

2016

Corporate Responsibility Report



3	Chairman's letter
4	Year in review
8	Our approach to corporate responsibility
12	Awards and recognition
14	Performance summary
18	Communities
34	The IBMer
42	Environment
84	Supply chain
98	Governance

About this report

IBM's annual Corporate Responsibility Report is published during the second quarter of the subsequent calendar year. This report covers our performance in 2016 and some notable activities during the first half of 2017.

In selecting the content for inclusion in our 2016 report, we have used the [Global Reporting Initiative](#) (GRI) reporting principles of materiality, sustainability context, stakeholder inclusiveness, and completeness. A GRI report utilizing the GRI [G4 Sustainability Guidelines](#), as well as additional details about IBM's corporate responsibility activities and performance, can be found at our [corporate responsibility website](#).

Unless otherwise noted, the data in this report covers our global operations. Information about our business and financial performance is provided in our [2016 Annual Report](#). IBM did not employ an external agency or organization to audit the 2016 Corporate Responsibility Report.

As we continue our journey to transform IBM into a cognitive solutions and cloud platform company, we regularly review our strategy and approach to corporate responsibility. This ongoing analysis helps us to identify and prioritize the issues of relevance to our business and our stakeholders. In 2014 we engaged [Business for Social Responsibility](#), a global nonprofit business network and consultancy dedicated to sustainability, to conduct a materiality analysis. That analysis maps corporate responsibility priorities to IBM's business strategy, stakeholders, and impact on global society. This process was completed in 2014 and the results have been considered in the approach and content of this report.

Innovation, transformation and leadership

Tackling big challenges comes naturally to our company. There is a reason one of the core Values that IBMers wrote for themselves was “Innovation that matters — for our company and for the world.” The harder the problem, the more interested an IBMer becomes — and the more the world turns to us for ideas, breakthroughs and partnership.

You see this in the kinds of challenges IBM has undertaken over the years — from the creation of Social Security in the United States; to the shaping of modern finance, transportation and business; to putting a man on the moon and returning him safely. You see it in our current “moonshots,” as we apply the power of cognitive technology and the thinking and dedication of the world’s most brilliant workforce to problems like cancer and education.

You see this mindset not only in which challenges we tackle, but in how we tackle them. We don’t just throw money at a problem or make symbolic gestures of our good intentions. We actively seek out partners from across civil society and government, often collaborating with both — but we don’t wait for someone to ask us for help. Rather, we take the initiative, approach complex problems as the systemic challenges they are, and don’t feel satisfied until we have put in place lasting, institutionalized and systemic solutions.

For IBMers, this is what transformation and leadership mean. It is the “matters” in “innovation that matters.” And you will see example after example of it through this report. You will see the creation of an innovative model of education that seamlessly connects school to college and career; of citizen diplomacy designed to empower communities; and new ways to transform oncology, genomics and the “last mile” of healthcare. You will learn how we are not just offering new forms of artificial intelligence, but are implementing principles to guide their fair, just and societally sustainable use.



Finally, you see this seriousness of purpose in how we act as stewards of IBM itself. We are now in the midst of arguably the most ambitious and extensive transformation in a history of continuous reinvention. IBM is one of few companies in our industry to have moved from era to era for more than a century. We have done so not by tinkering around the edges of change, but accepting the need for fundamental, bet-the-business transformation — in order to help our clients and the world move to the future.

This nexus of innovation, transformation and leadership, on a societal scale and with global impact, is expressed nowhere more clearly than in our Corporate Citizenship strategy, work and outcomes. It is the subject of this report. I hope it engages you as an ambitious professional — no matter what your field or industry. And I hope you will join us in building a world that is healthier, less wasteful, more productive, more sustainable and fairer.

A handwritten signature in black ink that reads "Virginia M. Rometty".

Virginia M. Rometty
Chairman, President and Chief Executive Officer

Year in review

Responsibility is integral to our business and draws us to social challenges where we can matter, where IBM's innovation and expertise can improve communities and lives. We forge sustained partnerships with nonprofit organizations — allied in purpose, focused on results. Following are highlights of these efforts from our 2016 report.

New skill, new collar

Many jobs in today's economy are neither white nor blue collar but rather "new collar," requiring expertise but not always advanced degrees — so IBM is exploring new ways to build skills. Pathways in Technology, or P-TECH, joins schools with corporate partners to extend high school curricula with college courses and skills development through mentoring and internships. P-TECH schools will soon number 100 in the U.S. and Australia, with more planned. IBM has hired 10 P-TECH graduates, and most are pursuing four-year degrees as IBMers.

Our new Veterans Employment Accelerator Impact Grant program has trained 600 military veterans in IBM's i2® Analyst's Notebook software, and 100 have joined IBM and partner companies as data analysts. Our IBM Africa Skills Initiative helps universities across Africa prepare students for today's IT jobs, with nearly 600 participants having joined IBM as interns or employees.

C is for cognitive

Teacher Advisor with Watson uses cognitive computing to help teachers plan lessons, initially focused on third-grade math. Piloted with hundreds of teachers in 2016, the free resource will be available across the United States for the 2017-18 school year. Also, IBM Watson Education has partnered with Sesame Workshop to design and build an adaptive platform that applies Watson to early education through apps, games and educational toys. The collaboration's first result is a cognitive vocabulary app for kindergarten students, which completed the first phase of its pilot in Georgia's Gwinnett County Public Schools in May 2017.

Another initiative, Teachers TryScience, offers STEM-focused lessons and strategies free of charge to teachers worldwide. In 2016, its website added 425 new resources in 10 languages.

[Read more](#) about our education initiatives.



A new, rainbow version of our logo represents IBM's commitment to inclusion and equal opportunity for all IBMers worldwide. It's now used with our diversity initiatives and advocacy. [Read more](#) in the IBMer section.

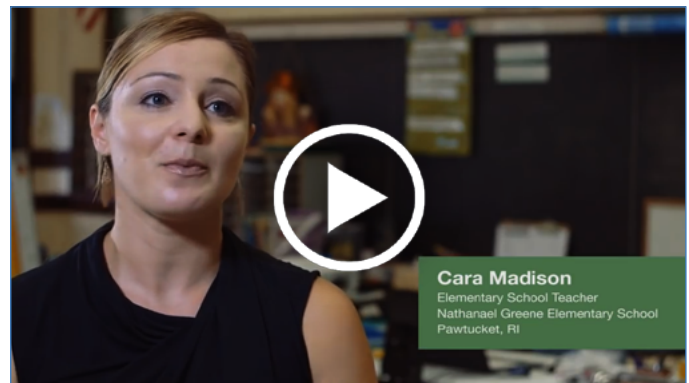
Society is our client

Applying expertise and technology to problems is what IBM does best, and our citizenship work takes the same approach. Launched in 2016, IBM Health Corps sends experts worldwide to work pro bono on engagements that expand and improve healthcare. Among its first five projects is a predictive analytics system to forecast demand for chemotherapy in sub-Saharan Africa, where few patients receive it. [Read more](#) in the communities section about other IBM initiatives that employ the same strategy:

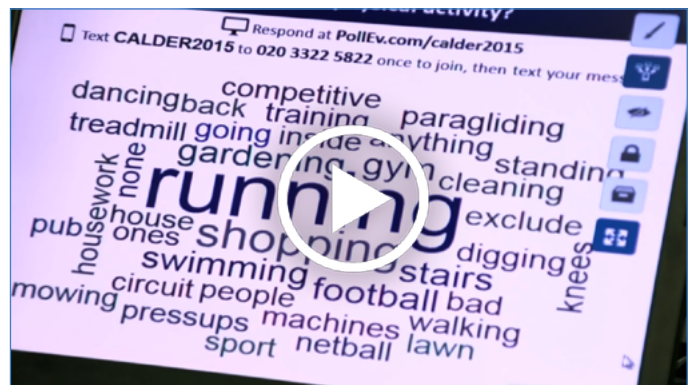
- Corporate Service Corps deploys teams of consultants worldwide to assist community organizations. In 2016 it reached 28 cities and began a partnership with the Peace Corps.
- Smarter Cities Challenge works with city authorities to devise strategies to manage congestion, pollution, poverty and other urban challenges. In 2016, the program engaged 10 cities on six continents.
- Impact Grants engaged over 400 nonprofit organizations in 60 countries in 2016, with consulting and software to support their work to resettle refugees, disrupt human trafficking, respond to natural disasters, contain infectious diseases, and much more.
- IBM SafetyNet helps nonprofits automate the collection and management of their data by providing Cúram software, consulting and ongoing support. Its initial five engagements are expanding to six more in 2017, with grants valued at \$300,000 each.

99

IBM regularly audits its suppliers for compliance with the Electronic Industry Citizenship Coalition (EICC) Code of Conduct. In 2016, 99 audits and re-audits were conducted in 15 countries. [Read more](#) in the supply chain section.



[Teacher Advisor With Watson overview](#)



[Introducing IBM Health Corps](#)

Environmental milestones

IBM achieved two important goals related to our efforts to help combat climate change, four years ahead of schedule. In 2016, IBM's renewable electricity purchases represented 21.5 percent of our global consumption (beyond what's already provided from the grid), exceeding our goal of 20 percent. IBM also achieved its third-generation CO₂ emissions goal, reducing operational emissions by 38.1 percent compared to a 2005 baseline and surpassing the 35 percent target we'd set for 2020. We continue to apply expertise and technology to address environmental challenges for our clients and the world. [Read more](#) in the environment section.

3,400 x 7

IBMers in Indonesia volunteered to organize a "typing challenge" to help convert books into braille. This event in Makassar, South Sulawesi, represents a fraction of the 50,000 who joined the effort. IBM supports volunteers like these through On Demand Community, which provides resources to assist their efforts and in 2016 recorded 1.2 million hours of service — or an average of 3,400 hours volunteered by IBMers worldwide, every day.



Innovation for life

World Community Grid® combines the idle computing power of PCs and mobile devices worldwide to create a "virtual supercomputer" that helps researchers working on humanitarian projects. In 2016, it provided the equivalent of 167,000 years of computing time to support projects including research into treatments for the Zika virus, cancer and tuberculosis.

IBM Research and the Vermont Electric Power Company have jointly developed a system to forecast the amount of power generated by solar and wind, to help integrate renewable energy into the electricity grid more effectively. IBM Research is also working with The Weather Company (acquired by IBM in 2016) to explore how "hyperlocal" weather forecasting can help farmers make more informed decisions. [Read more](#) about solutions for environmental sustainability.

IBM Accessibility Research is developing technologies that are more interactive and adaptive to people's ages and abilities. Its work includes "cognitive eldercare," exploring ways that technology can help families and caregivers monitor the health and well-being of older adults, and help seniors strengthen their social fabric. Read more at ibm.com/able.



IBM and Rice University create Watson-powered robot to improve eldercare

In recognition of outstanding leadership

The history of corporate citizenship is a narrative of transition — from the personal philanthropy of wealthy donors like Rockefeller, Carnegie and Ford, to targeted corporate giving, to IBM's pioneering integration of corporate citizenship into the company's overall business strategy. IBM's legacy of corporate citizenship — begun by Thomas Watson, Sr. more than 100 years ago — has been guided and refined by Stanley S. Litow for the past 22 years. Stan will retire from IBM — but not from public life — at the end of 2017. Most notably, Stan has focused his energies on helping to ensure that children and young adults from all backgrounds have access to quality education and the chance to succeed. He leaves behind a global organization committed to leveraging the full power of IBM's technical innovations, cross-industry knowledge and employee expertise in service to creating a better world.

“Stanley Litow has consistently and very effectively helped IBM harness technology and people power to refresh and express values of service to the world.”

— Rosabeth Moss Kanter, Harvard Business School

“Throughout different business eras and under three different CEOs, Stanley Litow has consistently and very effectively helped IBM harness technology and people power to refresh and express values of service to the world,” said Rosabeth Moss Kanter, Ernest L. Arbuckle Professor of Business at Harvard Business School, and director and chair of the Harvard University Advanced Leadership Initiative. “His leadership has been imaginative and visionary, reflected in numerous innovations in education, employee engagement, supplier connection, cultural heritage preservation, and using connected computing power to solve big global problems through a massive mobilization of volunteers. This is a remarkable range of remarkable achievements.”

Powered by Stan's vision, energy and leadership, IBM Corporate Citizenship stands apart — and boldly so. While others write checks to charities that reflect their interests, IBM

rolls up its sleeves to help others help themselves. IBM serves, but we also inspire and teach. When headline-making disasters strike, IBM and IBMers are there. But we also make quiet news everyday — enabling opportunity by redesigning education; driving economic development at the local, regional and national levels; providing massive, no-cost computing power for disease and climate research; delivering large-business capabilities and strategies to non-profit organizations; closing the gaps of culture and wealth in health treatment and outcomes.



Stan's 21st century corporate citizenship model also includes leadership development — both inside the company and through leadership-focused philosophies and curricula in leading graduate schools of business and public policy. Students at Harvard Business School read about IBM's “real change,” not spare change approach to corporate citizenship in their case studies. And IBM's Values-Driven Leadership in Action initiative focuses business schools across Africa and Europe on partnerships and curricula that emphasize cross-sector collaborations and ethical practices.

Our world's societal and environmental challenges are too great for any single entity to manage alone. That is why Stan has integrated partnership formation into leadership in the same way that IBM has interwoven citizenship into its overall business strategy. Governments at all levels, various nonprofits organizations worldwide, and IBM's commercial clients across industries have accepted Stan's invitations to combine expertise, networks and resources in service to the greater good. Because of Stan's influence, IBM's Culture of Service will continue to engage, inspire and enable the next generation of leaders well into our company's second century.

Our approach to corporate responsibility

IBM pursues the highest standards of corporate responsibility, from how we support and empower our employees, to how we work with our clients, to how we govern the corporation and connect to communities.

IBM has been delivering differentiating value to stakeholders through a legacy of service as old as the company itself. We continue to demonstrate the sustainability of our business practices and our ability to transform ourselves to build a better world as markets and industries change. We have nearly 400,000 employees and do business in more than 175 countries. And we have an extensive network of 12,000 suppliers operating in nearly 100 countries. Our definition of corporate responsibility reflects our expansive footprint and spans environmental responsibility; social responsibility to our workforce, clients and business partners; innovation to address critical societal needs in the communities in which we operate; and a culture of ethics and integrity — guided by a rigorous system of corporate governance — that promotes transparency on a global basis.

IBM's large and complex operations involve a vast ecosystem of stakeholders, including shareholders, employees, suppliers, nongovernmental organizations, public officials and community organizations. Exceeding the expectations of all of these varied interests is part of our corporate culture and integral to our business strategy and success. All of these stakeholders are equally important and should, and do, benefit from IBM's operations. To that end, as we continue to lead the cognitive era, IBM Chairman, President and CEO Ginni Rometty has said, "For most of our businesses and companies, it will not be man or machine... it will be a symbiotic relationship. Our purpose is to augment and really be in service of what humans do."

In addition to cognitive computing, IBM is pioneering many other technologies that are driving global business and societal progress — data and analytics, cloud, blockchain, nanotechnology, quantum computing and security. IBM annually invests 6 to 7 percent of total revenue on research and development aimed at making a positive and meaningful impact around the world. For the 24th consecutive year, IBM led the U.S. list of patent recipients and broke the 8,000 threshold.

Guiding principles

We follow four guiding principles in our corporate responsibility efforts:

Alignment to values — A company must be true to its values in all of its activities, both internal and external. IBM's core values have remained consistent and are embedded in all our citizenship activities. These values are:

- Dedication to every client's success
- Innovation that matters, for our company and for the world
- Trust and personal responsibility in all relationships

Our senior management is ultimately responsible for our economic, environmental and societal performance, as well as compliance with laws, regulations and the corporate policies that govern our operations and practices worldwide. This responsibility begins with our CEO and includes the IBM Board of Directors and its committees that regularly review performance and compliance.

A Corporate Responsibility Executive Steering Committee, made up of executives from all relevant global functions across IBM, provides leadership and direction across our corporate responsibility activities. Chaired by the vice president of Corporate Citizenship and Corporate Affairs, the Steering Committee includes members from human resources, employee well-being, corporate governance, environmental affairs, governmental programs, supply chain and corporate citizenship. Through all of our community efforts, as through our business pursuits, we step up as full partners, providing meaningful leadership in creating solutions, bringing them to scale and making them sustainable. We also believe that good corporate citizenship is good for business. For example, strong communities, strong healthcare systems and strong schools go hand-in-hand with strong business enterprises, which are directly connected to jobs and economic growth. This is how our good corporate citizenship can help produce real value for society and all of IBM's stakeholders.

Cross-sector collaboration — We work closely with the public and private sectors, including local, regional and national governments, nonprofit organizations, universities, research organizations and school systems. We engage with highly qualified public and civic entities that are deeply committed to solving problems, finding solutions and working together to amplify the positive impact we can have on communities around the world.

Solving problems by leveraging the full range of our resources and bringing solutions to scale — To address some of the world's toughest challenges at their roots requires more than merely making donations. We bring our best talents and technologies to bear in crafting innovative solutions, and then bringing them to scale. We collaborate with people, companies and governments across sectors and silos to concentrate efforts on fewer, more comprehensive programs that can help address issues that no single entity can manage alone.

Impact and measurement — Whether we are taking on some of the unique and complex problems brought about by climate change, helping to transform global health, or working to prepare an emerging generation with the skills and education needed for meaningful careers, we endeavor to effect widespread, measurable and sustainable change. We measure that change by developing a set of comprehensive desired outcomes and key performance indicators for each program we initiate. To maximize the impact of our investments, we plan for the longevity and sustainability of our solutions by ensuring that they are scalable and transferable.

Stakeholder engagement

At IBM, engaging and collaborating with stakeholders from a cross section of communities, governments, investors and the social sector is integral to our business strategy. Public/private collaborations and partnerships are essential to overcoming societal challenges that are too big for any single public entity or industry sector to manage.

In countries around the world, the race is on to prepare today's and tomorrow's workers with the skills required for careers in an evolving, knowledge-based economy. IBM works with educators and other key stakeholders globally to create innovative models and technologies that fundamentally transform teaching and learning in ways that better prepare people of all ages to engage meaningfully in 21st century opportunities.

- Reinventing high school and dramatically improving college completion rates, IBM in collaboration with New York Public Schools and The City University of New York created the innovative P-TECH 9-14 school model, which in just six years has scaled to 60 schools across the U.S. and Australia. Students have already graduated to “new collar” jobs with IBM, or have used their associate degree in Applied Science to transition to four-year colleges or universities.
- Teacher Advisor with Watson is a cognitive-computing-based personal coach created “by teachers for teachers” to improve their effectiveness in teaching math and save precious time while planning. Teacher Advisor will be available to teachers across the U.S. at no charge in time for the 2017-18 school year.
- Teachers TryScience, a global initiative developed in collaboration with the New York Hall of Science and teachengineering.org, registered 9,000 new users in 2016. IBM added 425 new lessons and pedagogic strategies in 10 different languages to the Teachers TryScience website, created to help teachers improve their math and science instruction skills.

- In 2016, the IBM University Relations program expanded and continued to work with university participants around the globe to engage and inspire postsecondary students for careers in the cognitive era. Students from hundreds of universities explored new career paths, joined IBM as interns or regular employees, or participated in competitions to demonstrate their technology training.

To address the skills gap while assisting military veterans, IBM's Veteran Employment Accelerator Impact Grant program helped hundreds of vets train for data analyst certification throughout 2016. Corporate partners such as American Express, Aetna, PNC and USAA are essential to the program, working with IBM to place these highly skilled vets in key roles in their companies.

IBM is a founding member of the Electronic Industry Citizenship Coalition (EICC) and [encourages its suppliers](#) of products and services to join the EICC and participate in the development and deployment of resources aimed at driving improvements in social responsibility. IBM's Global Employment Standards are aligned with the EICC Code of Conduct which contains provisions on labor, health and safety, environmental, ethics and management systems, and which reference international norms and standards.

IBM's commitment to making a difference through meaningful transformation requires that we incorporate the latest thinking and external expertise to advance our leadership development programs, foster employee engagement, and ensure our tradition of service remains vibrant.

- Our membership in The Conference Board, a global, independent business membership and research association, enables IBM to hone our thought leadership in areas including the economic and business environment, corporate leadership, and human capital, and allows us to better respond, anticipate and make the right strategic decisions. IBM has 15 senior executives serving on or leading each of The Conference Board's key councils, in addition to nearly 1,500 IBM employees who engage with and benefit from research provided by The Conference Board throughout the year.
- As chair of the U.S. Chamber of Commerce Foundation Center for Corporate Citizenship, dedicated to strengthening America's long-term competitiveness, IBM's vice president, Global Citizenship Initiatives, leads the efforts to educate the public on the conditions necessary for business and communities to thrive, on how business positively impacts communities, and on emerging issues and creative solutions that will shape the future.
- IBM is a founding member of IMPACT 2030, a business-led coalition that convenes leaders from corporations, the United Nations (U.N.), civil society, academia and philanthropic organizations from around the world, uniting their corporate volunteering efforts to address the U.N. Development Agenda through collaboration. IBM's vice president, Global Citizenship Initiatives, serves on IMPACT 2030's Executive Committee, and is leading the effort to align companies and their employee volunteer efforts with the Global Goals, advance the practice of employee volunteering and pro bono consulting, and create real and sustainable change.
- IBM's vice president, Global Citizenship Initiatives, also serves on the board of Independent Sector, the only national membership organization that brings together nonprofits, foundations and corporations to engage in charitable endeavors to advance the common good.
- IBM is a member of the Points of Light Corporate Service Council, a global platform for mobilizing, equipping and inspiring high-impact volunteering. Council members include 75 of the world's largest and most successful companies that are connected with experts in academia, business and civil society on issues that include creating effective employee volunteer programs and scaling and deepening global impact through service.

Our comprehensive environmental programs are boosted by partnerships with innovative organizations that bring together governments, nongovernmental organizations, multilaterals, leading companies, thought leaders and citizens to protect and preserve the planet.

- In 2016, IBM became a founding member of the SMARTer2030 Action Coalition, an initiative promoting an agenda that implements “smart” information and communications technology (ICT)-enabled solutions to advance a low-carbon economy.
 - In 2017, IBM also joined the U.S. Water Partnership whose mission is to unite and mobilize the best of U.S. expertise, resources and ingenuity to address global water challenges, with a special focus on developing countries, where needs are greatest.
 - IBM continues to promote wildlife habitat conservation and management through its membership and participation in the Wildlife Habitat Council (WHC). Five IBM sites in the United States currently have their wildlife habitat management and conservation education program certified by the WHC. In 2017, IBM’s Research Triangle Park (RTP) site partnered with local Eagle Scouts to build a Community Garden that will provide a food source for pollinators.
- Some of the additional organizations we work with are:
- ACHIEVE
 - American Federation of Teachers
 - American Red Cross
 - Australian Business Volunteers
 - Business for Social Responsibility
 - Carnegie Endowment for International Peace
 - Center for Climate and Energy Solutions
 - Committee Encouraging Corporate Philanthropy
 - Corporate America Supports You (CASY)
 - Corporate Responsibility Association
 - Council on Foreign Relations
 - CSR Asia
 - CSR Europe
 - Digital Opportunities Trust
 - Environmental Law Institute
 - European Academy of Business in Society
 - Global FoodBanking Network
 - International Medical Corps
 - Let Girls Learn
 - Meridian International Center
 - Peace Corps
 - Pyxera Global
 - Stop the Traffic
 - Student Achievement Partners
 - The Conservation Fund
 - The National Board of Professional Teaching Standards
 - The Nature Conservancy
 - UnboundEd
 - U.S. Agency for International Development (USAID)
 - U.S. Department of State
 - U.S. Diplomacy Center
 - VSO International
 - World Environment Center
 - Yale School of Management

Awards and recognition

On an annual basis, publications, advocacy groups, governments and nongovernmental organizations around the world rate and recognize IBM for our corporate responsibility efforts. We are proud to share highlights of our recognition at a local, regional, national and international level.

- *Barron's* — World's Most Respected Companies
- Boston Consulting Group — The 50 Most Innovative Companies
- *Fortune* — Most Admired Companies
- *Fortune* — Change the World list
- *Fortune* — The Most Powerful Women, Ginni Rometty
- *Forbes* — World's Most Valuable Brands
- Interbrand — Best Global Brands

Corporate responsibility

- CONCAMIN — Ethics and Values Award for 13th consecutive year
- *Corporate Knights* — 2016 Top Foreign Corporate Citizens (Canada)
- *CR Magazine* — 100 Best Corporate Citizens
- Dow Jones Sustainability Index, North America
- *The Economic Observer* — Most Respected Company Award to IBM China (13th consecutive year)
- EcoVadis — Gold-level CSR rating
- Points of Light — The Civic 50, most community-minded companies in the U.S.

HR/diversity

- American Indian Science and Engineering Society — Top 50 Workplaces for Native American STEM Professionals
- Asia Society — 2016 Overall Best Employer for Asian Pacific Americans
- Association of Southeast Asian Nations — IBM Malaysia, Top Employer for Work/Life Practices
- Association of Talent Development — 2016 Best of the Best Award
- *Black Enterprise* — 50 Best Companies for Diversity
- Brandon Hall Group — Two Gold Awards, Best Leadership Development Program and Best Launch of a Corporate Learning University
- *DiversityInc.* — Top 50 Companies for Global Diversity, 2016
- Excellence in Diversity — Top 50 Inclusive U.K. Employers
- Human Rights Campaign Foundation — Best Places to Work for LGBT Equality
- LATINA Style Magazine — 50 Best Companies for Latinas
- LEAD2017 — Best Global/International Leadership Program
- Military Friendly — 2017 Gold Medal-level Employer Award
- National Association of Female Executives — Top 50 Companies for Female Executives
- Ragan Communications — Best Employee Advocacy and Best Employee Education Program Awards
- Stonewall Global Equity Index — Top Global Employer and Star Performer LGBT-friendly workplace
- *The Times* — Top 50 Employers for Women in the U.K. in 2016
- *Working Mother* — Best Companies for Multicultural Women
- *Working Mother* — 100 Best Companies
- *Working Mother India* — Top 10 Employers
- Workplace Pride Foundation — World's Most LGBT-Inclusive Company

Environment

- American Chamber of Commerce of Mexico, Guadalajara Chapter — 2016 Sustainable Company Award
- City of Austin, Texas — Austin Green Business Leaders Program, Platinum level for IBM's Austin facility
- Colorado Department of Public Health & Environment — Gold Leader in the Environmental Leadership Program, for IBM's Boulder facility
- Distribution Business Management Association (U.S.) — 2017 Circle of Excellence Award
- Institute of Packaging Professionals (U.S.) — 2016 AmeriStar Award in the Electronics category
- Institute of Directors, India — 2016 Golden Peacock Global Award for Sustainability
- Philippines' Department of Energy — Outstanding Award in the 2016 Don Emilio Abello Energy Efficiency Awards (third consecutive year)
- U.S. Environmental Protection Agency, the Center for Climate and Energy Solutions, and The Climate Registry — Five-time Climate Leadership Award winner, 2017 winner in the Organizational Leadership category

Supply chain

- *Affinity Inc. Magazine* — Top Corporations for LGBT Economic Empowerment
- *Asian Enterprise* — One of the top corporations for Asian-American owned businesses
- *DiversityInc.* — Top 50 Companies for Supplier Diversity
- *DiversityBusiness.com* — Top 50 Corporations for Multicultural Business Opportunities
- Global Equality & Diversity — The Chancellor's Award for Global Supplier Diversity
- Institute of Economic Development — Corporate Supplier Diversity Award
- *Minority Business News* — Most Admired Corporations for Supplier Diversity, USA Champion of Supplier Diversity, Top Corporate Buyer for Supplier Diversity and Best-in-Class for Minority Business Development and Inclusion
- National Minority Supplier Development Council — Corporation of the Year and Leader of the Year
- National Veteran-Owned Businesses Association — Top Military-Friendly Supplier Diversity Program
- U.K. Employers Network for Equality and Inclusion — Inclusive Procurement Award
- WEConnect International — CEO Special Award, Corporate Leader of the Year for Diversity (China)
- Women's Enterprise USA — Top 100 Corporations of the Year for Supplier Diversity, Top 100 for Inclusion of Women Business Enterprises and Top 100 Leaders for Supplier Diversity

Performance summary

IBM relies on a series of metrics to measure our corporate responsibility efforts every year. Below is a summary of the data in several important areas. Our key performance indicators (KPIs) for various parts of the business are also noted, along with some explanation.

KPI denotes key performance indicator

Employees

Learning

We continue to support our employees and the business in building and modernizing the critical skills needed to innovate, work in new ways and adopt a growth mindset. IBM Learning creates learning solutions based on users' needs and wants. We offer personalized, real-time and inspiring learning experiences delivered through a cognitive and cloud-based digital platform. We use Watson Analytics to measure the impact through Net Promoter Score, analyze the emotional sentiment and predict digital learning preferences. These practices allow us to hone our learning solutions to better enable IBMers to achieve their full potential, provide value to our customers and support our strategic imperatives of cognitive, cloud and agile.

	2012	2013	2014	2015	2016
Learning investments worldwide (\$M) KPI	477	525	482	484	498
Learning hours worldwide (M)	33	40	25.8	25	26.7
Learning hours per employee KPI	78	82	62.5	58.3	56

Women in the workforce

IBM remains dedicated to addressing the specific needs of women in our workforce and to creating work-life and career development programs that address these needs. We are committed to the progress and leadership development of women in our workforce and to providing opportunities across the more than 175 countries where we do business.

Women in the workforce % KPI	2012	2013	2014	2015	2016
Global workforce	30.0	30.1	31.1	31.4	31.8
Global executives	22.3	23.2	23.9	24.0	24.0
Managers	25.6	26.0	26.5	26.4	26.7

Global illness/injury rate

	2012	2013	2014	2015	2016
Total number (per 100 employees)	0.29	0.30	0.42	0.33	0.30

Volunteering

IBM supports and encourages employees and retirees in skills-based volunteering in their local communities around the world. Since 2003, when IBM launched its volunteering enablement initiative, 287,000 registered users have logged over 20 million hours of service worldwide.

Retiree and employee volunteer hours (K)	2012*	2013	2014	2015	2016
IBM worldwide	1,581	1,496	1,532	1,195	1,248

* IBM celebrated its Centennial in 2011-12 and the exceptionally high volunteer hours reflect the many special volunteer projects associated with the Centennial.

Giving

IBM tracks and reports global corporate contributions by issue, geography and type of grant. Giving by issue reflects our goal to maintain education as our primary focus by using IBM's innovative skills and technology to improve student performance. Giving by geography helps us to understand the alignment of our resources with our global operations. But the type of our giving — a combination of services, technology (including software) and cash — is what we believe distinguishes IBM. We have long believed that money alone does not solve problems. Innovative solutions are also required to transform approaches to societal challenge and achieve measurable outcomes.

While education is our highest priority, we cannot achieve educational improvement without understanding its connection to other issues. Maintaining strategic investments in human services, culture, health and the environment gives us a more complete picture of how to effectively transform education. In addition, it is vitally important that we maintain the flexibility to address new initiatives and meet extraordinary external conditions such as disaster relief and recovery.

The geographic distribution of our citizenship contributions reflects how IBM operates — in a global, fully integrated fashion. Some of our contributions are given on a globally competitive basis, so geographical distribution may vary due to the number and quality of applications. We do not set goals for percentage change in contributions year-to-year, nor for giving by geography or by type of contribution. We focus instead on increasing the quality of our work with organizations on projects that use our most innovative solutions successfully and have a significant, measureable impact on key social issues. Current trends in contributions will not necessarily continue, but rather will be determined within the framework of our goal to increase the effectiveness of our contributions.

