2013 IBM and the Environment Report

Committed to environmental leadership across all of IBM's business activities

IBM

IBM AND THE ENVIRONMENT

IBM has long maintained an unwavering commitment to environmental protection, which was formalized by a corporate environmental policy in 1971. The policy calls for IBM to be an environmental leader across all of our business activities, from our research, operations and products to the services and solutions we provide our clients to help them be more protective of the environment. This report is IBM's 24th consecutive annual 'IBM and the Environment' report. Much of this content is also provided in IBM's Corporate Responsibility Report, which we have published annually since 2002, as well as in our annual Global Reporting Initiative Report. All of these reports may be found on IBM's Environment website at www.ibm.com/environment/annual.

TABLE OF CONTENTS:

A Commitment to Environmental Leadership

IBM's corporate environmental programs date back to the 1960s. In 1971, Thomas J. Watson Jr., IBM's CEO at the time, formalized the company's commitment to environmental protection with our Corporate Policy on IBM's Environmental Responsibilities. Updated a number of times over the intervening years, the policy and the global environmental management system and programs supporting it have addressed IBM's intersections with the environment and defined and driven our longstanding commitment to environmental leadership across all of our business activities.

IBM's operations can affect the environment in a number of ways. For example, the chemicals needed for research, development and manufacturing must be properly managed from selection and purchase through storage, use and disposal. Our data center operations are generally energy-intensive, and some of our manufacturing processes use a considerable amount of energy, water, or both. We continually look for ways to reduce consumption of these and other resources.

Our product stewardship requirements include product energy efficiency, the use of environmentally preferable materials, and designing for reuse, recycling and safe disposal at the end of the product's useful life. In addition, as we incorporate more purchased parts and components into our products, our requirements for the overall environmental responsibility of our suppliers and the environmental attributes of the goods they provide have become even more important.

Consistent with IBM's value of "innovation that matters – for our company and for the world," we also apply our expertise, research and technology to develop solutions that help our company, our clients and the world address the planet's most challenging environmental problems and operate in ways that are more efficient and sustainable.

Global Governance and Management System

IBM's Corporate Policy on Environmental Affairs calls for environmental leadership in all of the company's business activities.

Global Environmental Management System

Our corporate environmental affairs policy objectives range from workplace safety, pollution prevention and energy conservation to product design for the environment and the application of IBM's expertise to help address some of the world's most pressing environmental problems.

IBM's corporate environmental affairs policy calls for environmental affairs leadership in all of the company's business activities. This leadership is implemented through a global environmental management system (EMS) that integrates corporate directives that govern IBM's conduct and operations worldwide. These directives cover areas such as pollution prevention, chemical and waste management, energy management and climate protection, environmental evaluation of suppliers, product stewardship, and incident prevention and reporting. It is through the consistent implementation of this global EMS that IBM ensures operations are executed with the same high standards all across the world.

Employee and management responsibility

As noted in IBM's Business Conduct Guidelines, all IBMers have a role to play in protecting the environment. IBM's corporate policy on environmental affairs and its supporting global EMS provide more specificity on IBM's environmental requirements. Every employee is expected to follow IBM's corporate environmental policy and report any environmental, health or safety concern to IBM management. Managers are expected to take prompt action when faced with a potential violation of the policy or its directives. IBM executives are responsible for the environmental performance of their organizations or locations.

Our environmental programs and performance are routinely monitored and results are reviewed annually by all levels of management up to the Directors and Corporate Governance Committee of IBM's Board of Directors. Formed in 1993, this committee was assigned the ongoing responsibility of reviewing IBM's position and practices on significant issues of corporate public responsibility, including protection of the environment.

Environmental goals

Environmental goals are an important part of IBM's EMS. We maintain environmental goals covering the range of our environmental programs, including climate protection, energy and water conservation, pollution prevention, waste management and product stewardship. These goals and our performance against them are discussed in their respective sections of this report, and are provided in the listing of IBM's environmental Key Performance Indicators.

ISO 14001 Standard on Environmental Management Systems

In 1997, IBM became the first major company in the world to earn a single global registration to the ISO 14001 Environmental Management System Standard. We achieved this credential within just one year of the finalization of the standard.

The initial registration covered IBM's manufacturing, product design and hardware development operations across our business units worldwide. We have since expanded our global ISO 14001 registration to include our research locations that use chemicals, several country organizations with their non-manufacturing locations, our product development function, our Global Asset Recovery Services and our Integrated Supply Chain organization.

As our business model has evolved to include more services offerings, we have updated our EMS to appropriately address environmental opportunities and challenges in the services area.

ISO 50001 Standard on Energy Management Systems

IBM's energy management program dates back to 1974, when our CEO issued a formal corporate policy calling for the conservation of energy and materials in all of IBM's activities. Over the intervening years, we sustained our global energy management program and integrated it into the company's global EMS.

Upon the issuance of the ISO 50001 standard on energy management systems in June 2011, IBM set forth a strategy to achieve verification of conformity of our EMS against this newly published standard.

Within one year of the issuance of this standard, we achieved ISO 50001 registration of our energy management program at the corporate level and as an integral component of IBM's global EMS. Our approach recognizes and leverages the fact that IBM's existing EMS addresses both environmental and energy management.

Consistent with our global ISO certification strategy and following our successful ISO 50001 EMS registration at the corporate level, IBM's major energy-consuming locations are now receiving registration audits of their site-specific energy programs under IBM's single global ISO 50001 certification.

Nine locations — seven in the United States and one each in Mexico and Canada — have successfully concluded their registration audits thus far. Additional IBM locations are undergoing ISO 50001 registration audits during 2014 as we continue the demonstration of conformity of our global EMS, inclusive of our energy program, against the requirements of the ISO 50001 standard.

Public disclosure

IBM's Corporate Policy on Environmental Affairs also calls for the company to publicly disclose information on our environmental programs and performance. This report marks IBM's twenty-fourth consecutive year of annual corporate environmental reporting.

In addition to providing information on our environmental programs and performance in this report and in IBM's annual corporate environmental report, which we have been publishing annually since 2002, we provide a report based on the Global Reporting Initiative (GRI) and provide information through a number of other voluntary reporting programs and tools, such as the Carbon Disclosure Project, EcoVadis and the OneReport Sustainability Reporting Network. For more details on IBM's environmental reporting, see the IBM environmental reporting, disclosure and verification webpage.

Stakeholder Engagement

IBM has a variety of outreach programs through which we engage with various groups and individuals on the subject of the environment. Our community environmental outreach programs range from open houses and emergency preparedness drills with local organizations to the support of and participation in local environmental projects and environmental education efforts.

IBM has ongoing dialogues with many stakeholders, including socially responsible investors and other shareholders, environmental nongovernmental organizations (eNGOs), governments, employees, clients, suppliers, and others on a range of environmental issues. We consider these relationships to be very valuable, as they allow us to share ideas and obtain various perspectives, input and feedback regarding our programs, activities and performance. They also inform our reporting, enabling us to better meet the information needs of a wide variety of interested people and entities.

In addition, IBM Stockholder Relations holds an annual Corporate Responsibility Financial Analysts Call and Webcast during which executives from various areas of corporate responsibility in IBM—including Corporate Environmental Affairs, Global Supply Chain, Corporate Legal/Governance, Global Human Resources, and Corporate Citizenship & Corporate Affairs—present a brief update on our programs and performance and invite questions from analysts on any of the areas of corporate responsibility in IBM.

The executives participating on this annual analyst call are on IBM's Corporate Responsibility Executive Steering Committee. Corporate responsibility is not a separate, standalone organization in IBM. Consistent with our century-long commitment to being a good corporate citizen, corporate responsibility is integrated throughout IBM. We coordinate across the company through our Corporate Responsibility Executive Steering Committee, which consists of executives responsible for the various relevant functions in IBM. The Committee is supported on a day-to-day basis by a Corporate Responsibility Working Group of representative experts from these various IBM functions.

Another example of engagement is collaborative innovation. We believe that integrating different expertise and unique perspectives can accelerate new solutions to longstanding problems. You will find examples of IBM's collaborative innovation—in research and solutions, with business partners, clients, universities and other entities—throughout this report and in the section on Solutions for Environmental Sustainability.

Voluntary Partnerships and Initiatives

IBM is strongly committed to participation in voluntary programs and we have founded or joined many voluntary initiatives and partnerships with governmental and nongovernmental organizations (NGOs) over the years.

Some current governmental examples include the United States Environmental Protection Agency's (EPA) ENERGY STAR®, SmartWay® and WasteWise programs and the European Community's EU ENERGY STAR® program and EU code of conduct for energy-efficient data centers.

Examples of partnerships with environmental NGOs (eNGOs) include membership in the Center for Climate and Energy Solutions (C2ES), Best Workplaces for Commuters, and the Wildlife Habitat Council. We also work with and support organizations such as The Conservation Fund, the Environmental Law Institute, the World Environment Center (WEC) and the WEC's Innovations in Environmental Sustainability Council.

In addition, we partner with other companies and institutions to foster solutions for environmental sustainability. For example, IBM is a founding member of the GridWise® Alliance, an organization representing a broad range of the energy supply chain—from utilities and technology companies to academia and venture capitalists. Its mission is to transform the electric grid to achieve a sustainable energy future.

The Eco-Patent Commons

The Eco-Patent Commons provides a unique opportunity for business to share innovation that can foster sustainable development. It was designed to facilitate the use of existing innovation that is protective of the environment,

and encourage collaboration for new innovation through an online collection of environmentally beneficial patents pledged by the member companies for free use by anyone.

Examples of the environmental benefits of patents that may be pledged to the Eco-Patent Commons include:

- Energy conservation or improved energy or fuel efficiency
- Pollution prevention (source reduction, waste reduction)
- Use of environmentally preferable materials or substances
- Water or materials use reduction
- Increased recyclability

Since the launch of the Eco-Patent Commons by IBM, Nokia, Pitney Bowes, Sony and the World Business Council for Sustainable Development in January 2008, more than 100 patents have been pledged by 11 member companies representing a variety of industries worldwide: Bosch, Dow, Fuji-Xerox, HP, IBM, Nokia, Pitney Bowes, Ricoh, Sony, Taisei and Xerox. The Environmental Law Institute became the host organization in 2013.

A Recent Addition: The Nature Conservancy's Latin America Conservation Council

The Nature Conservancy is one of the world's premier conservation organizations. As a nonprofit eNGO with work in 30 countries and all 50 US states, it addresses pressing conservation threats at a large scale. The Latin America Conservation Council (LACC) was conceived in 2011 by a group of leading business thinkers and conservationists who wanted to apply their expertise, influence and resources to the task of putting Latin America on a sustainable path.

In partnership with The Nature Conservancy, LACC members aim to help conserve Latin America's "natural capital" – its healthy rivers, forests and seas – as well as to solve real environmental challenges across the region and develop innovative, pragmatic, and scalable solutions to three widespread environmental challenges: water security, sustainable food security, and smart infrastructure.

In early 2013, IBM CEO Ginni Rometty joined the LACC on behalf of IBM. Since then, IBM has been leveraging its deep expertise with Smarter Planet® solutions and sharing IBM's point of view about the role technology can play for solving these three grand environmental challenges.

For a more complete listing of our voluntary partnerships and initiatives, see IBM's voluntary environmental initiatives webpage.

We also encourage our employees to support environmental efforts. For example, through our Matching Grants program IBM matches contributions made by our US employees to a wide variety of environmental organizations including The Nature Conservancy and the World Wildlife Fund, as well as smaller groups dedicated to preserving lands and habitats in local communities.

In addition, our employees can support environmental organizations in their local communities through IBM's On Demand Community (ODC) program. ODC is a first-of-its-kind global initiative to encourage and sustain corporate philanthropy through volunteerism. It provides our employees and retirees with a rich set of IBM technology tools they can use to help schools and nonprofit organizations with which they volunteer, including environmental organizations. The program combines the expertise, interests and skills of our employees with the power of IBM's innovative technologies and solutions to help nonprofit organizations more effectively address community needs.

Environmental Investment and Return

Over the past five years, IBM has spent $74.7 million in capital and $479.5 million in operating expense to build, maintain and upgrade the infrastructure for environmental protection at our plants and labs, and to manage worldwide environmental programs.

Environmental Capital and Expense Worldwide
($ in Millions)

	2009	2010	2011	2012	2013
Capital	$14.3	$15.1	$18.4	$9.9	$17.0
Expense*	$102.3	$90.6	$96.1*	$98.2	$92.3
Total	$116.6	$105.7	$114.5	$108.1	$109.3

**IBM modified its methodology for estimating operating expenses in 2011 to include information on expenses associated with compliance with worldwide environmental legal requirements for products, including costs associated with compliance with worldwide product takeback and recycling requirements.*

IBM has tracked environmental expenses related to our facilities, corporate operations and site remediation efforts for more than 25 years, and began publicly disclosing this information in our environmental report for 1992. In 2011, we expanded our tracking of environmental expenses to include expenses associated with compliance with environmental legal requirements related to products, including those costs incurred for compliance with product takeback and recycling requirements. In 2013, total environmental expenditures associated with IBM's operations were $109.3 million.

IBM also estimates savings that resulted from our policy of environmental leadership. These include savings that come from energy, material and water conservation; recycling; packaging improvement initiatives; reductions in chemical use and waste, and process improvements from pollution prevention. Ongoing savings from the previous years' initiatives are not carried over in this comparison, resulting in very conservative estimates.

$125.2 million

estimated environmental savings and cost avoidance worldwide in 2013

In addition, IBM realizes avoidance of costs that likely would occur in the absence of our environmental management system. These savings are not measurable in the same way that expenses are, but avoiding these environmental costs does result in savings for IBM, and a reasonable attempt has been made to estimate them. In 2013, IBM's estimated environmental savings and cost avoidance worldwide totaled $125.2 million.

IBM's experience has shown that annual savings from our focus on conservation, pollution prevention and design for the environment consistently exceed environmental expenses, thus demonstrating the value of proactive environmental programs and performance.

2013 Environmental Expenses Worldwide
($ in Millions)

Personnel	$39.5
Consultant and legal fees	2.7
Laboratory fees	2.2
Permit fees	0.8
Waste treatment and disposal	7.1
Surface water and wastewater management operations	8.7
Air emission control operations	0.3
Groundwater protection operations	0.7
Product takeback and recycling costs	0.9
Waste and materials recycling	4.2
Superfund and former IBM site remediation	16.2
Other environmental operations	9.0
Total	**$92.3**

2013 Estimated Environmental Savings and Cost Avoidance Worldwide
($ in Millions)

Location pollution prevention operations*	$32.5
Corporate operations*	7.4
Packaging improvements	4.7
Environmentally preferable materials usage	0.2
Energy conservation and cost avoidance	49.5
Superfund and site remediation efficiencies	1.0
Spill remediation cost avoidance**	4.9
Compliance cost efficiency***	18.5
Potential fines, penalty and litigation avoidance****	6.5
Total	**$125.2**

** Savings or costs avoided by having internal professional staff and tools versus using external consultants and tools.*

*** These savings are estimates based upon certain assumptions. The figure for spill remediation cost avoidance is estimated considering IBM's actual experience with remediation costs.*

**** Compliance cost efficiency considers costs avoided through proactive efforts to stay ahead of environmental regulations and requirements.*

***** The estimation for the avoidance of potential fines, penalties and litigation does not include cost avoidance of potential business interruption or fines related to noncompliance with product environmental laws and regulations (e.g., EU REACH or RoHS requirements).*

Energy Conservation & Climate Protection

IBM recognizes climate change as a serious concern that warrants meaningful action on a global basis to stabilize the atmospheric concentration of greenhouse gases (GHGs). We believe all sectors of society, the economy and governments worldwide must participate in solutions to climate change.

Climate Change

IBM has been a leader in addressing climate change through our energy conservation and climate protection programs for decades. IBM's leadership is defined by our:

- Longstanding global commitment
- Comprehensive and multifaceted programs covering the company's operations, products and services
- Leading-edge innovations and client solutions
- Significant results, both early and ongoing, benefiting IBM, our clients and the world

A Six-Part Strategy

We have a longstanding commitment to climate protection and execute a six-part strategy to reduce the GHG emissions related to our operations:

1. Designing, building, updating and operating facilities, including data centers and manufacturing operations, that optimize their use of energy and materials and minimize GHG emissions
2. Purchasing electricity generated from low carbon dioxide (CO_2)-emitting and renewable energy-generating sources where it makes business and environmental sense
3. Minimizing the use and emissions of GHGs in semiconductor manufacturing, including perfluorocompounds (PFCs—a family of GHGs) and other GHGs

4. Requiring our suppliers to maintain an Environmental Management System which includes energy use and GHG emissions inventories and reduction plans

5. Reducing employee commuting and business travel

6. Increasing the efficiency of IBM's logistics operations

In addition, for our hardware and software products and services, IBM's strategy includes designing energy-efficient products and providing clients with energy-efficient solutions that also help reduce their climate impact.

IBM considers energy and material conservation to be the cornerstone of our climate protection efforts. IBM does not have plans to use emissions offsets to become "carbon neutral" for all or part of our operations. Our efforts to reduce IBM's GHG emissions are focused on delivering results in the areas where the company can make the greatest positive impact on climate protection—by devoting available resources to actions, products and solutions that actually increase energy efficiency and reduce GHG emissions for both IBM and our clients, rather than offsetting them.

Conserving Energy

IBM's commitment to energy conservation dates back to 1974 and has continued unabated ever since. Energy conservation is a major component of our comprehensive, multifaceted climate protection program because the release of CO_2 by utility companies powering our facilities, or from the use of fuel for heating or cooling, represents the greatest potential climate impact associated with our operations.

In 2013, IBM's energy conservation projects across the company delivered savings equal to 6.7 percent of our total energy use versus the corporate goal of 3.5 percent. These projects avoided the consumption of 334,000 megawatt-hours (MWh) of electricity and 275,000 million British thermal units (Btu) of fuel oil and natural gas, representing the avoidance of 152,000 metric tons of CO_2 emissions. The conservation projects also saved $35.8 million in energy expense, an increase of $0.8 million over 2012 savings. These strong results are due to our continued, across-the-board focus on energy demand reduction, efficiency and the implementation of standard, global energy conservation strategies for facility operating systems.

IBM's energy conservation goal recognizes only completed projects that actually reduce or avoid the consumption of energy in our operations. Reductions in energy consumption from downsizings, the sale of operations and cost avoidance actions, such as fuel switching and off-peak load shifting,

Energy Conservation

3.5%

Goal
Achieve annual energy conservation savings equal to 3.5 percent of IBM's total energy use.

6.7%

Result
In 2013, IBM's energy conservation projects across the company delivered savings equal to 6.7 percent of its total energy use.

152,000 metric tons

of CO_2 emissions avoided through IBM's energy conservation projects in 2013

are not included in the results for measuring performance against achieving this goal. Moreover, the conservation results discussed above are conservative in that they include only the first year's savings from the conservation projects. Ongoing conservation savings beyond the first year are not included in the tally. Accordingly, the total energy savings and CO_2 emissions avoidance from these conservation actions is actually greater than this simple summation of the annual results.

