was instrumental in achieving these improvements, supported by energy champions for each product stream. Monthly energy team meetings and frequent communications on progress maintained the drive to cut energy.

Renewable energy is a growing part of the GSK energy and climate programme and includes biomass as well as wind and solar. Even without improved energy efficiency, renewables reduce emissions by replacing fossil fuel sources with

wind or solar power. During 2010 we generated 1,742 GJ from renewables at sites in Belgium, Germany, India, Singapore, South Africa, the UK and the US. Sites in several countries also installed solar water heating systems.

Solar panels cut emissions from GSK's global data centre

GSK's data centre in Upper Providence, Pennsylvania, will contribute 222 tonnes of CO_2 savings a year, following the installation of solar panels on the roof.

The investment, supported by funding from GSK's Climate Change and Energy Reduction programme and by state and federal grants and tax incentives, generates 492,000 kWh a year. Replacing power from the grid with this solar energy saves the site $60,000 a year.

The Director of Data Center Operations and Facilities says that making the Upper Providence site as green as possible has been one of the guiding design principles from the beginning, adding: "A large global data centre requires a great deal of energy to power and cool the thousands of computers it contains. The photovoltaic installation is an example of our commitment to designing sustainable operations."

Emissions trading

In 2010 13 GSK sites participated in the European Union Emissions Trading Scheme (EU ETS). Collectively, these sites emitted below their specified CO_2 allowances, generating a surplus of carbon credits. Proceeds from the sale of carbon credits are invested in energy-saving projects.

Several UK sites participate in the UK government's voluntary Climate Change Agreement programme which provides discounts on the climate change levy if the sites meet agreed energy-efficiency targets. In 2010 all participating GSK sites complied with their Climate Change Agreements.

GSK will participate in the UK's Carbon Reduction Commitment (CRC) scheme because GSK House in London qualifies for the scheme. This means that all GSK sites in the UK will be affected by the CRC unless they are already regulated under the EU ETS or have Climate Change Agreements in place. In preparation for the CRC, GSK has obtained certification to the Carbon Trust Standard, not just for the UK sites but globally, and has installed continuous energy monitoring equipment at all the sites affected.

Transport and travel

We estimate that transport of our products, the sales fleet and employees' business air travel accounted for approximately 22% of the direct greenhouse gas emissions from our operations and transport in 2010. They come more or less equally from transporting products from manufacturing plants to distributors, from business air travel and the sales fleet.

Product transport

In 2010 our logistics group set a target of 9,000 tonnes of CO_2 to be saved from the distribution of products worldwide. We achieved this by:

- Switching transport mode from air to sea where practical (see below)
- Optimising our European road freight network by improving vehicle load configuration to maximise use of the available capacity, resulting in fewer vehicles on the road
- Warehousing improvements
  - Reducing the number of external warehouses, and therefore cutting travel between our sites and the warehouses
  - Installing intelligent lighting controls and energy efficient lighting
  - Consolidation of refrigerated storage units, thereby reducing the amount of electricity used for refrigeration
  - Using energy efficient forklift truck charging units.

We have to use air freight for some of our products because they have a short shelf life, but we are switching others from air to sea freight.

Since 2007 our Air-to-Ocean programme in pharmaceutical and consumer healthcare manufacturing has switched over 140 routes to ocean freight, saving more than 38,000 tonnes of CO2 emissions. In 2010 we achieved over 9,000 tonnes of savings by changing the transport mode.

We initiated 16 air-to-sea mode changes in 2010. The most significant savings are on the routes from Evreux in France to Japan (almost 1,800 tonnes of CO2 per annum) and from Zebulon, North Carolina to Australia (almost 2,200 tonnes of CO2 per annum).

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2011 plans

In 2011 our logistics group has a target to save 7,000 tonnes of CO_2.

A further ten transport switches from air to sea will contribute some of these savings and we will continue to improve the European road distribution network. We will also investigate opportunities to use the European rail network and will benefit from improved pallet loading thanks to product simplification and packaging improvements.

Two major projects looking at efficient distribution will further reduce transport emissions, including a multi market warehouse in our Asia Pacific region which will allow transport mode changes for the majority of the distribution chain

to the markets it will serve.

Travel

We have ‘green travel plans’ at a number of sites to encourage employees to reduce the environmental impact of their travel to work.

We have made a significant investment in videoconferencing systems, with over 500 videoconference rooms in 68 countries. Other technology includes teleconferencing, desktop and personal videoconference units and web conferencing. Staff can select the most appropriate system for their needs, depending on the number of participants and objectives of the meeting.

In 2010, driven by our desire to reduce unnecessary employee travel costs and environmental impacts, there was a 40% increase in the use of videoconferencing compared to 2009. The distance flown fell by more than 200 million km and we used nearly 85,000 fewer single flights compared to 2009. This reduced CO2 emissions by more than 30,000 tonnes, a 25% reduction.

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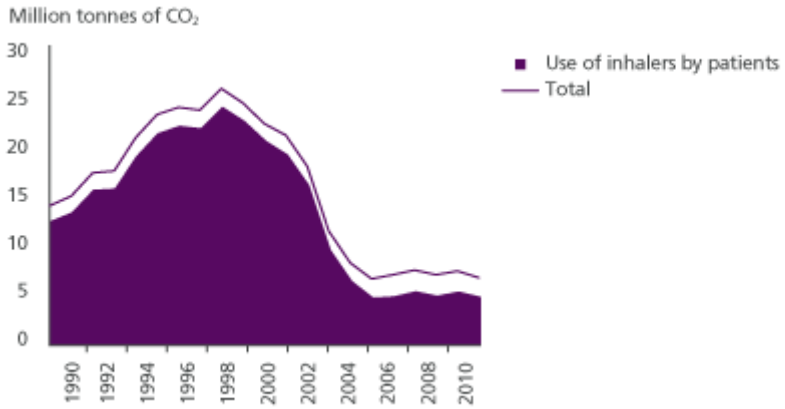
Climate change and energy performance

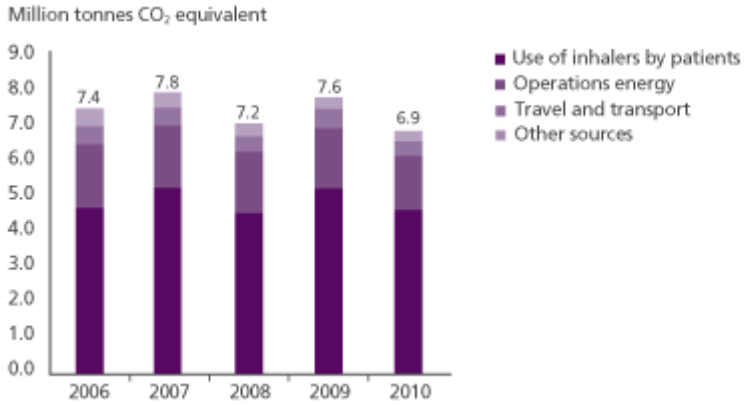
Total energy and emissions

Global warming potential from energy, transport and inhaler use



Note: Before 2006, emissions from patient use of inhalers are calculated retrospectively from sales data

Climate change impact from operations, transport and inhaler use



The long-term trend shows a sharp fall in emissions since 1998 when we began replacing CFC gases in metered dose inhalers. Our climate impact levelled out in 2005 but has begun to fall again as energy-saving investments showed positive results.

In 2010 our climate change impact, including operational energy, travel, transport and other direct sources, plus use of inhalers by patients, was 6.9 million tonnes of CO_2, 9.2% lower than in 2009. This includes 4.6 million tonnes from patient use of inhalers, down by 10.1% from 2009.