Global corporate contributions by issue (\$M) KPI	2012	2013	2014	2015	2016
Education	143.0	147.1	149.2	154.8	208.4
Culture	3.7	3.0	3.6	3.4	4.0
Human Services	16.9	17.3	20.1	18.6	15.9
Health	3.5	3.5	3.7	3.6	5.2
Other	24.8	32.0	30.7	23.9	20.8
Environment	5.2	5.0	3.1	0.6	3.5
Total	197.1	207.9	210.4	205.0	257.8

Global corporate contributions by type (\$M) KPI	2012	2013	2014	2015	2016
Cash	42.6	41.4	36.8	35.5	41.8
Technology	99.2	100.2	104.4	109.5	171.7
Services	55.3	66.3	69.2	60.0	44.3
Total	197.1	207.9	210.4	205.0	257.8

Global corporate contributions by geography (\$M) KPI	2012	2013	2014	2015	2016
North America*	77	83.5	84.7	65.4	99.2
Asia Pacific	35.9	37.5	40.3	42.6	39.3
Europe, Middle East, Africa	64.4	65.7	64.8	82.2	104.2
Latin America	19.8	21.2	20.6	14.8	15.1
Total	197.1	207.9	210.4	205.0	257.8

*Combined Canada with U.S. as North America — both countries reported separately in previous reports.

Environment

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 **KPI**

IBM's goal is to achieve annual energy conservation savings equal to 3.5 percent of IBM's total energy use. In 2016, IBM again achieved this goal, attaining a 5.3 percent savings from its energy conservation projects.

	2012	2013	2014	2015	2016
Energy conservation as % of total electricity use	6.5	6.7	6.7	6.3	5.3

Renewable electricity procurement **KPI**

IBM's renewable electricity procurement goal is to purchase 20 percent of our electricity consumption from renewable sources by 2020, over and above the quantity of renewable electricity provided as part of the mix of electricity that we purchase from the grid. In 2016, IBM contracted with its utility suppliers to purchase approximately 783,000 megawatt-hours of renewable electricity, representing 21.5 percent of our global electricity consumption and exceeding our goal four years early.

	2012	2013	2014	2015	2016
Renewable electricity procurement as % of total electricity purchases	9.8	11.8	14.2	16.2	21.5

CO₂ emissions reduction **KPI**

Our third-generation CO₂ emissions reduction goal is to reduce CO₂ emissions associated with our energy consumption 35 percent by year-end 2020, against base year 2005 and adjusted for acquisitions and divestitures. In 2016, IBM achieved and exceeded this goal four years early as IBM reduced its operational CO₂ emissions by 38.1 percent against the 2005 baseline.

	2012	2013	2014	2015	2016
CO ₂ emissions reduction as % of 2005 baseline CO ₂ emissions	15.7	24.7	27.7	28.7	38.1

Product energy efficiency **KPI**

IBM has two goals related to product energy efficiency. The first goal is to improve the computing power delivered for each kilowatt-hour of electricity used with each new generation or model of a product. The second goal is to qualify its new server and storage products to the ENERGY STAR program criteria where practical, and where criteria have been developed for the specific server or storage product type. Please see the 2016 [product stewardship goals and performance](#) table for information regarding performance against these goals.

Nonhazardous waste recycling **KPI**

Our goal is to send an average of 75 percent (by weight) of the nonhazardous waste generated at locations managed by IBM to be recycled. In 2016, we recovered and recycled 86 percent of our nonhazardous waste.

	2012	2013	2014	2015	2016
% by weight sent for recycling of total generated	87	86	86	85	86

Product end-of-life management **KPI**

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 (by weight) of the total amount processed. In 2016, IBM's PELM operations sent only 0.6 percent of the total processed to landfill or incineration facilities for treatment.

	2012	2013	2014	2015	2016
% by weight of total processed sent by IBM's PELM operations to landfill or incineration for treatment	0.3	0.3	0.5	0.7	0.6

Water conservation **KPI**

In early 2016, IBM established a new goal to achieve ongoing year-to-year reductions in water withdrawals at data centers and other large IBM locations in water-stressed regions. In 2016, IBM reduced water withdrawals at these locations by 6.6 percent against a 2015 baseline year.

Supply chain

2016 global supplier spending fell \$1.1 billion — primarily related to declines in IBM hardware revenue — with the largest decreases in Logistics Procurement (25 percent) and Production Procurement (19 percent). Our largest regional decrease was 9 percent in Asia Pacific. Total spending with diverse suppliers (first-tier) increased slightly from 2015, driven by diverse spending outside the U.S., and reached 8.5 percent of our global total spend.

Supplier spending by category	2012	2013	2014	2015	2016
Services and general procurement (%)	64	67	71	79	82
Production procurement (%)	33	30	26	18	15
Logistics procurement (%)	3	3	3	3	3
Services and general procurement (\$B)	22.8	22.1	21.6	20.3	20.3
Production procurement (\$B)	11.5	9.7	7.8	4.7	3.8
Logistics procurement (\$B)	1	1	0.9	0.8	0.6

Supplier spending by location	2012	2013	2014	2015	2016
North America (%)	35	36	37	42	43
Asia Pacific (%)	35	35	33	31	29
Europe, Middle East, Africa (%)	21	21	23	22	23
Latin America (%)	9	8	7	5	5
North America (\$B)	12.4	11.8	11.2	10.8	10.6
Asia Pacific (\$B)	12.4	11.4	9.9	8	7.3
Europe, Middle East, Africa (\$B)	7.4	7.0	6.9	5.8	5.6
Latin America (\$B)	3.1	2.6	2.3	1.2	1.2

First-tier spending KPI	2012	2013	2014	2015	2016
Total U.S. (\$B)	10.7	10.2	9.8	9.3	9.7
Diverse U.S. (\$B)	1.7	1.9	1.5	1.3	1.3
Diverse non-U.S. (\$M)	939	917	883	718	744

The decrease in supplier improvement plans completed and accepted was due to a lesser number of social responsibility full audits and re-audits conducted in 2016. This is part of our normal assessment cadence, as EICC audits have a two-year duration which affects (up and down) the number of audits in the successive calendar year. IBM requires an improvement plan for all suppliers with noncompliance discovered during an EICC audit or re-audit of their facilities; implementation of the plans may begin in one calendar year and complete in the next.

Supplier improvement plans KPI	2012	2013	2014	2015	2016
Completed and accepted	311	175	141	161	117

Communities

Through an integrated portfolio of innovative programs, IBM and IBMers contribute our best assets — our technology, time and global expertise — to create innovative solutions to some of the most challenging problems facing society in the places where we live, work and do business.

Education

In the 21st century, there are few fields of endeavor for which education is not essential. We all benefit when effective schools prepare the next generations for the challenges ahead. Established information economies need workers with both technical skills and emotional intelligence — the ability to think critically, communicate clearly and collaborate effectively.

These skills are no less in demand in developing economies — many of which are attempting to transition from the industrial or even pre-industrial eras into global players with rapidly growing youth populations unhindered by outdated thinking. Complicating the mix are issues of funding for public education, connecting that education directly to jobs, and in many cases helping young people overcome the socio-economic barriers that otherwise might exclude them from participation in the middle class and beyond.

Over the last several years, IBM has identified and developed innovations to address critical education challenges. In 2016, our P-TECH grades 9-14 schools continued to expand and flourish — scaling to 60 schools across the U.S. and Australia. P-TECH schools already have graduated young people into “new collar” jobs with IBM, with the academic preparation to transition successfully into four-year bachelor’s degree programs at major colleges and universities, or both. Teacher Advisor With Watson — a cognitive-computing-based personal coach to help teachers improve their effectiveness in teaching math — was developed by teachers for teachers. Teacher Advisor was refined and beta tested in 2016, and will be available to teachers at no charge in time for the 2017-18 school year.

These programs are not just “wish list” items or ideas. They are active, ongoing and growing commitments that speak to the world’s challenges. These innovative solutions already are delivering significant results — educating young people, helping teachers improve their teaching, and preparing more young people for success in their lives and careers. They represent just a few of the many ways that IBM has led — and continues to lead — the charge to provide, improve and expand educational opportunities to a world that is hungry for knowledge, skills and the chance to succeed.

P-TECH

High school graduation rates in the United States have increased steadily in recent years, and since the end of the recession in 2008 U.S. employers have created more than 10 million jobs, according to the [U.S. Bureau of Labor Statistics](#). Despite these positive developments, further analysis of these numbers reveals tens of thousands of “new collar” jobs — employment requiring postsecondary education or certification and workforce readiness skills — remain unfilled. Meanwhile, young people (many from low-income families) who otherwise might fill these newly created positions remain at the bottom of the ladder — shut out from meaningful participation in the economy and from opportunities to enter the middle class. The reason for this disconnect is simple: high school graduation does not equal college and career readiness.

IBM recognized the root causes of what others now refer to as the “skills gap” years ago. In partnership with the New York City Public Schools and The City University of New York, IBM launched the first P-TECH grades 9-14 school in Brooklyn in 2011. By 2016, the P-TECH network of schools that combine high school with community college and workplace learning to prepare graduates for college and career had spread to more than 60 campuses across the U.S. and Australia — with many more locations in the U.S. and around the world in the pipeline.

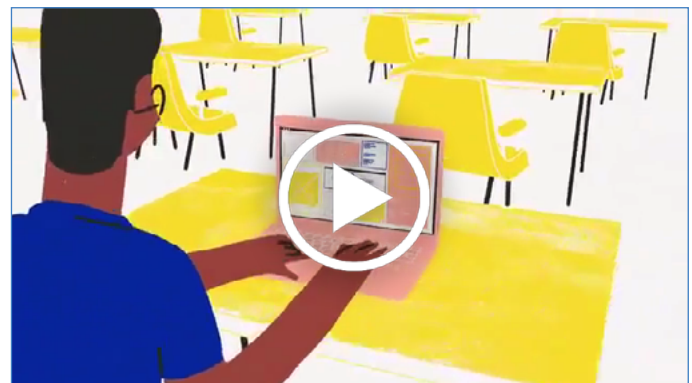
“The P-TECH program will be adapted to the Moroccan context to develop students’ entrepreneurial spirit in STEM, and will have a positive impact on the Moroccan education system.”

— Morocco Minister of Education and Vocational Training, Rachid Benmokhtar

“When I speak with parents around Australia, what they tell me is they want a great education for their children and to know that there will be a job for them when they finish their education. P-TECH complements absolutely our economic plan, our innovation plan and our student achievement plan,” says Australia Minister for Education Simon Birmingham. “The P-TECH pilot represents an excellent opportunity to further strengthen connections between education and industry to support young people.”

The main reason for P-TECH’s success is simple — it works. In 2016:

- Colorado, Maryland and Rhode Island opened eight new P-TECH schools, with seven new schools breaking ground in Australia, and commitments for further replication across the U.S. and in Morocco and the U.K. “In bringing the P-TECH model to Maryland,” said Governor Larry Hogan, “Baltimore City students and others will have the opportunity to gain in-demand skills that employers need in the 21st century workforce, and Maryland employers will gain a steady pipeline to skilled professionals.”
- With encouragement, motivation and support, students from Brooklyn P-TECH continued to blaze through their “six-year” programs, graduating with high school diplomas and associate degrees in technology in 3.5 to 5.5 years. IBM already has hired 10 of P-TECH’s early graduates, and most are earning four-year college degrees simultaneously with employment at IBM. Other graduates are pursuing their bachelor’s degrees full-time.
- Fifty-four young people of color from low-income families have graduated from Brooklyn P-TECH — all ahead of schedule — and 56 percent of P-TECH students from the first cohort are on track to complete their college and high school degrees on time or earlier.



Gabriel Rosa relates how P-TECH prepared him for a “new collar” job at IBM.

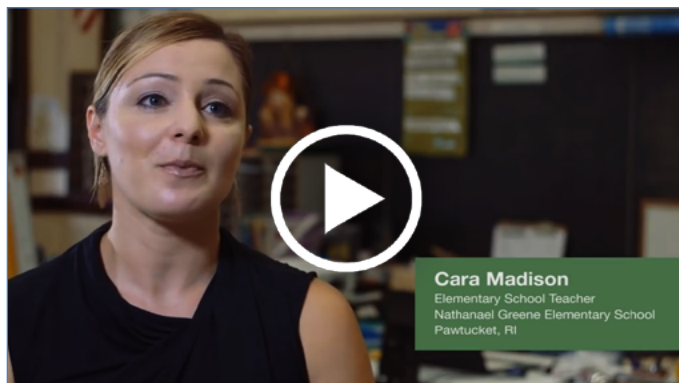
Teacher Advisor With Watson

Preparing young people for college and career is critical to social and economic progress. High-quality teaching drives education success, but good teaching and effective learning must start early. All the data and the views of educators and other experts indicate that quality math education (especially during the elementary school grades) is critical to a child's future academic success.

Unfortunately, many elementary school teachers are neither prepared nor trained specifically to teach math. That's why IBM — in consultation with education experts and the best elementary school teachers — created [Teacher Advisor With Watson](#). It is a “personal coach” that employs cognitive computing and natural-language capabilities to provide teachers with access to the best teaching strategies, and the ability to customize the best lesson plans, to teach more effectively. American Federation of Teachers President Randi Weingarten said the system “is the next iteration of technology most teachers would never have any access to. It will give them a wonderful, encyclopedic, ongoing, virtual resource at their fingertips.”

“Wow! What a difference this site is. I love the features of the different lessons. I also used Watson and it came up with exactly what I wanted, right away. This website is going to be a great resource and tool for teachers.”

— Jaclyn, teacher for eight years



[Teacher Advisor With Watson overview](#)

Last year marked significant progress for Teacher Advisor, which will launch across the U.S. at the start of the 2017-18 school year. With an initial focus on third-grade math, the system will ultimately address all elementary school grades and provide comprehensive, vetted education content — and confidential, personalized guidance — to teachers whenever they need it, at no cost. Hundreds of third-grade teachers were involved in piloting the program throughout 2016, with 94 percent indicating their intent to continue using the tool.

“About 200 teachers across the country, including about two dozen in New York City, have been part of a pilot program using Teacher Advisor. Cara Madison, a special-education teacher at Nathanael Greene Elementary School in Pawtucket, Rhode Island, said the program has been a big time-saver for her because the information, compiled by teachers who are math experts, has already been vetted.”

— *The New York Times*, “Next Target for IBM's Watson? Third-Grade Math” (Sept. 27, 2016)

Teachers TryScience

IBM's global initiative to help teachers improve their math and science instruction skills registered 7,507 new users in 2016. In addition, IBM added 425 new lessons and pedagogic strategies in 10 different languages to the [Teachers TryScience](#) website, which received 291,428 visitors in 2016.

In July, IBM featured Teachers TryScience at the company's STEM Summit for teachers and education administrators from India, Australia, Korea and Malaysia. Attendees participated in a hands-on workshop on design-based learning. “I did not have any idea about design-based learning prior to this Teachers TryScience workshop,” said a participant from South Korea. “I have learned and experienced the true meaning of design-based learning through various activities and lessons. Among several workshops I have participated in so far, this Teachers TryScience workshop was the ‘Best of the Best.’”

“Teachers TryScience has blown fresh wind to classes; educational reform is within our reach. Teachers TryScience has changed local teachers’ mindset on how to deliver a STEM lesson. Never has there been a student showing a low level of interest or engagement in the lessons. Difficult scientific knowledge becomes more vivid and easily stored in long-term memory.”

— Nguyen Van Thanh, head of Soc Son department of education, Vietnam

University relations

In 2016, the [IBM University Relations](#) program continued to engage and inspire many of the world’s most promising undergraduate and graduate students en route to ensuring that both academia and the private sector are ready for the challenges of the cognitive era.

The IBM Africa Skills Initiative expanded from a Middle East / Africa program to one that incorporates Eastern Europe, India and Singapore. Nearly 600 students from various universities participating in two of its programs, the Skills Academy and Leading to Africa, have joined IBM as interns or regular employees.

IBM continued our drive to ensure the democratization of education and entrepreneurship across the continent. Elsewhere across Africa, Asia and Eastern Europe, IBM University Relations programs added new career paths such as Business Process Analyst, Business Process Developer, Cloud Application Developer, and Cloud Enterprise Developer as options for the more than 12,000 students and faculty from 133 universities who were trained or certified under IBM programs in 2016.

In China, IBM sponsored a six-month “Master the Mainframe” contest that attracted more than 300 students from 21 universities. Mainframe experts from IBM, our business partners and commercial clients judged the submissions.

And in Armenia, the Innovative Solutions and Technologies Center (ISTC) — a joint venture among IBM, the Enterprise Incubator Foundation, the U.S. Agency for International Development, Yerevan State University and the government of Armenia — opened its new 1,000-square-meter facility on the Yerevan State University campus. The ITSC helps meet the demand for quality specialists to work in Armenia’s IT sector, and the new facility will provide a development environment for sustainable businesses, startups, and technical and business consultants.

“The Sustainable Development Goals call on global leaders to ‘end poverty in all its forms everywhere’ and underline that economic growth must be inclusive... to provide sustainable jobs and promote equality. Elimination of poverty and inequalities requires demand-driven skills development, particularly through private-sector engagement and partnerships with the industry. As UNDP, we acknowledge the significant efforts of IBM to improve the employability of disadvantaged groups through initiatives like the IBM Skills Academy program. Based on our partnership with IBM to foster public-private partnerships on skills delivery, we stand ready to elevate the positive development impact of such endeavors.”

— Marcos Neto, director, United Nations Development Programme (UNDP) IICPSD

Workforce development

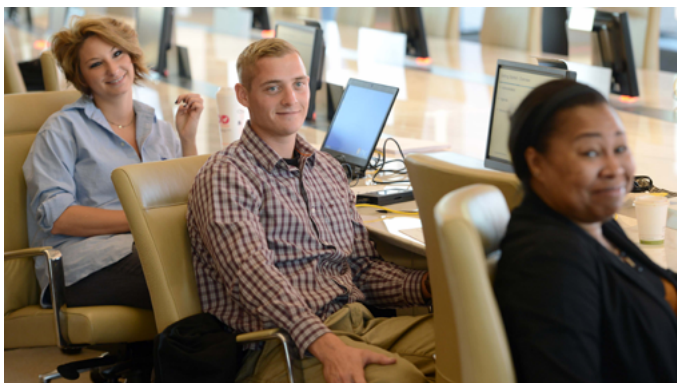
IBM's workforce development programs help people help themselves by providing the training and access they need to prepare for careers, apply their expertise in new ways, and transform their businesses into engines for economic growth.

Veterans employment initiative

Throughout 2016, IBM's [Veteran Employment Accelerator](#) Impact Grant program helped hundreds of vets in the United States, United Kingdom and Canada to train for data analyst certification using IBM's latest i2® Analyst's Notebook software. Through 20 no-cost, one-week training sessions per year, IBM and our nonprofit partners engaged veterans seeking to transition into new-collar civilian careers in such areas as fraud detection and cybersecurity. Nearly 500 former service members completed the training, with a 98 percent post-session certification rate.

[“What IBM offers through this program equips our veterans with the skillset to better their employment opportunities, especially with good paying positions that enhance their quality of life. Veterans have the capability to transfer their military skills and a solid foundation for learning from their experiences in the military that will be a benefit to any organization.”](#)

— General Ondra Berry, Assistant Adjutant General, Nevada Air National Guard



Veterans attend a November 2016 training session in Pittsburgh, Pennsylvania.

\$3b

Large companies spent over \$3 billion in 2016 with Supplier Connection participants.

In its first full year, 20 percent of participants have moved into new jobs in the public and private sectors. Corporate partners such as American Express, Aetna, PNC and USAA are essential to the program, working with IBM to place these highly skilled vets into key roles in their companies.

Supplier Connection

Supplier Connection, a free web-based portal, connects small and diverse businesses with the supply chains of larger organizations. It provides these small companies with a standardized, streamlined way to register basic information, share business practices, and potentially connect with both large and small businesses to enhance their opportunity for growth. In turn, large companies are now able to quickly find registered suppliers and communicate and forge stronger relationships with new and existing suppliers.

In 2016, the 40 large companies that are part of [Supplier Connection](#) spent over \$3 billion with the suppliers registered on the portal. The number of registered suppliers has grown to nearly 3,000 and is expected to grow by 50 percent in 2017.

One example of the many connections made in 2016 was between DuPont and Global Sourcing Connection, a promotional products supplier. Through Supplier Connection, DuPont was able to enhance both their understanding of the supplier's offerings and their confidence in the supplier's capabilities. Global Sourcing Connection was awarded the business, projected at millions of dollars annually.

Citizen diplomacy and cities

Cooperation to achieve common goals is as old as humanity itself. That is why it can be somewhat surprising to hear how some 21st century global enterprises have just “discovered” the benefits of collaboration across the corporate, nonprofit and government sectors.

IBM's commitment to citizen diplomacy began with our founding — with the core values that always have transformed each IBMer into an ambassador for the company. Essential to those core values is the understanding that no single entity, regardless of power or size, can overcome society's greatest challenges alone. Critical to any significant global undertaking is a diversity of talent, perspective and experience among those who would contribute.

Corporate Service Corps

Inspired by the Peace Corps — and newly partnered with that organization in 2016 — IBM's [Corporate Service Corps](#) (CSC) has provided pro bono consulting teams to communities worldwide since 2008. Like the Peace Corps, CSC provides an immersive service experience designed to benefit communities and culturally enrich the lives of participants.

The CSC program groups IBMers from around the world into multi-cultural, cross-functional teams that deploy for month-long assignments to assist community organizations. The teams — consultants, researchers, marketers and more — work on projects varying from upgrading educational technology to consulting on the best ways to improve water quality. Based on a methodical, problem-solving and client-focused IBM work process, the teams make recommendations designed to increase the community organizations' impact. In addition to benefiting communities, CSC attracts and retains top talent to IBM by providing unparalleled opportunities for global collaboration and leadership development.

In 2016, CSC deployed 357 top-talent IBMers from 46 countries in 28 cities in 19 countries. With a market value of nearly \$12 million, these engagements raised to more than \$80 million the value of CSC's consulting over the last 9 years. When asked about their CSC experience, 95 percent of community organizations told us they were satisfied with their overall CSC experience — and 96 percent were satisfied with the CSC teams' performance and the quality of assistance.

95%

Community organizations report 95 percent satisfaction with their CSC experiences.

Highlights from CSC's 2016 engagements include:

- Watson Analytics training and related work with the Department of Natural Resources and Environment of Ba Ria-Vung Tau, Vietnam.
- Developing communications, marketing and sales strategies for FOLKK, a nonprofit organization that provides employment opportunities to unemployed women in rural Serbia.
- Working with the Moroccan Foundation for Advanced Science, Innovation and Research to improve crop yields by using mobile, cognitive, data analytics and Internet of Things (IoT) innovations.
- Collaborating with the International Organization for Migration in Thailand on development of a mobile application to help prevent the exploitation of domestic workers in Asia.
- Collaborating with the Near East Foundation (NEF) on a project funded by the U.S. State Department to create business incubators that can address high youth unemployment in



A CSC team at work in the Philippines

Morocco. The CSC developed a framework and blueprint including strategies for developing partnerships, organization and governance, as well as marketing and communications. The project has worked with more than 400 young men and women ages 18-35 to launch more than 250 small businesses.

Partnering with the Peace Corps

In 2016, to increase impact for both communities and IBMers, CSC partnered with the Peace Corps to collaborate on pilot projects in Ghana, the Philippines and Mexico.

- In Ghana, we supported girls' education by enabling a social enterprise, TECHAiDE, through ICT enabled solutions and by assisting the Ministry of Gender, Children and Social Protection and the Ministry of Education, by advising on information management systems to support an extensive female mentorship strategy.
- In the Philippines, we assisted the Philippine Rice Research Institute to leverage information management tools to better fulfill its mission of reducing poverty and hunger, improving the health and welfare of rice farmers and consumers and protecting the rice-growing environment for future generations.
- In Mexico, we worked with the intergovernmental organization Aipromades to develop a strategic plan for the sustainable management of aquatic weed in Lake Chapala, in order to improve the regional economy.



Peace Corps partnership in Mexico

Smarter Cities Challenge

In a world that becomes more urban each year, cities serve as super-attractors of energy, innovation, talent and wealth. But cities also must confront the challenges of congestion, pollution, overly taxed resources (both natural and built) and poverty. The IBM Smarter Cities Challenge® (SCC) program contributes IBM technology and cross-industry expertise to cities around the world to help transform urban life.

In 2016, SCC deployed IBM teams to 10 cities in Africa, Asia, Australia, Europe and the Americas.

- In partnership with Twitter, and using IBM's cognitive and social media analytics capabilities, SCC helped Melbourne, Australia, understand how their citizens were receiving and disseminating information during emergency events. This helped the city revise its communications plan to better address the needs of citizens before, during and after emergencies.
- In Surat, India, SCC helped city leaders analyze demographics, internet traffic and other metrics in the development of data-driven decision-making tools for more effective urban management.
- An SCC team assisted the government of Sekondi-Takoradi, Ghana, in an analysis of income data to identify potential sources of additional tax revenue.



IBM's SCC team in Sekondi-Takoradi, Ghana

130 cities

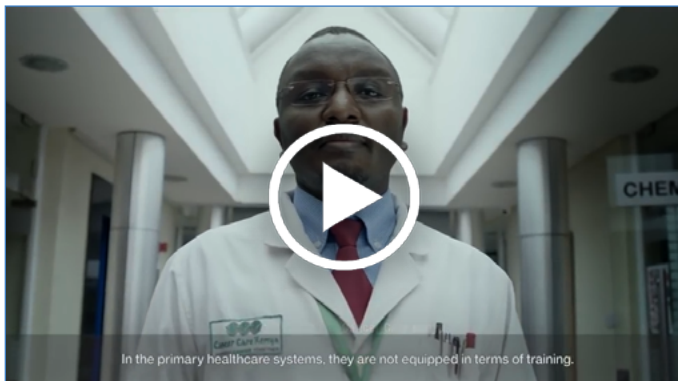
In six years, Smarter Cities Challenge has supported 130 cities worldwide.

- In Santiago, Chile, an IBM team developed a strategy to help coordinate data and services from government agencies responding to disasters. The team identified a lack of real-time weather data as an inhibitor — and post-deployment, The Weather Company® (an IBM Company) donated personal weather stations to give the city access to data that can aid in disaster management.
- In Memphis, Tennessee, an SCC team collaborated on strategies to provide targeted, preventive health services to reduce non-emergency strain on the city's 911 / Emergency Management System.

In the program's six-year history, SCC has deployed more than 700 IBM experts to help over 130 cities worldwide improve the quality of life of their residents.

“[When corporations] send... human talent and resources, that's worth more than a check.”

— Denver, Colorado Mayor Michael Hancock



IBM Health Corps and the American Cancer Society collaborate to address cancer treatment disparities.

Health and human services

Health, research, discovery and technology have been linked inextricably for centuries. The good news is that many of humanity's greatest thinkers have dedicated themselves to enhancing and preserving our lives. The challenging reality is that even our most qualified experts can no longer keep pace with the overwhelming volume and complexity of emerging health research.

Disconnects between massive amounts of health-related data and our ability to transform it into actionable information often lead to tragic results for individuals and populations who are unable to benefit even from existing diagnostics and treatments. But by applying augmented intelligence through cognitive systems in service to finding the best treatments at the right time, IBM is helping to reverse the trend of needless suffering and mortality.

IBM is harnessing data and designing analytics systems to enhance the ability of health practitioners and public administrators to identify, engage and assist at-risk populations for diseases and conditions such as cancer, obesity, cardiovascular disease and nutrition poverty. With the participation of volunteers around the world, IBM also provides — free of charge — the massive computing power that humanitarian researchers need to find cures for disease and investigate solutions to protect and preserve healthy environments. And finally, IBM is a global leader in developing and providing employee health initiatives.

IBM Health Corps

IBM launched **IBM Health Corps** at the 2016 World Health Care Congress. This global pro bono incubator partners with health organizations to address some of the most challenging health disparities by exploring big ideas in technology for public and population health. With dedicated teams of experts on the ground for three-week engagements, IBM Health Corps makes use of IBM's expertise in cognitive, analytics, data science and design to help partner organizations expand health access and services, and improve health systems and outcomes.

In August 2016, the program announced its [first five projects](#). Engagements in 2016 included:

- IBM Health Corps' collaboration with the American Cancer Society on ChemoQuant — the world's first chemotherapy forecasting tool to predict treatment need in low- and middle-income countries. Currently only 10 percent of cancer patients in sub-Saharan Africa can access cancer care and pain relief, according to Quartz Africa. Ethiopia and Uganda will begin using ChemoQuant in 2017 to improve their chemotherapy procurement processes.
- Working with the Taiwan Centers for Disease Control, IBM Health Corps developed a mathematical model to evaluate the impact of public health interventions to fight dengue fever — a mosquito-borne disease that reached epidemic proportions in Taiwan in 2014-15, and which threatens nearly half of the world's population, according to the World Health Organization. "We are excited about this collaboration opportunity with IBM Health Corps," said Jen-Hsiang Chuang, MD, PhD, deputy director general of the Taiwan CDC. "With their expertise in data analytics and population health capabilities, IBM's support will definitely accelerate our work and potentially help close the gap in global disease detection and in fighting against the threat of emerging and re-emerging infectious diseases."

"For too long, it has been assumed that cancer treatment is too expensive and too complex to be scaled up in lower-income countries. But this simply is not true. In partnership with IBM and other global health leaders, we are going to change the rules of the game globally in oncology."

— American Cancer Society CEO Gary Reedy

World Community Grid

IBM World Community Grid® enables "citizen scientists" from around the world to contribute their unused computer power in service to humanitarian research. Medical, climate and other researchers use the power of the [World Community Grid](#) "virtual supercomputer" to shorten the time-to-results of data-intensive computing projects by weeks, months or even years. Standout projects in 2016 included:

- The OpenZika project, seeking effective treatments for the Zika virus, for which there currently is no cure.
- Help Stop TB, a collaboration with the University of Nottingham (U.K.) to unlock the secrets of the bacterium that causes tuberculosis — which remains among the top 10 causes of death worldwide.



IBM Health Corps joins the Taiwan CDC to fight dengue fever.



The OpenZika project seeks a treatment for Zika virus infection.

- Computing for Clean Water, which used IBM World Community Grid to simulate water flow through carbon nanotubes to help understand processes that could lead to improved global access to clean water.

World Community Grid provided the equivalent of 167,000 years of computing time in 2016, performing 431 million scientific calculations. Since the program's inception, more than 728,000 volunteers have contributed unused computing time from 3.3 million devices in service to 28 humanitarian research projects. The program has provided 1.4 million years of computing time, valued at more than \$500 million. Research enabled by World Community Grid has provided the basis of more than 50 peer-reviewed scientific articles.

World Community Grid attracted five new corporate partners in 2016, and beat out MTV and Tumblr to win the 2016 People's Voice Webby Award for Corporate Social Responsibility.

"The beauty of it is, you don't have to have any particular skills. You don't have to have any scientific background. You just have to care."

— Hands On Orlando Executive Director Chris Allen



SafetyNet is helping the Hudson Guild in New York.

SafetyNet

Service organizations, such as settlement houses, that provide vital support for low-income families and individuals often strain to supply the program documentation required to maintain public and private financing. **IBM SafetyNet** is helping to solve that problem by helping nonprofits automate the collection and management of program data — freeing social services personnel to help their clients more effectively. The data management solution is built on IBM's Social Enterprise and Smarter Care Curam platform, and designed to help standardize and centralize contract, program, and client data.

Each selected organization receives a grant valued at \$300,000 that includes access to the cloud-based IBM SafetyNet application, training, 16 weeks of consulting services to configure the system, and ongoing support. In 2016, IBM SafetyNet:

- Launched a [new website](#) through which prospective grantees can learn about the program and apply for grants.
- Partnered with nonprofit grant recipients the city of Rochester, New York, and United Way of Rochester to support IBM Smarter Cities Challenge recommendations to help fight poverty by improving the reach of social services.
- Expanded its partnership with the United Neighborhood Houses to four new nonprofit grant recipient locations in New York City.

Since the program's inception, 10 grants valued at \$3 million have been awarded to help nonprofits better serve 150,000 low-income clients.