Electricity and Fuel Use and Related CO_2 Emissions

Scope 1 and Scope 2 CO_2 Emissions

		CO_2 Emissions (estimated) (metric tons x 1,000)	
Year	**Electricity and fuel use (1,000 MMBtu)**	**Calculated with grid emissions factors**	**Reduced by the CO_2 avoided by renewable electricity purchases**
2009	21,507	2,895	2,436
2010	21,622	2,426	2,156
2011	21,758	2,397	2,182
2012	21,613	2,404	2,195
2013	21,190	2,186	1,962

IBM uses the Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard developed by the World Resources Institute and the World Business Council for Sustainable Development for estimating and reporting its CO_2 emissions.

CO_2 emissions data includes the CO_2 avoidance associated with IBM's purchases of renewable energy.

Between 1990 and 2013, IBM saved 6.4 billion kWh of electricity consumption, avoided 4.0 million metric tons of CO_2 emissions (equal to 59 percent of the company's 1990 global CO_2 emissions) and saved $513 million through its annual energy conservation actions.

1990-2013

6.4 billion kWh

of electricity conserved, 4 million metric tons of CO_2 emissions avoided and $513 million saved between 1990 and 2013 through IBM's annual energy conservation actions

Managing IBM's energy program

Our global energy management program leverages the expertise of more than 50 IBM energy management professionals deployed around the world. The team has created best-practices checklists that set minimum expectations for building systems and operations, including controls and equipment for lighting, heating/ventilating/air conditioning (HVAC), central utility plants, compressed air, data center and IT systems, cafeterias, and office systems.

All IBM sites using 2,000 MWh/year or more of energy must complete the checklists, perform a gap analysis and develop an energy conservation implementation plan a minimum of every four years. The program is buttressed by several enterprise-level databases that collect, store and analyze energy-use data, conservation project results, completed checklists, and relevant key performance indicators. These analyses enable monthly metrics reporting to the management team and the identification of opportunities for improvement. The continuous review of energy use and conservation performance has driven the strong results noted above.

More than 2,600 energy conservation projects involving a full-range of energy efficiency initiatives delivered savings at 364 IBM locations globally in 2013. Examples include:

- Projects to match building lighting and occupancy schedules or install more efficient lighting systems were implemented at 171 locations, reducing electricity use by 10,400 MWh while saving $1.1 million.

- HVAC systems or operating schedules were modified at 165 locations reducing 50,700 MWh of electricity use and 107,600 MMBtu of fuel use, saving $6.1 million.

- Central utility plant projects were implemented at 85 locations:

    - Boiler and chiller operation optimization helped reduce 29,500 MWh of electricity and 4,100 MMBtu of natural gas consumption at a savings of $1.5 million.

    - Free cooling reduced 2,800 MWh of electricity consumption saving $98,000.

    - Equipment upgrades and maintenance improvements reduced 22,900 MWh of electricity and 56,000 MMBtu of natural gas consumption while saving $0.9 million.

- Manufacturing energy-efficiency projects:

    - IBM’s microelectronics locations derived energy savings from over 100 efficiency improvement projects in their manufacturing and test areas. These projects saved 28,000 MWh of electricity, 68,000 MMBtu of fuel and $2.4 million.

    - Results were achieved by increasing manufacturing equipment capacity and throughput, improved HVAC management and optimized temperature and humidity settings, and installation of more efficient equipment.

Leveraging analytics for further efficiencies

As "standard" opportunities for incremental savings from typical energy conservation projects have diminished due to IBM's decades-long focus on energy efficiency, we are increasingly leveraging analytics to uncover less obvious, embedded opportunities to achieve continual improvement in operational energy efficiency.

Smarter Buildings technologies such as IBM TRIRIGA® Energy Optimization (ITEO) are being deployed in IBM facilities to increase energy efficiency. IBM locations are updating and connecting existing sensor networks to analytics-based control systems to collect data and analyze individual events and system trends. The information gained is then used to optimize building energy consumption.

ITEO enables facility operations staff to continually inspect the building infrastructure and quickly correct problems – be they simple or complex. Two examples follow:

- At one location, ITEO identified a discarded piece of cardboard that had partially blocked an intake duct - wasting 453 MWh/year.

- At another location, ITEO identified that a low temperature safety setting, which runs the air handlers at low outside temperatures to prevent coil freezing and damage, was depending on a sensor that was located in a room that was unheated on the weekend while the air handler was in a heated space. It was thus causing the freeze protection to start automatically most weekends during the winter wasting 457 MWh/year of energy.

In the above instances, continuous monitoring of the system operations quickly revealed and allowed correction of the out-of-specification conditions, which likely would have lingered for an extended period of time on a traditional manual preventative maintenance program.

IBM has deployed ITEO at 28 of our highest energy consuming sites, with deployment underway at six more locations in 2014. In 2013, the installed systems realized savings of 13,600 MWh of electricity and 76,000 MMBtu of fuel consumption, with a net savings of $1.5 million.

IBM has now introduced a new product, TRIRIGA Real Estate Environmental Sustainability Impact Manager (TREES), with increased functionality and capability to replace ITEO. IBM will begin upgrading ITEO to TREES in its internal operations in 2014.

Data centers

IBM manages a diverse portfolio of data centers, consisting of both IBM and IBM-managed customer facilities all over the world. IBM operates additional

raised-floor space to support internal operations, as well as design and test centers, for our Systems and Technology Group and Software Group.

We take a holistic approach to managing our data center portfolio— building new, high-efficiency data center space where we need to expand our raised-floor space to meet the needs of existing and new customers, and retrofitting and improving existing data center space to increase utilization and derive more workload per area, equipment and energy resources. These efforts are accomplished through initiatives that include the following:

1. Building new high-efficiency data center space: IBM's most recent data center expansions in the United States have achieved LEED certification and use state-of-the-art design and system techniques to enable Power Usage Effectiveness (PUE) measurements of 1.4 to 1.6 when the data center is fully populated. PUE is the ratio of the total power required at the data center divided by the power required to operate the IT equipment.

2. Implementing best practices and thermal monitoring programs at our data centers to optimize cooling delivery and minimize energy use and cost.

3. Consolidating and virtualizing workloads for our internal operations and our customers' operations, and utilizing cloud computing.

Efficiency improvements in existing data centers

In 2013, we completed nearly 300 projects at more than 85 existing data center locations. These projects reduced energy use by over 53,400 MWh, and saved more than $5.2 million. This energy savings is equivalent to the total annual energy use of 5,000 homes in the US.

$5.2 million

saved by nearly 300 energy conservation projects at more than 85 existing data center locations that reduced energy use by a total of over 53,400 MWh

The IBM Measurement & Management Technologies (MMT) thermal management system has been installed at IBM's major data centers representing more than 60 percent of the global raised-floor energy consumption for IBM's internal and client IT operations. This innovative technology from IBM Research produces a real-time, three-dimensional thermal map of the detailed heat sources and sinks within a data center. Using the information provided by MMT, IBM has been able to take the following actions over the past three years:

- Install thousands of blanking panels and cable cutout plugs, reducing the short-circuiting of cooling air in the data center

- Shut down more than 30 percent of the total installed computer room air conditioning (CRAC) units from 2010-2013 and improved average CRAC utilization to greater than 60 percent

- Increase the average raised-floor temperature by 0.5ºC in 2013 and 1.6ºC for the period 2011-2013, with work continuing to further raise temperatures toward an average of 24ºC

MMT offers the additional benefit of rebalancing a data center's thermal profile as equipment is removed and installed, enabling the early identification of developing problems to proactively mitigate their impacts.

System virtualization and cloud computing

Virtualizing workloads allows a single system to support multiple applications or images, making greater use of the full capabilities of the IT equipment and executing more workloads in less space with less energy.

IBM is utilizing virtualization to consolidate multiple workloads from servers and storage systems with low utilization onto single systems, reducing energy use and cost by more than 99,000 MWh and $11 million in 2013. IBM virtualized more than 30,000 applications in our owned/leased data centers in 2013 and plans to continue these projects in 2014 and beyond to continually improve utilization of IBM and client hardware assets and reduce data center operation energy use and space requirements.

We continued to expand IBM's cloud computing programs through 2013, offering IBM Cloud Managed Services from 12 IBM data centers around the globe and, with our acquisition of SoftLayer in 2013, an additional 7 data centers in the United States and 6 locations around the globe in third-party data centers. IBM and SoftLayer announced a $1.2 billion investment to increase IBM's global cloud data center portfolio to 40 global locations. Cloud computing is an efficient model for providing IT services that optimize hardware utilization and virtualization technologies. It allows us to further improve utilization of IT equipment assets, better balance workloads, adjust power consumption, and virtualize infrastructure in data centers to align processing and storage needs with power consumption.

Data center power usage performance

IBM measures, calculates or uses estimating protocols to determine the PUE of the data centers we manage. These data centers include recently constructed Leadership Data Centers as well as large legacy data centers. The average PUE for this raised-floor space is 1.73, based on data collected from 58 percent of the raised-floor space.

Because the majority of the data centers in IBM's facility portfolio consists of spaces that are 10-30 years old and contain IT equipment varying in age from new to 10 years, improving the energy efficiency of these data centers requires thoughtful planning and execution to ensure that we meet both our operational objectives and our commitments to our customers.

The overall performance of these IBM data centers compares favorably with

the average PUE of 1.65 as reported in the Uptime Institute 2013 Data Center Industry Survey of 1,000 data center users predominately located in North America and with an average PUE of 2.9 as reported by a Digital Realty Trust 2012 survey of 300 IT decision makers. IBM has made – and will continue to make – significant investments and improvements to reduce energy demand and improve energy efficiency in our data centers.

Voluntary data center energy efficiency initiatives

In January 2012, the European Commission awarded 27 IBM data centers in 15 European Union (EU) countries with "Participant" status in Data Center Energy Efficiency, based on the EU Code of Conduct (CoC) for Energy Efficiency in Data Centres. We subsequently registered an additional 16 data centers to "Participant" status later in 2012.

46

IBM data centers across

19

countries were awarded "Participant" status in Data Center Energy Efficiency, based on the EU Code of Conduct (CoC) for Energy Efficiency in Data Centres

Three additional IBM data centers were awarded "Participant" status in 2013, bringing our total to 46 registered data centers across 19 countries -- the largest portfolio of data centers from a single company to receive the recognition to date. These registered data centers represent more than 70 percent of IBM's IT delivery and business recovery data center space in the EU. The EU CoC for Energy Efficiency in Data Centres is a voluntary initiative that aims to promote energy efficiency performance standards for data centers.

IBM maintains energy efficiency leadership in data centers by deploying uniform practices across our global data center portfolio. In addition, IBM applies innovative solutions such as Measurement & Management Technologies (MMT) thermal monitoring and control system, virtualization technologies, dynamically managed air conditioning control systems, and development of alternate power systems such as the direct-current solar system at IBM's software lab in India.

IBM data center and IT system professionals continue to be involved in governmental and professional data center energy efficiency initiatives, including the EU CoC for Energy Efficiency in Data Centres program, ENERGY STAR and The Green Grid initiatives. These programs set operating criteria or metrics that inform and encourage data center operators and owners to reduce energy consumption in a cost-effective manner while enabling operators to maintain the mission-critical functions of their data centers.

An additional significant energy conservation goal

Since 2009, an integrated team from IBM's environmental and finance staffs, real estate organization and business units have collaborated to realize energy conservation savings through a multi-disciplinary assessment of demand-side opportunities in manufacturing, data center, and IT test lab operations. The initial effort from 2009-2012 saved 1,246,000 MWh of energy through conservation and efficiency. The projects involved the deployment of unique

IBM technologies and know-how, as well as a strong management system supported by senior executives.

In early 2013, the same integrated team leveraged their skill and expertise and established processes to set a new 2013-2015 Energy Conservation and Efficiency Plan to save an additional 570,000 MWh of energy by year-end 2015. By year-end 2013, the team delivered 321,500 MWh of energy savings which exceeded the first year target of 207,200 MWh by 55 percent.

The following provides a summary of the accomplishments achieved in 2013:

- As discussed earlier, data center cooling optimization and virtualization projects delivered energy savings of 152,400 MWh and $16.2 million. In addition, we retired end-of-life and/or end-of-project server and storage systems to reduce an additional 12,700 MWh of electricity, saving $1.3 million.

- Chilled Water Optimization utilizing real-time analytics to maximize the overall efficiency of chilled water systems saved 22,000 MWh and $1.4 million.

- At IBM's semiconductor manufacturing locations and hardware development and test labs, conservation projects involving equipment and process broadening, optimizing clean room temperature and humidity specifications, virtualization and consolidation of IT equipment, and the installation of higher-efficiency equipment saved 66,000 MWh in energy use and $3.9 million.

Renewable Energy

In 2013, IBM contracted with its utility suppliers to purchase 580 million kWh of renewable energy over and above the quantity of renewable energy provided as part of the mix of electricity that we purchased from the grid. The 580 million kWh represented 11.8 percent of our global electricity usage and resulted in the avoidance of 224,000 metric tons of CO_2 emissions.

IBM's renewable energy purchases increased by 16 percent from 2012 to 2013. The increase was achieved through the addition of 2,178 MWh of wind-generated electricity in India and over 98,000 MWh of hydro power at our New York facilities. In addition, approximately 5 percent of IBM's electricity purchases from the grid were electricity generated from renewable sources – bringing our total renewable energy purchases to approximately 17 percent of our consumption in 2013.

IBM continued to contract for defined renewable energy purchases above and beyond the renewable electricity supplied in our overall contracts in Australia, Austria, Belgium, Denmark, Finland, Germany, Italy, Japan, Netherlands,

580 million kWh

of renewable energy purchased by IBM from its utility suppliers

11.8%

The amount of IBM's global electricity usage represented by purchased renewable energy

Spain, Sweden, Switzerland, the United Kingdom and the United States in 2013. We added 2,178 MWh of wind-generated electricity in India in 2013. These purchases enable 33 percent of IBM's locations with data centers, IT labs, and/or product development labs and over 40 percent of its cloud data centers to source some or all of their electricity from renewable generation sources.

In addition, SoftLayer, which was acquired by IBM in April 2013, procured 10 percent of its electricity use, 6,500 MWh, in 2013 from wind-generation sources at three of its Texas data centers. It completed a contract in April 2014 to increase the procurement to 100 percent wind-generated electricity. SoftLayer's energy use and CO_2 emissions data is not included in this report for 2013, but we wanted to note the renewable electricity purchases that have been made at the three cloud facilities.

We procure renewable electricity generated from a mix of wind, large and small hydro, biomass, and solar installations around the globe. We report all of our contracted renewable electricity purchases and the associated CO_2 avoidance, be they from new, "additional" or existing generation sources, and without discriminating large hydro installations. Our rationale is that all purchases signal to our suppliers our desire for them to maintain and broaden their renewable electricity offerings. We value all economically accessible renewable generation sources and their availability from our utility suppliers.

Our procurement of renewable energy must meet our business needs. Not only should the offerings be cost-competitive with market prices over time, but the electricity supply must also be consistently reliable to ensure uninterrupted power for our critical operations. IBM's strategy of contracting for defined renewable energy has been successful in Europe and we continue to request the inclusion of electricity generated from renewable sources as an option in our contracts in all geographies.

Procuring electricity from renewable sources remains complicated by the relatively low energy density and intermittent nature of wind- and solar-generated electricity, limitations and choke points in the electricity transmission system, and international, national, state, and provincial treaty, regulatory and legislative requirements. Continued advances are needed in renewable electricity generation, distribution and storage technologies, and contracting and delivery mechanisms to increase the availability of economically viable renewable electricity in the marketplace to supply electricity directly to consuming locations. IBM is working with industry peers, utilities, NGOs and other renewable energy industry participants to identify, develop and capture opportunities to procure electricity generated from renewable sources where it makes business sense.

IBM also endeavors to incorporate on-site solar energy, co-generation or tri-generation systems, or geothermal systems on an individual location basis. Some recent examples:

- In 2012, we contracted with the landlord of a leased location in Massachusetts to purchase electricity from a 780-kilowatt (kW) rooftop solar panel array at this location. The system supplies electricity directly to the facility and is estimated to deliver 5-10 percent of the location's annual electricity use. The system became fully operational in April 2013.

- Three facilities in Europe have co-generation/tri-generation systems which provide 10-20 percent of our electricity use at these facilities, as well as heating and cooling to support building operations.

- The IBM Zurich Research Center has a 40 kW solar photovoltaic (PV) system to generate electricity and a 480 MWh geothermal heating system.

- The IBM India Research lab operates a 50 kW solar PV system which is used to supply direct-current power to operate a server rack.

- The IBM Research Triangle Park, North Carolina, facility has a solar hot water system that supplies hot water to the site cafeteria.

We are continuing to pursue additional opportunities to install on-site electricity generation systems at our facilities. These systems offer a means to diversify our electricity supply and increase our purchases of renewable energy, though they typically only generate 10-20 percent of our site energy demand because the majority of the energy consumed by IBM occurs at locations with energy-dense activities, such as data centers and semiconductor manufacturing sites.

Research and solutions to advance the use of renewable energy

As noted earlier, procuring electricity from renewable sources remains complicated for all but new-built facilities specifically located to be powered by renewable energy. In part, this is due to the relatively low energy density and intermittent nature of wind- and solar-generated electricity, and to limitations and chokepoints in the electricity transmission system. In addition to procuring renewable energy for our own use, IBM is working to further the availability and affordability associated with various forms of renewable energy by investing in IT-related research and development. Two examples are provided here. Other examples may be found in the Solutions section of this report.

- IBM Research is developing the Wind and Hydro Integrated Stochastic Engine (WhISE), which is an energy generation planning tool that forecasts renewable generation and matches it with expected demand and available hydro resources to manage and optimize the dispatching of committed power. The WhISE approach enables the grid to reduce reserve generation capacity while insuring that demand is met,

reducing power costs on the system.

- IBM partnered with an energy provider in Switzerland to implement an automated demand management program that utilizes residential water heaters to manage the intermittent influx of renewable electricity into the grid. The networked system uses predictive analytics to optimize power transfer from the grid to the water heaters based on a complex set of variables including energy-use forecast data, the availability of renewable-source electricity, and electricity pricing predictions. The innovative system enables intelligent demand-side management, which in turn enables better integration of renewable generation into the grid system, while offering consumers savings on their electricity bill.

Operational CO_2 Emissions Management

IBM's operational CO_2 emissions, those associated with IBM's use of fuel and electricity at its locations, were reduced 10.6 percent from 2012 to 2013. There were three key factors that drove this year-to-year reduction:

- IBM's energy conservation efforts drove reductions in electricity use for the second year in a row. Electricity use was reduced by 3.1 percent year-to-year as a result of the energy conservation work discussed earlier in this report, resulting in a decrease in CO_2 emissions of 2.8 percent.

