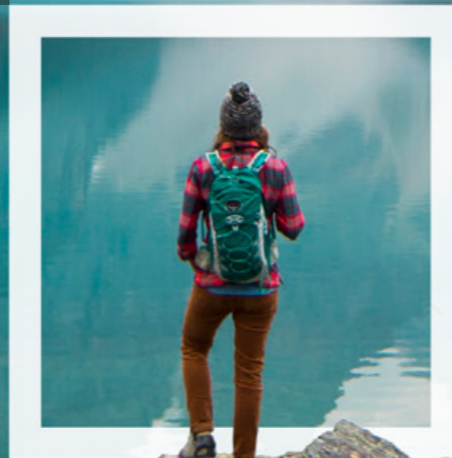




2020 Environmental Sustainability Report

A Year of Action



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-  Link to web pages
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Carbon negative
1.3M
metric tons of carbon removal procured


Water positive
20
water replenishment projects funded to date

Zero waste
60K
metric tons of waste diverted from landfills

Ecosystems
10
petabytes of environmental data now available

For the best experience, we recommend using the free software Adobe Reader, or iBooks if viewing on an Apple mobile device. Interactive functionality may be limited when viewed in a web browser.

This report is part of the Microsoft CSR and sustainability reporting suite. Access all our reports at:

 Find out more here

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Foreword

Letter from Brad Smith

In January 2020 we announced a bold commitment and detailed plan to be carbon negative by 2030 and to remove from the environment all the carbon the company emitted since its founding by 2050.

Over the past year, we built on this pledge by announcing a series of commitments to be water positive by 2030, zero waste by 2030, and to protect ecosystems by developing a Planetary Computer.

When we set out on our carbon negative journey a year ago, we knew the climate crisis was urgent and required immediate attention. No one had yet realized that the world would be facing a global pandemic and long-term shutdown just a few months later. Over the past year, we've addressed both. COVID-19 is the crisis of the year, addressing climate change is the crisis of the decade.

We grounded our sustainability strategy and commitments in the belief that technology can help solve the world's biggest challenges. We began by asking three simple questions:

1. Are we doing enough?

The answer was simple: No. Microsoft has focused on sustainability for more than a decade, and we are proud of our achievements. But those of us who can afford to move faster and go further should do so. Using technology, we can do just that, including minimizing the environmental impact of our own operations and ensuring the resilience of our infrastructure to climate change. Importantly, we can extend beyond our walls to help build the broader solutions the world requires.

2. Can we make a difference?

We believe that by focusing on all the ways we can drive change, we can make an outsized impact on climate change. We, and other organizations that are serious about an environmentally sustainable future, need to pull all levers of influence we have—our operations and as a customer, supplier, investor, employer, policy advocate, and partner in innovation to customers, organizations, and institutions around the world.

“We believe that by focusing on all the ways we can drive change, we can make an outsized impact on climate change. We, and other organizations who are serious about an environmentally sustainable future, need to pull all levers of influence we have.”

Brad Smith, President

2050

Microsoft will remove from the environment all the carbon the company has emitted since its founding by 2050.



Microsoft can't solve the world's environmental challenges alone, but we can play a significant role in driving a broader societal transformation if we use our positions of influence and our technologies to effectively bring others along with us on our sustainability journey.

3. What should we do?

This is what we focused most on in 2020. It required building a new sustainability vision and strategy for Microsoft through a series of industry-leading commitments to be a carbon negative, water positive, zero waste company by 2030, and to develop a new Planetary Computer to better monitor, model, and manage the world's ecosystems. We're making a bold bet to address climate change and the world will need to too. To help do that, we want to become the world's leading technology provider of sustainable solutions.

2020 Report

In Microsoft's first annual sustainability report, we look back at how and why we made our commitments, details about them, progress to date, and key lessons we have learned. We intend to not only share our successes, but also share our challenges. That is why, in each section, we've also included additional information and resources to help others accelerate their progress towards a prosperous, just, and environmentally stable future.

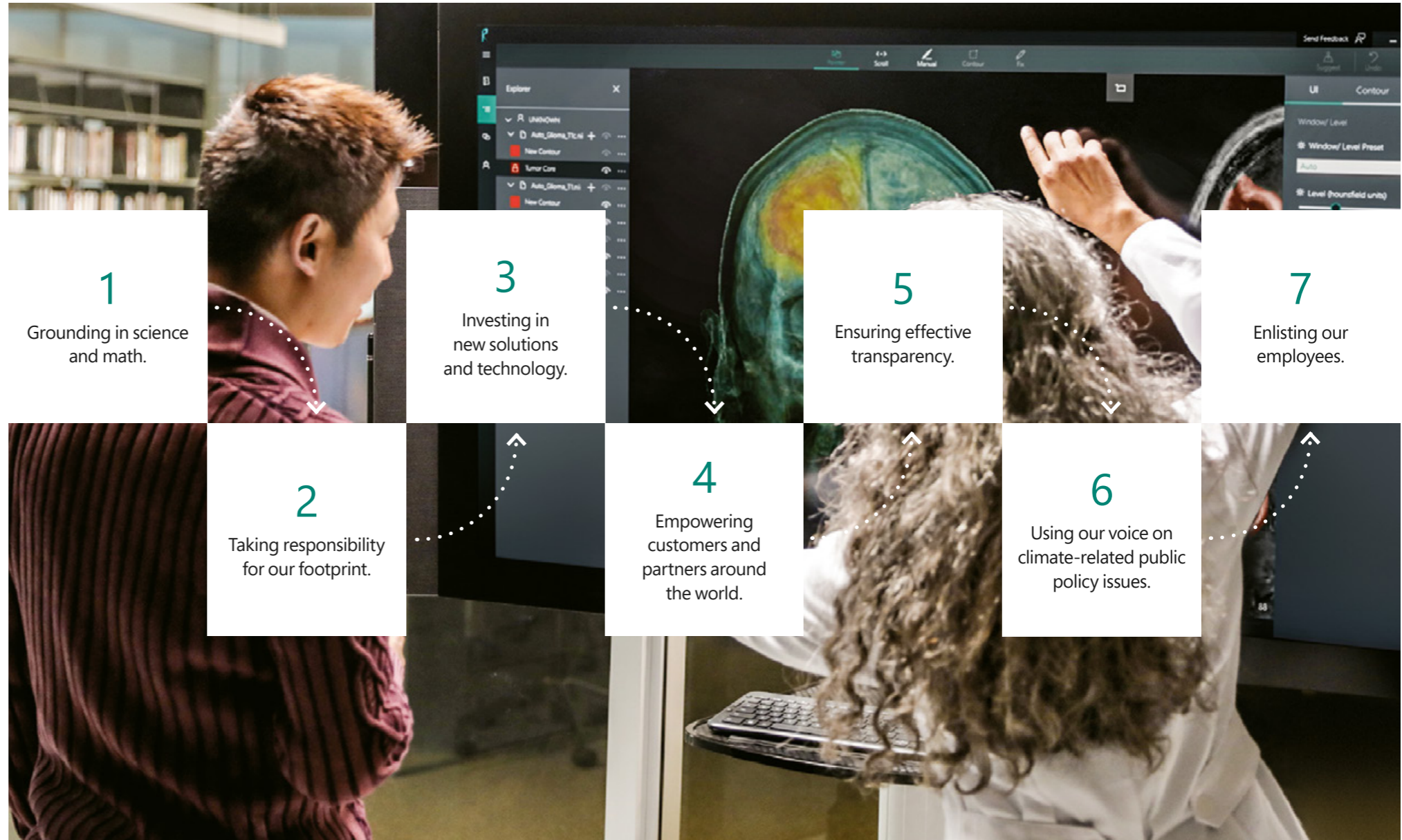
Brad Smith, President

How we work

Taking a principled approach

Whenever Microsoft takes on a new and complex societal issue, we strive first to learn and then to define a principled approach to guide our efforts. In 2020, we did the same with environmental sustainability.

Our seven principles



How we work (continued)

Defining focus areas

We focus on four areas—carbon, water, waste, and ecosystems—where we can scale by minimizing the negative impacts of our operations and maximizing the positive impacts of our technology.

While we start with our operations, our strategy expands beyond our four walls by ensuring those changes also benefit the communities in which we operate and flow into our product strategy.

Through technology adoption by customers and partners, we can drive positive impact across the globe, accelerated by our investments, engagement in policy, and commitment to innovation.



How we work (continued)

Putting sustainability into practice

We support each of our four focus areas with five strategic pillars. They are:

Operations

We will take responsibility for our carbon, water, waste, and land footprints across the way our products and facilities are sourced, manufactured, operated, and managed at end-of-life, including our supply chain.

Products and services

We will develop new technology and services driven by data, AI, and digital technology to power environmental sustainability.

Customers and partners

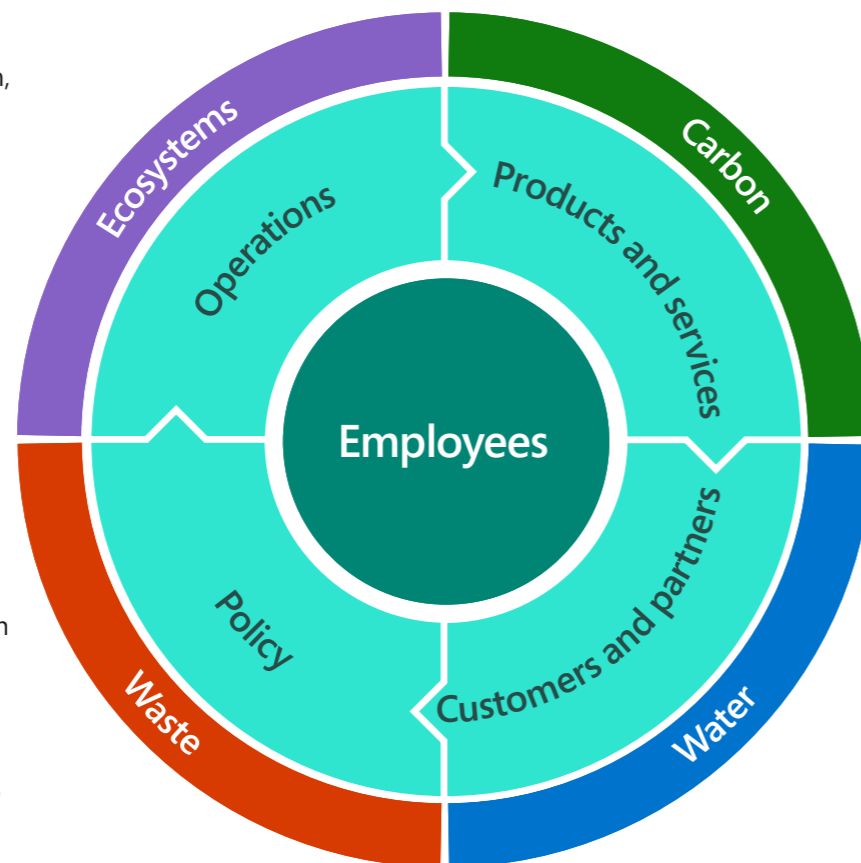
We will help our customers and partners around the world reduce their carbon, water, waste, and land footprints through our learnings, technology, and services.

Policy

We will use our voice on climate-related public policy issues. We will support new public policy initiatives to accelerate carbon, water, waste, and ecosystems opportunities.

Employees

We recognize that our employees are the most important asset and resource in advancing innovation and will create new opportunities for them to contribute to our efforts.



Driving global impact

We also have programs that extend across all five pillars to drive global impact, including investment and climate science.

Climate Innovation Fund (CIF)

CIF will invest \$1 billion over four years to help scale up existing climate technologies and invest in new technologies that currently don't exist or are too niche for broad adoption. This work also supports Microsoft sustainability commitments in carbon, water, waste, and ecosystems. As we consider investments, we prioritize those that:

- Provide measurable climate impact in our four areas of focus.
- Bring additional capital to underfunded markets where the capital need for climate solutions is not being met.
- Ensure developing economies and underserved communities benefit from climate solutions.
- Align to Microsoft's core business and that of our customers.

[Find out more here](#)

AI for Earth

We believe that there is a massive opportunity for the technology sector to improve the way we manage the Earth's natural resources. In 2017, we launched Microsoft's AI for Earth program to put cloud and AI technology into the hands of the world's leading ecologists and conservation technologists, and organizations around the world that are working to protect our planet. The program increases access to AI technologies through grants, provides education on cloud and AI to increase collaboration through our community, and fuels innovation through research and strategic partnerships. So far, we've empowered over 700 organizations in more than 100 countries around the world working on game-changing environmental innovations.

[Find out more here](#)

Sustainability science

Our sustainability work is guided by science. We believe that overcoming society's biggest sustainability challenges will require working at the intersection of technology and the natural and social sciences. We have a growing team of sustainability scientists working with researchers, businesses, governments, and non-profit organizations around the world to help Microsoft, its customers and partners, and the world to build a more environmentally sustainable future. This involves creating new knowledge and tools that enable improved management of environmental resources and mitigation of risks from local to global scales.

2021 Outlook

A look ahead from Lucas Joppa

This must be a decade of ambition paired with action. At Microsoft, we appreciate the urgency, responsibility, risks, and opportunities ahead.

For Microsoft to do well, we need the world to do well. This belief is why our mission is to empower every person on the planet to achieve more, and why our CEO, Satya Nadella, stated, “the purpose of a corporation is to find profitable solutions to problems of people and the planet.”

Unfortunately, 2020 brought an array of new challenges to this already complex work. COVID-19 has devastated human lives in every corner of the globe, while climate change caused unprecedented environmental and economic damages.

While vaccines are becoming available as a solution for COVID-19, solutions for climate change will require deploying a host of different tools to combat the many drivers of climate change. For the survival of people and our planet, this is a battle we can’t afford to lose.

This will require the dedication of individuals, organizations, and governments, all focused on stabilizing Earth’s climate and properly managing its natural resources.

We have a limited amount of time to accomplish what will be the most significant behavioral and technological societal transformation in modern human history. By 2030, society must be well on its way to mitigating and adapting to rapidly changing climates, ensuring resilient water supplies, reducing the amount of waste we generate, and reversing the ongoing and catastrophic degradation of ecosystems while halting the extinction of species.

That is why this must be a decade of ambition paired with action.

At Microsoft we appreciate the urgency, responsibility, risks, and opportunities ahead. That is why a little over a year ago we began a process to transform our company’s work on sustainability to better align with the scope, scale, and speed of the world’s environmental challenges and yet-to-be created solutions.

“Addressing six enabling conditions will ultimately dictate the success or failure of the sustainability agenda this decade—for Microsoft and the world.”

Dr. Lucas Joppa, Chief Environmental Officer



2030

By 2030, Microsoft will remove more carbon than it emits. By 2050, we will remove all historical emissions.

Six enabling conditions

As we worked to set and implement our commitments to become carbon negative, water positive, and zero waste and to deploy a Planetary Computer, some of these global challenges came into sharp focus. There is a suite of enabling conditions that must exist for Microsoft and the world to effectively and efficiently achieve a more sustainable and just future.

The enabling conditions that we must address inside Microsoft are clear—broadening and strengthening our governance and accountability frameworks while building a culture of sustainability investment and innovation. But it will be the creation of six enabling conditions outside Microsoft that will ultimately dictate success or failure of the sustainability agenda. Resolving or improving these conditions will ensure a coherent, coordinated, cost-efficient approach to individual and collective action on climate change.

Risk recognition

Without a holistic assessment of risk, it is difficult for companies to efficiently manage their sustainability challenges.

Unfortunately, the scale and societal interdependencies of climate risk make a comprehensive assessment difficult. While many important efforts are underway, there is not yet an exhaustive framework for risk assessment for businesses.

By 2030, a widely adopted and comprehensive risk framework will need to be in place to ensure every business can fully integrate environmental risk at the core of their corporate governance process.

2021 Outlook (continued)

Standards setting

Standards and globally accepted definitions drive efficiency, clarity, and interoperability. For corporate sustainability commitments to be meaningful, we must ensure that everyone is working from the same taxonomy. Without standards we won't be able to compare one company's net-zero commitment to any other, and more time will be spent trying to assess whether a commitment is meaningful than will be in making meaningful progress on sustainability. If we can't do basic math on carbon numbers from different sources because they were created using different methods, then how will we be able to track progress on emissions reductions and carbon removal, or incentivize suppliers or customers to improve their impact? Solving this means that society needs to make rapid advances on agreeable sustainability standards.

Companies are used to coming together within a sector to collectively advance industry standards. By well before 2030, we must be operating in a world where companies have come together across sectors to agree on common sustainability units and methods of measurement.

Data digitization

Organizations' sustainability data systems are often analog, siloed, and one-off—if they exist at all. Digital monitoring and recording systems of carbon emissions, water consumption, waste generation, and ecosystem health at an operational and planetary level will be the foundation upon which the private sector will ensure transparency, meaningfully inform policy advances, and unleash the creativity of markets to help build new solutions.

By 2030, we must be operating in a world where digitized and standardized sustainability data are the platform that allows society to stitch together the incredible dimensionality of the sustainability landscape from the bottom up, and analyze them from the top down.

More needs to happen

By 2030, we must progress on the six enabling conditions:

1. Risk recognition

A widely adopted and comprehensive risk framework will need to be in place to ensure every business integrates environmental risk at the core of their corporation's corporate governance process.

2. Standards setting

By well before 2030, we must be operating in a world where companies have come together across sectors to agree on common sustainability units and methods of measurement across carbon, water, and waste.

3. Data digitization

Digitized sustainability data must become a platform that allows society to stitch together the dimensionality of the sustainability landscape from the bottom up, and analyze them from the top down.

4. Innovation investment

Most climate investments will need to fit within a well-structured and accepted framework that aligns investment vehicles along an appropriate risk-tolerance spectrum, targeted on the most impactful areas.

5. Market maturation

Carbon offset and removal, water replenishment, and ecosystem service markets can supply greater and growing demand, transparently and with standard insurance guarantees.

6. Policy progression

A globally coordinated policy regime should be in place that limits emissions in line with a 1.5°C future, while respecting political sovereignty and the cross-boundary nature of the Earth's life support systems, and does so with a focus on the need to equitably share these resources across cultures and communities.

2021 Outlook (continued)

Innovation investment

Not all solutions to our sustainability challenges are available today, and those that are available are often early-stage, too expensive, or don't currently scale. There is already a large and growing amount of capital starting to flow into the climate and sustainability markets to help with these issues, but little agreement on the framework that should guide these investments. This splinters the solutions market, makes it difficult to understand investment gaps, and disempowers investors to quantify both financial and environmental returns on investment.

Attracting the amount of capital required and deploying it optimally means that by 2030, most climate investments will need to fit within a well-structured and accepted climate investment framework that places the large constellation of investment vehicles along an appropriate risk-tolerance spectrum while thoughtfully targeting the most impactful areas of innovation.

Market maturation

Meeting the world's sustainability goals will require the procurement of new solutions, particularly in areas like carbon reduction and removal, and water replenishment, at levels many orders of magnitude greater than they exist today. If these markets don't mature rapidly, they will be overwhelmed by the demand that will be placed on them in the coming years. Current sustainability markets, such as those for avoided emissions offsets or carbon removal credits, are opaque and poorly understood by many current customers and most future ones. Standard contracting templates, aggregating demand through buyers' alliances, and well communicated pricing and delivery are all advances that will mature these markets and ready them for the onslaught of demand that will occur in the final years of this decade and beyond.

By 2030, we must be operating in a world where carbon offset and removal, water replenishment, and ecosystem service markets can supply demand many orders of magnitude greater than today and do so with transactional transparency and standard insurance and indemnification guarantees.

Policy progression

Policy action is the ultimate enabling condition to move the world beyond the voluntary action of a few corporations, and into a world where this work is required of all organizations. We've seen a tremendous amount of corporate action in the past several years. Yet still only around 5 percent of the world's largest companies represented by the Global Fortune 500 have pledged to become net zero. We cannot depend on the leaders to bring up the laggards—that is what government action must do.

By 2030, we need to be operating under a comprehensive and globally coordinated policy regime that limits emissions in line with a 1.5°C future, and holistically monitors and manages humanity's deposits and withdrawals from the natural systems that support our species. This must be done in a way that respects the political sovereignty of nations around the world but respects the cross-boundary nature of the Earth's life support systems, and the need to equitably share these resources across cultures and communities.

We will act in accordance with what we think needs to be done today to create the world we need to be operating in by 2030.

We are more convinced than ever that Microsoft, and the rest of the world, is up to the task.

The coming years of action

As you will see in the pages of this report, we have begun work on all six enabling conditions. Sometimes our actions may seem counterintuitive, and sometimes we will be wrong. But over the next decade, our mentality will stay the same—we will act in accordance with what we think needs to be done today to create the world we need to be operating in by 2030.

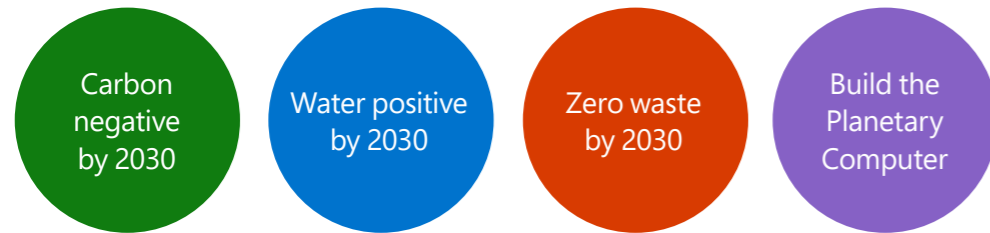
When we announced our carbon negative commitment a year ago, we likened it to a moonshot—a grand goal that will require exceptional organizational focus, an integration of innovation from multiple sectors, and a can't-fail mentality. We know the work is monumental, for all of the reasons outlined previously.

If the past 12 months of the COVID-19 pandemic and vaccine development have taught us anything, it is a reminder that the human species is capable of tremendous scientific and technological innovation when faced with a crisis. Our climate crisis may be playing out more slowly than COVID-19 has, but the potential impact on the global economy, livelihoods, and human health is the same—and so, too, must be the scale and speed of our response.

As we enter 2021, we are more convinced than ever that Microsoft, and the rest of the world, is up to the task. We are committed to playing our part and look forward to working with all of you to help accelerate the world's transition to a more economically and environmentally sustainable future for us all.

2020 Progress

In 2020, we announced our four commitments that will guide our sustainability work for the next decade. While we have much to do, we have already begun to see progress.



Ecosystems

700+

Grew the AI for Earth grantee community to over 700 grantees in over 100 countries.



Zero waste

\$30M

Invested \$30 million in Closed Loop Partners' funds to help build a circular economy.



Water positive

\$10M

Invested \$10 million in the Emerald Technology Ventures' Global Water Impact Fund to support innovative technologies for water conservation, access, and quality.

Carbon negative

500MW

PPA with Sol Systems will advance clean energy and environmental justice.

Carbon negative

1.3M

Secured 1.3 million metric tons of carbon removal via projects from RFP process for FY21.

Zero waste

10,500

Over 10,500 employees engaged in Ecochallenges to reduce personal waste footprints.

Carbon, water, and waste

\$129M

Invested \$129 million across funds and organizations innovating in carbon reduction, water management, and circular economy.

Ecosystems

10PB

On-boarded 10 petabytes of environmental and Earth observation data to Azure that is now freely available for the conservation community.

Zero waste

90%

Circular Centers, piloted this year, can contribute to increased reuse of servers by 90 per cent by 2025.

Water positive

7X

Increased our replenishment project portfolio by nearly 700 percent from FY19.

Carbon negative

21M

Top suppliers reduced their collective footprint by 21 million metric tons CO₂e as reported by CDP.

Carbon negative

First

Delivered first tool to provide CO₂ transparency for cloud via the Microsoft Sustainability Calculator.

Zero waste

Zero

Achieved Zero Waste Certification of datacenters in Dublin, Ireland and Boydton, Virginia.

Carbon negative

586,683

Reduced emissions across all scopes by 586,683 metric tons CO₂e in FY20.

Water positive

1.5M

Launched water accessibility work to provide 1.5 million people access to safe drinking water and sanitation.

Carbon negative

100%

All suppliers must report their GHG emissions through updated Supplier Code of Conduct.

Water positive

20

To date, funded nearly 20 replenishment projects in six states and two countries.



How we report

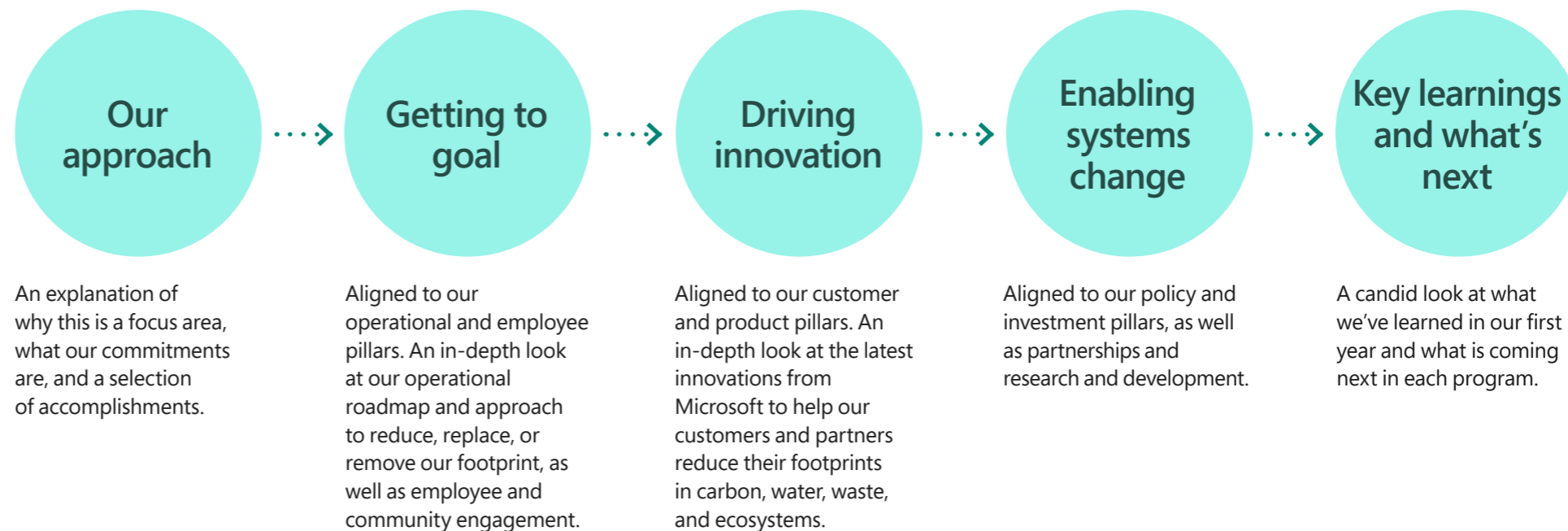
About this report

We believe in transparency and accountability. This report is one way we will deliver on these principles, which is why we have shared our progress and challenges, as well as our environmental data, which was reviewed by a third party.