Impact Grants

IBM Impact Grants bring the power of IBM capabilities to our communities, to transform organizations and help them tackle society's toughest challenges. Around the world, Impact Grants deliver strategically designed pro bono consulting and integrated software solutions, with particular emphasis on cloud, mobile, analytics and cognitive. Over the past seven years, 5,000 IBM consultants have delivered 2,200 Impact Grants, worth \$65 million, to 1,500 nonprofit organizations in 60 countries. These grants equip organizations — especially those in health, education, disaster, jobs, and youth empowerment — to make profound changes for good. Selected recipients in 2016 included:

- The Shenzhen Center for Disease Control and Prevention in China, where IBM provided an analytics solution that uses cognitive-based modeling to predict (and therefore prevent) outbreaks of infectious diseases, particularly Dengue Fever.
- The Maternity Foundation, a Danish NGO that uses IBM-provided SPSS® software licenses as part of a solution that tracks and analyzes data collected through the foundation's "Safe Delivery" mobile app, which is used by skilled birth attendants in developing countries.
- Stop The Traffik, a U.K.-based NGO that uses IBM SoftLayer® Cloud and i2 Analyst's Notebook software licenses to support its mobile STOP App — an anonymous reporting tool for victims and observers of human trafficking activity. These IBM tools have helped Stop The Traffik identify and disrupt key hotspots for human trafficking.
- The United States Chamber of Commerce Foundation, which partnered with IBM on a first-of-its-kind Social Media Analytics study of the influence of corporate social responsibility (CSR) engagement on a company's brand. Its results will give corporate decision-makers the hard data they require to initiate or increase their company's CSR participation and brand reputation.



IBM Impact Grant to Shenzhen Center for Disease Control & Prevention



Tamil Nadu government and IBM build an Emergency Management Operations Center

Disaster preparedness and resilience

2016 was a significant year for cultural, political and environmental upheaval. The sudden displacement of millions by armed conflict in the Middle East and Northern Africa continues to strain the fabric of physical and social resources throughout Europe. Meanwhile, unprecedented natural events including extreme heat and rising sea levels — the results of erratic weather patterns caused by global climate change — threatened the lives and livelihoods of millions throughout India, Korea and the Philippines.

In response to these challenges and more, IBM and IBMers stepped up, hunkered down and committed themselves to helping those in need. In 2016, IBM's [Disaster Relief](#) program addressed the following:

- Earthquakes in Japan and Italy killed nearly 300 people, injured hundreds more, and damaged or destroyed thousands of homes and businesses, according to reporting by *The New York Times* and *Japan Times*. IBM awarded Impact Grants to the Ishinomaki Disaster Recovery Support Network (Japan) to implement a disaster management solution and provide social media analytics, and to the Italian National Institute for Geophysics and Vulcanology to support research to develop an earthquake early warning system using IBM sensor and cloud computing technologies.
- In Brazil, an IBM grant to the Oswaldo Cruz Foundation (Fiocruz), the country's preeminent health and medical research institution, supported their Zika virus research by providing social media analysis to track the spread and effects of the virus. The grant also provided training on IBM's open source Spatio Temporal Epidemiological Modeler, and ran a hack-a-thon focused on developing health apps. In a related grant, IBM donated data from The Weather Company® as well as consulting services to the U.S. Fund for UNICEF in support of its Zika research.
- In the United States, IBM launched a free online disaster volunteering course — "Disaster Volunteering: Learn, Prepare, Engage" — to educate IBM employees and others on best practices and the most effective ways to volunteer to support disaster relief and recovery.

Throughout 2016, IBM awarded approximately \$1 million for all Impact Grants related to disaster relief and resiliency, including grants in response to Europe's ongoing refugee and migrant crisis. MSF Italy has used the "People on the Move" mobile app in more than 9,000 individual and group medical consultations.

Update on Chennai flood response

Begun in 2015, IBM's efforts to help India recover from the catastrophic Chennai floods continued in 2016. The IBM Intelligent Operations Center for Emergency Management — enabled by a grant to Tamil Nadu state — was deployed for use in future crises. The IBM team integrated local disaster-response-related data into a customized solution that facilitates situational awareness for both mobile and crisis-center-based users across a variety of government agencies.

Apps for social good: Doctors Without Borders

As part of IBM's continuing response to the global migrant and refugee crisis, the IBM Italy Foundation partnered with Médecins Sans Frontières (MSF, or Doctors Without Borders) to develop and deploy [People on the Move](#) — a mobile application that enables MSF personnel to capture medical data in real time, regardless of connectivity. The app's inclusion of Watson Analytics™ allows medical personnel to understand and act on collected data quickly and accurately. People on the Move is helping users manage data from thousands of medical and mental health consultations in MSF's reception centers in Italy, at mobile clinics in Serbia, and on the Bourbon Argos rescue vessel.

["Migration is not an occasional emergency, but a global humanitarian crisis that requires a proper response to the needs of refugees... The solution developed by IBM Italy Foundation is an innovative and high-quality tool — both scientifically and medically."](#)

— MSF Italy General Director Gabriele Eminente

Investing in the future

Part of supporting a just, global society involves advocating for cultural, geographic and gender equality. In 2016, IBM continued to play an important role in supporting the United Nations Sustainable Development Goals (SDGs) through our employee volunteerism initiatives, and in encouraging and providing opportunities for girls, women, people of color and those from low-income backgrounds to participate in education and the global economy.

Promoting action and understanding

Supporting the U.N. SDGs

IBM joined Ritz-Carlton, SAP and UPS as founding members of IMPACT 2030, a global, private-sector-led collaboration dedicated to mobilizing corporate volunteers in service to achieving the SDGs by 2030. As the only business-led effort designed to marshal the power of human capital to address the U.N.'s 17 SDGs in developed and developing nations, IMPACT 2030 continues as a first-of-its-kind collaboration of corporate volunteering initiatives.

Teaching diplomacy

Housed in the U.S. Department of State, the U.S. Diplomacy Center will be the first museum and education center "dedicated to the history, practice, and challenges of American diplomacy." The center's mission will be to help visitors understand the critical role that diplomacy has played in American history. As a key technology partner and IBM Impact Grant recipient, the U.S. Diplomacy Center leveraged IBM expertise in social media, technology infrastructure planning, as well as digital strategies and virtual experiences during its development.

Supporting the next generation of global leaders

In 2016, IBM launched a new pan-African program to identify and develop the continent's next generation of ethical leadership. The "Values-Driven Leadership in Action" initiative is a partnership with the Academy of Business in Society (ABIS) — a 15-year-old network founded in part by IBM to focus on sustainability as a core competency for executive leaders. First established in Europe, ABIS's rollout in Africa is a collaboration among IBM, GSK and Unilever. The program encompasses eight business schools across Egypt, Ethiopia, Ghana, Kenya, Nigeria and South Africa — each a partner in developing a shared values-driven leadership curriculum.

Two essential differentiators of Values-Driven Leadership in Action will be cross-sector learning, with senior business and government leaders participating together, and the involvement of an active alumni community to build and sustain ethical organizational practices across the continent. Courses at the participating schools will involve managers from IBM, GSK and Unilever in addition to governmental representatives. We believe that public-private partnerships such as these will encourage innovation, cross-cultural understanding and a shared sense of core values throughout a global network of emerging leaders.

Women and diversity

While there has never been a better time for women to pursue STEM careers, and for girls to include STEM careers in their lifetime goals, the unfortunate fact remains that only 24 percent of STEM workers are female, according to the U.S. Census Bureau. For many girls, the challenge is lack of encouragement and role models, not lack of ability. For women, the challenge can be maintaining patience with an industry that — while changing for the better — is changing too slowly. IBM is working to help enable greater change, to make change happen faster, and to ensure that the women and girls currently fighting on the front lines of change are encouraging and bringing more women and girls into technology and engineering.

Youth empowerment

In South Africa, IBM volunteers have been teaching STEM, independent living, leadership and entrepreneurship skills to young people with cerebral palsy. The goal is multi-faceted. On the personal level, skills-based volunteering enriches the contributor as much as the recipient. Talented employees who believe in service join IBM because of the company's legacy of contributing to the communities in which it does business. These employees also tend to make their careers at IBM because of the availability of ongoing opportunities to serve. And from a broader perspective, services programs such as those for disadvantaged learners inspire others — fellow IBMers, business partners and clients — to serve.

For disadvantaged learners, IBM's skilled volunteers provide the chance for these young adults to live well-rounded, independent lives. For girls in grades 8 through 10 — to cite another example from South Africa — it means the opportunity to make the most of their aptitudes in math and science before moving into careers in science, engineering, commerce and IT.



IBMers lead a “Coder Dojo” session, introducing programming concepts to children in Dublin, Ireland, October 2016.

Employee engagements

Through technical innovation, skills-based volunteering, capabilities and skills delivery, payroll deductions and direct grants, IBM and IBMers contribute directly to service and humanitarian causes. On the larger scale, company programs coordinate tens of thousands of volunteer hours each year, millions of dollars annually of employee charitable contributions (more than \$1 billion since the program started), and the development and delivery of technological solutions to help nonprofits serve more effectively. On a more intimate scale, IBM's corporate culture encourages and supports individual acts of giving and service. Indeed, one of the key characteristics of IBM that has attracted and retained top talent for more than 100 years is the ability for employees to integrate community involvement with their family lives and careers.

On Demand Community

For more than 10 years, IBM's [On Demand Community](#)[®] has served as a hub through which current and retired IBMers can engage in service and maximize the value of their contributions of skills. Through On Demand Community, nearly 290,000 IBM employees and alumni have contributed more than 20 million hours of skilled service in every corner of the world.

The critical differentiator between On Demand Community and other outlets for general volunteerism is the professional, high-value nature of the services that IBMers contribute. The greater IBM community is educated, innovative, technically sophisticated and steeped in a culture of values that encourages and enables service. When we say that service is part of IBM's DNA, we mean that responsibility and service are baked into the cake — not just icing on the top. Coming from that perspective, when IBMers serve, they deliver value that is essential, lasting and scalable.

IBM Volunteer Excellence Awards

There is no greater testament to the importance of service at IBM than the legacy of the IBM Volunteer Excellence Awards — annual recognition from IBM's president, chairman and CEO Ginni Rometty of individuals and teams who have personified our culture of service through their selfless actions. Celebrated since 2005, the [awards for 2016](#) recognized IBM volunteers who...

- Helped scale the P-TECH grade 9 to 14 model to Australia by enlisting IBMers and community college faculty to create a conducive environment and develop the first non-U.S. pilot for this proven program that connects high school to college and new-collar jobs.
- Used music to help children with autism in China improve their social skills through a joint program of the IBM Design Studio in Shanghai and the Shanghai Cao Peng Music Center.
- Enabled greater social integration capabilities of the Romani population in the Czech Republic through mentoring, STEM tutoring and helping young people meet educational goals and pursue careers.
- Created a Business Mentor Program for Refugees in Denmark, successfully moving displaced persons into education, apprenticeships, internships, full-time employment and entrepreneurship.
- Launched the development of a 50,000-book digital library for the blind in Indonesia, where currently less than 2,000 titles in braille exist for nearly 4 million blind citizens, according to an article in Forbes Indonesia.
- Forged partnerships with NGOs to raise awareness of LGBT+ acceptance as a workplace issue in Japan.
- Employed STEM education and training as a catalyst to help girls in Ireland and the U.S. achieve, gain confidence and prepare for advanced study and careers in technology.

Employee Charitable Contribution Campaign

In Canada and the United States, the IBM Employee Charitable Contribution Campaign (ECCC) raised \$25.4 million in pledges from employees, executives and retirees. Through the ECCC, active IBMers can contribute to the charitable organizations of their choice through payroll deductions, with many contributions matched in whole or in part by the company. The greater IBM community has contributed more than \$1 billion to worthy causes via the ECCC program.

IBM Community Grants

Totaling more than \$4 million in 2016, IBM Community Grants support organizations and schools where current and retired IBMers are providing skills-based volunteer service. Last year's grant recipients included:

- The Shanghai Cao Peng Music Center, for which an IBM Design Center team used their skills and resources to increase awareness of autism and positively influence the music center's fundraising efforts.
- The Spastics Society of Karnataka (SSK), an NGO in Bangalore, India, where IBM volunteers run 10-week vocational training sessions twice yearly, and have used IBM Community Grants to help the society acquire systems and software used to train students in employable skills.



Girl Scouts in Orlando, Florida, show their "Teaching Respect" activity patches following an event organized by IBMers in October 2016.

- The Nightline Association in the United Kingdom, where an IBM volunteer helped raise awareness and dramatically increase volunteer participation in this organization through which young people provide confidential emotional support to fellow students.
- Work with Pride, an NGO in Japan, where last year seven IBM volunteers used their expertise and skills to raise awareness of the continuing challenges for LGBT+ citizens in the workplace.
- Carmen Rodriguez High School, a Chilean institution that welcomes children at social risk, and where since 2013 an IBM volunteer has conducted workshops and activities to promote self-esteem and self-care among young people.
- Shriners Hospital for Children (Houston, Texas), where a volunteer IBM team helped develop a plan to improve the efficiency of an antiquated transportation system — engaging patients more effectively and reducing no-shows and surgical cancellations. A second volunteer team is developing a social media strategy to increase the hospital's brand recognition. The model will be replicated across the Shriners Hospital network.
- The Girl Scouts of Citrus Council (Florida), where an IBM volunteer initiated programs leading to a STEM-related activity patch, and where in 2016 IBM piloted an anti-bullying and diversity program that resulted in the development of a new IBM Activity Kit on "Teaching Respect" and an associated Girl Scouts activity patch.

IBM Apps for Social Good

IBM Apps for Social Good is a portfolio of mobile applications designed to help nonprofit organizations address their critical needs, and the needs of their clients. Typically developed by local IBM teams in collaboration with an NGO partner, these apps reside on IBM's Cloud for Social Good. Through this program, IBM and our partners are developing signature apps that can be used by NGOs around the world. For example:

- In Italy, hospital system Fondazione Bambino Gesù (OBG) asked IBM to re-purpose a mobile app that was developed in collaboration with Médecins Sans Frontières (MSF, or Doctors Without Borders) to help collect data on obesity and diabetes in children. This data will be measured against socio-economic variables to help doctors implement better prevention and treatment programs.
- In Australia, we partnered with the Australian Museum to develop a mobile education app that teachers and children can use to access classroom activities and lesson plans, and even to record frog calls as part of learning about various species.

The IBMer

At IBM, we understand that we are at a turning point in our history and the history of technology. Together, IBMers are committed to doing what every prior generation of IBMers has done — transform ourselves to lead in a new era of business and technology, in order to remain essential to our clients and to the world. That's why brilliant experts, professionals and innovators seek to become and remain IBMers.

Supporting IBMers

To create moments of impact, we must inspire and guide IBMers in their careers and journeys to create personal value. We provide guidance and resources so that IBMers around the world can increase their expertise, learn from others, feel engaged in their professional development and celebrate career milestones and achievements. It is through these efforts that we encourage and empower IBMers to help build a better world in the cognitive era.

Feedback is a gift

To keep pace in a complex world, organizations and individuals need to act with agility, and feedback plays a critical role. At IBM we believe that feedback should be immediate, frequent and flow both ways between leaders and team members. Learning to both give and receive feedback improves interactions with clients and colleagues and accelerates employee learning and company growth. To support a culture of feedback, we provide training and tools to IBMers such as the ACE app and Checkpoint, our new performance management system introduced in February 2016 as part of our strategy to empower employees to transform processes and business through ongoing feedback.

Skill as currency

In our dynamic and fast-changing technology industry, skills have become a currency and in IBM we help our employees to close their skills gap and ensure future success. We call this "Skills as Currency," and it's a significant component of our people strategy.

Skills as Currency is a culture where we appreciate and understand the value of a skill to drive better outcomes for our employees and our company. For IBMers, this means clarity in making informed and confident decisions to invest in skill development as they build careers. For IBM, it means having the right skills to win in the marketplace and serve our clients.

As part of this strategy, in 2016 we launched a cognitive platform for IBMer education — Your Learning. This platform is an IBMer's gateway to professional development. Personalized with cognitive capability, it understands exactly what an IBMer needs and recommends and tracks their professional education journey all in one place. This cognitive tool supports IBM's ongoing transformation and strong culture of innovation.

Encouraging innovation:

The Cognitive Build Outthink Challenge

We continue to encourage people to co-create innovative solutions. The Cognitive Build Outthink Challenge was a strong example from 2016, with an important impact on employee engagement.

“The whole reason for doing this was to drive a culture of innovation ... This is going to go down in our history.”

— Ginni Rometty, IBM CEO

The Cognitive Build began in February with ThinkAcademy education to help IBMers understand what it takes to become a cognitive business. Then IBMers joined forces, forming more than 8,000 teams around their ideas. Teams built new cognitive apps for IBM clients, added cognitive enhancements to our own products and services, and used cognitive to transform IBM processes. They used data and Watson, and applied new tools and methods like MURAL and IBM Design Thinking. Over 2,700 teams passed feasibility reviews with expert cognitive coaches to make it to the crowdfunding stage. Finally, IBMers rallied around their favorite teams, investing over 291 million iFundIT dollars to select the 50 finalist teams that advanced to the Outthink Challenge.



IBM Outthink Challenge - Cognitive Build

In May 2016, representatives traveled from all over the world to the IBM Design Studio in Austin, Texas. They honed their prototypes and business plans with the help of a host of technical and business mentors, and then presented them to judging panels of IBM senior leaders from every part of the business and globe. Those judging panels selected eight teams to move on to the Outthink Challenge livestream and engage “Shark Tank” style with IBM CEO Ginni Rometty and the panel. As a result, IBM created new cognitive apps that we currently use within IBM and with our clients.

Employee well-being

At IBM we believe that we are only as strong as our people — our ability to better serve our clients and our communities depends upon employee well-being. Reflecting this, our culture of health and safety spans every aspect of our global business. Our systems and programs are widely accessible and in sync with IBMers’ changing needs — how and where they work and live. As employee needs and global environments evolve, we continue to transform our total health management system, incorporating the latest technology advances to deliver demonstrable value to employees’ lives. In 2016, we continued to advance our initiatives worldwide.

IBM Germany’s holistic approach to well-being

IBM Germany was recognized not only for their outstanding health promotion and health management, but also for the holistic approach of the integrated health concept and in-depth risk assessment for stress and psycho-social aspects at work. For the third time, IBM Germany received the prestigious Corporate Health Award (CHA) from the German government, in addition to special recognition for the “best digital workplace health management” over strong competition. The innovative approach to risk assessment involved a combination of an IBM-customized online questionnaire and targeted workshops to identify work-related risk factors that were used to develop improvement opportunities. Active involvement of employees and management was the key to success.

Safety awareness initiatives reduced accidents in Brazil

IBM Brazil reduced accidents/incidents by 15.49 percent in their “SAFETYFIRST” campaign, creating awareness through bulletin boards, communities, IBM TV and IBM News. Brief video themes for seat belt safety, responsible cellular phone use and road-crossing safety tips provided engaging methods to deliver safety messages in the SAFETYFIRST campaign.

IBM China hosts World Hepatitis Day

The World Hepatitis Day event, organized by the Beijing Center for Disease Control (CDC) and the [Asian Liver Center at Stanford University](#), was hosted at the headquarters of the IBM Greater China Group (GCG) in July 2016.

Hepatitis is a major disease in China. According to the World Health Organization (WHO), more than 90 million Chinese are infected by chronic hepatitis B. Among the first in China, IBM has implemented a hepatitis B program including a non-discriminatory policy and company-paid hepatitis B vaccinations since the 1990s. Considered a role model for hepatitis prevention and control in the Chinese workplace, IBM was selected to host the 2016 event.

Many stakeholders including WHO and local CDC officers, representatives from the Asian Liver Center, as well as external volunteers, media and IBM employees and family members attended this event. Liming Chen, IBM GCG chairman, gave the opening speech.



IBM's successful hepatitis B vaccination program at this IBM office and others, is due to employee engagement in their well-being.

Bureau Veritas recertifies

IBM's Well-being Management System

IBM's Well-Being Management System (WBMS) reaches IBMers globally with coordinated and consistent delivery of health and safety objectives across all geographies and time zones. First implemented in 1999, this foundational architecture is framed around IBM's corporate policy of responsibility for employee well-being and product safety. Following [International Organization for Standardization \(ISO\)](#) consensus standards, system components include proactive planning, execution excellence, measurement, and continuous improvement in the areas of employee health and well-being.

External certification of IBM's WBMS through the Occupational Health and Safety Advisory Services (OHSAS) 18001 [certification process](#) has helped improve the quality and consistency of our global implementation of well-being. Recertification was awarded to IBM in 2016 by [Bureau Veritas](#). This provides IBM the ongoing ability to fulfill marketplace demands and foster business opportunities through a standardized approach to managing employee well-being to existing and potential clients.

Additionally, all of IBM's hardware research and development operations in the United States were recognized once again as Occupational Safety and Health Administration (OSHA) [Voluntary Protection Programs](#) star sites. Designed to promote worksite-based safety and health, OSHA's highest honor recognizes outstanding programs and results.

Awards

- The Taiwan Government recognized IBM Taiwan with one of the Top 5 Taipei Health Workplace Excellence awards.

Employee inclusion

Diversity allows us to bring our best talents to bear as we continue on our transformation journey. It is an essential component of our corporate values and is tightly integrated into our business strategy. Our leaders strive continually to manage employees in line with our values and beliefs, to enable them to develop their full potential. As we move beyond inclusion to a world of engagement, we also endeavor to engage governments, communities and other corporations in our efforts. In 2016, IBM continued to demonstrate leadership in its support of constituent groups.

“Today when I think about diversity, I actually think about the word ‘inclusion.’ And I think this is a time of great inclusion. It’s not men, it’s not women alone. Whether it’s geographic, it’s approach, it’s your style, it’s your way of learning, the way you want to contribute, it’s your age — it is really broad.”

— Ginni Rometty, IBM CEO

LGBT workplace equality

IBM has a long history with LGBT (lesbian, gay, bisexual, trans-gender) workplace equality. As early as 1984, we included sexual orientation in our nondiscrimination policy. In 1995, we established an LGBT executive task force that today is known as the Global LGBT Council and is focused on making IBM a safe and desirable workplace for all people.

In 2016 IBM was named, for the third year in a row, the world’s most gay-friendly employer by [Workplace Pride](#), based in Amsterdam. This announcement was the result of the foundation’s [Global Benchmark](#) survey that scored large international employers for their LGBT workplace inclusion policies and practices around the world.

In addition, for the 14th consecutive year, IBM scored 100 percent on the Human Rights Campaign’s [Corporate Equality Index](#), the national benchmarking tool for corporate policies and practices related to LGBT employees. The index, released each autumn, provides an in-depth analysis and rating of large U.S. employers and their policies and practices pertinent to LGBT employees,



IBM introduced a new symbol of our ongoing push for diversity, acceptance, inclusion and equal opportunity — a rainbow version of IBM’s iconic 8-bar logo. [Read more](#)

such as equal-employment opportunity policies that include sexual orientation and gender identity or expression, employment benefits for all benefits-eligible U.S. employees, and ongoing LGBT-specific engagements that extend across the company.

We are also pleased to report that we added same-gender benefits in 11 countries in 2016.

Advancement of women

More than 24 percent of IBM’s global executive population is made up of women. About two-thirds of IBM’s women executives across the world are working mothers, demonstrating that women can pursue a career and motherhood at our company.

IBM was recognized by Working Mother Media as one of the top 10 companies on both its [2016 100 Best Companies](#) (for the 31st consecutive year) and [Best Companies for Multicultural Women](#) lists. IBM was also named a top 10 employer by [Working Mother India](#) in its inaugural year. In addition, the [National Association of Female Executives](#) recognized IBM among the top 10 of its Top 50 Companies for Executive Women.



[How IBM helps create a diverse talent pipeline for STEM](#)

As part of IBM's ongoing commitment to advancing women in the workplace, we invest in programs like Building Relationships and Influence for Women — designed for high-potential women leaders, with experiential and action-centered learning to help participants develop skills in building, developing and maintaining business relationships and influence. Additionally, we offer Creating Your Leadership Journey for mid-level career women. The content for both of these courses is based on the three themes that emerged from our [Advancing Women at IBM](#) study:

1. Be visible
2. Plan your career
3. Integrate work and life

We also work to build the pipeline of women in the technical industry by supporting and partnering with external programs dedicated to inspire, educate and connect women to excel in technology careers. IBM recently partnered with the Boston College Center for Work & Family to develop the case study, [Empowering Women's Success in Technology, IBM's Commitment to Inclusion](#). Based on findings from IBM's 2016 Global Career Progression Survey, it shows that career progression for women is driven by three separate but interconnected factors: the culture and society at large, one's immediate career environment, and the woman herself. The study describes some of our initiatives, from career and leadership to work/life integration programs — a small sample of how we link our culture and the actions we take to grow and support an inclusive work environment.



IBM CEO Ginni Rometty opens the Anita Borg Institute's Grace Hopper Celebration with a keynote address. [Read more](#)

"Women have helped drive all eras of computing so far: tabulating, programmable, and now cognitive."

— Ginni Rometty, IBM CEO

Ginni Rometty delivered a keynote at the Anita Borg Institute's Grace Hopper Celebration of Women in Computing, sharing her perspective on [women pioneers in technology](#), today's cognitive era and three personal lessons learned. Drawing inspiration from the achievements of those who have gone before us, she reminded attendees: "Past is prologue. And the fact remains: women have helped drive all eras of computing so far: tabulating, programmable, and now cognitive."

People with disabilities

The skills and capabilities of the workforce must keep pace with a constantly evolving world as the competition for talent intensifies. Including people with different abilities in IBM's workforce is based on sound business judgment and anchored in IBM principles and HR strategy.

IBM's recruiting teams play an essential role in identifying and interviewing skilled people with disabilities. Through a training module and a recruitment guide, IBM helps recruiters understand how to provide reasonable accommodations effectively when recruiting people with different abilities, and to know what support is available within IBM for employing people with disabilities.

In 2016 we developed new manager training, "Making managers disability-confident," and rolled it out across the company. In addition, IBM became the first global IT company to join the International Labour Organisation Global Business and Disability Network.

Work-life flexibility

IBM is committed to creating a supportive, flexible work environment that provides principles, guidelines and workforce options to help our employees effectively manage their work and family responsibilities. In fact, that understanding is a cornerstone of our employment value proposition; we know that IBMers need time to cultivate personal interests and integrate the demands of the job with the demands of their personal lives.

To deepen IBM's ongoing commitment to foster a supportive, flexible career environment, in 2016 we established The Global Work/Life Fund, a multi-year \$50 million investment, created to address the dependent care needs of our employees.

To build managers' and employees' understanding of work-life offerings and to create a work/life-supportive culture at IBM, we offer a variety of resources including classes, toolkits, webinars and communities.

Diversity and inclusion education

IBM continues to invest in education and development programs for diverse talent. The award-winning Building Relationships and Influence program now has over 3,500 women in its alumni network. In addition, we have continued to focus on unconscious bias to help educate our employees on the way bias can impact business decisions and impede inclusion. IBM appreciates the differences in our employees because we know that these differences help to drive the innovation necessary for continued leadership in the cognitive era.



[What is a Business Resource Group in IBM?](#)

Business Resource Groups

As we refine our employment and leadership practices to attract and develop global thought leaders continuously, it is imperative that our diversity strategy enables us to meet the company's business objectives and talent requirements. IBM's Business Resource Groups (BRGs) tie directly into our diversity strategy and voluntarily bring together talented groups of diverse IBM professionals with the goal of enhancing the success of IBM's business objectives by helping members succeed in the workplace. As part of their charter, BRGs align their programs and initiatives with at least one of four IBM business and talent workstreams: recruitment and hiring, talent development, employee retention and market development.

IBM now has more than 266 BRG chapters registered in 46 countries supporting 13 constituencies or focus areas:

- Asian
- Black
- Cross-cultural
- Cross-generational
- Hispanics
- LGBT
- Men
- Native Americans
- New hires
- People with disabilities
- Veterans
- Women
- Work/life integration

In 2016, we introduced our first LGBT BRG in Russia and our first Women's BRGs in Saudi Arabia and Pakistan.

IBM Business Resource Groups are volunteer, employee-led groups centered around a common interest or a certain constituency. Learn more about IBM's inclusive and diverse culture in this short video.

Leadership development

IBM's leaders can be found at all levels of the company and are central to our continued transformation. Developing leaders is not just about creating innovative, experiential and practical learning opportunities and resources, but also fostering a partnership with the business to be the trusted advisor, helping to drive behavioral change where needed. It's about helping leaders influence their peers to drive greater collaboration and self-direction. Ultimately, it's about modeling what it truly means to be a transformational leader.

Transformational Leadership Framework

In 2016, we reinforced our commitment to the Transformational Leadership Framework defined the previous year, by making it pervasive in everything we do. Through 360-degree assessments, unique games, customized business unit workshops, program updates and executive initiatives, we've worked with market leaders and IBM business leaders within their respective markets to create a common language for our senior leadership to discuss the behaviors needed to be a transformational leader. From the most senior executives to first-line managers, these leaders have become our best champions, boosting and amplifying our messages to shape a healthy culture through the lens of the Transformational Leadership Framework.



IBM Leadership Academy Team, 2016

Collective leadership

Developed in partnership with market leaders, we co-created a way for leadership teams to drive outcomes that are the result of leaders thinking and acting together in the pursuit of a common goal, rather than any one person providing the answers or solutions. When collective leadership is used, interdependencies and unique strengths are more prominent than market, unit or hierarchical distinctions. By establishing an open, safe environment characterized by trust, mutual respect and empathy, leaders ensure the voices of all team members are consistently heard. Utilizing this mindset, we partnered with the market leaders to facilitate global sessions to work past organizational boundaries, create greater alignment and, ultimately, help bring our IBM teams closer to the clients' needs.

Manager Champion Group

Launched in 2013, each year the Manager Champion Group identifies the 50 most exemplary IBM managers worldwide. Building on year-over-year momentum, our 2016 cohort had their most successful year to date. Manager Champions from 26 countries co-led virtual, global sessions, reaching over 29,000 IBM managers and enabling them around our new performance management tool, Checkpoint. They also partnered with our Client Experience Team to deliver IBM BOLD, a face-to-face initiative aimed at activating local leadership to develop innovative solutions to complex, cross-boundary challenges. Our Manager Champions advocated for their peers around the world by acting as sponsor users, thought leaders and first adopters to



Manager Champion Group

help create transformational initiatives with enterprise-wide impact. These “managers developing managers” not only developed others, they themselves received exposure, networking and executive coaching to continue their growth as transformational leaders.

Corporate citizenship

IBM recognizes that continued social progress requires that we influence leader behaviors not just within IBM, but externally as well. In 2016, we worked with the IBM Corporate Citizenship and Corporate Affairs (CC&CA) team to redesign our Leadership Impact Grants. CC&CA provides these grants to nongovernmental organizations (not-for-profits) at no cost to support development opportunities that would otherwise be unaffordable. We piloted a subset of the grant materials for the International Young Leaders Assembly during their 2016 Global Summit hosted at the United Nations.

Awards

- IBM received two gold Brandon Hall Awards in 2016: Best Unique or Innovative Leadership Development Program, and Best Launch of a Corporate Learning University.
- IBM was named a 2017 LEAD Award winner for Best Global/International Leadership Program.

Environment

Our long-standing commitment to environmental protection encompasses all our business activities worldwide, from conserving energy and water to minimizing waste and much more. We are also applying technological innovation to the critical challenge of creating a more environmentally sustainable world.

Commitment to environmental leadership

While IBM has undergone many transformations over its history, our commitment to protecting the environment has remained constant. Our global environmental management system ensures that we execute our operations and activities with the same protective standards for the environment in every country where we do business.

IBM's corporate environmental programs date from the 1960s. The following highlights demonstrate our history of commitment and leadership:

- 1967 — IBM issued its first formal directive on pollution control, disposal of liquid wastes, and wastewater treatment.
- 1971 — IBM CEO Thomas J. Watson Jr. formalized the company's commitment to environmental protection in our first Corporate Environmental Policy.
- 1972 — IBM issued a corporate directive requiring the environmental evaluation of suppliers of hazardous waste services. That directive was later expanded to include product recycling and disposal suppliers, and certain production-related suppliers.
- 1973 — IBM established its global energy conservation program and developed the methodology leading to its first conservation goal in 1975.
- 1974 — IBM issued a corporate policy on energy and materials conservation and recycling.
- 1978 — IBM began a global program to monitor groundwater quality at its manufacturing and development locations and to perform groundwater remediation as needed.
- 1988 — IBM established its first nonhazardous waste recycling goal.
- 1989 — IBM set a goal to eliminate chlorofluorocarbons (CFCs) and carbon tetrachloride from all its products and manufacturing processes by the end of 1993.
- 1990 — IBM began its annual corporate environmental reporting which has continued annually since that date.
- 1991 — IBM established its product stewardship program as a proactive and strategic approach to the environmental design and management of our products.