- The CO_2 emissions factors associated with our electricity purchases at several locations were reduced as a result of a change in electricity suppliers and/or a change in the mix of generation sources supplying the locations. These changes contributed to a reduction of approximately 6.7 percent in the CO_2 emissions inventory.

- The increase in the amount of renewable energy IBM procured in 2013, discussed above, resulted in a reduction of 1.1 percent in the CO_2 emissions inventory.

IBM met its second-generation climate protection goal in 2012, reducing our operational CO_2 emissions by 15.7 percent against the 2005 baseline and exceeding our commitment to achieve a 12 percent reduction over the period. The significant reductions achieved in the 2013 operational CO_2 inventory are indicative of IBM's continued commitment to addressing the challenges of climate change through energy conservation initiatives and the procurement of renewable energy for its operations.

Operational CO_2 Emissions Management

10.6%

reduction in operational CO_2 emissions associated with IBM's use of fuel and electricity at its locations from 2012 to 2013

PFC Emissions Management

IBM releases some perfluorocompounds (PFCs) from our semiconductor manufacturing operations, with PFC emissions representing approximately 10 percent of IBM's Scope 1 and 2 emissions. IBM was the first semiconductor manufacturer to set a numeric reduction target for PFCs in 1998. We subsequently set a second-generation goal to achieve an absolute reduction in PFC emissions from semiconductor manufacturing of 25 percent by 2010 against a base year of 1995. We exceeded this goal by reducing IBM's PFC emissions by 36.5 percent at the end of 2010.

PFC Emissions Management

12.7%

reduction in PFC emissions between 2010 and 2013

We continue to take actions to reduce our PFC emissions and monitor performance. Our PFC emissions were 194,300 metric tons of CO_2e, a reduction of 12.7 percent from 2010. The IBM semiconductor manufacturing plant in Vermont continued to convert from C_2F_6 to C_4F_8 on selected chamber cleaning processes, accounting for approximately half of the reductions. C_4F_8 has a much higher utilization rate and much lower global warming potential than C_2F_6, significantly reducing the GHG emissions from the process. The other half of the reductions can be attributed to reduced production for the year due to current market conditions.

IBM's manufacturing facility in New York also continues to abate its PFC emissions associated with its semiconductor operations, minimizing the emissions from that facility.

IBM also monitors three other materials with global warming potentials that are used in connection with manufacturing, lab and office operations: 1) nitrous oxide (N_2O), which is used in manufacturing semiconductors but has a lower global warming potential than PFC gases; 2) heat transfer fluids (HTFs) that are primarily used in tool-specific chiller units associated with manufacturing and lab processes; and 3) HFCs which are used in chiller units used to cool manufacturing, lab, or office space.

IBM continues to evaluate replacements for the HTFs that have lower volatility and global warming potential. IBM has achieved reductions in these emissions through the use of lower GHG-emitting materials in some test operations and through the installation of solid-state chillers on some semiconductor equipment.

Overall CO_2 Emissions Inventory

IBM tracks and manages operational Scope 1 and 2 emissions across its operations, collecting and aggregating data from its data center, semiconductor research and manufacturing, hardware development and assembly and office operations. As discussed in the previous sections, IBM has a broad, effective set of programs and processes to inventory its energy

use and GHG emissions and take action to increase the efficiency of its operations. IBM decreased its overall Scope 1 and 2 emissions by 10.6 percent from 2012 to 2013. The summary of our 2013 emissions inventory is provided in the following table:

IBM 2013 Scope 1 and 2 Emissions Inventory
(Metric Tons [MT] of CO_2 equivalent)

	Emissions Type	2012	2013
Scope 1 Emissions			
Fuel Use	Operational	220,851	225,514
Perfluorinated Carbon Compounds	PFC	231,832	194,301
Nitrous Oxide	Other	24,037	23,150
Heat Transfer Fluids	Other	57,436	61,747
HFCs	Other	7,428	9,752
Total Scope 1 Emissions		**541,584**	**514,464**
Scope 2 Emissions			
Electricity: Using Grid and Location MT CO_2/MWh Emissions Factors	Operational	2,162,543	1,934,736
Purchased Energy Commodities	Operational	45,916	43,858
Total Scope 2 Emissions		**2,208,459**	**1,978,594**
Total Scope 1 and 2 Emissions		**2,750,043**	**2,493,058**
CO_2 Avoidance: Renewable Electricity Purchases	Operational	(211,819)	(223,624)
Total Scope 1 and 2 Emissions Adjusted for Renewable Electricity		**2,538,224**	**2,269,434**

Transportation and Logistics Initiatives

Employee commuting and leased/rental vehicles

IBM has been active for decades in promoting programs that reduce employee work commutes. Key contributors to this effort are IBM's two flexible work programs:

- Work-at-home: Enables many employees to work from a home office
- Mobile employees: Enables many other employees to work from home for a designated number of days each week

In 2013, 105,000 of our 431,000 global employees participated in one of these two programs, which not only helps employees balance their work and personal responsibilities, but also benefits the environment. In the United States alone, IBM's work-at-home program conserved approximately 5.6 million gallons of fuel and avoided more than 44,000 metric tons of CO_2 emissions in 2013.

IBM is a member of the Center for Urban Transportation Research (CUTR) Best Workplaces for Commuters (BWC) program. Currently, 22 IBM locations are registered as BWC sites, which represent approximately 60 percent of the company's US employees. Many locations actively work with their local or regional transit commissions to integrate IBM's programs with regional programs to increase commuting options for the company's employees. Globally, many of our locations provide support for the use of public transit systems, including shuttles from locations to mass transit stations and alternate transportation or "loaner" cars for business trips during the workday.

In some countries, IBM provides leased vehicles for employees that they may use for both business and personal purposes. For these vehicles, we continue our effort to move to more fuel-efficient models by setting standard guidelines for smaller engine sizes with lower emissions profiles. These guidelines enable reductions in average car emission levels as their car fleets are renewed. For the cars our employees rent while travelling for business, we have worked with rental car companies to require and/or offer more fuel-efficient vehicles for employee rentals.

Efficiency of logistics

IBM is reducing the CO_2 emissions associated with transporting our products through the efficient design of our packaging, working with suppliers on their packaging designs and optimizing logistics. IBM has been an active participant of the US EPA's SmartWay Transport Partnership since 2006. SmartWay is a voluntary initiative to improve fuel efficiency and reduce GHG emissions associated with logistics operations.

Since 2009, 100 percent of IBM's spend for shipping goods within the United States and from the United States to Canada and Mexico went through a SmartWay logistics provider. IBM also voluntarily applies specific SmartWay requirements to our distribution operations globally.

IBM's packaging programs also help reduce transport-associated CO_2 emissions by reducing the volume and weight of the company's product shipments through innovative packaging design. Accomplishments in this area are discussed in the Product Stewardship section of this report.

Energy and Climate Protection in the Supply Chain

IBM is committed to doing business with environmentally responsible suppliers. One of the supply chain areas on which we focus is our suppliers' energy efficiency and climate protection programs.

We require that all of our "first-tier" suppliers—those firms with which we hold a direct commercial relationship—establish and sustain a management system to address their corporate and environmental responsibilities—including their use of energy and Scope 1 and Scope 2 GHG emissions. Our suppliers are also required to measure their performance, establish voluntary goals in these areas, and publicly disclose their performance against those goals. We manage this requirement through two processes: IBM's own supplier environmental management system requirements, and our membership in the Electronic Industry Citizenship Coalition (EICC).

IBM has continued to work with Tier 1 suppliers to further our company's requirement that all IBM suppliers have an environmental and social management system in place and disclose information on goals and performance. More information on this supplier program may be found in the Environmental Requirements in the Supply Chain section. The IBM Integrated Supply Chain organization assesses suppliers (existing and new) as to their compliance with the IBM Social and Environmental Management System Requirements as a component of its broader supplier management and assessment process.

IBM's requirements for our suppliers rest on the foundational belief that real results in GHG emissions reduction are made possible by actionable information about a company's energy use and GHG emissions, and that each company is best positioned to assess and implement actions to address its own emissions in a way that is meaningful and sustainable. In short, each enterprise must take responsibility to reduce its own energy use and GHG emissions.

IBM has been an active participant in the EICC Environmental Reporting

Initiative, which asks EICC members and suppliers in the global electronics supply chain to measure and report key energy consumption, carbon emissions, water, and waste indicators. We believe, as do the other EICC members, that as companies gain an understanding of their energy use and GHG emissions, they are more likely to take actions to improve their performance. EICC and its member companies have developed education modules to assist suppliers in developing their energy use and GHG emissions inventories. Companies in the electronics industry share many suppliers, and the EICC GHG emissions disclosure process provides efficiency associated with information disclosure. We use the EICC reports completed by our component and parts suppliers to augment and validate our internal supplier assessment work.

IBM's position on the determination of Scope 3 GHG emissions

Gross approximations of Scope 3 GHG emissions can help entities recognize where the greatest amounts of GHGs may occur during the lifecycle of a typical process or general product or service on a macro level. This can be helpful when assessing, for example, what phases of a general product's design, production, use and disposal are ripe for improved energy efficiency and innovation. However, IBM does not assert on a micro level what the Scope 3 GHG emissions are from the operations of our suppliers and external distribution partners in their work that is specific to IBM, or associated with the use of our products and services. The necessary estimating assumptions and corresponding variability simply do not allow for adequate credibility, let alone calculations that could be perceived as deterministic.

Like many manufacturers, IBM has thousands of suppliers around the world. They are in all types of businesses and very few, if any, work solely for IBM. Furthermore, the sources of energy used by these suppliers vary, and IBM does not believe we could determine a credible estimate or apportionment of the energy used by these suppliers that would be associated with the products or services provided to IBM, versus that associated with products or services provided to other companies and customers. In addition, IBM's specific scope of business with any given supplier remains dynamic, as it is driven by business need.

Moreover, one company's asserted Scope 3 emissions are another company's Scope 1 and Scope 2 emissions. Since the ultimate goal for climate protection is for global societies to achieve demonstrable reductions in actual GHG emissions, IBM believes real results in GHG emissions reduction are directly achieved when each enterprise takes responsibility to address its own emissions and improve its energy efficiency. This is reinforced by IBM's announcement in 2010 that all of our first-tier suppliers will be expected to develop a management system, inventory their key environmental impacts—including GHG emissions—and develop reduction plans for those key impacts.

Product Stewardship

IBM's Product Stewardship program was established in 1991 as a proactive and strategic approach to the environmental design and management of our products. The program's mission is to develop, manufacture and market products that are increasingly energy efficient; can be upgraded and reused to extend product life; incorporate recycled content and environmentally preferable materials and finishes; and can be recycled and disposed of safely.

Framework

IBM's product stewardship objectives and requirements are implemented through our Global Environmental Management System (EMS), internal standards, product specifications and other requirements in IBM's Integrated Product Development process. Product environmental attributes such as energy efficiency, materials content, chemical emissions testing, design for recycling, end-of-life management plans and packaging data must be documented and reviewed in IBM's Product Environmental Profile (PEP) tool at various checkpoints during the development process.

Compliance management tools like the Product Content Declaration for IBM Suppliers support the assessments required for a complete PEP prior to product release. IBM's design and compliance controls, including a specification for Baseline Environmental Requirements for Supplier Deliverables to IBM, Product Content Declarations, and compliance assessment protocols are managed by an interdisciplinary team with representatives from all IBM organizations that design, manufacture, procure, deliver and service our product offerings. The team's activities are coordinated by IBM's Center of Excellence for Product Environmental Compliance.

Process Efficiency for Dynamic Requirements

Our supply chain represents a significant aspect of IBM's product manufacturing. Accordingly, our Environmental Management System includes programs and processes to monitor and verify supply chain performance against IBM's environmental requirements as well as legal requirements. These programs and processes must be increasingly dynamic

and efficient to keep pace with the changing cadence of environmental requirements globally.

Frequent verification of product data is needed to maintain the accurate status of parts and products relative to both IBM’s product environmental requirements and the latest regulatory requirements such as the expiration schedule for exemptions in the European Directive on the restriction of hazardous substances (RoHS, 2011/65/EU) and disclosure of the regularly amended list of Substances of Very High Concern for the European REACH Directive (Regulation (EC) No 1907/2006).

In 2013, IBM developed new processes to automate the revalidation of Product Content Declarations (PCDs) for procured parts. The processes identify a regular refresh cycle for PCDs and use a third-party service provider to contact suppliers to request updated declarations. This system was piloted by 10 engineering commodity teams which worked with the third-party provider to improve the request process with suppliers and the reports generated for affected parts.

At the conclusion of the pilot, all production suppliers were notified of IBM's PCD revalidation requirements and the revalidation program began processing 2,000 PCD updates per month. This process improvement in product data management ensures that IBM's technical documentation for product hardware meets the quality requirements of European Norm 50581, "Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances."

In a parallel project, quality audits of selected PCDs were conducted to identify improvements in administrative and technical content of the declarations. The quality audits resulted in better correlation between declarations and supporting prints and specifications from IBM’s centralized corporate engineering repository for product development, and in focused training for specific suppliers on calculations associated with the data requested for particular regulatory requirements.

Also with respect to improvements in technical documentation, IBM led a team of international experts to develop a set of technical compliance guidelines for hexavalent chromium (Cr(VI)) in metallic surface coatings. The guideline supports the IEC 62321 standards, which define methods for testing electro-technical products in order to determine the levels of chemical substances regulated by international legal frameworks like the EU RoHS Directive. The guidelines provide interpretation of test results which, according to the international analytical test protocols for the Cr(VI) standard, are measured in different units (grams/surface area) than those specified for legal compliance in the relevant regulation (grams/coating weight).

2013 Product Stewardship Goals and Performance

Recycled Plastics	Recycled plastic used in IBM's products can range from 50 to 100 percent by weight of the commercial resin. In 2013, 14.8 percent of the total weight of plastic resins procured by IBM and its suppliers through IBM's corporate contracts for use in IBM's products were resins that contained between 50 and 100 percent recycled content. Comparing only the weight of the recycled fraction of these resins to the total weight of plastics (virgin and recycled) purchased, 10.8 percent of IBM's total weight of plastic purchases in 2013 was recycled plastic versus the corporate goal of 5 percent recyclate.
Use of Landfills	IBM's product end-of-life management operations worldwide processed 32,220 metric tons (71 million pounds) of end-of-life products and product waste, and sent only 0.3 percent of the total to landfills or to incineration facilities for treatment, versus IBM's corporate goal of minimizing its combined landfill and incineration rate to no more than 3 percent of the total amount processed.

Product Energy Efficiency*

	IBM Power Systems™: IBM released six models of IBM Power Systems servers, the 710 and 720 one-socket servers, the Power® 730 and 740 two-socket servers and the Power 750 and 760 four-socket servers. All servers use the POWER7+™ processor.
Servers	The two servers for which typical power consumption per unit of relative performance as measured by watts per relative performance, are available from the comparable, previous generation system, the 730 and 740, achieved reductions between 50 and 60 percent in this metric. These Power Systems servers continue to use 80 PLUS Platinum certified power supplies, one grade above the ENERGY STAR requirements and two grades above the EU server power supply requirements. Four systems, the Power 730, 740, 750, and 760, are certified to the ENERGY STAR server requirements (Version 2). The two-socket servers

reduce idle power 28-50 percent from maximum power, and the four-socket servers 16-30 percent, depending on the configuration.

IBM System x®: The power/performance characteristics as reported in watts/MTOPS** under the Japan Energy Saving Law Metric were compared generation to generation for four System x servers announced in 2013; the metric improved by 16-84 percent. The majority of servers announced in 2013 featured 80 PLUS Platinum certified power supplies. Eleven systems have been certified to the ENERGY STAR server requirements (Version 2). The ENERGY STAR certified servers reduce the power used at idle 23-67 percent depending on the machine type/model and the configuration of the server.

IBM System z®: IBM announced the new IBM zEnterprise® BC12 entry-level mainframe system which offers the capability to consolidate multiple traditional and cloud-based workloads onto a single platform with superior workload delivered per unit of energy consumed. The new BC12 has the same energy use and cooling footprint as the previous generation model, while supporting 77 percent greater workload with higher availability, improved security and simplified operation.

Storage Subsystems

IBM continues to innovate in storage products, improving storage performance through the use of mixed-drive systems with capacity and throughput improvements, integration of flash drives and optimization driven by software capabilities such as IBM Easy Tier®, thin provisioning, data compression and deduplication, and storage virtualization. IBM announced new product offerings for IBM XIV® storage systems and the IBM Storwize® family of products to incorporate new hardware and software capabilities to store more data more efficiently on a smaller quantity of storage media.

** IBM's product energy goal is to continually improve the computing power delivered for each kilowatt-hour (kWh) of electricity used with each new generation or model of a product.*

*** MTOPS-million theoretical operations per second is a calculation of machine operations based on a specified formula.*

Product Energy Efficiency

Product energy efficiency has long been one of IBM's environmental and climate protection objectives. It was formalized as one of the company's corporate objectives when IBM's Product Stewardship program was established in 1991. We have initiated and invested in innovations and integrated solutions through collaboration between IBM Research and our product development teams. These teams have combined hardware and software innovations to improve the energy efficiency of IT equipment and data centers.

IBM also actively assists in the development of external product energy efficiency standards. As we did in 1992 when we helped to develop and were a charter member of the US Environmental Protection Agency (EPA) ENERGY STAR Computer program, IBM is currently participating in the development of the ENERGY STAR specifications for server and storage products. We are providing technical assistance regarding the assessment of the new Server Efficiency Rating Tool (SERT) metrics data, working both inside IBM and in conjunction with industry groups to evaluate the SERT results and assist EPA and various regulatory bodies outside the United States in developing server energy efficiency criteria based on the SERT metric. Similar work is planned to assess the Storage Networking Industry Association Emerald results for storage products.

On December 16, 2013, Version 2 of the ENERGY STAR program requirements for computer servers became effective. Version 2 also creates new product categories for blade servers and resilient servers, and eligible systems can be qualified upon the publication of the Version 2 requirements.

As of May 2014, IBM has certified 11 server machine types to the ENERGY STAR requirements: qualified server systems available on the market—4 IBM Power Systems and 7 IBM System x enterprise server systems. These servers meet the US EPA's requirements for power supply efficiency, idle power limits or power management capability and data reporting. For a list of IBM ENERGY STAR certified servers, see our ENERGY STAR qualified products webpage. IBM intends to qualify its System p and System x servers to the ENERGY STAR Version 2 requirements, including the addition of blade and resilient servers.

The ENERGY STAR Data Center Storage Specification Version 1 went into effect on December 2, 2013. IBM intends to certify several of its storage systems to the specification in 2014.

Our IBM technical experts are also participating in the Institute of Electrical and Electronics Engineers 1680.4 working group that is developing a standard that defines environmental requirements for some server products. It is expected that this standard will be completed in 2015, and that it could be

incorporated in the Electronic Product Environmental Assessment Tool process that is used by the US government and other large institutional purchasers of electronic products to define more environmentally preferable products.