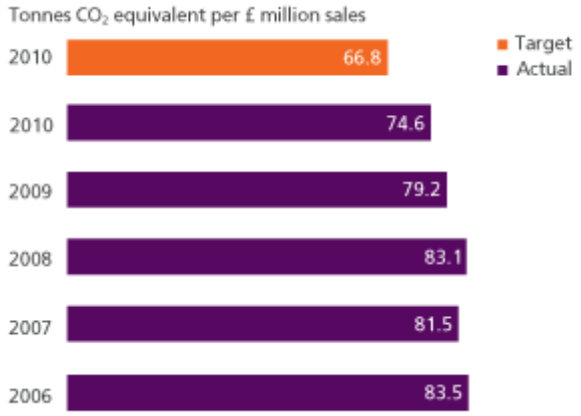
Excluding the manufacture and use of inhalers, our climate change impact from operations energy and transport (the scope of our target) fell from 2.2 million tonnes of CO2 in 2009 to 2.0 million tonnes in 2010.

The energy use from operations and transport decreased 6.6% from 26.0 million GJ in 2009 to 24.3 million GJ in 2010.

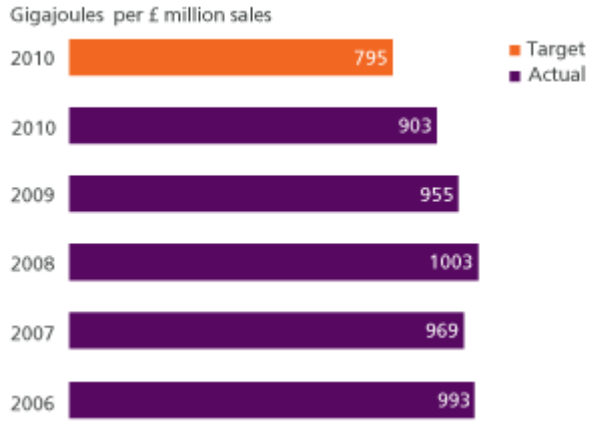
Sales-related data

Our targets are based on emissions and energy consumption from operations and transport per million £ sales, with sales adjusted at constant exchange rates. In 2010 these normalised emissions decreased by 5.8% while energy use per million £ sales fell by 5.5%. Cumulatively we have cut normalised emissions by 10.7% and energy use by 9.11% since 2006, missing our 20% target for each measure.

Climate change impact from operations energy and transport



Energy use for operations and transport



Explanation for trends

After emissions levelled out from 2005 we launched a new energy programme but initial progress was slow. Performance began to improve in 2009 as investments paid off and over the past two years GSK's climate change emissions have fallen by 9.2% in absolute terms.

We closed a number of facilities in 2010 but this was balanced by acquisitions and growth. The reduction in emissions was mainly driven by investment in projects supported by the climate change programme. In addition there was a decrease in transport emissions caused by reductions in both distance driven by the sales forces and in employee air travel.

The significant acceleration in performance since 2008 demonstrates that we can achieve the ambitious targets in the new environmental sustainability strategy.

Note: All figures, including targets, are restated at constant exchange rates

SGS Verified

Water

Approach

Fresh water is a finite and vulnerable resource. The increasing demands on water sources resulting from population growth, rising urbanisation and increasing affluence, together with the effects of climate change, mean that many areas are now water-stressed. By 2025, a third of the world's population is expected to suffer severe and chronic water shortages, damaging ecosystems and the quality of human life.

We recognise the need for a strategic approach to water use that reflects the complex interactions with human population growth, climate change, disease pattern changes and biodiversity stresses. Addressing water issues will help our business by increasing water security, improving manufacturing efficiency and strengthening our reputation and relationships with stakeholders.

Our approach has four elements:

- Continuing reduction in water use and making water quality improvements, maximising water efficiency and minimising risks and impacts
- Assessing both direct and indirect (supply chain) water use
- Collaboratively managing shared water risks with the communities in which we operate
- Reducing human health impacts caused by water scarcity.

We also target reducing the pollution potential of the wastewater our sites discharge, measured using the chemical oxygen demand (COD) – the oxygen required to chemically oxidise the compounds in the water.

Direct operations and supply chain

We require clean water mostly for manufacturing (for processes, products, cooling and cleaning), and also for R&D and general site uses such as drinking, food services and sanitation. Action to reduce consumption focuses on sites in areas of water scarcity and on water-intensive products.

We are developing site-specific targets for facilities in areas of water scarcity, which account for less than 10% of all our sites. We identified these sites using the World Business Council for Sustainable Development’s Global Water Tool supplemented with local watershed information and intelligence.

Assessments of total water use (direct and indirect) across primary product categories will identify water-intensive products and help to develop product-specific water strategies. Using economic commodity models, we have estimated direct and indirect water use associated with energy, agriculture, chemicals and packaging. For most products, 80-90% of the estimated total water use is embedded in the supply chain.

Recognising that this ‘virtual water’ associated with the materials we buy represents a major part of our water footprint, we are engaging with suppliers to assess their awareness of, exposure to and plans for mitigating water risks. We will use this information to grade suppliers and drive improvements.

Our target has been to reduce water consumption by 2% per annum per unit of sales from 2006-2010. We only reduced water consumption in 2010 by 1.6% but since 2006 we have exceeded our target, cutting consumption by a total of 15.7%.

These examples show the progress made at pharmaceutical and consumer healthcare manufacturing sites:

- Agbara (Nigeria) saved 81,000m^3 - more than 36% of its overall water consumption by removing old, inefficient washing equipment and improving the inspection and maintenance of water pipelines and sources to minimise losses
- Parma (Italy) saved 67,000m^3 - more than 15% of its overall water consumption – through a water reduction programme focused on cooling water, resin replacement in water softeners and steam discharges from autoclaves
- Zebulon (US) saved 31,000m^3 by using recycled water from a municipal treatment works.

Community engagement

Community health and local ecosystems are linked through watersheds. In 2010 we conducted a global assessment of our sites to gauge local awareness of water scarcity, the status of local watersheds and levels of community engagement. We are using the results to develop site communication plans, raising awareness and providing guidance for engaging local communities.

One example is Consumer Healthcare's Turn off the Tap campaign, launched in Italy in 2010 to encourage people to use less water when they brush their teeth. We estimate that 40,000 litres of water will be saved by this education and awareness campaign about the responsible use of water in everyday life.

Health impacts - water-borne diseases

GSK addresses water-borne diseases, for example with the *Rotarix* vaccine, as part of our commitment on diseases of the developing world. We also continue to support PHASE, a simple hand-washing programme first launched in 1998, which has taught hundreds of thousands of children how to reduce the spread of infection, in particular diarrhoeal disease.

Engagement with governments and other organisations

We endorsed the United Nations CEO Water Mandate in 2009, in line with our support for global health programmes and community initiatives to improve access to medicines. It will guide us in integrating water policy and stewardship into our global healthcare commitments. The strategic elements of the Mandate are the foundation of our approach to water stewardship.