- 1991 — IBM began the Chairman's Environmental Award Program — recognizing achievement and progress in environmental affairs on the part of IBM's organizations. The award is presented annually by IBM's chairman.
- 1992 — IBM became a charter member of the U.S. Environmental Protection Agency's ENERGY STAR computer program and helped to develop the first ENERGY STAR criteria for personal computers.
- 1997 — IBM was the first major multinational company to earn a single global registration to the ISO 14001 environmental management system standard.
- 2000 — IBM established a water conservation goal, which was first focused on the significant use of water in our microelectronics manufacturing operations, then in early 2016 focused on reductions in water withdrawals at IBM locations in water-stressed regions.
- 2000 — IBM established its first operational carbon dioxide (CO₂) emissions reduction goal when we helped the World Wildlife Fund create its Climate Savers program.
- 2004 — IBM established environmental and social requirements for all IBM suppliers via IBM's Supplier Conduct Principles and supporting audit program.
- 2010 — IBM eliminated perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) in its manufacturing, development and research processes.
- 2016 — IBM achieved and exceeded its third-generation CO₂ emissions reduction goal four years early.
- 2016 — IBM achieved and exceeded its 2020 renewable electricity goal four years early.

We also apply our expertise, research and technology to develop solutions that enable our clients to conserve natural resources, reduce the environmental impacts associated with their operations, and make more informed decisions that drive improved sustainability. At IBM, environmental protection will always be at our forefront, because we have long believed that what is good for the environment is also good for our business.

Global governance and management system

IBM implements its environmental, energy and chemical management programs through a global environmental management system that integrates corporate directives governing IBM's operations worldwide.

Global environmental management system

IBM's [corporate environmental policy](#) calls for environmental leadership in all of the company's business activities. This leadership is achieved through implementation of a [global environmental management system](#) (EMS) that puts IBM's corporate directives into action. These directives cover areas such as energy conservation and climate protection, product stewardship, pollution prevention, chemical and waste management, and environmental evaluation of suppliers, as well as incident prevention, preparedness, response and reporting. Through the consistent implementation of this EMS, IBM ensures operations are executed with the same protective standards for the environment in every country where we conduct business. Highlights of our management system and resulting environmental performance are outlined throughout the sections that follow.

Employee and management responsibility

As noted in IBM's [Business Conduct Guidelines](#), all IBMers have a role to play in protecting the environment. Every employee is expected to follow IBM's corporate environmental policy and report any environmental, health or safety concerns to IBM management. Managers are expected to take prompt action when faced with a potential violation of the policy or directives. IBM executives are responsible for the environmental performance of their businesses functions 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. This ensures the ongoing suitability, adequacy and effectiveness of IBM's EMS for IBM's activities, products and services. Formed in 1993, the Directors and Corporate Governance Committee reviews IBM's position and practices on significant issues of corporate responsibility, including protection of the environment.

Environmental goals

Environmental goals are an important part of IBM's EMS. We maintain a range of environmental goals designed to address significant environmental aspects and impacts of our operations and to drive continual improvement of our environmental performance. These include goals on energy and water conservation, renewable electricity sourcing, carbon dioxide emissions reduction, product stewardship and waste management. IBM's voluntary goals and our performance against them are discussed in their respective sections of this report, and a summary of key goals and their outcomes 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 multinational company to earn a single global registration to the International Organization for Standardization (ISO) 14001 environmental management systems standard. We achieved this credential within just one year of the finalization of the first edition of the standard. This was in part due to the results already delivered under our environmental policy, first issued in 1971, and the early implementation of our environmental management programs.

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 additional entities such as our research locations that use chemicals, several IBM organizations at a country level, as well as our Procurement and Supply Chain, and Global Asset Recovery Services organizations.

As our business has evolved to include more services offerings, we have updated our EMS to address environmental opportunities and challenges in the services area. IBM's single global ISO 14001 EMS accreditation, with a complete list of registered entities worldwide, can be viewed on IBM's [ISO 14001 webpage](#).

IBM is currently working to update its management system to achieve conformity with the latest ISO 14001:2015 standard.

ISO 50001 standard on energy management systems

IBM issued a formal corporate policy in 1974 that called for the conservation of energy and materials in all of IBM's activities. Over the intervening years, we improved our global energy management program and integrated it into the company's global EMS.

When ISO issued 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 the ISO standard, we achieved ISO 50001 registration of our energy management program at the corporate level 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.

Following our successful ISO 50001 registration at the corporate level, many of IBM's major energy-consuming locations and one country organization received registration of their specific energy programs under IBM's single global ISO 50001 certification. As of year-end 2016, 16 entities were registered under IBM's global ISO 50001 certification — 12 in the Americas, three in Europe and one in the Asia Pacific region.

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 27th consecutive year of annual corporate environmental reporting.

In addition to providing information on our environmental programs and performance in this report, we provide a report based on the Global Reporting Initiative and supply information through a number of other voluntary reporting programs and tools, such as CDP, EcoVadis and OneReport. For more details on IBM's environmental reporting, see the IBM [environmental reporting, disclosure and verification webpage](#).

Stakeholder engagement

At IBM, engaging and collaborating with stakeholders from a cross-section of nongovernmental organizations, governments, investors and other interested parties is integral to our worldwide EMS. We publicly disclose information on our environmental

strategy, goals and targets, performance, and continual improvement activities widely through our voluntary reporting programs discussed above. In addition, IBM has a formal system for tracking and responding to inquiries from interested parties on environmental issues.

IBM's community outreach programs include support of and participation in local environmental projects and education efforts including Earth Hour, Earth Day, and World Environment Day, as well as site environmental awareness events and local clean air activities focused on the use of public transportation options.

IBM also engages its supply chain on environmental initiatives. For example, IBM is a founding member of the Electronic Industry Citizenship Coalition (EICC), a nonprofit industry group which helps manufacturers support continuous improvement in the social, environmental and ethical responsibility of their supply chains. IBM requires its suppliers to adhere to the EICC Code of Conduct, which contains environmental requirements, as well as provisions on labor, health and safety, ethics, and management systems.

Another important element of IBM's stakeholder engagement strategy is our collaborative work with business partners, clients, universities and other organizations to apply IBM technologies and solutions to solve many of the world's most challenging environmental problems. You will find examples of IBM's collaborative innovation 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 governments and environmental nongovernmental organizations (eNGOs) over the years.

Some current government examples include the U.S. Environmental Protection Agency's (EPA) ENERGY STAR and SmartWay programs, the European Union (EU) ENERGY STAR program, and the EU Code of Conduct for Energy Efficiency in Data Centres.

Examples of partnerships with eNGOs include our membership in the Center for Climate and Energy Solutions, our participation in Best Workplaces for Commuters, and our collaboration with The Nature Conservancy and the World Resources Institute. In 2016,

we joined the Business Renewables Center and the Renewable Energy Buyers Alliance. We also work with and support organizations such as The Conservation Fund, the Environmental Law Institute, and the World Environment Center.

In addition, we partner with other companies and institutions to foster solutions for environmental sustainability. In 2016, IBM became a founding member of the SMARTer2030 Action Coalition. In 2017, IBM joined the U.S. Water Partnership.

- SMARTer2030 Action Coalition is an initiative of leading companies, governments, multilaterals, eNGOs, thought leaders, and community-based organizations promoting an agenda that implements "smart" information and communications technology (ICT)-enabled solutions to advance a low-carbon economy.
- U.S. Water Partnership's mission is to unite and mobilize the best of U.S. expertise, resources and ingenuity to address global water challenges, with a special focus on developing countries where needs are greatest.

IBM has been a longstanding member of the Wildlife Habitat Council (WHC), a nonprofit organization dedicated to protecting and enhancing wildlife habitat. The WHC helps large landowners, particularly corporations, manage their open lands in an ecologically sensitive manner for the benefit of wildlife. Five IBM sites in the United States currently have their wildlife habitat management and conservation education program certified by the WHC — our corporate headquarters in Armonk, New York; IBM's site in Boulder, Colorado; IBM's Research Triangle Park (RTP) site in North Carolina; and two sites in San Jose, California (IBM Research-Almaden and our Silicon Valley Laboratory). At our RTP site, IBM partnered with local Eagle Scouts in 2017 to build a community garden — including seven garden beds (totaling approximately 200 square feet) in an 880-square-foot dedicated space — in a courtyard between two buildings. The garden will provide an opportunity for employees to take an outdoor break to tend to the garden and harvest fresh vegetables. In addition, it will benefit the environment, as the blooms in the garden and the screening shrubs will provide a food source for pollinators. The site plans to donate unpicked produce from the garden to a local food bank.

Environmental investment and return

Over the past five years, IBM has spent \$71.2 million in capital and \$428.6 million in operating expense to build, maintain and upgrade the infrastructure for environmental protection at its locations, and to manage its worldwide environmental programs.

Environmental capital and expense worldwide

(\$ in millions)

	2012	2013	2014	2015	2016
Capital	9.9	17.0	20.3	16.7	7.3
Expense	98.2	92.3	86.4	83.1	68.6
Total	\$108.1	\$109.3	\$106.7	\$99.8	\$75.9

IBM has tracked environmental expenses related to our facilities, corporate operations and site remediation efforts for 30 years, and began publicly disclosing this information in our environmental report for 1992. In 2016, total environmental expenditures associated with IBM's operations were \$75.9 million. Reductions in environmental expenditures were primarily a result of IBM's divestiture of its semiconductor manufacturing operations in July 2015.

IBM also estimates savings it has realized from its environmental leadership practices. These include savings from recycling, packaging improvement initiatives, waste reductions, and from energy, material and water conservation. Ongoing savings from previous years' initiatives are not carried over in this calculation, yielding conservative estimates.

In addition, IBM realizes avoidance of costs that likely would occur in the absence of its EMS. These savings are difficult to quantify, so a reasonable attempt has been made to estimate them. In 2016, IBM's combined, estimated environmental savings and cost avoidance worldwide totaled \$99.4 million.

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

2016 environmental expenses worldwide

(\$ in millions)

Personnel	25.8
Superfund and former IBM site remediation	21.6
Waste and materials recycling	5.3
Waste treatment and disposal	4.3
Surface water and wastewater management operations	3.4
Consultant and legal fees	1.4
Permit fees	0.6
Laboratory fees	0.5
Product takeback and recycling costs	0.4
Groundwater protection operations	0.2
Other environmental operations	5.1
Total	68.6

2016 estimated environmental savings and cost avoidance worldwide

(\$ in millions)

Energy conservation and cost avoidance	50.7
Location pollution prevention operations	20.0
Compliance cost efficiency*	13.7
Corporate operations**	5.3
Spill remediation cost avoidance***	4.9
Packaging improvements	2.1
Potential fines, penalty and litigation avoidance****	1.9
Superfund and site remediation efficiencies	0.8
Total	99.4

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

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

*** These savings are estimated considering IBM's actual experience with remediation costs.

**** 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).

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 more than 25 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.

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 chairman presents the award to an executive from the recipient business unit at a gathering of IBM senior executives from all business units.

IBM's Real Estate Strategy and Operations (RESO) organization received the 2016 Chairman's Environmental Award. RESO manages IBM's global real estate portfolio, made up of office, data center, manufacturing, development and lab space.

During the three years covered by the Chairman's Environmental Award nomination, RESO achieved the following results:

- Performed nearly 7,000 energy conservation projects, saving \$81 million while achieving an average conservation rate of 6.5 percent per year
- Leveraged analytics technologies to achieve increased energy efficiency:
 - Deployed the IBM TRIRIGA® Real Estate Environmental Sustainability Manager in 145 buildings (representing 45 percent of IBM's global energy use), delivering \$5 million in cost savings and providing a reference point for clients
 - Installed Chilled Water Optimization software at our seven largest U.S. sites, delivering \$2 million per year savings



IBM CEO Ginni Rometty presents the 2016 Chairman's Environmental Award to James Kavanaugh, senior vice president, Transformation and Operations.

- Developed analytics software in conjunction with Global Technology Services and IBM Research to sense conditions in data centers and automatically control cooling, which is being implemented at 42 data centers following a successful pilot in 2015
- Increased the contracted purchase of renewable electricity from 11.8 percent in 2013 to 16.2 percent in 2015
- Certified 12 sites to the ISO 50001 energy management standard
- Sent 84 percent (by weight) of construction waste for recycling, and composted more than 4 million pounds of organic waste
- Executed a variety of water conservation projects including rainwater harvesting, air-cooled chillers, and drought-resistant plantings
- Led IBM's effort to implement the Globally Harmonized System of Classification and Labeling of Chemicals (a new U.N. standard)
- Earned over 25 external awards recognizing leadership in environmental and energy management

While only one organization is selected each year to receive the Chairman's Environmental Award, the competition highlights the company's worldwide commitment to environmental leadership.

Energy conservation and climate protection

In 1973, IBM began its formal energy conservation program. In 2000, IBM set its first carbon dioxide (CO₂) emissions reduction goal when we helped the World Wildlife Fund create its Climate Savers program. In 2007, IBM published its position on climate change: IBM recognizes that climate change is 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 and the economy, as well as 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:

- Long-standing 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 five-part strategy

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

1. Designing, building, updating and operating facilities, including data centers and product development and manufacturing operations, that optimize their use of energy and materials and minimize GHG emissions
2. Purchasing electricity generated from renewable sources where it makes both business and environmental sense
3. Requiring our suppliers to maintain an environmental management system that includes inventories of energy use and GHG emissions, reduction plans and public reporting of results

4. Managing business travel

5. Increasing the efficiency of IBM's logistics operations

In addition, IBM's strategy includes designing energy-efficient products and providing services and solutions that help our clients reduce their own energy use and climate impacts.

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 our operations. Our efforts to reduce IBM's GHG emissions are focused on delivering results 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 merely offsetting them.

Conserving energy

IBM formalized its energy conservation and management program in 1974 and has continued it unabated ever since. Energy conservation is a major component of our comprehensive, multifaceted climate protection program because the release of CO₂ by utility companies powering our facilities, or from our use of fuel for heating or cooling, represents the greatest potential climate impact associated with our operations.

In 2016, IBM's energy conservation projects across the company delivered annual savings equal to 5.3 percent of our total energy use, surpassing the corporate goal of 3.5 percent.

These projects saved and avoided the consumption of 190,000 megawatt-hours (MWh) of electricity and 163,000 million British thermal units (MMBtu) of fuel oil and natural gas, and an associated 83,000 metric tons of CO₂ emissions. The conservation projects also saved \$20.4 million in energy expense. These strong results were due to our continued, across-the-board focus on energy demand reduction, efficiency, and the implementation of standard, global energy conservation strategies at our facilities.

In measuring performance against IBM's energy conservation goal, we recognize 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 are not included in the results for measuring

performance against achieving this goal. Moreover, the results cited above are conservative in that they include only the first year's savings from projects. Ongoing conservation savings beyond the first year are not included in the results. Accordingly, the total energy savings and CO₂ emissions avoidance from these conservation actions is actually greater than this simple summation of the annual results.

Electricity and fuel use and related CO₂ emissions

Scope 1 and Scope 2 CO₂ emissions

	Electricity and fuel use (1,000 MMBtu)	Calculated with grid emissions factors*	Reduced by the CO ₂ avoided by renewable electricity purchases*
2016	14,876	1,554	1,254
2015	17,974	1,836	1,584
2014	20,842	2,092	1,842
2013	21,190	2,186	1,962
2012	21,613	2,404	2,195

*CO₂ emissions (estimated) – metric tons x 1,000

1. The 2016 CO₂ emissions quantities were not calculated in accordance with the GHG Protocol Scope 2 Guidance, issued in 2015, to enable consistent year-to-year comparisons. As discussed in the overall CO₂ emissions inventory section on page 58, the differences between the quantities reported here using the IBM methodology and the quantities calculated using the market-based methodology of the GHG Protocol are minimal (0.6 percent). See the IBM 2015 and 2016 Scope 1 and Scope 2 emissions inventory for more detail.
2. IBM divested its semiconductor manufacturing operations in July 2015. Data from 2012 to 2014 include full-year emissions from the semiconductor manufacturing facilities. The 2015 data includes emissions from those facilities during the first half of 2015.
3. Data for IBM's operations at co-location data centers are not included in this table.

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/ventilation/air conditioning (HVAC), central utility plants, compressed air, data center and information technology (IT) systems, cafeterias and office systems.

5.3%

In 2016, IBM's energy conservation projects delivered annual savings equal to 5.3 percent of its total energy use — surpassing our goal of 3.5 percent.

7.2m MWh

From 1990 through 2016, IBM conserved 7.2 million MWh of electricity, avoiding 4.4 million metric tons of CO₂ emissions and saving \$600 million.

All IBM locations 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, results of conservation projects, completed checklists and key performance indicators. These analyses enable monthly metrics reporting to management 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 2,000 energy conservation projects involving a range of energy efficiency initiatives delivered savings at more than 500 IBM locations globally in 2016. Examples include:

- Projects to match building lighting and HVAC with occupancy schedules, or to upgrade equipment efficiency through recommissioning equipment or installation of new equipment, were implemented at 227 locations, reducing annual energy use by 44,000 MWh and saving \$3.8 million.
- Central utility plant projects were implemented at 52 locations, reducing annual energy use by 24,900 MWh and saving \$1.6 million.

\$2.6m

344 energy conservation projects at 97 data center locations reduced cooling energy use by nearly 25,800 MWh in 2016, saving more than \$2.6 million.

- The IBM Building Monitoring and Management solution, a part of IBM's Building Management Center solution, has been installed at 27 major IBM campuses, encompassing 155 buildings, reducing annual energy use by 41,800 MWh and saving \$1.8 million.
- Data center cooling projects and server and storage virtualization and consolidation projects reduced annual energy use by nearly 102,000 MWh and saved \$10.4 million.

Applying analytics to drive further efficiencies

The IBM energy management and data center teams leverage analytics-based monitoring to minimize energy use and optimize operating performance at many IBM locations.

IBM continues to install its Building Monitoring and Management solution at IBM locations, deploying the solution at 10 additional buildings in 2016. In addition, the energy management team added 15 new operating rules and modified 12 existing rules during 2016 to increase and improve the solution's systems and operations coverage. Annual energy savings achieved using the solution increased 52 percent to 41,000 MWh from 2015 to 2016.

The solution enables early identification of building system problems. For example, use of the solution reduced the number of "comfort calls," concerns about an office being too hot or cold, by 20 percent at the 10 largest locations that have deployed the solution. Overall, the solution saves 5 to 15 percent of the overall system operating costs at the locations and buildings where it is used.

IBM also continues to leverage and upgrade its data center cooling management systems. Three locations have piloted a new generation of the automated cooling management system with functionality that dynamically matches cooling and IT heat load in real time, delivering significant energy savings at the demonstration sites. It is expected that further deployment of this technology will yield a 10 percent reduction in cooling energy demand at the locations where it is implemented. Specific energy conservation results for data centers are discussed in the next section.

Data centers

IBM manages a diverse portfolio of data centers worldwide in support of our clients and our internal operations. IBM also operates IT lab raised-floor spaces that support its hardware and software development and testing operations.

We take a holistic approach to managing our data centers — improving existing data center space to derive more workload per area, equipment and energy resources utilized, and building new, high-efficiency data center space required to meet the needs of our clients.



2016 energy conservation savings by project category

- 50% Data centers
- 15% Heating, ventilation and air conditioning
- 11% Central utility plant
- 10% Building controls
- 6% Continuous commissioning
- 5% Lighting
- 3% Other

In 2016, we completed 344 projects to improve cooling efficiency at 97 existing data center locations, reducing energy use by nearly 25,800 MWh while saving over \$2.6 million. Some examples of projects included:

- Installed thousands of blanking panels, wall panels between racks, cable cutout plugs, and cold aisle containment systems, reducing the mixing of hot and cold air and increasing cooling efficiency.
- Shut down computer room air conditioning (CRAC) units, reducing energy use. For the period 2011-2016, IBM increased the average raised floor temperature by more than 2.5 degrees Celsius by shutting down CRACs and rebalancing data center airflow.

Achieving these savings while maintaining the reliability of the data center operations required the use of analytics-based IT systems to monitor the data center temperature profile and identify and mitigate hot and cold spots.

Construction was completed on two new data centers that began operation in Belgium in 2016. The centers are in the process of consolidating workload from nine current data centers and have sufficient capacity to support new business. The data centers are designed for a power usage effectiveness (PUE) of 1.3, a 30 percent improvement over the data centers being replaced and a best-in-class PUE for high-reliability, enterprise-class data centers. The data centers use indirect free cooling, hot/cold aisle containment and CRAC units with variable-speed fan drives.

IBM also continues to expand its cloud computing offerings. At year-end 2016, IBM operated over 55 cloud data centers in 19 countries. IBM is building its cloud data centers using standard installation templates for a highly efficient IT infrastructure. These data centers are typically designed to operate at a PUE of 1.5 or better at full IT capacity. The templates are updated with each new generation of IT technology. The templates also address cold aisle containment to optimize cooling delivery. Cloud computing can be an efficient model for providing IT services, optimizing hardware utilization and virtualization technologies across the server, storage and network infrastructure.

Data center power usage performance

IBM collects meter readings or uses estimating protocols to calculate the PUE at many of the data centers we manage. PUE is the ratio of the total energy consumed by the data center, divided by the energy consumed by the IT equipment. The closer the value is to 1, the more efficient the cooling delivery. Using data reported from 59 percent of IBM's data center space, we calculated the average PUE for IBM's raised-floor space to be 1.69, a 1 percent reduction from 2015. The PUE range for the reporting facilities was 1.39 to 2.7. Data centers are highly complex systems. As clients move in and out of the data center and increase or decrease their workloads, and as existing server, storage and network equipment is refreshed with new technologies, data center equipment layout changes. Depending on how cooling delivery is adjusted in response to these changes, PUE can increase or decrease.

As one of the longest-term providers of service in the IT industry, IBM's data center portfolio consists of spaces and equipment of varying vintages. Improving the energy efficiency of these data centers requires thoughtful planning and execution to meet operational objectives and commitments to clients. IBM has made — and will continue to make — significant investments 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 "Participant" status in the EU Code of Conduct (CoC) for Energy Efficiency in Data Centres program. Over the last four years, we have registered additional data centers, bringing the total number of data centers participating in this program to 39 in 18 countries. IBM's [registered data centers](#) represent the largest portfolio from a single company to receive the recognition to date. The registered locations include more than 70 percent of IBM's IT delivery and resiliency services 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.

21.5%

Contracted renewable electricity represented 21.5 percent of our global electricity purchases in 2016, or 783,000 MWh, achieving our renewable electricity procurement goal four years early.

40.6%

Combining our contracted renewable electricity purchases and renewable electricity in the grid mix, 40.6 percent of our global electricity supply in 2016 was generated from renewable sources.

In addition to the EU CoC for Energy Efficiency in Data Centres program, IBM is involved with ENERGY STAR (a U.S. government program) and The Green Grid (industry collaboration) data center energy efficiency initiatives. These initiatives have established recommended operating criteria and metrics that inform and encourage data center operators and owners to reduce energy consumption in a cost-effective manner without compromising the objectives of mission-critical operations.

System virtualization and cloud computing

Virtualizing server and storage systems allows individual systems 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 continues to virtualize and consolidate workloads from multiple servers and storage systems with low utilization onto single systems, reducing energy use and expense. In 2016, we increased the number of virtualized images by more than 29 percent, the average number of images per virtualized server by 20 percent, and the number of virtualized servers by 4 percent — improving the overall efficiency of our installed base of servers. Storage and server virtualization consolidation projects avoided nearly 78,000 MWh and \$8.4 million of annualized consumption and cost. Implementation of server and storage virtualization has been a key contributor in reducing the overall electricity consumption of our data centers over the past five years.

Renewable electricity

In 2016, IBM contracted with its utility suppliers to purchase approximately 783,000 MWh of renewable electricity representing 21.5 percent of our global electricity consumption. These purchases exceeded IBM's goal to purchase 20 percent of its electricity consumption from renewable sources by 2020, over and above the quantity of renewable electricity provided as part of the mix of electricity that we purchase from the grid. We achieved this goal four years early. IBM avoided 300,000 metric tons of CO₂ emissions through these purchases.

Our contracted renewable electricity purchases as a percent of our global electricity consumption increased by over five points year-over-year, due to increased purchases of renewable electricity and reduced electricity consumption.

IBM's contracted renewable electricity purchases occurred in 18 countries: Australia, Austria, Belgium, Brazil, Denmark, Finland, France, Germany, India, Ireland, Italy, the Netherlands, Spain, Sweden, Switzerland, Taiwan, the United Kingdom and the United States.

We procure renewable electricity generated from wind, large and small hydro, biomass, and solar installations around the globe. We report all of our contracted renewable electricity purchases — be they from new or existing generation sources, “additional” or otherwise, without discriminating against large hydro installations — and their associated CO₂ avoidance. 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.

Combining our contracted renewable electricity purchases and the amount of renewable electricity IBM received as part of the grid mix, 40.6 percent of our global electricity supply in 2016 was generated from renewable sources.

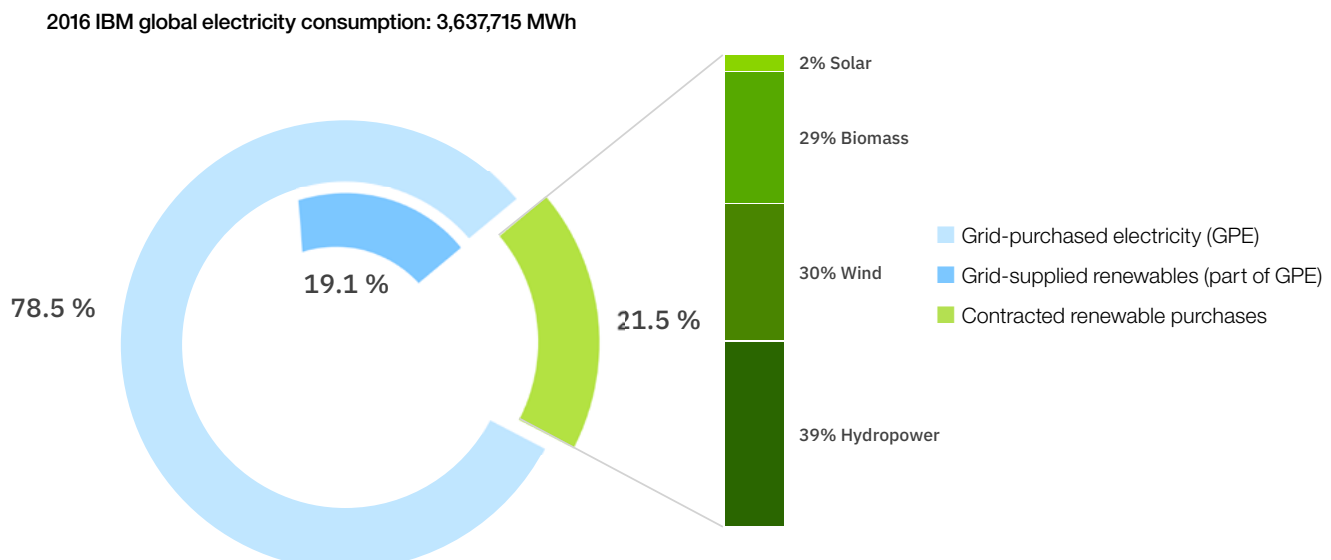
Purchases of renewable electricity for data centers

IBM locates most of its data center operations in data centers managed by the company. Overall, 37 percent of IBM's managed data centers obtained some or all of their electricity from our contracted renewable-generation sources in 2016. Including both contracted and grid-supplied renewables, nearly 50 percent of the electricity procured for IBM's managed data center operations comes from renewable sources.

IBM also locates some data center operations in co-location data centers where a third party (known as a co-location provider) owns the facilities and provides power and cooling services, while IBM installs, owns and operates the IT equipment. For these co-location data centers, 18.2 percent of electricity supply came from renewable generation sources in the grid. In addition, we obtained renewable energy certificates (RECs, see additional discussion about RECs) for approximately 10 percent of the electricity consumed by IBM's operations at these locations. These RECs were allocated to IBM by the landlord of the facilities. Overall, 28.2 percent of the electricity consumed at these locations came from renewable sources or was offset by RECs.

Renewable energy certificates (RECs)

An REC is a document that is created for every MWh of renewable electricity generated. RECs are tradable, non-tangible commodities representing the zero emissions attributes of power produced from renewable sources. They are used to offset CO₂ emissions associated with the use of electricity from conventional sources (e.g., natural gas, coal or oil). RECs can be further defined as either bundled RECs or unbundled RECs. When bundled, the renewable electricity and its associated REC are sold in the same grid region where the power provider and user are located. When unbundled, the REC is separated from the renewable electricity that was generated and sold separately to a purchaser residing in a different grid region from where the renewable electricity was actually generated. To avoid "double counting," only the final owner of the RECs (bundled or unbundled) can claim their environmental attribute.



IBM's strategy and approach regarding renewable electricity purchases

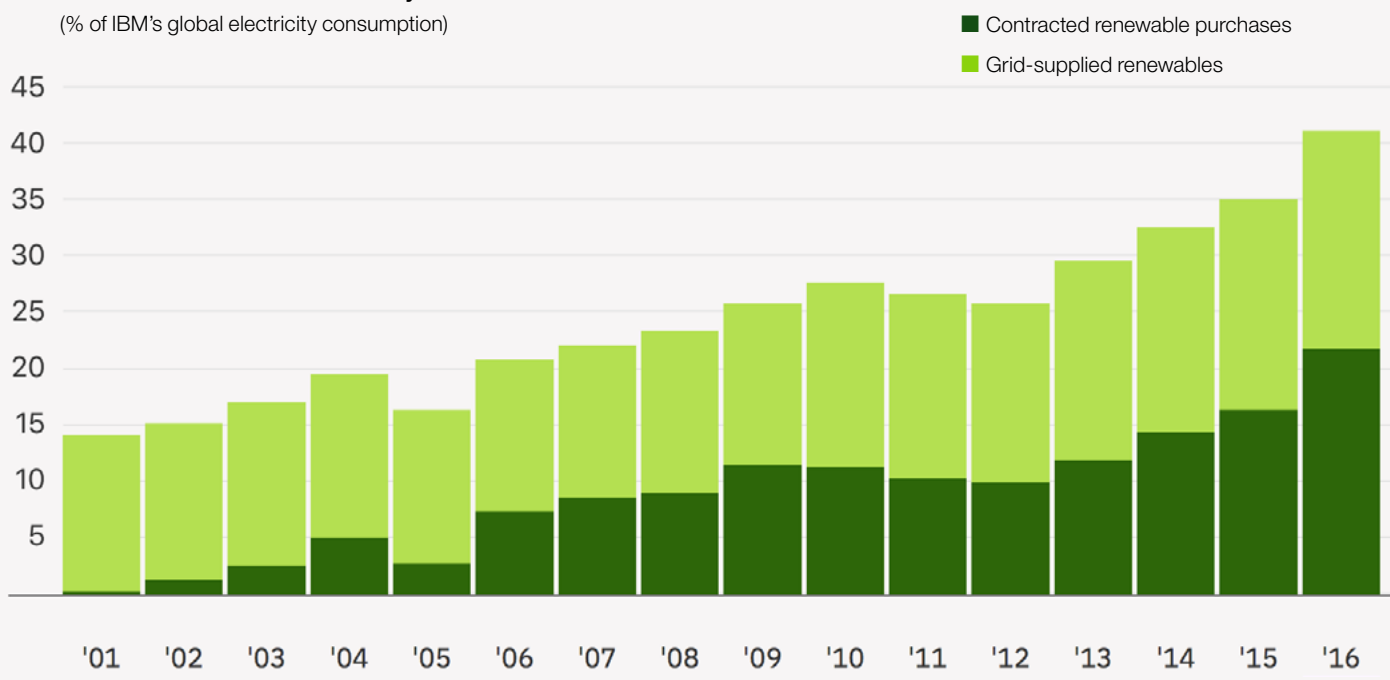
IBM's strategy is to procure renewable electricity that is generated in the grid regions where IBM's facilities are located. When possible, we match our purchases to the physical consumption of our facilities so that we are consuming the electricity at the same time that the renewable electricity is being generated. However, output from wind and solar facilities varies depending on the time of day and weather conditions. As such, we must rely on electricity generated from conventional sources (i.e., fossil fuels) to ensure business continuity in such cases. When our consumption exceeds the output from renewable sources, we use "bundled" RECs to offset the CO₂ emissions associated with the electricity we consumed from conventional sources. Our intent is to procure renewable electricity and its zero-emissions attributes from the grid regions in which our facilities operate, either by directly matching our physical consumption or using bundled RECs to offset emissions.