New advancements for increased product energy efficiency performance

The following are examples of new IBM technologies, software and solutions that have enabled the increased energy efficiency of IBM's servers and storage products:

IBM System x:

IBM announced new server solutions designed to expand cloud and analytics capabilities, helping to make Smarter Computing a reality for IBM System x x86 server clients. IBM's new portfolio of x86 computing solutions includes the following:

- IBM X6 Technology: The X6 technology delivers a resilient server based on x86 technology combined with IBM innovations that produces an enterprise server that offers unique and superior capabilities. Available systems include the x3850 and x3950 X6 servers and the IBM Flex System® x280, x480, and x880 X6 compute nodes. From an energy efficiency standpoint, these server products offer several options:

    - Calibrated Vectored Cooling™: Innovations include tandem counter-rotating fans, hexagonal ventilation holes, and isolated cooling zones which match individual fans to zones of the server so that only a single fan, rather than the full fan set, accelerates to cool an isolated hot spot. These features reduce energy use and wear and tear on the fans.

    - 80 PLUS Platinum-rated power supplies: These supplies have efficiencies up to 94 percent, putting more energy to work and reducing cooling requirements.

    - 2.5-inch Hard Disk Drives (HDD) and Solid State Drives (SSD): 2.5 inch drives use 40 percent less energy than 3.5 inch drives and SSDs consume 2 watts compared to 5.5 watts for 2.5 inch HDDs. Using these storage technologies reduces energy use while improving performance of the overall system.

    - Low Voltage Memory: The X6 products use 1.35-volt DIMMs, which offer 19 percent energy savings compared to the standard 1.5-volt DIMMs.

- The IBM System x3650 M4 is optimized for virtualized and cloud environments and is offered in three machine types, each optimized for specific workloads. All three machine types are certified to ENERGY STAR. The servers have an 80 PLUS Platinum certified power supply and power management capabilities can reduce energy consumption by 23-64 percent when no workload is present. The idle reduction achieved depends on the configuration of and system power management settings used for a given server.

The energy use reduction benefit of IBM System x products is exemplified by an IBM System x3650 M4 server installation completed at a fast-growing U.S. retailer in 2013. IBM consolidated twenty x86 servers by virtualizing the workloads onto three x3650 M4 servers integrated with a V7000 storage solution, increasing the flexibility and resiliency and expandability of the system while significantly reducing energy use.

IBM Power Systems:

Power Systems provide enterprise-class server capabilities for traditional and cloud applications, offering superior utilization, security, virtualization, reliability, serviceability and data processing capabilities. Power Systems are optimized for the compute intensive performance demands of database and analytics applications. From an energy efficiency standpoint, Power Systems can deliver the most workload for unit energy consumed of any server when the system is configured to achieve maximum utilizations of 50-65 percent through workload virtualization and the use of EnergyScale™ power management capabilities which matches energy use to the workload levels on the server. The recently announced POWER8™ builds on and strengthens these capabilities, delivering significant performance increases with minimal change in the power footprint of the server systems. An example of the benefits of a client's use of a Power Systems solution follows:

- A regional energy provider upgraded its IT infrastructure with four IBM Power 770 servers, reducing the number of physical servers by 95 percent through an aggressive virtualization project, reducing estimated electricity use by one-quarter to one-third, and increasing system flexibility and scalability to respond to the dynamic demands of its business.

IBM PureSystems®:

PureSystems combine automated systems management expertise and pre-loaded/pre-tuned application software with open, scalable hardware systems that help maximize system utilization and reduce the total number of servers required in the data center. By eliminating lower utilization servers, PureSystems allows companies to consolidate their IT operations and enable continued application/user growth without significant hardware system

additions. Increased utilization leads to a smaller real-estate requirement, lower energy costs and lower systems management costs.

- A regional water and energy utility needed to upgrade its IT infrastructure to respond to the increasingly dynamic business environment resulting from deregulation of their primary markets. They chose two IBM Flex System compute nodes, each containing six 240 compute nodes running 110 virtual servers. The upgrade reduced the server footprint by 66 percent and reducing energy costs by 20 percent.

- A direct marketing solutions provider installed an IBM PureFlex® System populated with two IBM Power p460 compute nodes and six x86 x240 compute nodes combined with a V7000 disk system, replacing 12 servers and 4 storage systems, shrinking their IT footprint from 4 to 1 rack, significantly improve system utilization, and reduce electricity costs by more than 40 percent. From a business perspective, the Flex System provides greater flexibility and speed of response to client requests.

Appliances:

An IT appliance combines server, storage and network capabilities and optimizes them to execute a specialized task or group of tasks with a significantly smaller IT hardware and energy footprint than would be required if conventional systems were combined. IBM released a new server appliance, named MessageSight, designed to help organizations manage and communicate with the billions of mobile devices and sensors found in systems such as automobiles, traffic management systems, smart buildings and household appliances. The appliance can support up to one million machine-to-machine (M2M) or smart and mobile devices in near real-time, handling up to 13 million messages per second. Previously, achieving connectivity at this level required up to 280 servers; the MessageSight appliance manages the same connectivity with a single 2U rack appliance reducing the energy use by two orders of magnitude while improving the efficiency of the data collection and access process. Furthermore, it enables management of the “Internet of Things” in ways that are likely to improve the efficiency and reduce the energy use of a whole range of activities and systems.

Storage systems:

IBM continues to enhance our portfolio of storage systems, utilizing and improving various software-based data management capabilities such as Easy Tier, thin provisioning, data compression and deduplication, and storage virtualization which can reduce the storage hardware and energy footprint and the number of terabytes required to accomplish a given storage task.

In 2013, IBM introduced a range of flash-based storage systems. The FlashSystem™ 840 offers up to 12 flash cards in 2- and 4-terabyte sizes. Flash storage reduces energy use by 60 percent or more compared to disk drives and significantly improves server and storage performance by minimizing the latency associated with data transfer within the data center.

In May 2014, IBM announced Elastic Storage, a software-defined storage technology which accelerates access to data storage both locally and globally and enables storage automation and virtualization in both traditional enterprise and cloud environments. Elastic Storage will enable the reduction of storage costs through data consolidation and the use of data placement technologies to optimize the use of available storage devices, including tape storage. The ultimate outcome is to maximize the amount of data stored on a minimum number of storage products, in turn minimizing the energy use and hardware deployment of the overall storage system.

High Performance Computers (HPC):

IBM offers a full range of purpose-built and "off-the-shelf" technical computing (supercomputer) solutions. IBM's supercomputer solutions are prevalent on both the TOP500® and Green500™ supercomputer lists. As of November 2013, 16 of the top 25 most energy efficient supercomputers in the world are built on IBM high-performance computing technologies; IBM Blue Gene®/Q and IBM iDataPlex® dx360 M4. IBM HPC systems also occupy 5 of the top 10 spots and 9 of the top 25 spots on the November 2013 TOP500 list of the world's top supercomputers. Technologies developed through IBM's HPC development efforts are leveraged across the entire IBM Systems and Technology Group product line to improve performance and energy efficiency.

The speed and expandability of IBM's HPC products have enabled business and the scientific community to address a wide range of complex problems and make more informed decisions in the life sciences, astronomy, climate, system simulations and modeling, and many other applications. The use of HPC systems also enables simulations of activities, such as crash testing, vehicle or airplane designs, and fuel burners, without the need to expend physical resources on prototypes or physical testing. IBM continues its leadership performance in a space-saving, power-efficient HPC package to address the most demanding performance applications.

As an example, IBM is partnering with the National Center for Atmospheric Research on a supercomputer named Yellowstone, which is being used to explore the nature of tornadoes, hurricanes, water shortages, solar patterns, and wind. The supercomputer is also working to study how wind turbines interact with the weather to get a detailed picture of when and why turbines turn, helping to develop predictive programs and siting algorithms to enhance the efficiency and utilization of wind farms.

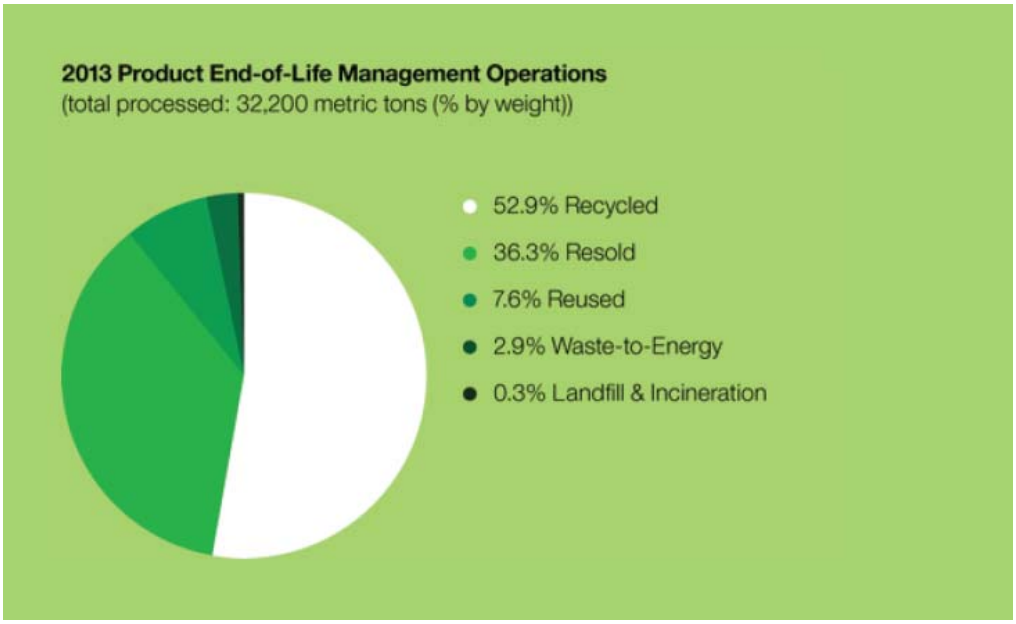
Product Recycling and Reuse

As part of our product end-of-life management (PELM) activities, IBM began offering product take-back programs in Europe in 1989, and has extended and enhanced them over the years. IBM's Global Asset Recovery Services organization offers Asset Recovery Solutions to commercial customers in countries where we do business. These solutions include:

- Management of data security and disk overwrite services
- Worldwide remarketing network for product resale
- State-of-the-art refurbishing and recycling capability for IT equipment
- Optional logistic services such as packing and transportation

In many countries and US states, we offer solutions to household consumers for the end-of-life management of computer equipment, either through voluntary IBM initiatives or programs in which we participate.

In 2013, the total weight of end-of-life products and product waste processed by these operations was 32,200 metric tons (71 million pounds). This represents 67 percent of the estimated 47,800 metric tons of new IBM IT equipment put on the market in 2013.



IBM's voluntary environmental goal is to reuse or recycle end-of-life products such that the amount of product waste sent by IBM to landfills or to incineration facilities for treatment does not exceed a combined 3 percent of the total amount processed.

Of the 32,200 metric tons processed by IBM PELM operations worldwide; approximately 52.9 percent was recycled as materials, 36.3 percent was resold

Product End-of-Life Management (PELM)

3%

Goal
Reuse or recycle end-of-life products such that the amount of product waste sent by IBM's PELM operations to landfills or to incineration for treatment does not exceed a combined 3 percent of the total amount processed.

0.3%

Result
In 2013, IBM's PELM operations sent only 0.3 percent to landfills or to incineration facilities for treatment.

as products, 7.6 percent was product reused by IBM, 2.9 percent was incinerated for energy recovery, and 0.3 percent was sent to landfills or incinerated for final disposal.

IBM's corporate-wide requirement for the environmental evaluations of the company's PELM suppliers was established in 1991, an expansion of our supplier environmental evaluation program introduced in 1972. We evaluate these suppliers prior to doing business with them and every three years thereafter. Our objective is to use only those suppliers that have a strong focus on environmental management, including complying with laws and regulations as well as sound management practices. More about IBM's requirements for our PELM suppliers may be found in the Environmental Requirements in the Supply Chain section of this report.

In 2013, IBM's PELM program reached another major milestone. From 1995, when we first began including product recovery in our annual corporate environmental reporting, through the end of 2013, IBM has processed over 2 billion pounds (913,000 metric tons) of product and product waste worldwide.

2 billion pounds
(913,000 metric tons)
of product and product waste collected and processed for reuse and recycling from 1995 through 2013

IBM Worldwide PELM Operations:
Total Annual Quantity Processed
(Metric Tons)

Year	Total Processed
2009	38,000
2010	36,700
2011	38,000
2012	36,100
2013	32,200

Product Packaging

IBM has had a program focused on the environmental attributes of our product packaging since the late 1980s. Under the program, IBM packaging engineers design solutions that minimize toxic substances and packaging waste by specifying nontoxic materials and inks. We keep packaging to a minimum while continuing to provide protection to the product being shipped to clients, and we collaborate with suppliers to use recycled and recyclable materials and promote reuse.

The design of rugged products and other optimization measures for the efficient use of product-protective packaging are addressed within IBM's Product Stewardship program and associated engineering specifications.

Efficient use of product packaging and improvements in transportation efficiency are tracked through this program.

IBM's environmental requirements for product packaging are included in our Environmental Packaging Guidelines, which were first published in 1990 and have been updated as needed over the years. Key elements of these guidelines have also been embedded in various engineering specifications and procurement documents, which extend their reach beyond IBM to include our supply chain and other business partners. The following supplier environmental packaging requirements are accessible from the Information for suppliers webpage:

- IBM Packaging Requirements; Packaging and Handling Supplier and Interplant Requirements - EC G48655
- IBM Engineering Specification (ES) 5897661: Recyclable packaging materials, selection and identification
- IBM ES 5897660: Packaging materials, essential requirements, restricted heavy metals and other substances of very high concern
- IBM ES 37L8024: Wooden packing, materials treatment and marking requirements

IBM's environmental packaging requirements incorporate a list of the most commonly used packaging materials. Each is evaluated on a variety of environmental criteria. When options are available, suppliers are required to choose the material that has the least possible adverse effect on the environment. The materials listed are based on practical and regulatory experience and customer feedback. Other environmental areas addressed in the packaging requirements include:

- Ozone-depleting substances
- Restricted heavy metals and other materials of concern
- Source reduction
- Re-useable packaging systems
- Recyclable packaging
- Conserving natural resources

Protective product packaging

In 2013, the integrated worldwide packaging engineering team saved an estimated 452 metric tons of packaging materials through the implementation

of 19 packaging redesign projects for parts and assemblies shipped to manufacturing locations, and for packaged finished products supplied to clients worldwide. These projects delivered an annual materials and transport cost savings estimated at $4.74 million.

The following are highlights of two projects implemented:

- Packaging engineers redesigned a storage systems' single-use cardboard box packaging for supply of sub-assemblies from Romania to IBM Vac, Hungary. The single-use corrugated cardboard carton containing the part was replaced with a plastic box that could be reused, on average, 18 times. Fifty metric tons of packaging materials were saved per year with annual cost savings estimated at $208,500 for materials and transportation.

- The redesign of the molded cushions and outer cardboard carton for an IBM xSeries blade server resulted in added compression strength to protect the server while reducing the overall size of the corrugated cardboard carton. The smaller design allowed the packing of up to 48 units on a full pallet compared to 42 with the old packaging, which resulted in a significant reduction in shipping cost. The annual estimated savings on packaging materials was 88 metric tons with cost savings estimated at $1.3 million per year for materials and transportation.

IBM suppliers are also applying these types of new design specifications across IBM and with their other customers to deliver tangible benefits across the integrated supply chain. Over the last six years, IBM has reported combined environmental savings of over 6,670 metric tons of product packaging materials from redesign projects implemented by the packaging engineering team worldwide. The total materials and transportation cost savings was $65.1 million over the same period, benefiting IBM, parts suppliers and clients globally.

IBM's requirement for sourcing packaging materials

IBM established its voluntary environmental requirement for the responsible sourcing of paper- and paper/wood-based packaging in 2002. It required that the paper- and wood-based packaging directly acquired by IBM be procured from suppliers that source from sustainably managed forests, where such sources exist.

When this goal was first established, sufficient quantities of sustainably sourced paper and packaging materials were not yet available for much of the company's needs. With a continued focus on this objective by IBM and our suppliers over the years, 99.7 percent of the cut sheet paper and paper/wood-based packaging IBM procured worldwide in 2013 came from suppliers that warranted that the source was derived from forests managed in an ecologically

sound and sustainable manner. This requirement is now incorporated into our standard supplier specification for paper/wood-based packaging.

Product Safety

IBM's product requirements are integrated within various steps of the product development, test, manufacturing and delivery processes as part of a comprehensive product safety management system. Each product completes required product safety and electromagnetic compatibility compliance reviews as part of IBM's Integrated Product Development process to ensure that newly announced products comply with applicable standards, regulations and third-party certification requirements.

Compliance management tools are used by interdisciplinary teams from all IBM organizations that design, manufacture, procure, deliver and service our product offerings.

IBM’s Integrated Supply Chain organization ensures that the design and certification requirements necessary to ensure compliance are fully incorporated into supply chain functions from procurement through product delivery. Supplier procurement specifications and contracts include design-specific regulatory compliance requirements. Manufacturing controls and product end-of-line tests are implemented in each production facility to ensure compliance with applicable requirements.

Programs for continual improvement include both internal and third-party assessments of IBM’s product safety design, development and product control implementation. These assessment results are fed back into the development and conformity assessment process for future products. In addition, product safety and regulatory compliance incident review programs provide effective capture, investigation and remediation of product safety-related incidents.

IBM also plays a leading role in the development of national and international product safety and electromagnetic compatibility design and conformity assessment standards for IT products and solutions. IBM's subject-matter experts are an integral part of international standards development organizations that are working on “next generation” and state-of-the-art standards that will be used to design and provide safe and compliant products in the future.

Process Stewardship

Among its objectives, IBM's Corporate Policy on Environmental Affairs calls for our use of development and manufacturing processes that are protective of the environment.

Environmentally Preferable Substances and Materials

As an integral part of the global EMS through which we support the objectives of our Corporate Policy on Environmental Affairs, we routinely and consistently monitor and manage the substances we use in our manufacturing and development processes and in our products.

Our precautionary approach includes the careful scientific review and assessment of certain substances prior to their use in IBM processes and products. In specific instances, we have chosen to proactively prohibit, restrict or find alternative substances used in our processes and products when the weight of scientific evidence determines a potential adverse effect upon human health or the environment, even when law permits the use of the substance.

We also conduct scientific assessments of existing approved substances when new processes or major modifications to existing processes are being developed. The objective of these scientific assessments is to identify potential substitutes that may be environmentally preferable. We believe that the same scientific rigor is required when investigating the human health and environmental effects of potential substitutes as was applied to the investigation of the substance in use.

IBM has a long history of continually taking proactive steps to evaluate the chemicals used in our processes and products; identifying potential substitutes that may have less impact on the environment, health, and safety; and eliminating, restricting and/or prohibiting the use of substances for which a more preferable alternative is available that is capable of meeting quality and safety requirements of our processes and products.