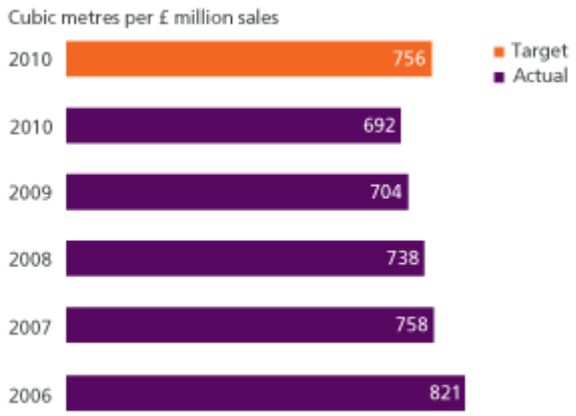
This commitment demonstrates our recognition that water is a valuable natural resource, and that businesses can play a positive role in managing it. By endorsing the mandate, we have pledged to:

- Improve our water sustainability in direct operations and our supply chain
- Work with other organisations and governments to encourage sustainable policy and practices
- Engage with our sites' local communities in providing education and support on water and sanitation
- Be accurate and transparent in our reporting of water-related issues

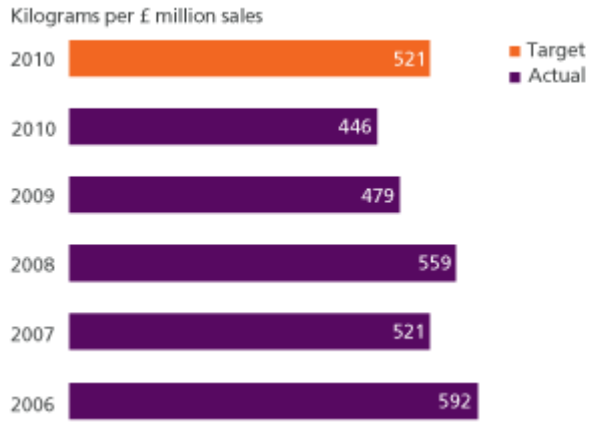
This section on water constitutes our Communication on Progress in accordance with the Mandate reporting requirements.

Performance

Water consumption



Chemical oxygen demand of wastewater



In 2010 GSK's worldwide water use totalled 18.7 billion litres, 0.5 billion litres less than in 2009. Water consumption per unit of sales was 1.6% lower than in 2009. Cumulatively, water use per unit of sales has fallen by 15.7% since 2006, ahead of the 2% annual reduction target.

Explanation for trend

Water consumption has fallen due to site closures and a range of water saving initiatives across the business. This reduction has been offset through business growth, particularly in Consumer Healthcare, biopharmaceuticals manufacturing and vaccines.

Wastewater

We generated 9.9 billion litres of wastewater in 2010, 1.5% higher than 2009 but more than 15.8% below the 2006 baseline.

In 2010 the chemical oxygen demand (COD) of wastewater fell 8%. COD per million £ sales fell 6.9%, reaching a cumulative 24.8% below the 2006 baseline. This puts us ahead of the target to decrease 3% per year.

Explanation for trend

Wastewater volumes increased because of new and expanded operations, particularly in our vaccines and biopharmaceuticals businesses.

The quality of wastewater discharged, measured in COD, is closely related to the types and amount of materials

produced in the manufacture of our active pharmaceutical ingredients (APIs) and consumer products. The decrease this year is due to lower production from some water-intensive processes in the manufacture of APIs and a number of COD reduction projects. Projects included:

- Segregating and off-site treatment of a high COD waste stream at a pharmaceutical manufacturing site in the UK
- Installing a new effluent treatment plant at our site in Bangladesh
- Introducing a new plant to remove solids at a toothpaste factory in the UK.

Our work to improve manufacturing efficiency should continue to decrease wastewater pollution in the future.

Note: All figures, including targets, are restated at constant exchange rates

SGS Verified

Environmental stewardship

We aim to operate responsibly, using input materials and packaging efficiently and safely, minimising waste and avoiding harm to humans and the environment.

Raw materials are typically one of the top contributors to the overall environmental impact of pharmaceutical operations, read more in life cycle assessment. Using materials more sustainably requires changing business processes to consume fewer resources and generate less waste, removing hazardous substances where possible and eliminating waste that is persistent, toxic or bio-accumulative.

We routinely evaluate the environmental footprint of our products and processes to explore ways to minimise their impacts. Our R&D and manufacturing operations use Fast Life cycle Assessment for Synthetic Chemistry (FLASC), a web-based tool that helps to identify the most sustainable processes and materials. We are currently expanding our FLASC assessments to include the eco-footprint of the tablet formulation processes.

In 2010 we launched an enhanced solvent selection guide, doubling the number of solvents covered and including a simplified version for the earliest manufacturing stages. We also began developing a reagent selection guide for different chemical transformations. These two tools will help our R&D scientists to select materials with reduced environmental impacts.

Some of our wastes such as used solvents can be reused in our processes or as a raw material for another industry, achieving what is known as a ‘cradle-to-cradle’ approach. For instance, sites that manufacture active pharmaceutical ingredients recover some solvents for reuse. Our pilot plants also send solvents such as ethyl acetate and ethanol for external recovery and reuse.

Biodiversity

We support efforts to conserve biological diversity, such as the Convention on Biological Diversity. While we use biological materials in developing new medicines and vaccines, and in some production processes, it is unusual for a biological material to be used in its natural form as an active component of a pharmaceutical.

Our operations and those of our suppliers may have an impact on local habitats. GSK's EHSS standards require impact assessments which include impacts on ecosystems that could affect biodiversity. Some sites support protected habitats while others use wastewater to support native species gardens.

Our Procurement group is analysing potential supplier impacts to understand priorities and ensure that biodiversity is covered by our responsible sourcing approach.

We are involved in a number of projects in the UK and the US to remediate sites with land contaminated by past handling practices for chemicals. We have identified five sites in the UK and more than 50 sites[1] in the US that require some remediation. Most of them are waste disposal sites where GSK is one of several responsible parties. GSK and its heritage companies have spent more than £100 million cleaning up sites in the US over the last 20 years and we are involved in continuing work on 25 of them.

1. These figures are not included in the data verification

Potential hazards

We continuously examine the use of materials of concern across all phases of development to determine which are being used and identify how they can be replaced during development.

For instance, a new manufacturing route for an epilepsy treatment eliminated the use of a highly hazardous oxidizing agent, peracetic acid, as well as a chlorinated solvent, a highly odorous sulphur reagent and its sulphur waste. Read more about this project which was runner-up in the CEO's Sustainability Science and Technology Awards in 2010.

In 2010 we used 73 metric tonnes of materials of concern (up from 26 tonnes in 2009). The increase was driven by undertaking more manufacturing to support late stage development of products which needs higher volumes of product for clinical trials. Seven solvents accounted for about 80% of this volume. Most of the solvent waste from this production was destroyed by incineration, although some was recycled.

Pharmaceuticals in the environment

A portion of active pharmaceutical ingredients (APIs), the substances that make medicines work, eventually enters the environment, mainly through being excreted by the patient but also the disposal of unused medicines and discharges from manufacturing.

The current scientific consensus is that pharmaceutical residues present in the environment do not pose a risk to human health. We are working to identify any potential impacts on the environment, continue to monitor the issue and contribute to working groups and research which will inform all stakeholders.

We have discharge limits for APIs in wastewater from our manufacturing sites, assess process waste concentrations against these levels and treat the wastewater if necessary to achieve safe levels.

For more information read our public position statement about pharmaceuticals in the environment.

Genetically modified micro-organisms (GMMs)

We use GMM in the research and development of new therapeutic agents and in the manufacture of certain medical products such as vaccines. We do not produce products that contain viable organisms and do not routinely undertake research and development involving the cultivation of genetically modified plant species.

GMMs help us to identify the genetic targets and causes of disease and to develop new antibiotics and drugs for conditions such as heart disease, diabetes and depression. We use a number of different GMMs, predominantly harmless organisms such as disabled strains of the bacterium *E.coli* and eukaryotic cells in culture. We also manufacture a number of products that are derived from GMMs, such as hepatitis B vaccine.