Our strategy and approach make it clear to our electricity suppliers that we want them to increase the quantity and availability of renewable electricity in their offerings. IBM continues to work with industry peers, utilities, NGOs and other renewable energy industry participants to identify, develop and capture opportunities to procure electricity generated from renewable sources. In 2016, we joined the Business Renewables Center and the Renewable Energy Buyers Alliance to broaden our networking and efforts to expand the availability of renewable electricity to corporate buyers.

While the purchase of unbundled RECs is an admirable way to financially support the production of renewable energy, we think it would be misleading for IBM to claim that we are consuming renewable electricity based on purchases of unbundled RECs. The reason is simple: IBM would not actually be using the renewable electricity that the purchase of unbundled RECs helped to fund. It also obfuscates the need for hard public policy decisions and investments across the energy value chain that must be made to genuinely increase the quantity and availability of renewable electricity delivered to the grid.

IBM's use of renewable electricity from 2001 to 2016

(% of IBM's global electricity consumption)



We would certainly like to be able to power our operations with 100 percent renewable electricity, and we are committed to expanding our procurement of renewable electricity for our global operations. However, we recognize that it is not possible in today's market or in the foreseeable future to actually power IBM's operations reliably with 100 percent renewable electricity, given the company's vast and diverse presence in over 170 countries along with its need in many places for uninterrupted power (which is usually made possible by fossil fuels).

Transparency in communicating about the use of renewable electricity

There is a difference between purchasing RECs and actually using renewable electricity. A complete understanding of a company's use of renewable electricity requires a higher degree of transparency in how renewable electricity and REC purchases are reported.

IBM supports and exercises full transparency in disclosing its use of renewable electricity. We are seeking to increase our procurement of renewable electricity for our operations and working with industry groups, selected utilities and energy service companies to develop contracting approaches to enable physical delivery of renewable electricity to our facilities. There are myriad challenges involving renewable electricity output, demand forecasting, grid management, and transmission and storage infrastructures that must be overcome before large organizations, with few exceptions, can actually power all their operations with renewable electricity. In the interest of more transparent accounting, we believe renewable electricity purchases may logically be broken down and reported under three categories:

- **Physical or matched consumption:** In this case, renewable electricity is generated in the grid region where the consuming facility is located and at the same time that the facility is consuming electricity. The electricity can be physically delivered or it can be matched to the facility's consumption.
- **Matched offsets:** In this case, renewable electricity is generated in the same grid region where the consuming facility is located, but it occurs at a time when the facility is not able to consume it or when the amount of renewable electricity generated exceeds or lags the demand from the facility. In this case, the RECs are separated from the renewable electricity and bundled with the electricity generated from conventional sources (i.e., fossil fuels) that is actually consumed by the facility. The purpose is to offset the GHG emissions associated with conventional generation in this specific grid region.
- **Unbundled RECs:** In this case, as renewable electricity is generated, the RECs are separated or "unbundled" from the renewable electricity with which they are affiliated. The electricity is sold into the grid region in which it is generated, but the "unbundled" REC is sold to a consumer of conventional electricity (i.e., fossil fuels) who is located in a different grid region in order for the purchaser of these unbundled RECs to offset the emissions associated with the conventionally generated electricity that it actually consumed. There is no physical connection between the facility generating the renewable electricity and the facility using the unbundled REC.

The type of contract used to procure renewable electricity or RECs and the renewable generation source(s) will determine what percentage of a company's renewable purchases fall into each of the three categories. A purchase from a biomass or hydropower plant will likely be able to be matched to physical consumption. A wind or solar power purchase will have a portion of the output or bundled RECs matched to physical consumption, while most will be used as matched offsets due to the intermittent nature of wind and solar generation. Unbundled RECs are not matched to any of a facility's consumption because the renewable electricity is generated in a different grid region. They serve solely as an offset for the CO₂ emissions associated with the purchaser's actual consumption of electricity from conventional sources (i.e., fossil fuels).

Each of these three categories is often represented as a “use” of renewable electricity but only renewable generation that is matched to physical consumption can truly be considered to provide power to a facility. IBM does not rely upon the purchase of unbundled RECs to assert that a facility is using renewable electricity when, in fact, it is not. It is admirable to financially support the production of renewable electricity by purchasing RECs, but we do not believe it is appropriate for IBM to assert that the purchase of RECs is equivalent to physically using renewable electricity.

The following table (Allocation of renewable electricity IBM received during 2016) shows the renewable electricity procured by IBM during 2016 broken into the three categories discussed above. We used publicly available information to estimate the quantity of renewable electricity in our grid supply. (For more, see [The Shift Project Data Portal: Energy and Climate Data](#).) We developed the following assumptions for allocating renewable electricity to the categories of (a) physical or matched consumption and (b) matched offsets (using bundled RECs) for solar and wind generation, based on our knowledge of their characteristics such as output profiles and shape curves.

- Wind — 40 percent physical or matched consumption and 60 percent matched offsets
- Solar — 20 percent physical or matched consumption and 80 percent matched offsets
- Hydropower and biomass — 100 percent physical or matched consumption

Using representative data for the average utilization of the wind and solar generation to determine the percentage of renewable output that can be matched to consumption is a conservative approach. We will endeavor to continually refine our estimating methodology going forward.

Allocation of renewable electricity IBM received during 2016

Total MWh of renewable electricity received (contracted purchases and grid-supplied)	1,478,850
Percent of renewable electricity in IBM's total electricity supply	40.6%
• Percent supplied through the grid	19.1%
• Percent obtained through contracted purchases	21.5%
Renewable electricity use by category	
• Physical or matched consumption	83.5%
• Matched offsets	16.5%
• Unbundled RECs	0%

IBM has a high percentage of physical or matched consumption because almost three-quarters of IBM's contracted and grid-supplied renewables come from hydropower or biomass generation sources.

Challenges and opportunities in procuring renewable electricity

Through our efforts over the years to increase our purchases of renewable electricity to power our operations, we have identified a number of factors that impact a company's ability to, or must be considered when, procuring renewable electricity for consumption. They include:

- Size of electricity demand of consuming facilities. A smaller demand presents a greater challenge to execute contracted purchases.
- Ownership of the facilities (e.g., owned, leased). Leased locations have more constraints in negotiating contracted purchases.
- Number of countries in which a company's facilities operate (consume electricity). As the number of countries increases, procurement becomes more challenging as many countries do not currently offer renewable electricity for commercial purchase.
- Type of electricity market (e.g., regulated, unregulated) serving the facilities and availability of renewables from service providers.

Many of IBM's clients require their data center operations to be supported from facilities in specific countries or geographical regions to ensure response times and provide backup should a disruptive event occur at one facility. As a result, IBM operates a large number of data centers that are geographically dispersed and that have relatively low electricity demands (0.5 to 5 megawatts (MW)). The diversity of size and location of IBM data centers and the relatively low demand make it difficult to economically match renewable generation sources to our consumption.

In addition, a great majority of IBM's facilities with electricity demand greater than 1 MW are leased locations, and these locations reside across 30 countries. Over one-third of these locations have limited or no opportunity to procure economically priced, commercial quantities of renewable electricity. These realities further challenge our ability to negotiate appropriate contract terms with providers and/or to procure renewable electricity to power our operations.

In the current market, "green tariff" offerings of one- to three-year terms from utilities and energy service companies offer the best match to our needs, but come with high premiums in many markets. Contract offerings with four- to eight-year terms for our desired quantity of electricity have emerged in the last year, and we are hopeful they will present us more economical procurement options in the future. Despite these challenges, we remain steadfastly committed and will continue to aggressively pursue renewables procurement to power our operations.

Research and solutions

to advance the use of renewable electricity

While increasing the renewable generating capacity in the global electricity supply is an important step to decarbonizing the electricity supply, the quantity of renewable electricity in the grid will ultimately be limited without advances in demand and the forecasting of generation; grid management systems; and electricity storage and transmission technologies. Recognizing the importance of these advancements to expanding the availability of renewables, IBM has made major investments in the use of powerful weather models and analytic and cognitive capabilities to develop highly accurate forecasting tools for

38.1%

IBM's 2016 net operational CO₂ emissions were reduced by 38.1 percent versus the 2005 baseline, surpassing our goal four years early.

13.2%

IBM's net operational CO₂ emissions associated with the use of fuel and electricity at our locations were reduced by 13.2 percent from 2015 to 2016.

electricity demand as well as solar and wind-power generation. These tools will enable better utilization of available renewable generation and more effectively integrate new capacity into the grid. IBM has worked with partners and clients to implement forecasting and management projects in over 30 countries, with one example detailed in the [solutions for environmental sustainability](#) section of this report. The environmental benefits resulting from IBM's investment in these technologies exceed the benefits from IBM's purchases of renewable electricity for its own consumption by increasing the quantity and availability of renewable electricity from existing and planned projects.

Operational CO₂ emissions management

In 2016, IBM achieved and exceeded its third-generation CO₂ emissions reduction goal: to reduce CO₂ emissions associated with our energy consumption 35 percent by year-end 2020, against base year 2005 and adjusted for acquisitions and divestitures. The achievement of this goal came four years early as IBM reduced its operational CO₂ emissions by 38.1 percent against the 2005 baseline. This result was driven by a continuous decrease in energy consumption since 2011, a robust renewable electricity procurement program, and a reduction in the overall electricity emissions factor associated with IBM's grid purchased electricity.

IBM's net operational CO₂ emissions associated with its energy use were reduced by 13.2 percent from 2015 to 2016 when excluding the first half year emissions from semiconductor manufacturing operations which were divested in July 2015. There were three main factors that drove this reduction:

1. Energy conservation actions and a reduction in our energy consumption drove a 61,000 metric ton (MT) reduction in CO₂ emissions. This accounted for an approximate 4.2 percent reduction in our overall CO₂ emissions.
2. The average CO₂ emissions factor associated with our grid purchased electricity was reduced by over 0.02 MT/MWh, reducing CO₂ emissions by 80,700 MT. This accounted for a 5.5 percent reduction in our overall CO₂ emissions.
3. An increase in renewable electricity purchases avoided 50,500 MT of CO₂ emissions — an approximate 3.5 percent year-over-year reduction.

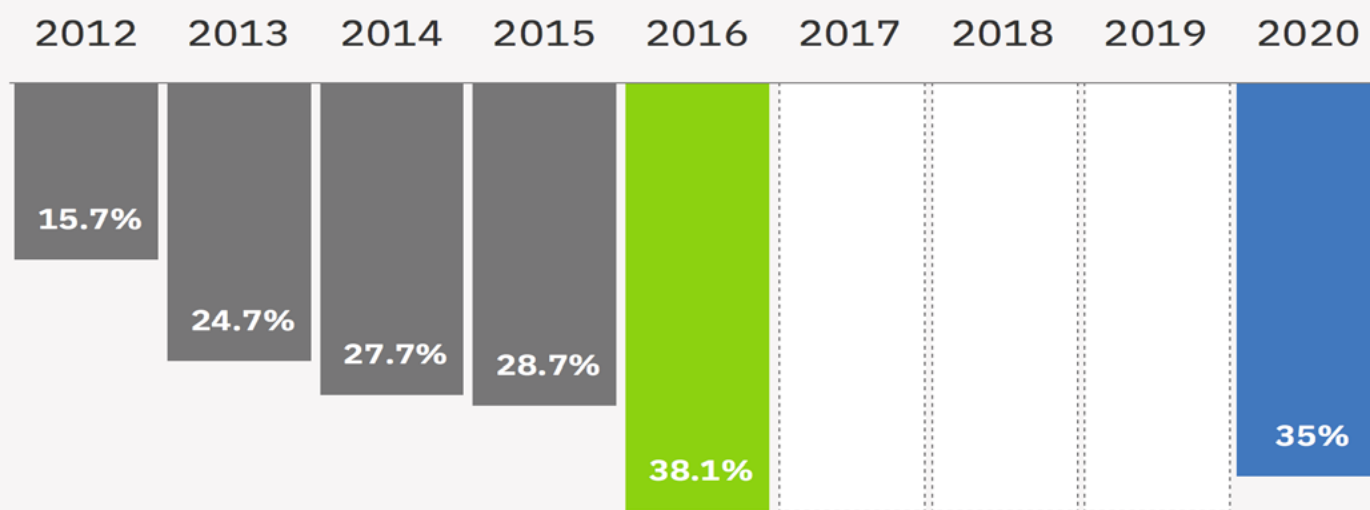
Overall CO₂ emissions inventory

IBM tracks and manages Scope 1 and Scope 2 CO₂ emissions across its operations. This includes operational CO₂ emissions related to IBM's energy consumption as discussed in the previous section, as well as other Scope 1 emissions such as those resulting from the use of leased vehicles for IBM's service technicians and other operations, refrigerants in cooling systems, and heat transfer fluids in our lab and test operations. IBM's overall Scope 1 and Scope 2 emissions decreased by 27 percent from 2015 to 2016. Excluding the emissions from the divested semiconductor manufacturing operations, the year-to-year reduction was 12.8 percent.

We calculated our 2015 and 2016 emissions in accordance with the "market-based method" in the GHG Protocol Scope 2 Guidance (issued in 2015), as well as in accordance with IBM's own calculation method, which preceded the newest guidance and was used to assess IBM's progress in attaining its CO₂ emissions reduction goal. The IBM method calculates the operational CO₂ emissions based on emissions factors specific to a location, country and grid region, and then subtracts the avoided CO₂ emissions associated with IBM renewable electricity purchases to get the net operational CO₂ emissions for the year.

Operational CO₂ emissions reduction against 2005 baseline

3rd-generation goal



The market-based method recognizes the actual environmental attributes of energy consumed (e.g., assigns zero emissions to the consumption of contracted renewable electricity), allows the use of utility-specific emissions factors in the calculation at locations where they are available, and requires the use of “residual” emissions factors (currently available for the European Union) for grid consumption at locations where only a portion of the consumption is satisfied through contracted renewables purchases. Our comparison of the operational CO₂ emissions calculated by the IBM and GHG Protocol market-based methods indicates that the results from the two calculation methods only differ by 0.6 percent.

A summary of our total 2015 and 2016 emissions inventory is provided in the following table:

Transportation and logistics initiatives

Employee commuting and leased/rental vehicles

IBM has been active for decades in promoting programs that reduce employees’ work-related commutes and/or that reduce commute-related CO₂ emissions. For example, many locations promote biking to work by having bicycle lockers, racks and showers available on-site. At several larger locations, IBM sponsors shuttle services to transport employees to mass transit stations and also between IBM campuses and buildings. Globally, many of our locations partner with local public transit authorities to develop ride-sharing programs and negotiate subsidized transit passes for IBM employees. In Europe and Japan, for example, many IBM locations are within reach of the public transportation system, giving employees the choice to use more energy-efficient mass transit to commute to work.

IBM 2015 and 2016 Scope 1 and Scope 2 emissions inventory

(Metric tons [MT] of CO₂ equivalent, including semiconductor manufacturing operations for the first half of 2015)

Summary	2015		2016	
	IBM Method	Market-based method	IBM Method	Market-based method
Operational Scope 1 Emissions	161,638	161,638	90,995	90,995
Scope 2 emissions: Electricity	1,638,067	1,397,190	1,425,275	1,118,170
Scope 2 emissions: Purchased commodities	36,266	36,266	37,663	37,663
CO ₂ avoidance from renewable electricity purchases	(252,231)	Captured above	(299,536)	Captured above
Net Operational Scope 1 and Scope 2 emissions	1,583,740	1,595,094	1,254,397	1,246,828
Net Operational Scope 1 and Scope 2 emissions, excluding divested semiconductor manufacturing operations	1,445,817	1,459,291	1,254,397	1,246,828
Non-operational Scope 1 emissions	<i>Emissions type</i>			
Fuel use	<i>Transportation</i>			
Semiconductor research and manufacturing chemicals	<i>PFC</i>			
Nitrous oxide	<i>Other</i>			
Heat transfer fluids	<i>Other</i>			
HFCs	<i>Other</i>			
Total other Scope 1 emissions	192,408	192,408	42,668	42,668
IBM's total Scope 1 and Scope 2 emissions	1,776,148	1,787,502	1,297,065	1,289,496
IBM's total Scope 1 and Scope 2 emissions, excluding divested semiconductor manufacturing operations	1,487,733	1,501,207	1,297,065	1,289,496

IBM employees in the United States can now take advantage of IBM's Commuter Benefits Program. Launched in 2016, the program allows employees to pay for eligible mass transit and qualified parking expenses related to commuting to work with pre-tax money. Use of the benefit to procure mass transit passes translates into monetary savings on commuting costs and encourages employees to opt for more efficient commuting options where available.

IBM is a member of the Best Workplaces for Commuters (BWC) program. Currently, 18 IBM locations in the United States are registered as BWC sites, where approximately 42 percent of the company's U.S. employees report to work. Many locations actively work with their local or regional transit commissions to integrate IBM's programs with regional programs, increasing commuting options for our employees.

In some countries, IBM provides leased vehicles for employees that they may use for both business and personal purposes. For these vehicles, we have set standard guidelines for the leasing of vehicles with lower emissions profiles. These guidelines enable reductions in average car emission levels as the car fleets are renewed. For the cars our employees rent while traveling for business, we have worked with rental car companies to require or offer more fuel-efficient vehicles.

Reducing business travel

Business travel is a necessary and important part of ensuring that IBM understands our clients' needs and delivers the best client experience possible. IBM has developed and deployed a number of technologies, including IBM Connections™, our primary social platform, Sametime® messaging, and IBM SmartCloud® meetings to facilitate remote collaboration and reduce the need for some business travel.

Efficiency of logistics

IBM is optimizing logistics operations and increasing packaging density and strength to reduce the CO₂ emissions generated by the transport of IBM products and their components.

IBM has been an active participant of the U.S. Environmental Protection Agency's SmartWay Transport Partnership since 2006. SmartWay is a voluntary initiative to improve fuel efficiency and reduce GHG emissions associated with logistics operations.

In 2016, 98 percent of IBM's spending on shipments of goods within the United States and from the U.S. to Canada and Mexico went through a SmartWay logistics provider. The remaining 2 percent were largely carriers hired for local or one-off deliveries or support at an operating facility. IBM voluntarily applies specific SmartWay requirements to our distribution operations globally.

IBM also develops product packaging that minimizes material use and package volume while optimizing package strength. This helps reduce transport-associated CO₂ emissions. 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. We require that all of our "first-tier" suppliers (those 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 — and to cascade IBM's requirements to their suppliers who perform work that is material to the goods or services being supplied to IBM. 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). The IBM Global Procurement organization assesses suppliers (existing and new) regarding their compliance with the IBM Social and Environmental Management System requirements as a component of its overall 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 indicators on energy consumption, carbon emissions, water and waste. 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 establishing programs to track their energy use and GHG emissions. Companies in the electronics industry share many suppliers, and the EICC GHG emissions disclosure process enables more efficient information disclosure. We use the EICC reports completed by our component and parts suppliers to augment and validate our internal supplier assessment work.

More information on IBM's supplier programs may be found in the [environmental requirements in the supply chain](#) section.

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

Approximations of Scope 3 GHG emissions can help entities recognize where the greatest amounts of GHGs may be generated during the lifecycle of a typical process, 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 provide the best opportunities for improved energy efficiency and innovation. However, IBM does not assert the specific amount of Scope 3 GHG emissions associated with our value chain. 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 companies, 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 generate a credible estimate or apportionment of the energy used by these suppliers that would be associated with the products or services provided to IBM alone, versus those emissions associated with products or services provided to their other 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 are expected to develop a management system, identify their significant environmental impacts — including GHG emissions — and develop reduction plans for those impacts.

Product stewardship

IBM established its product stewardship program 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, that can be upgraded and reused to extend product life, that incorporate recycled content and environmentally preferable materials and finishes, and that 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 applicable IBM offering management processes. Information on product environmental attributes such as energy efficiency,

materials content, chemical emissions, design for recycling, end-of-life management and packaging are documented in IBM's Product Environmental Profile (PEP) application and reviewed at various checkpoints during the development process.

Compliance management tools like the [Product Content Declaration \(PCD\) 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](#), PCDs and compliance assessment protocols — are managed by an interdisciplinary team with representatives from 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.

2016 product stewardship goals and performance

Use of landfills

IBM's product end-of-life management operations worldwide processed 30,800 metric tons (67.9 million pounds) of end-of-life products and product waste, and sent only 0.6 percent (by weight) of the total to landfills or incineration facilities for treatment, performing better than IBM's corporate goal of sending 3 percent or less of the total amount processed to landfill or incineration facilities for treatment.

Product energy efficiency

One of IBM's product energy efficiency goals is to improve the computing power delivered for each kilowatt-hour (kWh) of electricity used by each new generation of server. In 2016, the IBM OpenPOWER S822LC for high-performance computing (HPC) was released. It improved its Server Efficiency Rating Tool (SERT) weighted geomean active efficiency metric by 18 percent versus that of the comparable previous generation product. The SERT was created by the Standard Performance Evaluation Corporation (SPEC). The SPECpower Committee designed, implemented, and delivered the SERT suite, a next-generation tool set for measuring and evaluating the energy efficiency of servers. In the future, all comparisons of performance/power efficiency improvements for servers will be performed using the SERT metric.

IBM also has a goal to qualify its new server and storage products to the ENERGY STAR program criteria where practical, and where criteria have been developed for the specific server or storage product type. In 2016, IBM certified selected configurations of the IBM Storwize® V5030 (2078-324 and 2078-12C) storage product to Version 1 of the ENERGY STAR data center storage requirements.

As of May 2017, IBM had [nine Power Systems™ servers](#) and [six storage](#) machine types certified to the ENERGY STAR requirements. The Power® servers meet the U.S. Environmental Protection Agency's (EPA) requirements for power-supply efficiency, idle power limits or power management capability, and SPEC SERT metric data reporting. The storage products meet requirements for power-supply efficiency and reporting of the Storage Networking Industry Association (SNIA) Emerald Power Efficiency Measurement Specification results.

All ENERGY STAR certified IBM FlashSystem® storage products and certified IBM server products also have 80 PLUS Platinum certified power supplies.

Product environmental compliance processes

Regulatory and legislative requirements affecting electrical and electronic equipment continue to proliferate globally. Integrated within IBM's global EMS, IBM has programs — underpinned by robust processes and state-of-the-art applications — that ensure our continued compliance with worldwide environmental laws and regulations without impacting business. In 2016, we identified 129 new or modified product-related regulations and acted upon them to meet the requirements of the regulations.

Frequent verification of product data is required to maintain compliance 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 Union Directive on the Restriction of Hazardous Substances (RoHS, 2011/65/EU). IBM conducts quality audits of PCDs to drive improvements in the content of the declarations and the supporting administrative processes. Improvements in data management regarding the materials contained in IBM's products ensure that IBM's technical documentation for products meets the quality requirements described within European Norm 50581: "Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances."

IBM has also deployed analytical applications for managing environmental compliance of products. As an example, one application identifies which IBM part numbers (among thousands) are impacted by expiring exemptions for the European Union RoHS Directive. This information, coupled with other supply chain information, assists engineers and procurement staff with part-number transition management and ensures compliance while avoiding a negative impact on IBM's business. Prior to the application's deployment, engineers spent extensive amounts of time analyzing complex bills-of-materials to identify which IBM parts were impacted by changing RoHS requirements.

Product energy efficiency

Product energy efficiency was formalized as one of the company's corporate objectives when IBM's product stewardship program was established in 1991. Through collaboration of IBM Research and our product development teams, we have combined hardware and software technologies to improve the energy efficiency of IT equipment and data centers.

Following are some examples of new products IBM has developed with increased performance and improved energy efficiency. Additional information about these products, and how they are being used by clients to improve their operations, reduce energy use and costs, and lower the greenhouse gas emissions associated with their operations, can be found on IBM's [energy efficient products, services and solutions](#) webpage.

IBM Power Systems

IBM's Power Systems, with IBM POWER8® and OpenPOWER technologies, provide enterprise-class server capabilities for traditional and cloud applications, with an emphasis on data-centric and highly virtualized operations that require high reliability and availability. IBM Power Systems servers offer a broad range of specialized functional capabilities that may not be available in other servers. From an energy efficiency standpoint, IBM Power Systems servers can deliver the most workload per unit of energy consumed of any server, when the system is configured to enable virtualization of workloads for maximum utilization of up to 80 percent. Power Systems also offer IBM EnergyScale™ power management capabilities that match energy use of the server to its workload levels, minimizing energy use. For selected products, water cooling is available to cool the system more efficiently, reducing required cooling fan speeds to deliver an 8 percent lower energy use.

The IBM OpenPOWER S822LC server has an 80 PLUS Platinum certified power supply, one grade above ENERGY STAR requirements and two grades above requirements established pursuant to European Union Directive 2009/125/EC, which sets ecodesign requirements for computer servers.

IBM Power Systems client efficiency examples

- IBM Power Systems servers can make material improvements in the efficiency of data center operations. **One client** implemented an IBM Power Systems S822L server solution to perform complex time- and computational-intensive workloads. Compared to a competing x86-based solution, IBM reduced computing time by 40 hours (40 percent) while reducing energy consumption by 6 MWh/year (40 percent). The reduced energy consumption avoided 3 metric tons (MT) of CO₂ emissions for each S822L server deployed.
- **Another client** installed two IBM Power Systems E880 servers and six IBM FlashSystem 820 storage products to replace a legacy IT system. The new system delivered up to 90 percent faster production planning through improved computational and storage performance, which enabled the client to speed up deliveries to customers. At the same time, system energy consumption was reduced by over 450 MWh/year, avoiding 210 MT of CO₂/year.
- Energy use reductions and efficiency improvements are also achieved through the improved utilization capabilities of IBM Power Systems servers. A cloud services client selected the IBM Power Systems S812L server because it could host twice the number of virtual environments as a competing x86-based server. Deployment of the Power Systems server reduced the server count by half and energy consumption by approximately 40 percent while offering improved reliability, serviceability and performance. The improved efficiency saves 3 MWh/year and avoids associated CO₂ emissions of 1 MT. Similar productivity and energy efficiency improvements are being achieved across the thousands of IBM Power Systems that IBM sells each year.

To improve the energy efficiency of IBM Power Systems servers, IBM developed a technique, called “resonant clocking,” which reduces the power demands of the processor clock. The processor clock sets the rate of computation and can consume up to 25 percent of the processor power. The innovation reduced clock power by 40 percent and processor power demand by 10 percent. The power savings translates into a 2 to 4 percent higher processor frequency or an 8 percent higher workload throughput, enabling the server to deliver more work for each watt consumed.

z Systems mainframes

IBM z Systems® mainframe servers provide a unified, secure infrastructure for cloud, enterprise mobility, and analytics operations and applications. The IBM z13® can support up to 8,000 virtual images and operate at utilizations of 90 percent or better to enable the consolidation of multiple workloads onto a single, highly efficient server platform. With its high utilization rates, the z13 offers one of the most efficient computing platforms when measured by the workload delivered per unit of energy consumed. One client, using a workload management automation tool, consolidated and optimized software from its legacy server and storage systems onto an IBM z13 server, reducing overall energy use in its data center by 40 percent — saving approximately 45 MWh/year of electricity consumption and avoiding 18 MT of associated CO₂ emissions.

IBM offers a water-cooled version of the z13, which provides 8 percent more computing capacity per kilowatt consumed when compared to the air-cooled model.

High-performance computing systems

IBM offers a full range of purpose-built and “off the shelf” technical computing (supercomputer) solutions and systems. IBM’s supercomputers are found in both the **TOP500** and **Green Graph 500** supercomputer lists. As of November 2016, IBM had five BlueGene®/Q supercomputers among the top 30 in the TOP500 list, as well as 19 BlueGene/Q supercomputers in the top 100 of the Green Graph 500. The TOP500 list ranks computers based on their ability to solve a linear set of equations, while the Green Graph 500 compares HPC systems based on a “performance per watt” metric. Technologies developed through IBM’s HPC development efforts are leveraged across the entire IBM product line to improve performance and energy efficiency.

The speed and expandability of IBM's HPC products and solutions have enabled users — in the business and scientific community, as well as governments — to carry out complex simulations and address a wide range of problems on topics such as life sciences, astronomy, climate and many other applications. OpenPOWER HPC technology is enabling advances in supercomputing. In 2016, the [Little Green Machine II](#) HPC cluster was announced by a research institute. The HPC cluster is based on the OpenPOWER architecture and consists of one IBM OpenPOWER S821LC and four IBM OpenPOWER 822LC servers with eight compute nodes, and is small enough to be transported with a carrier bicycle. It uses 1 percent of the electricity of a large supercomputer while enabling the execution of simulations that were run on the 18,688-node Titan supercomputer at Oak Ridge National Laboratory in the United States.

Storage systems

IBM's range of storage products — including the IBM FlashSystem 900, the IBM XIV®, the Storwize family, the DS8880 enterprise storage family, and tape systems — offer clients solutions for all their data storage needs. IBM storage products are supported by software-defined storage and capacity optimization methods (COMs) that maximize the utilization of available storage capacity and assign data to the storage tier commensurate with the importance of the data. COM functions include software-based data management capabilities such as Easy Tier®, thin provisioning, data compression and de-duplication, and storage virtualization. These capabilities can reduce the storage hardware and energy footprint as well as the number of terabytes required to accomplish a given storage task.

IBM's FlashSystem storage devices reduce energy use by 60 percent or more compared to disk drives, and significantly improve server and storage performance by minimizing the latency associated with data transfer within the data center.

Storage systems client solutions

- [One client](#) implemented an IBM flash storage solution to replace a large disk storage system. The solution incorporated a new IBM FlashSystem V9000 and storage area network volume controller with existing IBM XIV and Storwize V7000 storage products, using IBM Spectrum Virtualize™ software and VersaStack solutions to integrate the hardware, maximize performance and minimize the system electricity consumption and equipment footprint. The integration of the FlashSystem storage improved system performance by 57 percent while reducing floor space 98 percent, energy use by over 60 MWh/year, and associated CO₂ emissions by 23 MT.
- Another client consolidated six high-end storage racks onto two IBM Storwize V7000 storage products using IBM Spectrum Virtualize software to centralize storage management and optimize capacity use. The consolidation boosted storage capacity by 150 percent and performance by 200 percent, while reducing occupied floor space by 75 percent, energy consumption by 55 percent, and CO₂ emissions by 2 MT.

IBM's software-defined [Spectrum Scale™](#) technology enables storage automation and virtualization in both traditional and cloud environments. In addition, it enables the reduction of storage energy consumption and costs through data consolidation and 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 energy use.

Similar productivity and energy efficiency improvements are being achieved, leveraging IBM storage technologies and capabilities, across the thousands of systems that IBM sells each year.

Development of energy efficiency standards

IBM actively assists regulatory and standards bodies in the development of product energy efficiency standards. In 1992, IBM became a charter member of the EPA's ENERGY STAR computer program and helped to develop the first ENERGY STAR criteria for personal computers. Since then, we have continued our support for the ENERGY STAR program and assisted in the development of new criteria for certifying server and storage products.

IBM engineers are also working with industry peers and technical associations to support the development of harmonized energy efficiency standards for server and storage products worldwide. As a part of this effort, we are providing technical assistance to government regulatory bodies regarding the assessment of the Standard Performance Evaluation Corporation (SPEC) Server Efficiency Rating Tool (SERT) and the Storage Networking Industry Association (SNIA) Emerald Power Efficiency Measurement Specification. Examples of our activities include:

- Performing extensive evaluations of SERT test data and other industry metrics in support of creating a single metric that can be used to assess effectively the energy efficiency of server products in terms of minimizing the deployed server power required to deliver a given workload.
- Working in collaboration with The Green Grid, the Information Technology Industry Council, and DIGITALEUROPE to evaluate the SERT and Emerald results and to advocate for SERT and Emerald as the harmonized energy efficiency test metrics for server and storage products.

- Assisting the EPA ENERGY STAR program and regulatory bodies in China, the European Union and Japan with the development of server energy efficiency criteria based on the SERT metric.