We intend to have additional key portions of the report reviewed by a third party by our next annual report. This is part of a multi-year effort to provide leading transparency, visibility and reliability in our non-financial reporting.

How to read this report

The report structure follows our four areas of commitment, across carbon, water, waste, and ecosystems, with each as a chapter. Within each chapter, you will find sub-sections outlining the work we've done this year and where we are headed in the coming years across our pillars:



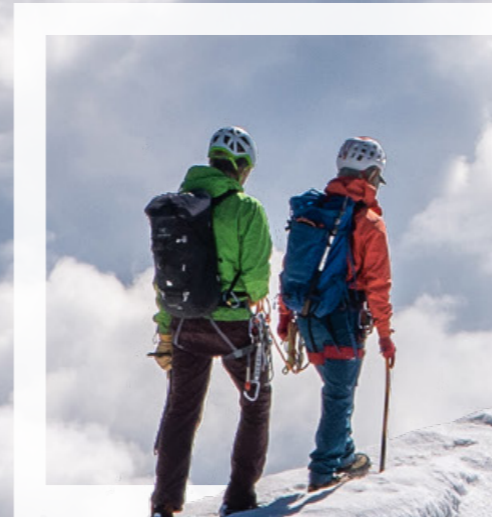
Carbon negative

“While the world will need to reach net zero, those of us who can afford to move faster and go further should do so. That’s why Microsoft is working to reduce and ultimately remove our carbon footprint.”

Brad Smith, President

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Our approach

Overview

By 2030, we will be carbon negative, and by 2050, we will remove from the atmosphere all the carbon dioxide we have emitted since we were founded in 1975.

The context

The science is clear—to avert the worst effects of the rapidly changing climate, the world needs to transition to a net zero carbon emissions economy by 2050.

To reach net zero emissions, the world must prioritize making deep emissions reductions across all sectors, thereby cutting carbon emissions by half over the next 10 years. In addition, to account for hard-to-abate emissions sources, we must invest in reliable techniques for permanently removing carbon.

Microsoft has operated carbon neutral since 2012. Like many companies, our neutrality commitment relied on investing in offsets that paid others to not emit carbon, instead of removing carbon dioxide. The science, and the social and economic impacts of climate change, drove our conclusion that carbon neutral alone is not enough—leading to our carbon negative commitment in 2020.

[Find out more here](#)



Microsoft received certification from the Science Based Target Initiative (SBTi) for our carbon goals and targets in 2019.

2030

By 2030, Microsoft will remove more carbon than it emits.

Our progress to date



Net Zero

Became a founding member of Transform to Net Zero.

\$50 million

Invested \$50 million in Energy Impact Partners.

1.3 million

Secured 1.3 million metric tons of carbon removal for FY21 from projects via RFP.

Launched the Microsoft Sustainability Calculator to provide transparency on carbon to customers.

Scope 3

Extended internal carbon fee to include Scope 3 emissions.

Named to the CDP A List for Climate Change in 2020.

586,683

Reduced emissions across all scopes by 586,683 metric tons of CO₂e in FY20.

Updated our Supplier Code of Conduct to require a greenhouse gas emission disclosure.

Our approach (continued)

Our carbon commitments

In January 2020, Microsoft CEO Satya Nadella, President Brad Smith, and Chief Financial Officer Amy Hood announced a new ambitious goal and plan for Microsoft to be carbon negative by 2030.



Nearly eliminating direct emissions

We will reduce our Scope 1 and 2 emissions to near zero by the middle of the decade, through energy efficiency work and reaching 100 percent renewable energy by 2025.

Empowering customers and partners

We will help our suppliers, customers, and partners around the world reduce their carbon footprints through our learnings and with the power of data, AI, and digital technology.

We will help our suppliers, customers, and partners around the world reduce their carbon footprints through our learnings and with the power of data, AI, and digital technology.

Using our voice on carbon-related public policy issues

We will support new public policy initiatives to accelerate carbon reduction and removal opportunities.

Becoming carbon negative

By 2030, Microsoft will be carbon negative, and by 2050, we will remove from the atmosphere all the carbon dioxide our company has emitted either directly or by our electricity consumption since we were founded in 1975.



Removing carbon

By 2030, Microsoft will remove more carbon than it emits. By 2050, we'll remove all our historical emissions.



Investing in the future

We have created a \$1 billion Climate Innovation Fund to accelerate the global development of carbon reduction and removal technologies, as well as related climate solutions.

Reducing value chain emissions

By 2030, we will reduce our Scope 3 emissions by more than half.



Our approach (continued)

Table 1

Microsoft's pathway to carbon negative by 2030¹

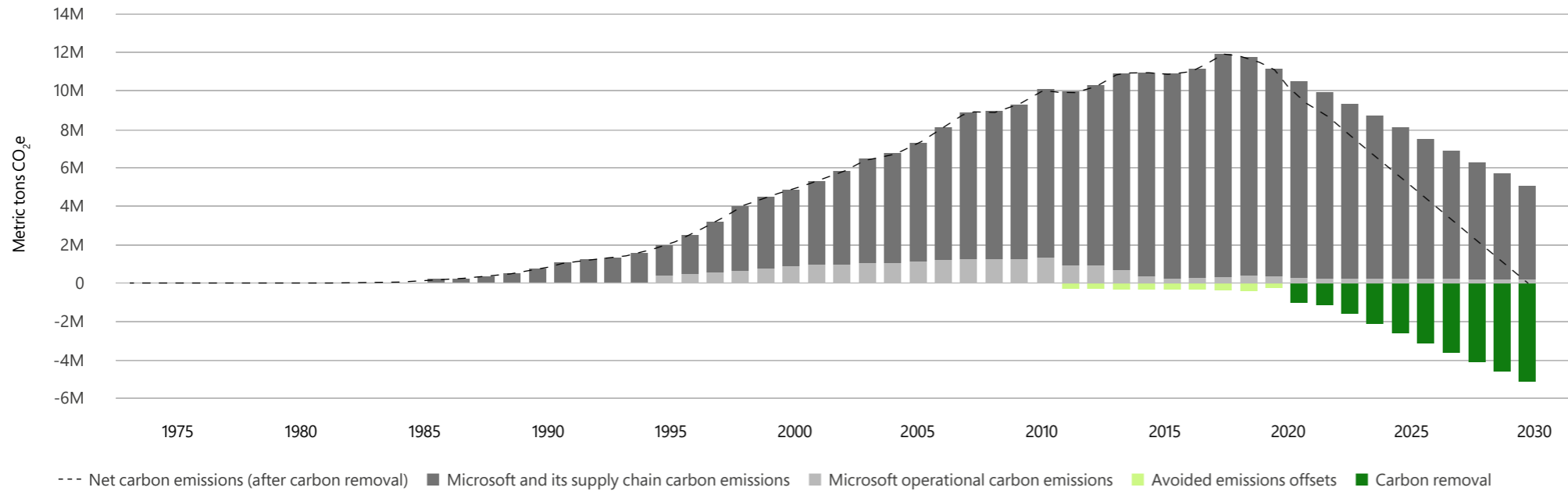
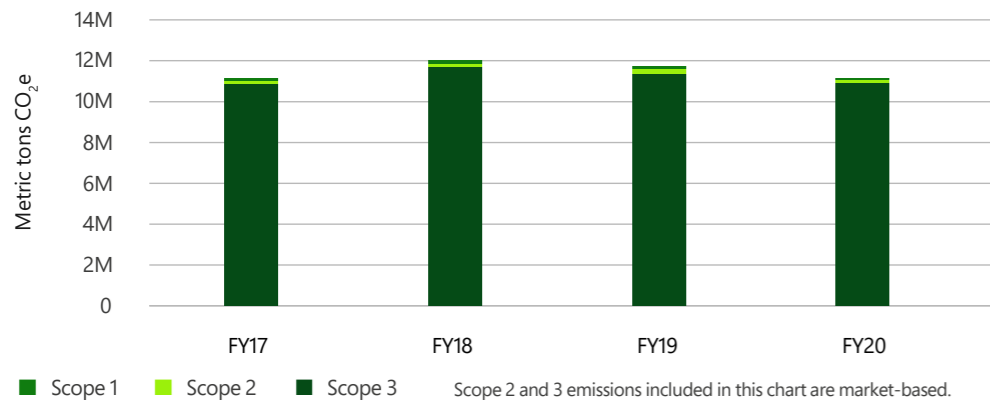


Table 2

Microsoft emissions (Scopes 1, 2, 3)



¹ Chart has been updated to reflect latest actual values which incorporate latest methodology and structural change adjustments. Historic and projected emissions driven by latest actual data have also been updated for consistency. Projected removal values have also been updated consistent with our latest projected emissions and procurement strategy.

Microsoft's definitions of carbon neutral and carbon negative:

Carbon neutral

A company is said to be carbon neutral by reducing their emissions and/or paying others to not emit an equivalent to their remaining emissions.

Carbon negative

A company is carbon negative when it removes more carbon than it emits each year. Our definition is that carbon negative must be even bolder than net zero—making deep reductions first and foremost, then using removal only for the residual footprint, and going beyond that to cover even more.

Carbon negative

Getting to carbon negative

Our strategy includes reducing our Scope 1 and 2 emissions to near zero by the middle of this decade, reducing our Scope 3 emissions by more than half by 2030, and removing more carbon than we emit.

Scopes explained



Scope 1

Direct emissions created by your activities

This is the exhaust that comes from the vehicles on your campus, natural gas that your buildings directly consume, and the generators you might run.



Scope 2

Indirect emissions from the production of the electricity or heat you use

This type of emission comes from the traditional energy sources that power your office buildings or your home.



Scope 3

Indirect emissions from all other activities in which you're engaged

These emission sources can be extensive. They cover all parts of your supply chain, from materials in buildings, business travel for your team, and product lifecycle all the way to the electricity your customers consume.

This is the largest category of all the different emission scopes and poses one of the largest areas for improvement.

Reducing Scope 1 and 2 emissions

We are driving down Scope 1 and 2 emissions to near zero by the middle of this decade, focusing on our direct and indirect emissions from our facilities and datacenters through the following methods:

Zero carbon power and diesel-free generation

We are working to scale up our consumption of zero carbon energy in our campuses and datacenters.

- Our Puget Sound campus has been powered by zero carbon Washington hydropower since 2019, and now, with our Puget Sound Campus Modernization project, we're going a step further and eliminating the use of fossil fuels for all daily operations, including the use of natural gas in our kitchens.
- We will eliminate our dependency on diesel fuel at our datacenters by 2030. Cloud providers around the world rely on diesel-powered generators for backup power to support continuous datacenter operations. We will shift to low-carbon standby power systems including battery storage, and low-carbon fuel such as hydrogen, building on a successful test in 2020 using hydrogen fuel cells as backup power for datacenters.

Zero carbon transport

We will electrify our global campus operations vehicle fleet, over 1,800 vehicles, by 2030. This work encompasses every vehicle that supports our office locations around the world. With many vehicle types, ownership structures, and regional market variations, we have begun developing a 10 year execution strategy that will demonstrate market demand for zero carbon transportation and interweave technology to enable our goals.

Improving operational efficiency in buildings

Since 2012, we've deployed an energy smart buildings (ESB) solution that has reduced energy consumption and costs by 6 to 10 percent at Puget Sound, Las Colinas, Beijing, Shanghai, Fargo, Charlotte, Silicon Valley,

and Dublin campuses and sites. ESB, in addition to energy optimization programs and modern workplace solutions, has enabled us to reduce our energy consumption globally by almost 25 percent since 2012, while growing our building portfolio.

With new campuses, we will pursue LEED Platinum certification. These projects demonstrate high performance designs through innovations such as all-electric central plants, thermal energy storage, geothermal wells, operable windows, mass timber construction, and embodied carbon reduction via material selection.

Improving energy efficiency in datacenters

We use a familiar industry calculation, power usage effectiveness, to measure and improve efficiency, while also evaluating new innovations and initiatives that we can pilot on our own datacenters.

In 2018, a report showed significant energy and carbon emissions reduction potential from the Microsoft cloud when compared with on-premises datacenters. These gains, as much as 93 percent more energy-efficient and as high as 98 percent more carbon-efficient, are due to Microsoft's extensive investments in IT efficiency from from chips to datacenter infrastructure, as well as renewable energy.

We also prioritize supporting local communities in which we operate datacenters with programs to reduce local air pollution, improve air quality, and cut carbon emissions. Projects include initiatives that enable the shift to clean, affordable, renewable energy and that transform the grid towards a low-carbon future, such as distributed renewables installations, community ground mount systems, localized clean energy plans, and renewable energy education.

 Find out more here

Carbon negative (continued)

Moving to 100% renewable energy

By 2025, we will reach our 100 percent renewable energy goal by purchasing enough renewable energy to match our electricity consumption at our datacenters, buildings, and campuses worldwide. We are well on our way to reaching this goal, as we began purchasing renewable energy via long-term power purchase agreements (PPAs) in 2013, and have steadily signed more deals in subsequent years, purchasing renewable energy across three continents.

Our approach to renewable energy has two core tenets: **regional impact** and **additionality**. We have focused on regional matching to operations, because where and how you buy matters—the closer the new wind or solar farm is to your datacenter, the more likely it is those zero carbon electrons are powering it. Microsoft, as a result, is sometimes a market driver, striking the first or the largest corporate PPAs in a state or region that was not previously viewed as a good market for renewables. We also focus on additionality, using our capital to fund new projects that may not succeed without our investment.

We utilize on-site energy when it makes sense. For example, we currently power 25 percent of our Silicon Valley campus from on-site photovoltaic panels.

Our efforts go well beyond procurement because we recognize that simply adding more renewables is insufficient. We are innovating ways to enable utilities to on-board increasing amounts of renewables in an effective and efficient way, so more people can benefit from renewable energy, including the following:

24/7 renewable energy matching solutions

In 2020, we launched a new 24/7 matching solution with Swedish energy company Vattenfall—a first-of-its-kind approach that allows an hourly-matched supply of 100 percent renewable energy. Microsoft Azure IoT gives renewable energy suppliers, like Vattenfall, real-time data on their renewable energy and energy storage

assets, as well as their customers' consumption, to supply them with continuous renewable energy. Azure IoT solutions also allow users to adjust their business operations to better fit the availability of renewables, monetizing their energy flexibility and decreasing their carbon footprint. This solution is being used at our Swedish offices and, in the third quarter of 2020, we announced that our new datacenter region in Sweden will also rely on the solution—which is now available to customers throughout the country via Vattenfall.

Piloting distributed generation

We believe distributed energy generation has a key role to play in the transition to a zero-carbon grid. In 2020, Microsoft launched a new project to pilot this work. We partnered with SSE Airtricity, Ireland's largest provider of 100 percent renewable energy and a part of SSE Group, to install and manage a large number of internet-connected solar panels, which are connected via Azure IoT to Microsoft Azure. Software tools then aggregate and analyze real-time data on energy generated by the solar panels, allowing optimization and reduction of the carbon footprint of electricity grids globally.

Grid-interactive energy storage batteries

Microsoft has successfully piloted, in partnership with Eaton and PJM Interconnection, grid-interactive energy storage batteries in Virginia and Chicago. Utilizing Eaton's EnergyAware technology, we used a battery that typically sits in our datacenter as a backup system, hooked it up to the grid to receive signals about when to take in power, when to store it, and when to discharge to support stability, grid balancing, and integration of renewable energy. With thousands of batteries as part of our backup power systems, this pilot demonstrates the potential to rapidly scale storage solutions, allowing datacenters to support grid stability, furthering the penetration of renewable energy. Following the successful pilots, we are investigating the suitability of further deployment at new projects in other geographies.

We support local communities in which we operate datacenters with programs to reduce local air pollution, improve air quality, and cut carbon emissions.



In our datacenters, we're measuring and improving efficiency.

Supporting climate equity and environmental justice

We recognize that climate and environmental issues don't affect every community in the same way and that we need to address environmental equity as a broader issue. In fact, those most affected by climate change are those who have contributed the least to climate change. Renewable energy procurement can help address these inequities.

In June 2020, we announced our largest power PPA to date with this in mind. Our 500MW PPA with Sol Systems is a first-of-its-kind initiative, tying the purchasing of renewable energy to environmental justice and equity in under-resourced communities. This partnership:

- Prioritizes projects in under-resourced communities, working with local leaders and prioritizing minority and women-owned businesses.
- Provides at least \$50 million for community-led grants and investments that support educational programs, job and career training, and programs that support access to clean energy and energy efficiency.
- Ensures that community benefits are realized with accountability measures, including using third-party evaluators to quantify and document social and environmental outcomes of the initiative.

Outside of the US, we are also using our procurement in support of climate equity. In the third quarter of 2020, Microsoft purchased the first-ever Peace REC (P-REC), issued by Energy Peace Partners from Congolese solar developer Nuru's newly commissioned 1.3MW commercial solar-plus-storage project in Goma, Democratic Republic of the Congo. The purchase helped Nuru install and operate 35 mini-grid-connected streetlights in the Ndoshoh neighborhood of Goma.

Carbon negative (continued)

Reducing Scope 3 emissions

We are reducing our Scope 3 emissions by more than half by 2030. While we do not have direct control over the majority of emissions in the Scope 3 category, they represent the bulk of our emissions and we are addressing them in our carbon negative commitment by the following methods:

Improving supplier emissions data tracking

In 2020, as reported to us by CDP, our top suppliers reduced their collective carbon footprint by 21 million metric tons of carbon dioxide equivalents (CO₂e). Our Devices team built an Audit Management System using Microsoft Power BI to embed compliance and sustainability into our business. Now, we can track performance and enable continuous supply chain improvements by tracking supplier maturity in social and environmental accountability.

Improving supplier emissions reporting

In 2020, we updated our Supplier Code of Conduct to now require a greenhouse gas emission disclosure. This is a first step to increase transparency and enable us to work collaboratively with our suppliers to help reduce their emissions.

In 2021, this data will become an explicit aspect of our procurement processes for our supply chain, including informing buying decisions. We will continue working with our suppliers to on-board them to our new approach and ensure compliance.



Extending the carbon fee to Scope 3 emissions

We established our internal carbon fee in 2012 to fund our carbon neutrality commitment. In 2019, we raised the fee to \$15 per ton, which we charged to each business group across Microsoft based on their Scope 1 and 2 carbon emissions and business air travel.

In 2020, we expanded the fee to cover each business group's Scope 3 emissions. While we've initially set the fee at a lower rate for Scope 3, it will ramp up over time until there is one single fee across our entire emissions portfolio. We are already seeing results, with accelerated investments in the energy efficiency of our software and hardware.

Scope 3

8.9%

Our Scope 3 carbon emissions related to devices was reduced by 8.9 percent (-524K mtCO₂e) from a 2017 base year.



Above left: Surface Pro X
Above: Xbox

Further improving energy efficiency of devices and software

In our devices and software, we are continuing to reduce carbon emissions and environmental impact from design to manufacturing. For further information see the Devices Sustainability Report.

Surface

The Surface Pro X uses less power than the Surface Pro 6, while providing similar high performance. Estimated total energy consumption for the Surface Pro X is 13.1 kWh/year, compared with 18.2 kWh/year for the Surface Pro 6, equivalent to a 28 percent reduction.

Xbox

Xbox recently added Regulatory Standby Plus (RS+) as a new power mode. At a high level, RS+ will provide the power savings and environmental benefits of RS with the benefits of keeping the user's OS and content up to date. This can reduce power from 15W to less than 2W during standby mode.

Windows

In May 2020, we launched the Windows Software Sustainability Initiative. It aims to reduce the carbon footprint of Windows software and will establish a set of best practices for energy-efficient Windows app development. We will build on this in FY21, aiming to reduce the energy consumption of the top 20 most-used Windows experiences, which together represent 90 percent of active Windows energy usage.

 [Find out more here](#)

Carbon negative (continued)

Reducing embodied carbon

In our 500-acre Puget Sound Campus Modernization project, we are partnering with industry leaders to pilot and fund a new tool, the Embodied Carbon in Construction Calculator (EC3). EC3 enables data-driven decisions in selecting carbon smart building materials while highlighting which materials have the greatest capacity for impact on the project—so we can prioritize investments accordingly.

In our modernization project, we set a 30 percent reduction target for embodied carbon. The commitment to using EC3 via third-party verified environmental product declarations (EPDs) led to the first manufacture-specific and product-specific EPDs for precast concrete in the US. Based on our lessons learned, we are expanding the use of the EC3 tool to our datacenters and other new campuses to reduce embodied carbon.

Rethinking travel

For the past several years, we've encouraged employees to rely more on Microsoft Teams and less on travel to work with their colleagues and customers. In 2020, prior to COVID-19, we began empowering employees with more information and new choices, including TripTrackerLite, which delivers personal travel statistics including carbon impact from travel. We worked with our travel partner, Concur, to provide the estimated carbon emissions of flights and help employees compare the carbon costs, as well as financial costs, of their travel options.

Shifting to virtual events

We began shifting events to a virtual format using Teams with our 2019 shareholder meeting. With virtual events becoming the norm due to COVID-19, we held all our 2020 events virtually, including flagship events like Build, Ignite, and Inspire as well as smaller regional and business group events. We relied on Teams, finding new ways to operate seamlessly and collaboratively—and are beginning to calculate the carbon benefits of this approach.

For example, Microsoft's multiple-day MVP Global Summit event in March 2020 was migrated to a virtual format on Teams. The Summit included over 2,000 attendees from around the world. By hosting the event virtually as compared to in-person, the carbon emissions were estimated to be lowered by nearly 5,000 metric tons. This is equivalent to removing roughly 390,000 cars from the road for one day, which is more than the number of cars crossing the George Washington Bridge per day, or the amount of carbon absorbed over 10 years by planting nearly 150 acres of forest, which is over half the size of Central Park. In 2021, we intend to share additional information on the carbon emissions impacts of our larger events, such as Build, and on remote work.

Reducing carbon from travel with SAF

When employees do travel, we want to use our travel dollars wisely and in support of greener options, including sustainable aviation fuel (SAF).

In October 2020, Microsoft announced a partnership with Alaska Airlines and SkyNRG to supply an amount of SAF that will cover Microsoft employees' travel on three frequently traveled Alaska routes—between Seattle and San Francisco, San Jose, and Los Angeles. The SAF, supplied by SkyNRG and produced from waste oil, is one way for the aviation industry to reduce carbon emissions on a lifecycle basis. It is also a way for us to reduce the emissions associated with our business travel in Scope 3. This first-of-its-kind partnership in the US is a model other companies can use to reduce their employees' carbon emissions associated with business travel.

Our partnership with Alaska builds on our commitment to more sustainable air travel that we started in October 2019 via a partnership with KLM, where we committed to purchase the SAF equivalent to all flights taken by Microsoft between the US and the Netherlands on KLM and Delta Airlines.



We've encouraged employees to rely more on Teams and less on airline travel.

Carbon negative (continued)

Removing carbon

In 2018, the Intergovernmental Panel on Climate Change (IPCC) special report on 1.5°C found that reducing emissions by transitioning to zero-carbon energy, avoiding deforestation, and increasing energy efficiency will be vital, but insufficient, to prevent the level of warming rising to unsafe levels. Carbon removal—the process of extracting carbon dioxide from the atmosphere and storing it in nature and deep in the Earth—will be crucial to achieving our climate goals. Microsoft’s commitment to become carbon negative will require us to purchase an increasing amount of carbon removal.

Meeting our goal will require the market to evolve—offering many more, better-quality carbon removal services at increasingly affordable rates. We intend to use our procurement of carbon removal to drive demand for high-quality carbon removal methods through our criteria, projects, and market innovations.

In 2020, we launched our removal program, with a goal to contract for the removal of 1 million metric tons of carbon dioxide from the environment.

We began with establishing key principles and defining our scope. We also enlisted the support of third-party scientific and market advisors, including NGO Winrock International and the advisory firm CarbonDirect, to inform our procurement strategy.



Carbon removal will be crucial to achieving our climate goals.

1.3M metric tons

of carbon removal contracted for in 2020, exceeding our goal of 1M metric tons.



Our initial portfolio focused on nature-based solutions.

Results of the first carbon removal RFP

In July 2020, we issued a request for proposal (RFP) to source carbon removal from a range of solutions. Our initial portfolio focused on nature-based climate solutions due to pricing and availability. We will shift to a blend of nature and technology-based solutions as they become more viable. Our portfolio includes:

- Reforestation projects in Peru, Mississippi, Nicaragua, and India.
- Improved forestry projects in the US.
- Soil carbon removal projects in the US and Australia.
- Biochar projects in Europe and Australia.
- Engineered solutions such as direct air capture and bio-oil sequestration.

Beyond the projects we supported, our RFP process brought us a new level of insight about quality and volume on the market today. We need far clearer standards for carbon removal durability and reversal risk, and we need collective buying and investment to accelerate and scale this nascent market.

Carbon removal principles

Net negativity

Scientific verification

Avoidance of harm

Other considerations*

* Consideration of scalability, affordability, climate equity, geographic location, and technology innovation.

Carbon removal solutions

Afforestation and reforestation

Soil carbon sequestration

Bioenergy with carbon capture and storage*

Direct air capture (DAC)

* (BECCS).