We manage the use of GMMs through bodies such as site Institutional Biosafety Committees or Genetic Modification Safety Committees in line with national and local regulations.

We require that GMMs are inactive in waste streams to ensure safety to human health and the environment.

In 2010 we published a policy statement on genetically modified micro-organisms and environment, health and safety.

Nanomaterials

We are investigating opportunities to use nanomaterials – materials that are on an atomic or molecular scale – in our R&D programmes. We currently have no products on the market that contain deliberately engineered nanomaterials.

Read our public position paper on the use of nanomaterials.

REACH

During 2010 compliance activities under the EU's Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) requirements were fully embedded in manufacturing, R&D and procurement operations. We continued to implement the REACH legislation by:

- Identifying substances we buy that were required to be registered in 2010 and mitigating risks to supply by requesting confirmation of intent to register from all EU suppliers. Approximately 400 chemicals we purchase had a 2010 registration deadline
- Developing and communicating use conditions and exposure scenarios for substances we buy
- Submitting registration dossiers for two high-volume substances manufactured or imported by GSK that required registration by November 2010 – potassium phenylacetate and 6-aminopenicillanic acid
- Registering one new substance we manufacture or import in volumes greater than one tonne per year
- Reviewing the candidate list of substances of very high concern and implementing substitution plans for two – a phthalate and musk xylene
- Developing procedures at our EU manufacturing sites to meet our responsibilities as a downstream user of chemicals.

In 2011 we will meet our obligations as a downstream user of chemicals registered by suppliers in 2010. This will include reviewing extended safety data sheets and implementing any necessary changes in our risk management measures.

Read our public position paper on REACH regulation

Classification and labelling

We met the European Union deadline of December 2010 for implementing the UN's Globally Harmonized System for Classification and Labelling of Chemicals (GHS), which is being adopted as regulation around the world. Implementation required:

- Updating and publishing on our intranet revised GSK Safety Data Sheets (SDS) in GHS-compliant format
- Reclassifying over 1,000 substances according to GHS criteria
- Submitting classification and labelling information to the European Chemicals Agency inventory for approximately 500 hazardous substances supplied by GSK EU sites or imported into the EU
- Developing e-learning and posters for employee training on new hazard warning symbols and labels introduced as part of GHS
- Producing GHS-compliant hazard labels at manufacturing sites.

We will make further changes to the format of our SDS to comply with the EU REACH Annex II requirements.

Mass efficiency

Approach

The pharmaceutical industry has typically used more than 100 tonnes of material for every tonne of active pharmaceutical ingredient (API) produced. This is because pharmaceutical processes are often complex, usually requiring large amounts of solvents and other raw materials, and it can take several processes to obtain the right pharmaceutical purity. It is also necessary to finalise production processes quickly to avoid delaying drug approval and production.

We originally set a target in 2005 for R&D to double the average mass efficiency of processes for new products, to achieve 2%. In 2009 we increased the target to 2.5% by 2015, an additional 25% increase in efficiency, for new products launched after 2010.

We also set a target for our manufacturing sites to achieve 3% mass efficiency by 2015 for products launched between 2007 and 2012. Our aspiration as part of our new environmental sustainability strategy is to achieve 5% efficiency by 2020.

As well as specific projects to achieve our mass efficiency targets, we launched the GSK-Singapore Partnership for Green and Sustainable Manufacture in 2010.

Process design and redesign

Effective process design is essential to minimise environmental impacts. It determines which chemicals and processes are used in manufacturing as well as the impacts from production waste. We have developed a sustainability strategy for R&D to achieve our mass efficiency and sustainability aspirations.

The Operational Sustainability Team works with process development teams to incorporate EHSS considerations into process design and materials sourcing, helping R&D scientists to select materials with the least environmental impacts and identifying potential sustainability and EHSS risks in manufacturing. In 2010 we expanded the solvent selection guide, doubling the number of solvents covered and including a simplified version for the earliest stages in medicinal chemistry. We also simplified our **life cycle assessment tool.**

In 2010 our Operational Sustainability Team was recognised by the American Institute of Chemical Engineers with its Industrial Practice Award in Sustainable Engineering. The Institute cited our work of embedding sustainability into R&D and manufacturing and the Eco-Design Toolkit.

In manufacturing we have assessed potential improvements for new products that are being transferred from R&D as well as existing products. A project at Jurong to redesign a process for one of our existing compounds will improve its mass efficiency from about 2.5% to about 4.5%.

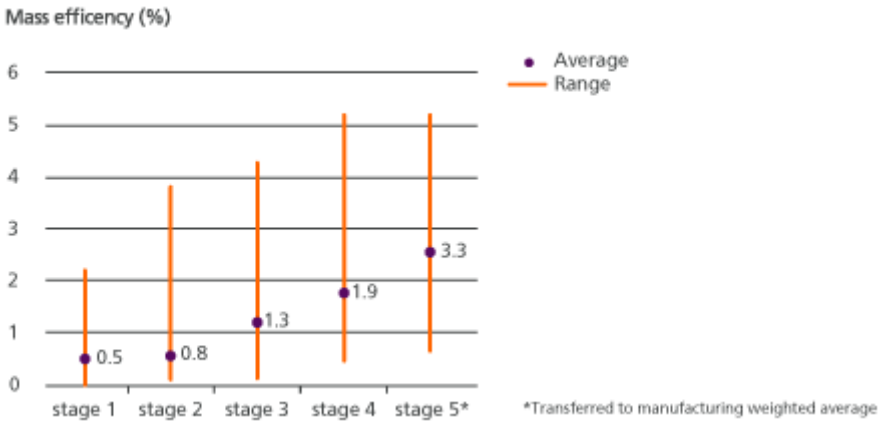
Redesigning a process to save materials and money

Redesigning the manufacturing route for albiglutide, a product in development at Upper Merion in Pennsylvania, improved the overall yield by 24%, reduced water consumption by more than half and increased mass efficiency from 1.7% to 3.9%. These improvements reduce the cost of raw materials by 35%.

This initiative won second place in the CEO's Science and Technology awards in 2010.

Performance

Mass efficiency (average 2006-2010)



The chart shows the range of mass efficiency and the average for each process stage while the manufacturing process is being developed in R&D. It demonstrates that we improve mass efficiency as compounds move through development stages. In the early stages many processes achieve less than 1% mass efficiency. By the last stage when the process is transferred from R&D to manufacturing they average 3.3% mass efficiency for the 2006–2010 period.

As well as exceeding our target for the 2006-2010 period, the mass efficiency for new products transferred in 2010 was also within target. In 2011 we will start reporting the mass efficiency performance of new products after they have been transferred into manufacturing.

Waste

Approach

Our production, research and sales activities all produce waste:

- Production – hazardous waste such as solvents and other chemicals, non-hazardous waste including packaging
- R&D and quality control laboratories – small amounts of chemicals including products and intermediates, as well as broken glassware and plastics
- Offices – paper and other standard commercial waste
- Maintenance – building renovations produce non-routine waste such as obsolete equipment, office furniture and structural materials.

A significant proportion of our waste is classified as hazardous, mainly because it contains solvents and chemicals used to manufacture active pharmaceutical ingredients. Most non-hazardous waste is general material such as office waste paper, kitchen waste and non-hazardous substances used in manufacturing.

We aim to eliminate waste where we can, reduce it if we cannot eliminate it, reuse materials if possible, recycle other waste and dispose of any remaining material sensitively. We require disposal contractors to comply with our requirements and local regulations. Sites audit their waste contractors or hire consultants to carry out the audits.

