IBM

2020
IBM and the Environment Report

31st Annual
Environmental
Report

Letter from the Chief Sustainability Officer

This year marks the beginning of IBM's fourth decade of environmental reporting, underscoring our sustained commitment to environmental leadership. Throughout, we have always strived for transparency and authenticity.

Accordingly, this report presents our latest results. It also unveils a substantial update to IBM's voluntary environmental goals. With decades of attention to emerging environmental challenges, we understand that setting environmental goals, holding ourselves accountable, and communicating our progress with transparency and authenticity are good for both the environment and our business.

Looking ahead, we anticipate in 2022 that we will stop publishing a stand-alone corporate environmental report in favor of fully integrating essential environmental content into our overall IBM Corporate Responsibility Report. While a stand-alone environmental report has served IBM and its audiences well for 31 years, today's integration of social and governance issues with the environment makes this choice a logical one.

We have always considered environmental leadership to be a long-term strategic imperative regardless of short-term business and economic cycles, and regardless of whether the topic is currently popular or not. After all, it's relatively easy to go green when so many are watching what a company does. But genuine leadership also involves what a company does when virtually no one is watching. You can depend upon IBM for an unwavering commitment, through thick and thin, substantiated by decades of action and results.

Wayne S. Balta
Vice President, Corporate Environmental
Affairs and Product Safety, and
Chief Sustainability Officer
Member, National Academy of Engineering
July 2021

50-year anniversary of IBM's first environmental policy

This year marks the 50th anniversary of IBM's first corporate environmental policy, which was put into place by IBM's Chairman and CEO at that time, Thomas J. Watson Jr., in May 1971. While the policy has been updated several times since its initial publication, the key, strategic tenets of the policy have guided IBM's environmental leadership across 50 years. Importantly, this early directive—published at the outset of the modern-day environmental movement—helped enable IBM to integrate environmental responsibility early on throughout the fabric of its business.

Highlights of 1971 environmental policy

– Published just five months after the US Environmental Protection Agency was created and one year before the United Nations (UN) Stockholm Conference on the Environment.

– Purposefully placed responsibility upon "line management," wisely articulating the roles of line organizations and staff functions.

– Called attention to the importance of designing for the environment during product development, not just focusing on waste resulting from production.

"We accept our responsibilities as a corporate citizen in community, national and world affairs; we serve our interests best when we serve the public interest…We acknowledge our obligation as a business institution to help improve the quality of the society we are part of. We want to be in the forefront of those companies which are working to make the world a better place."

Thomas J. Watson, Jr.
(1969)

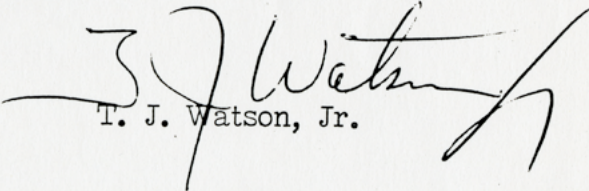IBM System/370 Model 155 manufacturing line in the 1970s.

IBM *Corporate Policy*

Number 129
May 26, 1971

SUBJECT: IBM's Environmental Responsibility

Line management in IBM must be continuously on guard against adversely affecting the environment. This effort must include constant attention not only to the waste incident to producing a product but also to the consequences of the processes established during product development.

The Real Estate and Construction Division, with the counsel of various staff groups, as appropriate, will prescribe the practices that must be followed to discharge this responsibility. The Corporate Staff -- particularly Engineering, Programming & Technology; Manufacturing; Personnel Plans and Programs; and Service -- is responsible for assuring the excellence of performance of the line organizations in pursuit of this objective. In all instances, of course, we must meet or exceed all relevant statutory and regulatory requirements.

T. J. Watson, Jr.

EFFECTIVE DATE

Immediately

DISTRIBUTION

Distribution Lists "A" and "B"

Highlights

Comprehensive update to voluntary goals
Announced 21 new, updated, or continuing goals for environmental sustainability, all of which compel specific, measurable near-term action. They cover energy and climate change, conservation and biodiversity, pollution prevention and waste management, supply chain and value chain, and our global environmental management system—including goals to help IBM achieve our target of net zero greenhouse gas emissions by 2030.

Environmental Management System certification
Maintained single global registration of our EMS to ISO 14001 for the 24th consecutive year and ISO 50001 for the 9th consecutive year.

Energy conservation
Implemented nearly 1,400 energy conservation projects delivering energy savings of 145,500 megawatt—hours.

Procurement of renewable electricity
Procured 59.3 percent of the electricity consumed across IBM's global operations from renewable sources—surpassing our previous goal of 55 percent by 2025, five years early.

Carbon dioxide (CO_2) emissions
Reduced CO_2 emissions 56.6 percent against base year 2005, adjusted for acquisitions and divestitures—surpassing our previous goal of 40 percent by 2025, five years early.
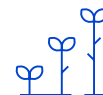
Biodiversity
Created a new initiative to deploy pollinator gardens across IBM locations to help sustain critical biodiversity.

Water withdrawals
Reduced water withdrawals at larger locations and data centers in water-stressed regions by 6.7 percent versus 2019.

Waste recycling
Sent 83.8 percent (by weight) of nonhazardous waste for reuse, recycling or recovery.

Product reuse and recycling
Processed 16,900 metric tons of end-of-life products and product waste, and 96.5 percent (by weight) was reused, resold, or recycled.

European Green Digital Coalition
Became a founding member of the European Green Digital Coalition in 2021, and pledged to continue developing digital technologies and services that are more energy- and material-efficient, along with methods and tools to measure the environmental impacts of these technologies.

IBM Research's Future of Climate initiative
IBM Research® launched a Future of Climate initiative to help accelerate the discovery of new materials for carbon removal, leveraging its expertise in materials science and advanced computing.

External disclosure
Submitted extensive data and descriptive information to the repositories of 14 third-party organizations, answering over 1,000 individual questions in the process. Completed this document, IBM's 31st annual voluntary corporate environmental report since 1990.

Driving progress with 21 goals for environmental sustainability

Setting goals has long been an essential part of IBM's global environmental management system, with formal goals involving energy conservation (1970s); pollution prevention and recycling (1980s); chlorofluorocarbons (1989); design for the environment (1991); ISO 14001 (1996); CO_2 (2000); and specific perfluorinated compounds, PFOS and PFOA (2007), being characteristic of IBM's journey.

We recently conducted an extensive review and evaluation of our goals against our business and its intersections with the environment. As a result, we are announcing IBM's 21 goals for environmental sustainability. Many of the goals are new, some have been updated and others are continuing. Collectively, they cover energy and climate change, conservation and biodiversity, pollution prevention and waste management, supply chain and value chain, and our global environmental management system.

"Setting environmental goals is a long-standing core element of IBM's global environmental management system. We continually assess our intersections with the environment across our operations and drive action to minimize IBM's impact."

Edan Dionne
Vice President,
Environmental, Energy and
Chemical Management Programs,
Corporate Environmental Affairs

Guiding principles: transparency and authenticity

IBM has always sought to be transparent and authentic in its quest for environmental leadership. Applying that to IBM's voluntary goals, we shall:

– Establish near-term targets to promote action and accountability, and to accompany any long-term objectives.

– Encompass 100 percent of IBM's business operations unless otherwise specified.

– Adjust goals for acquisitions and divestitures.

– Avoid opaque representations of achievement.

Energy and climate change

1. Procure 75 percent of the electricity IBM consumes worldwide from renewable sources by 2025, and 90 percent by 2030.

– We include renewable electricity (a) in the grid mix IBM receives from utilities, (b) for which IBM contracts over and above what's contained in the grid mix, and (c) generated on site.

– We challenge ourselves by not counting the purchase of unbundled Renewable Energy Certificates to comprise any percent renewable if IBM cannot credibly consume the electricity those certificates represent.

This is IBM's third successive renewable electricity goal. The prior goal was 55 percent by 2025.

2. Reduce IBM's greenhouse gas (GHG) emissions 65 percent by 2025 against base year 2010, adjusted for acquisitions and divestitures.

– This covers our Scope 1 and Scope 2 emissions, as well as Scope 3 emissions associated with IBM's electricity consumption at co-location data centers.

– This achieves a rate of reduction that equals or exceeds what scientific recommendations from the UN Intergovernmental Panel on Climate Change (IPCC) indicate is necessary to limit Earth's warming to 1.5 degrees Celsius above pre-industrial levels.

– We challenge ourselves by not including the purchase of nature-based carbon offsets to comprise any emissions reduction.

This is IBM's fifth successive emissions goal. The prior goal was 40 percent reduction of CO_2 emissions by 2025 against base year 2005. In addition to increasing our numerical target, this updated goal expands from CO_2 emissions to all GHG emissions and moves the base year for comparison from 2005 to 2010. Both of these latter adjustments increase IBM's ambition.

3. Reach net zero greenhouse gas emissions by 2030 using feasible technologies to remove emissions in an amount which equals or exceeds IBM's residual emissions. Aim for residual emissions of 350,000 metric tons of CO_2 equivalent or less by 2030, with 90 percent of IBM's electricity coming from renewable sources.

– This covers our Scope 1 and Scope 2 emissions, as well as Scope 3 emissions associated with IBM's electricity consumption at co-location data centers.

– We challenge ourselves by setting a numerical target for residual emissions.

– We anticipate new carbon removal solutions such as direct air capture, and support their development with research to accelerate the discovery of enabling materials.

This new goal is responsive to the global ambition of the UN IPCC.

4. Implement a minimum of 3,000 energy conservation projects to avoid the consumption of 275,000 megawatt-hours (MWh) of energy from 2021 to 2025.

This new goal builds upon IBM's decades of rigorous energy conservation. From 1990 through 2020, IBM conserved 9.8 million MWh of energy, avoided 4.6 million metric tons of CO_2 emissions, and saved $661 million. The energy with least environmental impact is the energy IBM does not need to consume.
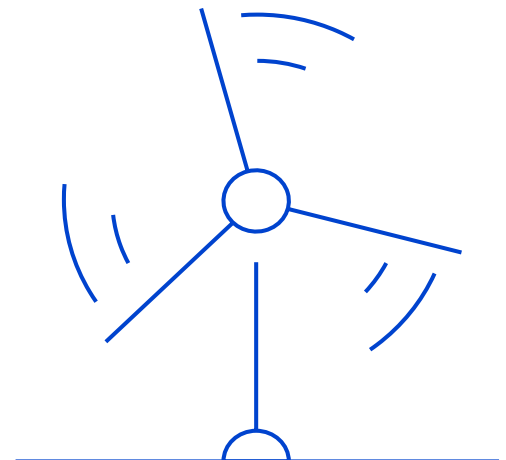
5. Improve average data center cooling efficiency 20 percent by 2025 against base year 2019.

This new goal expands upon IBM's continual innovation for energy-efficient data centers, originating with IBM Research's Measurement and Management Technology invented in 2007.

6. For server products with a valid upgrade path, reduce power consumption per unit of delivered work versus the previous generation.

This goal continues IBM's design for the environment practice across several decades.

7. Establish, by year-end 2021, individual baselines for fleet carbon intensity with each key carrier and shipment supplier involved with IBM's product distribution globally. Starting in 2022, convene with each supplier to set a fleet carbon intensity reduction target covering the services they provide to IBM.

This new goal engages suppliers involved with the distribution of our products.

Conservation and biodiversity

8. Achieve a year-to-year reduction in water withdrawals at specified IBM locations in high or extremely high water-stressed regions.

This goal continues IBM's existing focus upon water resources.

9. Source paper and paper/wood-based packaging directly procured by IBM from forests that are sustainably managed and certified as such.

This goal continues IBM's focus on the use of more sustainable materials.

10. Plant 50 pollinator gardens at IBM locations globally by year-end 2023 to support biodiversity.

This new goal promotes local action to support biodiversity.

11. Pursue third-party sustainability certification for major office construction and renovation projects executed by IBM globally.

This new goal will help guide IBM's real estate occupancy post-pandemic.

Pollution prevention and waste management

12. Divert 90 percent (by weight) of IBM's total nonhazardous waste from landfill and incineration by 2025 through reuse, recycling, composting, and waste-to-energy processes. Use waste-to-energy processes for no more than 10 percent (by weight) of the diverted waste.

This new goal builds upon IBM's prior nonhazardous waste recycling goals across several decades.

13. Send no more than 3 percent (by weight) of end-of-life product waste to landfill or to incineration for treatment. Recycle or reuse at least 97 percent (by weight).

This is a continuing goal which has driven IBM's industry-leading performance across many years.

14. Eliminate nonessential, single-use plastic items (including cups, straws, cutlery, plates, carry bags, and food containers) from IBM-managed cafeteria operations globally by 2025. (An example of an essential use is plastic wrap to protect food for sanitary reasons.)

This new goal addresses concern regarding single-use plastics.

15. Eliminate nonessential plastic from the packaging of IBM logo hardware by year-end 2024. For essential plastic packaging, ensure they are designed to be 100 percent reusable, recyclable, or compostable; or incorporate 30 percent or more recycled content where technically feasible. (Examples of essential plastic packaging include electrostatic bags and certain cushions.)

This new goal addresses concern regarding single-use plastics.

Supply chain and value chain

16. Require all first-tier suppliers to maintain their own environmental management system; set goals regarding energy management, GHG emissions reduction, and waste management; and publicly disclose progress.