The following provides a sampling of IBM's 40-plus years of early leadership in prohibiting or restricting many substances of concern from our processes and products before regulatory requirements were imposed. For a more complete listing, see our Materials use webpage.

- **Polychlorinated biphenyls (PCBs)**
  IBM initiated a multi-year effort to eliminate PCBs from use in our products in 1974 and achieved elimination in 1978.

- **Chlorofluorocarbons (CFCs)**
  In 1989, IBM became the first major IT manufacturer to announce a phase-out of CFCs, a Class I ozone-depleting substance, from our products and manufacturing and development processes.

- **Class I and II ozone-depleting substances**
  IBM completed the phase-out of Class I ozone-depleting substances in 1993. Subsequently, IBM eliminated Class II ozone-depleting substances from our products and processes in 1995.

- **Trichloroethylene (TCE), ethylene-based glycol ethers and dichloromethane**
  Examples of other chemicals that IBM voluntarily prohibited from our manufacturing processes include TCE in the late 1980s, ethylene-based glycol ethers in the mid-1990s and dichloromethane in 2003.

- **Polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs)**
  IBM prohibited PBBs and PBDEs from its product designs in the early 1990s and then extended the prohibition to purchased commodities through our procurement specifications in 1993.

- **Cadmium**
  IBM prohibited the use of cadmium in inks, dyes, pigments and paints in 1993, in plastics and plating in 1994, and in CRT monitors along with nickel cadmium batteries in the mid-1990s.

- **Polyvinyl chloride (PVC) and tetrabromobisphenol A (TBBPA)**
  IBM ceased the specification of PVC in our IT system enclosures in 2000 and prohibited the use of TBBPA as an additive flame retardant in IT system enclosures for newly released products in 2007.

- **Specific perfluorinated compounds (perfluorooctane sulfonate [PFOS] and perfluorooctanoic acid [PFOA])**
  IBM prohibited the use of PFOS and PFOA in the development of new materials in 2005, in new manufacturing applications in 2007, and eliminated the use of these chemicals in manufacturing, development and research processes as of January 31, 2010.

The IBM restrictions on specific substances and other environmental requirements for our products are identified in our Engineering Specification: Baseline Environmental Requirements for Supplier Deliverables to IBM.

Nanotechnology

By definition, nanotechnology is the application of scientific and engineering principles to make and utilize very small things (dimensions of roughly 1 to 100 nanometers), creating materials with unique properties and enabling novel and useful applications. It involves an ever-advancing set of tools, techniques and unique applications involving the structure and composition of materials on a nanoscale.

Nanotechnology is already part of a wide variety of products—from cosmetics and sunscreens to paints, clothing and golf equipment. It can make products lighter, stronger, cleaner, less expensive and more precise, more energy efficient, and it has been critical to advancements in the IT industry.

IBM Research became involved in the world of nanoscience in 1981 when Gerd Binnig and Heinrich Rohrer invented the scanning tunneling microscope, revolutionizing our ability to manipulate solid surfaces the size of atoms. Since then, IBM has achieved numerous developments in the field – from moving and controlling individual atoms for the first time, to developing logic circuits using carbon nanotubes, to incorporating sub-nanometer material layers into commercially mass-produced hard disk drive recording heads and magnetic disk coatings.

We were also one of the first companies to create safe work practices and health and safety training for our employees working with nanoparticles. IBM, along with the International SEMATECH Manufacturing Initiative and other semiconductor companies, is participating in a collaborative study with the National Institute for Occupational Safety and Health and the College of Nanoscale Science and Engineering of the University at Albany, State University of New York, to monitor potential workplace exposure to nanoparticles during chemical mechanical planarization operation and maintenance.

IBM's current nanotechnology research aims to devise new atom- and molecular-scale structures and methods for enhancing information technologies, as well as discovering and understanding their scientific foundations. We believe these technologies can bring with them significant social and environmental benefits.

Two of our latest nanotechnology research advancements:

- **New polymers that could deliver cheaper, lighter, stronger and recyclable materials ideal for electronics, aerospace, airline and automotive industries**

  IBM researchers recently discovered a new class of synthetic polymers. They are the first new family of polymers discovered in

decades. To achieve this advancement, the researchers used a novel computational chemistry hybrid approach to accelerate the materials-discovery process that couples lab experimentation with the use of high-performance computing to model new polymer-forming reactions.

The new materials are strong, cheap, flexible, readily recyclable, and self-healing. IBM delivered the news in a peer-reviewed publication in the academic journal *Science* in May 2014. The new industrial polymers are the world's first family of materials that are stronger than bone and solvent resistant while being completely recyclable back to their starting material. Additionally, these strong materials can be made at least 50 percent stronger through the addition of carbon nanotubes to their composition.

The application of these materials across a broad range of engineering and product design challenges is highly likely. They could be used as cheaper, lighter and stronger recyclable materials in manufacturing industries such as semiconductors, aerospace, airline and automotive industries. They could also be used to replace the current polymers in more common items such as drink bottles and secure food packaging that currently are difficult to recycle.

- **Turning waste plastic bottles into antifungal agents**

  Researchers from IBM and the Institute of Bioengineering and Nanotechnology have made a nanomedicine breakthrough in which they converted common plastic materials like polyethylene terephthalate (PET) into non-toxic and biocompatible materials designed to specifically target and attack fungal infections. Traditional antifungal therapeutics need to get inside the cell to attack the infection but have trouble targeting and penetrating the fungi membrane wall. Also, since fungi are metabolically similar to mammalian cells, existing drugs can have trouble differentiating between healthy and infected cells.

  Recognizing this, IBM scientists applied an organic catalytic process to facilitate the transformation of PET, or waste plastic from a bottle, into entirely new molecules that can be transformed into antifungal agents. This advancement is significant as plastic bottles are typically recycled by mechanical grinding and can mostly be reused only in secondary products like clothes, carpeting or playground equipment. These materials self-assemble through a hydrogen-bonding process, sticking to each other like molecular Velcro in a polymer-like fashion to form nanofibers. The positively charged nanofibers selectively target and attach to only the negatively charged fungal membranes through electrostatic interactions. After binding, the nanofibers break through and destroy the fungal cell membrane walls, preventing it

from developing resistance.

Pollution Prevention

Pollution prevention is a critical aspect of IBM's environmental efforts, and it includes, among other things, the management of hazardous waste, nonhazardous waste and chemical releases.

Hazardous Waste

The best way to prevent pollution is to reduce the generation of hazardous waste at its source. This has been a basic philosophy behind IBM's pollution prevention program since 1971. Where possible, we redesign processes to eliminate or reduce chemical use and substitute more environmentally preferable chemicals. We maintain programs for proper management of the chemicals needed for research, development and manufacturing, from selection and purchase to storage, use and final disposal.

To more effectively track IBM's hazardous waste management performance, we developed a methodology to correlate the hazardous waste generated from our manufacturing operations relative to production in 1992. We established a voluntary environmental goal based on this methodology in 1995 to drive continual reduction in the hazardous waste generated from these operations.

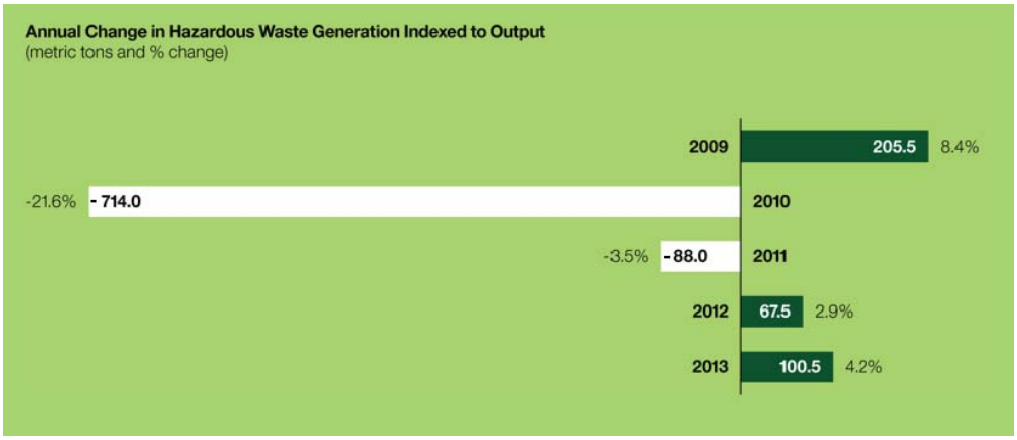
The goal is to achieve year-to-year reduction in hazardous waste generation from IBM's manufacturing processes, indexed to output. The metric is measured at IBM's three microelectronics manufacturing locations that generate the majority of IBM's hazardous waste attributable to manufacturing processes.

In 2013, IBM's hazardous waste generation indexed relative to production output increased by 4.2 percent, or approximately 100 metric tons, compared to 2012. There were two primary factors for this year-to-year increase: first, an increase in fluoride/heavy metal sludge generation at the Industrial Wastewater Treatment Plant (IWTP) at one of the manufacturing sites as a result of increased hydrofluoric acid chemical usage, and second, an increased use of a photoresist solvent with a corresponding increase in bulk waste solvent generation. The increase in hydrofluoric acid usage was due to the continued transition to single wafer tools and processes at thinner line width integrated circuit technologies — a continuing trend occurring across the semiconductor industry. The increase in bulk waste solvent generation was due to a higher use of the specific photoresist in the photolithography process to improve wafer yields. The waste solvent was sent by IBM to be recycled.

Hazardous Waste Generation

4.2%

In 2013, IBM's hazardous waste generation indexed to output increased by 4.2% (approximately 100 metric tons) over 2012— despite ongoing, focused reduction efforts. There were two main factors for this year-to-year increase:
an increase in fluoride/heavy metal sludge generation at one manufacturing site, due to an increase in hydrofluoric acid chemical used as part of the continued transition to single wafer tools and processes at thinner line width integrated circuits, and an increased use of the specific photoresist solvent to improve yield.

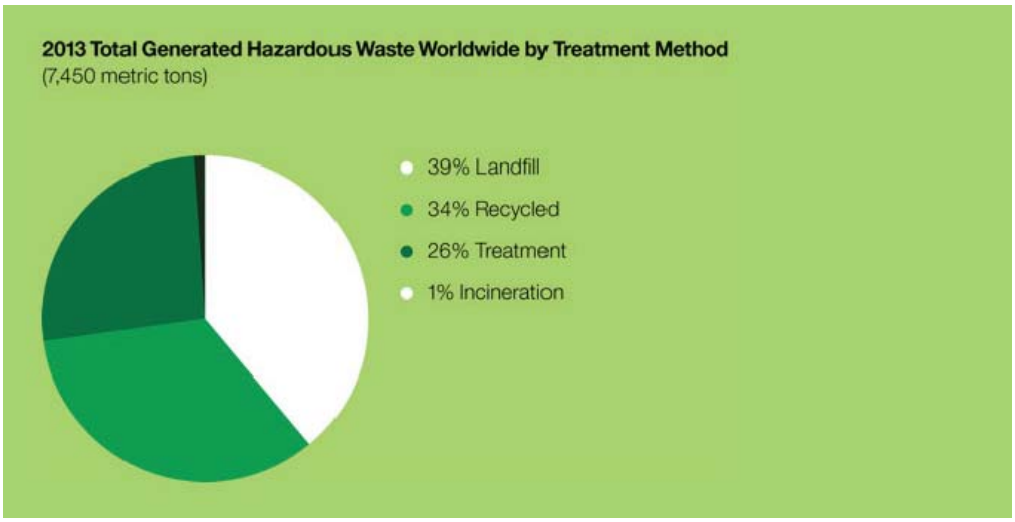


For the hazardous waste that is generated, we focus on preventing pollution through a comprehensive, proactive waste management program. For example, the spent solvents from photolithography are considered hazardous waste by regulatory definition and are therefore included in our hazardous waste metric. However, IBM has an active program for increasing the off-site reclamation and beneficial use of the primary spent solvent in this waste.

Of the total 7,450 metric tons of hazardous waste IBM generated worldwide in 2013, 34 percent was recycled, while 26 percent was sent off-site for treatment, 39 percent was sent by IBM directly to suitably regulated landfills, and 1 percent was sent for incineration worldwide.

At the end of 2012, one of IBM's microelectronics manufacturing locations successfully concluded an initiative to have its IWTP sludge delisted from a hazardous waste to a nonhazardous waste, pursuant to the US Environmental Protection Agency (EPA) regulations. As a consequence, beginning in 2013, the EPA and the relevant state regulatory agency authorized a beneficial use of the 2,200 metric tons of sludge this IBM location generated in 2013 as an "Alternative Daily Cover" for a landfill in Vermont. As such, this application helped the landfill operator avoid the purchase of other clean fill materials for the required cover.

In 2013, our worldwide operations generated and sent off-site for treatment approximately one percent more hazardous waste compared to 2012. The disposal of 2,300 metric tons of soil sent to landfill from a soil removal project at one manufacturing site in the United States was a factor influencing this result. Government regulations required disposition of the excavated soil in a secure landfill.



Nonhazardous Waste

IBM also has focused for decades on preventing the generation of nonhazardous waste, and where this is not practical, recovering and recycling the materials that are generated. Nonhazardous waste includes paper, wood, metals, glass, plastics and other nonhazardous chemical substances.

We established our first voluntary environmental goal to recycle nonhazardous waste streams in 1988. The goal has since evolved on two fronts. The first expanded on the traditional dry waste streams to include nonhazardous chemical waste and end-of-life IT equipment from our own operations, as well as IBM-owned equipment that is returned by external customers at the end of a lease. The second expansion was made to include nonhazardous waste generated by IBM at our leased locations, meeting designated criteria.

In 2013, our worldwide operations generated and sent for treatment off-site approximately 65,100 metric tons of nonhazardous waste, a reduction of 3,800 metric tons (5 percent) compared to 2012. This reduction was achieved despite the inclusion of over 2,200 metric tons of the IWTP sludge categorized as hazardous waste in 2012 being de-listed to nonhazardous waste, as previously outlined in this report. Source reduction and waste prevention initiatives implemented by IBM worldwide were estimated to have prevented the generation of over 8,100 metric tons of nonhazardous waste, with estimated annual handling, treatment and disposal cost savings and revenue returns totaling $9.8 million.

Our voluntary environmental goal is to send an average of 75 percent of the nonhazardous waste generated at locations managed by IBM to be recycled. In 2013, 86 percent of the nonhazardous waste generated by IBM worldwide was

Nonhazardous Waste Recycling

75%

Goal
Send an average of 75% of the nonhazardous waste generated at locations managed by IBM to be recycled.

86%

Result
In 2013, IBM sent 86% of its nonhazardous waste to be recycled.

sent to be recycled.

Treatment methods that were credited toward the waste recycling target included: recycle, reuse, energy recovery, composting, reclamation, fuel blending, and land farming. Treatment methods that were not credited toward the recycling target included:

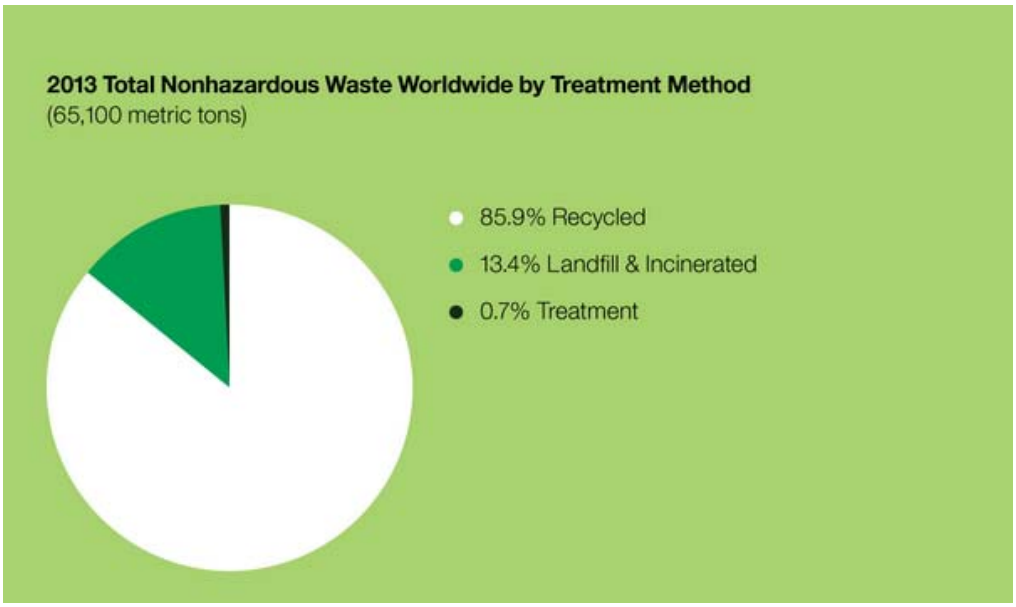
- Incineration
- Landfilling
- Treatment, such as aqueous treatment, biodegradation of organics, filtration, neutralization and stabilization

The majority of materials recovered from nonhazardous waste and sent to be recycled included: paper and cardboard, metals, plastics, furniture, wood, construction debris, cafeteria waste, waste chemicals, and mixed waste. Materials sent by IBM for landfilling or incineration as treatment for final disposal were primarily construction debris and mixed waste.

Total Annual IBM-Generated Nonhazardous Waste Quantity and Recycling Performance
(Metric Tons x 1,000)

	2009	2010	2011	2012	2013
Total sent for recycling	60	56	55	**60**	**56**
Total generated	79	71	70	**69**	**65**
Percentage recycled*	**76%**	**79%**	**78%**	**87%**	**86%**

** Percent recycled versus the target of 75%*



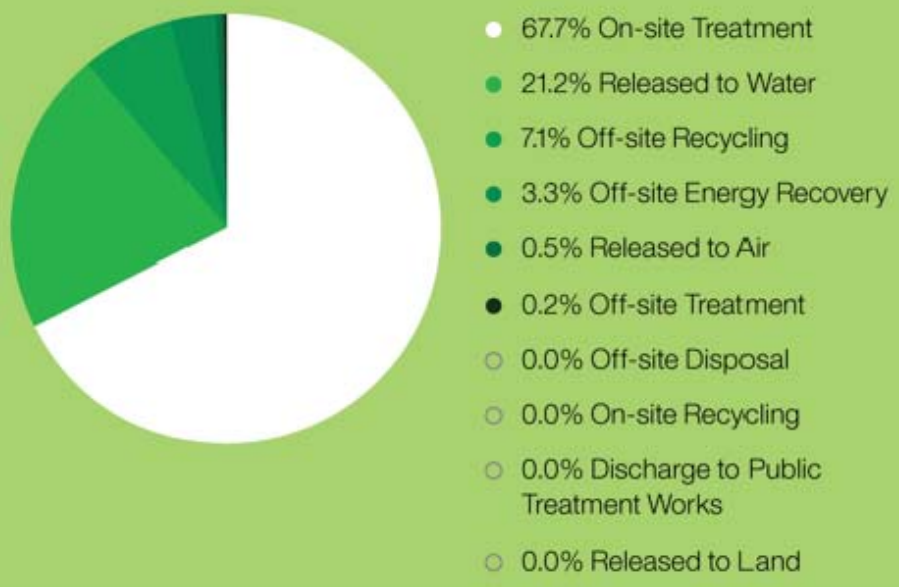
Management of Chemical Releases

Under Section 313 of the US Emergency Planning and Community Right-to-Know Act (EPCRA), companies are required to file an annual inventory of reportable quantities of more than 600 chemicals that were manufactured, processed or otherwise used in quantities exceeding the reporting threshold of 10,000 pounds (4.54 metric tons) for the preceding calendar year. These reportable quantities include:

- Routine releases of chemicals to the environment (e.g., permitted air emissions, water discharges, etc.)
- Chemical quantities that are treated, recycled, or combusted for energy recovery on-site
- Chemical quantities that are sent off-site for recycling, combustion for energy recovery, treatment or disposal

Though EPCRA is a US reporting requirement, we have voluntarily extended this reporting metric to cover our worldwide operations since 1994. In 2013, IBM's worldwide reportable quantities of EPCRA-listed chemicals amounted to 2,857 metric tons, representing an increase of 2.1 percent compared to 2012. More than 78 percent of this quantity was treated on-site or sent off-site for recycling or combustion for energy recovery.