Product recycling and reuse

As part of our product end-of-life management (PELM) activities, IBM began offering product takeback 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 U.S. 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.

IBM's goal is to reuse or recycle end-of-life products such that the amount of product waste sent by our PELM operations to landfills or to incineration facilities for treatment does not exceed a combined 3 percent (by weight) of the total amount processed. In 2016, IBM's global PELM operations sent approximately 0.6 percent by weight of end-of-life products and product waste directly to landfill or incineration as a disposal treatment. The total



2016 product end-of-life management operations

(% by weight of 30,800 metric tons processed)

- 51.3% Recycled
- 40.8% Resold
- 4.9% Reused
- 2.4% Waste-to-energy
- 0.6% Landfill and incineration

weight of end-of-life products and product waste processed by these operations was 30,800 metric tons (67.9 million pounds). Of the 30,800 metric tons processed by IBM PELM operations worldwide, 51.3 percent was recycled as materials, 40.8 percent was resold as products, 4.9 percent was product reused by IBM, 2.4 percent was incinerated for energy recovery, and an estimated 0.6 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.

From 1995, when we first began including product recovery in our annual corporate environmental report, through the end of 2016, IBM has documented the collection and processing of approximately 1 million metric tons (about 2.2 billion pounds) of product and product waste worldwide.

Product packaging

IBM has had a program focused on the environmental attributes of its product packaging since the late 1980s. Our corporate 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.

Under IBM's program, packaging engineers design solutions that minimize toxic substances by specifying nontoxic materials and inks. We keep packaging to a minimum while achieving protection of the product being shipped. We also collaborate with suppliers to use recycled and recyclable materials and promote reuse. The design of rugged products, the efficient use of protective packaging, and the environmental benefits resulting from improvements in transportation efficiency are addressed and tracked through this program. Key elements of IBM's packaging guidelines have been embedded in various engineering specifications and procurement documents, which can be found on IBM's [information for suppliers](#) webpage. This helps to extend the reach of IBM's environmental packaging program to include our supply chain and business partners.

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 adverse effect on the environment. The materials listed in our requirements are evaluated based on our practical and regulatory experience and customer feedback. Other environmental areas addressed in IBM's packaging requirements include:

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

All product packaging suppliers that pack or ship products to customers on behalf of IBM worldwide must submit packaging environmental data to IBM, along with other relevant compliance and performance data. Suppliers with a non-conformance must submit and implement improvement plans to close out the identified issues within an agreed timeframe. Applying this process to packaging suppliers ensures ongoing compliance with IBM's product packaging requirements.

Packaging reduction and improvements

In 2016, IBM's global packaging technology team saved an estimated 160 metric tons of packaging materials through the implementation of packaging redesign projects for parts and assemblies shipped to manufacturing locations, and for finished products supplied to clients worldwide. These projects delivered an estimated annual materials and transportation cost savings of \$2.1 million.

Following are highlights of two packaging reduction projects implemented:

- Redesigning packaging for server shipments

Instead of shipping finished goods to customers in single packages, a redesign allows rack servers to be sent in bulk packaging (e.g., 10 per package). Implementing this redesign results in a 60 percent reduction in packaging materials used and less waste to be disposed of by clients following bulk installation into data centers. In addition, rather than sending 10 printed and media publications packs as was done previously, only one set is now required, providing a 90 percent reduction in paper use. Each bulk packaging shipment is estimated to save 8.4 kilograms of wood, polyethylene foam, corrugated paperboard packaging and paper publications. Corresponding transport and logistical savings are \$58 per shipment. There will also be associated reductions in fossil fuel use and greenhouse gas emissions resulting from the increased shipment density. This new packaging project, introduced in late 2016, will allow most IBM Power Systems servers to be shipped this way in the future, providing significant packaging materials savings and transport and logistics cost savings.

- New hybrid corrugated fiberboard wood pallet

Some IBM server and storage systems require a pallet for shipping. To reduce weight and materials waste, IBM designed a new hybrid corrugated fiberboard and wood pallet that is lighter in weight and retains the strength of the original wood pallet to withstand the rigors of forklift handling. It has a normal wooden bottom, but IBM replaced the wooden top deck boards with paper edgeboards and a corrugated fiberboard deck. Depending on the size of the pallet, it reduces the weight by 3-6 kilograms and results in savings of \$9 per pallet in transport and logistics costs. The environmental benefits also include a reduction of fossil fuel consumption and associated greenhouse gas emissions.

Sourcing of paper and paper/wood-based packaging materials

IBM established its voluntary environmental goal for the responsible sourcing of paper and paper/wood-based packaging in 2002. It required that the paper and paper/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 available to meet business needs.

Continued focus on this objective by IBM and our suppliers over the years has allowed IBM to attain this goal consistently for more than 95 percent of paper and paper/wood based packaging that we directly acquired. In 2016, the goal was enhanced requiring suppliers either to disclose sources for paper/wood to IBM, or provide evidence that sources have been certified to be from sustainably managed forests by an accredited third-party certification scheme. In 2016, 97 percent of the paper and paper/wood-based packaging IBM directly procured worldwide came from suppliers that warranted that the source was derived from forests managed in an ecologically sound and sustainable manner. This figure includes a portion of paper with recycled post-consumer content. Requirements in support of this goal are incorporated into our standard supplier specifications for paper and paper/wood-based packaging.

Materials research and process stewardship

As an integral part of its global environmental management system, IBM routinely and consistently monitors and manages the substances used in its development and manufacturing processes, and in its products.

Environmentally preferable substances and materials

IBM's focus on environmentally preferable substances and materials considers the weight of scientific evidence for potential adverse effects on human health or the environment when selecting substances for use in the company's products and processes. To that end, IBM is unique in its industry in maintaining corporate programs and strategic skill sets to evaluate product and process materials. As a result of initiatives in both product and process toxicology, we have proactively prohibited the use of certain substances, restricted their use or found alternative substances to use in our processes and products — even when current laws permit such use.

When IBM develops new processes or significantly modifies existing processes, we conduct a scientific assessment of all substances in the process, including those that have been approved previously. Through these scientific assessments, we seek to identify potential substitutes that may be environmentally preferable.

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

Recent developments in U.S. federal chemical legislation highlight the effectiveness of IBM's programs for environmentally preferable substances and materials. In 2016, reforms to the Toxic Substances Control Act (TSCA) in the United States opened a new chapter of regulatory investigation of chemical use throughout industry at large. The Frank R. Lautenberg Chemical Safety

for the 21st Century Act, also known as TSCA reform legislation, was signed into law, giving the U.S. Environmental Protection Agency (EPA) increased authority to systematically prioritize and assess existing chemical substances, and manage identified risks. The EPA has since identified the first 10 high-priority chemical substances to undergo risk evaluations under the new TSCA rules. IBM's precautionary process stewardship programs addressed many of those substances a long time ago — eliminating some from our business, and establishing restrictions on others — in its ongoing commitment to identify and implement environmentally preferable substances and materials.

The following is a sampling of IBM's 40-plus years of leadership in voluntarily prohibiting or restricting substances of concern from our processes and products, even before regulations required that we do so. For a more complete list, 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 stopped specifying the use of PVC for IT system enclosures in 2000 and prohibited the use of both PVC and 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 and in new manufacturing applications in 2007, and eliminated their use in existing manufacturing, development and research processes as of Jan. 31, 2010.

We communicate IBM's restrictions on specific substances and other environmental requirements for our products through our [Engineering Specification: Baseline Environmental Requirements for Supplier Deliverables to IBM](#).

Nanotechnology and horizon materials

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 at 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, more precise and more energy-efficient. Nanotechnologies have 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. Further development of nanomaterials presents the potential to reduce the overall materials use footprint of microelectronics manufacturing as well as to produce advanced materials that reduce impact on both human health and the environment.

While IBM does not directly manufacture most components used in our current products, we continue to make significant new investments in research and development for “7 nanometer and beyond” silicon technology that will address physical challenges that threaten current semiconductor scaling. In addition, we are focused on developing alternative technologies for post-silicon-era chips using entirely different approaches that are required because of the physical limitations of silicon-based semiconductors.

In 2016, IBM scientists demonstrated a new way to store and process data using phase-change materials at nanoscale dimensions, opening a new pathway for the development of energy-efficient, integrated neuromorphic technologies for applications in cognitive computing. Inspired by the way the biological brain functions, IBM scientists created a large population of nanoscale artificial neurons that mimic biological neurons by integrating multiple input signals until a threshold is met, causing the artificial neurons to “fire.” The firing of the artificial neuron results in the transmission of fast and complex data signals. These data signals enable the performance of computational tasks such as data-correlation detection in real time and unsupervised learning at energy expenditures and densities comparable to those seen in biology — something scientists had been striving to accomplish for decades. Historically, artificial

neurons have been built using CMOS-based circuits, the standard transistor technology used in everyday computers. IBM scientists, however, implemented the use of non-CMOS devices, such as nanoscale phase-change devices, to reproduce similar functionality at reduced power consumption and increased areal density. Applications for the artificial neurons could include detecting patterns in financial transactions to find discrepancies, or analyzing social media data in real time to discover new cultural trends. Large populations of these high-speed, low-energy nanoscale neurons could also be used in neuromorphic coprocessors with co-located memory and processing units. This enables these nanoscale networks to perform cognitive computing tasks that mimic the way the human brain processes information.

In developing nanomaterials and other horizon materials and technologies, IBM takes care to ensure that we minimize the risks that new materials may pose to employees and the environment. As a part of our upstream chemical review process, materials intended for core technology development are reviewed prior to their use in IBM processes and products. This rigorous review not only prevents specific chemicals from being used in IBM development and manufacturing processes, but also sets the conditions and settings in which other materials can be used — including engineering, administrative and personal protective controls. In addition, we continue to assess the environmental, health or safety impacts of our manufacturing processes, even after they are put into production, versus newly developed scientific information to determine if process and material changes are necessary.

Investigation into the occupational exposure limit for indium

As IBM Research continues to push the boundaries of conventional physics in the development of advanced microelectronics devices, the use of new and exotic materials (horizon materials) is necessary. So-called III-V materials, combinations of elements in the columns III and V of the periodic table, are good examples of this. As IBM and others in the microelectronics industry study these materials, indium and indium compounds are increasingly showing promise in microelectronic and photonic applications. However, not much is known regarding the environmental, health

and safety aspects for many of these materials. A team of IBM toxicologists, industrial hygienists and occupational physicians from IBM's Corporate Environmental Affairs and Integrated Health Services organizations carefully investigated the scientific and clinical literature regarding indium and indium compounds, as well as their use in IBM. The team's work revealed that few documented Occupational Exposure Limits (OELs) were available for these materials. The team further concluded that the available evidence suggested that the current recommended OELs for indium should be lowered as an added precaution for IBM employees. IBM has a formal process for establishing new internal OELs when its experts document that: 1) there is no OEL for a material in use, or 2) it can be documented that existing OELs for a material are no longer sufficient and should be lowered as a precaution.

Using quantitative toxicology risk assessment methods and techniques, IBM developed, peer-reviewed and adopted a new internal OEL that was orders of magnitude below the current OEL for these materials. Moving from the previous government recommended OEL of 100 µg/m³ dating back to 1969 (U.S. National Institute for Occupational Safety and Health; American Conference of Governmental Industrial Hygienists) to a new IBM internal OEL of 0.03 µg/m³ for respirable indium, IBM continues a long record of precautionary assessment and reduction of risks associated with the chemicals and materials it brings into its operations.

IBM's team then inventoried the uses of indium and indium compounds across IBM, determined the tasks and work areas in which exposures should be measured, and sampled associated employees for respirable airborne concentrations of indium. The results revealed the levels of respirable indium to which the sampled employees were exposed were all below the new OEL of 0.03 µg/m³. When new areas of indium use are brought online, workspace air sampling will be performed to assure that indium exposures remain below the new internal OEL.

Pollution prevention

Pollution prevention is an important aspect of IBM's long-standing environmental efforts and it includes, among other things, the management of wastes.

Hazardous waste

The best way to prevent pollution is to reduce the generation of 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 to substitute more environmentally preferable chemicals. We maintain programs for proper management of the chemicals used in our operations, from selection and purchase to storage, use and final disposal.

IBM's total hazardous waste generation in 2016 decreased by 36 percent from 2015, to 1,360 metric tons. This reduction was primarily associated with the divestiture of IBM's semiconductor manufacturing operations in 2015. If hazardous waste from those operations was removed, IBM would have seen a 14 percent reduction of hazardous waste generation in 2016.

For the hazardous waste that is generated, we focus on preventing pollution through a comprehensive, proactive waste management program. Of the total 1,360 metric tons of hazardous waste IBM generated worldwide in 2016, 65 percent (by weight) was recycled, 18 percent was sent directly by IBM to suitably regulated landfills, 14 percent was sent for incineration, and 3 percent was sent off-site for treatment.

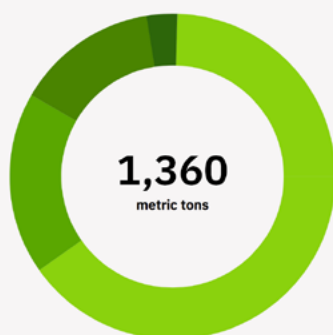
Nonhazardous waste

IBM has also 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 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 leased locations meeting designated criteria.

Our voluntary environmental goal is to recycle at least an average of 75 percent (by weight) of the nonhazardous waste generated at locations managed by IBM. In 2016, we sent 86 percent of the nonhazardous waste generated by IBM worldwide to be recycled.

Treatment methods that were credited toward the waste recycling target included recycle, reuse, energy recovery, composting, reclamation, and land farming. Treatment methods that result in a non-beneficial use and that were not credited toward the recycling target included incineration, landfilling, and treatments such as aqueous treatment, biodegradation of organics, filtration, neutralization and stabilization.



2016 total generated hazardous waste worldwide by treatment method

- 65% Recycled
- 18% Landfill
- 14% Incineration
- 3% Treatment

Total annual nonhazardous waste quantity and recycling performance
(Metric tons x 1,000)

	2012	2013	2014	2015	2016
Total sent for recycling	60	56	92	46	38
Total generated	69	65	107	53	44
Percent recycled (by weight)	87%	86%	86%	85%	86%

In 2016, our worldwide operations generated approximately 44,000 metric tons of nonhazardous waste, a decrease of 9,000 metric tons from 2015. This significant reduction was largely due to the divestiture of IBM's semiconductor manufacturing operations in 2015. Excluding wastes associated with divested semiconductor operations, IBM would have seen a 500-metric-ton reduction in nonhazardous waste generated in 2016.

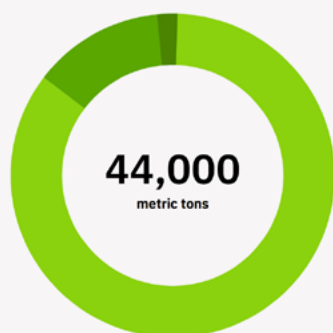
Source reduction and waste prevention initiatives implemented by IBM worldwide were estimated to have prevented the generation of about 225 metric tons of nonhazardous waste in 2016, with estimated annual handling, treatment and disposal cost savings and revenue returns totaling \$2.2 million.

Water conservation

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

IBM established its first water conservation goal in the year 2000, focusing on the significant use of water in our microelectronics manufacturing operations. From 2000 to 2015, IBM's water conservation efforts avoided the accumulated use of 21.3 million cubic meters of water in those operations. With the divestiture of IBM's semiconductor manufacturing operations in July 2015, we substantially reduced our direct water use. IBM's current water use is primarily associated with cooling at our large facilities and data centers, and for irrigation and domestic purposes.

Following IBM's divestiture of its semiconductor manufacturing operations during 2015, we reassessed the environmental impacts of our water use. We identified 45 data centers and other large IBM locations located in water-stressed regions. We did this by using the World Business Council for Sustainable Development's Global Water Tool, which highlighted places around the globe with highly stressed, or extremely highly stressed, water resources. Following this assessment, IBM established a new goal in 2016 to achieve ongoing year-to-year reductions in water withdrawals at these locations, even though many of these locations had already undertaken projects to reduce water consumption.



2016 total generated nonhazardous waste worldwide by treatment method

- 86% Recycled
- 12% Landfill
- 2% Other treatments

In 2016, IBM reduced water withdrawals at these locations in water-stressed regions by 6.6 percent against a 2015 baseline year. Water sources for these locations consisted of municipal water supplies (72 percent), surface water (24 percent), and groundwater (4 percent). These sources accounted for 97 percent of total water use at these locations, while 3 percent came from on-site process water reuse, process water recycling, or grey water. The main uses of water at these locations are for heating, ventilation and air conditioning (HVAC) systems (31 percent), washrooms (23 percent), cleaning (22 percent), irrigation of gardens and lawns (17 percent), and food preparation (7 percent).

Water conservation projects continue to be implemented across IBM. In 2016, projects at locations in water-stressed regions included:

- The IBM Almaden Research Laboratory, California, achieved a 13 percent reduction in water withdrawals through reuse of treated industrial and sanitary wastewater in cooling towers.
- IBM's Boulder, Colorado, location reduced water use in HVAC systems by modifying chiller set points and operational changes, thereby reducing water withdrawals by approximately 10 percent.

In addition, IBM continued to implement water conservation projects at locations that are not in water-stressed regions. Examples included:

- IBM's Bromont, Canada, location implemented an underground fire pipe leak reduction project, reducing water withdrawals by more than 2,000 cubic meters annually. The site decommissioned a reverse osmosis water treatment unit no longer required by the business, reducing water withdrawals by nearly 4,000 cubic meters annually. The site also modified the size of part carriers (trays used to transport parts throughout different process stages) in the manufacturing line, allowing for more parts to be placed in each carrier, increasing the efficiency of water use in the cleaning process, and reducing water withdrawals by more than 8,100 cubic meters annually.
- IBM's Montpellier, France, location installed water meters to help identify hidden water leaks, and implemented a program to check for leaks in faucets and pipes continuously. In addition, the site now uses a water saving system with infrared sensors for toilets and washbasins. These efforts are reducing water withdrawals by 15 percent, or about 950 cubic meters annually.
- The IBM Thomas J. Watson Research Center in Yorktown Heights, New York, has a deionized water purification process which accounts for approximately 50 percent of the site's overall municipal water usage. For every cubic meter of purified water generated, half a cubic meter of wastewater is also produced. In 2016, the location implemented a process to reclaim this wastewater and reuse it in the cooling tower system. In addition, rainwater was harvested from building roofs and redirected to the cooling towers. These combined efforts resulted in a reduction in water withdrawals of 35,000 cubic meters annually.



Water use at IBM locations in water-stressed regions

- 31% Heating, ventilation and air conditioning
- 23% Washrooms
- 22% Cleaning
- 17% Irrigation of gardens and lawns
- 7% Food preparation

Solutions for environmental sustainability

At IBM, we apply expertise, research, and technology to address and solve the environmental challenges of our clients and the world. We offer innovative products, services and solutions that enable our clients to conserve natural resources and reduce the environmental impacts associated with their operations.

Digital solutions are transforming industries by providing companies access to data, and the insights that can be garnered from that data in real time. Information displayed on dashboards can be shared immediately across and among large organizations. These solutions are built with intelligence on a cloud platform, and they use analytics to turn data into actionable insights that enable our clients to make more informed decisions that drive improved sustainability.

Our water solutions help water agencies monitor and manage water usage and operations more effectively. Our energy solutions help utility companies increase the predictability and use of renewable energy sources, and they enable building managers to conserve energy in buildings. Our Smarter Cities® solutions help governments and utilities deliver more efficient services to citizens by improving the productivity of waste management and recycling processes. Our agriculture and food solutions help improve crop yield, food safety and reliability.

IBM's portfolio of solutions has been developed across all IBM organizations and in collaboration with other companies and institutions.

Water

Reducing water use and combatting drought with IBM Watson

OmniEarth Inc., an environmental analytics company, is using IBM Watson cognitive capabilities to turn satellite and imagery data into actionable insight that is being used to help water conservation efforts in California and other drought-stricken areas. With IBM Watson Visual Recognition, OmniEarth can process data 40 times faster than it could before, sorting through an estimated 150,000 images on a parcel-by-parcel basis in 12 minutes. By pinpointing potential water-using activities at the granular, land-parcel level with Watson, OmniEarth is helping water authorities target areas where water may be wasted. Some of OmniEarth's customers have already identified areas where overwatering or leaks are occurring, and have reported a 15 percent reduction in water use since the service was implemented. The Watson-based OmniEarth solution has been used by over 90 agencies in California.

Harnessing insights from big data for better water management

IBM partnered with Veolia, the global leader in optimized resource management (water, waste and energy management solutions) to develop and promote a Smarter Water® solution with advanced analytics and cognitive computing capabilities. IBM Water Operations for Waternamix delivers a comprehensive solution to the challenges faced by cities, utilities, and commercial enterprises of all sizes by mining water-usage data for insights that help drive efficiencies, reduce costs, make better decisions and improve services. The solution helps water utilities integrate disparate data streams to enable a 360-degree view of water flow and leakages, water supply levels, wastewater operations, and possible performance alerts. In addition to enhancing efficiency and reducing water losses, utilities can make proactive decisions to minimize the risk of network disruptions. IBM Global Business Services and Veolia have collaborated to deploy the solution in 10 cities including Lyon, Lille and La Baule in France, and Tidworth in the U.K., and they continue to expand to additional cities.

Enhancing understanding of water networks through interactive visualization

In September 2015, IBM Research Ireland released epanetReader, an open source package for EPANET analyzing water networks in the R environment for statistical analysis. EPANET is software from the U.S. Environmental Protection Agency that simulates water network behavior. The epanetReader solution helps users understand water efficiency by allowing rapid visualization and interactive analysis of EPANET simulation results for key environmental parameters such as water quality and quantity. The solution improves visualization by allowing users to track the evolution of water network variables through time, and display the results in a graphical representation. The solution also helps users further analyze water networks and reduce environmental impacts by better understanding their use of energy and chemicals. Since its release, epanetReader has been downloaded more than 6,000 times by water utilities, consultants, and universities in 100 countries.

Energy

Improving renewable energy forecasting

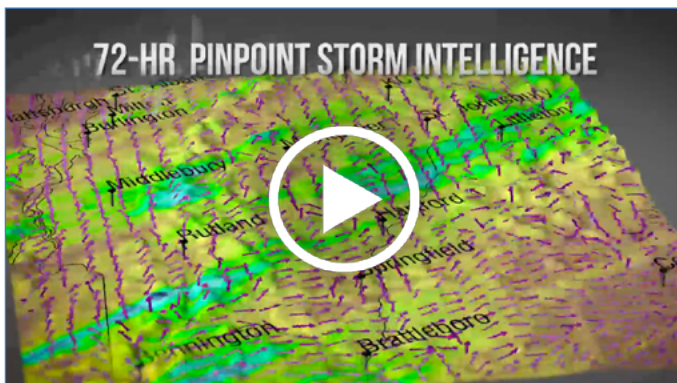
In 2014, the Vermont Electric Power Company (VELCO) started a partnership with IBM Research to accelerate the integration of renewable energy into the electricity grid and improve grid resiliency with the creation of the Vermont Weather Analytics Center (VWAC). Leveraging Deep Thunder™, IBM Research's hyperlocal weather model, the VWAC and IBM Research teams developed an automated renewable energy forecasting tool for

solar and wind power. These tools deliver 95 percent accuracy in solar-power forecasting and 93 percent accuracy in wind-power forecasting.

In February 2017, IBM and VELCO announced the creation of Utopus Insights Inc., with IBM Research's Smarter Energy® team and the intellectual property related to these forecasting tools and other products, forming the new company's core team and software offerings. This new energy analytics software company will provide solutions that secure increased reliability and efficiency at lower cost and reduced risk. These industry-tested solutions will offer a system of insight to optimally plan and orchestrate today's transforming grid toward an era of clean, reliable, distributed and cost-effective energy.

Building management solution using Watson IoT and weather sensing technologies

PhotonStar Technology Ltd., a British company and leader in intelligent building solutions, partnered with IBM to create a commercial, retrofittable building management system based on low-cost wireless monitoring and live weather data. Using the IBM Watson IoT™ platform, PhotonStar pioneered a new solution called halcyon cloudBMS — cognitive software that collects energy use and building occupancy metrics, consolidates them on the cloud for remote monitoring, and compares them to the local weather forecast. Building managers anticipate weather conditions and adjust temperature, lighting, heating, and cooling parameters to eliminate wasted energy. The cloud-based solution also allows operators to manage a collection of buildings and building sites simultaneously. It can save up to 50 percent of heating costs by triggering proactive decisions based on real-time weather conditions. For example, the management system heats buildings when cold weather is moving in or is expected overnight. In addition, the solution enables automatic window shade lowering or raising according to changes in sunlight and temperature.



Vermont Weather Analytics Center

Cities

Cleaner Streets with smarter waste management and recycling services

Hera SpA, a multi-utility operator in water, energy, and environmental services in Italy, partnered with IBM Global Business Services to reinforce its equipment planning, sustain its waste management processes, and more efficiently serve its 5 million customers. The IBM team helped Hera design an optimized waste management and recycling solution, HergoAmbiente, based on SAP for Utilities software and featuring the SAP Waste and Recycling software component. IBM used SAP to automate Hera's entire waste management process, managing 700 vehicles, 300,000 waste containers, more than 2,000 waste disposal orders per day, 18,000 routes and 140 destination landfills.

IBM consultants also built a mobile solution using IBM WebSphere® Application Server. The introduction of mobile technologies and sensors, connected to a central computer system, provides HergoAmbiente users with on-demand insight into the number of waste disposal orders, vehicle locations, filling percentage of waste containers, waste type collected, and percentage of streets cleaned. With real-time information, HergoAmbiente has been able to optimize the emptying frequency of containers and redesign the routes of operators based on the actual filling level of the containers. Citizens can also directly collaborate in enhanced service delivery and efficiency by sending Hera reports on bins, abandoned waste and street cleaning, and by alerting the company to any other waste management issues via a mobile application.

Agriculture and food

The Weather Company enables more sustainable farming

The Weather Company®, an IBM Business, is helping drive transformation in the agriculture industry by providing farmers with insight into meteorological data. Precision agriculture solutions, using in-field weather sensors, are helping growers make decisions in real time as agricultural data shifts from the farm to field-level. IBM Research and The Weather Company's joint hyperlocal weather forecasting provided by the sensors enables more precise, predictive modeling in the field and allows greater visibility into the specific weather conditions impacting the land. Access to accurate, localized weather data is helping farmers make more informed decisions on field operation scheduling, harvest timing, equipment deployment, soil needs and nutrient requirements.

Blockchain improves food supply chain traceability and food safety

In 2016, IBM partnered with Walmart and Tsinghua University to explore food supply chain traceability, authenticity and safety in China. Leveraging blockchain — a distributed, immutable ledger technology — IBM researchers created a model to digitally trace the movement of Chinese pork through the commercial network, from suppliers to store shelves. The goal was to bring increased transparency into the food supply chain, and ultimately create a more secure supply network where fraud and inaccuracies are nearly eliminated. In the ongoing pilot, Walmart is using blockchain to track information on farm origin, factory data, expiration dates, storage temperatures and shipping. Food supply chain digitization and tracking enables a more trusted, secure and comprehensive view of key operational data and easier detection of contamination sources.

[Click to see the infographic: Blockchain improves food supply chain traceability and food safety](#)

IBM is tapping blockchain for a more transparent, authentic and trustworthy global food supply chain.



Environmental requirements in the supply chain

IBM does business with suppliers that are environmentally and socially responsible, and encourages environmental leadership among them. IBM also routinely responds to requests from our clients and governments for information about the environmental attributes of our products. In many cases, the source for this information is our suppliers.

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

- Ensuring that IBM does business with environmentally responsible suppliers that are actively managing and reporting on their environmental impacts
- Helping our suppliers build capabilities and expertise in the environmental area
- Avoiding 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 of our suppliers
- Protecting IBM, to the greatest extent possible, from potential environmental liabilities or adverse publicity

Supplier social and environmental management system requirements

Since 2010, IBM has required that all of its first-tier suppliers maintain a management system to address their social and environmental responsibilities. Our objective is to help our suppliers build their own capability to succeed in this area. With this in mind, the requirements for IBM suppliers are summarized below:

- Define, deploy and sustain a management system that addresses the intersections of their operations with 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 operations
- 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

The full set of requirements may be found on IBM's [social and environmental management system supplier requirements webpage](#).

Suppliers managing chemicals, wastes and end-of-life equipment

IBM has additional requirements for those suppliers where IBM:

- Specifies and/or furnishes chemicals or process equipment
- Procures hazardous waste treatment and/or disposal services
- Procures product end-of-life management services
- Uses extended producer responsibility solutions

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, down-stream supplier management, and reporting.

For suppliers providing hazardous waste management services or product end-of-life management services (including extended producer responsibility solutions), IBM conducts a three-stage supplier environmental evaluation, with increasing levels of required detail, depending on the risks associated with and the potential environmental impacts from the supplier's operations.

We evaluate these suppliers prior to entering into a contract with them, and then approximately every three years thereafter, to ensure their operations and commitment to workplace safety and sound environmental practices continue to meet our requirements. The evaluations are conducted by IBM's Corporate Environmental Affairs staff, or internal or third-party environmental professionals under the direction of this staff.

IBM's hazardous waste and product end-of-life management supplier evaluations are comprehensive in the scope of the environmental aspects covered, including:

- Facility operational activities, capabilities, capacities and services
- Corporate environmental and social responsibility
- Compliance with IBM's social and environmental management requirements and supplier's own social and environmental management system
- Applicable legal requirements and compliance
- Permits, licenses and other applicable regulatory requirements
- Environmental liability insurance and financial assurance

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.

As with all of our environmental programs, IBM manages its hazardous waste and product end-of-life management programs to the same high standards worldwide. Doing so can be particularly challenging in some countries where processing infrastructure that meets IBM's requirements (for treatment, recycling and/or disposal) is limited or nonexistent.

Under IBM's waste management program, hazardous wastes are treated, recycled or disposed at IBM-approved facilities within the country where they are generated, whenever possible. IBM does not export hazardous wastes from the U.S. 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 accordance 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 until suitable processing facilities are available.

IBM's supplier evaluation program was extended in 2014 to cover suppliers providing collective solutions (e.g., consortia) for the management of IBM's end-of-life product wastes. These suppliers have become more important as new extended producer responsibility regulatory schemes have been implemented in many countries. IBM evaluates the collective solutions we use to fulfill our responsibilities as a manufacturer of products covered by such schemes, as well as collective solutions that we use for the disposal of products purchased for our internal use.

Key IBM milestones for responsibility in the supply chain

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

1993

Established product environmental compliance specification 46G3772 with environmental requirements for parts and products IBM procures from suppliers

2002

Added a requirement to assess our suppliers and certain subcontractors they may use to handle recycling and/or disposal operations in countries outside the Organisation for Economic Co-operation and Development (OECD)

2005

Created a part and product compliance declaration form (referred to as Product Content Declaration or PCD) to facilitate transfer of part and product compliance information from the supply chain to IBM

2010

Required suppliers having a direct relationship with IBM to establish a management system that addresses their social and environmental responsibilities and to cascade these requirements to their suppliers

2013

Incorporated the assessment of product environmental compliance requirements into the supply chain audit process, and introduced reviews via a sampling approach of PCD forms for data integrity

2014

Expanded our supplier evaluation program to include suppliers providing collective solutions for the management of IBM's end-of-life product wastes

2016

Established an environmental goal to have first-tier suppliers providing product end-of-life management, recycling and disposal services in the U.S., Canada, or the EU achieve third-party certification to an acceptable electronic product recycling standard

Remediation

When groundwater contamination was first discovered at one of IBM's sites in 1977, the company voluntarily initiated groundwater monitoring at all of its manufacturing and development locations worldwide. Today, IBM has 2,353 monitoring wells and 93 extraction wells in place at its current and former locations.

In 2016, IBM's remediation wells extracted approximately 13,500 pounds of solvents from past contamination at four currently operating IBM locations and 14 former IBM locations in three countries. At six of these locations, an additional 3,406 pounds of solvents were removed by soil vapor extraction or other methods. IBM also has financial responsibility for remediation at two additional former locations.