This is a continuing goal, first established in 2010.

17. Require key suppliers in emissions-intensive business sectors to set an emissions reduction goal by 2022, addressing their Scope 1 and Scope 2 GHG emissions, that is aligned with scientific recommendations from the UN IPCC to limit Earth's warming to 1.5 degrees Celsius above pre-industrial levels.

This new goal builds upon Goal 16 and deepens our engagement with those suppliers who can have the greatest impact on reducing emissions across IBM's supply chain by requiring them to set more aggressive goals.

18. Convene an annual Sustainability Leadership Symposium to recognize progress and achievement among suppliers in emissions-intensive business sectors across applicable areas of environmental stewardship.

This new goal is a companion to Goals 16 and 17, aimed at encouraging suppliers to take ownership and build their capacity to succeed.

19. Document 100 client engagements or research projects by 2025 in which IBM products, capabilities and/or solutions have enabled demonstrable environmental benefits.

Under this new goal, IBM will keep track of the many ways in which its technology and innovation enable clients to improve environmental sustainability.

Management system

20. Maintain a single, global registration to the ISO 14001 standard for Environmental Management Systems (EMS).

This is a continuing goal, in place since IBM became registered in 1997 (one year after the ISO 14001 standard was released).

21. Ensure IBM's EMS conforms to the ISO 50001 standard for Energy Management Systems.

This is a continuing goal, established one year after the ISO 50001 standard was released in 2011.

Designing our products for business and for the planet

"In today's world, it's not enough to simply create great products. The environment is now a board-level conversation and the greatest thinkers across IBM are working to address energy consumption and sustainability. We must continue to do everything we can to minimize our impact and align with the values and priorities of like-minded customers."

Jamie Thomas
General Manager, Strategy and Development, IBM Enterprise Security Executive,
IBM Systems

Former IBM Chairman and CEO, Thomas J. Watson Jr., is often credited with the phrase, "Good design is good business." Those words were never more true than now, particularly when it comes to designing products to be more protective of the environment. IBM's design for the environment program dates back more than three decades to the early 1990s. While we have continued to develop products at the leading edge of innovation, the guiding principles to develop, manufacture and market them in an environmentally conscious manner are still the same:

– Increasingly energy efficient

– Incorporate recycled content and environmentally preferable materials and finishes

– Can be upgraded, refurbished, remanufactured and reused to extend product life

– Can be dismantled, recycled and disposed of safely

IBM Systems continues to drive innovation focused on the environmental attributes of our IT infrastructure products and manufacturing processes. In 2019, IBM released the IBM z15™, which uses 20-30 percent less power than a comparably configured IBM z14®, and improves computing power delivered for each kilowatt-hour of electricity consumed by 31 percent. Last year, we unveiled the IBM Power 10 processor. Available in IBM Power Systems starting in the second half of 2021, the new 7 nanometer (nm) technology is expected to deliver up to a 3x improvement in energy efficiency over its 14 nm predecessor.

But using less power is only the beginning. IBM has also innovated new packaging designs, including a crate for the z15 that reduces material weight by 25 percent. We also developed a new "Hybrid Pallet" for IBM Power Systems and IBM Storage systems, which replaces the top deck of a wooden

pallet with lightweight paper materials. Although IBM's servers and storage systems do not contain large amounts of plastics, we continue to increase our use of post-consumer recycled materials and plastics generated from renewable feedstocks, such as corn.

Manufacturing and disposal of batteries also have a large environmental impact. IBM Systems has a reclamation process for Battery Backup Units used in many IBM Storage systems. Implemented in customer data centers in 113 countries around the world, IBM has reclaimed more than 954,000 pieces for redemption or repair.
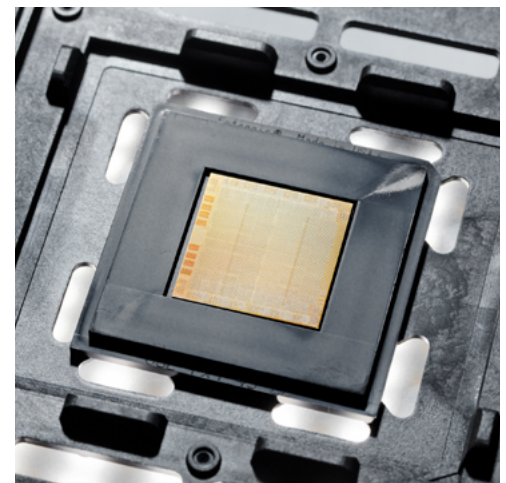
IBM Power 10 chip

Addressing climate change: Early action, transparency and authenticity

IBM has been addressing climate change for the last three decades. In 1992, IBM was one of eight companies that helped the US Environmental Protection Agency (EPA) launch ENERGY STAR. Three decades later, ENERGY STAR is ubiquitous across many industry sectors. That's all about climate change because the most environmentally favorable energy is the energy you do not have to consume in the first place.

Today, many companies are reporting their CO_2 emissions. Investors, clients, and others expect it. IBM has been voluntarily reporting its CO_2 emissions since 1994, 27 years and counting.

IBM published its position on climate change in 2007, calling for meaningful action on a global basis. That was 14 years ago, at a time when climate change wasn't nearly as prominent as it is today, and when there was not nearly as much pressure for companies to speak or take action.

In 2015, IBM supported the UN Paris Climate Agreement. We reiterated our support for the Paris Agreement in 2017 and urged the United States government to remain a party to it.

In 2019, IBM became a founding member of the Climate Leadership Council, supporting its bipartisan plan for a carbon tax with corresponding carbon dividends to be returned to citizens.

In February 2021, we updated IBM's voluntary goals for energy and climate. All of them compel near-term action. IBM's latest renewable electricity goal is to procure 75 percent of IBM's electricity from renewable sources by 2025, and 90 percent by 2030. Our latest GHG emissions reduction goal is to reduce our emissions 65 percent by 2025 against a base year of 2010.

We also set a new goal to achieve net zero GHG emissions by 2030. In doing so, we established a specific numerical target for what we expect our residual emissions will be in 2030, after we have reduced them as much as we can. Then, we will look for technology-based solutions to remove carbon in an

amount which equals or exceeds those residual emissions. In conjunction with this goal, IBM Research has launched a Future of Climate initiative to help accelerate the discovery of new materials for carbon removal.

Early action

– 1992: Helped US EPA launch ENERGY STAR

– 1994: Began reporting CO_2 emissions

– 2001: First purchase of renewable electricity

– 2007: Published position on climate change (calling for meaningful action)

– 2015: Supported Paris Agreement

– 2017: Reiterated support for Paris Agreement

– 2019: Founding member of the Climate Leadership Council (supporting its bipartisan plan for a carbon tax with carbon dividends)

Transparency and authenticity

– IBM does not use the purchase of unbundled Renewable Energy Certificates to comprise any "percent renewable" if we cannot credibly consume the electricity those certificates represent. Furthermore, we do not equate the purchase of nature-based carbon offsets to any reduction of IBM's emissions.

– Transparency and authenticity are essential for corporate environmental leadership. If people who are skeptical of climate change conclude they have been misled by opaque representations of achievement, it will only make it harder to secure their support for climate action.

Collaborating with suppliers on environmental matters

"Engagement with our suppliers is critical to IBM's success. We continually work to improve our own environmental management and performance, as well as our supply chain's, to collectively minimize our overall impact on the environment."

Bob Murphy
Vice President, Supply Chain and Chief Procurement Officer

IBM has long been committed to doing business with suppliers who conduct themselves with high standards of ethical, environmental, and social responsibility. We support this commitment not only by setting specific environmental requirements for our suppliers, but also by partnering with them to drive continual improvement.

IBM believes each supplier must build its own capacity to succeed for the long term, regardless of whether IBM continues to procure from them. Each supplier must do so because it genuinely wants to, not just because a current customer requires it. That is how we will make real progress. Accordingly, we work with suppliers with that objective in mind. Following are some highlights of how we engage with our suppliers to help build their capacity to succeed.

– **Bringing suppliers on board:** Today IBM works with more than 15,000 suppliers in over 120 countries. Our suppliers change based on business needs, and they range in size and sector, as well as where they are on their sustainability journey. Since 2010, IBM has required all suppliers to establish their own environmental management system and report on their performance, including energy use and greenhouse gas emissions. During supplier onboarding, IBM brings awareness to and educates suppliers about why these requirements are important. In 2020, IBM assessed over 1,800 suppliers for compliance to its requirements.

– **Educating and sharing best practices:** Environmental laws and regulations are complex and often not harmonized across jurisdictions. To ensure suppliers can deliver compliant parts and assemblies to IBM, we provide periodic training and education on environmental requirements to relevant suppliers throughout the year.

– **Sourcing:** IBM was a founding member of the Responsible Business Alliance back in 2004. We require our first-tier suppliers to comply with its Code of Conduct, which we helped develop. In addition, we engage with suppliers and implement practices to ensure the responsible sourcing of minerals (e.g., tantalum, tin, tungsten, gold, and cobalt) used in IBM hardware products.

– **Setting goals:** IBM continues to enhance its supplier engagement and in April 2021 set a new goal requiring key suppliers in emissions-intensive business sectors to establish more ambitious GHG emissions reduction targets. For more details, see the section, "Driving progress with 21 goals for environmental sustainability."

IBM remains committed to driving progress in environmental and social responsibility throughout its supply chain.

Engaging employees on environmental sustainability activities

Some IBM employees are assigned work responsibilities that directly involve managing IBM's intersections with the environment. Many more employees' day-to-day work does not, but they are passionate about environmental sustainability and interested in volunteering their time in this area. Recognizing this, in 2019, we formalized the IBM Global Environmental Business Resource Group (BRG) to engage employees and harness their interests toward contributing to IBM's environmental goals and programs.

While local "green teams" are not new to IBM, through the environmental BRG we are able to bring together this global community of employees, facilitate their sharing of ideas, accomplishments, and best practices, and help scale the impact of employee-led sustainability activities worldwide.

Currently, there are 28 local environmental BRG chapters, covering 70 IBM locations across 21 countries, and with more than 1,200 active members. All employees are welcome to participate in their local environmental BRG chapter. If no local chapter exists, interested IBMers can start one.

Each local environmental BRG chapter focuses on activities that are most relevant and impactful for their location. IBM's Corporate Environmental Affairs staff provides guidance to environmental BRG chapters ensuring their activities are in alignment with and support IBM's environmental policy and programs.

While 2020 was certainly an atypical year, IBM's environmental BRGs sponsored more than 150 local environmental activities including educational webinars and movies, clean-up events, recycling challenges and more. It is the work of IBMers across our businesses that has built our record of achievements over decades. Bringing together more employees interested in protecting the environment, we hope to accomplish even more.

"Each of us can do something and together we can do great things—as people, IBMers, companies, and countries. And to act quickly, there have to be effective and systematic solutions."

Veronika Hagovská has been with IBM 13 years and is the leader of the IBM Slovakia environmental BRG, lesswaste@IBM. After witnessing large amounts of plastic waste on the beach during her honeymoon in April 2018, she saw a greater need for action and began working with other employee volunteers and local IBM organizations to eliminate single-use plastic cups from IBM locations in Slovakia.

Now with IBM's Global Environmental BRG, she believes the volunteer work that local employees are actively engaged in can have a greater impact toward supporting IBM's environmental programs and initiatives. The IBM Slovakia environmental BRG currently has two main focus areas: employee environmental education and implementing new initiatives that will continue to reduce IBM's waste and help to create environmentally friendly workplaces.

Veronika reminds us that, "Resources of our planet are not unlimited. Environmental sustainability is about acting in a way that ensures future generations have the natural resources available to live an equal, if not better, way of life as current generations."

Using IBM technology to help our clients become more sustainable

One of the greatest opportunities we have to contribute to sustainable development comes from the innovative technologies and solutions that we deploy to help our clients reduce their environmental impacts.

Integrating and balancing wind and solar energy in electric grids

Here are two examples of how utility companies and their ecosystem partners are teaming up with IBM to fuel the future more sustainably:

As Europe pursues a wide-scale transition to use more renewable energy, smaller and more distributed providers are joining the electricity grid, making it more difficult to balance electricity supply with demand. Leading electricity transmission systems operators (TSOs) needed a way to address increased volatility in a highly weather-dependent electricity system. Three national TSOs, TenneT (Netherlands and Germany), Swissgrid (Switzerland), and Terna (Italy) launched the Equigy Crowd Balancing Platform, and APG (Austria) joined in 2021. This platform unlocks the aggregated flexible power from devices such as electric cars and home batteries for balancing the electricity grid, and uses IBM Blockchain to validate energy transactions. Device owners are rewarded for their participation to keep the grid stable, making the energy transition more inclusive. The ecosystem's joint effort enables TSOs to more intelligently manage flows of electricity in networks with decentralized, distributed energy sources, and facilitates the integration of renewable electricity. Learn more at ibm.com.

A partnership between Andel and IBM Denmark is contributing to the Nordics green transition with a solution that optimizes the power system and reduces associated greenhouse gas emissions in the city of Copenhagen. Using Internet of Things, AI, blockchain technology and the cloud, IBM and Andel co-developed the Utilities Flex Platform, which can adjust the load from users' electricity consumption to match the system-wide demand, flexibly. This new solution gives large government and private sector energy consumers the ability to reduce their electricity consumption and sell that reduced load back to the grid, in lieu of relying on reserve power plants using fossil fuels. The platform allows energy providers to use that reduced load to keep the power system stable while integrating larger amounts of fluctuating renewable electricity sources into the power system. Learn more at ibm.com.