2013 Worldwide Reportable Quantities of EPCRA-Listed Chemicals
(2,857 metric tons)



Worldwide Reportable Quantities of EPCRA-Listed Chemicals*
(2009-2013, metric tons x 1,000)

* As defined under Section 313 of the US EPCRA.

2013 Worldwide Reportable Quantities of EPCRA-Listed Chemicals

Chemical	Metric Tons
Sulfuric acid (Aerosol only)	1,167
Nitrate compound	756
Xylene	115
Hydrogen fluoride	246
Nitric acid	207
n-methyl-2-pyrrolidone	143
Ethylbenzyne	25
Ozone	37
All others	161
Total	**2,857**

IBM's voluntary goal in this area is to achieve year-to-year reduction in routine releases of EPCRA reportable chemicals to the environment, indexed to output.

In 2013, IBM's routine releases of EPCRA reportable chemicals indexed to output increased by 15.4 percent from the prior year. The primary reason for this year-over-year increase was an increase in nitrate releases indexed to output at one of our manufacturing sites and the delayed start-up of that site's nitrate reduction process, which was designed and constructed on a voluntary basis to address these releases. Releases of nitrate compounds from this facility are not regulated by the facility's discharge permit and are not impacting the quality of the receiving water body in a material way. However, limiting discharges of nitrate compounds is a requirement of IBM's own corporate environmental practices. Accordingly, we invested in process upgrades and treatments aimed at reducing nitrate discharges in our effluents. We expect the nitrate reduction process to be in operation in the second half of 2014.

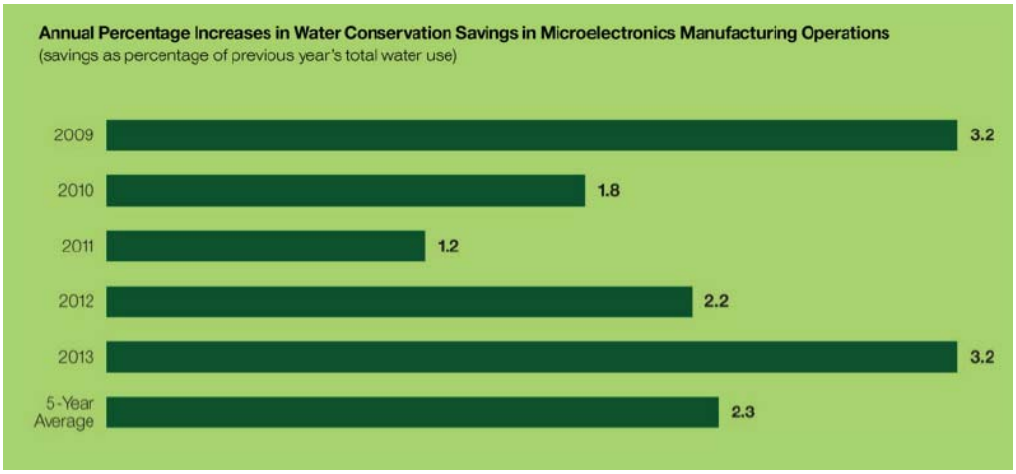
Water Conservation

The preservation of water resources and protection of watersheds are important areas of focus for IBM.

IBM's microelectronics manufacturing operations represent our company's most water-intensive business activities. In 2013, these semiconductor manufacturing operations represented 82 percent, or 9,302 Thousand Cubic Meters (TCMs), of the 11,391 TCMs of water used in our manufacturing operations and laboratories worldwide.

Though our microelectronics operations are not located in areas of water scarcity, in 2000 we established a water conservation goal to achieve average annual water conservation savings equal to 2 percent of IBM's annual water use in microelectronics manufacturing operations, based on the water usage of the previous year and measured over a rolling five-year period. This voluntary environmental goal measures increases in annual water conservation resulting from new water reduction projects and improvements in water reuse and recycling at these locations.

In 2013, new water conservation initiatives in IBM's microelectronics manufacturing facilities achieved an annual 3.2 percent water conservation savings versus 2012 usage. Over the past five years, new water conservation initiatives at our microelectronics manufacturing facilities have achieved an average of 2.3 percent water conservation savings against the 2 percent goal.



In 2013, 643 TCMs of water were conserved in our microelectronics manufacturing operations through new and ongoing reduction, reuse and recycling activities. Of this total conservation, 509 TCMs of water withdrawals were avoided through on-site water reuse, and wastewater and groundwater recycling projects. New water use reduction projects contributed a further 134 TCMs in water savings. The total accumulated water

Water Conservation in Microelectronics Manufacturing Operations

2%

Goal
To achieve an annual average water savings equal to 2 percent of total annual water usage in our microelectronics manufacturing operations, based on the water usage of the previous year and measured as an average over a rolling five-year period.

2.3%

Result
As of year-end 2013, IBM's microelectronics manufacturing operations had achieved an average annual water savings of 2.3 percent over the past five years versus the 2 percent goal.

conservation over the past five-year rolling period was 3,331 TCMs.

The significant efforts undertaken by IBM's microelectronics operations in the early years of our water conservation goal were very effective in capturing opportunities for water conservation. Over the past 13 years since 2000, when the goal was introduced, water conservation efforts have avoided the accumulated use of 20,345 TCMs. As additional annual water conservation savings become harder to secure, due in part to the significant conservation efforts already delivered, we are evaluating options to further drive the efficient use of water resources across our business operations worldwide.

Solutions for Environmental Sustainability

We apply our expertise, research and technology to develop solutions that help our company, our clients and the world operate in ways that are more efficient and protective of the environment.

Our world's sustainability requires a balance among many interdependent and competing needs — of society, its economies, and the planet itself. As the world has become increasingly instrumented and interconnected, we are witnessing an extraordinary growth of "big data." A range of technologies and capabilities — from cloud computing to analytics, from mobile and social platforms to cognitive learning — is transforming this data into a resource that can lead us to better choices and new opportunities for improving environmental sustainability.

IBM is leveraging these technologies and applying our expertise to understand these competing needs and develop innovative solutions to help build and live on a smarter, more sustainable planet. These efforts reflect our longstanding commitment to environmental leadership and one of IBM's core business values "innovation that matters — for our company and for the world." Examples of IBM solutions that are advancing sustainability follow.

Water

Water is one of the world's most abundant natural resources but it is also fast becoming one of the most stressed. Growing populations can strain the supply of clean water, while changing weather patterns challenge our ability to sustain agriculture through droughts or to prevent floods during storms.

The use of real-time data analysis, visualization and prediction generates insight on water consumption, supply, distribution and the need for maintenance. IBM is engaged in several initiatives that help people manage and conserve water. Two examples follow.

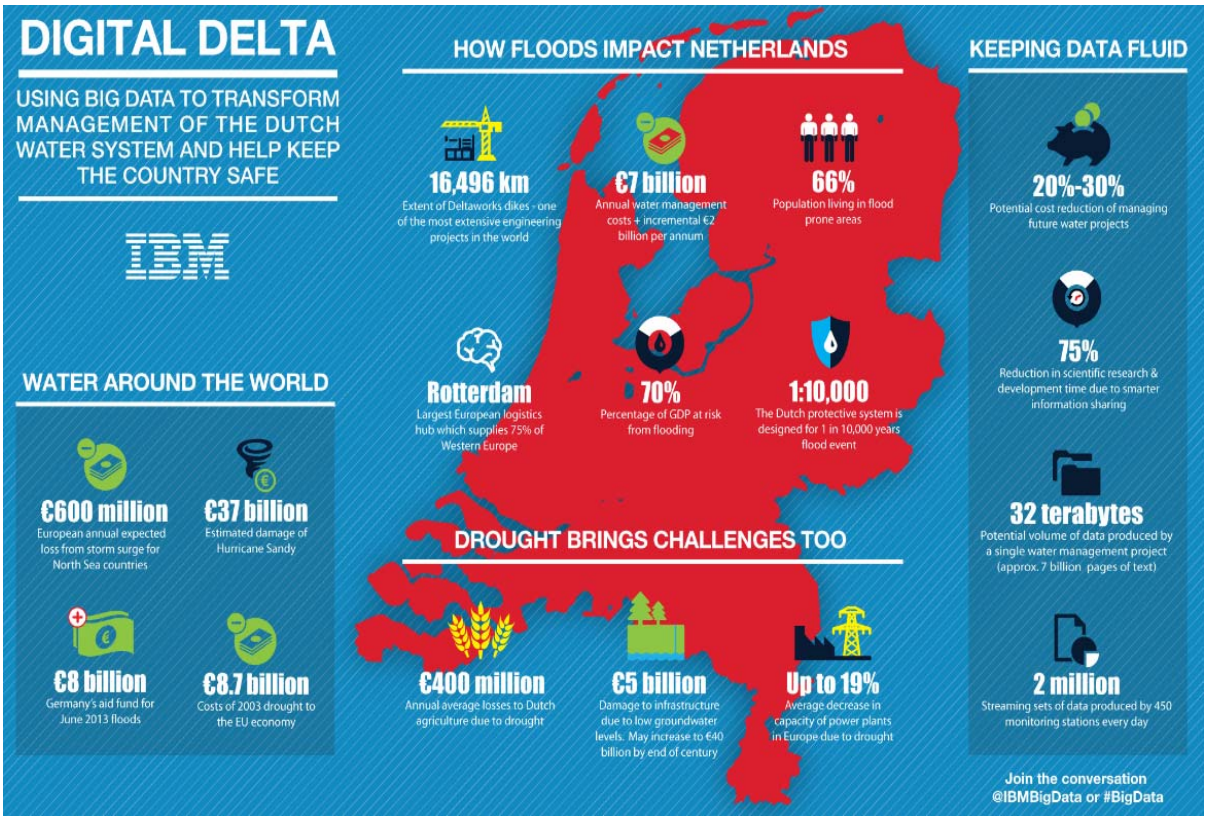
- **Digital Delta – The Netherlands**

  With 55 percent of the Dutch population located in areas prone to large-scale flooding, the Netherlands has vast experience in flood prevention and water management. Every water-related event is critical and can impact businesses, agriculture, and citizens' daily lives.

  While the Netherlands has one of the best-monitored water systems in the world and collects large amounts of data, relevant data can be difficult to find, and the data quality can be uncertain. Since the data is also in many different formats, integrating it is challenging and costly for water managing authorities and hinders the development of complex decision support capabilities.

  Digital Delta, a solution developed by IBM in collaboration with the Dutch Ministry for Water (Rijkswaterstaat), the local Water Authority Delfland, Deltares Science Institute and the University of Delft, is harnessing insights from big data to transform flood control and management of the entire Dutch water system.

This new management system is helping address far-reaching concerns ranging from the quality of drinking water and the increasing frequency and impact of extreme weather-related events, to the risk not only of floods but also droughts. By modeling weather events, the Netherlands can determine the best course of action, including storing water, diverting it from low-lying areas, and avoiding salt-water intrusion into drinking water, sewage overflows, and water contamination. The initiative is providing water experts with a real-time intelligent dashboard to harness information so it can be shared immediately across organizations and agencies.



View a larger version of the infographic

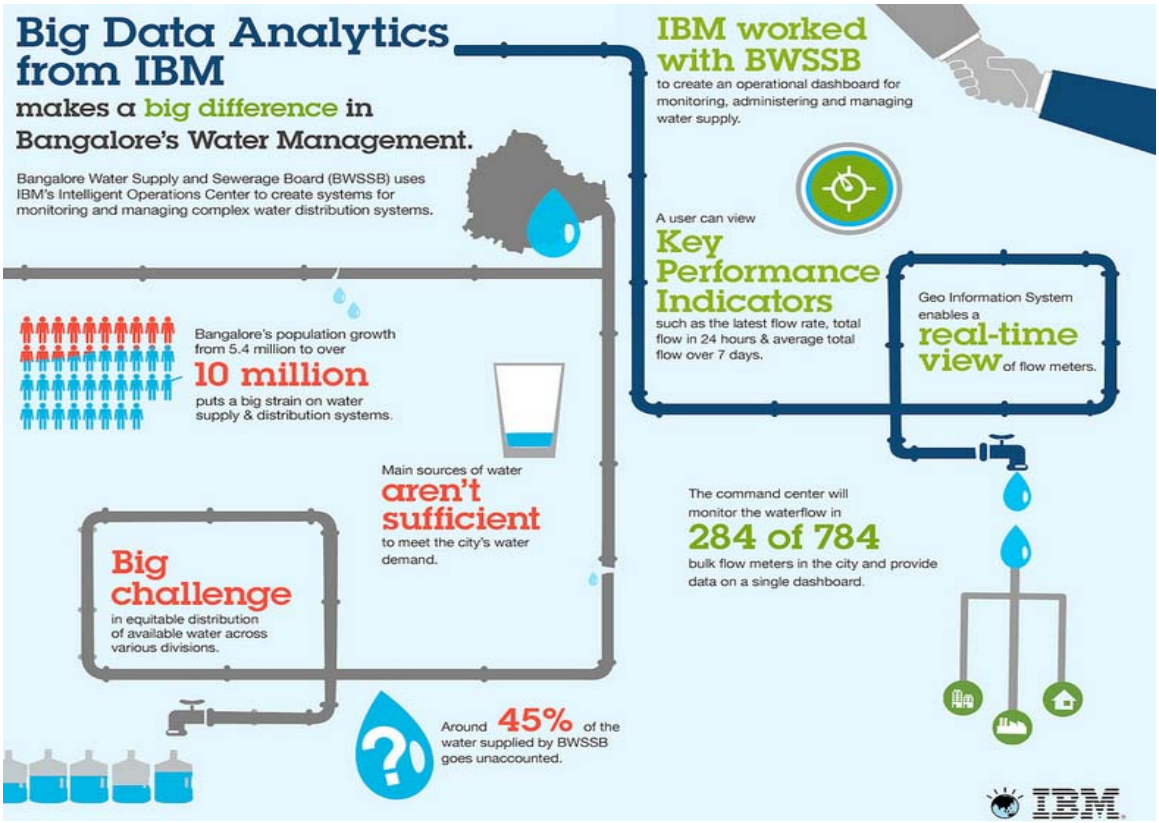
As water stress, droughts, flooding, and failing infrastructure strain economies and quality of life in many regions of the world, the Digital Delta solution offers a smart model that is now being replicated for better water management in other areas of the world.

- **Water distribution systems – Bangalore, India**

The World Bank estimates that global costs from leaky water pipes total $14 billion annually. Our water infrastructure, in service for upwards of 100 years in many regions, is under pressure, to say the least.

Along with these “aging pipe” challenges, developing economies like India are facing a serious water crisis associated with its rapid urban population growth and economic development.

Last year, IBM began collaborating with Bangalore Water Supply and Sewerage Board (BWSSB), which supplies water across nearly 800 square kilometers of the city, to create systems for monitoring and managing increasingly complex water distribution systems. Bangalore's massive population growth -- from 5.4 million in 2000 to over 10 million and counting has put tremendous strain on the city's water supply and distribution systems.



View a larger version of the infographic

IBM worked closely with BWSSB to create a water management system with operational dashboards and analytical tools to serve as a central command center for monitoring, administering and managing the city's water supply networks. By setting and adjusting thresholds at key points, engineers can ensure that supply meets their expected goals.

Implementing this solution helps minimize water loss by:

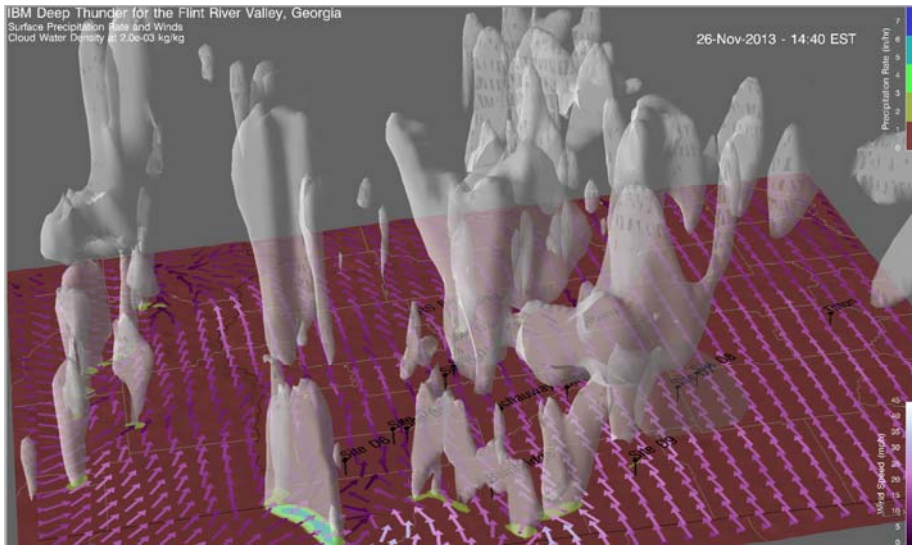
- detecting large changes in water flow through real-time monitoring
- enabling engineers to assess real-time water supply at the click of a mouse
- bringing a degree of predictability and real-time controllability of water supply across the city and population

Agriculture & food

The land and water we use for our food supply are both limited and at risk. At the same time, it is estimated that, by 2050, our planet will need to feed more than 9.2 billion people, 34 percent higher than today. Exacerbating this huge challenge are failing water infrastructures and changing weather patterns resulting in floods and droughts. Fortunately, there is a wealth of one resource that we can use to be more efficient -- information. Using big data and analytics, we are creating smarter food systems across the value chain. Two examples:

- **Flint River Partnership – Georgia, United States**

  Data-driven precision agriculture is the focus of a collaboration in which IBM and the Flint River Partnership (which includes the Flint River Soil and Water Conservation District, the US Department of Agriculture's Natural Resources Conservation Service, and The Nature Conservancy), together with the University of Georgia, are helping farmers in the Lower Flint River Basin of Georgia conserve water, improve crop yields and mitigate the impact of future droughts.