Under the U.S. Superfund law, IBM is involved in cleanup operations at some non-IBM sites in the United States. The Superfund law creates retroactive responsibility for all parties that may have sent waste or otherwise contributed to contamination at third-party-owned sites, regardless of whether the sites and the shipments of waste to those sites were in compliance with environmental laws at the time. As of year-end 2016, IBM had received notification (through federal, state or private parties) of its potential liability at 114 such sites since the beginning of the Superfund program in 1980. Of these, 63 are on the U.S. National Priority List. At most of the 114 sites, IBM has either resolved its liability or has proven it has no outstanding liability. Currently, IBM is actively participating in a cleanup or otherwise managing its potential liability at 18 Superfund sites.

When environmental investigation and/or remediation at a current or former IBM location or a non-IBM facility is probable, and the costs for future activities can be reasonably estimated, IBM establishes financial accruals for loss contingency. IBM accrues for estimated costs associated with closure activities (such as removing and restoring chemical storage facilities) when IBM decides to close a facility. As of Dec. 31, 2016, the total amount accrued for all such environmental liabilities and associated activities was \$272 million.

Audits and compliance

IBM reviews its environmental performance against both external and internal requirements, and takes prompt and decisive action if issues are identified.

Every year, IBM's manufacturing, hardware development and chemical-using research locations and organizations — such as product groups, Real Estate Strategy and Operations, Global Services, Global Logistics, Global Asset Recovery Services, and Global Procurement — complete a comprehensive self-assessment. IBM's Corporate Internal Audit organization may also conduct environmental, health and safety audits. Audit and self-assessment results are communicated to top management. Follow-up, accountability and closure of actions are clearly delineated.

In addition, independent audits are conducted as part of IBM's single, global registration to the ISO 14001 standard. Approximately 25 IBM locations and relevant business organizations (known as registered entities) are audited annually by an external ISO 14001 registrar. Our manufacturing, hardware development, chemical-using research locations and other registered entities are audited by the ISO 14001 registrar on a 12- to 30-month cycle.

As an integral part of IBM's global environmental management system, the ISO 14001 registrar also audits IBM's energy management program and the enterprise-wide database for recording and managing energy information (e.g., consumption, conservation, renewable electricity purchases) against the ISO 50001 standard on energy management systems. Annually, between six and eight of our ISO 14001 registered entities are audited for conformance to the ISO 50001 standard.

On an annual basis, using a sampling approach, the registrar audits IBM's ISO 14001 registered entities covering 15 to 30 percent of IBM's global annual energy consumption. During these audits, the auditor tests energy consumption records in the enterprise-wide database, comparing the consumption values on the energy bill to the database entries, determining the accuracy of reported savings from energy conservation projects, and verifying that IBM's energy management program requirements are being implemented consistently. The results of this testing are used as inputs for a separate, third-party validation audit of IBM's corporate greenhouse gas emissions management and reporting process. The results of the latest audits can be found on the [IBM environmental reporting, disclosure and verification](#) webpage.

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 applicable legal reporting requirements, and every event meeting IBM's reporting criteria must be reported through the EIRS. Each IBM location must have a documented incident prevention program (including provisions for preventing environmental incidents or their recurrence) and reporting procedure. In 2016, seven accidental releases of substances to the environment related to IBM operations were reported through the EIRS — three releases to air and four to land.

Emissions to air were two releases of refrigerants due to minor leaks in refrigeration systems and one release of propane due to a leak in a piping system. Releases to land were one release of sanitary wastewater, one release of steam condensate, one release of antifreeze, and one release of cooling-tower water. The root causes were 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 proactive approach to pollution prevention and environmental performance is its record of fines and penalties. In 2016, IBM received 61 agency inspections at facilities worldwide with no resulting fines or penalties. Over the past five years, IBM has paid seven fines totaling \$81,939.

Fines and penalties worldwide

(\$ in thousands)

	2012	2013	2014	2015	2016
Number	3	0	4	0	0
Fines	\$74.8	\$0.0	\$7.1	\$0.0	\$0.0

Supply chain

In relationships with approximately 12,000 suppliers worldwide, IBM requires a commitment to social and environmental responsibility — as an extension of what IBM's own clients expect of us. We establish meaningful requirements for suppliers and assess compliance, collaborate with industry groups to drive broader improvements, and work to increase the diversity of our supply chain.

Our supply chain

IBM incorporates social and environmental responsibility in our relationships with approximately 12,000 suppliers in nearly 100 countries. We recognize the potential for progress in a supply chain of this scale, and invest in a range of initiatives to promote sustainable performance as a shared objective.

IBM's global supplier spending was \$24.7 billion, down \$1.1 billion in 2016, affected by decreased revenue across IBM's product and services lines, and from leveraging marketplace pricing opportunities. Production Procurement and Logistics Procurement had a significant decrease driven by lower sales in IBM's hardware portfolio. Spending with our Services and General Procurement suppliers remained flat year to year.

The following lists of suppliers — with links to their responsibility reports and/or related websites — represent a significant portion of IBM's global expenditures.

In 2016, half of our suppliers listed below published corporate responsibility reports, and nearly 85 percent of those published are mapped to the Global Reporting Initiative guidelines — with most to the latest G4 criteria. We encourage our suppliers without public reporting to take that step as a means to further expand the transparency of the supply chain.

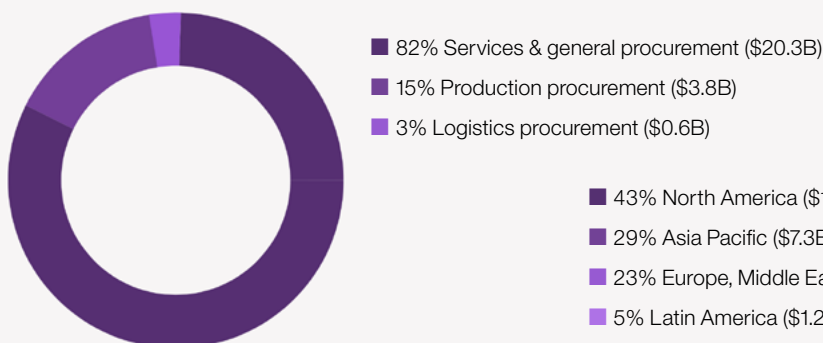
In 2016, just over 90 percent of our global spending in Production and Logistics Procurement (supporting our hardware and logistics business operations) was with the following 50 firms:

- Acbel Polytech
- Applied Materials
- Artesyn
- Avnet
- BDT Media Automation
- Benchmark Electronics
- Broadcom (formerly Avago)
- Brocade
- Celestica
- Cisco Systems
- Compro Business Services
- Dai Nippon Printing
- Delta Electronics
- Finisar
- Flextronics
- Fuji Electric
- Fujifilm
- Geodis
- GlobalFoundries
- Hon Hai
- i3 Technologies
- Intel
- Jabil Circuits
- Kyocera
- Lam Research
- Lenovo
- Mellanox Technologies
- Mercury Corporation
- Micron Technology
- Microsemi
- Molex
- NEC Platform Technologies
- NetApp
- Nvidia
- QLogic
- Quantum
- Redsis
- Samsung
- Seagate
- Super Micro Computer
- Supply Technologies
- Syncreon
- Tel-Ad Electronics
- Teleplan
- Tokyo Electron
- Toshiba
- Venture
- Western Digital
- Wistron
- Zollner Elektronik

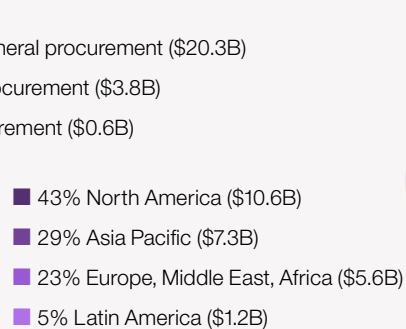
In Services and General Procurement (supporting our software, services and overall operations) approximately 45 percent of our global spending was with the following 50 firms:

- Adecco
- American Airlines
- American Express
- Apple
- Artech Info Systems
- AT&T
- Bilfinger
- BMC Software
- CA Technologies
- Camelot Information Systems
- CBRE Group
- CDI
- Cisco Systems
- Collabera
- Computer Task Group
- CVS Caremark
- Deloitte Touche Tohmatsu
- Delta Airlines
- EMC
- Fluor
- George P. Johnson
- Hewlett Packard Enterprise
- Hilton
- Hitachi
- Infinite Computer Systems
- INTEC (formerly IT Holdings)
- Internet Initiative Japan
- Jones Lang LaSalle
- Juniper Networks
- Lenovo
- Manpower
- Mitsubishi
- NetApp
- NTT Group
- Open Systems Technology
- Oracle
- Persistent Systems
- Randstad
- Red Hat
- Rocket Software
- SAP
- SDI International
- SHI International
- Skanska
- Sumitomo Corporation
- The Employment Solution
- UNICOM Systems
- Westcon Group
- WPP
- ZeroChaos

2016 supplier spending by category



2016 supplier spending by location



Supplier assessment and improvement plans

Commitment to continuous improvement is essential to sustained progress in supply chain social responsibility. Our concentrated effort to lead and encourage our supply chain to embrace positive change has generated many improvements. This section includes successes that IBM and our suppliers achieved in 2016, along with our approach to the challenges that still remain.

IBM's Social and Environmental Management System for its suppliers

In 2010, IBM established a requirement that first-tier suppliers create 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. In summary, suppliers are required to:

- Define, deploy and sustain a management system that addresses intersections with employees, society and the environment, and that addresses integration with and compliance to the Electronic Industry Citizenship Coalition (EICC) Code of Conduct.
- 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 social and environmental management system, conduct self-assessments, audits and senior leadership reviews of their system.
- Cascade these requirements to their next-tier suppliers.

In 2016 over 1,200 new suppliers — primarily from the Services and General Procurement sector of our supply chain — were afforded a period not to exceed 12 months to demonstrate compliance with these requirements. Suppliers are tracked monthly and action is taken by purchasing to ensure plans reach acceptance.

More information on these eight supplier requirements may be found on IBM's [supply chain environmental responsibility](#) webpage.

Supply chain social responsibility

Supply chain social responsibility has been a key element of IBM's procurement strategy since 2004. Today, supply chain social responsibility is a mainstream topic within the technology sector, as the EICC continues to expand and attract new members each year. As a founding member of the EICC, IBM endorses the EICC Code of Conduct for its internal operations and requires the same of our first-tier suppliers for hardware, software and services. IBM communicates our requirement for EICC code compliance at the initial stages of supplier onboarding. Continuous focus on social responsibility as part of our daily business and the commitment of our suppliers has led to many improvements over the past decade and a half. Along with partaking in EICC-generated education, audits and re-audits continue to play a valuable role in providing our suppliers with objective, third-party evidence to determine if their operations are code-compliant or need further improvement.

IBM's continued focus on improving supply chain compliance manifests itself through assessing a cross-section of our supply chain in the developing world. In this report we are communicating the outcomes of these audits and sharing the results of improvements made by our suppliers, which have positively affected working conditions for thousands of people employed in our extended supply chain.

In 2016, audits to the EICC Code of Conduct took place simultaneously for both our Production and Logistics Procurement suppliers, and those in the Services and General Procurement supply chain. Generally, companies that perform social responsibility assessments on their suppliers focus on factories producing hardware componentry. Historically, this is where perceived risks of noncompliance with Labor, Health and Safety, and Environmental aspects were thought to be higher. However, IBM has long maintained a dual path of supplier assessments and included its services and general purchasing suppliers. Our experience has been that risk of noncompliance is present in these sectors as well, since services suppliers may be less familiar with health and

safety and environmental aspects of the EICC code. By including both categories of suppliers we have assessment coverage across our broad set of suppliers, which permits testing of code compliance across the spectrum of suppliers in critical emerging areas such as the prevention of human trafficking. For all of its supplier assessments, IBM continued its long-standing use of the EICC's Validated Audit Process (VAP), the standardized social responsibility audit developed by the electronics industry.

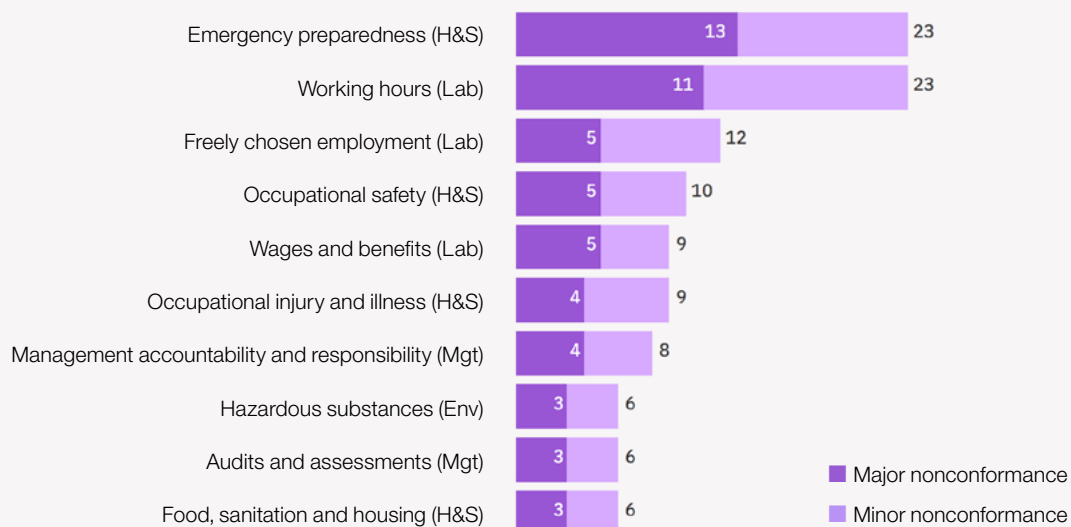
By year-end 2016, the total number of full-scope audits (not counting re-audits) in the 12-year time frame reached 1,921. These assessments measured supplier compliance to the EICC code and in earlier years — prior to 2010 for Production Procurement suppliers, and 2012 for Services and General Procurement suppliers — to IBM's Supplier Conduct Principles. Since 2013, IBM has been using the EICC's Validated Audit Process exclusively for all of its supply chain social responsibility assessments. In order to depict this transition accurately, last year we separated our audit history to show results prior to full EICC audit usage, as well as after. Audit results from 2004 through 2012 are shown in a heritage chart (available in our 2015 report). Starting this year, we

will focus exclusively on audit and re-audit results from 2013 onward which are attenuated exclusively to the EICC code and its provisions. This change allows us to present suppliers' audit results exclusively against the EICC code without any lingering influence from audits performed to the legacy IBM Code of Conduct.

From 2013 through year-end 2016, IBM's suppliers were engaged in 330 full-scope EICC audits. Data included in the 2013-16 cumulative chart includes second-, third- and fourth-cycle full-scope audits reflecting IBM's practice of including social assessment as part of its ongoing engagement with suppliers. For the EICC audit results, we are showing two levels of data. The first level depicts the percentage of major and minor nonconformance to the EICC code based on the five pillars of the code: labor, health and safety, environmental, ethics, and management system. (For reporting purposes, incidents of priority nonconformance found during IBM-commissioned audits to the EICC code are consolidated into major nonconformance depicted in the charts.)

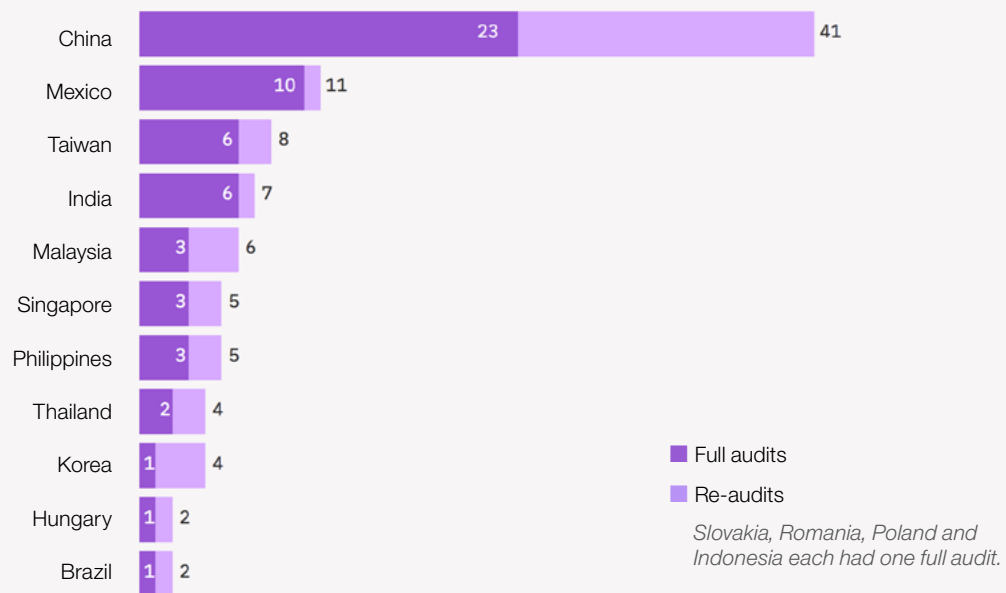
Full audit results: 330 total, cumulative 2013-16

(top 10 nonconformances to EICC code provision by %)



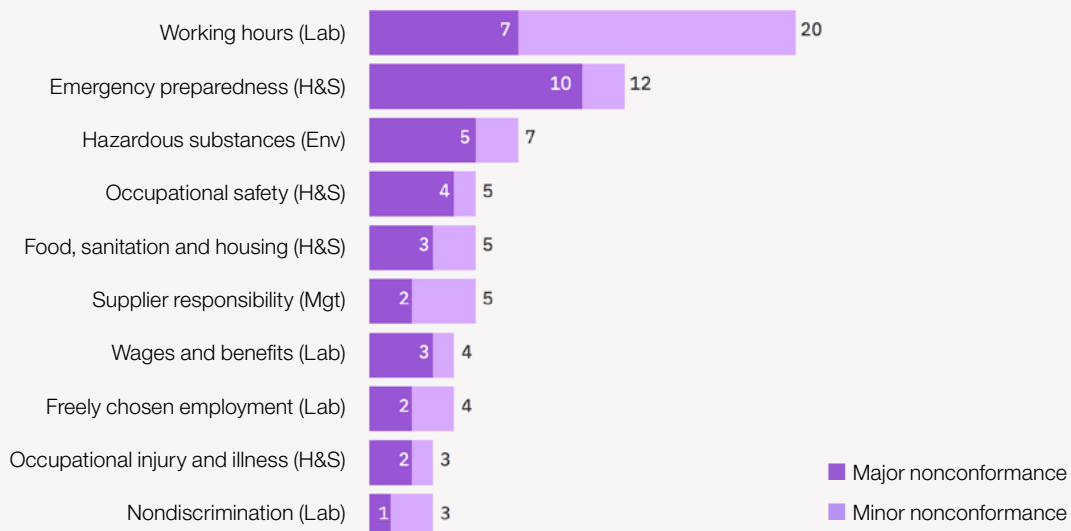
2016 completed audits by country

(99 conducted)



2016 full audit results (63 total)

(top 10 nonconformances to EICC code provisions by %)



Our second-level data reporting presents the 10 most frequent code nonconformance (major and minor) for these same 330 full-scope audits, showing both major and minor nonconformance. (For reporting purposes, incidents of priority nonconformance found during IBM-commissioned audits to the EICC code are consolidated into major nonconformance depicted in the charts). For linkage of the provisions to the five code sections, we have noted this via abbreviation: Lab (labor), H&S (health and safety), Env (environmental), Eth (ethics) and Mgt (management system).

In 2016, IBM engaged its first-tier suppliers in 63 full-scope audits and 36 re-audits for a total of 99 assessments in 15 countries or territories. China was the most active for audits and re-audits, followed by Mexico, Taiwan, India, Malaysia, Singapore and the Philippines. Of these assessments, 78 percent were with our Production and Logistics suppliers, and 22 percent with our

Services and General Procurement suppliers. Eleven countries had re-audit activity, following audits conducted in the prior two years, as we aim for re-audits to follow any full-scope audits with noncompliance. Year to year, total audits and re-audits performed decreased 34 percent as a result of changes in business with suppliers caused by prior years' divestitures of System x servers and Microelectronics Group business units. Full audits were commissioned only with suppliers having continued IBM business; re-audits were completed with divested suppliers in order to complete the EICC recommended cycle. By comparison with aggregated data from the 2016 EICC annual report (page 28), IBM's 63 full-scope audits comprised 17 percent of all full-scope EICC audits conducted, while IBM's 36 re-audits represented 22 percent of all EICC re-audits performed in 2016.

The charts below depict the full audit results mapped to the five sections of the EICC code, for 2013-13 and for 2016.



2013-16 full audits: Distribution of nonconformances

- 30% Labor
- 28% Health and safety
- 23% Management systems
- 11% Ethics
- 8% Environmental



2016 full audits: Distribution of nonconformances

- 35% Labor
- 35% Health and safety
- 14% Management systems
- 13% Ethics
- 4% Environmental

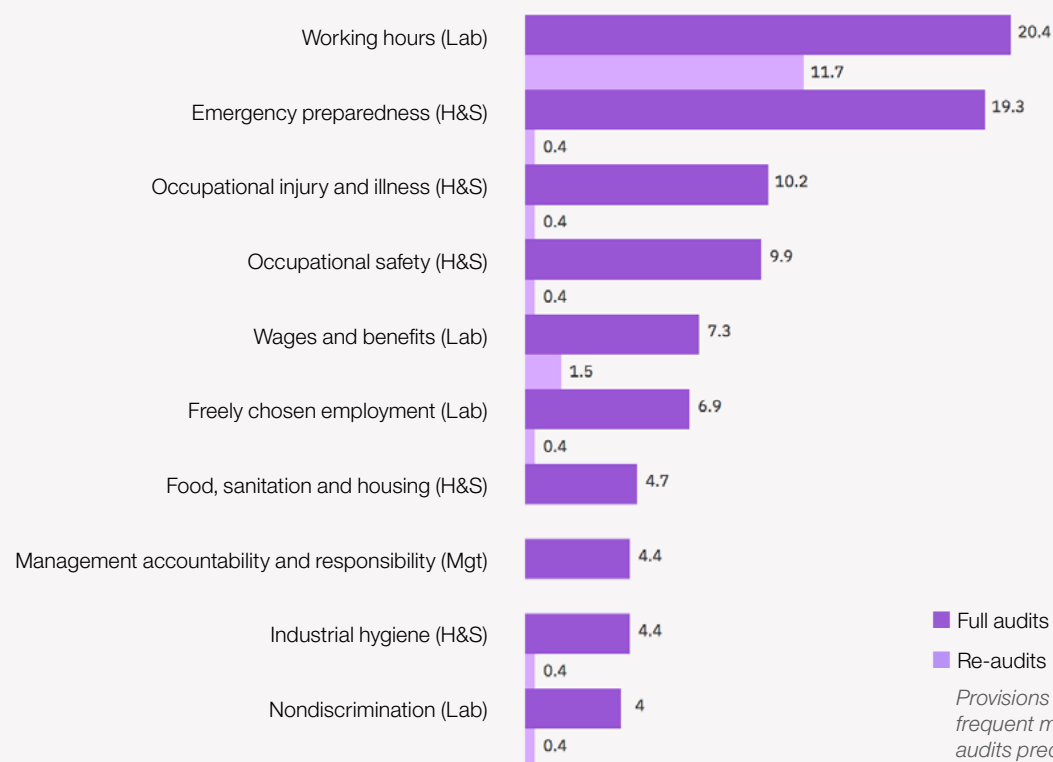
In 2016, the largest two contributors to noncompliance were labor, and health and safety. The environmental category improved its compliance level as a result of continued dialogue with our suppliers & as described earlier, relating to our requirement for suppliers to have a social and environmental management system in place. Examining 2016 audit results at the second level of data reporting, the chart below depicts the 10 most frequent nonconformances found in the 63 full-scope audits.

Among the 63 full-scope EICC audits in 2016, 52 were from Production Procurement suppliers and 11 were from Services and General Procurement suppliers; in the latter group, these often were the first time suppliers were assessed to the EICC Code of Conduct. IBM is one of the pioneering companies in the extensive use of EICC audits in the so-called indirect supply chain (services and software).

In 2016 full-scope audits, four of the top 10 nonconformances were labor-oriented and four were related to health and safety. Audits are a valuable tool, and if combined with long-term supplier relationships and suppliers' agreements to invest in improvements toward code compliance, they can help drive relative long-term improvement. For example, consider "working hours." By comparing results over the near- and mid-term, we can see improved results. In 2016 data, combined major and minor nonconformance for working hours was 20 percent for audits conducted; in 2015 it was 26 percent. "Emergency preparedness" saw an improvement from 2015's 21 percent to 12 percent in 2016. And "freely chosen employment" saw noncompliance drop from 15 percent total to 4 percent in 2016. The EICC Code (by design) is very robust in management systems relating to an organization's structure to attain and maintain long-term compli-

Improved nonconformance rates from 2016 re-audits

(% nonconformance to EICC provisions)



ance to the code provisions. Suppliers with nonconformance were often lacking one or more elements of a strong management system — having documented goals, objectives, metrics, periodic reviews with in-line management and tracking of closure actions. For each nonconformance found in an EICC assessment, the EICC audit report provides a description of the finding — and very importantly, a cross-reference to the specific provision of the EICC code and/or the local law or regulation. This level of detail is an important feature of an EICC audit and enables suppliers to isolate the root cause of any finding and work on lasting improvements.

IBM's supplier assessment activity stringently follows the methodology developed by the EICC, whereby audited suppliers create and submit a CAP for all nonconformance discovered in an assessment. This requirement is a core tenet of IBM's supplier management system and is fully supported by IBM Global Procurement and its executive team. The CAP enables the audited company to create meaningful targeted improvements — and later, test their effectiveness by means of a re-audit. During 2016, 117 supplier CAPs were reviewed and accepted within 90 days of submission, reflecting audits and re-audits that occurred in late 2015 and throughout 2016.

The effectiveness of our audit/CAP/re-audit system is depicted by comparing “before and after” results of suppliers undergoing a complete assessment cycle, as shown by the following chart. Re-audits conducted during 2016 at 36 Production and Services and General Procurement suppliers are compared with their full-scope audits (conducted over the 2013-15 timeframe). For ease of reading and comparison, only major noncompliance results are depicted.

Contained within 36 re-audits, there were 41 code provisions from the full-scope audits with major or minor nonconformance. The CAPs drove compliance improvement across all 41 code provisions. The above chart shows a sample of these improvements focusing on the 10 provisions having the highest relative nonconformance in the full audits that preceded the 36 re-audits. All 10 provisions registered significant improvement, including working hours (43 percent improvement), emergency preparedness (98 percent) and occupational injury and illness (96 percent). For the following 25 code provisions, all prior major and minor noncompliance were fully rectified in the CAP/re-audit process:

- Food, sanitation, and housing (H&S)
- Management accountability and responsibility (Mgt)
- No improper advantage (Eth)
- Hazardous substances (Env)
- Child Labor Avoidance (Lab)
- Supplier Responsibility (Mgt)
- Fair business, advertising, and competition (Eth)
- Communication (Mgt)
- Humane treatment (Lab)
- Legal and customer requirements (Mgt)
- Improvement objectives (Mgt)
- Freedom of association (Lab)
- Machine safeguarding (H&S)
- Air emissions (Env)
- Protection of identity (Eth)
- Environmental permits and reporting (Env)
- Non-retaliation (Eth)
- Company commitment (Mgt)
- Training (Mgt)
- Physically demanding work (H&S)
- Intellectual property (Eth)
- Privacy (Eth)
- Worker feedback and participation (Mgt)
- Corrective action process (Mgt)
- Health and safety communication (H&S)

Analyzing the 2016 re-audit data further, 60 percent of the re-audited suppliers resolved all major code noncompliance after completion of their re-audit cycle — a sizable accomplishment and testament to the results of following the full EICC process as well as the commitment of our suppliers to invest in lasting improvements. IBM Global Procurement has contingency plans for suppliers that remain noncompliant after a re-audit, and each is handled with executive involvement. Our procurement executive team reviews the results of all supplier assessments (full-scope and re-audits) on a monthly basis, and quarterly with IBM's chief procurement officer.

From the results of 2016 EICC full-scope audits and re-audits, IBM is able to attenuate its communication plans with suppliers for the following year of assessments. Our 2017 audit plan includes full-scope audits aligned with the EICC Code of Conduct version 5.1 (effective Jan. 1, 2016), and to further improve full-audit compliance we will be extending to suppliers access to a core set of EICC learning academy courses designed to build capability in the provisions of the code.

Center of Excellence for Product Environmental Compliance

IBM's Center of Excellence (CoE) for Global Product Environmental Compliance enables IBM to meet the environmental regulations in all the countries in which IBM does business, by rolling out consistent methodologies to deliver environmentally compliant products. The CoE's mission includes comprehensive and detailed review of regulations, the development of compliance strategies, processes and deployment plans, as well as education and training materials for IBM's employees and suppliers. The CoE is also an active member on many industry and regulatory bodies around the world.

As governments worldwide become increasingly concerned about the environment and health and safety of their citizens, the number of product environmental laws has grown exponentially over the last several years and looks set to continue this trend. Not only are such laws growing in number year over year, but they are also increasingly more detailed, and the scope of what constitutes an environmental law has continued to expand. The product-oriented laws directly pertain to all hardware products IBM designs, manufactures or contracts to manufacture, and/or purchases for resale, and the scope of IBM's product environmental compliance work includes but is not limited to:

- Validating that all IBM hardware products do not contain prohibited substances, or do not exceed certain maximum thresholds of reportable substances, as called out by EU RoHS and REACH regulations, in addition to non-EU RoHS and REACH-type regulations.
- Meeting eco-design directives as well as power and energy reduction regulations and voluntary standards such as the U.S. Environmental Protection Agency's ENERGY STAR program.
- Complying with the U.S. Toxic Substance Control Act, nanomaterials reporting requirements, battery laws, product takeback regulations and annual reporting.
- Delivering supplier education via dedicated global webinars.

Globally, in 2016 the CoE identified 154 new or modified product-related regulations for review, of which 129 required implementation plans and all were successfully executed to meet their respective compliance dates.

Engagement and collaboration

Collaborating with industry groups, academics, nongovernmental organizations and other professional organizations is a way of leveraging individual efforts for the benefit of the whole. IBM openly shares our work and learns from these varied groups in order to make ongoing investments in supply chain social responsibility.

In 2016, IBM's involvement with the Electronic Industry Citizenship Coalition (EICC) remained strong in terms of support, participation and utilization of the organization's growing base of collateral. The EICC continues to expand its membership and make strides toward its ultimate goal of creating a sector that consistently operates in a socially and environmentally responsible fashion. As a founding member, IBM encourages its suppliers of products and services to join the group and participate in the development and deployment of resources aimed at driving improvements in social responsibility.

At year-end, the EICC had grown to 114 member companies across retail, electronics brands, contract manufacturing, hardware components, software, logistics, communication and (new) automotive industries, representing multiple distinct tiers of the extended supply chain. IBM is also an active member of the Conflict-Free Sourcing Initiative (CFSI), which is focused on the topic of conflict minerals (detailed in the following section).

Each member of IBM's Supply Chain Social Responsibility team is part of one or more of the EICC's workgroups. This allows us to remain engaged in, contribute to and learn from other companies that constitute the various groups. IBM expanded its participation in a number of EICC or CFSI working groups, including:

- Code revision workgroup
- Validated audit process workgroup
- Capability building workgroup
- Indirect spend workgroup
- China smelter engagement team
- Europe smelter engagement team
- Asia/Indonesia smelter engagement team
- Global smelter engagement team
- Gold subteam
- Conflict minerals reporting template team

Building upon its long history of working with indirect suppliers (often in our services and software businesses), IBM co-leads the EICC's indirect spend workgroup. This group is engaging EICC members that deploy the EICC Code of Conduct to indirect suppliers that support the electronics industry. Suppliers in this sector are varied and range from large global firms to locally owned small enterprises, which presents a challenge in terms of communicating and assessing compliance to the EICC code. This workgroup is also engaging key suppliers to collaborate on determining the most effective means of deploying the code and assessments in this varied sector of the supply chain.

The [EICC annual report](#) provides an in-depth review of the organization's accomplishments. This report is highly recommended for anyone with an interest in the areas the EICC is engaged in and the collateral being developed for members and suppliers to use in making improvements across the five pillars of the EICC Code of Conduct. The report also publishes aggregate results for EICC audits commissioned by members and their suppliers during the course of the year.