Driving innovation

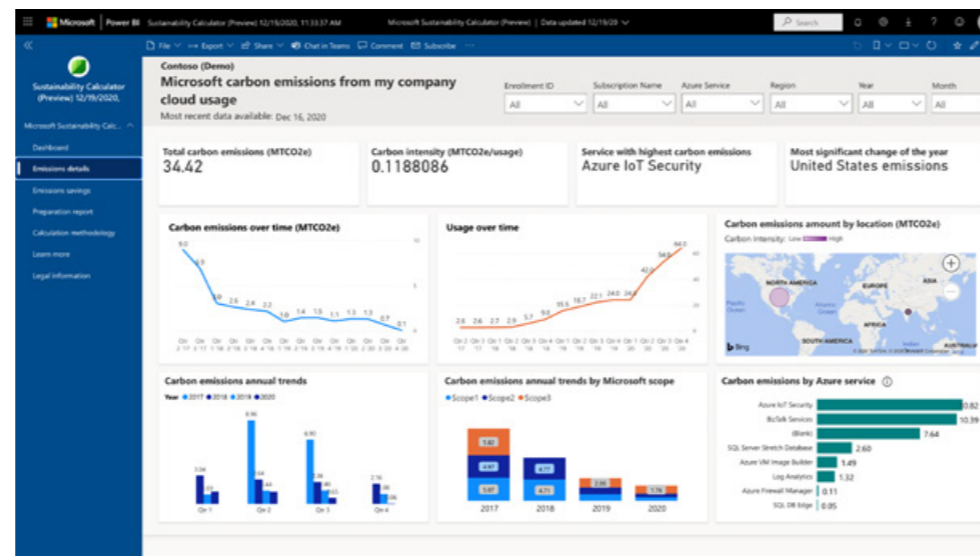
Digital tools for carbon reduction

We believe that Microsoft's most important contribution to carbon reduction will come not from our own work alone, but by helping our customers, partners, and suppliers reduce their carbon footprints through our learnings and with the power of data, AI, and digital technology.

Microsoft Sustainability Calculator

We have introduced the **Microsoft Sustainability Calculator**, which provides our customers with transparency into their carbon emissions resulting from their cloud usage, making Microsoft the only cloud provider to provide full transparency to customers across all three scopes of emissions. Using AI and advanced analytics, the Sustainability Calculator shows reduction trends for customer cloud usage over time, providing the ability to forecast cloud emissions and simplify carbon reporting. It uses consistent and accurate carbon accounting to quantify the impact of Microsoft cloud services on customers' environmental footprint and can compile the information into reports for voluntary or statutory reporting requirements.

[Find out more here](#)



Microsoft Sustainability Calculator.

10K

Over 10,000 users of EC3 tool, hosted on Azure, to improve transparency of carbon emissions in building materials.



Helping our customers, partners, and suppliers around the world reduce their carbon footprints.

Embodied Carbon in Construction Calculator (EC3)

Launched in November 2019 and hosted on Azure, the free **EC3 tool** reveals the embodied carbon in materials so architects, engineers, and contractors can make informed choices, selecting materials with the lowest climate impact.

There are now over 10,000 users of the EC3 tool. It received the World Green Building Council's Chair's Award on Global Green Building Entrepreneurship in 2020 and has a global database of carbon data for almost 5,000 individual building products across major material categories.

[Find out more here](#)

Driving innovation (continued)

Enabling customers and partners across industries

Advancing the energy transition

BP and Microsoft have formed a strategic partnership to further digital transformation in energy systems and advance the net zero carbon goals of each company. In 2020, the companies signed an agreement to co-explore co-innovation opportunities across several key areas of decarbonization that are important for our journey as well as for the world. We are currently focused on IoT, AI, and cloud solutions that are intended to advance smart and clean cities, clean energy parks, and consumer energy.

Supporting technology-backed geological carbon sequestration

In the last quarter of 2020, Microsoft signed a memorandum of understanding (MOU) to explore ways to support the **Northern Lights** carbon dioxide transport and storage project. It is a joint effort of the Norwegian government and energy firms Equinor, Shell, and Total that chains together technologies developed for the energy industry across decades, using them in new ways to provide for the effective transportation, receipt, and permanent storage of carbon in a reservoir in Norway's North Sea. As part of the MOU, Microsoft and Northern Lights partners will explore opportunities to integrate digital expertise, supporting the work to standardize and scale carbon capture across Europe and use the transport and storage facilities as part of Microsoft's climate ambitions.



Enabling new energy efficiencies

A robust partner ecosystem, relying on Azure, is accelerating Microsoft's impact on carbon reduction. **ABB** energizes the transformation of society and industry to achieve a more productive, sustainable future. The IoT cloud platform for ABB Ability solutions is based on Azure. **Honeywell** is using Azure in Honeywell Forge, its Enterprise Performance Management software that integrates with Microsoft Dynamics 365, enabling predictive maintenance applications to improve performance and energy efficiency across enterprise environments. **Johnson Controls** and Microsoft expanded their partnership in December 2020 with a new collaboration to digitally transform how buildings and spaces are conceived, built, and managed to deliver energy optimization among other benefits. Together with Microsoft Azure, **Schneider Electric's** EcoStruxure digital solutions empower all to make the most of our energy and resources, bridging progress and sustainability.

You can learn more about these and other partner solutions at:

[Find out more here](#)

IoT and AI can improve building efficiency.

40%

In the US, buildings account for 40 percent of overall energy consumption.

Providing growers with insights to lower GHGs

Cloud Agronomics uses remote-sensing technology and AI, leading a new wave of proactive analytics to lower greenhouse gas emissions and spur sustainable food production. They scan crops and soils using hyperspectral imaging, generating lab-grade analysis from the air. Then, within Azure, calibration and analysis algorithms convert the data into insights. Through their crop nutrient and soil carbon measurement products, Cloud Agronomics is building one of the largest tagged datasets for agriculture, removing verification as a key barrier to scale and boost soil-based carbon offset projects around the world.

Unlocking sustainable agriculture

Land O'Lakes, Inc. and Microsoft forged a new alliance in 2020, aimed at pioneering new innovations in agriculture. The work is already underway to build a connected Digital Ag platform on Azure that brings Land O'Lakes' portfolio of digital tools into a standardized architecture. In addition, the teams have been collaborating on the initial build of soil health technologies that bring data from sensors and satellites together with farmer behavior data to predict carbon sequestration. These estimates, as well as information in Truterra Insights Engine, can help reduce carbon for the planet while turning a profit for farmers.

Enabling systems change

Catalyzing innovation and collective action

We are focused on new ways to harness the power of technology, partnerships, investments, and policy to drive impact at scale and pace to help the world get to carbon zero.

Research and development

Researchers at Microsoft are charged with inventing the future of Microsoft and addressing societal challenges. With that mandate, teams around the globe are developing new technology approaches aimed at providing better performance than today's state-of-the-art, while also using energy and materials more efficiently. Research ideas being explored include radically different datacenter architectures, use of novel materials and techniques to store and transport data, and more computationally- and energy-efficient methods for training and deriving predictions from AI models.

Project Natick evaluates the benefits that underwater datacenters have on reliability, efficiency, and sustainability.

Jonathan Banks.



1/8th

Failure rate of undersea servers compared with land-based control group.



Datacenter systems

In July 2020, **Project Natick** retrieved its underwater datacenter from the sea floor off Scotland's Orkney Islands. This project had previously demonstrated the feasibility of undersea deployment. Its latest phase evaluated practical concerns, with many promising learnings for environmental sustainability:

- Servers failed at one-eighth the rate of a land-based control group—prolonging the life of the computers and reducing the need for replacement components and materials.
- Cold seawater can be used for cooling servers—without detectable temperature impact a few meters downstream, without tapping critical freshwater resources, and with greater cooling efficiency than air.
- The datacenter ran reliably on a renewable energy grid supplied 100 percent by wind, solar, and experimental green energy technologies. It also provided an attractive location for sea life—it was quickly colonized by multiple species of fish and other sea life.

Enabling systems change (continued)

Datacenter storage

The demand for long-term data storage in the cloud is reaching unprecedented levels, and continues to grow into the zettabytes (tens of billions of gigabytes). This reality demands step-change growth in storage densities, material lifetimes, and large-scale storage system architectures to avoid costs and environmental impacts from vastly scaling up storage facilities with today's technologies. Fundamentally new approaches we are developing for archival storage include quartz glass and synthetic DNA:

- **Project Silica** is capitalizing on recent discoveries in ultrafast laser optics to store data in quartz glass by using femtosecond lasers. In a 2019 proof of concept, the project was able to store and retrieve the entire Warner Bros. *Superman* movie on a piece of glass roughly the size of a drink coaster (75 by 75 by 2 mm thick). Now, researchers are working closely with our Azure team to build a completely new storage system from the ground up around this technology. This effort opens up an exciting opportunity to completely re-think traditional storage system design, and to co-design the future hardware and software infrastructure for the cloud.



- Researchers at Microsoft and the University of Washington are collaborating to advance long-term storage of digital data in synthetic DNA, including system architectures supporting random access and encoding schemes. DNA storage is attractive because it is both extremely dense and long-lasting: it could hold up to 1 exabyte of data (1 billion GB) per cubic inch, with durability from hundreds to thousands of years. These features make it attractive for avoiding construction, material (embedded carbon), operational (energy), and other environmental impacts of scaling up use of existing technologies. Based on these impacts, a recent lifecycle analysis estimated that relative to archival storage on tape, DNA-based storage could reduce greenhouse gas emissions, energy, and water consumption by more than 60 percent each.

Researchers from Microsoft and University of Washington in the wet lab, working on DNA data storage experiments.

Dennis Wise/University of Washington.

>60%

DNA-based storage could reduce GHG emissions, energy, and water consumption by more than 60 percent each.

Datacenter networking

Emerging workloads such as distributed machine-learning training and memory disaggregation will require orders of magnitude higher bandwidth and lower latency than today's applications. It will be very hard to meet these demands with today's electrical-switch-based infrastructure due to the fundamental challenges in scaling electrical bandwidth in a cost and power-effective way and in providing sub-microsecond predictable latency at scale. **Project Sirius** is investigating whether ultra-fast optical switching within datacenters could allow us to sidestep these disruptions. It aims to develop an all-optical, datacenter-wide network that is completely flat. By eliminating the inefficiencies of hierarchy and using the strengths of optics, such a network could provide better and more predictable performance with higher reliability and at lower cost.

AI efficiency

The rise of data and AI means we must also pursue a variety of approaches to increase efficiency in AI hardware and software. Azure AI Ops is building on AI systems research to make more efficient use of computational resources in the cloud. Advances in deep learning research are reducing the computational intensity of AI model training and inferencing. The Weightless PARSEC algorithm efficiently identifies high-performing deep neural network architectures, and in our tests, uses 100 times less computational cost to achieve levels of accuracy similar to comparable models. Platform-Aware Search enables similar efficiencies at inference time, by accounting for additional constraints such as latency or energy usage; Factorized Neural Layers speed up training and inference and enable reductions in model size with minimal impact on performance.

Enabling systems change (continued)

Climate Innovation Fund

Our Climate Innovation Fund is focused on accelerating existing technology and investing in the innovation of new technologies to help Microsoft and the world reach net zero emissions.

In the first year of our fund, we have made commitments to carbon removal and carbon reduction technologies across a range of sectors, including designing a carbon removal project finance facility with direct air capture pioneer **Climeworks**, to support its first-of-a-kind commercial-scale, fully renewable carbon capture and mineralization plant, located in Iceland.

We are seeding the global economy's future portfolio of climate solutions with early stage investments such as:

- \$50 million in **Energy Impact Partners'** (EIP) global investment coalition, a leading private equity platform focused on new technologies enabling the transition to cleaner, more resilient, and more inclusive energy and transportation ecosystems, two sectors that account for most greenhouse gas emissions. EIP follows a uniquely collaborative impact investment model by partnering with over 30 of the world's largest, most innovative, and environmentally conscious corporate firms as highly engaged, strategic investors.
- **CarbonCure**, a low-GHG concrete technology company, in a round with Amazon and Breakthrough Energy Ventures. Cement accounts for approximately

\$50M

investment in Energy Impact Partners' global investment coalition, focused on new technologies.



Carbon removal and reduction will change all sectors of the economy.

8 percent of global emissions, and low-GHG innovations like CarbonCure can reduce the carbon footprint of our built environment. Microsoft used the CarbonCure product in concrete mixes provided to our LinkedIn Bay Area campus where our collective low-carbon concrete strategies will keep approximately 4.8 million pounds of carbon out of the atmosphere, a 30 percent reduction in business as usual. We see CarbonCure as a technology solution to decarbonize our global construction activities, as well as a market enabler for productive use of captured carbon.

- **Aclima**, a climate technology company with a pioneering approach to mapping hyperlocal air pollution and greenhouse gases block by block. Their technology supports data-driven environmental decisions with consideration for climate equity.

Our portfolio to date includes a mix of fund partnerships and direct investments. Each commitment represents a key ingredient in the technology roadmap to net zero. In particular, our investments target inflection points in technology development and deployment where capital is scarce, and investment can make an outsized impact on growth prospects and early adoption.

Enabling systems change (continued)

Transformational partnerships

Transform to Net Zero. Microsoft is a founding member of Transform to Net Zero, launched in July 2020. This small group of established leaders aims to demonstrate and enable the business transformation needed to achieve net zero emissions by 2050, in addition to driving broader change with a focus on policy, innovation, and finance. The initiative is led by A.P. Moeller – Maersk, Danone, Mercedes-Benz AG, Microsoft, Natura & Co., Nike, Starbucks, Unilever, and Wipro, as well as the Environmental Defense Fund. It is supported by BSR, which is serving as the secretariat.

The initiative intends to complete the outputs of this work by 2025. Already, the group has produced:

The Building Blocks for Net Zero Transformation.

PwC and Microsoft have created a blueprint to help guide companies to embed net zero aspirations and actions within and across their business. Delivering on net zero requires wholesale business transformation, and functions across the organization need to play a vital role. The guide includes good practices for net zero transformation for stakeholders across a business.

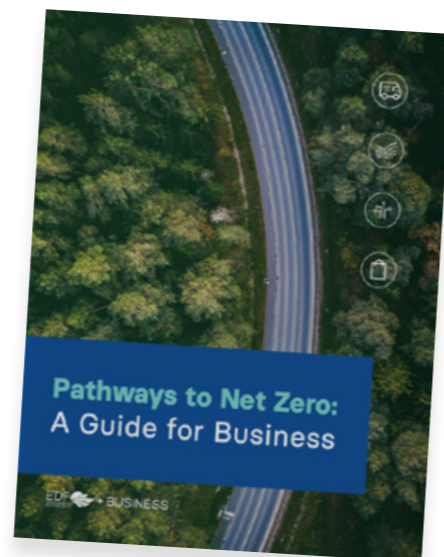
Find out more here



Pathways to Net Zero: A Guide for Business.

This report from EDF+Business, with analytical research support from Deloitte Consulting and contributions from Transform to Net Zero members including Microsoft, provides specific recommendations for the transportation and agriculture sectors, and for the retail and technology industries to begin and maintain a pathway towards net zero. It includes a roadmap with detailed action items that companies, industries, and sub-sectors can take today to accelerate net zero progress in their own operations, investments, coordination, and advocacy.

Find out more here



The Transform to Net Zero coalition will focus on moving beyond commitments to business transformation by:

- Sharing the business transformation each company is undertaking.
- Delivering robust emission reductions across the business and value chains.
- Working jointly with our partners across supply chains.
- Innovating and investing at scale in products, services, and business models that amplify impact.
- Engaging with policymakers to incentivize progress toward net zero.
- Ensuring a just and sustainable transition.



Playing for the Planet. Our gaming business has partnered with the United Nations Environment Programme on the Playing for the Planet initiative. Its goals are to reduce the impact of the gaming ecosystem on the environment through better carbon accounting and educating gamers everywhere on sustainable causes. For example, the Minecraft Build a Better World Initiative delivers in-game content, ranging from the need to protect and conserve, and matching funds to charitable organizations focused on conservation.

Enabling systems change (continued)

Policy

Future climate-related risks would be reduced by the upscaling and acceleration of far-reaching, multilevel, and cross-sectoral climate mitigation and by both incremental and transformational adaptation. Those efforts must be guided by policy that accelerates carbon reduction and removal opportunities.

In past years, we have supported carbon pricing and clean energy policy efforts at the state and national level in the US, through direct lobbying, engagement, and groups such as the Climate Leadership Council, CERES BICEP Network, Advanced Energy Economy, Climate and Clean Energy Solutions, and the Renewable Energy Buyers Alliance.

In 2020, we committed to using our voice to speak out on four public policy issues that we think can advance the world's carbon efforts:

- Expanding global basic and applied research efforts on carbon, funded by governments, and reorienting them towards targeted outcomes and enhanced cross-border collaboration to develop the breakthrough technologies needed to achieve net zero global emissions.
- Removing regulatory barriers to help catalyze markets to enable carbon-reduction technologies to scale quicker.
- Introducing market and pricing mechanisms so people and businesses can make more informed carbon purchasing decisions.
- Empowering consumers through transparency based on universal standards to inform purchasers about the carbon content of goods and services.

We have seen progress against the following areas already:

Clean energy

Microsoft advocated for several bills that would provide a critical boost to research, development, and deployment of clean energy and carbon reducing technologies such as energy storage, direct air capture, and other carbon removal technologies, such as S. 2657, the American Energy Innovation Act. Congress approved a package of these measures authorizing over \$35 billion in new climate R&D as part of the omnibus spending bill.

Distributed energy resources

Microsoft has been advocating for the Federal Energy Regulatory Commission (FERC) to update its rules on distributed energy resources (DERs) to participate in wholesale electricity markets, provide resiliency, and speed up innovation en route to a zero-carbon grid. In 2020, FERC approved a historic final rule, Order 2222, enabling DER aggregators to compete in all regional organized wholesale electric markets.

Carbon markets

In 2020, Virginia joined the Regional Greenhouse Gas Initiative (RGGI) after ongoing advocacy and support by Microsoft. RGGI is a multi-state cap-and-invest program in the Northeast and Mid-Atlantic US, and the revenue generated through RGGI is reinvested into the states through energy efficiency mechanisms and bill savings, renewable energy markets, and other initiatives to benefit the community and reduce emissions.

Carbon pricing

Microsoft was a lead member in the largest business gathering on Capitol Hill to advocate for climate legislation in over a decade, the Lawmaker Education & Advocacy Day (LEAD) in 2019. We followed up in 2020 to urge Congress to keep the focus on a green recovery and investments in a net zero economy.

Microsoft has been actively engaged in policy efforts to advance clean energy, well-functioning carbon markets and carbon pricing, reduction targets, product transparency and more in both the United States and Europe throughout 2020.

In September 2020, Microsoft filed comments to support FERC's proposed carbon pricing policy and provided input on how to incorporate state-determined carbon prices in wholesale electricity markets.

GHG reduction

In Europe, we have used our voice in support of more ambitious carbon reduction targets through the EU Climate Law, for example by signing an open letter by the Corporate Leaders Group Europe, calling on the EU leaders to reduce GHG emissions by at least 55 percent by 2030, as a milestone towards the EU's 2050 net zero goal.

Transparency on products

We advocated for increased transparency in reporting the carbon footprint of products, services, and organizations, through legislative initiatives as part of the EU Green Deal. In 2020, we submitted comments to the public consultations on the revision of the Non-Financial Reporting Directive, Renewed Sustainable Finance Strategy, and Green Claims to begin shaping legislative proposals expected in 2021.

Efficiency of datacenters

Microsoft has been supporting the EU's efforts to develop a policy proposal on climate neutral datacenters. We also helped commission a major think tank study on datacenter energy efficiency issues for use in advocacy efforts and are helping create dedicated trade association projects in Brussels and Dublin to engage in the related policy efforts.

Key learnings

What we've learned

We need clearer standards, better accounting, and new ways to contract to get to net zero—which will require partnerships across many carbon market stakeholders.



1 Concentration matters. Our current atmospheric concentration of greenhouse gas emissions is catastrophically high to keep the climate stable, and far too dilute to make carbon easily removable from the atmosphere. The world must build a carbon removal market on an unprecedented scale and timeline, from nearly scratch. This work will be incredibly hard, requiring integrity, public-private coordination, and heavy investment simultaneously.

2 Contracts are the building blocks of the new carbon economy. Our bold carbon negative goal was splashy—but the real work is in contracting, whether to decarbonize our supply chain or to fund net new carbon removal. Contracts today do not include a price on carbon, or the cost of getting and keeping carbon out of the atmosphere—and they must. Passive purchasing is not sufficient; we must also invest in market-making activities to boost supply of technologies for carbon reduction and removal alike.

3 We need to raise the bar on standards. In our January 2020 event and accompanying blog post, we focused on the need to get real on carbon math. The methodologies for carbon accounting are ambiguous and discretionary, which won't hold us collectively accountable on a path to 1.5°C. We need clearer protocols to ensure that progress reported on the balance sheet is truly progress in the real world. Meanwhile, the accounting of carbon removal is far from straightforward. These much-needed market improvements will require partnership among many carbon market stakeholders.

How to get started on carbon in your organization



Building Blocks for Net Zero Transformation: a how-to guide to establishing a net zero strategy, including clarity on terminology and carbon offset engagements.

[Find out more here](#)

Microsoft's Sustainability Guide: a short guide and longer playbook offer companies guidance on how to get started in a technology-led sustainable transformation.

[Find out more here](#)

Sustainability. Good for Business. Executive Playbook: part how-to guide, part inspiration from real case studies, the playbook offers all companies, particularly those in Western Europe, a way to begin or accelerate their work on sustainability.

[Find out more here](#)

Explainer Video – Carbon Math: get smarter on the challenge of carbon, and why we need to be real about carbon math.

[Find out more here](#)

Carbon Negative by 2030: check out the announcement of our strategy, featuring CEO Satya Nadella, CFO Amy Hood, and President Brad Smith.

[Find out more here](#)

What's next?

Our focus for 2021

1 In 2021, we will continue to make progress against our carbon negative agenda, and regularly share results and learnings. We will scale up our supply chain work, including deeper engagement with top suppliers to reduce their carbon emissions and collect carbon data from the activities they undertake in their business with us. Also, given how frequently our supply chain overlaps with those of our customers, we will explore new ways of working together to obtain accurate data, improve reporting, and support our suppliers' sustainable transformations.

2 Another key area of growth is in technology-based carbon removal options, as we begin to shift our carbon removal portfolio towards a balance of nature-based and technology-based solutions. We will seek partners to co-finance and co-offtake from innovative carbon removal projects. Microsoft alone cannot bring about this market change, and we are committed to forming alliances that can have catalytic impact.

3 Technology and data will also play a role in our product strategy. We aim to **expand the functionalities of the Microsoft Sustainability Calculator** to better serve our customers, while also **bringing new solutions accelerators and features to market**, via our product stack and our partner network. Looking for new approaches to test how to use real-time electricity data to pave a path towards always-available renewable energy, technology pilots focused on verification of sequestration in soils, and engineered solutions and expanded partner capabilities in driving energy efficiency across all industries.



Carbon removal and increasing transparency will be key to our success in FY21.

Water positive

“Microsoft is taking responsibility for our own water use and developing technology to help others do the same.”

Brad Smith, President

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Our approach

Overview

We will reduce the water intensity of our direct operations, replenish in water-stressed regions where we work, and enable access to 1.5 million people—becoming water positive by 2030.

The context

According to the World Bank, the reduction in freshwater availability due primarily to climate change, coupled with increased demand, could reduce water availability in cities by more than 66 percent by 2050.

Getting ahead of the world's imminent water crisis will require a reduction in the amount of water used to operate economies and societies while ensuring there is sufficient and clean water for all. This will require a transformation in the way water data is collected and managed, the way we build solutions and approaches to water, and a concerted effort for all organizations to properly account for and balance their water use.

Microsoft has taken steps to reduce the water consumption in our datacenters and buildings over the past decade. With the latest scientific data on water scarcity in mind, we expanded our efforts in 2020, setting a new commitment to be water positive by 2030.

[Find out more here](#)



Ensuring there is sufficient and clean water for all.

>66%

Climate change and increased demand could reduce water availability in cities by more than 66 percent by 2050.

Our progress to date



Co-founded the Water Resilience Coalition.

\$10M

Invested \$10 million in the Emerald Technology Ventures' Global Water Impact Fund to support innovative technologies for water conservation, access, and quality.

1.5M

Launched water accessibility work to help provide 1.5 million people access to safe drinking water and sanitation.

7X

Increased our replenishment project portfolio by nearly 700 percent from FY19. To date, we have invested in nearly 20 replenishment projects in six states and two countries through partnerships with organizations such as The Nature Conservancy, Trout Unlimited, and Ducks Unlimited.

Our approach (continued)

Our water commitments

With the latest scientific data on water scarcity in mind, we expanded our efforts in 2020, setting a new commitment to be water positive by 2030.

Investing in the future of water

We will work with companies around the world to drive innovation and adoption of water technologies.

Digitizing water data

We will use our technology to generate actionable insights, increase awareness of water issues, and optimize water replenishment.

Influencing policy

We will use our voice at the local, national, and global levels to increase water access and availability, improve quality, and ensure the integration of water into climate strategies.

Empowering our customers and partners

We are developing solutions to help customers and partners understand water-related risks.

Becoming water positive by 2030

We will reduce the water intensity of our direct operations, replenish in water-stressed regions where we work, and enable access to 1.5 million people.

Driving collective action

We will partner with others to drive collective action, which begins with joining the Water Resilience Coalition as part of the United Nations Global Compact CEO Water Mandate.

We will work with companies around the world to drive innovation and adoption of water technologies.

1.5M

We will enable access to water to 1.5 million people in seven countries by 2030.