Tracing the environmental footprint of consumer products

Newlight Technologies, Inc., developed a technology that can convert greenhouse gases into a naturally occurring material Newlight named AirCarbon that can be used to replace plastics at a yield that allows them to produce at scale.

Covalent, a fashion brand recently launched by Newlight, is using IBM Blockchain technology, built on IBM LinuxONE and deployed on IBM Cloud™, to allow consumers to trace the steps that went into creating their AirCarbon-based fashion accessories, from eyewear to handbags. AirCarbon-based fashion products have a unique number printed on them. The supply chain journey that brought each product to life is stored in an immutable record. Consumers can go to the Covalent website, enter their product's number and find out how the product was made and who independently verified its environmental footprint.

In partnership with IBM Business Partner Cognition Foundry, Newlight used IBM Blockchain technology to ensure that every step in its process and its environmental impact can be independently tracked, audited and communicated to consumers. Learn more at ibm.com.

Photo credit: Newlight Technologies

Understanding our oceans with the Mayflower Autonomous Ship

Marine research organization ProMare, in partnership with IBM, developed one of the world's first, full-size, uncrewed autonomous ocean research vessels.

Using IBM automation, edge computing and computer vision technologies, as well as data from The Weather Company (an IBM Business), the Mayflower Autonomous Ship (MAS) will self-navigate by identifying hazards and optimizing course to avoid collision, enabling the vessel to spend long durations at sea collecting critical data about the ocean. Together with ProMare, IBM Research is pioneering new AI-powered approaches for in-situ collection and analysis of both water samples and data. Working in tandem with human oceanographers and other autonomous vessels, MAS will provide a flexible and cost-effective option for deepening our understanding of critical issues such as global warming, ocean plastic pollution and marine mammal conservation. Learn more at ibm.com.

Ensuring business continuity using the IBM Environmental Intelligence Suite

Around the world, the impact that weather and climate change have on businesses is escalating in severity and frequency. This is requiring industry leaders to employ data insights and intelligent workflows to ensure business continuity and enable sustainable operations.

The IBM Environmental Intelligence Suite uses data and AI to help organizations plan for and respond to critical weather and environmental conditions in order to reduce their operational impact on the environment and improve business resiliency. For example, the Environmental Intelligence Suite can model the risk of severe weather events, monitor environmental conditions, predict impacts, and recommend corrective action. This enables organizations to plan for and respond to both immediate disruptions and longer-term climate trends that could affect enterprise assets, supply chains, and critical infrastructure. Learn more at ibm.com.
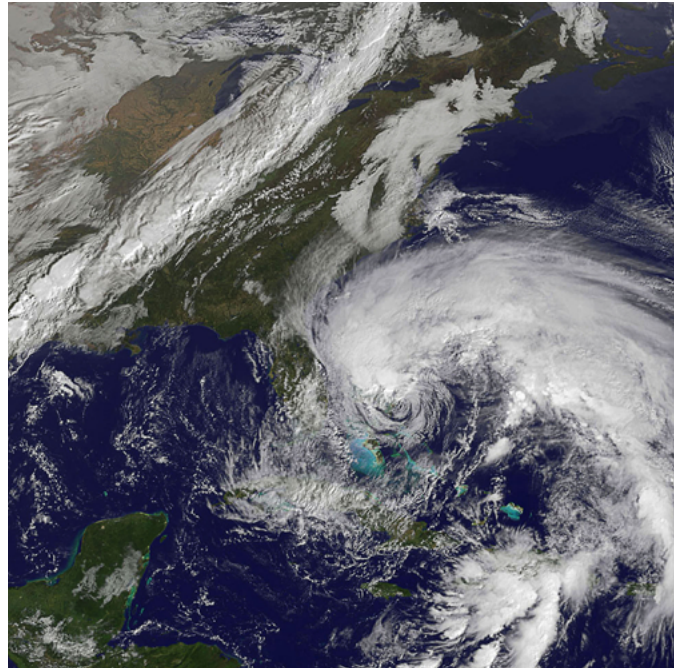
Leveraging data to reduce plastic waste

Right now, most data on plastics, plastics waste, and waste management infrastructure is contained in silos. There are several excellent—but independent—initiatives underway with NGOs as well as within the private sector to collect data; however, there is an opportunity to bring this data together and further fill the gaps in a unified system that will allow for multi-dimensional analysis.

To help address this problem, IBM and the Alliance to End Plastic Waste are co-developing the "Plastics Recovery Insight and Steering Model" platform (or PRISM, for short). The platform is being designed as an open platform that can bring data sets together so everyone better understands the full plastics ecosystem and can target interventions that will have the biggest impact where they are needed most. Using PRISM, organizations will be able to assess the plastic waste situation in a particular geography, identify data gaps, and create models to determine the impact of needed interventions. The initial prototype is being developed and deployed on the IBM Cloud using the IBM Garage™ method, the company's approach to fast-tracking innovation at scale by quickly combining technology with design and business strategy. Learn more at ibm.com.

Addressing global environmental challenges

As a founding member of the United Nations Environment Programme's Science-Policy-Business Forum on the Environment (UNEP-SPBF), IBM is committed to working with the UNEP-SPBF and its stakeholders to accelerate the adoption of IT to assist in sound policy making, solutions development and global collaboration.

We are currently engaged in applying IBM technology and expertise to cross-industry initiatives to address global environmental challenges. IBM made substantial contributions during the Third Global Session of the UNEP-SPBF online event in February 2021, sharing some of our ongoing efforts, including:

– UNEP-IBM pilot project for a marine litter digital hub to address UN Sustainable Development Goal 14, specifically the target related to reducing marine pollution.

– IBM Research's initiative to apply AI to accelerate discovery of new materials for a sustainable future.

– Evaluating opportunities to reduce the environmental footprint of AI.

– Defining ways to improve the management of electronic waste using blockchain.

– An IBM and Yara collaboration on a digital farming platform leveraging IBM technology to provide accurate, hyperlocal weather forecasts and real-time recommendations to farmers, tailored to the specific needs of individual fields and crops.

Learn more at the UNEP-SPBF website.

Image credit: UN Environment Programme

About this report

This report marks the 31st consecutive year that IBM has published an environmental report. The data in this report covers our 2020 fiscal year (January 1 to December 31, 2020). Monetary figures are in US dollars.
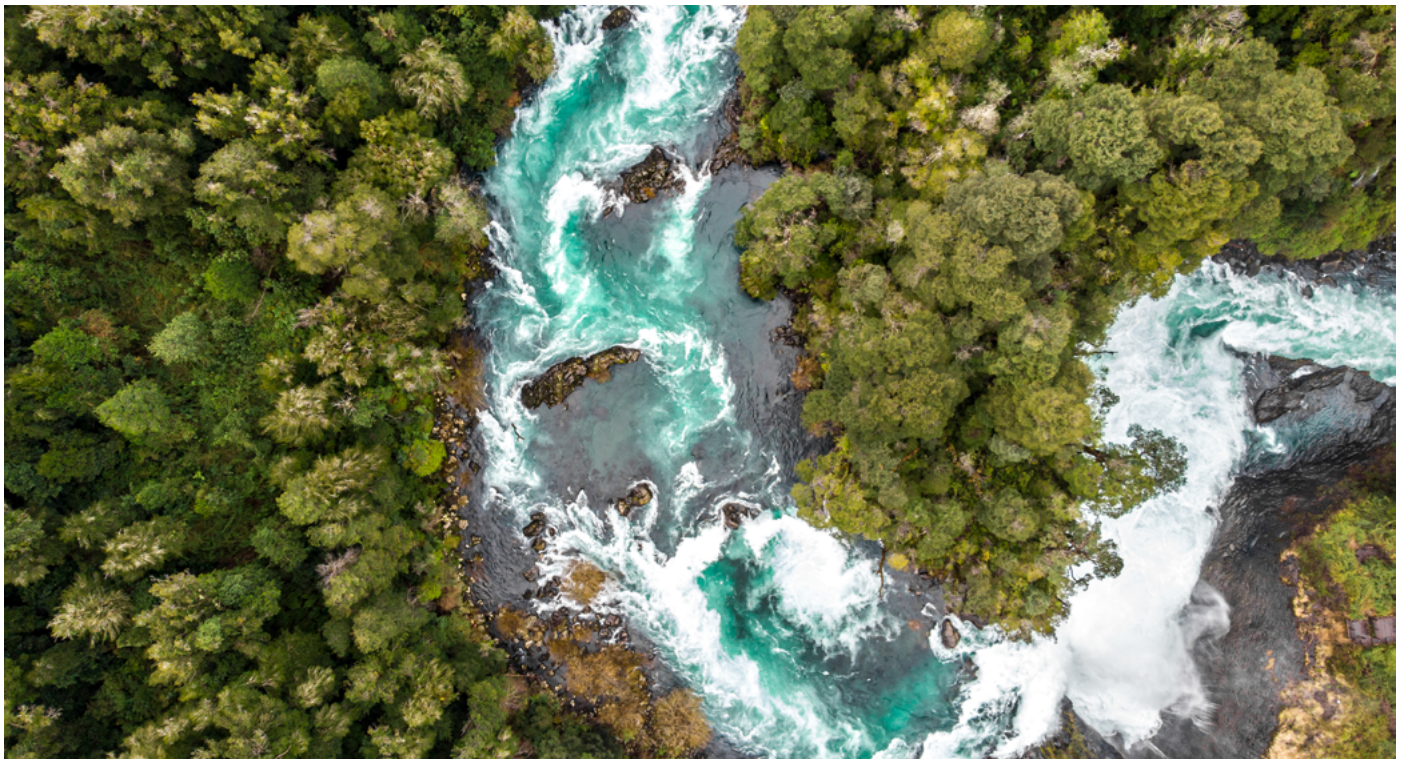
In 2019, IBM acquired the software and hybrid cloud company Red Hat®. Our reported data for 2020 includes energy consumption and the associated carbon dioxide emissions and renewable electricity at Red Hat locations. Other environmental performance data discussed in this report does not include Red Hat operations whose impacts to our performance were minimal. Additional information can be found in the Red Hat Community and Social Responsibility 2020 Report.

Our energy and greenhouse gas (GHG) emissions goals and reporting cover all activities taking place in IBM (inclusive of Red Hat)-owned or leased facilities. These facilities include IBM data centers located in facilities managed by third parties where IBM does not procure the energy or control the operations of the buildings–also known as co-location data centers.

In selecting content for inclusion in this report, we considered frameworks and initiatives such as the Global Reporting Initiative, the Sustainability Accounting Standards Board, the Financial Stability Board Task Force on Climate-related Financial Disclosures, and the United Nations Sustainable Development Goals.

IBM's environmental data is subject to internal and external audits in line with our global environmental management system (EMS) and International Organization for Standardization (ISO) 14001 and 50001 certifications at the corporate level. In addition, IBM's energy consumption and GHG emissions inventories were audited by an independent assessor who issued a limited level of assurance of IBM's corporate GHG emissions inventory and disclosure process in accordance with ISO 14064-3.

For more information about our EMS, related audits and certifications, and environmental sustainability initiatives, please visit our IBM and the Environment website. Details about IBM's other corporate responsibility initiatives can be found in our annual Corporate Responsibility Report.

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Global governance and management system

IBM has maintained a strong worldwide Environmental Management System (EMS) for decades. Through this EMS, we manage our operations around the globe to minimize their potential impact on the environment.

Governance

The Vice President of Corporate Environmental Affairs and Product Safety (and Chief Sustainability Officer) is the top environmental executive of IBM. This person is authorized to set IBM's strategy for environmental affairs, including matters related to climate change, and to establish the company's environmental requirements, goals, and management system to drive consistent execution across IBM's global operations and achieve results consistent with environmental leadership.

The Directors and Corporate Governance Committee of the IBM Board of Directors oversees IBM's environmental programs and performance, and is responsible for reviewing and considering IBM's position and practices on issues related to corporate responsibility such as protection of the environment, corporate citizenship, and philanthropic contributions. The Vice President of Corporate Environmental Affairs and Product Safety meets with the board committee annually to discuss IBM's environmental programs, performance, challenges and emerging issues.

Environmental Management System

IBM's corporate environmental policy provides the strategic framework for the company's global EMS. The policy outlines 11 objectives that address environmental considerations of our business. IBM's EMS, which integrates corporate environmental directives governing our conduct and operations worldwide, has been sustained for decades and reflects our business and its intersections with environmental matters.

The global nature and scope of IBM's EMS is unique among the IT industry and across industries. Today, the scope of IBM's EMS covers the following IBM operations worldwide: hardware product design and development, manufacturing, data centers, procurement, logistics, asset recovery services, and business services. In 1997, IBM became the first major multinational company to earn a single global registration of its EMS to the International Organization for Standardization (ISO) 14001 environmental management systems standard and we have expanded the scope of the initial certification and maintained this global registration through our business transformation.

IBM's energy management program is an integral part of its global EMS. Within one year of ISO issuing the ISO 50001 standard on energy management systems in June 2011, IBM successfully demonstrated conformity of its EMS against it. IBM has maintained this conformity ever since.