Building upon a successful irrigation model and other water conservation measures already in place, the Flint River Partnership is using IBM's Deep Thunder™ precision weather forecasting to help farmers make more informed irrigation scheduling decisions. Because the forecasts will be available on mobile devices, farmers will have 24-hour access to critical weather information in conjunction with other relevant field data.

The Partnership is also leveraging IBM SoftLayer® to manage data flows and automate irrigation recommendations, allowing farmers to determine how much water a specific crop needs at various stages of its life cycle.

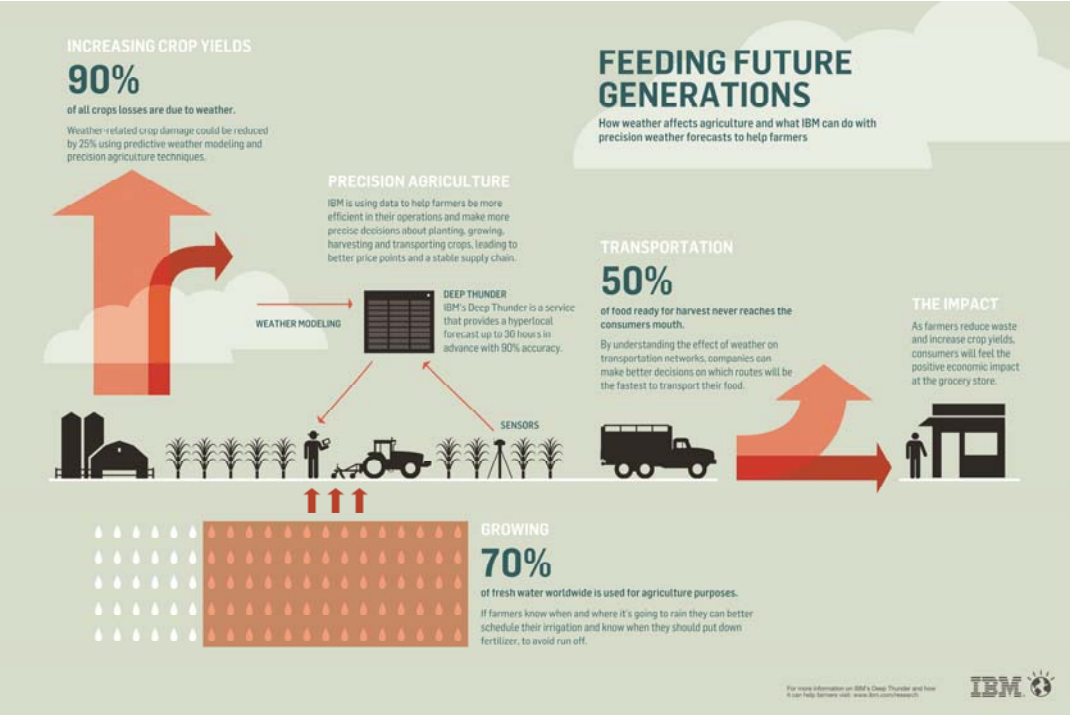
"Our job is to help farmers conserve water. Irrigation scheduling based on highly accurate weather forecasts and real-time field data will optimize decision making and consequently reduce resource use. Having access to such forecasts and field data on a mobile platform makes the data relevant, so that we can make proactive irrigation scheduling decisions on the fly."

--Marty McLendon, chairman, Flint River Soil and Water Conservation District

The integration of complex data streams generated by GPS–enabled farm equipment and in-field sensors with IBM's Deep Thunder weather forecasting technology delivered to mobile devices will provide 72-hours advance notice of weather in the Flint region, allowing farmers to be more prepared to make decisions on when to irrigate, plant, fertilize, and deploy labor resources.

"Farming operations are highly sensitive to weather. In the United States, that sensitivity is about $15 billion per year. For example, the USDA estimates that 90 percent of crop losses are due to weather. In addition, improving efficiency in irrigation will reduce the impact in areas with limited water supplies. By better understanding and then predicting these weather effects, we can help mitigate these impacts. Innovators like the Flint River Partnership are showing how they can leverage IBM's advanced modeling and analytics to increase crop yields. When we consider the need to increase food availability to a growing population, their leadership is helping to create a more sustainable approach to agriculture."

-- Lloyd Treinish, distinguished engineer & chief scientist, IBM Research



View a larger version of the infographic

- ## Food safety

  In China, pork is a major pillar of the economy in the Shandong Province, one of the country's most important agricultural regions. To limit the impact of porcine diseases and prevent tainted pork from being sold to consumers, experts from IBM China Development Lab and China's National Engineering Research Center for Agricultural Products Logistics

have created a pork monitoring and tracking system. It can extract and store information from millions of interconnected sensors. The system brings an unprecedented level of accountability and efficiency to every stage of the pork production process, from production to distribution to retailer.

IBM is also focused on helping address food-related crises after they occur. These situations have the potential to affect thousands of people, leading to significant healthcare costs, loss of revenue for food companies, and—in the worst cases—death. According to the US Department of Health, in the United States alone, one in six people are affected by food-borne diseases each year, resulting in 128,000 hospitalizations, 3,000 deaths, and a nearly $80 billion economic burden.

IBM scientists have built a system that automatically identifies, contextualizes, and displays data from multiple sources to reduce the time to identify the most likely contaminated sources by a factor of days or weeks. It integrates pre-computed retail data with geo-coded public health data to allow investigators to see the distribution of suspect foods and, selecting an area of the map, view public health case reports and lab reports from clinical encounters. The algorithm effectively learns from every new report and re-calculates the probability of each food that might be causing the illness.

Energy

Smarter energy use is critical for a sustainable energy future. Smarter energy ranges from providing the intelligence that enables us to manage our consumption of energy from any source to the use of renewable energy sources such as wind and solar.

- **Smart grids**

  IBM is helping utilities in mature and emerging markets around the world add a layer of digital intelligence to their grids. These smart grids use sensors, meters, digital controls and analytic tools to automate, monitor and control the two-way flow of energy across operations—from power plant to plug. With this intelligence, power companies can optimize grid performance, prevent outages, restore outages faster and allow consumers to manage energy usage right down to the individual networked appliance. IBM is actively engaged in this area as a founding member of the Intelligent Utility Network Coalition and through our own research and solutions.

- **Advancing the efficiency and availability of renewable energy**

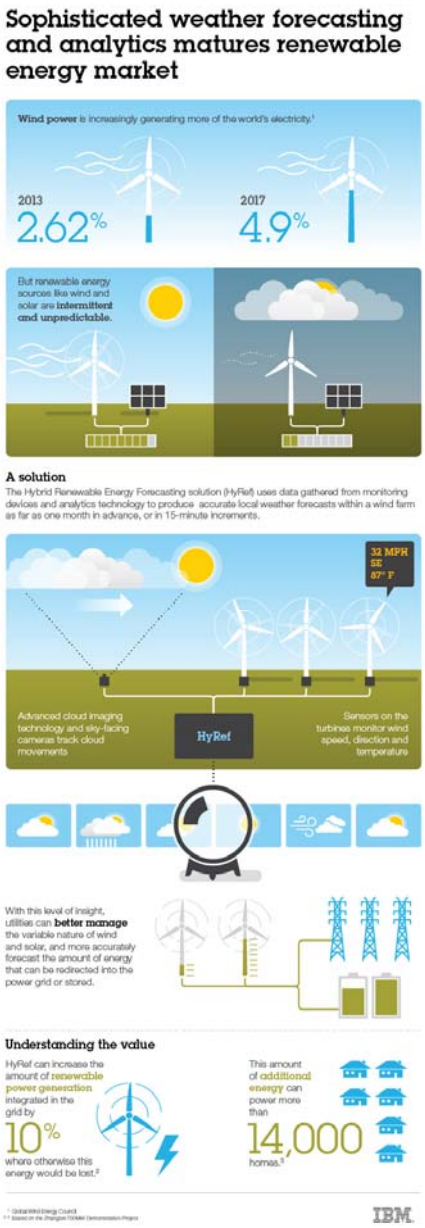
  IBM's "Hybrid Renewable Energy Forecasting" (HyREF) solution is an advanced power and weather modeling technology to help utilities increase the integration into and reliability of renewable energy resources on the electric grid.

  The solution combines weather prediction and analytics to accurately forecast the availability of wind power and solar energy. Using weather modeling, advanced cloud imaging, and turbine and solar photovoltaic sensors combined with analytics, it can provide accurate estimates of 15-minute to one-month energy output projections. Experience with the system has

reduced forecast errors from 25 percent to 8 percent; increased the quantity of intermittent generation dispatched to the grid by 10 percent; and improved the planning for and matching of conventional output with renewable-generation sources.

This capability enables utilities to integrate more renewable energy into the power grid, helping reduce carbon emissions while significantly improving clean energy output for consumers and businesses.

IBM is involved in more than 150 smart grid engagements around the world, in both mature and emerging markets.



View a larger version of the infographic

Cities

The planet's urban population is expected to almost double by 2050 – to 6.4 billion people – and account for 70 percent of the world's population. IBM is helping many cities leverage their data with analytics to address the challenge of meeting the needs of all these people effectively and sustainably. One example:

- **Accelerating data-driven cities: water, transport and emergency management**

  Cities are "systems of systems" – with separate but interconnected challenges. The cities of Minneapolis, Minnesota, and Montpellier, France, are working with IBM to make data-driven decisions to rapidly transform the way they provide water, transportation and emergency management.

  Built in partnership with cities, these new Smarter Cities® Management Centers for transportation, water and emergency management bring together IBM's portfolio of leading Intelligent Operations software, IBM Global Business Services expertise, and IBM's broad analytics capabilities. They provide cities repeatable models for urban development. The solutions are available via the cloud or on premise through a combination of hardware, software, services, and preconfigured analytics models for best practices in city management. Rather than complex, customized projects, cities can begin getting insight from their data in a little more than a week.

  - Transportation management provides city-wide traffic visibility to help alleviate congestion, improve traffic management, optimize road capacity, rapidly respond to incidents and deliver travel advisories to citizens. The solution has been proven to help some cities reduce congestion by 25 percent.

  - Water management provides the ability to use analytics and decision support to improve flood protection, water quality and integrated water resource management. It also helps forecast future demands on the water supply and helps city leaders coordinate responses to flood or drought. The solution has been proven to help some cities reduce leaks by 20 percent.

  - Emergency management offers geospatial intelligence and analytics to provide a central point of command for emergency management. Some cities using this solution have reduced response time by 25 percent.

  These and other cities around the world are increasingly using data to make better decisions and allocate resources to sense and respond to challenges in city infrastructure. By improving traffic management, responding rapidly to incidents, using effective communication channels with citizens, and ensuring sustainable natural resources, data and analytics are providing new insight to create more effective cities.

Sustainable development

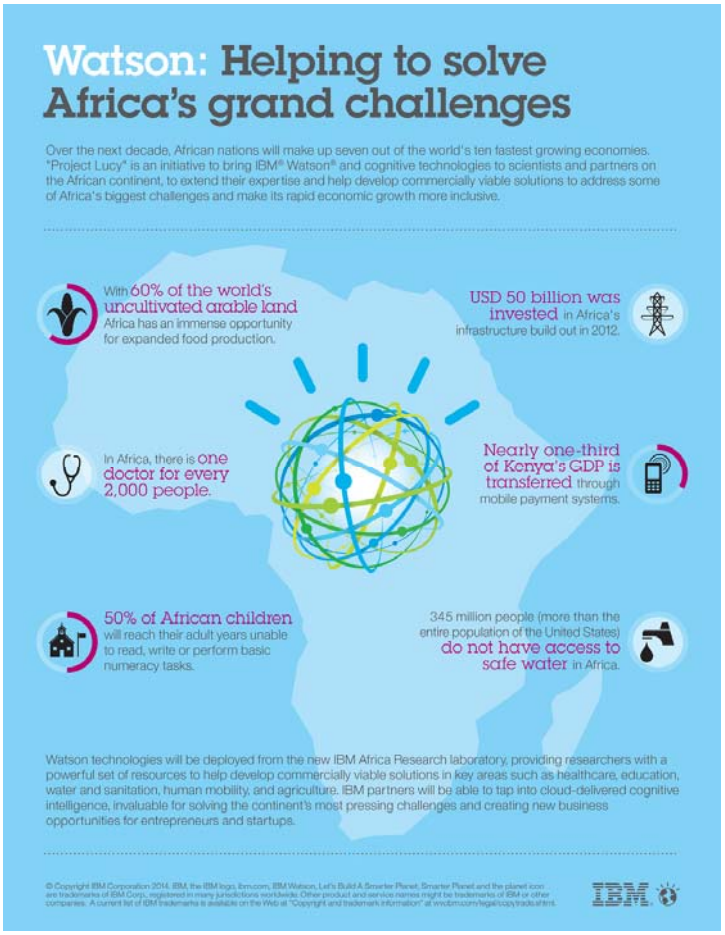
Energy, water and sanitation, agriculture and human mobility are all critical aspects for economic and societal development. One example is IBM's initiatives to help Africa tackle these challenges.

- **Africa, IBM Watson™ and "Project Lucy"**

  The last decade has been a period of tremendous growth for Africa – but the continent's challenges, stemming from an increasing population, water scarcity, disease, low agricultural yields, lacking infrastructure and other factors have impeded inclusive economic growth. IBM is actively working to help change that through two new initiatives.

  In November 2013, IBM opened its 12th global research lab. Located in Nairobi, Kenya, it is the first commercial technology research facility in Africa. Supported by the Kenyan Information, Communication and Technology Authority and located at the Catholic University of Eastern Africa, it features one of Africa's most powerful cloud-enabled computing hubs. It is giving researchers the ability to analyze and draw insight from vast amounts of data to develop solutions for Africa's most pressing challenges ranging from energy and water to transportation, agriculture and healthcare.

  In February 2014, IBM announced a 10-year, $100 million initiative to bring IBM Watson – our cognitive computing technology - and other systems to Africa. Under "Project Lucy," named after the earliest known human ancestor, IBM researchers in Africa, along with business and academic partners, will use Watson to leverage its cognitive technology to fuel development and spur business opportunities across the world's fastest-growing continent.



  View a larger version of the infographic

  Watson technologies will be deployed from IBM's new Africa Research laboratory and provide researchers with a powerful set of resources to help develop commercially viable solutions in key areas such as:

  - Water and sanitation

- Agriculture
- Human mobility
- Infrastructure
- Healthcare

In addition, to further leverage Watson's capabilities and help fuel the cognitive computing market, IBM is also establishing a new pan-African Center of Excellence for Data-Driven Development. We are recruiting research partners such as universities, development agencies, start-ups and clients in Africa and around the world to participate in this initiative. By joining, these partners will be able to tap into IBM's unparalleled expertise in cognitive computing across our 12 research labs and our new Watson business unit. This access will be invaluable for solving the continent's most pressing challenges, creating new business opportunities and assisting in development that is more sustainable.

Environmental Requirements in the Supply Chain

IBM has a long-standing commitment to protect the environment and to pursue environmental leadership across all of our business activities. As a part of this commitment, it is IBM's desire to do business with suppliers who are environmentally and socially responsible and to encourage environmental and social awareness with these suppliers. Further, there is increasing interest from customers and governments for information about the environmental attributes of IBM's products, and in many cases, the source for this type of information is IBM's suppliers.

Program Objectives:

The objectives of our requirements for suppliers and our supplier evaluation programs include:

- Preventing the transfer of responsibility for environmentally sensitive operations to any company lacking the commitment or capability to manage them properly
- Reducing environmental and workplace health and safety risks
- Protecting IBM, to the greatest extent possible, from potential long-term environmental liabilities or potential adverse publicity

While examples of this commitment have been highlighted in other relevant sections of this report, the following graphic provides key milestones of this leadership over the past four decades.

IBM's environmental evaluations of suppliers

Environmental evaluations of suppliers—key milestones

1972

Established a corporate directive requiring the environmental evaluation of suppliers of hazardous waste services

1980

Expanded our environmental evaluations of suppliers by establishing a second corporate directive to require the environmental evaluation of certain production-related suppliers

1991

Further expanded our environmental evaluations of suppliers, adding a requirement that product recycling and product disposal suppliers be evaluated

2002

Added a requirement to assess our suppliers and certain subcontractors they may use to handle recycling and/or disposal operations in non-OECD countries

2010

Established a requirement that all of IBM's first-tier suppliers establish a management system to address their social and environmental responsibilities—and that they cascade this requirement to their suppliers

IBM's environmental requirements for its suppliers are set forth in a corporate directive that governs the contracts by which we:

- Specify and/or furnish chemicals, process equipment or contaminated equipment involved in production for decontamination or cleaning
- Procure materials, parts and products for use in hardware applications
- Procure hazardous waste and nonhazardous special waste treatment and/or disposal services
- Procure product end-of life management services
- Use extended producer responsibility systems

Specific environmental requirements are documented in our contracts with suppliers conducting these types of activities anywhere in the world. These may include requirements related to chemical content, chemical management, waste management, spill prevention, health and safety and reporting, to mention some of the most relevant ones.

For hazardous waste and product end-of-life management suppliers, IBM conducts a supplier evaluation which may include an on-site review of the supplier facility's environmental, health, safety and industrial hygiene management program; its medical screening and monitoring programs; and a review of its environmental, health and safety audits for the previous three years. We evaluate these suppliers prior to entering into a contract with them

and then again approximately every three years thereafter to ensure their operations and commitment to workplace safety and sound environmental practices continues to meet our requirements. The evaluations are conducted by IBM's Corporate Environmental Affairs staff or by environmental professionals under the direction of this staff or by third-party environmental professionals.

IBM's hazardous waste and product end-of-life management supplier evaluations are comprehensive in the scope of the environmental aspects covered. The following provides a summary of the scope of the environmental aspects covered under these evaluations:

- Facility operational activities, capabilities, capacities and services:
    - Waste management services, treatment, recycling or final disposal methods, processing capacity and facility construction design (floors, docks, secondary containment),
    - Treatment and recycling methods for the hazardous and nonhazardous special wastes generated by supplier's operations,
    - Environmental, health and industrial safety and hygiene management plans, training programs, emergency response plan and fire and safety equipment, personal protective equipment, chemicals used, safety data sheets and hazards communication program, evacuation plans, first aid, medical screening and monitoring programs, etc.
- Corporate Environmental and Social Responsibility:
    - Supplier's compliance to IBM's Social and Environmental Management Requirements – Supplier's Social and environmental management system.
- Applicable legal requirements and compliance:
    - Permits, licenses and other applicable regulatory requirements, regulatory agencies and contacts,
    - Compliance history (notices of violation, government citations, public complaints and summary of inspections and findings).
- Environmental programs including:
    - Air emissions, water (consumption and discharges), chemical management, waste management, supplier evaluations, incident prevention and reporting, energy management, soil and

groundwater, etc.