Our approach (continued)

Table 1

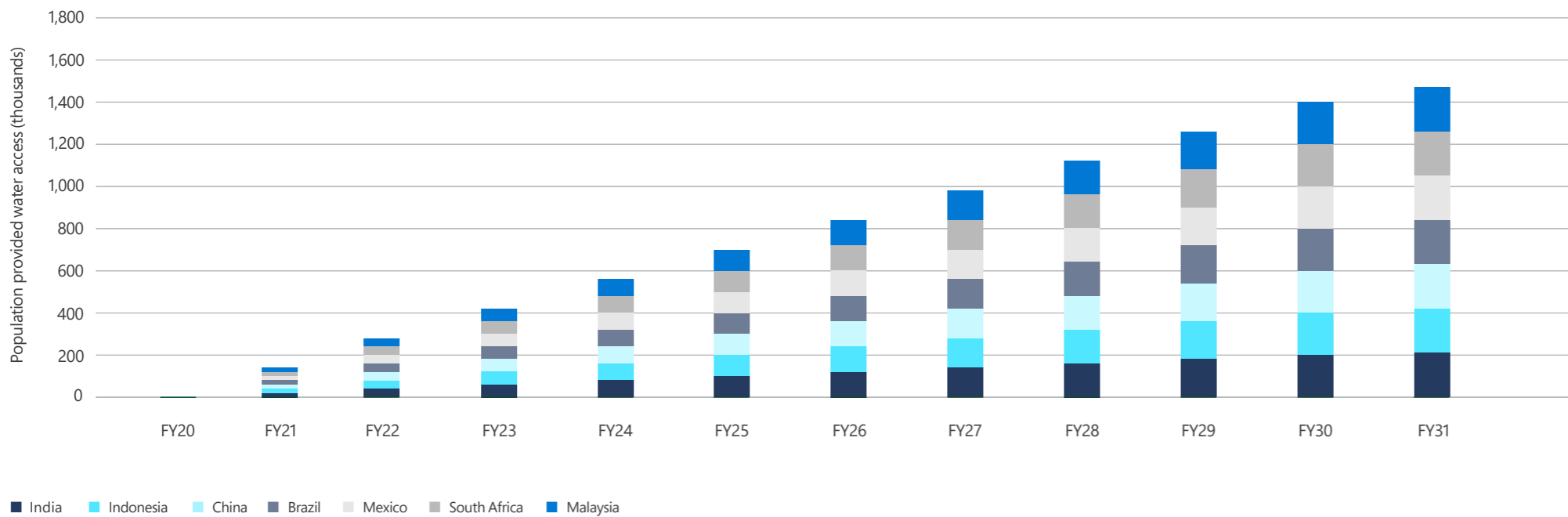
Water availability: replenish more water than we use globally by 2030 (m³)

	FY17	FY18	FY19	FY20
Water withdrawals	5,148,454	6,718,985	7,505,081	7,618,089
Water consumption	1,912,934	3,325,664	3,945,783	3,966,639
Water replenishment ¹		96,906	235,380	1,621,629

¹ Reported volumes represent total incremental contracted water replenishment projects for each fiscal year. Reported volumes may be adjusted once individual water replenishment projects are completed and volumes verified.

Table 2

Water accessibility: enable the provision of water and sanitation services to 1.5 million people in 7 countries by 2030



Straight line projections are subject to change as water accessibility projects are implemented.

In FY20 we increased our water replenishment by 1,621,629 m³.

Water positive

Getting to water positive

To meet our commitment to being water positive by 2030, we will reduce our water footprint across our direct operations, while replenishing and increasing water access in water-stressed regions where we work.

Reducing our water footprint

We are innovating in water collection, treatment, reuse, and water use intensity at our campuses and datacenters across the globe.

Net zero water campus

Our new Silicon Valley campus, due to come online in 2021, will be among the first large office buildings in the world to be certified by a third party as a net zero water facility. It will feature an on-site rainwater collection system and waste treatment plant to ensure 100 percent of the site's non-potable water comes from on-site recycled sources. An integrated water management system will manage and reuse rainwater and wastewater. By recycling our water, the campus will save an estimated 4.3 million gallons of potable water each year.

New offices, less water

We help support water-stressed communities by recycling, reusing, and replenishing water where possible. When regional water shortages hit Johannesburg, South Africa in 2018, we built an on-site greywater treatment plant and began collecting rainwater to reduce the amount of water our local office needed to operate. Since then, we've built on this approach in other campuses around the globe.

Beijing is one of the world's most water scarce cities. At our Beijing West campus, we are taking steps to minimize our impact. We have installed a greywater treatment system that allows the recycling of HVAC condensed water, followed by water purification. Current recycled water averages around 1,100 cubic meters per month. The recovered water represents approximately 10 percent of daily domestic water consumption in the campus.

35%

Our new Herzliya, Israel campus features water-efficient plumbing fixtures that drive up water conservation by 35 percent.



At our new Herzliya, Israel campus, water collected from air conditioners will be used exclusively to water plants on-site. In addition, water-efficient plumbing fixtures will drive up water conservation by 35 percent.

Herzliya campus with water reuse to minimize potable water consumption.

In India, where several of its most populous cities are struggling with water shortages, our Hyderabad campus has a different challenge—high annual rainfall and floods that jeopardize water quality. That is why the newest building on our Hyderabad campus will support 100 percent treatment and reuse of wastewater on-site for landscaping, flushing, and cooling tower makeup.

Even in the rainy Pacific Northwest, water is an issue, with quality affected by runoff from urbanization and climate change. At our headquarters modernization in Puget Sound, all new office buildings will reuse harvested rainwater in flush fixtures and low-flow systems, which is projected to save more than 5.8 million gallons annually. We also were awarded Salmon Safe certification, confirming that our designs protect local watersheds.

Water positive (continued)

Cooling with less water

While energy has received most of the attention as our cloud has grown, datacenters generate significant amounts of heat, which has typically been addressed by using water for cooling. We have taken steps over the past decade to minimize our water consumption, including new approaches such as fresh air and adiabatic cooling. This optimizes the use of both energy and water in a way most efficient for the local climate, while still delivering maximum computer power and performance.

Saving water in the desert

At our new datacenter region in Arizona, slated to open in 2021, we will use zero water for cooling for more than half the year, taking advantage of adiabatic cooling. We are also partnering with First Solar to provide solar energy rather than traditional electricity generation, which is expected to save more than 350 million liters of water annually.

Working to avoid Zero Day in South Africa

In South Africa, we use atmospheric water generation to collect water out of the air to fill storage tanks for use in cooling our datacenters. These systems function as industrial dehumidifiers.



Community engagement

Our community engagement programs focus on addressing community freshwater needs, alleviating competition for water resources, and improving local water quality and accessibility. For example, in Quincy, Washington, we installed a water reuse system. Industrial water reuse systems are designed to address growing water supply deficiencies in water-stressed areas while avoiding the need to develop additional potable water supplies. In South Africa, we supported the installation of smart water meters at 53 public hospitals in the Cape Town region. These meters provide greater visibility into water consumption to ensure that hospitals can remain operational despite a water crisis.

Minimizing water consumption in datacenters using fresh air and adiabatic cooling.

350M

Saved 350 million liters of water at Arizona datacenter thanks to solar energy from First Solar.

5.8M

Projected to save 5.8 million gallons of water annually at our new Puget Sound headquarters.

Water positive (continued)

Replenishing water

Water replenishment seeks to return water to the ecosystem from which an organization has consumed or sourced it, while also generating co-benefits. Our water replenishment efforts complement our reduction efforts by enabling us to make investments beyond our four walls in the communities where we operate. We are one of the first technology companies to adopt such a target.

Our strategy includes investments in projects such as wetland restoration and the removal of impervious surfaces like asphalt, which will help replenish water back into the basins that need it most. We focus our replenishment efforts on roughly 40 highly stressed basins where we have operations, using the World Resources Institute's Aqueduct tool to identify areas subject to water stress.

Wetland restoration in Chennai

In partnership with The Nature Conservancy, we are helping to demonstrate the potential of a scientific wetland restoration approach at Sembakkan Lake in Chennai, India. This project will support the local ecosystem's health, reduce pollution, recycle nutrients, act as carbon and flood sinks, and contribute towards increasing resilience to severe weather events like floods and droughts.

Audubon Dakota Urban Woods and Prairie Initiative

We are supporting the National Audubon Society to restore and enhance riparian grassland, wetland, and woodland habitats along the Red River in Fargo, North Dakota and Moorhead, Minnesota. The restoration of 44 acres of wetland and prairie habitat will improve water storage and quality, and enhance urban wildlife habitat. In addition to investment, Microsoft has participated in three stewardship events to plant nearly 2,000 native flowers and harvest seed.



Pole Mountain wetland and riparian restoration

We are supporting the National Forest Foundation in a unique water project. By decommissioning seldom-used roads, the project will support wetland and riparian improvement, water replenishment, and sediment reduction in the Pole Mountain area near Cheyenne, Wyoming, home to one of our datacenter regions. As of 2020, over 6 acres of national forest were restored, which is helping to increase water yield, decrease erosion, and protect the quality of Cheyenne's drinking water.

Water conservation in Lake Mead

We are supporting a project led by the Colorado Indian Tribes that allocates 150,000 acre-feet of "system conservation" water to shore up levels of Lake Mead. Project benefits include fostering stabilized water levels in Lake Mead, preventing shortages in California, Arizona, and Nevada, and supporting tribal water plans and infrastructure development. Microsoft has played a catalytic role in this project with a one-to-one match on contributions from the philanthropic community, as well as paving the way for eight additional companies, including The Coca-Cola Foundation, Procter & Gamble, and Intel, to make similar investments.

Water replenishment returns water while generating co-benefits.

1.5M

We are working with non-governmental organizations (NGOs) to ensure more than 1.5 million people have access to sustainable, safe drinking water and sanitation.

Improving access to water

Our reduction in water use intensity and our replenishment commitments address the key issue of water availability, which is the amount of water that can be used to meet demand. That, however, is only part of the challenge. Equally important is the issue of accessibility, which involves having access to reliable and safe drinking water and sanitation services.

We are working with NGOs to ensure more than 1.5 million people have access to sustainable, safe drinking water and sanitation, focused on seven countries. We started this work in 2020, and will grow it in 2021.

Enabling via microfinance

We've begun work with Water.org, a leading global non-profit focused on underserved communities, to help people in Brazil, India, Indonesia, and Mexico. Our investments will enable Water.org and its network of microfinance institutions to offer water supply and sanitation (WSS) loans that are used to install household-level taps and toilets, community water and sanitation solutions, and rainwater harvesting and storage.

Water.org expects nearly 90 percent of the participants to be women living below the poverty line. This partnership will provide reliable drinking water and/or sanitation access for 140,000 people by the end of FY21 and empower 840,000 people by the end of FY23. Microsoft's investment will be leveraged 68:1 and enable at least \$200 million in microloans.

In addition to the human impact, we will assess the volumetric water benefits in strategic high-stress watersheds and river basins overlapping with our business. We'll then expand this work with partners in China, Malaysia, and South Africa.

Driving innovation

Digitizing water

We believe that Microsoft's most important contribution to water reduction will come not from our own work alone, but by helping our customers, partners, and suppliers around the world reduce their water footprints through our learnings and with the power of data, AI, and digital technology.

As we worked to establish our water strategy, we quickly realized we would need to address and overcome several key challenges specific to water data.

Water data is often segmented and siloed, both within an organization and across multiple organizations operating in the same watershed, which makes managing a shared resource particularly challenging. Water data often lacks context, meaning it is provided without an understanding of underlying conditions in the area. This makes it difficult for any single organization to assess its impact on a water basin, which in turn complicates or obscures the most impactful intervention to address water issues in that area. In addition, water data often suffers from discontinuities, where data collection is interrupted due to equipment failure or lack of funding for observational networks. The digitizing of water data is about overcoming these limitations to make water data credible, transparent, useful, and actionable.

Measuring quality and consumption

Microsoft is developing solutions to help customers understand water-related risks due to climate change, use data to reduce water use, and make smarter decisions about water. In the past year, we've launched new solutions accelerators on Azure IoT Central that include remote, real-time water quality monitoring and water consumption monitoring, geared toward reducing water consumption.

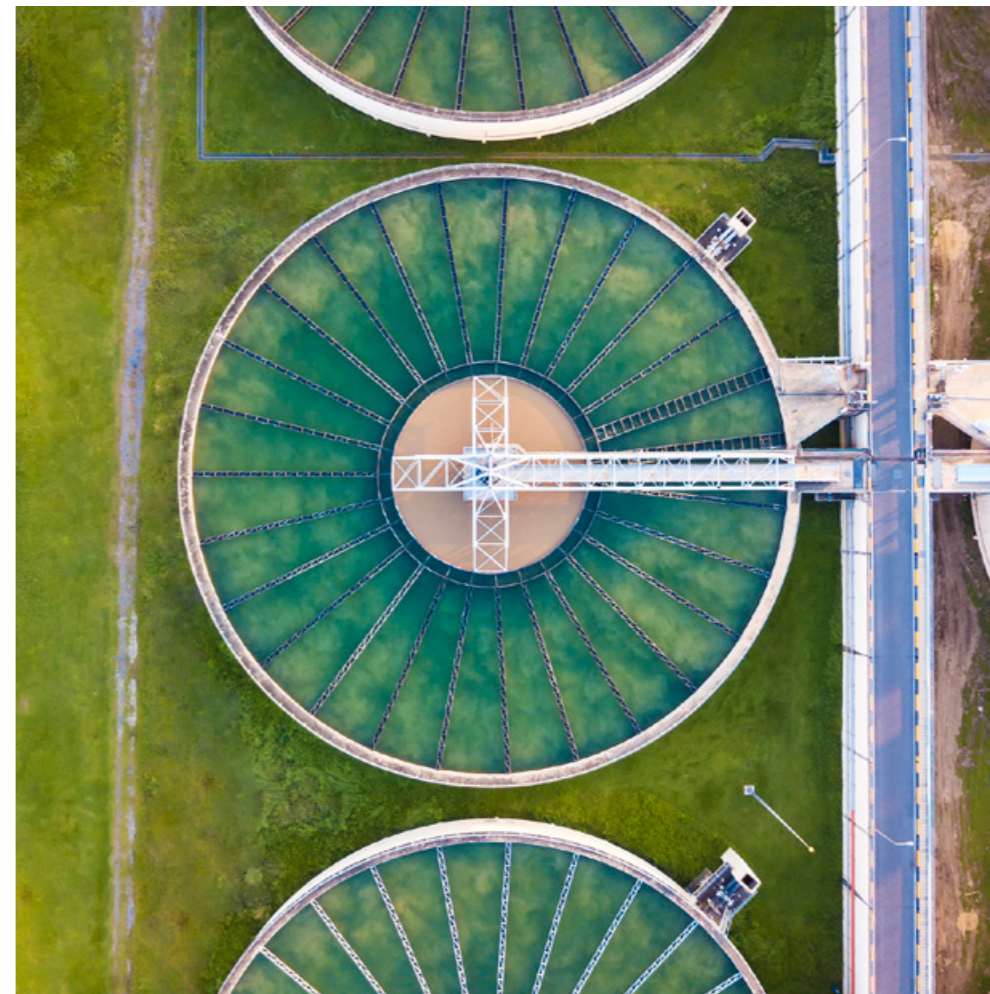
[Find out more here](#)

\$200M

We will enable nearly \$200 million in microfinance loans to support water and sanitation access projects.

Leak detection

Several organizations in our partner ecosystem have deployed water solutions focused on leak detection and mitigation running on Azure. One such partner is Ecolab, who is working to reduce water consumption and increase water recycling, starting with leak detection in manufacturing and industrial settings.



Our partner ecosystem has deployed water solutions for leak detection and mitigation.

Driving innovation (continued)

Risk assessment

In partnership with Microsoft and S&P Trucost, **Ecolab** offers the Water Risk Monetizer and Smart Water Navigator to businesses and organizations around the world. The Water Risk Monetizer provides actionable information to help organizations understand water-related risks and quantify them in financial terms to inform responsible decisions that enable growth. This tool is available to the public at:



Find out
more here

The Smart Water Navigator helps companies reduce their water usage at a facility level by generating a tailored, industry- and location-specific guide. This information helps facilities reduce water and energy use, and, in aggregate, aids companies in achieving corporate water reduction targets while reducing costs. The tools are available to the public at no cost. An updated, integrated version of these tools is planned for release in March 2021, which will include new features such as context-based approaches to local water challenges and organizational benchmarking.



Find out
more here

40%

The UN estimates global demand for water will exceed supply by 40 percent by 2030.



Optimizing crop yields with IoT sensors.

Tackling water consumption across product lifecycle

Unilever continues to grow and evolve its business in a purpose-driven way to reduce its environmental impact, improve global health and well-being for 1 billion people, and enhance the livelihoods of millions. Unilever and Microsoft have collaborated for many years on new ways to use digital solutions, from enabling affordable internet access and community engagement to deploying IoT sensors in field crops and manufacturing facilities to discover new, actionable insights. This capability has allowed factories to generate new data insights that reduce water wastage in production and ways to optimize crop yields. In addition, Unilever and Microsoft are educating global communities about water quantity and quality to enable everyone to access safe and clean water.

Enabling systems change

Catalyzing innovation and collective action

We are focused on new ways to harness the power of technology, partnerships, investments, and policy to drive impact at scale and pace to help the world more effectively address water availability and accessibility.

Driving collective action with the UN and customers

Microsoft was a founding member of the **Water Resilience Coalition**, launched in 2020. It is an initiative of the United Nations Global Compact CEO Water Mandate. Initially comprised of seven companies, the coalition has since grown to 18 industry-leading corporations, all of whom have pledged to work collectively on availability, quality, and accessibility issues in water-stressed locations. The Coalition is working together to identify priority basins for collective action in 2021 and to set targets for improving conditions in those basins.

Funding innovation via CIF

Through our Climate Innovation Fund (CIF), we have invested \$10 million in the Emerald Technology Ventures' \$100 million Global Water Impact Fund, whose other investors also include Temasek, Ecolab, and SKion Water. The fund partners with early-stage to expansion-stage companies from around the world, to drive innovation in water technologies and market adoption. It focuses on solving key challenges, including water conservation, water efficiency and quality, reduction of carbon emissions in water treatment, and climate adaptation. This fund is one of the few funds solely focused on emerging water technologies.

\$10M

Invested \$10 million in the Emerald Technology Ventures' Global Water Impact Fund focused on emerging water technologies.



Perception Reality Engine uses data on rainfall, groundwater, and plant growth to map water availability.

Capitalizing on AI

Through our AI for Earth program, we are also supporting startups and non-profits capitalizing on the cloud, data, and AI to accelerate the pace of innovation in water.

Gaining insights into water conditions

Vector Center utilizes Azure in its Perception Reality Engine to collect, correlate, and analyze water-related data to produce an overall picture of what's happening in a city, region, or watershed in real time. Their unique approach combines state-of-the-art satellite data, social sentiment analysis, and on-the-ground investigative research to deliver focused intelligence, scenarios, contexts, and response strategies about the world's water, food, and energy supplies in a disruptive era.

Enabling systems change (continued)

Assessing agricultural practices with AI

The **Freshwater Trust** and **Upstream Tech** are using Azure and AI tools to expand the **BasinScout Platform**, which pinpoints where changes in agricultural management will result in the greatest benefits for surface water quality and groundwater conditions. Their approach applies machine learning and water resource models to satellite/aerial data, available farm management and environmental data to assess the potential for improving field-level agricultural practices and to quantify the impact on water resources. Stakeholders can then design scenarios of optimal changes across multiple farms to improve the use of water in a cost-efficient manner. BasinScout Platform has accelerated the process to protect and restore watersheds, as field-scale environmental and economic impact now takes months instead of years; watershed program planning now takes minutes, instead of months.

Predicting the quality of river water

SOS Mata Atlântica in Brazil has developed an AI solution to predict the quality of the water in several rivers in the region. The project relies first on 3,600 volunteers mobilized in groups from diverse backgrounds, such as schools, universities, churches, scouts, community centers, and others, who monitor water quality with a kit. The results are uploaded to Microsoft Azure, where AI resources are applied, providing more effective and accurate insights. In the future, it will be possible to cross-reference data from different sources, such as public health reports, and to assess the correlation between water quality and epidemic outbreaks.

Improving water resource management

Leadership Counsel for Justice and Accountability is a California non-profit focused on various environmental justice issues in underserved communities. They are working to address the challenge of drinking water availability in California's San Joaquin Valley. Nearly 2 million people in the state rely on private domestic wells for drinking water, and many of these wells often fail during drought or due to groundwater management issues. The Leadership Counsel is using AI to predict domestic well failure resulting from groundwater changes and resulting drinking water shortages. They are providing this information to affected residents and local, regional, and state agencies that can use it to prevent well failure and improve water resource management and planning.



We are advocating for improved data in water-stressed areas.

Policy

Governments play a fundamental role in ensuring the availability of safe, clean drinking water, maintaining and expanding water infrastructure, protecting critical water ecosystems, and responding to water crises. As part of our water positive commitment, we outlined areas in which we will advocate, including the following:

Improving data in water-stressed areas

We will advocate for the development of more accurate and up-to-date assessment of ground and surface water levels and how they are changing over time. This data can help local stakeholders calculate and forecast demand and supply balances, track water quality, facilitate disaster prevention and early warning systems, and ultimately develop innovative solutions.

Upgrading water infrastructure

We need governments to invest in upgrading and expanding water infrastructure. This is critical to provide safe drinking water, treat storm and wastewater, manage water levels, and protect against climate impacts, particularly in the most vulnerable communities.

Integrating water into climate strategies

Water is the primary means through which climate change will be experienced. As such, we need governments to address climate and water challenges in a more integrated way. One way to do this is through the long-term goals that countries set as part of their national climate plans or Intended Nationally Determined Contributions (INDCs) under the Paris climate agreements.

In 2020, we have begun this work by:

- **Joining WaterEurope**, the leading association in Europe focused on technology and innovation aspects of water, with a focus on digital water. We will use our voice in the organization to call for improved collaboration in the water sector, advocating for proper inclusion of water-related topics in EU policies, European funding programs, and shared research.
- **Supporting the creation of the Common European Green Deal data space**, as part of the European Strategy for Data, that aims to harness the potential of environmental data to help achieve the EU's ambitious climate objectives.
- **Encouraging our trade associations and coalitions** to look for opportunities to support the inclusion of water infrastructure into COVID-19 recovery packages and foster innovative solutions.

3,600

The SOS Mata Atlântica project in Brazil has 3,600 volunteers participating to monitor water quality.

Key learnings

What we've learned

Creating credible, transparent, and trusted platforms for sharing water data is foundational to functioning ecosystems.

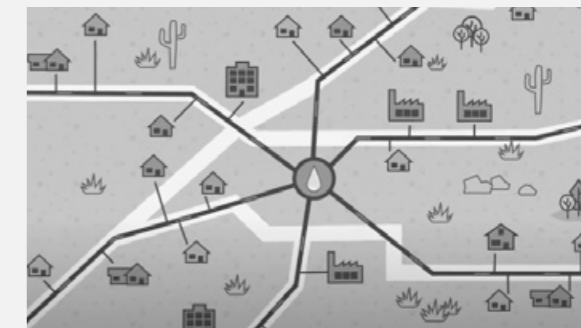


1 Water is local and your commitments should be too. While carbon is a global pollutant and emission reduction and removal projects can be sourced anywhere, water is a local resource and commitments to improve water conditions need to align spatially with where your facilities are using or sourcing water. This requires building awareness of the water context where you operate, as well as being able to source projects that are informed by that context and that will improve conditions in those locations. Building up this local awareness and these partnerships, and working with groups like the Water Resilience Coalition to facilitate and expedite this work, will be crucial for driving impact that is meaningful and relevant.

2 Time matters as much as place. Given that the demand for and the quality and supply of water varies over time, it's important to account for this temporal variability when tailoring your water strategy. For example, if a given location experiences acute scarcity during the summer months or if water quality is exacerbated during the months when heavy rains typically occur, then the interventions you support should reflect this variation. When we established our availability target, we considered annual baseline water stress as well as monthly baseline water stress and while it will be challenging, we will strive to inform our replenishment work with this nuance.

3 Water data is too little, too late. Water data, especially water quality, often is not available, if it is available at all, until it is too late to inform real-time adjustments. It also is often siloed, making it difficult to generate and share meaningful insights that inform management decisions. And the lack of widely used water-climate scenarios hinders the ability to make long-term planning investments. Remediating this by creating credible, transparent, and trusted platforms for sharing water data is particularly critical, especially for a resource that cuts across multiple sectors and is foundational to functioning ecosystems.

How to take action on water in your own organization:



Explainer video:
Get inspired by our strategy.

[Find out more here](#)

Water Risk Monetizer:
use this free tool, built by Microsoft and Ecolab, to assess the true value of water and risk exposure you face.

[Find out more here](#)

WRI Aqueduct Tool:
understand the local water stress and scarcity concerns where you operate.

[Find out more here](#)

Learn how to create a **water quality monitoring application** in Azure IoT.

[Find out more here](#)

Learn how to create a **water consumption monitoring application** in Azure IoT.

[Find out more here](#)

What's next?