Applying the waste hierarchy to solvents (the main hazardous waste), our work to improve mass efficiency reduces the waste volumes. Our first choice is then to reuse or recycle, and most used solvent is recovered and purified on site. It is then reused in the original manufacturing process and some is sold to commercial reprocessing companies. When reuse or recycling is not possible, solvents are usually incinerated and the energy recovered wherever possible. Regulations vary widely around the world but by working to this hierarchy we manage waste in a way that meets or exceeds regulatory expectations.

Until 2010 our target referred only to non-hazardous waste sent off-site for disposal (see Waste-Performance). From 2011, as part of the new environmental sustainability strategy we have set a target for both hazardous and non-hazardous waste generated. We aim to cut total waste by 25% by 2015 and 50% by 2020, also aiming for zero waste to landfill by 2020.

In 2010 33 GSK sites (excluding offices) did not send any waste to landfill.

Cutting waste at source

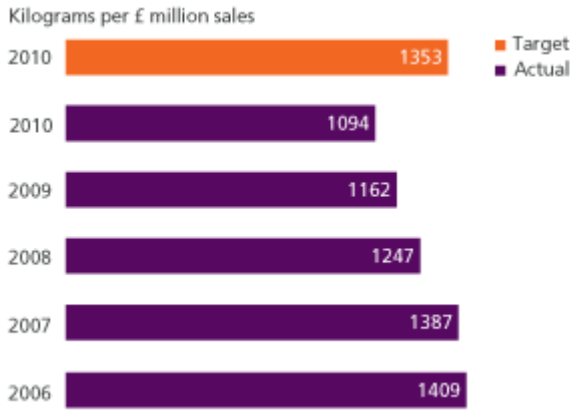
We have significantly reduced waste in supplying clinical trials by tackling waste at source. Through improved planning, a simpler network of distribution depots and optimising the supply chain, we have avoided producing too much of the medicines being tested in trials. This initiative, which began in 2007, has not only reduced excess production of active pharmaceutical ingredients (APIs) and tablets, but also saved the packaging which the excess production would have needed, and avoided the resulting incineration of unused material. We estimate the improvements have saved almost 12,000 tonnes of CO_2 since 2007 through:

- Manufacturing 17.5 tonnes less API, roughly 20% of the previous level
- Making 20 million fewer tablets
- Using 1.8 million fewer plastic bottles to pack the clinical trials materials.

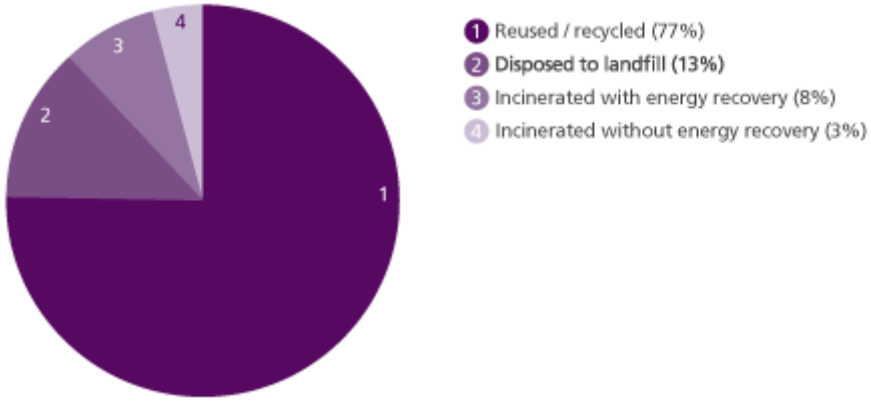
Performance

Non-hazardous waste

Non-hazardous waste disposed



Destination of non-hazardous waste 2010



These data do not include non-routine waste such as construction and demolition rubble and similar material not related to day-to-day operations

In 2010 the amount of non-hazardous waste disposed fell by 7.0% and was 22.2% lower than the 2006 baseline at 29,490 tonnes. Waste per million £ sales was 5.9% lower in the year and more than 22.4% down on 2006. This is substantially beyond our 1% per year improvement target and we will build on this performance with our new ambitious targets.

Our target was specific to non-hazardous waste disposed, but we also measure total non-hazardous waste generated, which includes waste that is recycled. In 2010 we generated 125,700 tonnes of non-hazardous waste, 5.8% higher than the previous year. Of this, 76.5% was recycled and 23.5% was disposed of via landfill or incineration, both figures showing improvements on the 2009 data.

Explanation for trend

The increase in non-hazardous waste generated is due to higher production at two of our manufacturing facilities in

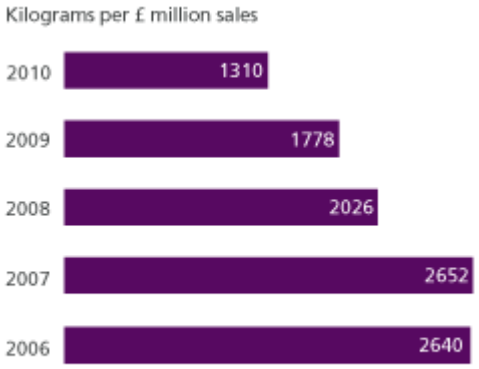
Australia and India. However, we managed to increase the percentage of this waste sent for recycling. In particular, the sites in Australia and India which increased their generation of non-hazardous waste were also able to significantly increase the amount of waste they sent for recycling. The site in Australia increased recycling by 45% and the site in India increased recycling by 31%. In addition a site in Nigeria increased the amount of waste recycled by 61%. Overall GSK's total recycling rate increased from 73% to 77%.

Note: All figures, including targets, are restated at constant exchange rates

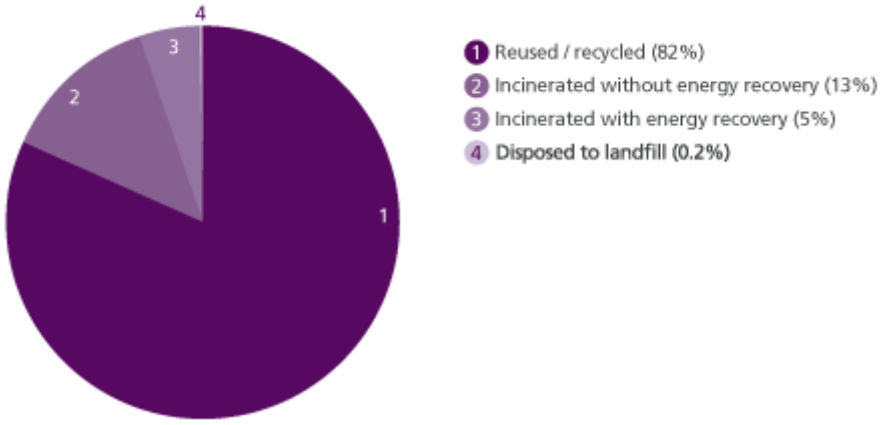
SGS Verified

Hazardous waste

Hazardous waste disposed



Destination of hazardous waste 2010



In 2010 we generated 191,470 tonnes of hazardous waste, down from 214,520 in 2009 – a reduction of 10.7%. Of this, 81.6% was recycled and 5.3% was incinerated with energy recovery. Only 0.2% of this waste went to landfill.

Hazardous waste disposed was 35,300 tonnes, 27.2% lower than in 2009. Waste disposed per million £ sales fell by 26.3% and was 50.4% below the 2006 level.