IBM employs a variety of mechanisms to monitor and measure the effective implementation of its EMS requirements. These include comprehensive annual self-assessments by business functions, internal audits conducted by IBM's corporate audit function, and ISO 14001 and ISO 50001 audits conducted by third-party auditors. Learn more here.

Risk identification and management

IBM's Enterprise Risk Management program considers environmental risks, including those related to climate change. Environmental risks are reviewed with relevant IBM organizations responsible for business operations continuity, supply chain, and reputation to ensure plans are in place to minimize risks. In addition, our global EMS also includes a process for identifying and assessing significant environmental aspects of our business.

IBM considers risks as identified by the Financial Stability Board Task Force on Climate-related Financial Disclosures (TCFD) in its risk management process. IBM senior management assesses the significance of environmental and climate-related risks and opportunities. They also manage these risks and provide updates to the IBM Board of Directors and its Directors and Corporate Governance Committee about these matters.

Furthermore, IBM has established internal objectives and targets for energy conservation, procurement of renewable electricity, greenhouse gas emissions reduction and other key environmental performance indicators. Performance against these objectives and targets is routinely monitored, and results are reviewed annually by the Board's Directors and Corporate Governance Committee.

While IBM, like most companies, is subject to potential climate-related risks, we do not expect climate change or compliance with environmental laws and regulations related to climate change to have a disproportionate adverse effect on the company. Conversely, as described in the table below, we believe that there is significant opportunity to use IBM's AI, hybrid cloud, and other technologies to assist clients with managing their climate-related risks.

Potential climate-related risks and opportunities

Risks and opportunities	Timeframe*	Discussion
Regulatory: Expanded energy efficiency legislation and standards for hardware products	Short term	IBM has maintained a rigorous product design for environment programs for over three decades, which has enabled IBM to produce increasingly more energy-efficient products.
Regulatory: Expanded energy efficiency legislation and standards for data centers, including those that may affect equipment which may be used in data centers	Medium term	IBM has a comprehensive energy conservation program covering its data centers. It continues to drive conservation through introducing more energy-efficient IT equipment, virtualizing workloads to increase system utilization, and improving data center cooling efficiency.
Regulatory: Carbon taxes, carbon trading, mandates to use renewable energy and other government measures to reduce use of fossil fuels	Short term Medium term Long term	As a result of its long-standing energy conservation programs and goals for procurement of renewable electricity, IBM is well positioned to minimize any potential risks associated with carbon taxes or increases in energy costs. IBM has opportunities to assist clients in becoming more energy efficient through its hybrid cloud and AI technologies, among others.
Physical: Increased frequency of severe weather events (hurricanes, typhoons, storms, flooding, heat waves, extreme cold fronts) that could impact operations and the supply chain	Short term Medium term Long term	IBM has established measures to minimize impacts of severe weather events to its operations. IBM has opportunities to assist clients with managing their severe weather risks through its Global High-Resolution Atmospheric Forecasting System (IBM GRAF) and the application of AI and other technologies.
Physical: Prolonged, increased temperatures leading to increased water stress	Long term	IBM has established measures to minimize impacts of increased global temperatures leading to a rise in sea level to its operations. IBM has opportunities to assist clients in managing their longer-term risks associated with sea level rise through the use of AI to analyze and identify assets that may be at risk.
Reputational: Increased expectations for companies related to climate change response and advocacy	Short term Medium term	IBM publicly issued and has maintained its position on climate change since 2007. We have a sustained track record of supporting energy and climate policies and demonstrating how technologies can help meet policy objectives. IBM publicly supports putting a price on carbon. Our consistent position and effective advocacy on climate protection support our commitment to environmental leadership.

*Short term = 0-3 years, Medium term = 3-10 years, and Long term > 10 years

Environmental investment and return

In 2020, IBM invested $12.4 million of capital and spent $61.4 million in operating expense to build, maintain and operate its worldwide environmental protection infrastructure and programs.

IBM estimates the savings it has realized from its proactive environmental programs. These include savings from energy, material and water conservation; recycling; packaging improvements; and reductions in waste. Ongoing savings from previous years' initiatives are not carried over in this calculation, yielding very conservative estimates. In addition, IBM estimates the avoidance of costs that likely would have occurred if its EMS were not effectively implemented. This cost avoidance is difficult to quantify, so a reasonable attempt has been made to estimate it. In 2020, IBM's combined, estimated environmental savings and cost avoidance totaled $100.1 million, resulting in an estimated net savings of $26.3 million for the company.

Accidental releases

IBM locations around the world report environmental incidents and accidental releases of substances to the environment to IBM management through the company's Environmental Incident Reporting System (EIRS). IBM's environmental incident reporting criteria are equal to or more stringent than applicable legal reporting requirements. All

IBM locations must have a documented incident prevention program and reporting procedure.

In 2020, seven accidental releases of substances to the environment related to IBM operations were reported through the EIRS—three releases to air, one release to land and three releases to water. The three releases to air were all refrigerants, and the one release to land was a condenser water drip from a frozen line on a flow meter. Of the three releases to water, one was hydraulic fluid released to a storm drain from a compactor, one was groundwater contaminated with an organic solvent caused by a pump failure, and the third was diesel oil that leaked from a delivery truck during a rainstorm. All environmental releases were promptly and effectively managed, root causes were investigated, and appropriate corrective actions were taken. No long-term impacts are expected from the above releases.

Fines and penalties

In 2020, IBM received 23 agency inspections at its locations worldwide with no resulting fines or penalties. Over the past five years, IBM has paid no environmental fines.

Stakeholder engagement and voluntary collaborations

At IBM, we proactively engage and collaborate with stakeholders from a cross-section of nongovernmental organizations (NGOs), government agencies, businesses, industry associations, investors, academia, communities and employees.

IBM publicly discloses information on its environmental strategy, goals and targets, performance, and continual improvement activities widely through this report and other external voluntary reporting programs. Our community outreach programs include support of and participation in local environmental projects and education efforts, including Earth Hour, Earth Day, and World Environment Day. IBM also engages employees through site environmental awareness events and local clean air activities focused on the use of public transportation. Four IBM sites currently hold Wildlife Habitat Council's Conservation Certification, recognizing their wildlife habitat management and conservation education programs.

IBM has a Global Environmental Business Resource Group (BRG) to connect our global community of IBMers who are passionate about the environment. Business Resource Groups are volunteer, cross-department, employee-led groups that focus on a common interest or a certain constituency. Through our Global Environmental BRG, we facilitate the sharing of ideas, accomplishments, and best practices to help scale employee-led sustainability efforts that contribute to IBM's environmental programs and goals. There are currently 28 local environmental BRG chapters, covering 70 IBM locations across 21 countries.

Following are some more specific examples:

– **Alliance to End Plastic Waste:** In December 2020, IBM announced its membership in and collaboration with the Alliance to End Plastic Waste, a nonprofit organization that brings together a community of members from across the plastics value chain to combat the global waste challenge. The collaboration is helping to co-create, build and manage a new platform to serve as a single source of actionable data to inform how global businesses, NGOs, customers, communities and regulators improve plastic waste management decisions and programs.

– **Climate Neutral Data Centre Pact:** IBM joined the Climate Neutral Data Centre Pact in May 2021. As a member of the initiative, IBM has committed to take actions to increase energy efficiency, purchase additional renewable electricity, conserve water, and facilitate the reuse and repair of IT equipment at our data centers.

– **European Green Digital Coalition:** IBM became a founding member of the European Green Digital Coalition (EGDC) in 2021. The EGDC is a group of companies committed to supporting the green and digital transformation of the European Union. In joining the coalition, IBM pledged to continue developing digital technologies and services that are more energy- and material-efficient, along with methods and tools to measure the environmental impacts of these technologies.

– **Massachusetts Institute of Technology Climate and Sustainability Consortium (MCSC):** In January 2021, IBM along with a dozen other enterprises became the inaugural members of the MCSC. Its mission is to accelerate the large-scale, real-world implementation of solutions to address the threat of climate change. IBM's membership in the MCSC is yet another demonstration of our commitment to lead with solutions that mitigate and adapt to climate change.

– **World Business Council for Sustainable Development:** IBM rejoined the World Business Council for Sustainable Development in 2020 to help accelerate the transition to a sustainable world. This relationship further extends IBM's leadership in managing waste, conserving energy, using renewable electricity and reducing carbon dioxide emissions. Technical and industry professionals across IBM's business units continue to develop new solutions to address difficult environmental problems using data and today's exponential information technologies—including AI, automation, analytics, IoT and blockchain.

Examples of IBM's voluntary collaborations

Government

– European Union Code of Conduct for Energy Efficiency in Data Centres

– United Nations Environment Programme

– US Environmental Protection Agency ENERGY STAR Program

Environmental NGOs

– Center for Climate and Energy Solutions

– Environmental Law Institute

– The Climate Registry

– The Nature Conservancy

– Wildlife Habitat Council

– World Environment Center

Industry partnerships

– Alliance to End Plastic Waste

– Call for Code

– Climate Leadership Council

– Climate Neutral Data Centre Pact

– European Green Digital Coalition

– Renewable Energy Buyers Alliance

– Responsible Business Alliance

– The Green Grid

– World Business Council for Sustainable Development

Universities

– Massachusetts Institute of Technology Climate and Sustainability Consortium

– Pennsylvania State University Center for the Business of Sustainability

– University of Pittsburgh Center for Sustainable Business

Energy and climate change

IBM has long recognized the urgency to limit global warming. IBM first published its policy position on climate change in 2007. We recognize that climate change is a serious concern that warrants timely, meaningful action on a global basis to reduce the atmospheric concentration of greenhouse gases (GHGs) in accordance with scientific judgement. We believe all sectors of society, the economy and governments worldwide must participate in solutions to climate change.

In 2015, IBM voiced its support for the Paris Agreement and reaffirmed its support in 2017. IBM became a founding member of the Climate Leadership Council in 2019 and publicly supported the council's plan for a carbon tax, with the proceeds of that tax—a "carbon dividend"—to be returned to citizens.

Previous goals

In 2018, IBM established a second-generation goal for the use of renewable electricity and a fourth-generation goal to reduce carbon dioxide (CO_2) emissions. Those goals were to:

– Procure 55 percent of the electricity IBM consumes worldwide from renewable sources by 2025.

– Reduce operational CO_2 emissions associated with IBM's energy consumption 40 percent by 2025 against base year 2005, adjusted for acquisitions and divestitures.

IBM achieved both of these goals five years early. At year-end 2020, 59.3 percent of the electricity IBM consumed came from renewable sources, and CO_2 emissions were reduced 56.6 percent versus 2005. The sections that follow provide further details about these results.

Updated goals

In February 2021, IBM established its third consecutive goal for the use of renewable electricity; its fifth consecutive goal to reduce GHG emissions; a goal to achieve net zero GHG emissions; and related goals for energy conservation and data center energy efficiency. Our new goals are to:

– Procure 75 percent of the electricity IBM consumes worldwide from renewable sources by 2025, and 90 percent by 2030.

– Reduce IBM's GHG emissions 65 percent by 2025 against base year 2010, adjusted for acquisitions and divestitures.

– Reach net zero GHG emissions by 2030 using feasible technologies to remove emissions in an amount which equals or exceeds IBM's residual emissions. Aim for residual emissions of 350,000 metric tons of CO_2 equivalent ($mtCO_2e$) or less by 2030.

– Implement a minimum of 3,000 new energy conservation projects to avoid the consumption of 275,000 megawatt-hours (MWh) of energy from 2021 to 2025.

– Improve average data center cooling efficiency 20 percent by 2025 against base year 2019.

IBM's new 2025 GHG emissions reduction goal achieves a rate of reduction that exceeds what scientists from the UN Intergovernmental Panel on Climate Change (IPCC) indicate is necessary to limit Earth's warming to 1.5 degrees Celsius above pre-industrial levels. It expands from CO_2 emissions to all GHG emissions. We adjusted our baseline year from 2005, used in our fourth-generation goal, to 2010 in our fifth-generation goal to better align our reporting with IPCC recommendations. Doing so further increases IBM's ambition because we forego results from IBM's early action.

In executing against these goals, we include renewable electricity (a) in the grid mix IBM receives from utilities, (b) for which IBM contracts over and above what is contained in the grid mix, and (c) generated on site. We do not purchase

unbundled Renewable Energy Certificates (RECs) to comprise any "percent renewable" if IBM cannot credibly consume the electricity those certificates represent. In addition, we do not equate the purchase of nature-based carbon offsets to any reduction of IBM's emissions.

Our energy and emissions goals and reporting cover all activities taking place in IBM-owned or leased facilities. These facilities also include IBM data centers located in facilities managed by third parties where IBM does not procure the energy or control the operations of the buildings–also known as co-location data centers.

We will begin reporting against our new goals next year. More information about these goals may be found in the earlier section on [Driving progress with 21 goals for environmental sustainability](#).

Energy consumption and conservation

We recognize that the most effective way to reduce our GHG emissions is to make our operations more efficient and thereby reduce our actual consumption of energy, which is IBM's most significant source of GHG emissions.

Energy consumption
In 2020, IBM consumed 3,513,000 MWh of electricity and 605,000 MWh of fuel and other purchased energy commodities (e.g., chilled water, hot water and steam) worldwide. Our total energy consumption was reduced by 7.6 percent versus 2019. We estimate that 40 percent of our year-to-year reduction in energy consumption is attributable to lower office space utilization during the COVID-19 pandemic, while the remainder was due to our ongoing focus on operational efficiency and energy conservation.