Our focus for 2021

1 Sourcing replenishment projects that drive collective action and have transformative impact in our priority locations.

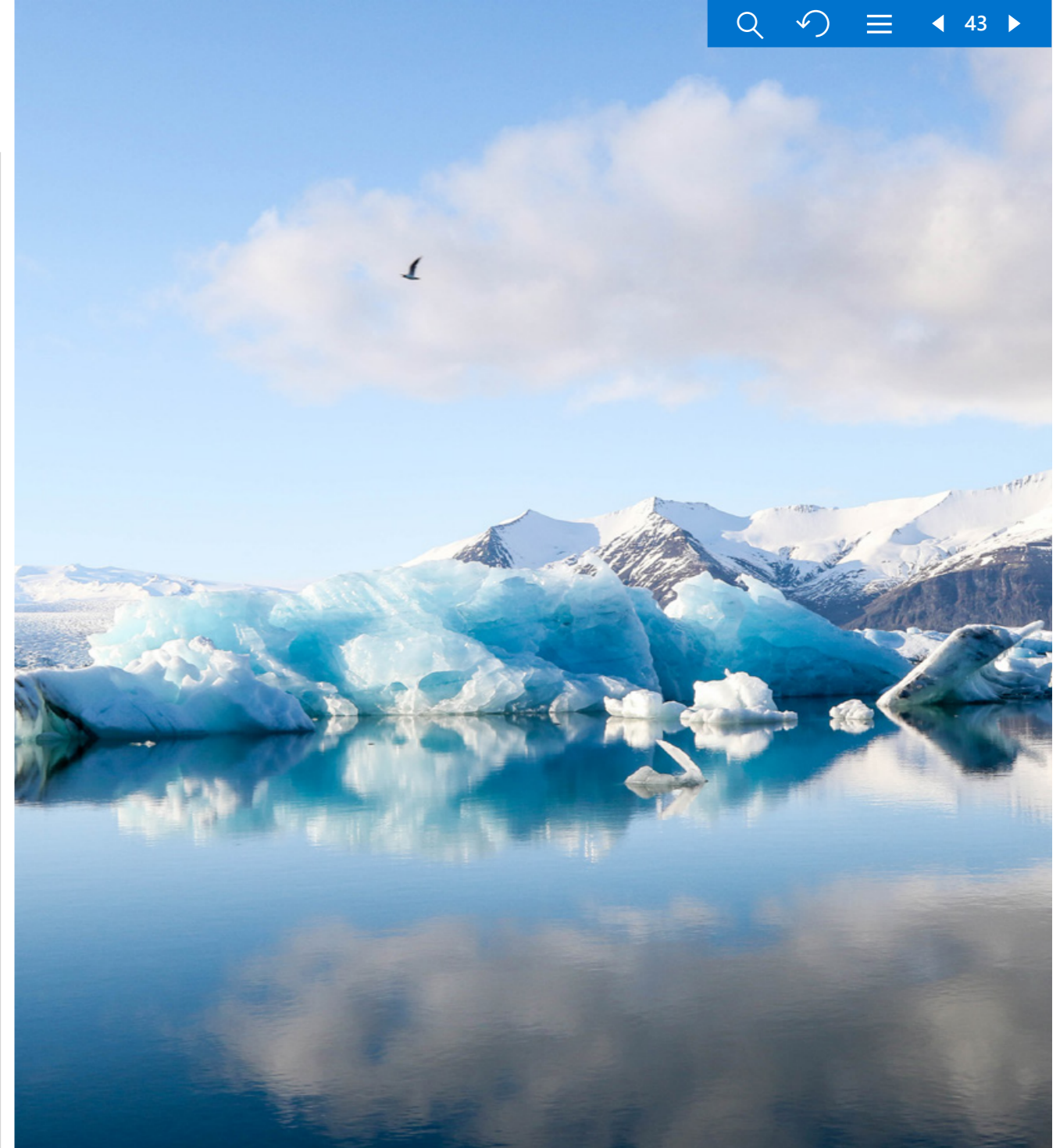
2 Enabling drinking water and/or sanitation access for **140,000 people** by the end of FY21 through our partnership with Water.org.

3 Creating new tools:

- Hosting the **next generation of global climate projections** so that the World Resources Institute and its partners can generate future water projections, thereby enabling water-climate scenario analysis and enhancing understanding of future water risks.
- Supporting the development of an **enterprise-scale water stewardship self-assessment tool** in partnership with the CEO Water Mandate.
- Working with our partners to **build new tools or accelerate the deployment of existing tools**, such as BasinScout Platform, to empower our customers to achieve their water goals.

4 Improving the usefulness of our **water consumption data**.

5 Using our Emerald Technology Ventures investment to **identify technology adoption opportunities for emerging water technologies** from our Climate Innovation Fund that can help Microsoft achieve our water positive commitment and support our customers.



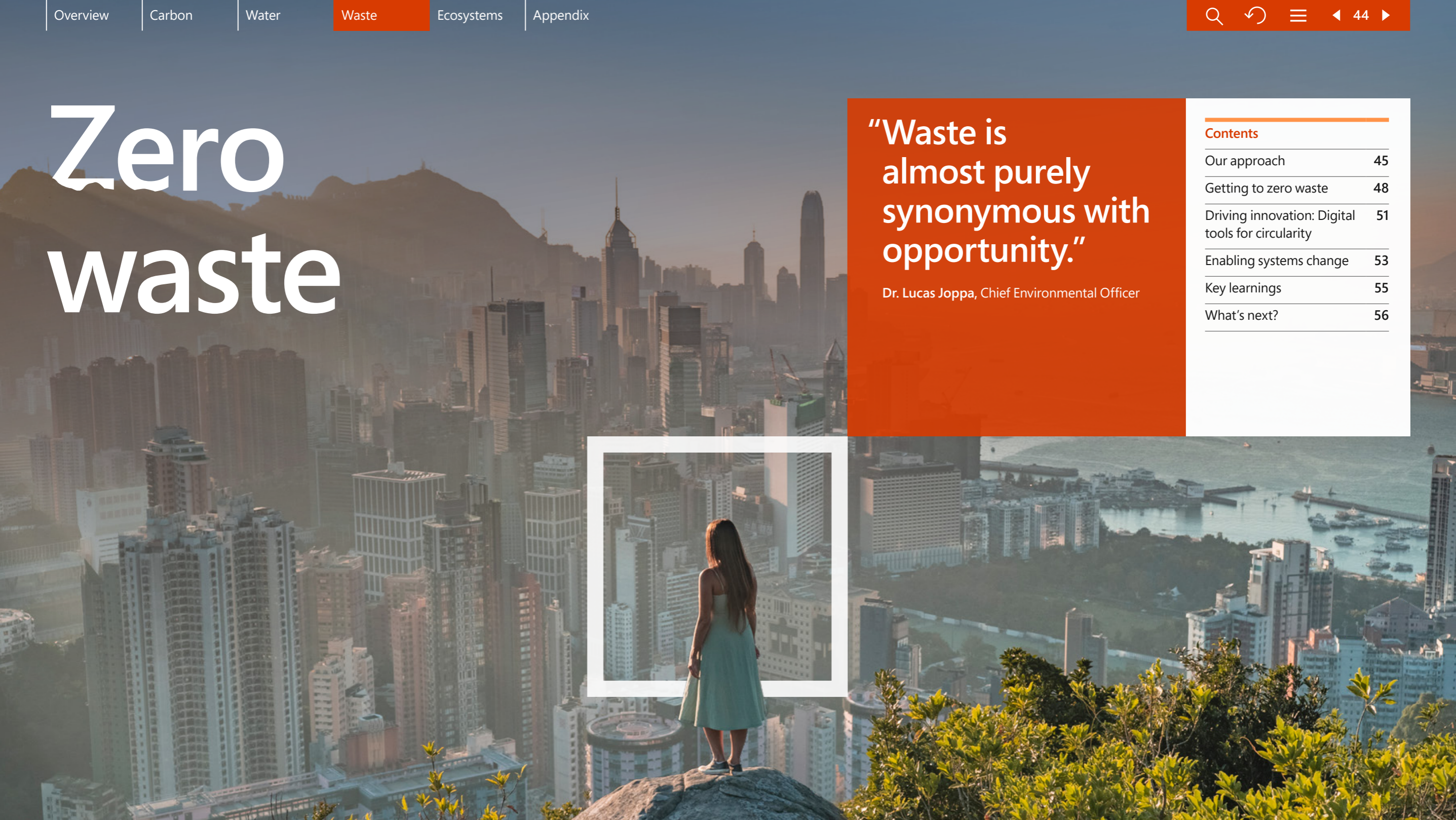
Identifying adoption opportunities for emerging water technologies.

Zero waste

“Waste is almost purely synonymous with opportunity.”
Dr. Lucas Joppa, Chief Environmental Officer

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Our approach

Overview

We will reduce as much waste as we create across our direct operations, products, and packaging—becoming zero waste by 2030.

The context

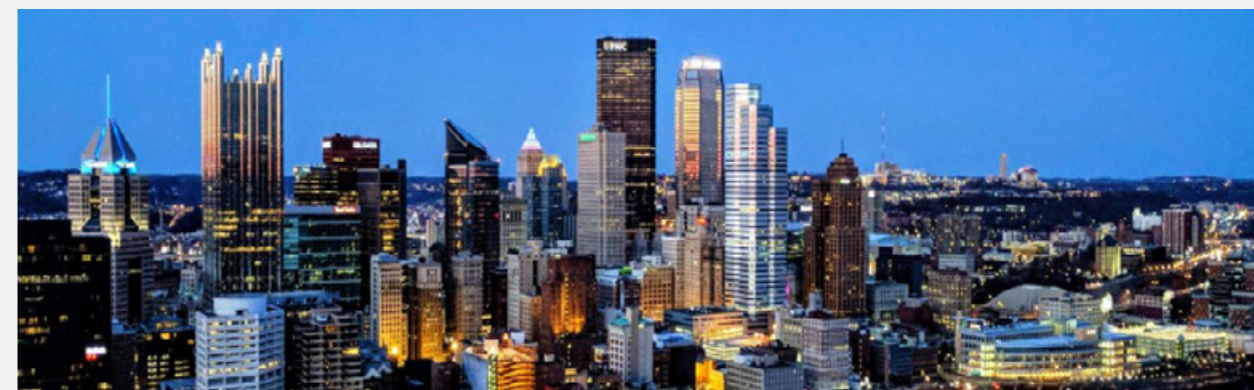
Every year, the world collects 11 billion tons of waste, according to the United Nations Environment Programme. Waste, including plastics, e-waste, and food waste, pollutes our land, clogs our waterways, depletes natural resources, and contaminates the air we breathe.

We recognize the urgent need to protect the world's ecosystems, give equal access to a healthy environment, meet the needs of a growing population, and reduce the carbon emissions that come from the creation, distribution, and disposal of waste. Moreover, we see incredible economic and environmental benefits of taking a circular approach to materials management, which reduces waste and keeps products and materials in use. There's a big opportunity to unlock a "triple bottom line" with circularity—delivering societal, environmental, and economic benefits. Accenture Strategy predicts a \$4.5 trillion market for circular economy business models by 2030.

Microsoft aims to unlock these opportunities via our commitment to change our operations, drive innovation, and invest in new solutions that accelerate the transition to a circular economy. In the third quarter of 2020, we established our new waste commitments.

[Find out more here](#)

Our progress to date



We are accelerating the transition to a circular economy.

Collaborated with Ellen MacArthur Foundation network members to develop Circular Business to Business Transport Packaging Solutions.

Zero

Achieved **Zero Waste Certification** of datacenters in Dublin, Ireland and Boydton, Virginia.

60K

In FY20, we diverted more than 60,000 metric tons of the solid waste otherwise headed to landfills and incineration from our campuses and datacenters.

\$30M

Invested \$30 million in Closed Loop Partners' funds to accelerate recycling and composting infrastructure, innovation, and business models for supply chain digitization, e-waste collection, food waste reduction, and recycling industry products to build a more circular economy at scale.

90%

Successfully piloted our first **Microsoft Circular Center** in Amsterdam, which shows Circular Centers can contribute to increased reuse of servers by 90 percent by 2025.

10,500

Engaged 10,500 employees in Ecochallenges to reduce personal waste footprints.

Our approach (continued)

Our waste commitments

By 2030, Microsoft will be zero waste across our direct waste footprint.

Investing in the future of circularity

We will partner with companies around the world to drive circular economy innovation and adoption of technologies to reduce waste and reuse materials and products.

Transforming waste accounting

We will improve waste data collection to ensure auditability and reporting.

Making fully recyclable Surface devices

We will manufacture Surface devices that are 100 percent recyclable in Organization for Economic Cooperation and Development (OECD) countries by 2030.

Eliminating single-use plastics

By 2025, we will eliminate single-use plastics in all Microsoft primary product packaging and all IT asset packaging in our datacenters.

Driving to zero waste in operations

We will reduce as much waste as we create across our direct operations, products, and packaging.

Increasing reuse of servers and components through Circular Centers

By 2025, 90 percent of servers and components within our regional datacenter network will be reused.

“Zero waste is an ambitious goal, but minimizing our own waste footprint is essential to preserving the natural resources and reducing carbon emissions to ensure our economies and societies around the world thrive for generations to come.”

Brad Smith, President

Our approach (continued)

Table 1

90% or more diversion of general waste by 2030

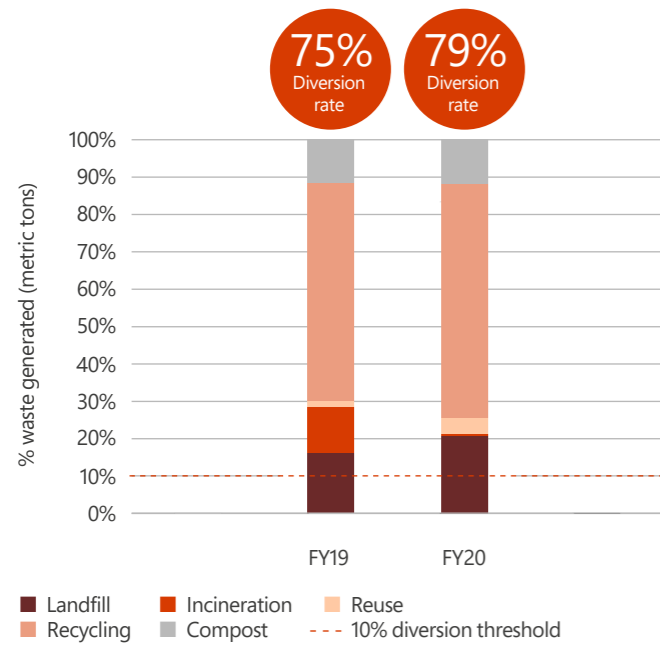
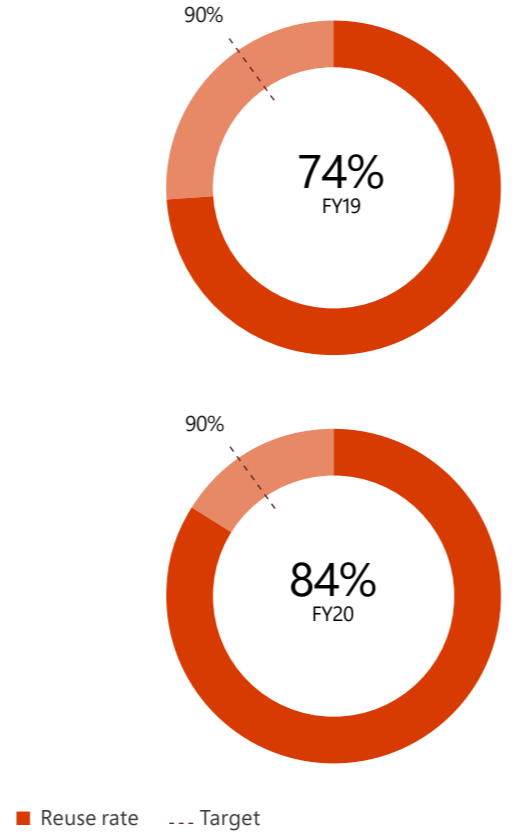


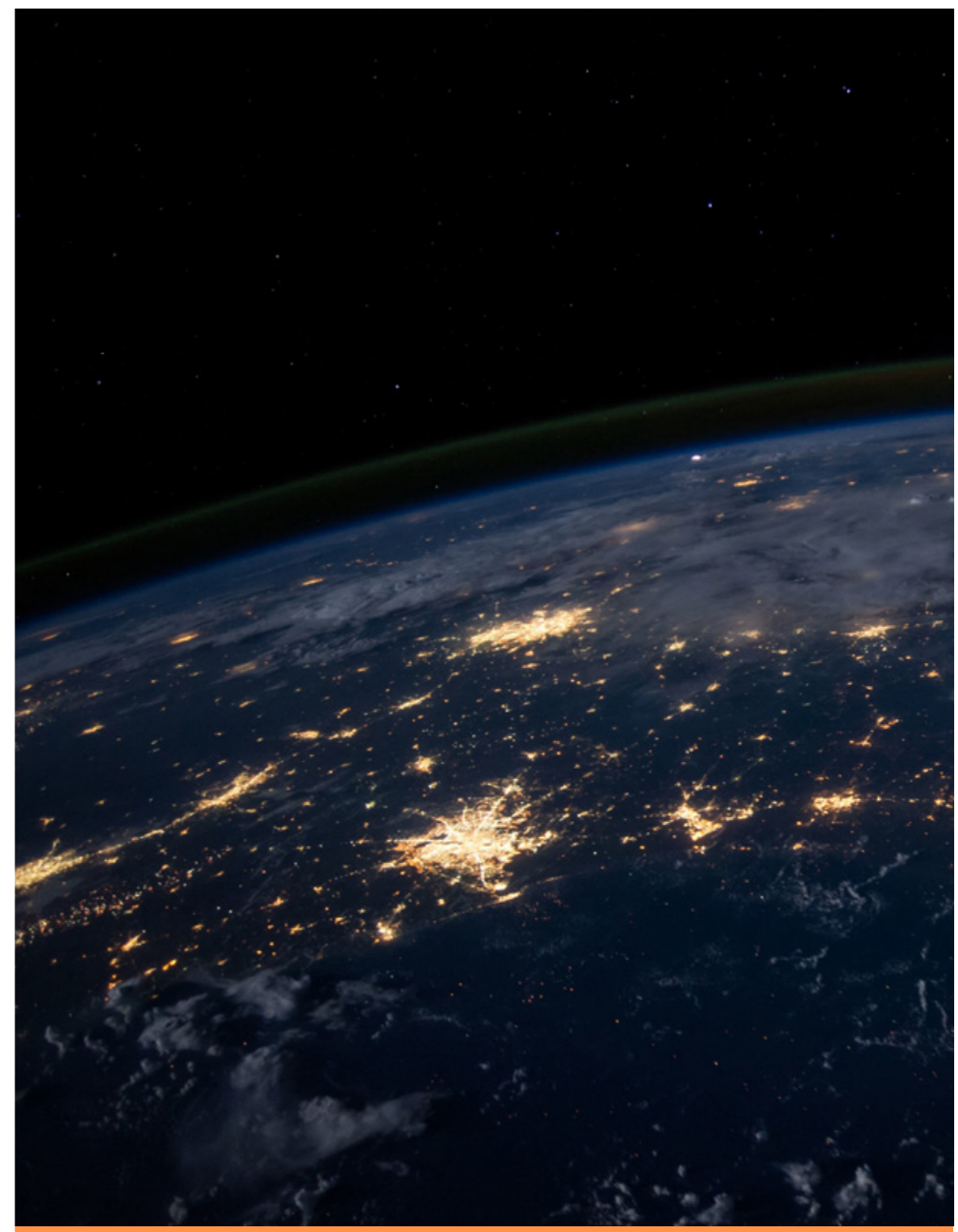
Table 2

90% reuse of servers and components in DCs by 2025



\$4.5 trillion

The market for circular economy business models will be \$4.5 trillion by 2030.



Driving technologies to reduce waste and reuse materials and products.

Zero waste

Getting to zero waste

To meet our commitment to being zero waste by 2030, we are looking at our waste footprint in facilities and datacenters, launching our innovative Circular Centers, cutting waste in our devices, and engaging our employees.

Our focus on waste reduction initiatives began in 2008, when our facilities implemented single-stream recycling and composting across our Puget Sound offices and dining services.

Since then, we've hosted certified zero waste events, like our Hackathons. Microsoft's Puget Sound campus, our largest campus and accounting for nearly half of our global facilities floor area, has been zero waste certified since 2016.

This commitment spans the globe. In India, our Bengaluru Ferns site installed a biogas plant, which uses anaerobic digestion (also called a biodigester) to break down and recycle 1,430 pounds of food waste each day, turning it into biogas. It creates enough biogas for half of the site's daily cooking fuel needs. At our sites around the world, we have implemented zero waste best practices, including ensuring proper signage and education materials to increase awareness of how to properly dispose of waste and reduce waste contamination in order to minimize our impact on the environment.

Zero waste facilities

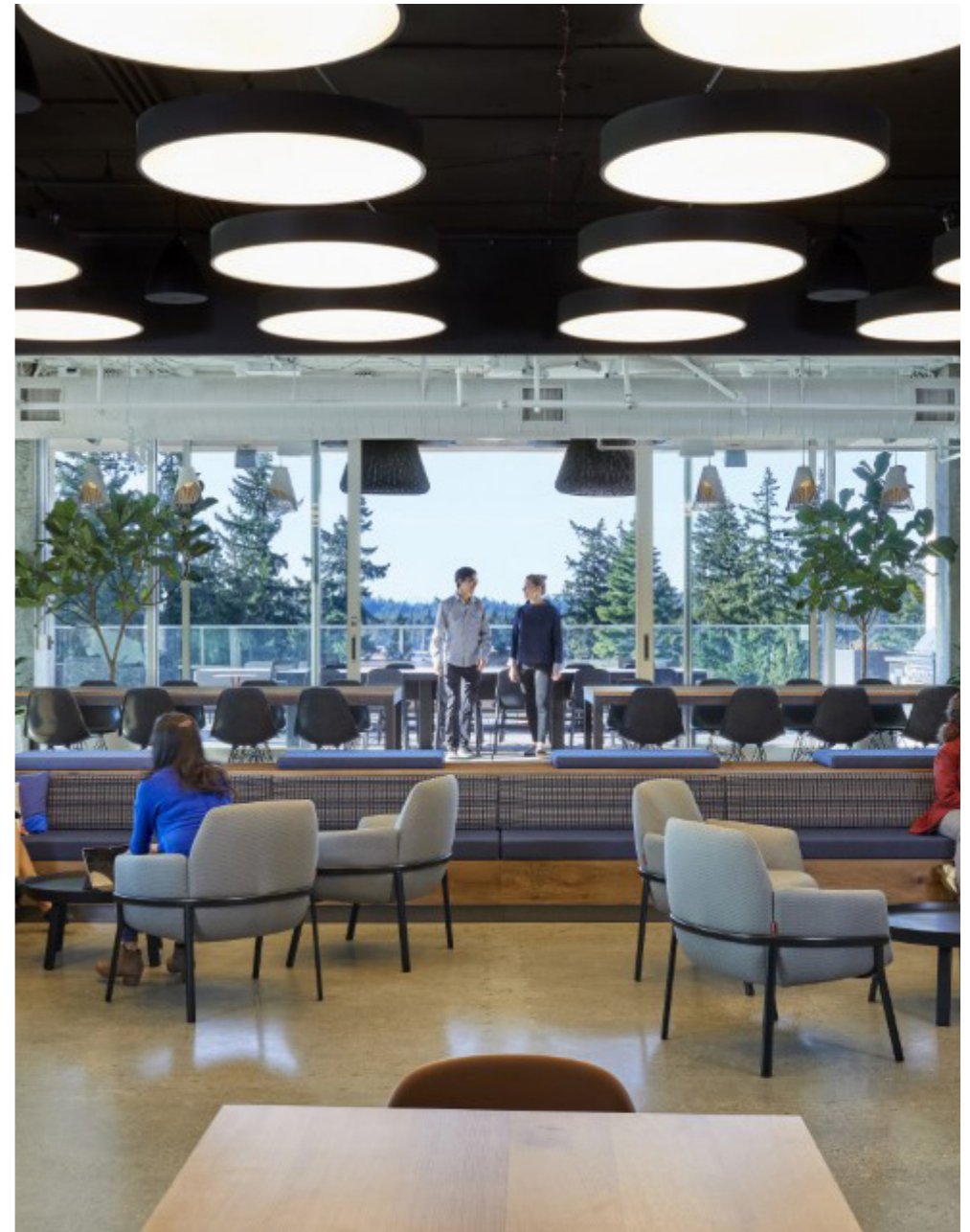
We are committed to diverting at least 90 percent of the solid waste headed to landfills and incineration from our campuses and datacenters. In addition, as we continue to grow, we will achieve, at a minimum, 75 percent diversion of construction and demolition waste for all projects. Some of our largest campus projects to date have shown exemplary performance in this area. On our campus in Israel, we demonstrated a 77 percent diversion rate and in Silicon Valley we achieved a 96 percent diversion rate. Our campus modernization project in Puget Sound is currently demonstrating a 95 percent diversion rate as we continue our construction process. In 2020, we also achieved Zero Waste Certification at our datacenters in Dublin, Ireland and Boydton, Virginia.

50%

Half of daily cooking fuel at our Bengaluru Ferns site in India comes from biogas made from food waste.

90%

Our target to divert solid waste from landfills and incineration is 90 percent.



Our Puget Sound campus has been zero waste certified since 2016.

Zero waste (continued)

Launch of Circular Centers

To meet the growing demand for our cloud services, our datacenter footprint—and the 3 million servers and related hardware that power it on an annual basis—must expand. But we must do this with our sustainability goals in mind, and that is more than just reducing the power they consume. Today, these servers have an average lifespan of five years. To better manage this waste stream, Microsoft is increasing control and innovating to create closed loop models.

In 2020, we announced our first-of-its kind approach to repurpose and reuse servers and network hardware through new Microsoft Circular Centers, which will be located on every new major datacenter campus. Using intelligent scheduling via Dynamics 365, these centers will process servers on-site through a variety of reuse routes working in close collaboration with datacenters, key suppliers, and partners.

Already, we are up and running in Amsterdam. We have seen increased availability of server and network parts for reuse and producer returns. We reduced downtime and transportation miles, extended the lifecycles of servers in use, and demonstrated savings linked to spares and repairs. We are seeing a 70 percent increase in value return for components that we are processing through our new disposition routes. We are also seeing an increased flexibility and new opportunities for end-of-life processing working with our partners.

The Circular Centers are an integral part of our design-for-sustainability workstreams, providing a responsive feedback flow of information, with learnings linked to reuse, disassembly, reassembly, and recycling shared with our design and supply chain teams to inform future sustainable generations of equipment. We are expanding from our pilot in Amsterdam to our Virginia, Sweden, and Dublin sites. The Circular Centers will contribute to and increase our reuse of servers and components up to 90 percent by 2025.



Extending circularity in datacenters to packaging

Given the number of components coming through our datacenters, in 2020 we launched our new Microsoft Cloud Responsible Packaging Goals for 2025. These guide our work on IT asset transportation packaging at our datacenters. Our goals include:

- All packaging will have a minimum of 50 percent recycled content.
- 100 percent of all cloud packaging will be reusable, recyclable, or compostable.
- Single-use plastics will be eliminated in all IT asset packaging in our datacenters.
- Packaging weight will be reduced by a minimum of 10 percent from a December 2020 baseline.

Repurposing and reusing servers and hardware through Microsoft Circular Centers.

100%

All cloud packaging will be reusable, recyclable, or compostable by 2025.