Explanation for trend

The decrease in hazardous waste disposed is due to continued efforts to manage and recycle it, especially solvents. It

is also due in part to decreased production of some products that used significant quantities of solvent. In 2010 three sites were responsible for 74% of the reduction of all hazardous waste generated. Waste reduced at one of these sites as it scaled down production prior to closure. Actions at the other two sites included the installation of new technology to increase manufacturing efficiency and the installation of an on-site treatment facility which prevented the need to send waste for offsite disposal.

The amount of hazardous waste disposed is related to the types and quantities of products made and the amount of solvent used to manufacture active pharmaceutical ingredients. Solvent waste is 91% of hazardous waste generated. The reduction in hazardous waste generated since 2006 is mainly due to the actions taken at the five main sites which use large quantities of solvents.

Note: All figures, including targets, are restated at constant exchange rates

SGS Verified

Packaging

We have substantial opportunities to improve our packaging profile and are working to reduce the environmental impact of product packaging. We have set a target to derive 50% of our paper packaging from sustainable sources by 2015, and 90% by 2020.

In 2010 we began to implement the sustainable packaging strategy developed in 2009, based on the '7 Rs' (see table). To support the new strategy, we began to update our Green Packaging Guide. The Guide helps designers and managers to benchmark new and existing packaging designs, taking into account manufacturing impacts, the mass and choice of material, its recyclability and reusability.

We evaluated the eco-footprint of a series of packaging options using life cycle assessment and carbon footprint analysis. The table shows examples:

Examples of application of the '7 Rs'

Principle	Focus	Example
Reduce	The mass of materials, complexity and the life cycle footprint of packaging	• The redesigned *Ventolin* canister will save 125 tonnes of aluminium and 1,200 tonnes of CO2 per year • Incoming dry powder inhaler components at Zebulon, US, are now shipped in pallet boxes instead of individual cases, saving 350 tonnes of CO2 and 180 tonnes of material per year
Remove	Materials with sustainability or EHS issues	• Removing the PVC tray for *Nicoderm* saved over 8 tonnes of material and 20 tonnes of CO2 per year
Reuse	Recycled materials in packaging (subject to regulatory requirements which mean this is a major challenge in pharmaceuticals)	• Reusing trays, pallets and drums saves plastic and wood
Recycle	Design for recyclability	• Moving the desiccant required in *Niquitin* bottles to the cap means bottles can be recycled • Working with suppliers to change a carton material for *Aquafresh* to a fully recyclable alternative, saving 30 tonnes of material and 250 tonnes of CO2
Renew	Use materials and energy from renewable sources	• For paper-based packaging we increasingly buy materials made from recovered fibres.
Reward	Improve the environmental impact of the total GSK packaging supply chain, meeting the needs of patients, customers and consumers at lower cost	• Sustainability is a key element in the selection and continued management of suppliers. It forms an integral part of the Procurement framework and general ways of working.
Respect	Use responsible suppliers	• We include social and environmental requirements as part of our supplier selection process and we are developing more detailed criteria for specific areas

Other examples of packaging improvements include:

- The new pack for *Iodex* pain relief ointment, which reduced the material used by 85%
- *Advair* carton and corrugate box materials reduction, which saves 571 tonnes of CO_2 per year
- *Abreva* clamshell packaging, replacing PVC with recycled PET, which saves 25–52 grammes CO_2 per pack
- Moving from glass to polypropylene or PET bottles for *Horlicks*, *Iodex*, and *Crocin* in India, which saves 11,700 tonnes of CO_2 per year
- *Horlicks* carton reduction, which saves 5,000 tonnes of CO_2 per year.

Emissions to air

Approach

The main emissions from GSK sites (apart from greenhouse gases) are gases that damage the ozone layer and volatile organic compounds (VOCs) that cause low-level pollution.

Ozone depletion

Ozone-depleting substances (ODSs) damage the ozone layer in the upper atmosphere, exposing people to radiation that can cause skin cancer and other health problems.

Until recently we used CFCs as the propellant gas in most of our metered dose inhalers (MDIs). The gas is released when patients use the inhalers and a small amount escapes during production. We stopped manufacturing CFC inhalers in all GSK sites and our two contract manufacturing sites in 2009.

We still use ODSs in some cooling systems and for other ancillary uses at GSK facilities. They are only released in the event of a leak or during maintenance but we are progressively switching to hydrofluorocarbons (HFCs), ammonia and hydrocarbons. More than 99% of CFCs associated with cooling systems and other ancillary uses were eliminated by 2010 but a few pieces of equipment remain in service. We plan to eliminate the use of CFC associated with the remaining equipment before the end of 2011.

We also plan to eliminate our use of HCFCs from cooling systems and ancillary equipment before the end of 2020. See more in our **public position statement.**

Volatile organic compounds

Volatile organic compounds (VOCs) react with nitrogen oxides in the presence of sunlight, creating ozone in the lower atmosphere. This results in smog which is a factor in human respiratory illness.

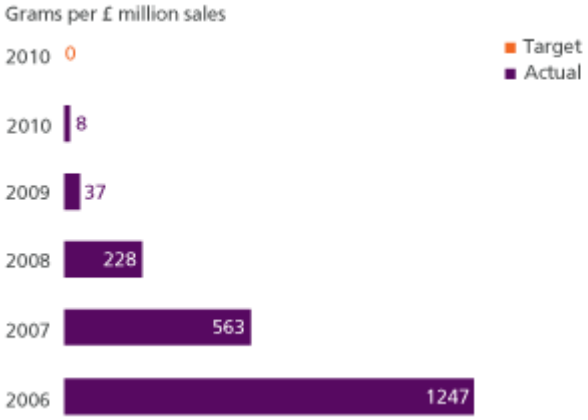
We emit VOCs to the atmosphere mainly from solvents used in the manufacture of our active pharmaceutical ingredients and in R&D pilot manufacturing plants. Our target has been to reduce VOC emissions per unit of sales by 2% per year.

In 2009 we focused on reducing VOCs at the three sites that are responsible for about three-quarters of VOCs released from all our facilities. During 2010 we improved solvent abatement at several sites including those in the UK, Singapore, India and Australia.

Performance

Ozone depletion

Ozone depletion potential from equipment and production (CFC-11 equivalent)



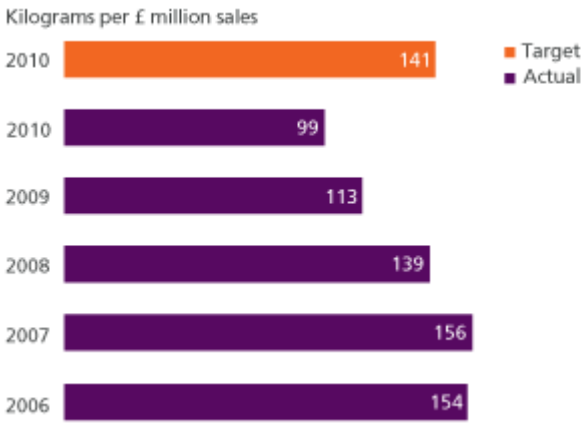
Releases of ozone-depleting substances (ODSs) during patient use of inhalers are now eliminated.

In 2010 ODSs from equipment and production losses decreased by 79% to 214 kg, compared to 1,019 kg in 2009. This follows a similarly substantial reduction in 2009 and means we almost met our 2010 target to eliminate losses of CFCs from production and equipment. More than 99% of the CFC which was in service in 2006 is no longer present.

We maintain a register of the significant pieces of equipment that contain refrigerants and use this to track progress. We have 52 pieces of equipment containing more than one kilogram of CFCs, amounting to approximately 4,500 kg in total.