IBM total energy consumption
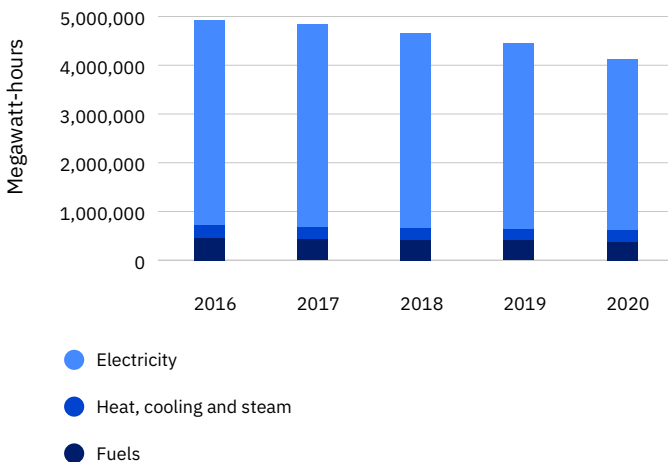
Energy conservation projects
IBM implemented nearly 1,400 energy conservation projects at more than 230 locations globally during 2020. These projects delivered annual energy savings of 145,500 MWh, equal to 3.5 percent of our total energy use during 2020 and surpassing the corporate goal of 3 percent. They also avoided 51,000 metric tons of CO_2 emissions and saved $15.4 million in expense. The avoided emissions were equivalent to removing more than 11,000 passenger vehicles from the road during the year.
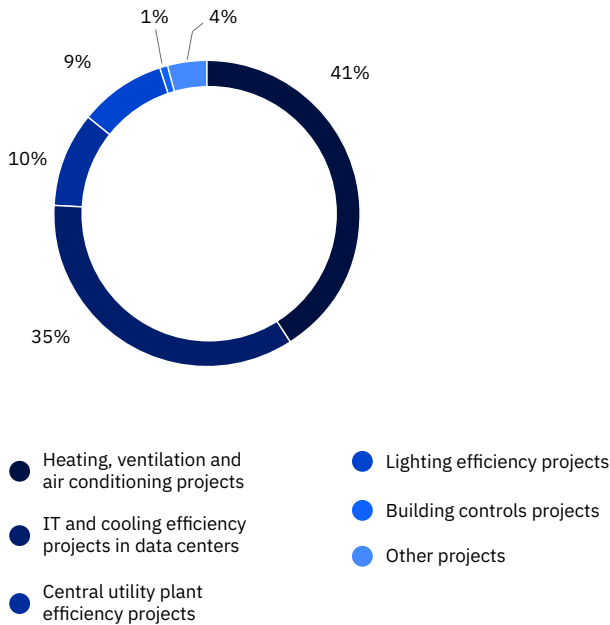
In measuring performance against IBM's energy conservation goal, we only include the first year's savings from projects. Accordingly, IBM's total energy savings and CO_2 emissions avoidance from these projects are greater than this simple summation of the annual results. We do not include reductions in energy consumption resulting from downsizings, the sale of operations or cost-avoidance actions, such as fuel switching and off-peak load shifting, in our energy conservation results.

When most of our workforce started working remotely due to COVID-19, our Global Real Estate organization acted swiftly to adjust lighting, temperature and other building systems schedules to avoid unnecessary consumption of energy. These actions significantly contributed to our 2020 energy conservation savings that came from measures related to heating, ventilation and air conditioning (41 percent of the total amount conserved). In addition, we implemented projects in our data centers, improving energy efficiency of both cooling and the IT equipment used, and contributing to 35 percent of the total amount conserved.

The remaining conservation savings were achieved across IBM's research, manufacturing and office space by implementing scheduled maintenance, lighting retrofits, and improving the operational efficiency of our building infrastructure. We have deployed IBM's IoT and analytics solution called IBM Smarter Buildings at 25 major IBM campuses covering 190 buildings and encompassing 41 percent of IBM's global energy consumption. During 2020, this program enabled the identification of energy conservation opportunities which resulted in the avoidance of 9,800 MWh of energy and $877,000 in expense.

From 1990 through 2020, IBM conserved 9.8 million MWh of energy, saving $661 million and avoiding 4.6 million metric tons of CO_2 emissions—equivalent to more than two times IBM's current annual energy consumption. We can report cumulative numbers since 1990 because that's how long IBM has been focused upon them.

IBM energy conservation savings by project type

- ● Heating, ventilation and air conditioning projects
- ● IT and cooling efficiency projects in data centers
- ● Central utility plant efficiency projects
- ● Lighting efficiency projects
- ● Building controls projects
- ● Other projects

Data center energy efficiency

IBM has a diverse portfolio of data centers supporting our clients and our internal operations worldwide. We take a holistic approach to managing and improving the energy efficiency of our data centers—from improving existing space to derive more workload per area; modernizing our IT infrastructure and reducing its energy consumption; to building or leasing new, higher-efficiency space.

Power Usage Effectiveness (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. IBM calculates the PUE at many of the data centers we manage and obtains PUE data from landlords of co-location data centers. For data centers where we are unable to obtain PUE data, we use industry average data. Using this approach, we calculated our 2020 weighted average PUE to be 1.67.

We recently established a new goal to improve average data center cooling efficiency 20 percent by 2025 against base year 2019. Looking ahead, most of these data centers will be third-party managed locations. We have developed lease terms enabling us to engage with landlords to improve efficiency of support infrastructure toward meeting this goal.
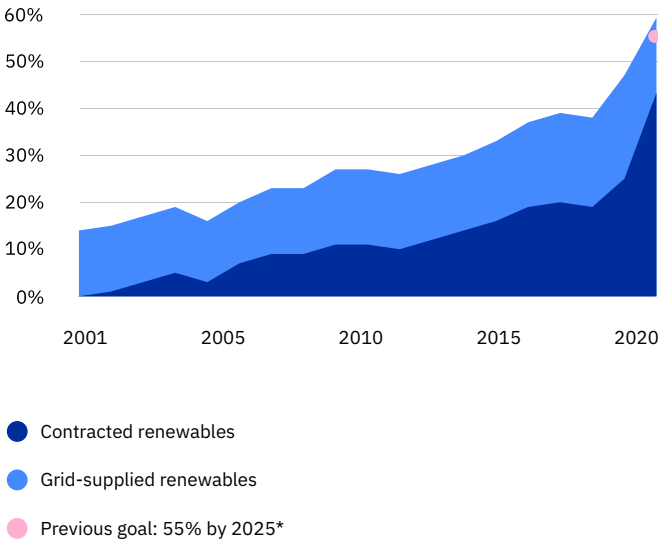
Renewable electricity consumption

In 2020, 59.3 percent (2,083,000 MWh) of the electricity consumed across IBM's global operations came from renewable sources, meeting our second-generation goal of 55 percent by 2025 five years early. The renewable electricity total includes 43.3 percent directly contracted from IBM's power suppliers, in addition to the other 16 percent already in the electricity mix we received from the grid.

When reporting our consumption of renewable electricity, we count only the renewable electricity that is generated in the grid regions where our consumption actually occurs. We do not rely upon the purchase of unbundled RECs to comprise any "percent renewable" if we cannot credibly consume the electricity those certificates represent. For more information about how IBM calculates its consumption of renewable electricity, please visit our website.

IBM significantly increased its consumption of renewable electricity through contracted purchases in the United States, Europe and Brazil. We are also working closely with landlords of our co-location data centers to increase the amount of renewable electricity they use in support of IBM's operations at those facilities.

IBM procures renewable electricity generated from wind, hydropower, biomass, and solar installations around the globe. We report all of our contracted renewable electricity purchases and their associated GHG emissions avoidance—whether from new or existing generation sources, "additional" or otherwise, and without discriminating against large hydropower plants. All purchases signal to suppliers our desire for them to maintain and broaden their renewable electricity offerings. This approach also recognizes that all sources of renewable electricity contribute to decarbonizing our economy.

IBM use of renewable electricity as percent of global electricity consumption

- Contracted renewables
- Grid-supplied renewables
- Previous goal: 55% by 2025*

*IBM established a more ambitious, third-generation renewable electricity consumption goal in February 2021 which calls for IBM to procure 75 percent of the electricity we consume worldwide from renewable sources by 2025, and 90 percent by 2030. We will begin reporting against that goal for the 2021 reporting year.

IBM consumption of renewable electricity by source

- Hydropower
- Wind
- Solar photovoltaic
- Biomass
- Geothermal

Data center renewable electricity consumption

Data centers continue to account for the majority of IBM's global electricity consumption, while representing only a very small fraction of our total space. In 2020, 61 percent of the electricity consumed in our data centers came from renewable sources, including both contracted and grid-supplied, up from 50 percent in 2019. IBM's data centers include 66 that were supplied with 100 percent renewable electricity, although they still depend on backup power from fossil fuels when renewable sources become interrupted.

Three IBM data centers have installed solar arrays in partnership with our local energy suppliers. Two solar arrays are installed at IBM's data centers in Bastogne and Vaux-sur-Sŭre, Belgium. One solar array is hosted at IBM's Boulder, Colorado, facility. IBM does not retain the ownership of the RECs associated with the power generation from these three projects. Therefore, IBM does not claim the use of any renewable electricity or any resultant decrease in its GHG emissions associated with the physical consumption of the renewable electricity from these installations. Nonetheless, IBM's role in making these on-site solar projects a reality has directly contributed to increased generation of renewable electricity in Belgium and Colorado.
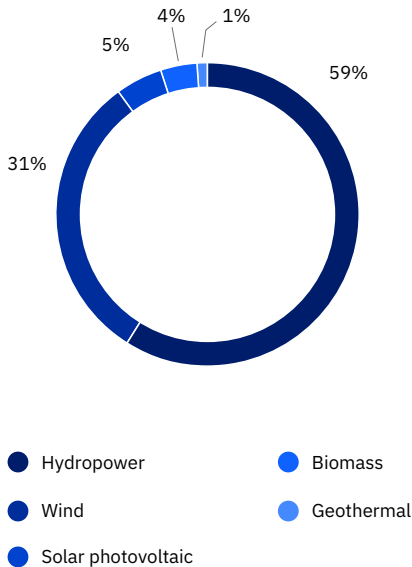
Renewable electricity procurement strategy

IBM's strategy is to purchase renewable electricity that is generated in the grid regions where our consumption of electricity occurs. Our definition of "grid region" aligns with how the US Energy Information Administration defines power balancing authorities' territories. We apply the same concept for other jurisdictions.

By aligning with this definition of "grid region," we ensure that the renewable electricity we purchase can actually physically flow from point of generation to point of consumption. For example, we do not use purchases of renewable electricity generated in Texas to claim consumption of that electricity in New York because the two states are in different grid regions.

It is not possible in today's market, or in the foreseeable future, for IBM's business operations to actually consume 100 percent renewable electricity with physical locations in over 100 countries, along with the need for uninterrupted power, which is usually only made possible today by the use of fossil fuel and nuclear generation sources.

In the interest of transparency, we categorize our procurement of renewable electricity as either physical consumption or matched consumption with bundled RECs.[1] Both categories represent scenarios in which an IBM facility and a renewable generation asset are connected to the same grid region (allowing electrons to physically flow from generation source to point of consumption).

– Physical consumption means the time of generation and consumption coincide. In this scenario, IBM is able to consume renewable electricity real-time, as it is generated.

– Matched consumption with bundled RECs means the time of generation and consumption do not coincide. This is the case, for example, when there is more renewable electricity being generated than what IBM needs to consume at a certain point in time. In this example, the excess renewable electricity is consumed by others within our same grid region.

We allocate our renewable electricity consumption among these two categories as follows, based upon our understanding of the sources and profiles of their output:

– Biomass: 100 percent physical consumption

– Geothermal: 100 percent physical consumption

– Hydropower: 70 percent physical consumption and 30 percent matched consumption

– Wind power: 40 percent physical consumption and 60 percent matched consumption

– Solar power: 20 percent physical consumption and 80 percent matched consumption

For more details on IBM's renewable electricity purchasing strategy, please visit our [website](#).

IBM allocation of renewable electricity in MWh

Total renewable electricity reported	**2,082,549**
By delivery type	
Grid-supplied	562,301
On-site generation*	0
Contracted purchases	1,520,248
By category	
Physical consumption	1,241,950
Matched consumption with bundled RECs	840,599
Unbundled RECs	0

*Although IBM consumes power from on-site solar arrays installed at three of our locations, we do not claim that consumption within our reported metrics because our local power suppliers retain ownership of the RECs.

[1]Even when IBM procures renewable electricity that is generated in the grid region where we are physically located and consuming, we cannot say with certainty that the electrons which actually reach us were not generated from fossil fuels. That is because the time when renewable electricity is generated (when the sun shines or the wind blows) may not coincide with the time when we are consuming energy. For that reason, our reporting will disclose what we estimate for physical consumption (when the time of generation and consumption coincide) and matched consumption (when generation and consumption occur at different times, but still within the same grid region).

Operational CO_2 emissions

IBM's fourth-generation CO_2 emissions reduction goal was to reduce emissions 40 percent by 2025 against base year 2005, adjusted for acquisitions and divestitures, and covered emissions associated with energy used to power our global operations. This includes emissions associated with the generation of electricity IBM consumed at co-location data centers.