Community engagement


Our programs enable waste reduction and help eliminate the community concept of waste through mindful inputs and highest-value use of by-products. Programs include projects such as research into decommissioned datacenter battery reuse for distributed energy projects, and training computer vision models to identify types of waste for recycling.

In 2020, we partnered with The Recycling Partnership to build two recycling units at an existing solid waste drop-off location in Mecklenburg County, Virginia where residential recycling services are currently limited. This project will allow residents to recycle plastic, glass, aluminum, steel, cardboard, and mixed paper, and provide public education for residents and operational training for county staff.

Zero waste (continued)

Cutting waste in devices

The sustainability of our devices begins with their design, including what our devices are made of, how they are made, and their lifespan. For more information, see the Devices Sustainability Report:

 Find out more here



New research on circularity

We partnered with KPMG to measure the circularity of our Surface devices and their packaging. The work explored how we could and should measure circularity, how our devices measure up to those methodologies today, how we should set targets for improvement, and how to assess impact. Circular Transition Indicators (CTI) results provided us with ranked opportunities to increase the circular inflows and outflows for our products. Top opportunities include increasing the recycled content of aluminum in our device enclosures and resins used in components.

Achieving EPEAT Gold for key Surface products

EPEAT, managed by the Green Electronics Council, is the leading global ecolabel for the IT sector that awards points based on sustainability categories such as product substance management, materials selection, and packaging. Microsoft has achieved the highest possible rating, EPEAT Gold, for the Surface Laptop 3, Surface Pro X, Surface Go 2, Surface Pro 7+, and Surface Laptop Go in the US and Canada.

100% recyclable Surface

We set a new target to reach 100 percent recyclable Surface devices by 2030. Today, our assessment found Surface Pro X and Surface Book 3 (15") both achieved a recyclability rating of 95 percent. In 2021, we'll integrate our new innovations, technologies, and learnings from our most recyclable products to the rest of our products.

Solving packaging problems

Our target is 100 percent recyclable packaging by 2030 and elimination of single-use plastics by 2025. The recyclability of our packaging portfolio was 88 percent and plastic constituted 7.7 percent of our packaging material use at the end of FY20. For Surface devices specifically, the recyclability of our packaging was 95 percent. We are developing programs to drive to 100 percent by 2030.

Engaging our employees

We recognize that our employees are our biggest asset in advancing innovation in our journey to zero waste and we have created opportunities to enable them to contribute to our efforts, while reinforcing the principle that individual action leads to collective impact.



“No one person or organization can solve the global waste problem. It will take all of us doing our part, including using better data to understand the problem and make smart waste policy decisions.”

Brad Smith, President

Waste reduction

Our Employee Waste Data Dashboard, introduced in 2020, provides Microsoft employees with transparency to the Puget Sound campus monthly waste data. It also enables us to test effectiveness of waste reduction campaigns, implementation of waste prevention initiatives, and more.

Gamifying behavior change

Ecochallenges provide our employees with the opportunity to learn and practice habits that support them on their personal zero waste journey. In 2020, we launched two:

- Our LinkedIn Ecochallenge lasted three weeks in honor of Earth Day 2020. Over 2,000 employees participated, resulting in 7,500 plastic bottles not sent to landfill, nearly 250 trees planted, and almost 220,000 pounds of carbon saved.
- The Microsoft Ecochallenge lasted 19 days in November 2020. Nearly 8,500 employees participated, resulting in nearly 20,000 plastic containers not sent to landfill and almost 1,300 pounds of waste composted.

The collective learning and ongoing behavior changes from the ecochallenges, if maintained over a year, could lead to significant impact, including nearly 280,000 plastic bottles and over 380,000 plastic containers not sent to landfill, nearly 25,000 pounds of waste composted, over 4,200 trees planted, and close to 4 million pounds of carbon saved. Microsoft worked with Ecochallenge.org, an easy-to-adopt platform for any organization.

Driving innovation

Digital tools for circularity

We believe that Microsoft's most important contribution to waste reduction will come not from our own work alone, but by helping our customers, partners, and suppliers around the world reduce their waste footprints through our learnings and with the power of data, AI, and digital technology.

Today, there is no consistent, high-quality data about the amount of waste, the type and quality, where it is generated, and where it goes.

Waste data needs a standardized methodology, better transparency, and higher quality. Without more accurate data, it's nearly impossible to understand the impact of operational decisions, what goals to set and how to assess progress, or to set an industry standard for waste footprint methodology.

We are investing to digitize waste data across the company in FY21 to identify opportunities to improve waste data collection, both for ourselves and for our customers. We plan to use technology to track and report on waste, using Power BI platforms to visualize e-waste chain-of-custody, and improving Microsoft Power Apps to capture real-time waste data.

Already, in 2020, we've put our technology to work for ourselves and our customers.



We are transitioning e-waste data to Power BI dashboards.

60K

In FY20, we diverted more than 60,000 metric tons of the solid waste otherwise headed to landfills and incineration from our campuses and datacenters.

Serving as customer zero

In 2020, we worked with our e-waste vendors to convert monthly e-waste data Microsoft Excel reports into real-time, chain-of-custody API reporting with Power BI dashboards. We're transitioning e-waste data across our company to this format, from the technology provided to employees to the IT assets in datacenters. In our Circular Centers, we will scale up the use of AI to process servers and hardware that are being decommissioned on-site. Our packaging team is using Dynamics 365 to manage its data, which acts as a data aggregator, with the ability to pull and push data to and from other tools. When linked with Power BI, the system has delivered a step change in our ability to manage data and reporting.

Blockchain for circularity

Blockchain can provide a secure and stable account of data across enterprises. It also works well as a solution to track materials over a full supply chain, which is necessary to reduce waste and bolster a circular economy. One organization using blockchain to support their work is the **Madaster Foundation**. Using Microsoft technologies, the Madaster Platform functions as a public online library of materials in the built environment. It links the identity of materials and products to a location and registers the information in a material or building passport. Through the passport, materials keep their identities, changing every building into a depot of materials with a certain value.

Driving innovation (continued)

Data and insights in recycling

Colchester Borough Council provides services to 192,500 residents, from licensing to recycling. The Council is using Dynamics 365 to unify its data, like the recycling tracking system that provides reporting via Power BI, showing data like heatmaps of problem spots for collections or where residents need more encouragement to recycle. The insights derived from Power BI close the loop for development, providing KPIs that help the Borough improve both the app and recycling services to improve landfill diversion rates.

IoT to cut food waste

A new platform, Alsense, entered the market in 2019, driven by a Danfoss and Microsoft collaboration. The new cloud-based service solution is powered by Azure and provides retailers with new ways to manage operations. Action can be taken quickly to prevent temperature changes and avoid inefficient energy usage. This will lead to reduced food waste and a more energy efficient supermarket.

Improving circularity with AI

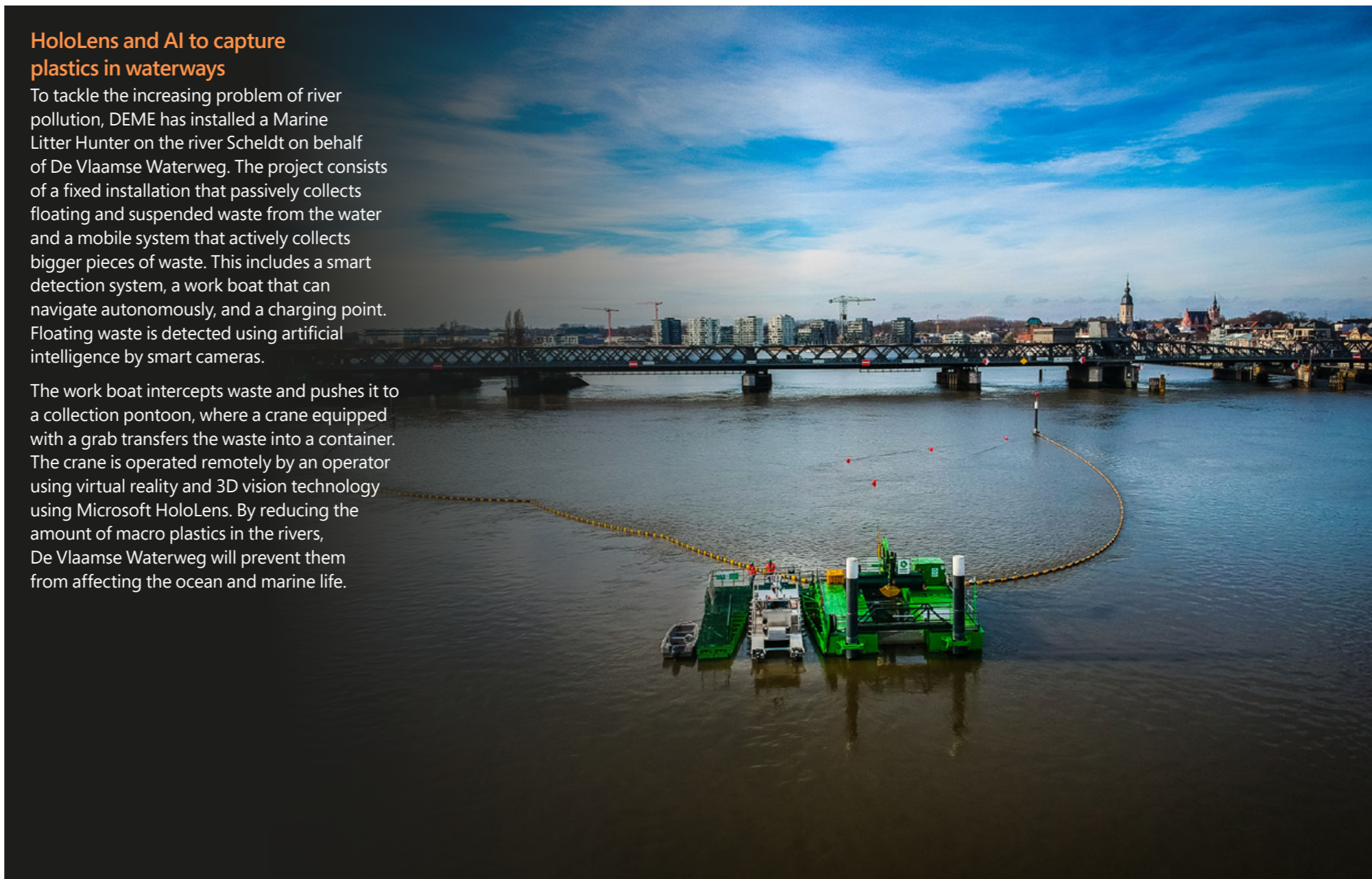
Chase and Microsoft are jointly building a traceable waste treatment system. Microsoft AI and cloud technologies are helping Chase digitize its industrial waste process and tracing. Using Azure, Microsoft AI, and IoT solutions, Chase is able to manage its business, from dispatch and garbage collection to sensors that capture the weight and composition of bin contents. The data is used for a wide range of scenarios including flagging improper bin contents to prevent potential quality risk in developing renewable products. Chase has noted that Microsoft has inspired them to become a waste management-as-a-service company, providing smart circular economy solutions and creating comprehensive, transparent, and safe service offerings.

HoloLens and AI to capture plastics in waterways

To tackle the increasing problem of river pollution, DEME has installed a Marine Litter Hunter on the river Scheldt on behalf of De Vlaamse Waterweg. The project consists of a fixed installation that passively collects floating and suspended waste from the water and a mobile system that actively collects bigger pieces of waste. This includes a smart detection system, a work boat that can navigate autonomously, and a charging point. Floating waste is detected using artificial intelligence by smart cameras.

The work boat intercepts waste and pushes it to a collection pontoon, where a crane equipped with a grab transfers the waste into a container. The crane is operated remotely by an operator using virtual reality and 3D vision technology using Microsoft HoloLens. By reducing the amount of macro plastics in the rivers, De Vlaamse Waterweg will prevent them from affecting the ocean and marine life.

Reducing plastics in waterways with HoloLens.



Enabling systems change

Catalyzing innovation and collective action

We are focused on new ways to harness the power of technology, partnerships, and investments to drive impact at scale and pace to help the world more effectively transform to a circular economy.

Collaborating on innovation

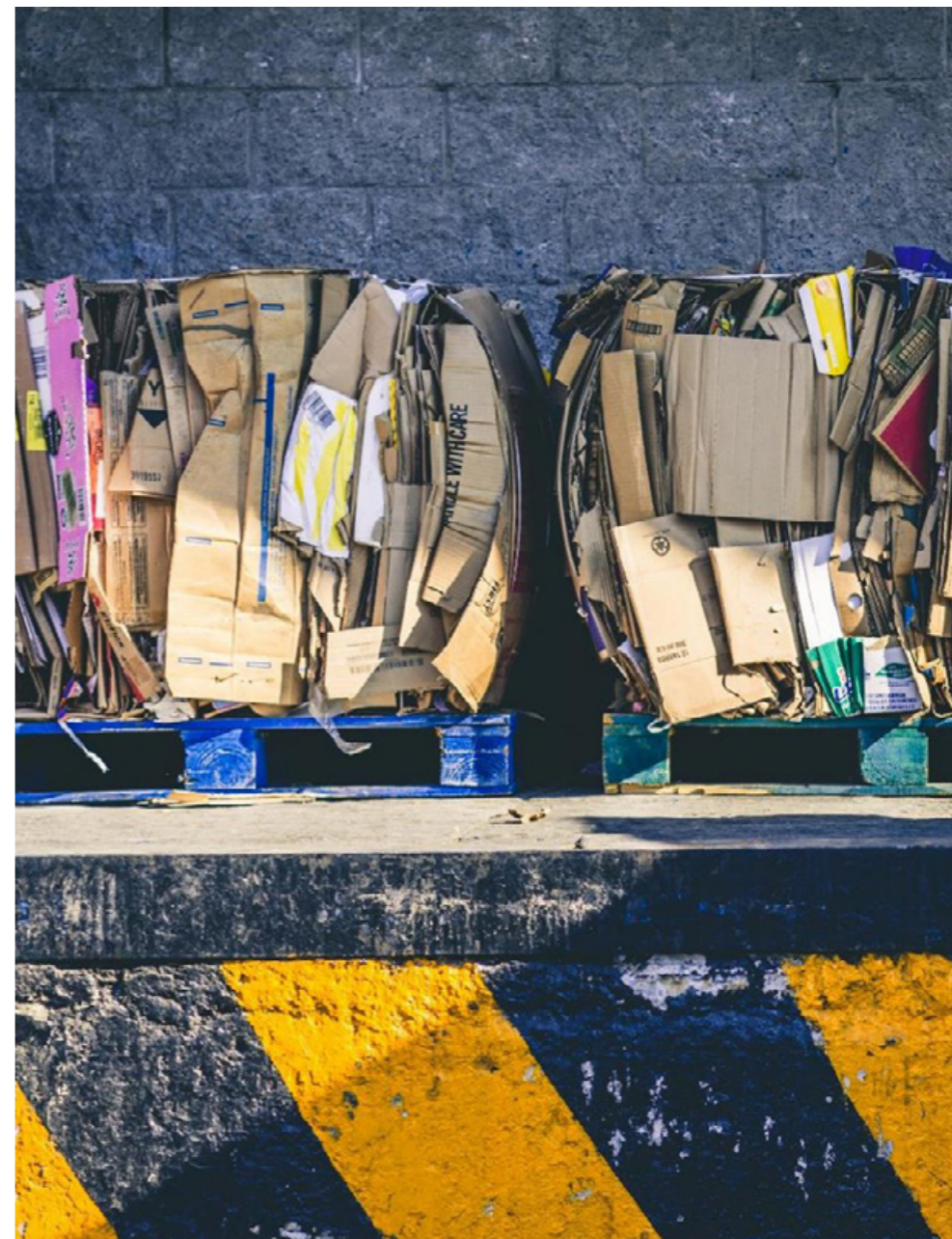
We kickstarted an **Ellen MacArthur Foundation** network project with Aquafil, BASF, CHEP, Cisco, and Flex to create an alternative circular supply chain packaging solution to replace the existing linear plastic-based shrink/stretch wrap material used to stabilize and protect products in transit. The volume of business-related packaging is significant, as are its environmental impacts. Most of the difficult-to-recycle non-consumer packaging waste is comprised of single-use plastic, contributing to the 6.8 million tons of plastic waste sent to landfill each year. Co-innovation in material alternatives and redesigning packaging ecosystems, including the transportation of packaging and improvements in the wider collection, sorting, and plastic recycling infrastructure, are urgently needed to reduce this waste stream and progress towards circular supply chains.

Funding innovation

Our Climate Innovation Fund combines economic opportunity with benefits to wider society and the environment. We have invested \$30 million in **Closed Loop Partners'** funds to accelerate infrastructure, innovation, and business models for supply chain digitization, e-waste collection, food waste reduction, and recycling industry products to build a more circular economy at scale.

\$30M

Invested \$30 million in Closed Loop Partners' funds to help build a circular economy at scale.



Creating alternative circular B2B packing solutions.

Enabling systems change (continued)

Investing in AI

Through our **AI for Earth** program we are supporting startups and non-profits using cloud, data, and AI to accelerate the pace of innovation in waste, including the following projects:

Citizen science + AI = waste reduction

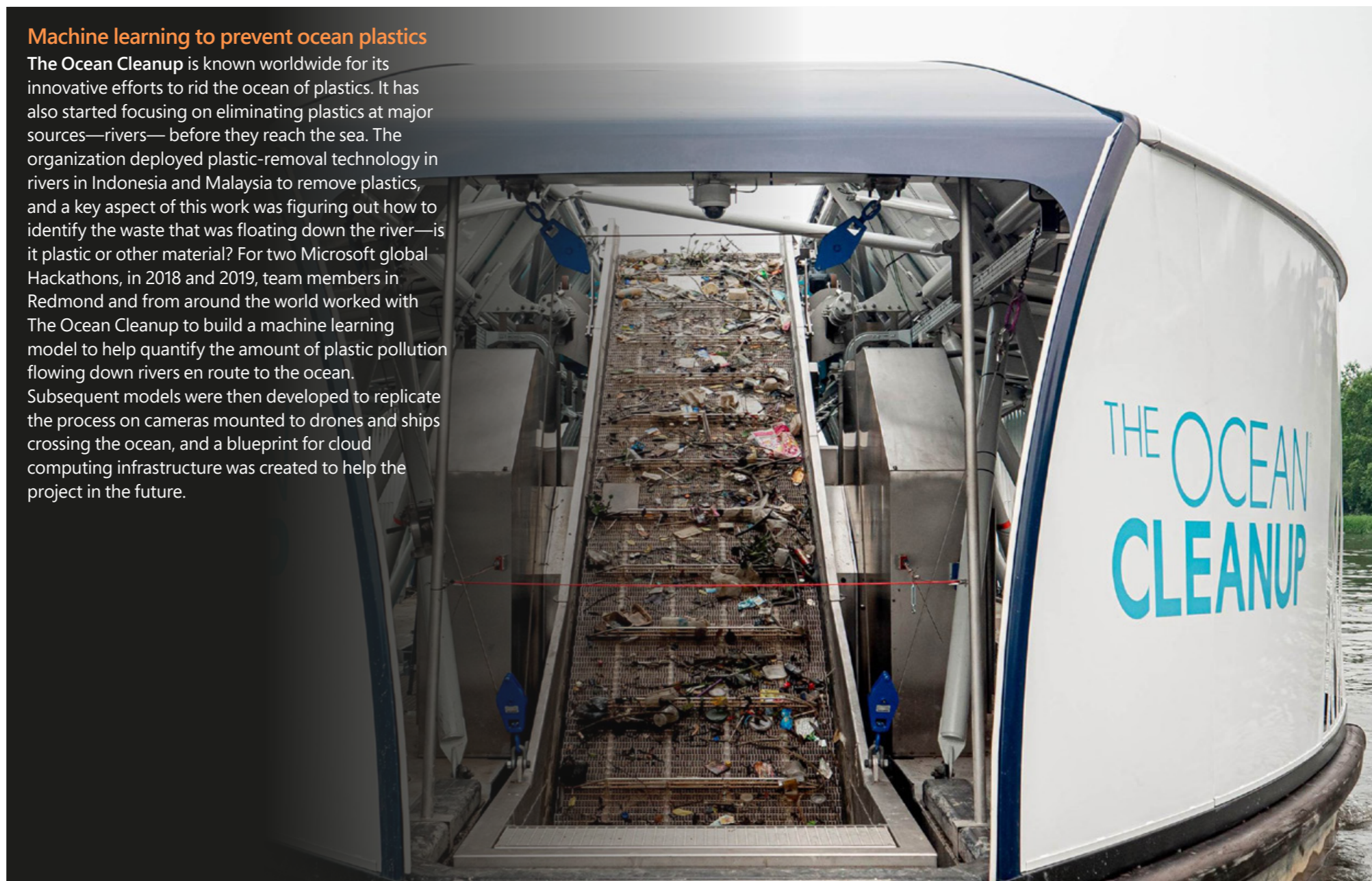
Sustainable Coastlines Charitable Trust is using Azure and AI tools to enhance its groundbreaking Litter Intelligence program, enabling communities around Aoeteroa, New Zealand to collect litter data, gain insights, and take action for a litter-free world. The non-profit hosts its citizen science technology platform and Learning Management System on Azure, while scaling and improving data quality by deploying machine learning techniques and computer vision to train its litter classification and count model. Litter Intelligence has established the country's first official marine litter database, and for the first time is enabling citizen science to be used at the highest levels of government reporting.

Computer vision to detect waste

Recycleye has developed a computer vision system that replicates the power of human vision to identify every item in waste streams, using AI to automate waste sorting and improve recycling. The organization recognized the huge issue of waste management and the importance of accelerating the transition towards a circular economy. It is using deep learning and AI advancements with a low cost, rapidly deployable, decentralized, scalable, and fully automated sorting solution which can be deployed inside waste management facilities. Their goal is to create waste removal chains that are just as efficient as today's supply chains, bringing transparency, accountability, and traceability to the waste management industry.

Machine learning to prevent ocean plastics

The Ocean Cleanup is known worldwide for its innovative efforts to rid the ocean of plastics. It has also started focusing on eliminating plastics at major sources—rivers—before they reach the sea. The organization deployed plastic-removal technology in rivers in Indonesia and Malaysia to remove plastics, and a key aspect of this work was figuring out how to identify the waste that was floating down the river—is it plastic or other material? For two Microsoft global Hackathons, in 2018 and 2019, team members in Redmond and from around the world worked with The Ocean Cleanup to build a machine learning model to help quantify the amount of plastic pollution flowing down rivers en route to the ocean. Subsequent models were then developed to replicate the process on cameras mounted to drones and ships crossing the ocean, and a blueprint for cloud computing infrastructure was created to help the project in the future.



The Ocean Cleanup focuses on efforts to rid the ocean of plastics.

Key learnings

What we've learned

The presence of waste in any system requires a closer look—including creativity, systems thinking, data science, and material science.



We need to identify the next best use to optimize materials.

1 Creativity kills waste. Examine any waste stream and it will reveal stories of unrealized value and products that weren't designed with end-of-life in mind. And, if you look a bit closer, you'll also see a grand opportunity. When we looked at the quantity and quality of electronic equipment leaving our datacenters to be responsibly refurbished or recycled by our partners, we realized that most of this hardware, or a subset of its components, still had significant value and could be reused at least once before being recycled. We recognized the opportunity to apply creativity and systems thinking to the problem and intervene in an existing system with the use of our Circular Centers, which are on-site reuse and repurposing facilities at our datacenters. Applying this solution allows us to retain the value of our hardware for longer and also introduces a feedback loop to share the learnings from disassembly with our designers so we can continue to extend the useful life and improve disassembly moving forward. The presence of waste in any system requires a closer look, and with creativity and systems thinking in mind.

2 Material science and data science are better together. Our ambition is to improve our waste data to make more informed decisions about design, reuse, and disposition. As we've improved our accounting, we have been reminded at nearly every turn that without improvement and innovations in material science, progress will be much slower. For example, we've greatly improved our quantification and tracking of single-use plastics in Microsoft packaging and suppliers' IT asset packaging in our datacenters. However, to continue to make progress towards eliminating single-use plastics in our packaging, some of our solutions will require a material replacement that can meet or exceed necessary functional requirements. Selecting sustainable material alternatives requires material science to ensure that the materials will circulate within existing waste management infrastructure and, if mismanaged, not end up as pollution in the environment. By using both material science and data science, we can solve waste and pollution problems, not create new ones.

3 Next best use needs to move from theory to practice. To keep products and materials circulating in the economy, we need the ability to efficiently identify the next best use so we can optimize materials and limit adverse environmental impacts, like carbon emissions. Right now we lack a principled approach on how to consistently consider the next best use of products and materials across our business. We believe technology can benefit our decision-making process by modeling disposition options and related environmental impacts, then recommending next best use based on a principled approach that aligns with current theories of waste reduction, like the Waste Hierarchy of Highest and Best Use.

How to get started on waste in your organization:

Microsoft Sustainability Guide:

Guidance on how companies can get started in a technology-led, sustainable transformation.

[Find out more here](#)

Sustainability. Good for Business. Executive Playbook: A way for companies to begin or accelerate their work on sustainability.

[Find out more here](#)

Learn more about our Circular Centers.

[Find out more here](#)

Build a connected waste application in Azure IoT Central.

[Find out more here](#)

Try the **Ellen MacArthur Foundation Material Circularity Indicator**, a tool we use as well.

[Find out more here](#)

Run an ecochallenge to give your employees the opportunity to learn and practice habits that support them on their personal zero waste journey.

[Find out more here](#)

Find out **where and how to recycle your Microsoft devices**, courtesy of Microsoft.