- Underground storage tanks and piping systems
- Spill prevention, containment and response
- Environmental liabilities, closure and post-closure care cost funding and plans and insurance coverage.

IBM also requires its hazardous waste and product end-of-life management suppliers to track the shipment and processing of any hazardous materials they handle for IBM down to the final treatment, recycling or disposal location and to report that information to us.

Global requirements for waste processing (treatment, recycling or disposal) and product end-of-life management

As we do with all of our environmental programs, IBM manages its hazardous waste and product end-of-life management programs to the same high standards no matter where in the world we are operating. Doing so can be particularly challenging in some countries when processing infrastructure (treatment, recycling and/or disposal) that meets IBM's requirements is lacking or not existent.

Under IBM's waste management program, hazardous and nonhazardous special wastes are treated, recycled or disposed at IBM approved facilities within the country where they are generated, whenever possible. IBM does not export hazardous and nonhazardous special wastes from the US or any other country where suitable processing facilities are available within the country.

If there are no suppliers in a country that meet IBM's environmental and safety requirements for hazardous waste or product processing, the waste generated by IBM's operations is shipped to facilities in other countries where those requirements can be met.

This shipping is done in compliance with country laws and regulations and in accord with international treaties such as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal.

Though rare, there are sometimes situations in which local processing of waste is not possible and shipping to IBM-approved suppliers in other countries is not allowed due to legal requirements. In these situations, IBM will store wastes and product end-of-life materials in properly contained and managed storage facilities as allowed by law and until suitable processing facilities are available.

IBM's Social and Environmental Management System requirement for all its suppliers

In 2010, IBM established a requirement that all first-tier suppliers establish a management system to address their social and environmental responsibilities. Our objective in establishing this requirement was to help our suppliers build their own capability to succeed in this area.

These suppliers are required to:

- Define, deploy and sustain a management system that addresses their intersections with their employees, society and the environment
- Measure performance and establish voluntary, quantifiable environmental goals in the areas of waste, energy and greenhouse gas emissions
- Publicly disclose results associated with these voluntary environmental goals and other environmental aspects of their management systems
- As part of their management system, conduct self-assessments and audits as well as management reviews of their system
- Cascade these requirements to their suppliers who perform work that is material to the products, parts and/or services supplied to IBM

More information on these new supplier requirements may be found on IBM's Supply Chain Environmental Responsibility website.

Remediation

When groundwater contamination was first discovered at one of IBM's sites in 1977, the company initiated groundwater monitoring at all of its manufacturing and development locations worldwide. Today, IBM has 2,656 monitoring wells and 107 extraction wells.

In 2013, approximately 15,500 pounds of solvents from past contamination were extracted while remediating, controlling and containing groundwater at six currently operating IBM locations and 12 former IBM locations in three countries. At six of these locations, an additional 2,500 pounds of solvents were removed by soil vapor extraction or other methods. IBM also has financial responsibility for remediation at two additional former locations.

As a result of the U.S. Superfund law, IBM is involved in cleanup operations at some non-IBM sites in the US. The Superfund law creates retroactive responsibility for certain past actions, even though those actions may have been technically acceptable and legally compliant at the time. As of year-end 2013, IBM had received notification (through federal, state or private party) of its potential liability at 114 sites, since the beginning of the Superfund program in 1980. Of these, 63 are on the U.S. National Priority List. At the majority of the 114 sites, it has been determined that IBM either never had liability or has resolved its potential liability. As of now, IBM believes it may have potential liability at only 17 sites noticed through 2013.

When investigation and/or remediation at an IBM current or former location or a non-IBM facility is probable, and its costs can be reasonably estimated, IBM establishes accruals for loss contingency. Estimated costs connected with closure activities (such as removing and restoring chemical storage facilities) are accrued when the decision to close a facility is made. As of December 31, 2013, the total accrual amount was $245 million.

.

Audits and Compliance

IBM measures our environmental performance against both external and internal requirements.

Every year, and more frequently for some, IBM's manufacturing, hardware development and research locations and organizations— such as Product Development, Global Real Estate Operations, Global Asset Recovery Services, Global Logistics, Global Services Environmental Compliance and Integrated Supply Chain—complete a comprehensive self-assessment. In addition, IBM's Corporate Internal Audit staff may conduct environmental, health and safety audits. Audit and self-assessment results are communicated to top management. Follow-up, accountability and actions are clearly delineated.

In addition, as part of IBM's single, global registration to ISO 14001, approximately 25 sites or registered entities are audited annually by an independent ISO 14001 registrar. The company's manufacturing, hardware development and chemical-using research locations are audited by the external ISO 14001 registrar every 18-30 months.

Accidental Releases

IBM sites around the world report environmental incidents and accidental releases to IBM management through the company's Environmental Incident Reporting System (EIRS). IBM's environmental incident reporting criteria are equal to or exceed legal reporting requirements and every event meeting IBM's reporting criteria must be reported through EIRS. Each IBM location must have a documented incident prevention program (including provisions for preventing environmental incidents or their recurrence) and reporting procedure.

In 2013, a total of 11 accidental releases of substances to the environment related to IBM operations were reported through EIRS. Of these, two were to air, seven were to land, one to water, and one to both land and water.

- Emissions to the air included two releases of refrigerants.
- Releases to land included two releases of fuel oil and one each of treated industrial waste water, water solution, chilled water, contaminated groundwater, and hydraulic fluid.
- The release to water was chilled water.
- The release to both land and water was a release of water used in a fire

suppression system.

The root cause was investigated for all releases and corrective actions were taken as appropriate. None of the releases was of a duration or concentration to cause long-term environmental impact.

Fines and Penalties

One significant measure of a company's environmental performance is its record of fines and penalties.

In 2013, IBM was the subject of 86 successful environmental regulatory agency inspections and visits worldwide with no fines being assessed.

Over the past five years, IBM has paid five fines for a total amount of $104,814.

Fines and Penalties Worldwide

($ in thousands)

	2009	2010	2011	2012	2013
Number	2	0	0	3	0
Fines	$30.0	$0.0	$0.0	$74.8	$0.0

Awards and Recognition

Internal Recognition

Chairman's Environmental Award Program

IBM established the Chairman's Environmental Award Program in 1991 to encourage leadership and recognize achievement and progress in environmental affairs on the part of IBM's organizations.

For over 20 years, the Chairman's Environmental Award has promoted the contributions of IBM's business units toward the objectives of IBM's Corporate Policy on Environmental Affairs. The focus of the competition for 2013 was on those elements of the policy that call for IBM to:

- Develop, manufacture, and market products that are safe for their intended use, efficient in their use of energy, protective of the environment, and that can be reused, recycled or disposed of safely, and
- Utilize IBM products, services and expertise around the world to assist in the development of solutions to environmental problems.

Competing IBM organizations were asked to address their accomplishments in these areas over the past three years. Recipients of the Chairman's Environmental Award are selected based on their degree of leadership, initiative and results in contributing to IBM's environmental policy objectives. Performance against these criteria is evaluated against each nominee's opportunity to contribute given its mission and operations.

IBM's Integrated Supply Chain (ISC) organization received the 2013 Chairman's Environmental Award. The ISC organization encompasses procurement, manufacturing, logistics, engineering, hardware operations, and sales transaction support for all IBM software, hardware and services offerings globally. It also oversees $35 billion of supplier expenditure with strategic focus on creating smarter value chains, driving effectiveness and enabling growth that implements IBM's high standards for environmental leadership.

IBM Chairman, President and CEO Ginni Rometty presents the 2013 IBM Chairman's Environmental Award to Tom Rosamilia, Senior Vice President, IBM Systems & Technology Group and IBM Integrated Supply Chain.

The selection of ISC for the 2013 IBM Chairman's Environmental Award recognizes this organization's comprehensive and outstanding contributions to product environmental stewardship and excellent environmental results across its diverse activities. Since 2010, ISC has achieved:

- Technical leadership to improve the energy efficiency of power supplies and memory components
- Leadership in developing a strategy to find halogen-free materials for IBM products ahead of regulatory and client requirements
- Execution of an end-to-end global product compliance process which benefits all business units with new tools to proactively address emerging environmental requirements
- Implementation of 111 projects that reduced the use of packaging material by 3,150 tons and saved $25 million
- Reduction in printed publications, saving over $19 million
- Expansion of product take back and recycling programs across the European Union, 25 U.S. states and growth market countries such as Australia, India, Brazil and Colombia
- Leadership in supply chain environmental management, establishing and communicating requirements to 28,000 suppliers around the world
- Completion of 844 supplier site audits in 30 growth market countries
- Impressive external recognition for environmental sustainability

While only one organization is selected each year to receive the Chairman's Environmental Award, the competition generates an integrated picture of the company's worldwide efforts to demonstrate exceptional commitment to environmental affairs leadership.

External Recognition

2013 Platts Global Energy Award

IBM won the 2013 Platts Global Energy Award in the category "Stewardship Awards, Efficiency Initiative - Commercial End-User" for its outstanding worldwide energy conservation results in 2012 and 2013. This annual awards program honors exemplary achievement in the energy industry, recognizing corporate and individual performance, innovation and entrepreneurship.

Top 25 Socially Responsible Dividend Stock, Dividend Channel

IBM was named a Top 25 Socially Responsible Dividend Stock by Dividend Channel, signifying a stock with above-average *"DividendRank"* statistics including a strong 2 percent yield, as well as being recognized by prominent asset managers as being a socially responsible investment. Environmental criteria included considerations such as the environmental impact of the company's products and services, as well as the company's efficiency in terms of its use of energy and resources.

United States

2014 Climate Leadership Award

IBM received a 2014 Climate Leadership Award from the US Environmental Protection Agency (EPA), the Association of Climate Change Officers, the Center for Climate and Energy Solutions, and The Climate Registry. The award recognized IBM for its ambitious greenhouse gas emissions reduction goals and for being at the leading edge of setting requirements for suppliers to measure, disclose and reduce their emissions. This is the third consecutive Climate Leadership Award for IBM, having received one in 2012, the first year the awards were given, and 2013.

One of Five Companies to Celebrate on Earth Day, The Motley Fool

To mark Earth Day in 2013, The Motley Fool selected IBM as one of only five "companies to celebrate," stating: "Perhaps more than any other major US corporation, IBM has been putting environmental stewardship front and center for over 30 years now." Also highlighted were IBM's technological advancements and operational excellence in energy conservation and our Smarter Planet® initiatives that help others reduce their consumption of resources.

US EPA ENERGY STAR® Certification

IBM's Leadership Data Center in Boulder, Colorado, earned the US EPA's ENERGY STAR certification, which signifies that the building performs in the top 25 percent of similar facilities nationwide for energy efficiency and meets strict energy efficiency performance levels set by the EPA. This is IBM's first ENERGY STAR certified data center.

Vermont Governor's Award

IBM Burlington, Vermont, received a 2014 Vermont Governor's Award for Environmental Excellence for its Photochemical Waste Reduction in Semi-Conductor Photolithography Process. IBM Burlington site engineers redesigned and qualified a device on a lithographic process tool called a "solvent block" that greatly reduced both the volume of cleaning solvent used and the waste of these manufacturing process chemicals. This is the 21st consecutive year that IBM has been recognized with at least one of these awards—which is every year the competition has been held. IBM also is the only entity in Vermont to receive recognition every year since the establishment of the award program in 1993.

Most Valuable Pollution Prevention Award

IBM's facilities in Burlington, Vermont, received a 2013 Most Valuable Pollution Prevention (MVP2) Award from the National Pollution Prevention Roundtable. The award recognized IBM for the greenhouse gas use reductions it achieved through its development of a new Reactive Ion Etch process that increased productivity by 30 percent while significantly reducing the use of greenhouse gases and their associated emissions. The IBM Burlington site has received an MVP2 Award for five consecutive years.

Environment Achievement Award

IBM Rochester, Minnesota, received an Environmental Achievement Award for its outstanding promotion in conservation from Olmsted County and Rochester Public Utilities. The award recognized IBM Rochester's work on chiller optimization and Smarter Buildings.

Canada

IBM Canada's Bromont site received an Environmental Excellence Award in the large and medium industries and institution category from the Estrienne Environment Foundation (FEE) for the site's energy management program and ISO 50001 implementation.

IBM Canada's Bromont site received the Energia Award in the Recommissioning category from the Quebec Association for Energy Management (AQME). The recommissioning of heating, chilled water, and HVAC systems saved $2.3 million between 2007 and 2012 and improved the efficiency and reliability of these systems.

Hong Kong

IBM Hong Kong received the WasteWise Label - Class of Excellence award for its waste avoidance and reduction in the Hong Kong Awards for Environmental Excellence.

Mexico

The Smarter Data Center in Guadalajara was recognized with the Datacenter Dynamics LATAM (Latin America) award in the category of Smarter Data Center Energy Efficiency.

Summary of IBM's Environmental Performance

IBM maintains goals covering the range of its environmental programs, including climate protection, energy and water conservation, pollution prevention, waste management and product stewardship. These goals and our performance against them are discussed in this report. The goals identified here as KPIs are based on stakeholder interest and materiality. IBM considers all of its goals to be important metrics of the company's performance against its commitment to environmental protection.

Energy Conservation:

IBM's goal is to achieve annual energy conservation savings equal to 3.5 percent of IBM's total energy use. In 2013, IBM again achieved this goal, attaining a 6.7 percent savings from its energy conservation projects.

Energy Conservation (KPI)	**2009**	**2010**	**2011**	**2012**	**2013**
As % of total electricity use	5.4	5.7	7.4	6.5	6.7

Product Energy Efficiency:

IBM's product energy goal is to continually improve the computing power delivered for each kilowatt-hour of electricity used with each new generation or model of a product. Performance is tracked by product line -- servers and storage systems.

Product Energy Efficiency (KPI)	Please see the Product Energy Efficiency table.

Recycled Plastics:

In 2013, 14.8 percent of the total weight of plastic resins procured by IBM and its suppliers through IBM's corporate contracts for use in IBM's products were resins that contained between 50 and 100 percent recycled content. Comparing only the weight of the recycled fraction of these resins to the total weight of plastics (virgin and recycled) purchased, 10.8 percent of IBM's total weight of plastic purchases in 2013 was recycled plastic versus the corporate goal of 5 percent recyclate.

Recycled Plastics	**2009**	**2010**	**2011**	**2012**	**2013**
% of total plastics procured through IBM contracts for use in its products that is recyclate	13.2	11.5	12.4	12.6	10.8

Product End-of-Life Management:

IBM's goal is to reuse or recycle end-of-life IT products such that the amount of product waste sent by IBM's Product End-of-Life Management (PELM) operations to landfills or incineration for treatment does not exceed a combined 3 percent of the total amount processed.

In 2013, IBM's PELM operations sent only 0.3 percent of the total processed to landfill or incineration facilities for treatment.

Product End-of-Life Management (KPI)	**2009**	**2010**	**2011**	**2012**	**2013**
% of total processed sent by these operations to landfill or incineration for treatment	0.5	0.6	0.4	0.3	0.3

Hazardous Waste Management:

IBM's goal is to achieve year-to-year reduction in hazardous waste generated from IBM's manufacturing processes indexed to output. IBM's hazardous waste generation indexed to output increased 4.2 percent in 2013.

There were two primary factors for this year-to-year increase: an increase in fluoride/heavy metal sludge generation at one manufacturing site, due to an increase in hydrofluoric acid chemical used as part of the continued transition to single wafer tools and processes at thinner line width integrated circuits, and an increased use of the specific photoresist solvent to improve yield. The waste solvent was sent by IBM to be recycled.

Hazardous Waste Management	**2009**	**2010**	**2011**	**2012**	**2013**
% change in hazardous waste generated from manufacturing operations indexed to output	+8.4	-21.6	-3.5	+2.9	+4.2

Nonhazardous Waste Recycling:

Our voluntary environmental goal is to send an average of 75 percent of the nonhazardous waste generated at locations managed by IBM to be recycled. In 2013, we recovered and recycled 86 percent of our nonhazardous waste.

Nonhazardous Waste Recycling	**2009**	**2010**	**2011**	**2012**	**2013**
% recycled of total generated	76	79	78	87	86

Water Conservation:

IBM's goal is to achieve annual water savings equal to 2 percent of total annual water usage in microelectronics manufacturing operations, based on the water usage of the previous year and measured as an average over a rolling five-year period. In 2013, new water conservation and ongoing reuse and recycling initiatives in IBM's microelectronics operations achieved an annual 3.2 percent savings in water use, resulting in a rolling five-year average of a 2.3 percent savings versus the 2 percent goal.

Water Conservation	**2009**	**2010**	**2011**	**2012**	**2013**
% annual water savings in microelectronics manufacturing based on previous year usage and measured as an average over a rolling five-year period	3.1	2.8	2.6	2.2	2.3

IBM ENVIRONMENTAL AFFAIRS POLICY

IBM is committed to environmental affairs leadership in all of its business activities. IBM has had long-standing corporate policies of providing a safe and healthful workplace, protecting the environment, and conserving energy and natural resources, which were formalized in 1967, 1971 and 1974, respectively. They have served the environment and our business well over the years and provide the foundation for the following corporate policy objectives:

- Provide a safe and healthful workplace and ensure that personnel are properly trained and have appropriate safety and emergency equipment.
- Be an environmentally responsible neighbor in the communities where we operate, and act promptly and responsibly to correct incidents or conditions that endanger health, safety or the environment. Report them to authorities promptly and inform affected parties as appropriate.
- Conserve natural resources by reusing and recycling materials, purchasing recycled materials, and using recyclable packaging and other materials.
- Develop, manufacture and market products that are safe for their intended use, efficient in their use of energy, protective of the environment, and that can be reused, recycled or disposed of safely.
- Use development and manufacturing processes that do not adversely affect the environment, including developing and improving operations and technologies to minimize waste; prevent air, water, and other pollution; minimize health and safety risks; and dispose of waste safely and responsibly.
- Ensure the responsible use of energy throughout our business, including conserving energy, improving energy efficiency, and giving preference to renewable over nonrenewable energy sources when feasible.
- Participate in efforts to improve environmental protection and understanding around the world and share appropriate pollution prevention technology, knowledge and methods.
- Utilize IBM products, services and expertise around the world to assist in the development of solutions to environmental problems.
- Meet or exceed all applicable government requirements and voluntary requirements to which IBM subscribes. Set and adhere to stringent requirements of our own no matter where in the world the company does business.
- Strive to continually improve IBM's environmental management system and performance, and periodically issue progress reports to the general public.
- Conduct rigorous audits and self-assessments of IBM's compliance with this policy, measure progress of IBM's environmental affairs performance, and report periodically to the Board of Directors.

Every employee and every contractor on IBM premises is expected to follow this policy and to report any environmental, health or safety concern to IBM management. Managers are expected to take prompt action.

IBM Corporate Environmental Affairs
294 Route 100
Somers, New York 10589

For more information about
IBM's environmental initiatives,
please visit our website:
www.ibm.com/environment