In 2020, we surpassed this goal five years early when we reduced our CO_2 emissions 56.6 percent against base year 2005, adjusted for acquisitions and divestitures. These reductions were the result of a significant increase in our purchases of renewable electricity, lower overall energy consumption partly driven by COVID-19, and an overall lower carbon intensity of many electric grid regions where IBM consumes electricity. Excluding the impact from COVID-19, we would still have met our target with an estimated 54 percent reduction against 2005.

IBM operational CO_2 emissions reductions against base year 2005, adjusted for acquisitions and divestitures

● Reduction against base year 2005

● Previous goal: -40% by 2025*
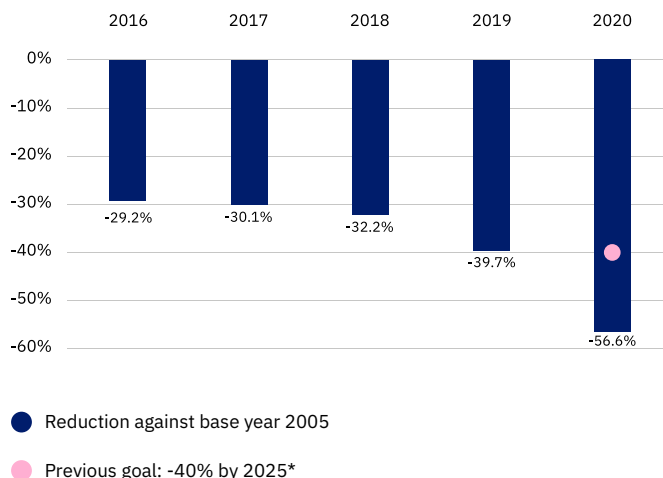
*IBM established a more ambitious, fifth-generation GHG emissions reduction goal in February 2021 which calls for IBM to reduce GHG emissions by 65 percent by 2025 against base year 2010. We will begin reporting against that goal for the 2021 reporting year.

IBM operational CO_2 emissions associated with energy consumption, in metric tons

		2016	2017	2018	2019**	2020
Scope 1*	Direct emissions associated with IBM's use of fuels for operations, such as heating	90,995	84,061	82,314	80,159	73,941
Scope 2	Emissions associated with IBM's purchased electricity and other energy commodities	1,155,833	1,076,882	963,304	827,369	530,365
Scope 3	Emissions associated with the generation of electricity consumed by IBM's data centers located in third-party managed facilities	189,636	257,042	329,409	315,095	275,882
Total emissions covered by IBM's 4th-generation goal		**1,436,464**	**1,417,985**	**1,375,027**	**1,222,623**	**880,188**
Reduction of operational CO_2 emissions against 2005 base year		**-29.2%**	**-30.1%**	**-32.2%**	**-39.7%**	**-56.6%**

*IBM's Scope 1 GHG emissions not included in this table are those associated with our use of fuels for transportation and from the use of refrigerants and chemicals with a global warming potential. For IBM's reporting of these emissions, see our complete GHG emissions inventory in our website.

**2019 data has been adjusted to correct a calculation error in figures reported in our 2019 IBM and the Environment Report.

While they are not included in our operational CO_2 emissions reduction goal, we estimate emissions in four additional Scope 3 categories for which we attempt to make broad approximations, and report these on our website. IBM does not attempt to estimate Scope 3 emissions in other categories. Although broad approximations of Scope 3 emissions can be helpful in identifying where the greatest amounts of GHG emissions may be generated during the lifecycle of a general process, product, or service on a macro level, the assumptions that must be made to estimate Scope 3 emissions in most categories do not enable credible, factual numbers. For more details about Scope 3 GHG emissions, please visit our website.

Building upon our decades-long and continuing efforts to reduce our GHG emissions, IBM's approach to meeting its net zero GHG emissions goal by 2030 is to minimize our GHG emissions by conserving energy and increasing the percentage of electricity we procure from renewable sources. This strategy positions IBM to reach residual emissions of 350,000 $mtCO_2e$ or less by 2030. At that time, we expect to rely on technology-based solutions to remove emissions in quantities equal or greater than our residual emissions. To further support this ambition, scientists from IBM Research are working to accelerate the discovery of materials for carbon removal.

Conservation and biodiversity

We continue to seek opportunities to reduce our use of natural resources and protect the biodiversity of our ecosystems.

Water conservation

Preserving water resources and safeguarding watersheds are important environmental protection priorities. IBM's first water conservation goal was established in 2000 and has evolved over time as our company has transformed into a hybrid cloud and AI platform company. Our current water use is primarily associated with cooling and humidity control at offices and data centers, domestic consumption at the workplace, testing of building fire protection systems, and landscape irrigation.

IBM's current water conservation goal is to achieve year-to-year reductions in water withdrawals at larger IBM locations and data centers in water-stressed regions. Using the World Resources Institute's Aqueduct Water Risk Atlas, we identify IBM locations in areas of "high" or "extremely high" baseline water-stress and use this, along with site-specific criteria, to determine the locations subject to our water conservation goal.

In 2020, water withdrawals at these IBM locations decreased by 6.7 percent versus 2019. A major factor contributing to this decrease was that many IBM employees worked from home for the majority of the year. However, several projects were implemented, resulting in better management of water used in building cooling tower systems and improved water use by humidification equipment for regulating environmental conditions in data centers. Other projects included the installation of automated water irrigation controls, maintenance of underground water pipelines, and installation of water-saving devices in our kitchenettes, restrooms and shower facilities.

Other actions that avoided water withdrawals included recycling treated wastewater for use in evaporative cooling systems and for landscape irrigation, as well as reusing water discharged from testing fire protection systems for landscape irrigation. In 2020, recycling of treated wastewater and on-site reuse of process water at these locations was equivalent to 3 percent of their total water use.

Annual reduction in water withdrawals at IBM locations in water-stressed regions

	2016	2017	2018	2019	2020
Percent reduction in withdrawals versus previous year	6.6%	2.9%	0.4%	2.0%	6.7%

IBM locations outside of water-stressed regions have also implemented water conservation measures to avoid water withdrawals. For example, our facilities in Bromont, Canada, and Vác, Hungary, implemented water reduction and reuse projects that decreased water withdrawals by approximately 5,800 cubic meters. Water conservation projects included the identification and repair of damaged underground water pipes, the reuse of process water, and upgrades and ongoing adjustments to building cooling and humidification systems.

Paper and paper/wood-based packaging

IBM has sustained a voluntary environmental goal for the responsible sourcing of paper and paper/wood-based packaging since 2002. The goal requires that the paper and paper/wood-based packaging directly procured by IBM must come from suppliers that source from sustainably managed forests where such sources exist.

Suppliers from whom IBM procures these commodities must either disclose their sources for paper and paper/wood-based packaging to IBM, or provide evidence that their sources have been certified by an accredited third-party certification program to be from sustainably managed forests. Requirements in support of this goal are incorporated into our standard supplier specifications for procuring paper and paper/wood-based packaging.

In 2020, over 99 percent (based on spend) of the paper and paper/wood-based packaging IBM directly procured worldwide came from suppliers that warranted that the source was derived from sustainably managed forests.

Percent of total worldwide spend meeting IBM's paper and paper/wood-based packaging goal

	2016	2017	2018	2019	2020
Percent of total spend meeting the goal	97.0%	98.4%	98.7%	99.6%	99.4%

Biodiversity

IBM has well-established, comprehensive environmental programs and goals that help conserve natural resources and protect biodiversity of our ecosystems.

Four IBM sites have achieved Wildlife Habitat Council (WHC) Conservation Certification for their wildlife habitat management and conservation education programs, including:

– IBM Corporate Headquarters, Armonk, New York

– IBM Research Triangle Park, North Carolina

– IBM Almaden Research Center, San Jose, California

– IBM Silicon Valley Laboratory, San Jose, California

Wildlife habitat management and conservation education programs at these sites range from maintaining nesting boxes for avian species and conducting semiannual bird counts to providing pollinator-friendly habitats and organizing employee nature and species identification walks.

In addition, IBM's Tutoia, Brazil, site is home to the highest vegetable garden in Latin America. The rooftop garden produces around 77 kilograms (kg) of fresh vegetables per month. All of the vegetables are used by the on-site cafeteria and any organic waste generated (~250 kg/ week) is subsequently used as compost for the garden.

IBM is not only fostering habitat management at its locations, but also sharing habitat management and conservation knowledge with employees. In March 2021, IBM leveraged its 30-year collaboration with WHC to develop education materials on how to create pollinator-friendly habitats and provided it to IBM employees worldwide. Employees can reference these geography-specific Conservation Pollinator Toolkits to learn what plants are suggested for their region, including planting instructions, to start their own pollinator gardens at home, in their communities or at work.

To continue to support ecosystem diversity and well-being, IBM set a new goal in April 2021 to plant 50 pollinator gardens at IBM locations globally by year-end 2023.

Pollution prevention and waste management

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. For waste that is generated, we focus on preventing pollution through a comprehensive, proactive waste management program. IBM's waste management (i.e., materials recovery and treatment) hierarchy defines our strategic management practice in order of preference as: (1) prevention, (2) reuse, (3) recycling, (4) recovery, (5) other treatment, and (6) land disposal.

Nonhazardous waste

IBM established its first voluntary environmental goal to recycle nonhazardous waste streams in 1988. Since then, we have expanded the goal to include nonhazardous chemical waste, end-of-life IT equipment from our operations, IBM-owned equipment that is returned by clients at the end of a lease, and nonhazardous waste generated by IBM at larger leased locations where IBM-generated waste can be tracked and reported.

In 2020, our operations generated 22,200 metric tons (MT) of nonhazardous waste worldwide. We sent 83.8 percent (by weight) of such waste for reuse, recycling or recovery— surpassing our previous goal of 75 percent. Materials recovered from nonhazardous waste and sent to be recycled included: paper and cardboard, metals, plastics, wood, construction debris, cafeteria waste and end-of-life IT equipment. In addition, IBM avoided the generation of 99 MT of waste in 2020 by reusing furniture across different offices, using demolition material for refurbishment projects, and by arranging the return of pallets to suppliers for reuse.

The amount of nonhazardous waste IBM sent for recycling in 2020 decreased by approximately 2.6 percent from 2019, mainly driven by a decrease in generation of more easily recycled end-of-life IT equipment, construction debris, cardboard and paper, and office waste. This was a result of reduced workplace activities during the COVID-19 pandemic. In addition, there was an increase in the amount of nonhazardous wastewater sludge sent for aqueous treatment (969 MT) which is not considered a means of recycling. The overall decrease in total nonhazardous waste generated by IBM last year was largely driven by fewer workers physically present at IBM locations due to the COVID-19 pandemic.

Since 2012, IBM has consistently sent more than 83 percent (by weight) of the total nonhazardous waste that we generate for recycling. In an effort to continue to improve its environmental performance, IBM set a new goal that built upon IBM's prior nonhazardous waste goal. The new goal is to divert 90 percent (by weight) of IBM's total nonhazardous waste from landfill and incineration by 2025 through reuse, recycling, composting, and waste-to-energy processes. Further, we will limit our use of waste-to-energy processes to no more than 10 percent (by weight) of the diverted waste.

In addition, as part of IBM's continual efforts to conserve natural resources and minimize waste, IBM set a goal to eliminate nonessential, single-use plastic items (e.g., cups, straws, cutlery, plates, carry bags, and food containers) from IBM-managed cafeteria operations globally by 2025.

IBM total annual nonhazardous waste quantity and recycling performance (metric tons x 1,000)

|	2016	2017	2018	2019*	2020
Total sent for recycling	38.4	32.4	30.6	27.4	18.6
Total generated**	44.5	36.9	34.2	31.7	22.2
Percent recycled (by weight)	86.3%	87.8%	89.5%	86.4%	83.8%

*2019 data has been adjusted to correct a calculation error in the figure reported in our 2019 IBM and the Environment Report.

**Nonhazardous waste does not include sanitary wastewater transported to public treatment systems.

Hazardous waste

IBM does not generate large quantities of hazardous waste. In 2020, IBM generated 1,422 MT of hazardous waste, of which 57 percent was reused, recycled, or sent for waste-to-energy recovery. Batteries (lead and other mixed chemistries) and activated carbon undergoing regeneration comprised the primary hazardous waste streams that were recycled or reused. When prevention, reuse and recycling are not available or practical, other recovery methods are utilized, such as waste-to-energy. Landfill and incineration are only used when recovery solutions are not available or when mandated by laws or regulations. For example, approximately 39 percent of the hazardous waste sent to landfills was de-watered contaminated sludge from industrial wastewater treatment which is required by law to be sent to a secure hazardous waste landfill.

IBM hazardous waste treatment methods

- Recycling and regeneration
- Landfill
- Incineration
- Other treatment
- Waste-to-energy
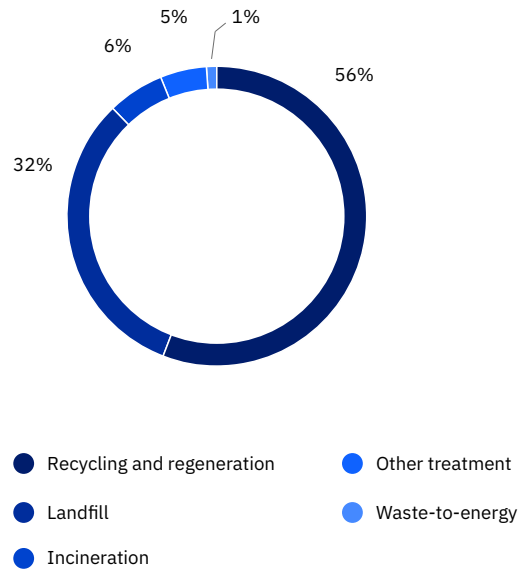
Design for the environment

IBM designs its products to be energy efficient, incorporate recycled content and environmentally preferable materials, and facilitate reuse and recycling at their end-of-life. IBM established its product design for the environment (DfE) program in 1991.