[Find out more here](#)

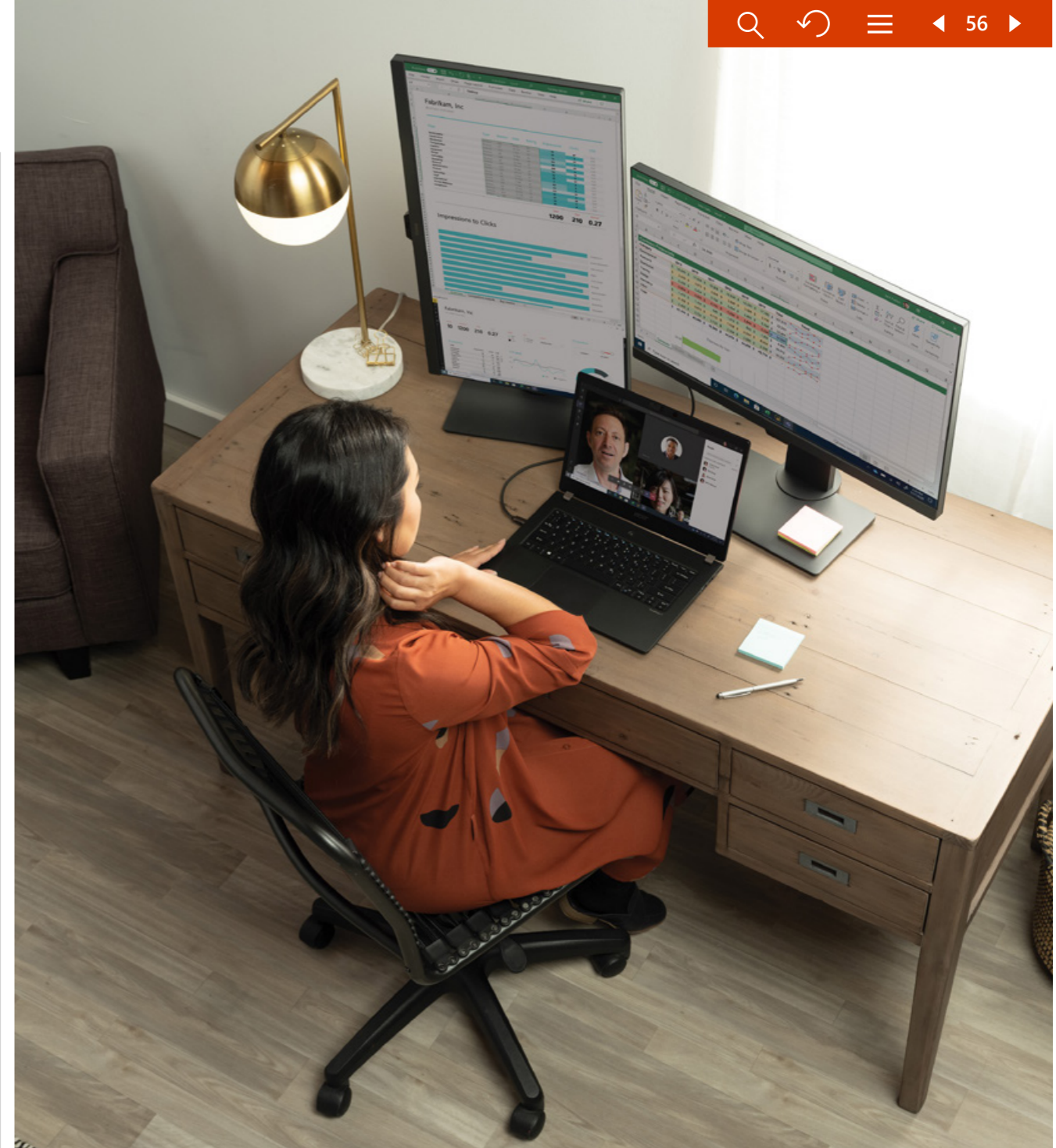
Achieving Operational Zero Waste: An inside look into Microsoft's operational zero waste journey.

[Download here](#)

What's next?

Our focus for 2021

- 1** In 2021, we will continue to make progress towards our zero waste by 2030 agenda and share results and learnings from our journey. One key area that we are focused on now is the **transformation of our waste accounting using a mix of technology and "boots on the ground" tactics**, like waste auditing. We look forward to sharing more details of our transformation, as customer zero, later this year.
- 2** We will deepen our involvement in **building an ecosystem of partners and suppliers to reduce single-use plastics in consumer and transportation packaging**. Our critical work with Ellen MacArthur Foundation network members will focus on shrink wrap/film in transportation packaging. We will also continue to scale our work with our cloud supply chain to quantify and identify alternatives to plastic waste shipped into Microsoft's datacenters.
- 3** Our datacenters will roll out a **global initiative to train employees on company-wide and site-specific procedures to operationalize zero waste**. We will continue to identify opportunities within our consumer devices to **transition to circular models and utilize recycled and renewable materials**. We are mapping opportunities to an effort and impact graph to chart the next phases of our journey.
- 4** We will continue to partner with our suppliers to run a series of feasibility tests to **determine if recovered ocean plastics can be processed and used in Microsoft products**.



We are transforming waste accounting using technology.

Ecosystems

“Only when we have a massive amount of planetary data and compute can we begin to answer the complex question—how do we manage the Earth’s natural resources to ensure a climate-stable future.”

Dr. Lucas Joppa, Chief Environmental Officer

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Our approach

Overview

We will aggregate environmental data from around the world and put it to work through data, AI, and technology with the Planetary Computer.

The context

Nature, and the benefits that it provides, are the foundation of our society, cultures, and the global economy. We depend on well-functioning ecosystems for clean air, water, food, medicine, energy, and building materials. But these very ecosystems are threatened or already in decline. When a species dies off, the implications for the ecosystem can be catastrophic.

One critical barrier to protecting our ecosystems is our current understanding of them. We know more about the rate of decline than we know about the species, biodiversity, and ecosystems that are vital to our health and prosperity. Simply understanding where the world's forests, fields, and waterways are remains a daunting task of environmental accounting. There is very little scientific data on what species call those ecosystems home and why they thrive or decline.

Scientists around the world are making tremendous progress collecting this data and answering key questions. However, when the work is done, it frequently takes too long—the assessments that do this work are thousands of pages, cite tens of thousands of scientific sources, and take years to publish. Assessing the planet's health must become a more sustained, efficient, and integrated practice that allows us to understand exactly what is happening over time.

Fortunately, there is massive potential for technology to revolutionize our environmental assessment practices, so they can be conducted faster and cheaper, and—for the first time—be able to operate at a truly global scale.

↘ Find out more here

-87%

Wetlands that purify and store water and provide habitats for thousands of species have been reduced by 87 percent relative to pre-industrial levels.

Our progress to date



Ecosystems are threatened or in decline.

700

Grew the AI for Earth community to over 700 AI for Earth grantees in more than 100 countries around the world, including 17 strategic partnerships with key platforms using the Azure cloud to provide conservation and sustainability services.

10PB

On-boarded 10 petabytes of environmental and Earth observation data to Azure that is now freely available for use by the conservation community.

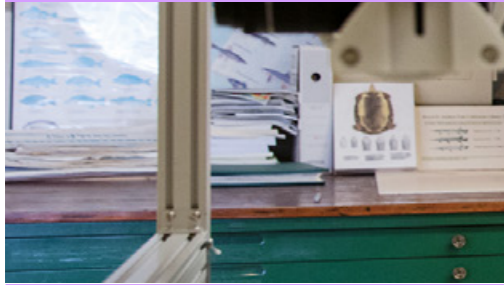
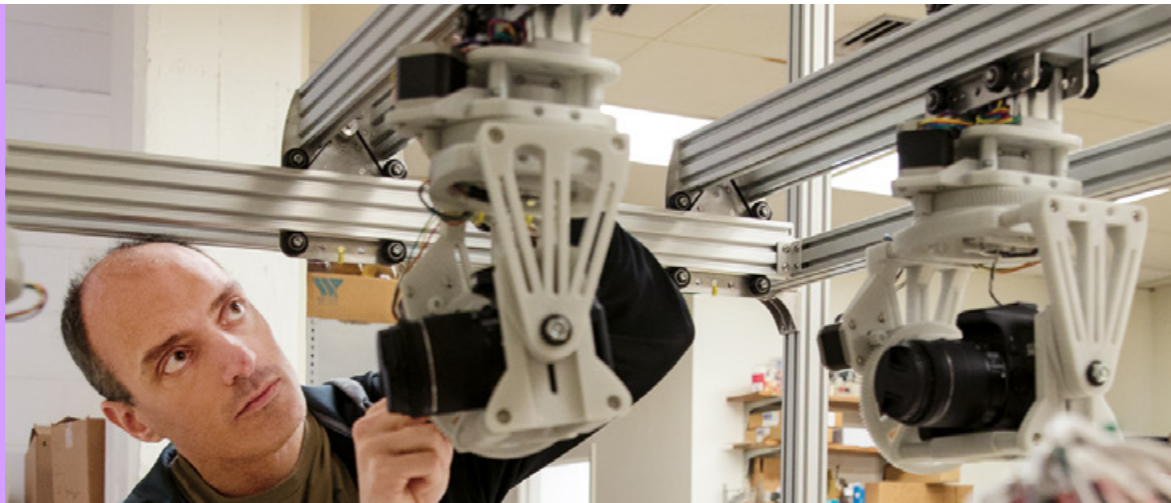
Protect

Established partnerships with The Nature Conservancy and the National Fish and Wildlife Foundation to fulfill our commitment to protect more land than we use by 2025.

Supported passage of the Great American Outdoors Act, which Microsoft directly advocated for throughout the legislative process.

Our approach (continued)

Our ecosystem commitments
 In 2020, we established new goals around ecosystems.



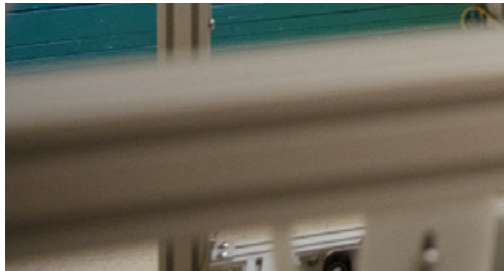
Use our voice on ecosystem-related public policy issues
 We will support and advocate for public policy initiatives that measure and manage ecosystems at the national and global scale.



Build a Planetary Computer
 We will aggregate environmental data from around the world and put it to work through computing and machine learning in a new Planetary Computer.



Empower partners and customers around the world
 We will use the Planetary Computer to develop and deploy the digital technology that helps our partners and customers with environmental decision-making in their organizational activities.



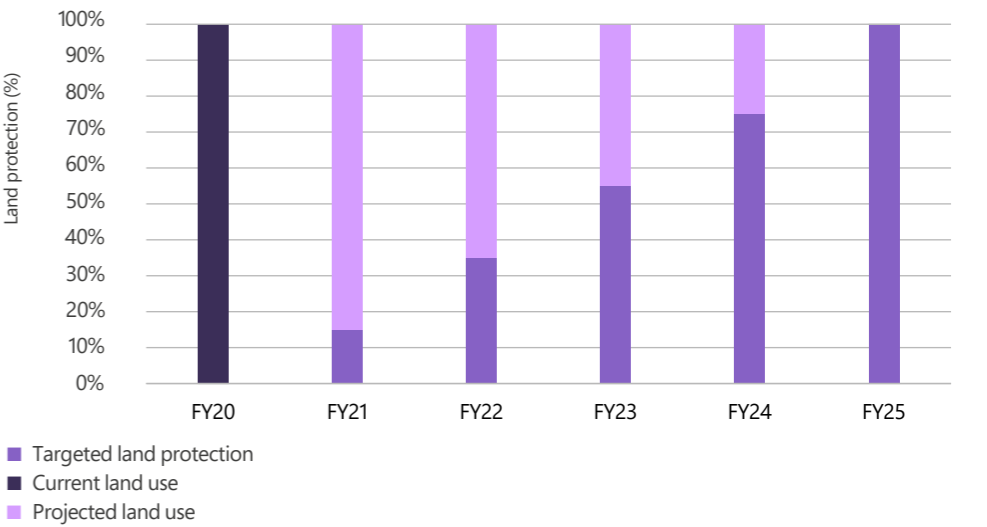
Take responsibility for our land footprint
 We will take responsibility for the ecosystem impacts of our direct operations by protecting more land than we use by 2025.



-60%
 Mammals, birds, and other wildlife populations are down almost 60 percent in the last 40 years.

Table 1

Protect more land than we use by 2025



Protecting ecosystems

Taking responsibility for our land footprint

To meet our commitment of protecting more land than we use by 2025, we are partnering with global organizations that can guide our data and science-driven approach to prioritizing the protection of ecosystems most at risk.

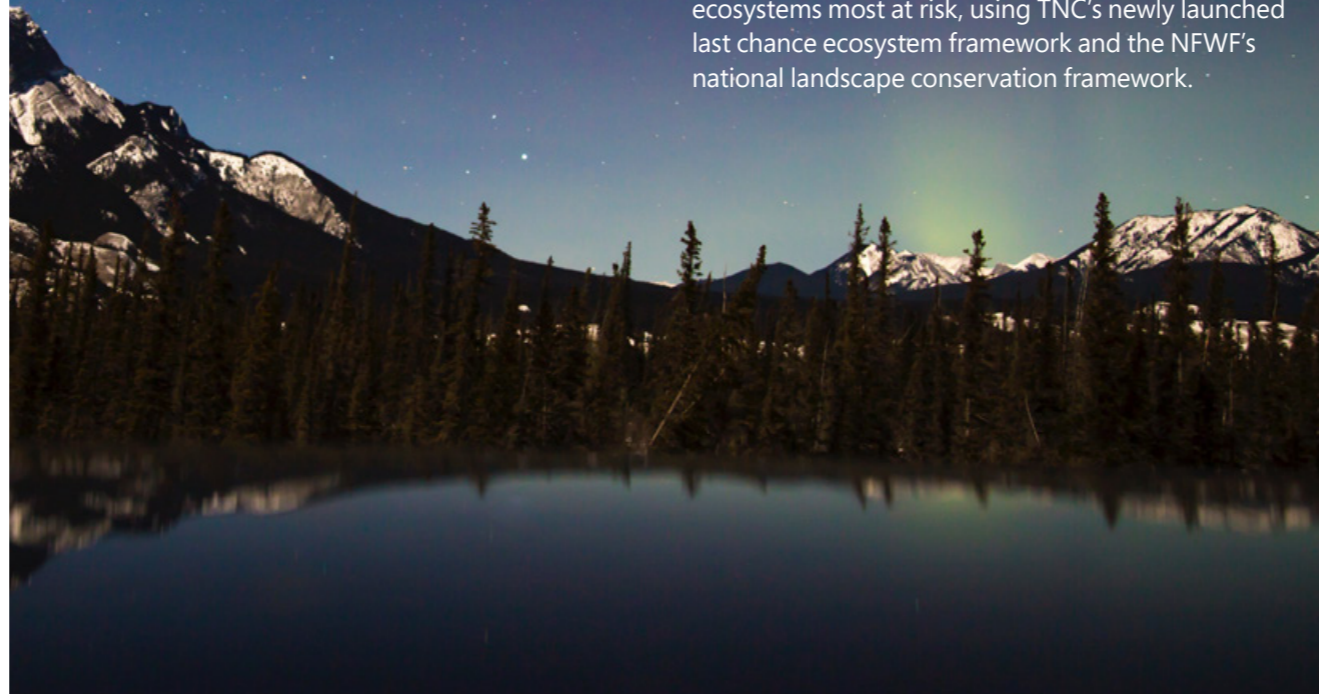
Changing land use and land cover is the most significant driver of terrestrial biodiversity loss

Previously, we have worked to address our land use impacts on a site-by-site basis in our campus and datacenter work. This is perhaps most visible in our Silicon Valley campus rebuild, where, to help restore Stevens Creek, we've planted nearly 600 trees, installed a three acre green roof, and created a landscape that mimics pre-development biodiversity.

Our commitment

In 2020, we committed to permanently protect and restore more land than we use company-wide by 2025, using approaches like land acquisition, conservation easement, national park creation, and community or indigenous-led conservation. While we do not have a particularly large footprint, Microsoft does directly operate on approximately 11,000 acres of land globally—that's equal to about three-quarters the size of Manhattan in New York City. We'll protect and restore land in partnership with The Nature Conservancy (TNC) globally and the National Fish and Wildlife Foundation (NFWF) in the United States.

We will use science and data to prioritize protecting ecosystems most at risk, using TNC's newly launched last chance ecosystem framework and the NFWF's national landscape conservation framework.



Prioritizing the protection of ecosystems, guided by data and science.

“We must work together to determine how we maximize the benefits that nature provides to people while minimizing the environmental harm of our activities. It won't be easy, but it is possible if we put the pieces together.”

Brad Smith, President

11,000

Microsoft operates on 11,000 acres of land globally.

Driving innovation

Building the Planetary Computer

We believe that Microsoft's most important contribution to protecting ecosystems and biodiversity is delivering the Planetary Computer, which provides access to the world's critical environmental datasets, AI, and digital technology.

AI for Earth: a global program and the precursor to the Planetary Computer

In 2017, we launched our AI for Earth program. Our aim was simple, but ambitious—to put cloud and AI technology into the hands of the world's leading ecologists and conservation technologists, and organizations around the world that are working to protect our planet.

So far, we've provided over 700 grants to organizations working on game-changing environmental innovations in more than 100 countries around the world. Our AI for Earth grantees authored more than 80 research papers as part of the program and have released over 50 GitHub repositories to the open-source community.

[Find out more here](#)

However, as we grew the program, we also learned what gaps still existed. Researchers needed much greater access to data, more intuitive access to machine learning tools, and a greater ability to share their work and build on the work of others. We recognized the need not only to host datasets on the cloud, but also to build the scaling infrastructure that would make it possible for the sustainability community to work with that data: data curation, computational platforms, the ability to train algorithms and run them at planetary scale, and the ability to serve the results of those algorithms as applications available to users anywhere in the world.

Our new focus: the Planetary Computer

Based on these lessons learned, in 2020, we committed to building the Planetary Computer: a platform that provides access to the world's critical environmental datasets. We will continuously on-board more data with our customers and partners and build the tools that make it easier for scientists to ask global-scale questions

of large datasets, then present those results in applications that support environmental monitoring, forecasting, planning, and attribution.

Since we announced our commitment to the Planetary Computer, we have on-boarded over 10 petabytes of environmental science data from dozens of sources. Some key examples include:

- **The Sentinel-2 satellite program**, which provides the highest-resolution satellite imagery that's available to the public at no cost. We have brought four years of Sentinel-2 data to Azure and processed it to an analysis-ready format, allowing environmental scientists to ask questions about the state of land use, forests, glaciers, and other critical landscape features.
- **Landsat 8**, which is the newest satellite in the Landsat program, a network of satellites that has been continuously monitoring the Earth since 1972.

700+

We've worked to empower over 700 organizations through our AI for Earth program.

80

Our AI for Earth grantees have authored more than 80 research papers as part of the program.

We have on-boarded four years of Landsat 8 data to Azure, the first step in making available a complete Landsat archive that will enable scientists to ask questions about long-term ecosystem change.

- The National Oceanic and Atmospheric Administration (NOAA), which provides invaluable information about weather and climate from a network of monitoring stations that includes both satellites and ground-based radar stations. We have on-boarded several key NOAA datasets to allow scientists to build a picture of weather and climate, including weather forecast data from **NOAA's GFS4 system**, historical estimates of global precipitation from **NOAA's Global Hydro Estimator program**, historical surface weather conditions from NOAA's Integrated Surface Data program, satellite-based weather imagery from NOAA's GOES-R weather satellites, and radar data from **NOAA's NEXRAD program**.
- Large-scale geospatial data, which is critical for environmental science, but training the next generation of AI-based biodiversity monitoring solutions requires lots of annotated wildlife monitoring data. In partnership with conservation biologists around the world, we've assembled on Azure the largest publicly available collection of AI-ready training data for wildlife conservation including data from motion-triggered camera traps, drones, satellites, and aircraft.

[Find out more here](#)

Driving innovation (continued)

Empowering customers and partners

Building the Planetary Computer will take several years, but there is much we can do in the meantime. Already, with Azure IoT and AI, we have tools and services to help customers around the world understand the ecosystem around them today as it exists, monitor and model changes from climate or human behavior, and manage these in a way that protects biodiversity, their community's well-being and way of life, and the planet. We announced and enhanced partnerships in 2020 that will help us do so, including the following:

Supporting scientific organizations

CSIRO, Australia's national science agency, signed a partnership agreement with Microsoft to harness artificial intelligence and other digital technologies to accelerate critical research and ambitious projects targeting advances in areas including illegal fishing prevention, removing plastic from rivers, and smarter farming.

“Maintaining nature for the benefit of current and future generations is one of humanity's greatest challenges. Deploying technology to support this global effort is one of ours.”

Brad Smith, President

Delivering geospatial data and analysis to the world

Esri is the global market leader in geographic information systems (GIS). Microsoft and Esri share the goals of making geospatial data and analysis—meaning the gathering, display, and manipulation of information about Earth systems—available to every sustainability researcher and practitioner around the world, and ensuring that every conservation organization can contribute its local data back to that global repository. From mapping forest loss to combating elephant poaching, organizations depend on Esri's tools and expertise to understand and protect the ecosystems in which they operate. We are already working with Esri to on-board key satellite datasets to Azure, and we will make sure that every user of the Planetary Computer has access to the vast repository of critical datasets in Esri's Living Atlas of the World.

Space age intelligence

Microsoft and **SpaceX** announced a partnership that would marry the tech leader's Azure computing system with the space company's Starlink satellite internet service. Through Starlink, SpaceX plans to use thousands of satellites that will provide high-speed internet anywhere on Earth. Microsoft Azure will connect those satellites to cloud storage. Conservation biologists across the world are tasked with the protection of biodiversity in remote areas that lack cellular connectivity. Starlink opens a completely new potential mechanism to address these connectivity issues, not just making monitoring more efficient, but also allowing the deployment of biodiversity monitoring networks at previously impossible scales.



Starlink satellite internet service and Azure provide conservation biologists with connectivity.

Enabling systems change

Catalyzing innovation and collective action

We are focused on new ways to harness the power of technology, partnerships, investments, and policy to drive impact at scale and pace to help the world protect ecosystems and biodiversity.

Investing in AI

Our AI for Earth grantees show how AI can drive exponential scale. A few that have pushed boundaries this year include the following:

Closing the gap to real-time biodiversity surveys

NOAA's Alaska Fisheries Science Center and UW-CICOES are working with Microsoft on training AI tools to distinguish a beluga whale's call from a dredging machine's squeak, to better understand how human noise might be related to the lack of recovery for this endangered and declining population. This type of data allows scientists to devise strategies to reduce negative effects from increased human activity in the whales' habitat. Machine learning is achieving more than 96 percent accuracy in classifying detections compared to a more traditional approach, and even picking up things human analysts miss. The model can also process a large amount of data very quickly—moving datasets from two weeks of processing and manual classification to completing a batch of six months of sound recordings in just two days.

Distinguishing whale calls with AI.



92B

Microsoft Azure and high-resolution satellite imagery was used to count 92 billion trees in the US.

Measuring biodiversity

In April 2020, we announced a new AI for Earth collaboration with the **Group on Earth Observations Biodiversity Observation Network (GEO BON)**. This \$1 million Essential Biodiversity Variables (EBVs) on the cloud grant program was launched to help advance efforts to monitor Earth's biodiversity and create useful measurements required for the study, reporting, and management of biodiversity change that inform conservation decisions across the globe. In October 2020, we announced five winners that will receive financial support, as well as access to resources from Microsoft and Esri. These projects include: mapping Belize's coastal and marine ecosystems, detecting change in essential biodiversity for citizen science initiatives, improving mapping accuracy of mountainous ecosystems, creating open source tools to analyze bioacoustics data, and combining data sources to assess EBVs.

Advancing forestry and sequestration measurement

Accurate forest inventories are an essential tool for conservationists, governments, and landowners who seek to promote ecological, social, and economic health. Microsoft has worked with **SilviaTerra** to accelerate their cutting-edge approach to precision forestry, and radically increase the scope, efficiency, and resolution of forest inventories. They produced the first ever comprehensive forest map of the US, covering every acre of the contiguous US and accounting for almost 92 billion trees. SilviaTerra applies this annually-updated data to predict carbon sequestration on each forest parcel, bringing to market a new gigaton-scale supply of forest carbon credits. They are also working to explicitly measure co-benefits such as wildlife habitat, water yield, and fire risk reduction. Microsoft is also supporting SilviaTerra's work by purchasing carbon credits generated by their pilot project.

Enabling systems change (continued)

Maps of natural resources

With support from Esri, The Nature Conservancy, and Microsoft's AI for Earth program, **NatureServe** has created a comprehensive set of habitat models for over 2,200 at-risk species in the contiguous United States, including those ranked as Globally Critically Imperiled or Globally Imperiled, or those listed as full species under the U.S. Endangered Species Act. Analyzed in conjunction with boundaries of protected areas, these data support mapping areas of high biodiversity importance—an invaluable input to guide effective conservation decision-making.



Guiding conservation decision-making with habitat models for at-risk species. Chris Lukhaup

Indigenous knowledge plus AI

The **Healthy Country partnership in Kakadu National Park** is a pioneering program that is mixing responsible AI and science with Indigenous knowledge to solve complex environmental management problems and care for animal species and habitats. The partnership is part of the National Environmental Science Program (NESP)'s Northern Australia Environmental Resources Hub. It brings together Kakadu Traditional Owners and indigenous rangers, CSIRO, Microsoft, Parks Australia, the University of Western Australia (UWA), and Charles Darwin University (CDU). Under the direction of Indigenous Traditional Owners and rangers, drones capture video footage in Kakadu National Park. The data is collected, labeled, and interpreted using a combination of Indigenous knowledge, Microsoft AI, data visualization, and scientific research. The models allow rangers to regularly survey large areas that are difficult to access and remove the need for people to review thousands of hours of video. The Healthy Country AI project represents an end-to-end solution to support adaptive co-management.

Enabling systems change (continued)

Advancing policy

Governments play a unique and important role in measuring and managing ecosystems and biodiversity as they collect and make publicly available massive amounts of data critical to environmental science. They also own billions of acres of public land that they can use to protect, manage, and restore critical ecosystems. And they establish and implement policies governing the use and management of natural resources and ecosystems.

As part of our 2020 commitment, we will act on policy by calling for:

- National ecosystem assessments which help governments understand what is happening in a country's natural environment and what actions are needed to safeguard critical ecosystem services.
- Infrastructure to accelerate measuring and monitoring of ecosystems, including digital tools and broadband connectivity to help collect, integrate, and make publicly available data and real-time insight into the health of our ecosystems.
- Public land and water conservation, including government funding for the acquisition and maintenance of land and water for conservation, recreation, and natural preservation.
- Public-private partnerships that encourage and facilitate investments by non governmental organizations, individuals, and the private sector to protect and restore critical ecosystems.