In addition to its involvement with the EICC, IBM continues its engagement activities with local and nongovernmental organizations around the globe. As a key member of the electronic industry in Mexico, IBM collaborates with industry chambers and nonprofit organizations that share our passion for a sustainable and responsible supply chain.

IBM continues its relationship with Centro de Reflexión y Acción Laboral, a nongovernmental organization located in Mexico. Through open communication, we are addressing in a constructive manner areas of mutual concern regarding working conditions in our regional supply chain.

Conflict minerals

In 2016, we continued working to achieve a supply chain free of minerals mined and processed in the conflict regions of the Democratic Republic of the Congo.

Throughout 2016, IBM and other members of the [Electronic Industry Citizenship Coalition](#) (EICC), in conjunction with over 350 companies from seven business sectors, continued working to achieve a supply chain free of conflict-originated Democratic Republic of the Congo (DRC) minerals. IBM participates in the [Conflict-Free Sourcing Initiative](#) (CFSI) industry group, where interested companies participate in working to resolve challenges associated with this issue.

Relating to the DRC, four minerals — tantalum, tin, tungsten and gold, commonly referred to as 3TG — are considered conflict minerals. With proper care, however, market access for legitimate sources of supply from within the DRC is possible to support a compliant supply chain. Like the majority of companies using these four materials, IBM is not a direct purchaser of conflict minerals and is four to six tiers downstream from the smelters or refiners of such minerals. As a result, we rely on processes developed by the CFSI and on information received from our in-scope direct suppliers relating to sources of supply.

IBM's conflict minerals program is executed by a dedicated team of experienced supply chain professionals within the IBM Global Procurement organization. The Conflict Minerals Program team structure reports into IBM's vice president and chief procurement officer. Relative to IBM's use of conflict minerals, the following products designed and manufactured by IBM are within the scope of our conflict minerals work:

- **Servers** — A range of high-performing systems designed to address computing capacity, security, and performance needs of businesses, hyperscale cloud service providers and scientific computing organizations. The portfolio includes z Systems®, a trusted enterprise platform for integrating data, transactions and insight, and Power Systems™, a system designed from the ground up for big data and analytics, optimized for scale-out cloud and Linux, and delivering open innovation with OpenPOWER.

- **Storage** — Data storage products and solutions that allow clients to retain and manage rapidly growing, complex volumes of digital information and to fuel data-centric cognitive applications. The portfolio consists of a broad range of software-defined storage solutions, flash storage, disk and tape storage solutions.

In 2016, our results reflected the work of the past six years in preparing for the reporting documentation required to be filed with the U.S. Securities and Exchange Commission under the [Dodd-Frank Wall Street Reform and Consumer Protection Act](#), section 1502; specifically, the Specialized Declaration Form (Form SD) and related Conflict Minerals Report.

IBM's due diligence measures for conflict minerals conform to the framework set forth in the Organisation for Economic Co-operation and Development (OECD) [Due Diligence Guidance for Responsible Supply Chain of Minerals from Conflict-Affected and High-Risk Areas](#). Our work to date can be summarized in four categories: establishing a supply chain standard for conflict minerals; performing a Reasonable Country of Origin Inquiry (RCOI) regarding the potential sources of conflict minerals in our products; performing due diligence by surveying our in-scope direct suppliers using the CFSI Conflict Mineral Reporting Template (CMRT) to ascertain the smelters or refiners present in the supply chain, and working with those smelters and refiners to gain their engagement in the Conflict-Free Smelter Program (CFSP) or equivalent programs.

IBM's [conflict minerals standard](#) outlines our recognition of the importance of this issue and our plans to take definitive steps to keep conflict-sourced materials out of our extended supply chain. This standard is posted on our [Global Procurement website](#) and has been brought to the attention of our upstream suppliers through multiple avenues of communication.

We have repeatedly conducted our RCOI regarding potential sources of conflict minerals and concluded in good faith that — in the absence of complete visibility to the sources of these materials within our extended supply chain — IBM would need to conduct due diligence regarding its supply chain to better understand the sources of these four materials.

To determine information about its upstream sources of the four materials, IBM used multiple iterations of the CFSI CMRT with its in-scope direct suppliers. The CMRT was developed to provide companies with a common format for their upstream suppliers to identify the use of the four materials, the smelters or refiners used in the extended supply chain and, where possible, the country of origin of the four minerals. In the fourth quarter of 2016, IBM deployed the CMRT to our in-scope suppliers representing greater than 95 percent of our total supply chain expenditures for our covered products. We received responses from all of the in-scope suppliers and learned the identities of 301 upstream tantalum, tin and tungsten smelters, and gold refiners, located in 41 countries and used by our upstream suppliers. (The number of smelters or refiners increased from 295 the prior year as our suppliers reported a higher number of upstream entities in their CMRTs and additional entities were approved as eligible smelters by CFSI.) The specific names and locations of these smelters or refiners can be found in IBM's 2016 Conflict Minerals Report. Additionally, these smelters or refiners were determined to process 3TG originating in 59 countries which are listed in the 2016 report. Illustrating the interest that companies have in conflict minerals, during 2016 IBM shared its own consolidated CMRT with many clients in support of their work on this topic.

IBM and members of CFSI are working together to identify, vet, converse with and lead the entire portfolio of member-identified smelters and refiners to participate in the CFSP. The CFSP was created for smelters and refiners that play a crucial role in the extended supply chain, as they are the point at which concentrated ores are refined into the higher-level materials that cascade into technology products. CFSP frequently updates its [online list](#) of conflict-free smelters and refiners, and as of June 2017 has identified 43 tantalum smelters, 72 tin smelters, 40 tungsten smelters and 96 gold refiners that are considered conflict-free. Included in the CFSP listing are smelters and refiners with CFSP cross-recognized conflict-free standards from the gold industry; in the spirit of collaborative work, IBM accepts the LBMA Good Delivery List as well as Responsible Jewellery Council Chain of Custody Certification as proof of conflict-free stature.

By comparing the IBM-identified smelters and refiners to the CFSP list, we determined at the end of 2016 that 82 percent of the

smelters and refiners identified by our upstream suppliers were conflict-free (up from 73 percent at year-end 2015), with 100 percent of the tantalum smelters, 81 percent of the tin smelters, 91 percent of the tungsten smelters and 73 percent of the gold refiners in IBM's supply chain conflict-free. Including smelters and refiners in the CFSP process, 86 percent are either conflict-free or waiting for their assessment.

Another aspect of our efforts to drive change is direct interaction with smelters and trade groups that are associated with the processing of these materials. Our global conflict minerals team works in association with the CFSI smelter engagement team to contact smelters and bring them into the CFSP process. In 2016, IBM global team members along with other member companies of CFSI met with smelters in China, Dubai, India and Vietnam to advance their participation in CFSP. This work takes us to smelter production facilities where we promote CFSP participation and help them to prepare for their CFSP audits. To remove the cost barrier of CFSP audits, IBM donated to the EICC Foundation and Initial Audit Fund, which offers smelters an incentive for participating in the CFSP by fully paying for the cost of their initial audit. Our smelter outreach efforts extended to minerals conferences in China, Dubai and Indonesia, which we attended to meet with SOR and industry contacts, to further CFSP participation and understanding.

In-scope direct suppliers with CMRTs containing SORs that are not progressing toward, or not already, conflict free are required to remove those SORs from products provided to IBM. The IBM Conflict Minerals team and the IBM Global Procurement organization work closely with suppliers to help them achieve this goal. The IBM Conflict Minerals team updates IBM executives weekly to address supplier progress and drive in-scope direct suppliers to source from compliant SORs. Recognizing that a well-informed supply base is required to sustain this complex challenge, IBM has provided conflict minerals education to our suppliers through webinars and via CFSI online courses. The work to attain a conflict-free supply chain is difficult, yet our suppliers recognize the expertise of the team and our commitment to their success.

For more details on our overall conflict minerals work and plans to further our efforts, please see our [2016 Conflict Minerals Report](#).

Supplier diversity

IBM has long recognized that diversity is critical to fostering innovation, impacting our bottom line and delivering value to clients — and that supplier diversity adds to our competitive advantage while stimulating growth in a global marketplace and driving development in growing economies.

IBM created its supplier diversity program in 1968, before the existence of the U.S. Department of Commerce's Minority Business Development Agency (MBDA) as well as the creation of both the National Minority Supplier Development Council (NMSDC) and the Women's Business Enterprise National Council (WBENC). Our program's goal is to provide opportunities to diverse suppliers who can add value to our supply chain in every region where we operate. Suppliers qualify as diverse by being at least 51 percent owned by people from an ethnic minority (as defined in each country or region), or by women, military veterans, people with disabilities or LGBT individuals.

In 2000, IBM was the first information technology firm to join the Billion Dollar Roundtable, an organization that encourages businesses to increase their spending with diverse suppliers. Since then, IBM has annually conducted greater than \$1 billion in business with first-tier diverse suppliers in the United States. (Companies with which IBM has direct business relationships are considered "first-tier" suppliers.) With the growth of IBM's diverse supplier initiative outside the United States, IBM since 2006 has conducted more than \$2 billion in business annually with first-tier diverse suppliers globally. In 2016, IBM purchased \$2.6 billion in goods and services from first- and second-tier diverse suppliers globally, of which nearly \$1.3 billion was with first-tier diverse

suppliers in the United States and \$744 million with first-tier diverse suppliers in other countries.

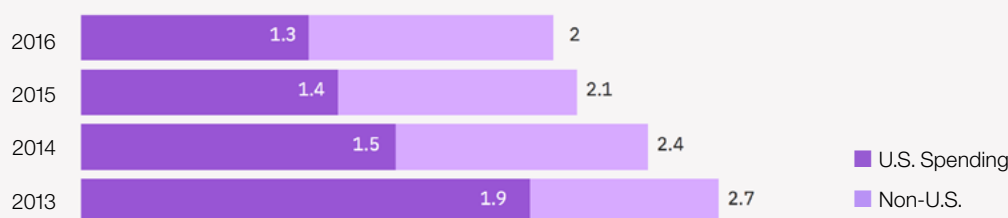
In 2003, IBM expanded the program beyond the United States to seek relationships with diverse suppliers in every country where we operate. Each geographic region has its own program manager, and each has established locally relevant criteria for diverse suppliers. IBM's representatives actively engage in partnerships with external organizations involved with outreach programs to facilitate diverse supplier identification and development. We have also expanded our second-tier program beyond the United States, requiring our direct suppliers to seek diversity through their supply chains. Our goal is to seek suppliers that can provide value to our supply chain, and to promote economic opportunities for historically disempowered groups wherever we operate.

In 2016, three of IBM's purchasing regions — Asia Pacific, Canada, and EMEA — showed growth in first-tier diverse supplier spending, with increases of \$12 million, \$11 million and \$13 million respectively.

IBM is a member of many international affiliates of the National Minority Supplier Development Council (NMSDC), including the Canadian Aboriginal and Minority Supplier Council (CAMSC), Minority Supplier Development China (MSD-China), Minority Supplier Development U.K. (MSDUK), South Africa Supplier Development Council, Supply Nation, and WEConnect International. IBM employees are on the boards of CAMSC, MSDUK, MSD-China, and WEConnect International, where an IBMer is also chair of its board.

IBM business conducted with first-tier diverse suppliers worldwide

(\$ in billions)



“IBM’s trust in our sustainable and scalable business models has helped make SDI the global company that it is today.”

— Carmen Castillo, SDI International

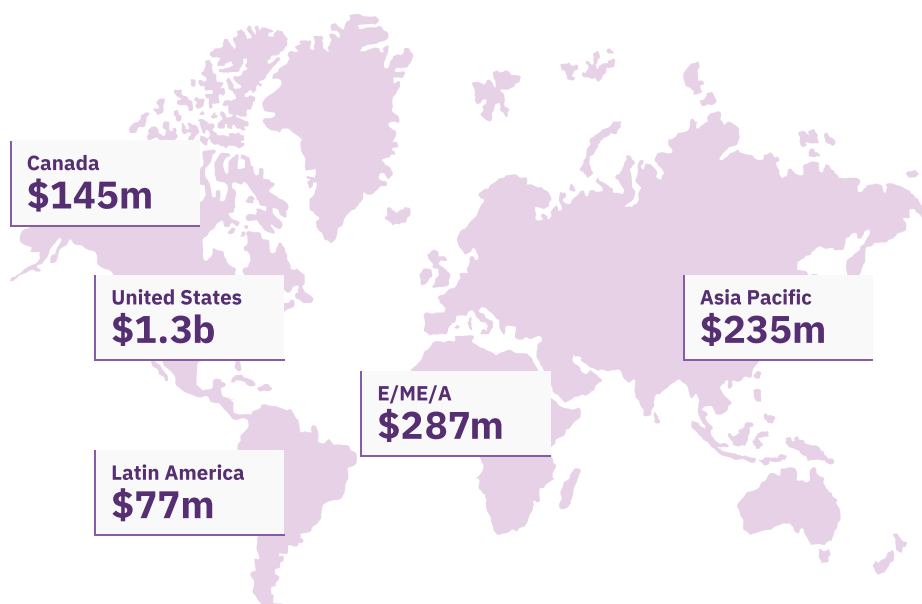
IBM often works with its strategic diverse suppliers to expand their capabilities and delivery models so they can respond more effectively to IBM’s requirements. For example, SDI International is a global integrator of non-strategic supply chains for labor- and services-based engagements and a first-tier IBM supplier. “IBM called on SDI to expand the scope and complexity of our delivery platform beyond the geographies of our mature market programs — such as those in North America, Europe and Asia — to incorporate emerging markets such as the Middle East, Africa and Latin America,” says Carmen Castillo, SDI International Corporation’s president and CEO. “IBM recognized that our long-tenured and proven programs could be quickly and cost-effectively scaled and customized to deliver quality-driven services across their growing enterprise. IBM’s trust in our sustainable and scalable business models has helped make SDI the global company that it is today, managing nearly \$3 billion in our customers’ indirect spend.”

In 2016, IBM was again recognized for its supplier diversity programs:

- The Women’s Business Enterprise National Council included IBM in its list of America’s Top Corporations for Women’s Business Enterprises, for the 14th consecutive year.
- The National Minority Supplier Development Council named IBM its Corporation of the Year.
- WEConnect International recognized IBM with its China’s Corporation of the Year award.
- Employers Network for Equality and Inclusion, based in the United Kingdom, presented IBM its Inclusive Procurement award.
- Michael Robinson, IBM’s program director of global supplier diversity, was recognized as Leader of the Year by the NMSDC.

IBM will continue fostering diversity in its global supply chain as its business needs evolve, and will work with external organizations to support the identification and development of diverse firms in countries where we have purchasing needs.

2016 spending with first-tier diverse suppliers by location



Governance

IBM has a culture based on ethics and integrity, which enables IBM to adapt to our changing world. Guided by a rigorous system of corporate governance, we strive to address today's challenges through transformative leadership, innovation, values and essential partnerships. In this section you'll find examples of how we continue to enhance how we govern the conduct of the company, manage risk and contribute our expertise to public discourse.

Governance at IBM

IBM senior management is responsible for our economic, environmental and social performance, as well as our adherence to IBM's overall compliance programs. Corporate responsibility at IBM is integrated across the business through the following forums.

Corporate Responsibility Executive Steering Committee

Our Corporate Responsibility Executive Steering Committee is charged with providing leadership and direction on key corporate responsibility issues. Chaired by the vice president for Corporate Citizenship and Corporate Affairs, the committee comprises senior executives from functional areas across the company. Each functional area within IBM is responsible for developing its own corporate responsibility goals and strategy, and organization-wide goals are approved by the steering committee.

Corporate Responsibility Working Group

Management of IBM's corporate responsibility activities and stakeholder engagement is handled by our Corporate Responsibility Working Group. Consisting of representatives from 10 functional areas across the company, including global representation, the working group meets at least monthly and is responsible for reviewing key policy and strategic issues, and making recommendations to the steering committee throughout the year.

Day-to-day activities are coordinated in the Corporate Citizenship and Corporate Affairs organization, which reports to the senior vice president for marketing and communications.

Ethics and integrity leadership

For decades, IBM has been recognized for its ethics and integrity leadership. It always has been at the core of the way we do business, and continues to guide us through our current transformation. Creating and maintaining our culture of ethics and integrity starts with our employees and leaders and extends to our business partners and suppliers. To cultivate this culture, we teach, listen and collaborate, and we continue to evolve and enhance our internal compliance, education and integrity programs.

Teaching — In 2016, as in prior years, IBM achieved 100 percent participation by its employees around the world in its online Business Conduct Guidelines (BCG) course and certification. First published in 1961, the BCG is currently available in 24 languages. For more than 10 years we have provided an online, interactive BCG training program in 14 languages. It is refreshed annually to include both an introductory video from our chairman on the importance of integrity to IBM, and timely, relevant business scenarios that employees may face when conducting IBM business.

Throughout 2016, IBM's trust and compliance officers, lawyers and management also provided compliance and ethics training to employees worldwide. These targeted group sessions covered various topics, including public procurement and business amenities.

In 2016, Trust and Compliance (T&C) provided "Enabling Excellence" and other T&C training sessions for T&C personnel. Nearly 14,000 IBMers completed Corporate T&C University online education lectures. Targeted integrity training was provided to employees at turning points in their careers, when they are likely to face integrity challenges related to their new responsibilities — for example, when they are new to IBM, new to management or new to emerging markets.

Also in 2016, IBM senior business leaders around the world worked to foster our culture of compliance by sponsoring integrity summits in 23 countries, in both emerging and major markets. These summits, managed and run by local senior leadership, emphasized the role of leaders in creating an ethical culture and focused on key compliance risks in each region, along with specific actions that can be taken to mitigate these risks.

Listening — In addition to teaching about ethics and integrity, we also listen. For more than 50 years, IBM has maintained an internal "speak up" reporting channel for employees, as well as channels for suppliers, business partners and others to report to the company concerns or suspected violations of our Business Conduct Guidelines as well as unethical or unlawful behavior. These channels support anonymous reporting.

Additionally, in 2016 nearly 27,000 IBM employees provided their perspective on integrity at IBM by participating in our annual

Global Integrity survey. Since 2010, hundreds of thousands of employees have completed these surveys, providing valuable feedback about their perception of ethics and integrity within the organization. The insights from these surveys are used to enhance our global ethics and integrity programs.

Collaborating — IBM's commitment to ethics and integrity leadership does not end with our employees. We also collaborate with IBM Business Partners and our suppliers to provide online ethics and integrity education to their employees, as part of their partnership commitment to IBM. In 2016, IBM extended its online education offerings to nearly 20,000 representatives from our IBM Business Partners and suppliers around the world. IBM Business Partner and supplier personnel have received in-person training in connection with our integrity summits in some emerging markets. And since 2013, IBM's chief trust and compliance officer has delivered an annual address at our Global Business Partner Leadership Conference (PartnerWorld®) on the value of ethics and integrity. In 2016, the presentation "Business Integrity: Using Technology to Build Transparency and Trust" was delivered to more than 2,000 business partner employees at this event.

IBM intends to continue its long-standing tradition of teaching, listening and collaborating with all our constituents around the world.

Security and privacy

As IBM's long history of security and privacy leadership demonstrates, IBM understands that these two elements are essential for trust in the digital economy. IBM will continue to lead in these critical areas as we embrace the challenge of reducing risk and safeguarding data at the cutting edge.

IT security

As companies continue to expand their businesses and IT infrastructure — adding more devices and increasing connectivity — their vulnerabilities can also increase. At IBM, we not only carefully consider security when developing our technology solutions, but also examine our internal systems and processes to assess how we can best reduce risk and maintain the continuity of our business.

The human element also puts businesses at risk as attackers take advantage of lapses in security or use social engineering to target unwitting users. Recognizing that education is among the best forms of protection, we continuously strive to reinforce a cybersecurity-aware culture within our company and throughout the communities around us, by promoting increased knowledge and understanding of relevant issues. Because threats continuously evolve, each of IBM's active employees is required to complete a mandatory, annual cybersecurity and privacy course that is regularly updated with new insights on the latest types of attacks and security best practices.

Privacy

Trust is the foundation of IBM's leadership in the cloud and cognitive solutions — trust in IBM's cutting-edge technology, but also trust in IBM's ability to protect data stored at the cutting edge. IBM continues to match its long-standing technical leadership in the fields of cloud and cognitive solutions with sustained leadership in the sensitive area of data privacy.

Global Data Stewardship Program — As a business that operates in a specialized and highly regulated space, Watson Health has developed a Global Data Stewardship Program to prevent and mitigate the risk of inappropriate access, use, disclosure, loss and theft of protected data with which we come into contact in connection with IBM's Watson Health business.

Compliance with Industry Standards — IBM's Watson Health Cloud remains HIPAA-enabled, allowing us to maintain and curate health data in accordance with industry-leading security requirements. With proper permissions, data stored on the Watson Health Cloud also may be used for research purposes or to improve health-related offerings and services. These advances are made possible through IBM's use of some of the most sophisticated, enterprise-level security capabilities and privacy-protective techniques available. For example, IBM's information security standards and management practices for cloud services align with the ISO/IEC 27001 standard for information security management and comply with the ISO/IEC 27002 Code of Practice for Information Security Controls. The majority of IBM's cloud offerings are now certified as compliant against these standards.

Responding proactively to the General Data Protection

Regulation — IBM's approach to privacy and security has been informed by key changes in industry standards and best practices — many of which reflect IBM leadership. Of critical importance, the European Union published in 2016 a new General Data Protection Regulation (GDPR), which enters into force in May 2018. This significant regulatory change will affect organizations that handle personal data in Europe and beyond, given the extraterritorial nature of the GDPR. IBM is responding proactively to GDPR, establishing a global project to implement GDPR — with respect to IBM's internal processes as well as IBM's commercial offerings. IBM recognizes that our customers will rely on IBM's offerings and technical assistance to achieve GDPR compliance within their own organizations, and IBM is well-positioned to meet this critical need.

As part of its GDPR project, IBM is enhancing its ongoing commitment to privacy by design. IBM is working to embed data protection principles even more deeply into its business processes, with the objective that technical and organizational security measures limit, by default, the amount and use of personal data to what is specifically required. This work also will strengthen controls already in place to limit access to personal data, including with respect to mobile applications that rely on sensible default settings to ensure that personal data is not inadvertently shared with others.

EU Data Protection Code of Conduct — Consistent with IBM's commitment to GDPR compliance, IBM also signed on to the EU Data Protection Code of Conduct for Cloud Services Providers for our IBM SoftLayer® and IBM Bluemix® Infrastructure offerings. This Code of Conduct resulted from a four-year development process involving multiple parties, including the Cloud Industry Select Committee, of which IBM was a founding member. IBM considers the Code of Conduct to be the most reliable tool available to assure cloud users that their data is secure. The Code of Conduct will strengthen the trust between cloud providers and cloud users, and IBM is proud to have championed its development.

For more, [read the blog post](#) by Cristina Cabella, IBM's Chief Privacy Officer, about IBM signing the EU Data Protection Code of Conduct for Cloud Service Providers.

Enterprise risk management

At IBM we are committed to building a better world through innovation and transformative leadership. While this approach offers significant opportunity, it is impossible to achieve and maintain without taking risks. We have a responsibility to manage these risks since our actions affect our key stakeholders — shareholders, clients, business partners and employees — and the communities where we do business.

IBM has developed a consistent, systemic and integrated approach to risk management to help determine how best to identify, manage and mitigate significant risks throughout the company.

The IBM Risk Management Framework aligns to industry standards and good practices, focusing on leadership, programs and practices, enablement and effectiveness supported by a strong risk-aware culture.

In 2016, we continued to enhance our approach with a greater focus of the cognitive era and our strategic imperatives, collaboration across lines of defense, identification of emerging risks, broadening risk awareness and increasing our use of analytics, including IBM's cognitive technologies.

Leadership and governance

Senior management is responsible for assessing and managing IBM's various exposures to risk on a day-to-day basis, including the creation of appropriate risk-management programs and policies. This leadership team continued its collaborative process of identifying, evaluating and managing enterprise-level risks in 2016. This includes periodic reviews and interaction with the audit committee of the Board of Directors, which oversees the company's enterprise risk management framework, program and associated processes. Risk is also an element of the executive compensation program, designed to motivate our leaders to deliver a high degree of business performance without encouraging excessive risk-taking.

A key aspect of senior management leadership in risk management is to identify and deploy a governance model and management system that fosters collaboration and transparency in managing risk across the entire enterprise. Our Enterprise Risk Management (ERM) Executive Council, comprised of 16 senior

15,000

The approximate number of IBMers who collaborate in an internal social community, engaging on key risk stories, news and practices; identifying and connecting risk-management experts; and participating in risk education.

managers representing different units, functions and geographies, meets regularly to help improve the management of enterprise risks. In 2016, we refreshed the ERM Council with six members rotating off and six new members replacing them. Participants share risk-mitigating actions that are taken in one part of the business so that these best practices may be standardized and applied across units globally.

Addressing emerging risks

Throughout the company, the approach to identifying and managing risk is based on the [ISO 31000 Enterprise Risk Management](#) (ERM) and the [Committee of Sponsoring Organizations of the Treadway Commission](#) (COSO) ERM guidance. In adapting these, IBM considers and assesses potential strategic, financial, operational, regulatory and other risks to our business, which could be driven by various factors, such as where we do business, how we do business and the nature of our offerings.

Over the course of the year we held in-depth discussions with leading consultants on emerging risks and conducted a robust internal study that included polling, surveys and interviews of approximately 150 top executives, and in 2016 began to collect insights from our millennial corps socially. As a result, we updated our enterprise-level risk map and refined senior management focus for 2017.

In 2016, we enhanced our identification and management of emerging risks, increasing the focus on the new cognitive era and related strategic imperatives. We also established an approach for scenario planning to enable better identification of emerging risks, and trained leaders around the world to utilize the method.

Enablement through analytics and cognitive

IBM is focused on applying technology, tools and analytics to support risk management. This past year we continued to build upon the success of the award-winning Country Financial Risk Scorecard, which leverages big-data automation to monitor trends and help develop intelligent and actionable insights. We also continued our focus-country risk summaries that provide just-in-time, robust, end-to-end views of situations of emerging risk. Analytics is the next big frontier for risk management which, when coupled with the abundance of data, provides the ability to infuse insight into risk management. In 2016, we co-developed and piloted with IBM Research a cognitive-based tool to automate the identification of emerging storylines and risks and project possible future scenarios and implications. The tool enhances our global leaders' risk awareness and ability to improve local resiliency to risks.

Benchmarking effectiveness

A risk management framework is most effective when it provides transparency, facilitates communication and monitoring of risks, and demonstrates success in mitigating enterprise-level risks. This level of effectiveness should ultimately lead to improved business performance and help the company protect its reputation while delivering on its social responsibilities. To measure the effectiveness of the risk management program and provide a guidepost to prioritization of activities, IBM continuously evaluates its ERM practices. In 2016, we expanded coverage to emerging

strategic imperatives to better reflect the future, and we aligned the evaluation content to industry standards.

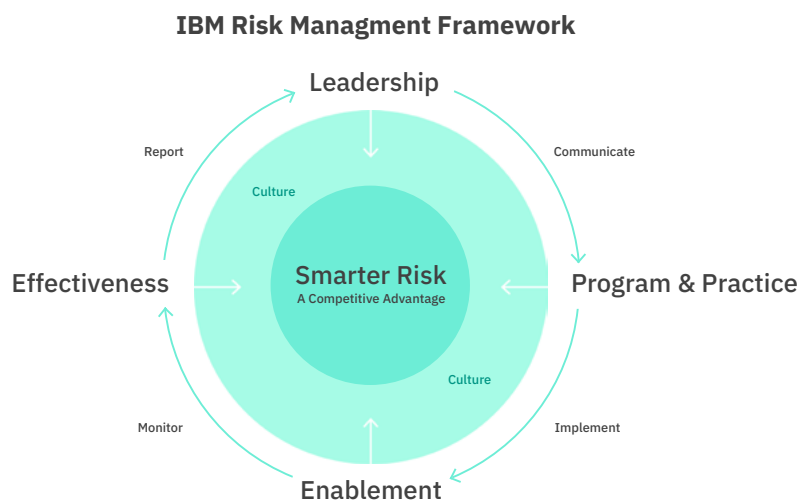
Also in 2016, we collaborated with Internal Audit and Business Controls to enhance IBM's approach to identifying and addressing key risks within business processes, in order to improve support for risk-based controls and assurance. Lastly, we continued our benchmarking with other leading organizations to provide insights to good practice and emerging risks.

Expanding risk education

The success of the framework is predicated on a strong culture of risk awareness, identification, analysis and mitigation. In support of this, IBM continued to expand its risk education and training. In 2016, we began deploying education modules in agile video formats and continued to provide awareness and transparency through global video blogs and "day in the life of a risk manager" case study videos. Thousands of IBMers from around the world view risk awareness material monthly.

Advancement through community engagement

IBM continues to engage with academia, external risk-management thought leaders, and community organizations to help advance the risk management acumen of current and future business leaders. For example, in 2016 we participated on five ERM councils, including advisory board membership for two university ERM programs.



Public policy

IBM is committed to making a positive and meaningful impact on the countries and communities in which we do business. Building on a rich history of advanced computing, IBM has been researching, developing and investing in leading-edge technologies for more than 70 years and uses this expertise as a basis to contribute to public policy issues.

IBM and blockchain

A major area of focus in 2016 stemmed from work initiated two years ago. In 2014, following the introduction of Bitcoin, IBM Research began work in the underlying blockchain technology network which offers a means to develop “trust in transactions” in the growing digital world. Working with policy makers, public officials, educators, regulators and civic leaders around the world, we seek to gain an understanding of the possibilities and considerations offered by blockchain technology.

As our society and economy move toward a world where transactions are primarily shared digitally among people, institutions and “things,” our current methods for securely managing personal and proprietary information are proving inadequate. Fraud, identity theft and data breaches are all too common, and many people only have the most basic security tools to protect their personal information.

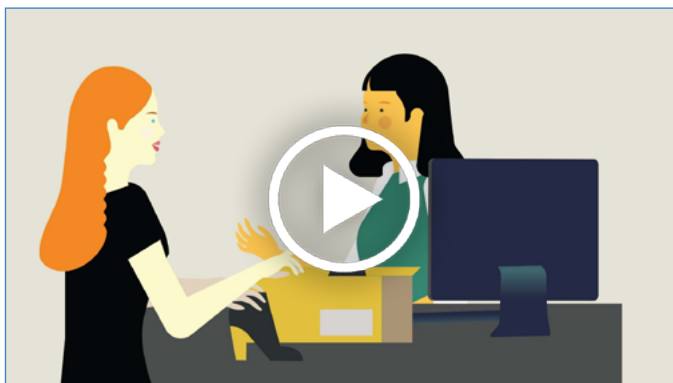
Blockchain technology enables the creation of trusted networks where personal information — identification, health records and prescriptions, finances and other data — is safe, secure and accessible to only those authorized with a need to know. These trusted transactions can unlock significant societal benefits. IBM is building and offering a complete blockchain platform that is open, scalable and highly secure, along with solution building blocks and expertise to accelerate adoption.

The benefits of blockchain technology include almost everything — from more secure financial transactions, to improved access to personal healthcare information, as well as more efficient and effective government and private-sector services.

While innovative technologies can help to change the face of business, IBM recognizes the need to educate elected officials, policy makers and regulators on the strengths and capabilities of blockchain technologies. An understanding of the potential of the technology and the mechanics is critical before statutes and regulatory frameworks should be developed. IBM strongly supports the creation of a robust blockchain ecosystem of solutions centered on the required business needs of the industries served.

Some examples of IBM's related work in 2016:

- Introduced a global blockchain educational strategy to discuss the potential capabilities of blockchain technology and its policy considerations.
- Participated in the President's Commission on Enhancing National Cybersecurity sponsored by the National Institute of Standards and Technology, which resulted in the [Report on Securing and Growing the Digital Economy](#).
- Globally identified and briefed legislative members and staff, as well as elected executive leaders who express interest and responsibility for blockchain and distributed-ledger technology.
- Became a founding member of the [Linux Foundation's Hyperledger Project](#), an open source, global collaborative effort to advance cross-industry blockchain technologies.



IBM Think Academy: Blockchain, How it works



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