IBM DfE objectives include developing and marketing products that are increasingly energy efficient; incorporate recycled content and environmentally preferable materials and finishes; can be upgraded, refurbished, remanufactured and reused to extend product life; and can be dismantled, recycled and disposed of safely.

Product compliance

IBM has robust processes and state-of-the-art tools to help ensure our continued compliance with applicable environmental laws and regulations worldwide. In 2020, we identified 142 new or modified product-related environmental laws and regulations and acted upon them as necessary to meet their requirements. We also provided training materials to help IBM's suppliers deliver compliant parts and assemblies for use in our products. More information about product compliance processes is on our website.

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) tool and reviewed at various checkpoints during the development process. Compliance management tools, such as the Product Content Declaration for IBM Suppliers, support the assessments required for a complete PEP prior to product release.

Materials

At IBM, we take a precautionary approach to selecting materials that we use in our products and processes, endeavoring to select materials that are safe for their intended use and that have the least impact on the environment. Prior to using new chemicals or materials in processes or technologies, IBM requires those chemicals or materials to undergo a rigorous environmental, health and safety evaluation called an upstream chemical review. This has been a long-standing practice within IBM, and it is a key element of IBM's approach to chemical management.

Prior to placing a new IBM logo product on the market, IBM evaluates the product for its chemical emissions. This ensures that our products are safe during their intended use and do not emit volatile organic compounds or ozone at concentrations known to cause toxicity or discomfort.

Product energy efficiency

One of IBM's product energy efficiency goals is to improve the computing power delivered for each kilowatt-hour of electricity consumed for new server products as compared to equivalent, previous-generation products. IBM's latest POWER9™-based servers, the S922, S924 and E950, improved the work delivered per unit of power consumed—as measured by the Standard Performance Evaluation Corporation (SPEC) Server Efficiency Rating Tool (SERT)—by 30-60 percent over previous-generation POWER8®-based servers. IBM's next-generation mainframe enterprise platform, the IBM z15, uses 20-30 percent less power than a comparably configured IBM z14, and improves computing power delivered for each kilowatt-hour of electricity consumed by 31 percent.

IBM was a founding partner in the US Environmental Protection Agency's ENERGY STAR program, and we continue to certify eligible products to its criteria. In 2020, IBM had four POWER9-based servers eligible for ENERGY STAR, and all of them were certified. IBM also had three storage products certified to ENERGY STAR in 2020.

IBM Power Systems Servers
In August 2020, IBM announced its next-generation IBM Power 10 processor, built using 7 nanometer process technology. The processor is expected to deliver up to a 3x improvement in energy efficiency as compared to the IBM POWER9 processor.[1] We plan to roll out our first systems with these processors in the second half of 2021. Systems built around the IBM POWER® processor have a 30-plus-year year history of improved system performance. From the release of the first system using POWER1 processors in 1990 to the release of our POWER9-based servers in 2017, the IBM POWER family has consistently used processor-level innovation to improve performance and energy efficiency.

IBM Storage
IBM offers a broad range of storage products—including the IBM FlashSystem® 900, the Storwize® family, the DS8880 enterprise storage family, and tape systems—to address our clients' needs. These products are supported by software-defined storage and capacity optimization methods (COMs) through IBM Spectrum® Scale storage offerings 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 deduplication, and storage virtualization. These capabilities can reduce the storage hardware and energy footprint as well as the capacity required to accomplish a given storage task.

For more information, please see how IBM FlashSystem Technology and IBM Spectrum Storage Suite are helping clients reduce their environmental footprints.

IBM Supercomputers
In March 2020, IBM spearheaded the development of the COVID-19 High Performance Computing Consortium along with the White House Office of Science and Technology Policy and the US Department of Energy. The consortium, chaired by Dario Gil, IBM's Senior Vice President and Director of IBM Research, brings together the federal government, industry, and academic leaders who are volunteering free compute time and resources in support of COVID-19 research. Researchers working on nearly 100 projects related to COVID-19 around the globe have had free access to some of the world's most powerful computers in the past year. Collectively, the group helped researchers worldwide gain access to more than 600 petaflops of computing capacity, in addition to more than 6.8 million compute nodes, such as computer processor chips, memory and storage components, and over 50,000 graphics-processing units. More details on the COVID-19 High Performance Computing Consortium can be found on our website.

[1] 3x performance is based upon pre-silicon engineering analysis of Integer, Enterprise and Floating Point environments on a Power 10 dual socket server offering with 2x30-core modules vs. POWER9 dual socket server offering with 2x12-core modules; both modules have the same energy level.

Product packaging

IBM has focused on the environmental attributes of its product packaging since the late 1980s. A priority is to design products which can be shipped with a minimum amount of packaging materials. Moreover, whenever possible, we choose packaging materials that have the least adverse impact on the environment, collaborating with suppliers to use recycled content and recyclable materials, and to promote reuse.

Our corporate environmental requirements for product packaging are embedded in various engineering specifications and procurement documents, which extend their reach beyond IBM to include our supply chain and other business partners.

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 that do not conform to an IBM specification or other requirement must submit and implement improvement plans to close out the identified issues within an agreed-upon timeframe.

Reusable crate packaging for IBM Z® mainframes
The z14 and z15 crates were redesigned in 2019 to use less wood, metal and plastic, reducing the total weight by 27 percent from the previous version. In 2020, when the

redesigned crate was fully deployed, this change saved 163 metric tons (MT) of material and approximately $462,000 in transportation costs.

In addition, because the crate was designed to be robust, it can be reused for domestic shipments in the US and for shipments to Canada, increasing its useful life. Each crate typically lasts up to five shipments, avoiding the purchase of 136 MT of wood crates per year, with a corresponding savings of $224,000.

Hybrid light weight pallet for shipment of IBM Power Systems and IBM Storage products
Working with our suppliers, we designed a hybrid pallet that replaces the top deck of a wooden pallet with lightweight paper materials. This change reduced the weight of the pallet by 25 percent while maintaining its structural integrity during transportation and handling. IBM began a phased rollout in 2018, starting with IBM Power Systems products, and completed the deployment for IBM Storage products in 2020. The hybrid pallet has avoided the use of 250 MT of wood per year with a corresponding savings of $1 million in transport costs.

Reducing plastic packaging waste

Plastic accounts for approximately 13 percent (by weight) of the product packaging put on the market by IBM. The primary plastic packaging materials used with IBM logo products are: polyethylene (PE) and low-density polyethylene (LDPE), extruded polyethylene cushions, high-density polyethylene (HDPE), polyurethane (PU) and multilayered/composite plastic foil packaging. IBM does not use expanded polystyrene (EPS) or expanded polyethylene (EPE) foams to protect our logo products.

IBM's product packaging engineers minimize waste associated with plastic packaging by eliminating non-essential plastics and increasing the use of recycled content or other materials that can be commercially recovered and recycled. To formalize this commitment, IBM set a new goal to eliminate nonessential plastic from the packaging of IBM logo hardware by year-end 2024. Further, essential plastic packaging must be designed to be 100 percent reusable, recyclable, or compostable; or incorporate 30 percent or more recycled content where technically feasible.

For additional information on IBM's packaging programs, please visit our IBM and the Environment website.

Product reuse and recycling

IBM develops products with consideration for their reuse, recyclability and recoverability to extend product life and minimize the amount of used product and valuable materials sent to landfills or for incineration.

IBM began offering product takeback programs for clients in Europe in 1989 and has extended and enhanced these activities over the years. Today, IBM's Global Asset Recovery Services (GARS) is responsible for remarketing pre-owned and end-of-lease IBM assets externally, reutilizing and redeploying assets internally, and providing an environmentally responsible process for the disposal of scrap IT equipment.

When assets cannot be directly reused, they are remanufactured or refurbished using rigorous processes and original manufacturing standards. Assets may also be reconfigured to meet specific client requirements. Parts are harvested for reutilization, as well as sold externally. These practices extend the life of IT equipment and reduce the need to manufacture new products. After all reuse and remarketing opportunities are exhausted, remaining components are sent for materials recovery and recycling.

IBM's environmental goal is to reuse or recycle end-of-life products such that the amount of product waste sent by our operations to landfills or to incineration facilities for disposal does not exceed a combined 3 percent by weight of the total amount processed. In 2020, IBM's global product end-of-life management operations processed over 16,900 MT of end-of-life products and product waste. More than 96 percent (by weight) was recycled, resold, or reused, 3 percent was sent to waste-to-energy, and less than 1 percent was sent to landfill or incineration operations for disposal.

Over the last 25 years since IBM began reporting these results in our annual environmental reports, IBM global operations have processed 1.1 million metric tons of product and product waste (2.4 billion pounds).

IBM product end-of-life processing methods

3.2%   3%   0.5%

33.7%   59.6%

● Recycled   ● Waste-to-energy
● Resold   ● Landfill or incineration
● Reused
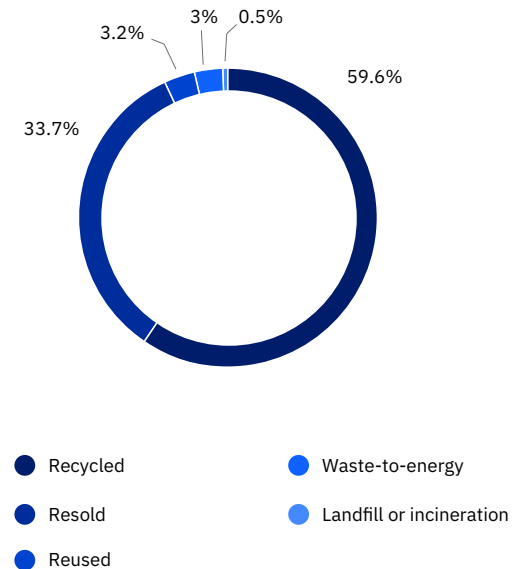
Supply chain

IBM is committed to doing business with environmentally responsible suppliers. We work with our suppliers globally to enhance their ability to manage environmental responsibilities and encourage them to report transparently on their environmental impacts.

Environmental requirements for IBM suppliers

Since 2010, IBM has required that 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. In summary, we require IBM suppliers to:

– 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 management 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 can be found on IBM's Global Procurement website.

New supply chain environmental goals

In April 2021, IBM announced two new supply chain goals. One goal will require key suppliers in emissions-intensive business sectors to set an emissions reduction goal by 2022, addressing their Scope 1 and Scope 2 greenhouse gas emissions, that is aligned with scientific recommendations from the Intergovernmental Panel on Climate Change to limit Earth's warming to 1.5 degrees Celsius above pre-industrial levels. This new goal deepens our engagement with those suppliers who can have the greatest impact on reducing emissions across IBM's supply chain by requiring them to set more aggressive goals. Emissions-intensive business sectors which are covered include:

– Production suppliers of components, parts, and assemblies incorporated into IBM hardware products.

– Technology products and maintenance suppliers for IT hardware equipment purchased for internal use, for use in IBM data centers on behalf of clients, or for resale to clients.

– Logistics suppliers associated with downstream transport of products manufactured by IBM.

– Hotel and airline travel suppliers.

IBM does not include suppliers in the utility and buildings sectors because our GHG emissions reduction goal already captures their emissions that are relevant to IBM's operations.

Another goal is to convene an annual Sustainability Leadership Symposium to recognize progress and achievement among suppliers in emissions-intensive business sectors across applicable areas of environmental stewardship.

We engage with our suppliers not only by setting specific environmental requirements, but also by helping them drive continual improvement on their own. IBM does not have suppliers that are contract manufacturers doing the vast majority of their work for IBM or as an extension of IBM. In fact, IBM's business does not represent more than 10 percent of any single production supplier's revenue. In addition, IBM may change the suppliers from which it procures at any time.

IBM believes each supplier must build its own capacity to succeed for the long term regardless of whether or not IBM continues to procure from it. That's how we will genuinely improve the sustainability of our supply chain. We work with suppliers with that objective in mind, and in that spirit, we don't wish to take credit for a supplier's accomplishment as our own. Instead, we celebrate our suppliers' successes as their own.

Supplier Code of Conduct

IBM is a founding member of the Responsible Business Alliance (RBA), a nonprofit industry group that helps its members support continuous improvement in the social, environmental and ethical responsibility of their supply chains. We require our suppliers to adhere to the RBA Code of Conduct, which contains environmental requirements as well as provisions on labor, health and safety, ethics, and management systems. We communicate our requirement for RBA Code compliance at the initial stages of supplier onboarding. Each year, a subset of our suppliers is assessed using the RBA's Validated Audit Process to verify their compliance with the code.

For more information on IBM's supplier audit requirements and results, please see our 2020 Corporate Responsibility Report.