Volatile organic compounds

Volatile organic compound emissions



In 2010 volatile organic compound (VOC) emissions decreased 13.8% to 2,660 tonnes. Emissions have now fallen by 35.7% since 2006. VOCs released to air per million £ sales decreased 12.8% in 2010, which means we have achieved our annual target. This continues the trend of reductions from previous years and takes the total reduction per unit sales to 35.8% since 2006.

Explanation for trend

Emissions of VOC to air are affected by the management of solvents and by the mix of products that are made in the year.

VOC emissions were once again one of our focus areas in 2010. We concentrated on the top three emitting sites which are in the UK, India and Singapore. The improvements in 2010 were mainly the result of improved solvent abatement at these and other sites. One of our other sites in Australia reduced its VOC emissions by more than 50%.

Note: All figures, including targets, are restated at constant exchange rates

SGS Verified

Data, audit and assurance

This section summarises key data, providing five-year trends, and contains internal audit and external assurance reports.

Basis of reporting

Environmental data are collected from all 76 of our Pharmaceuticals, Consumer Healthcare and Nutritional Healthcare manufacturing sites, 14 vaccines sites, 22 Pharmaceuticals and Consumer Healthcare R&D sites, the UK headquarters building and 60 offices and distribution centres.

Targets and performance are normalised by sales, based on a constant exchange rate, using the rate for 2010. This means that normalised figures for previous years are different to those shown in last year's report.

Data may also vary slightly from earlier reports because any errors found in data from prior years are corrected.

We use the Greenhouse Gas Protocol for all of our calculations of CO_2 emissions from energy use. We use the latest CO_2 country factors for electricity which are published by the International Energy Agency (IEA). We also updated the factors for climate change emissions from propellants and refrigerants using WMO (World Meteorological Organisation), Scientific Assessment of Ozone Depletion: 2006, Global Ozone Research and Monitoring Project – Report No 50, 572 pages Geneva, Switzerland, 2007, (chapter eight).

Data summary

This table is a summary of five years of environmental performance. For a breakdown of the components of each metric and more data, see the detailed data table.

	2010	2009	2008	2007	2006
Energy consumption from operations and transport (million gigajoules)	24.3	26.0	26.7	26.5	26.7
Climate change impacts (thousand tonnes):					
– From operations and transport	2011	2159	2214	2231	2246
– Inhaler use by patients	4647	5170	4747	5200	4685
– Total climate change impacts	6931	7633	7248	7801	7424
Water use (million cubic metres)	18.7	19.2	19.7	20.8	22.1
Wastewater volume (million cubic metres)	9.9	9.8	10.7	10.9	11.8
COD (thousand tonnes)	12.0	13.1	14.9	14.3	15.9
Hazardous waste generated (thousand tonnes)	191.5	214.5	237.1	222.5	241.7
– Disposed (other than recycling)	35.3	48.5	54.0	72.6	71.0
Non-hazardous waste generated (thousand tonnes)	125.7	118.7	109.8	121.5	116.4
– Disposed (other than recycling)	29.5	31.7	33.2	38.0	37.9
Otherwaste generated (thousand tonnes)	43.8	53.1	19.2	37.7	28.1
– Disposed (other than recycling)	2.1	7.4	7.0	14.6	17.0
Volatile organic compounds emissions (thousand tonnes)	2.7	3.1	3.7	4.3	4.1
Ozone depleting substance releases (tonnes):					
– Production and refrigerant releases	0.2	1.0	6.1	15.4	33.5
– Patient use of inhalers	0.0	112.9	87.7	136.5	182.2
– Total ODS	0.2	113.9	93.7	151.9	215.7
Ozone depleting potential of refrigerants in equipment (tonnes)	7.4	12.6	15.9	20.5	23.9

- 2010 values include some estimated data for December when actual data were not available in time for publication, see External assurance and GSK response to assurance.

- Energy and climate change impact for travel and transport by air, land and sea are calculated using the Greenhouse Gas Protocol. The measurement is based on distance travelled, not directly on fuel use. In years before 2006 we did not collect all categories of freight transport or employee business travel. For employee air travel we capture all routes globally for individual bookings but only UK and the USA for group bookings. For product logistics we capture all routes globally by air and sea, but by road we only collect EU, USA and Canada.
- Climate change impact is calculated as CO2 equivalent using the Greenhouse Gas Protocol developed by the World Resources Institute and the World Business Council for Sustainable Development. Each year we review the CO2 factors and update the data for all years as appropriate.
- We use the factors for climate change emissions and ozone depletion potential from WMO (World Meteorological Organisation), Scientific Assessment of Ozone Depletion: 2006, Global Ozone Research and Monitoring Project—Report No. 50, 572 pp., Geneva, Switzerland, 2007. (chapter 8).
- Each year we review refrigeration equipment inventories for all years and estimate incomplete data. We calculate the probable releases using a factor from the British Refrigeration Association.
- Since 2006 we have collected inhaler production volumes to allow us to more accurately calculate the climate change and ozone depletion potential impact from their use depletion potential impact from inhaler use before 2006.
- Recycled water is not included in total water consumption.
- We focus collection of wastewater and chemical oxygen demand data primarily on the major contributors; primary manufacturing operations, pilot plants, coating activities and sterile operations. Some sanitary wastewater streams are included if they cannot be separated from production wastewater streams or if they are significant.
- Chemical oxygen demand (COD), a measure of water pollution, is measured when wastewater leaves our sites following any on-site treatment.
- We focus collection of volatile organic compound emissions on the major contributors; primary manufacturing operations, pilot plants, coating activities and sterile operations.
- We consider a waste to be hazardous if it has any of the properties defined by the 1989 Basel Convention or if it is radioactive, bioengineered or biohazardous. Basel Convention properties include flammability, explosivity, water or air reactivity, corrosivity, oxidising potential, acute or chronic toxicity, ecotoxicity or infection. Biological waste rendered non-hazardous after treatment is considered non-hazardous waste. We focus collection of hazardous waste on the major contributors; primary manufacturing operations, pilot plants, coating activities and sterile operations.

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Internal audit

We regularly audit our operations, contract manufacturers and key suppliers to assess systems for managing risks and impacts, compliance with legislation and performance against our environment, health, safety and sustainability (EHSS) standards. Audits also assess whether appropriate management systems are in place to improve performance and maintain compliance. Our internal auditors are certified as lead auditors against the ISO 14001 standard.

In 2009 the EHSS audit team was integrated into the GSK Audit and Assurance function. This provides an independent audit and assurance capability, separate from the EHSS management organisation.

The EHSS audit team uses the GSK Audit and Assurance function's standardised risk-based audit process to audit the management of environmental risk. The 2010 audit strategy also included audits of 'themes' across several operations, such as the prevention of major releases of the propellant gas HFC 134a (tetrafluoroethane) used in the manufacture of metered dose inhalers.

The frequency of audits across operations is determined by the level of risk and impacts and a site's performance at managing those risks. In 2010 we audited 17 sites, covering key risks and performance against our EHSS standards.

In general, performance relating to the management of environmental risks was good. There were no critical findings that indicate lack of proper management of risks with potentially serious consequences concerning the environment. There were a number of positive performance areas including general management and reduction of environmental impacts. A number of findings were raised, mainly relating to aspects of the management of waste, emissions and containment.

Read more about our supplier audits in the Supply Chain section.

Certification

Sites continue to certify to international standards ISO 14001 and OHSAS where they see a potential benefit. This follows a review in 2009 which concluded that certification does not equally benefit all sites and that certification should focus on those that need to make the most significant improvement. All sites are required to have robust management systems, including self-audit systems, and are encouraged to have them certified but this is not a formal requirement. At the end of 2010, 25 sites were certified to ISO 14001.

External Assurance

This is the fifth year that SGS has reviewed the data in the environment section and the health and safety pages of the Corporate Responsibility Report. Its independent view of our processes has been very valuable and we have adopted its suggestions over the years, improving our processes.

Sites were selected for review from all of the GSK businesses. For the site visits, there was special focus on sites that had been top contributors to environmental emissions the previous year, relatively new sites that had not been visited by SGS for data verification and sites that had difficulty submitting data in a timely manner.

See the SGS Assurance statement below:

ASSURANCE STATEMENT

SGS UNITED KINGDOM LTD'S REPORT ON ENVIRONMENT, HEALTH AND SAFETY DATA IN THE GLAXOSMITHKLINE CORPORATE RESPONSIBILITY REPORT FOR 2010

NATURE AND SCOPE THE ASSURANCE

SGS United Kingdom Ltd was commissioned by GlaxoSmithKline (GSK) to conduct an independent assurance of the Environmental, Health and Safety data in their Corporate Responsibility (CR) Report for 2010. The scope of the assurance, based on the SGS Sustainability Report Assurance methodology, included 2010 data contained in the following sections of this report:

Environmental Sustainability	Health, safety and wellbeing
• Plans and targets – performance (climate change and energy, water, waste and emissions to air) • Climate change and energy – CO2 emissions savings • Climate and energy performance • Water – performance • Waste – performance • Emissions to air – performance • Data, audit and assurance • Environmental Data summary	• Safety programmes (Driver safety, Ergonomics and human factors) • Health and safety performance • Health and safety data table **Detailed Data Table (Environment, Health and Safety)**

The information in the GSK CR Report and its presentation are the responsibility of the directors and management of GSK. SGS United Kingdom Ltd has not been involved in the preparation of any of the material included in the CR Report. Our responsibility is to express an opinion on the data, graphs and statements within the scope of verification with the intention to inform all GSK's stakeholders. Financial data drawn directly from independently audited financial accounts has not been checked back to source as part of this assurance.

This report has been assured at a moderate level of scrutiny using our protocols for evaluation of content veracity. The assurance comprised a combination of interviews with relevant employees; documentation and record review at seven GSK locations during and at the end of the reporting year as follows:

- Interim site visits during October and November 2010 in Australia (Port Fairy), France (Marly-Le-Roi),UK (Coleford, Weybridge), USA (Marietta, Zebulon);
- Interviews with EHS Directors and Management Teams for Global Manufacturing and Supply; Biologicals and Pharma R&D in November 2010;
- End of year site visit during January 2010 in UK (Corporate Health, Safety, Environment & Performance function in London).

The sites selected included those submitting high proportions of key data and all parts of the GSK business.

STATEMENT OF INDEPENDENCE AND COMPETENCE

The SGS Group of companies is the world leader in inspection, testing and verification, operating in more than 140 countries and providing services including management systems and service certification; quality, environmental, social and ethical auditing and training; environmental, social and sustainability report assurance. SGS United Kingdom Ltd affirm our independence from GSK, being free from bias and conflicts of interest with the organisation, its subsidiaries and stakeholders. The assurance team was assembled based on their knowledge, experience and qualifications for this assignment, and comprised auditors and assurors registered with IRCA, IEMA and EMAS Verifiers.

ASSURANCE OPINION

On the basis of the methodology described and the verification work performed, we are satisfied that the Environmental, Health and Safety data contained within the GSK Corporate Responsibility Report 2010 is reliable and provides a fair and balanced representation of GSK's Environmental, Health and Safety activities in 2010. The assurance team is of the opinion that the Report can be used by the Reporting Organisation's Stakeholders.

Summary of Findings

Minor areas for improvement to data collection, submission and manipulation identified during the assurance process were addressed to incorporate improvements into this report. These improvement opportunities are outlined below to enable further review to establish the need for system or process changes in future reporting cycles:

- Due to earlier deadlines for compilation of data some estimated data for the final month of the reporting period requires to be updated with actual figures.
- Some sites have implemented improvements in monitoring and measurements of certain data (such as VOCs and COD), but further improvements in reliability could be considered at sites where emissions data are calculated based on a small number of samples.
- Some cases of known releases of ODS from equipment were not included in the equipment register. The methodology used to collate ODS data in equipment could be amended to enable specific known releases to be included.

In addition good practice was noted in the following areas:

- Increased comments and explanations made by sites inputting data to explain significant changes, estimations and calculations.
- The analysis of data at corporate level has made ongoing improvements including:
  - detailed review of reports illustrating significant changes and anomalous data on a site-by-site basis, including review of conflicting trends and requests to sites for detailed explanations;
  - introduction of graphical display illustrating year-on-year trends for each KPI, including contributions to performance, which is now possible to view by individual site; GSK Business Unit; or GSK Group.
  - introduction of automated report generation to improve evaluation and analysis of submitted data, including generation of reports of double entries, late entries and submissions, and estimated entries.

Recommendations for future data verification process include:

- Interviews with EHS Directors for each GSK Business Unit were found to be an effective method of gaining an overview of expected data trends and projects contributing to achievement of targets. One opportunity for improvement in this process would be to conduct the EHS Director interviews earlier in the reporting cycle to enable direct evaluation of relevant projects to be undertaken as part of the site visits and data verification.

Signed:
For and on behalf of SGS United Kingdom Ltd
Jim Weaver
UK Systems and Services Certification Business Manager
February 2010
WWW.SGS.COM

GSK response to assurance

We are pleased that most sites improved in submitting complete and accurate data, including comments for the explanation of trends, in a timely fashion. We are committed to continue improving, with the ultimate goal of providing accurate data to the public on the website in real time.

The data in the Corporate Responsibility Report can be used by sites to improve their management of their environmental programmes and their health and safety programmes. In 2010, in addition to the end-of-year data analysis, we conducted a mid-year evaluation of the data to encourage sites to track their progress and to assist in the management of environment, health, safety and sustainability.

We welcome SGS's findings on good practice and its recognition of the improvements we have made in data collection and analysis. We note that SGS found value in engaging with EHS Directors to discussing the anticipated performance trends for each GSK business. In 2011 we will arrange the EHS Director interviews earlier in the year so that any new EHS projects implemented can be evaluated during the subsequent site visits.

Our responses to specific areas recommended by SGS for improvement are as follows:

- "some estimated data for the final month of the reporting period requires to be updated with actual figures".

  The reporting deadline for the sites was brought forward to enable GSK to make the report available to the public as early as possible. For data which is obtained from invoices (such as energy consumption) we are dependent on external suppliers to provide the data in a timely fashion. Where the final data is not available we require sites to provide estimates. We have reviewed all the estimated data and we have ascertained that the estimates are reasonable. We will make sure the data is updated with actual figures by the end of the first quarter of the current year.
- "improvements in reliability could be considered at sites where emissions are calculated on the basis of a small number of samples".

  This recommendation relates to sites with a relatively low level of discharges where sampling may be infrequent. In such cases sites may not be required to make measurements by the local regulators, or the local regulators may specify a low frequency of sampling. Nevertheless we will work with these sites to ensure that there is at least one sample for each quarter and if unexpected discharge events occur, that they increase the frequency of sampling until discharges have returned to normal levels.
- "The methodology used to collect ODS data in equipment could be amended to enable specific known releases to be included":

  Our register holds information on the ODS content of equipment which we use to calculate fugitive emissions. This does not include any additional losses due to spillages which have to be reported separately. We will introduce a new record in our system to collect any accidental releases of refrigerant gases.