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

IBM has additional environmental requirements for suppliers who execute processes for which IBM has specified or furnished chemicals or process equipment; provide hazardous waste treatment and/or disposal services; or recycle and/or recover end-of-life IT products. Requirements are documented in our internal procedures, as well as in our contracts with these suppliers, and include those related to chemical management, waste management, spill prevention, operational and compliance control, health and safety, and downstream supplier management and reporting. Suppliers are managed to the same high standards, wherever in the world they operate.

Hazardous wastes are treated, recycled or disposed of at IBM-approved supplier facilities within the country where the wastes are generated, whenever possible. If there are no suppliers in a country that meet IBM's environmental requirements, the waste is shipped to facilities in other countries where those requirements can be met—in compliance with country laws and regulations and in accordance with international treaties. IBM does not ship waste from countries that are members of the Organisation for Economic Co-operation and Development (OECD) to countries that are not members.

For more information on IBM's requirements for suppliers managing chemicals, wastes and end-of-life equipment, please visit our IBM and the Environment website.
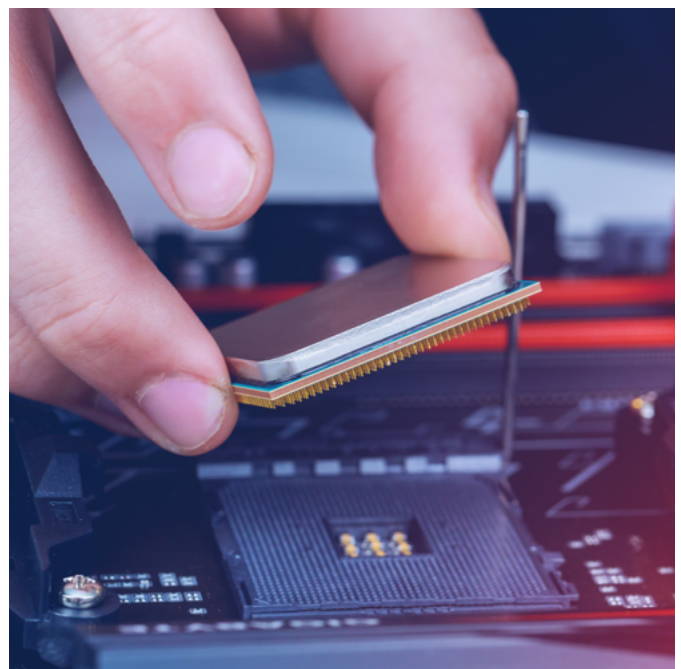
Value chain

As one of the world's premier innovation companies with the world's preeminent private-sector research organization, IBM has long believed the way it can most contribute towards environmental sustainability is by helping its clients transform their operations using the most advanced information technologies. Today that can be done more than ever before. Organizations of all kinds, whether they are private-sector companies or agencies of government, can now leverage vast quantities of unstructured data using tools like analytics software; IoT; AI (i.e., machine learning and natural language processing); and blockchain to extract new meaning, strengthen transparency, and make better decisions.

IBM has called this "innovation that matters" and "good tech." We want to see the most advanced information technologies applied to solving global problems—including those of environmental sustainability—which matter the most to the

world's people. This desire matches the intent of the UN Sustainable Development Goals. It is different than using technology just to further advance consumer convenience, as appealing and valuable as that may be.

Accordingly, IBM has featured examples in its annual reports, including this one, of how its clients are using information technology for environmental sustainability. Consistent with this, we have established a new goal to document 100 client engagements or research projects by 2025 in which IBM products, capabilities and/or solutions have enabled demonstrable environmental benefits.

Remediation

At IBM, we take swift actions to clean up environmental contamination found at our former and some current sites, and we are committed to taking proactive actions to prevent future contamination.

When groundwater contamination was first discovered at one of IBM's sites in 1977, the company voluntarily initiated groundwater monitoring at its manufacturing and development locations worldwide. Today, IBM has 2,611 monitoring wells and 113 extraction wells in place at its current and former locations. (Companies which were founded during today's era of global supply chains, rather than having once been a more vertically integrated manufacturer during prior decades such as the 1940s, 1950s, and 1960s, may not have these circumstances.)

In 2020, IBM operated remediation systems that removed approximately 13,000 pounds of solvents from groundwater and soil vapor at three currently operating IBM locations and 12 former IBM locations. IBM also has financial responsibility for remediation at two additional former locations.

Under the US Superfund law, IBM is involved in remediation activities at some third-party 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 a site, regardless of whether the site's operations and/or the shipments of waste to that site were legal, or even best practices, at the time. As of year-end 2020, IBM had received notification (through federal, state or private parties) of its potential liability at 116 such sites since the beginning of the US Superfund program in 1980. At most of these sites, IBM has either resolved its liability or has demonstrated that it has none. Currently, IBM is participating in remediation activities or bears some financial responsibility at 19 Superfund sites.

When an environmental investigation and/or remediation at a site for which IBM has responsibility is probable, and the costs for future activities can be reasonably estimated, IBM establishes financial accruals for loss contingency. As of December 31, 2020, the total amount IBM accrued for all such environmental liabilities and associated activities was $266 million.
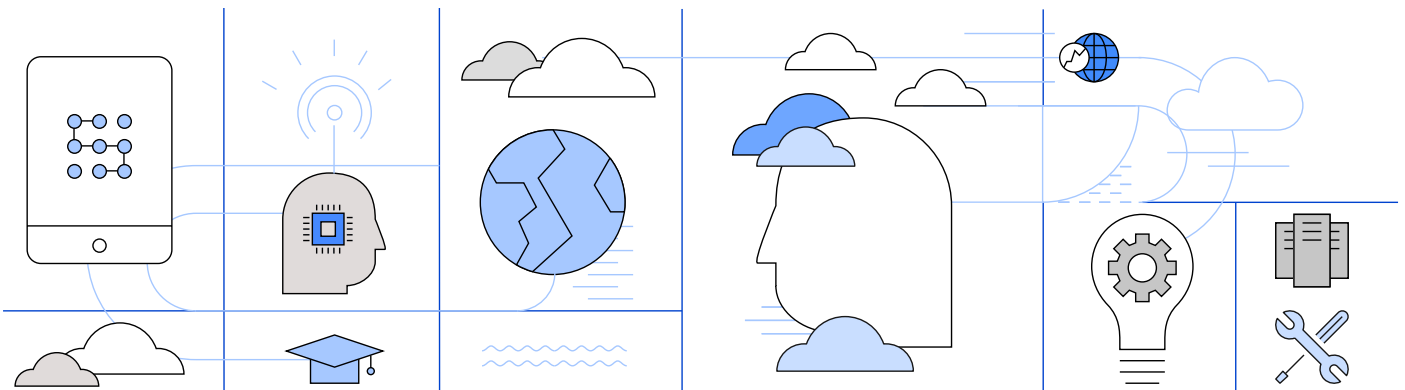
Appendix

Awards and recognition

External recognition

Best Workplaces for Commuters
2021 list includes the following IBM facilities: Austin, TX; Boulder, CO; Learning Center, Armonk, NY; North Castle, NY; Poughkeepsie, NY; Research Triangle Park, NC; and Silicon Valley Laboratory, CA

City of Austin, Texas, Green Business Leaders Program
Platinum level for IBM's Austin facility

Colorado Department of Public Health and Environment, Environmental Leadership Program
Gold Leader for IBM's Boulder facility

Content Marketing Institute
2020 Content Marketing Award for Best Series of Articles, recognizing "Forecast: Change" from The Weather Company

EcoVadis
2021 Platinum-level sustainability rating

Hong Kong Environmental Campaign Committee
Class of Excellence Wastewi$e Label for IBM Hong Kong

Institute of Directors, India
2020 Golden Peacock Global Award for Corporate Social Responsibility

Smart Energy Decisions
2020 Innovation Award in the Utility Partnership category recognizing IBM, NextEra Energy and Xcel Energy enabling onsite renewables at IBM's Boulder, CO, facility

Telecommunications Industry Association
2020 Global Sustainability Award (co-winner) for the Corporate category

Internal recognition:
IBM Chairman's Environmental Award

IBM established its Chairman's Environmental Award Program in 1991 to encourage leadership and recognize achievement and progress in environmental affairs by IBM's internal organizations.

For nearly 30 years, the IBM Chairman's Environmental Award has promoted the contributions of IBM's business units toward the objectives of IBM's corporate environmental policy. Recipients are selected based on their leadership, innovation and results.

IBM's Watson Advertising and Weather organization received the 2020 IBM Chairman's Environmental Award. A few highlights of their environmental accomplishments follow:

– Launched the IBM Global High-Resolution Atmospheric Forecasting System which not only enables smarter decisions for the environment by farmers, airlines, energy companies, and governments, but which also democratizes the most accurate weather forecasting by making it available to people in the developing world. It provides updated forecasts with 3 km resolution every hour versus previous forecasts with 10-15 km resolution updated every 6-12 hours.

– Produced several award-winning stories and series that highlight the effects of climate change on local communities, including The United States of Climate Change (2017), Exodus: The Climate Migration Crisis (2018), Collateral (2018), and Hidden Cost: Our Laws Have Not Kept Up with the Climate (2019). External recognition included two Emmy Awards and the Society of Professional Journalists' Delta Sigma Chi Award. (Stories on weather.com are available in the US only)

– Inspired action through "Forecast: Change," an initiative by The Weather Channel, the consumer arm of The Weather Company, in partnership with The Nature Conservancy and charity: water, to help combat freshwater scarcity around the world. This work helped to provide over 100 million liters of clean water for 50 different communities while strengthening our brand.

The Weather Company, part of IBM Watson Advertising and Weather, creates the world's most accurate forecast so that people, businesses and governments everywhere can make better decisions given the impacts of weather, especially climate change, in our daily lives.

While only one organization is selected each year to receive the IBM Chairman's Environmental Award, the competition highlights the company's worldwide commitment to environmental leadership. It also ensures that the leader of every major IBM business unit regularly assesses the unit's contribution to the environment.
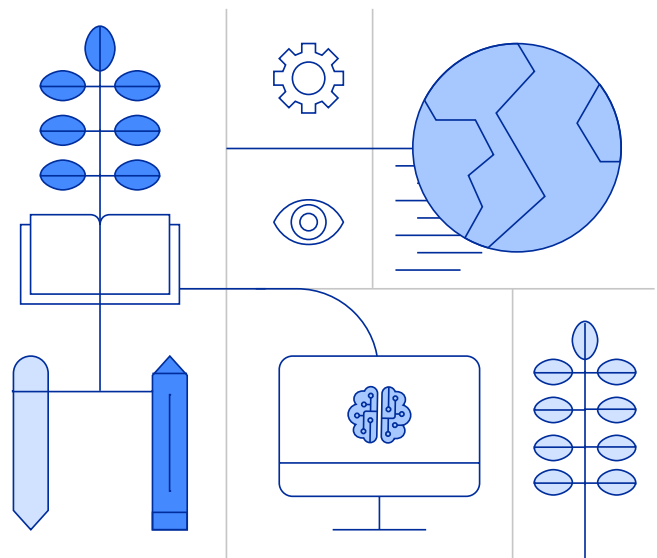
Environmental goals and results

The goals included below were those in effect during 2020. For our current goals, see the feature in this report named Driving progress with 21 goals for environmental sustainability.

	2016	2017	2018	2019	2020
Energy and climate change					
Energy conservation as % of total energy use (goal 3%)	4.8	3.6	3.3	3.2	3.5
IBM total energy consumption in megawatt-hours	4,912,714	4,845,695	4,666,514	4,455,805*	4,118,636
Renewable electricity procurement as % of total electricity consumption (goal 55% by 2025)	37.0	39.0	37.9	47.5*	59.3
CO_2 emissions reduction as % of 2005 baseline CO_2 emissions (goal 40% by 2025)	29.2	30.1	32.2	39.7	56.6
IBM total operational CO_2 emissions in metric tons	1,436,464	1,417,985	1,375,027	1,222,623*	880,188

Note: Energy and emissions goals and reporting cover all activities taking place in IBM-owned or leased facilities. These facilities include co-location data centers. Renewable electricity procurement includes contracted purchases and renewable electricity which automatically comes to IBM via routine grid power. CO_2 emissions reduction data is adjusted for acquisitions and divestitures.

*2019 data has been adjusted to correct a calculation error in figures reported in our 2019 IBM and the Environment Report.

	2016	2017	2018	2019	2020
Water conservation					
% annual reduction in water withdrawals at data centers and other large IBM locations in water-stressed regions (goal year-to-year reduction)	6.6	2.9	0.4	2.0	6.7

	2016	2017	2018	2019	2020
Nonhazardous waste recycling					
% by weight sent for reuse, recycling or recovery (goal 75%)	86.3	87.8	89.5	86.4*	83.8

*2019 data has been adjusted to correct a calculation error in the figure reported in our 2019 IBM and the Environment Report.

	2016	2017	2018	2019	2020
Product reuse and recycling					
% by weight of total IT product waste sent by IBM's product end-of-life operations to landfill or incineration for treatment (goal not to exceed a combined 3% by weight)	0.6	0.7	0.7	0.8	0.5

Product energy efficiency

The IBM z15 improves computing power delivered for each kilowatt-hour of electricity consumed by 31% versus the IBM z14.

IBM's next-generation Power 10 processor, announced in August 2020, is expected to deliver up to a 3x improvement in energy efficiency as compared to the IBM POWER9 processor. We plan to roll out our first systems with these processors in the second half of 2021.

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