Already, we've seen our advocacy play a meaningful role in policy solutions, including:

- The release in 2020 of the **EU Biodiversity Strategy for 2030 in Europe**, which Microsoft supported and will continue to engage on, as key initiatives under the strategy are expected in 2021. The strategy aims to increase protected areas across the EU, and to identify new measures for managing and restoring ecosystems. A dedicated "Biodiversity Partnership" will link researchers and practitioners, and support data-driven research to stop the loss of biodiversity.
- The **Great American Outdoors Act**, which Microsoft directly advocated for and publicly supported during the legislative process, and which was passed and enacted into law in 2020. The Act has two main components: fully and permanently funding the Land and Water Conservation Fund at \$900 million per year, and providing \$9.5 billion over five years to address maintenance backlogs at US National Parks.
- The **Trillion Trees Initiative**, which was unveiled at the World Economic Forum (WEF) in 2020. The US Chapter was launched in the third quarter of 2020 by WEF and American Forests and was bolstered by a presidential executive order to establish a high-level US interagency council. Microsoft serves on the Steering Committee of the initiative and submitted one of the initial corporate pledges. We have been working with the organizers on ways to design the initiative in a way that accelerates reforestation and verifiably removes carbon.

\$9.5B

Great American Outdoors Act provides funding for the Land and Water Conservation Fund and \$9.5 billion over five years for National Parks.



Governing the use and management of natural resources and ecosystems.

Enabling systems change (continued)

Scaling through new partnerships

OS-Climate

In Q3, Microsoft joined Allianz, Amazon, and S&P Global as initial founding members of OS-Climate, a new initiative hosted by the Linux Foundation to help close the \$1.2 trillion annual gap in investment urgently needed for decarbonization and climate resilience. OS-Climate is a collaborative, member-driven, non-profit platform for developing open data and open source analytics to enable climate aligned investing, finance, and business by resolving the major barrier of costly, poor quality, highly fragmented data, and a lack of analytic tools. The initiative serves not only the finance community but also governments, companies, NGOs, and academia. Microsoft has already begun sharing its relevant sustainability data to advance modeling and understanding of climate change impact on businesses, as well as contributing new solutions accelerators focused on ESG reporting and risk management.

One Planet Business for Biodiversity

Microsoft joined One Planet Business for Biodiversity (OP2B), an international cross-sectorial, action-oriented business coalition on biodiversity with a specific focus on agriculture, launched at the United Nations Climate Action Summit in 2019. The coalition is determined to drive transformational systemic change and catalyze action to protect and restore cultivated and natural biodiversity within the value chains, engage institutional and financial decision-makers, and develop and promote policy recommendations for the 2021 CBD COP15 framework.

Business for Nature Call to Action

Microsoft joined 560 other companies in September 2020 in signing the Business for Nature Call to Action, urging governments to adopt policies now to reverse nature loss in this decade.



1t.org—Conserving, restoring and growing 1 trillion trees by 2030.

The signatories are committing and acting to restore and protect ecosystems, and through this call, advocate for governments to work together and create a positive policy feedback loop.

C4IR Ocean

In the third quarter of 2020, Microsoft joined the World Economic Forum's Center for the Fourth Industrial Revolution Network for ocean innovation and technology in Norway (C4IR Ocean). C4IR Ocean is dedicated to using data, technology, and governance frameworks to protect the world's oceans and increase the sustainability of ocean-based industries.

We're one of the founding organizations working with C4IR Ocean on its Ocean Data Platform. This global, open-source platform gives data scientists, app developers, and marine spatial planners access to data coming from historic and real-time data sources to develop solutions for a healthy and productive ocean.

1 Trillion Trees

Microsoft submitted a pledge to 1t.org in 2020 with commitments and policies that grow and conserve trees, as well as activities that support forests. Launched in January 2020, 1t.org is a 10-year effort to support the UN Decade on Ecosystems Restoration from 2021 to 2030, which aims to conserve, restore, and grow one trillion trees by 2030.

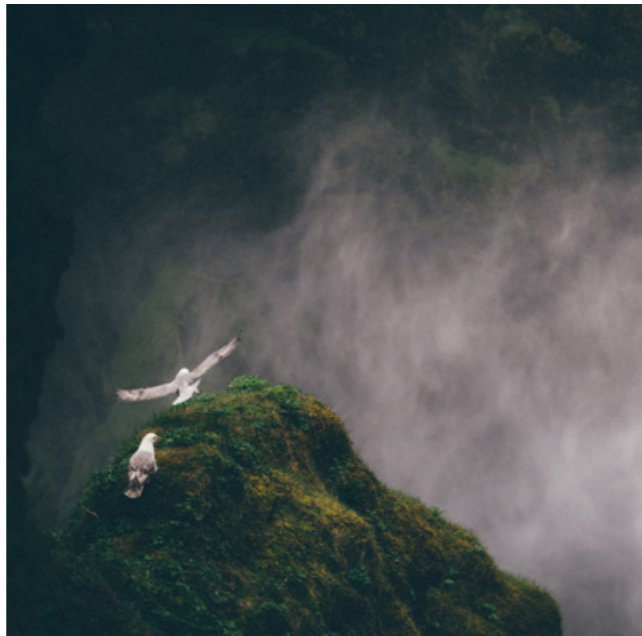
“It’s what we all do together that will make the difference.”

Dr. Lucas Joppa, Chief Environmental Officer

Key learnings

What we've learned

We need to accelerate the collection and collaborative analysis of ecosystems data through AI and machine learning, so scientists all over the world can work on a common platform.



1 The skills gap is real. In many cases, the barrier preventing environmental scientists from using the scale of the cloud isn't technical, it's expertise inertia. Climate and Earth science has developed on local computing infrastructure at universities, and if we want to provide that community with the ability to serve their work globally and use the cloud for collaboration, we have to lower that barrier, and we can't ask the community to become cloud infrastructure experts. Consequently, we need to double down on the education component of our AI for Earth grants program, and we need to provide simplified computing infrastructure for the Earth sciences that abstracts away the details of managing cloud computing and lets scientists focus on science.

2 Fifteen years is too long. Ecosystems are declining at an alarming rate, and the volume of data that needs to be collected and analyzed to quantify that decline is daunting: the 2019 Global Assessment Report on Biodiversity and Ecosystem Services was nearly five years in the making, and was published nearly 15 years after its predecessor, the Millennium Ecosystem Assessment. Waiting this long before the next assessment would be disastrous; reporting needs to be continuous, not limited by long cycles of annual conferences and funding bottlenecks. Consequently, we need to accelerate the collection of ecosystems data through AI and machine learning (letting conservation researchers spend less time annotating data, and more time planning conservation), and accelerate the collaborative analysis of ecosystems data through cloud-based tools that make global data available, so scientists all over the world can work on a common platform, reducing the time required for communication and iteration.

3 The world needs building blocks. Microsoft is at our best when we're building horizontally rather than vertically, putting in place the fundamental tools that support our customers and partners who are studying natural systems and guiding climate policy. Consequently, our role won't be building all the applications and AI models that are necessary to accelerate environmental sustainability, but putting in place the data, models, APIs, and open-source examples that allow the sustainability community to work at peak efficiency. That's why we're investing in our Planetary Computer, a platform that will bring together conservation scientists and practitioners around common tools that accelerate their work.

How to get started on ecosystem and biodiversity work in your organization

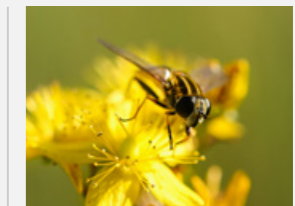


Hear Dr. Lucas Joppa discuss the Planetary Computer.

👉 Find out more here

Check out the explainer video on the Planetary Computer.

👉 Find out more here



Learn how to be a part of AI for Earth.

👉 Find out more here

Explore how you can access geospatial data and AI with Microsoft and Esri.

👉 Find out more here

What's next?

Our focus for 2021

- 1 Build our **open-source Planetary Computer tools**, which will simplify access to large datasets and powerful computing resources for the environmental science community.
- 2 Expand our data hosting program to **15 key environmental datasets** that will power Planetary Computer solutions.
- 3 Work with our land protection partners to **identify the specific areas of land that Microsoft will safeguard**, and initiate land procurement and protection.



The Planetary Computer will simplify access to datasets and computing resources.

Appendix

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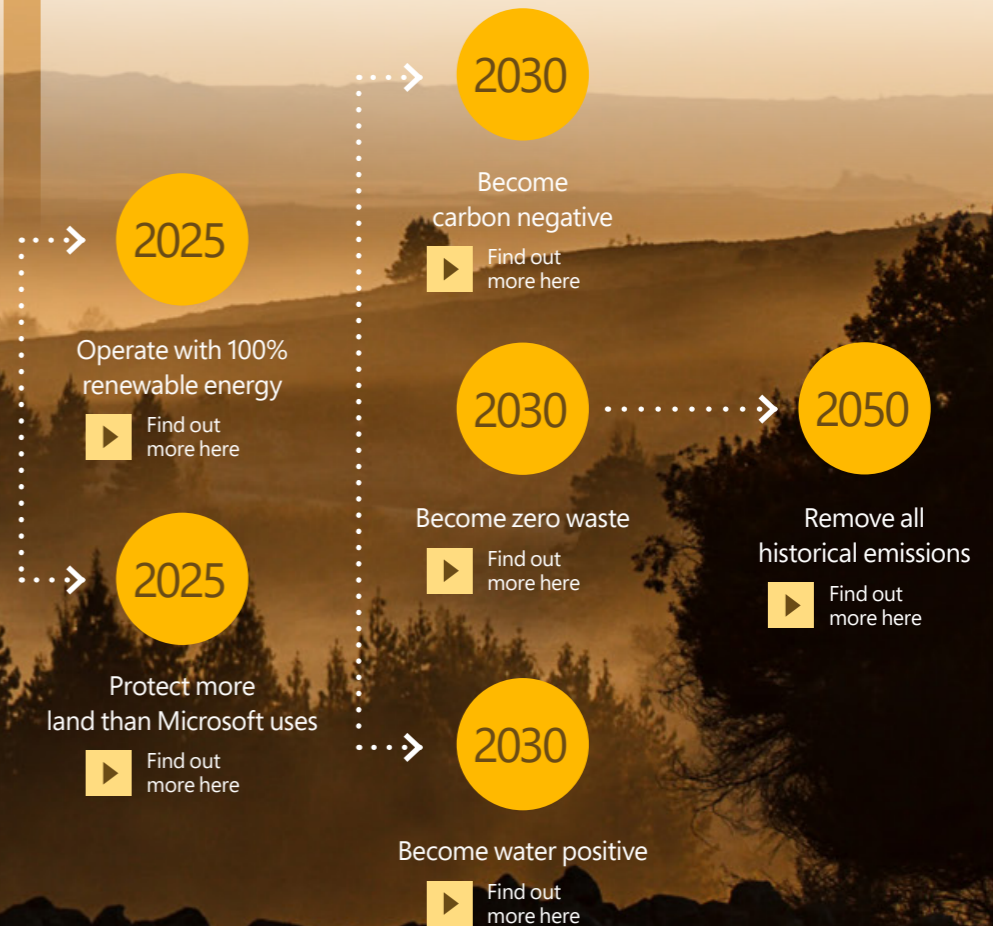
Appendix A

Commitments

Our history 2012–2019




Our commitments 2020–2050




Appendix A (continued)

Partnerships


Founding member of **Transform to Net Zero**, with eight leading organizations with aim to accelerate corporate transition to net zero.

 [Find out more here](#)


Founding member of **Water Resilience Coalition**, which will provide tools and guidance to improve water resiliency.

 [Find out more here](#)

Founding member of **Climate Finance Foundation** to help model climate risks.


 [Find out more here](#)

Partner to **Center for the Fourth Industrial Revolution Oceans (C4IR)** to develop technology-based solutions to improve ocean health.

 [Find out more here](#)

Ellen MacArthur Foundation

With members of the **Ellen MacArthur Foundation**, we developed a group on Circular Business to Business Transport Packaging Solutions.

 [Find out more here](#)

Memberships



Recognitions

Just 100: For the third year in a row, Microsoft took first place on The 2020 Just 100, a list by Just Capital and Forbes to rank companies perceived as “the best at doing right by America”.

 [Find out more here](#)

EcoAct Dow Sustainability Rankings: Microsoft was rated as the highest performing company across all indices within the CAC 40, Dow 30, FTSE 100, and IBEX 35.

 [Download here](#)

Named to CDP A List for Climate Change and Water Security for 2020.

 [Find out more here](#)

EPA Green Power: Microsoft won the top award for Sustained Excellence in Green Power Use, for its green power commitment, focus on innovation, and sustained commitment to direct project engagement.

 [Find out more here](#)

America’s Most Responsible Companies 2021: Microsoft was ranked third by Newsweek’s assessment of companies across leading ESG areas.

 [Find out more here](#)

Appendix A (continued)

How we report

Reporting standards

GRI: Microsoft works to align our corporate social responsibility (CSR) commitments and reporting to global standards. We inform our CSR reporting using the Global Reporting Initiative (GRI) Sustainability Reporting Standards.

TCFD and SASB: Microsoft is committed to fully aligning with the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) and the Sustainability Accounting Standards Board (SASB) standards. We adapted these frameworks, where necessary, to map them to our current operations, programs, and processes as they relate to climate risks and opportunities assessment and management with the intent to publish our disclosure in 2021.

SDGs: We're actively engaged in supporting the UN Sustainable Development Goals (SDGs) and publicly report how Microsoft contributes to the global effort to achieve them. More information on this year's report can be found here:

 [Our commitment to sustainable development](#)

Our policies and practices

We work to apply the power of technology to earn and sustain the trust of the customers and partners we empower and the communities in which we live and work. This focus extends to our work to build a sustainable future where everyone has access to the benefits and opportunities that technology can bring. It's central to our mission to empower every person and organization to achieve more, and it's why many of our employees come to work every day.

Working together with stakeholders

We know that the decisions we make affect our employees, customers, partners, shareholders, suppliers, and communities, and we take their voices into account. Microsoft receives input from millions of people each year—from individual customers to policymakers and global human rights specialists. We bring outside perspectives into the company and inform our business decisions through a variety of feedback channels. We go beyond formal channels, proactively engaging with key stakeholders, advocacy groups, industry experts, CSR rating agencies, CSR-focused investors, and many others. We also share our learnings and practices thereby generating industry dialogue, informing public debate, and advancing greater progress.

Identifying material issues

Our CSR materiality assessment reflects input gathered from our stakeholder engagement processes, consultation with Business for Social Responsibility and other external experts, and consideration of the impact of our core businesses.

In 2020, Microsoft conducted a new materiality assessment with a focus on environmental sustainability, which can be accessed in Appendix C.

 [Read more Appendix C](#)

Governance

Microsoft has made sustainability part of its business, including embedding it deeply into its governance structure. The Microsoft Board is engaged in oversight of climate-related risks and opportunities, and management is fully engaged in assessing and managing risks and opportunities. Additional information about our governance structure for sustainability can be found in Appendix D as well as in our CDP responses.

 [Read more Appendix D](#)

Forward-looking statements

This report includes estimates, projections, and other "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995, section 27A of the Securities Act of 1933, and section 21E of the Securities Exchange Act of 1934. These forward-looking statements generally are identified by the words "believe," "project," "expect," "anticipate," "estimate," "intend," "strategy," "future," "opportunity," "plan," "may," "should," "will," "would," "will be," "will continue," "will likely result," and similar expressions. Forward-looking statements are based on current expectations and assumptions that are subject to risks and uncertainties that may cause actual results to differ materially. We describe risks and uncertainties that could cause actual results and events to differ materially in our reports filed with Securities and Exchange Commission. We undertake no obligation to update or revise publicly any forward-looking statements, whether because of new information, future events, or otherwise.

Additional information

We regularly publish progress on our work on environmental sustainability, as well as our larger CSR work. This year's CSR report can be found here:

 [Download our 2020 CSR Report](#)

Previous reports can be found here:

 [Our Reports hub](#)

Our Sustainable Devices FY20 report can be found here:


 [Microsoft Devices Sustainability Report FY20](#)

Our yearly data sheet, with greater detail on our emissions and impacts, is in Appendix B:

 [Read more Appendix B](#)

Our current year CDP responses on Climate and Water, both named to the A List, can be found here:

 [Read our CDP response on Climate](#)

 [Read our CDP response on Water](#)

Appendix B

Our environmental data

As part of Microsoft's commitment to disclose information about our environmental footprint, the tables on pages 73–81 are a compilation of environmental indicators including our greenhouse gas emissions, energy consumption, water consumption and discharge, and waste.

All reported values represent best available data at the time of publication. Data is adjusted to incorporate updated methodology, structural changes, and/or minor corrections. Additional detail on these changes is included as footnotes where applicable.

Table 1

Greenhouse gas emissions (mtCO₂e)

	FY17	FY18	FY19	FY20
Scope 1 ^{1,2}	107,452	99,008	117,956	118,100
Scope 2 – Location-based ²	2,697,554	2,946,043	3,557,518	4,102,445
Scope 2 – Market-based ^{1,2}	139,066	183,329	275,420	228,194
Scope 3 – Purchased goods & services ^{3,5}	4,090,000	4,120,000	4,190,000	4,050,000
Scope 3 – Capital goods ^{3,5}	1,670,000	2,230,000	2,180,000	2,750,000
Scope 3 – Fuel- and energy-related activities (Location-based) ⁵	540,000	550,000	650,000	770,000
Scope 3 – Fuel- and energy-related activities (Market-based) ⁵	89,000	110,000	170,000	180,000
Scope 3 – Upstream transportation ^{3,5}	50,000	50,000	100,000	100,000
Scope 3 – Waste ⁵	700	500	1,100	800
Scope 3 – Business travel ^{1,4}	419,020	461,787	476,457	329,356
Scope 3 – Employee commuting ^{2,5}	343,000	345,000	411,000	317,000
Scope 3 – Downstream transportation ^{2,5}	85,000	98,000	57,000	44,000
Scope 3 – Use of sold products ^{2,5}	4,103,000	4,230,000	3,753,000	3,025,000
Scope 3 – End-of-life of sold products ^{2,5}	31,000	18,000	18,000	17,000
Scope 3 – Downstream leased assets	700	1,700	800	4,600
Total – Scope 1, Scope 2, and Scope 3⁶	11,128,000	11,947,000	11,751,000	11,164,000

1 Included in carbon neutral boundary. For Scope 3 business travel, only emissions from air travel are included.

2 Emissions calculations have been adjusted to include methodology improvements and/or structural changes, which have been applied to all years reported in this factsheet.

3 The emissions calculations for these categories have been adjusted to include latest supplier emissions reported through CDP Supply Chain.

4 Business travel now incorporates emissions from hotel night stays, rail travel, taxi, mileage reimbursement, and rental cars. Previously reported years have been adjusted to reflect these emission sources.

5 The reported emissions for this category represent an estimate based on broad-based assumptions and have therefore been rounded.

6 Scope 2 and 3 market-based emissions included in this total. Total rounded to nearest thousand mtCO₂e.

Appendix B (continued)

Through CDP (formerly the Carbon Disclosure Project) we have voluntarily reported our carbon footprint since 2004 and our water footprint since 2012. Please see our CDP submission for more detailed information.

The greenhouse gas, energy, and water data in our CDP filings and this report represent 100 percent of Microsoft's global operations and revenue. The data in this factsheet includes the integration of LinkedIn following our acquisition of this group in 2016.

To allow meaningful year-over-year comparisons, we have adjusted our data for previous years to reflect this integration.

This factsheet also reports both location and market-based Scope 2 emissions, per the World Resources Institute Greenhouse Gas Protocol Scope 2 guidance. Location-based emissions represent the physical emissions from local energy production, while market-based emissions represent emissions from choices related to electricity supply and products.

For Microsoft, market-based emissions take into account more than 10.2 billion kilowatt-hours (kWh) of renewable energy attributes that we purchased as part of our 100 percent renewable energy commitment.

Table 2

Greenhouse gas emissions normalized by revenue (mtCO₂e/M\$)

	FY17	FY18	FY19	FY20
Scope 1	1.1	0.9	0.9	0.8
Scope 2 – Location-based	27.9	26.7	28.3	28.7
Scope 2 – Market-based	1.4	1.7	2.2	1.6
Scope 3 – Business travel	4.3	4.2	3.8	2.3

Table 3

Energy use (MWh)

	FY17	FY18	FY19	FY20
Total energy use ⁷	6,756,779	7,781,383	9,249,361	10,757,166
Electricity ⁷	6,344,700	7,357,636	8,744,834	10,244,377
Other fuels ^{7,8}	412,078	423,748	504,527	512,788
Renewable energy usage	6,104,758	7,357,636	8,744,834	10,244,377
Renewable energy credits and power purchase agreements	6,104,340	7,357,235	8,744,247	10,244,059
On-site renewable energy	418	400	587	318
Percentage of renewable electricity	96%	100%	100%	100%

⁷ Values have been adjusted to include methodology improvements and structural changes, which have been applied to all years reported in this factsheet.

⁸ Other fuels include natural gas, LPG, diesel, jet fuel, district heating, and chilled water.

Appendix B (continued)

Table 4

Carbon neutrality (mtCO₂e)

	FY17	FY18	FY19	FY20
GHG emissions within carbon neutral boundary ^{9,10}	573,871	652,282	781,345	612,927
Offsets purchased	573,871	652,282	781,345	612,927
Net GHG emissions within carbon neutral boundary	0	0	0	0
Percent of total GHG emissions balanced by carbon offsets ⁹	100%	100%	100%	100%

⁹ Represents the value prior to historic benchmarking due to acquisitions and methodology changes.

¹⁰ Carbon neutral boundary includes global Scope 1, Scope 2 market-based, and Scope 3 business air travel.

Table 5

Water metrics (m³)¹¹

	FY17	FY18	FY19	FY20
Water withdrawals	5,148,454	6,718,985	7,505,081	7,618,089
Water consumption	1,912,934	3,325,664	3,945,783	3,966,639
Water discharge	3,235,520	3,393,321	3,559,298	3,651,450

¹¹ In FY18 we adjusted our water data collection methodology to include more accurate datacenter withdrawal estimates. FY17 withdrawal estimates were not retroactively adjusted. 50% of the change from FY17 to FY18 is from the methodology adjustment, and the other 50% is from organizational growth. We also began estimating water consumption in FY18, backfilling FY17 using the same estimation methodology. Values have been adjusted to include methodology improvements and structural changes, which have been applied to all years reported in this factsheet.

Table 6

Waste generation (metric tons)¹²

	FY17	FY18	FY19	FY20
Reused	325	40	1,325	3,016
Recycled	17,077	11,200	48,364	47,542
Composted	5,920	5,883	8,397	10,069
Landfilled	2,047	1,602	12,063	15,870
Incinerated	690	342	7,563	566
Hazardous waste (included in the categories above)	2,188	1,405	14,534	9,469
Recycled hazardous waste (included in the categories above)	2,122	1,376	7,280	9,461

¹² FY19 and FY20 now encompass global data across Microsoft's direct waste footprint, including estimates where needed. Currently only data captured from our largest office campuses is included as part of our limited assurance verification. As we continue improving our waste accounting, our reported values may change. Values currently exclude waste from construction and demolition.

Appendix B (continued)

Additional environmental indicators

Table 7

Greenhouse gas emissions (mtCO₂e)

	FY17	FY18	FY19	FY20
Scope 1 – CO ₂	82,448	81,263	95,667	96,700
Scope 1 – CH ₄	45	45	50	53
CH ₄ emissions – Asia	5	4	3	4
CH ₄ emissions – Europe, Middle East, Africa	16	15	26	28
CH ₄ emissions – Latin America	9	9	5	5
CH ₄ emissions – North America	16	17	16	16
Scope 1 – N ₂ O	248	261	256	236
Scope 1 – HFCs	24,710	17,408	21,951	21,070
Scope 1 – PFC	–	–	–	–
Scope 1 – SF ₆ ¹³	–	32	32	41
Scope 1 – Asia	9,699	6,483	7,330	8,650
Scope 1 – Europe, Middle East, Africa	44,873	41,276	57,957	61,719
Scope 1 – Latin America	6,260	6,173	3,919	3,871
Scope 1 – North America	46,620	45,076	48,750	43,859
Scope 2 – Location-based – Asia	439,035	528,277	691,772	804,567
Scope 2 – Location-based – Europe, Middle East, Africa	399,194	519,058	681,743	860,858
Scope 2 – Location-based – Latin America	20,968	23,450	25,403	15,707
Scope 2 – Location-based – North America	1,838,358	1,875,258	2,158,601	2,421,314
Scope 2 – Market-based – Asia	121,930	174,533	266,725	219,416
Scope 2 – Market-based – Europe, Middle East, Africa	14,460	7,301	7,463	7,376
Scope 2 – Market-based – Latin America	2,053	751	632	594
Scope 2 – Market-based – North America	623	744	600	808
CO ₂ Intensity – Scope 1 + Scope 2, Location (mtCO ₂ e/MWh)	0.42	0.39	0.40	0.39

¹³ In FY18 we began estimating SF₆ leakage at datacenters.

Appendix B (continued)

Table 8

Carbon offsets

	FY17	FY18	FY19	FY20
Percent of total scope 3 GHG emissions balanced by carbon offsets	3%	3%	3%	2%
Potential for carbon trade based on recent performance	No	No	No	No

Table 9

Other emissions (metric tons)¹⁴

	FY17	FY18	FY19	FY20
NO _x emissions	223	209	215	202
NO _x emissions – Asia	13	6	7	7
NO _x emissions – Europe, Middle East, Africa	152	145	144	137
NO _x emissions – Latin America	25	24	16	16
NO _x emissions – North America	33	34	49	41
SO _x emissions	13	13	12	12
SO _x emissions – Asia	2	1	1	1
SO _x emissions – Europe, Middle East, Africa	7	7	7	7
SO _x emissions – Latin America	1	1	1	1
SO _x emissions – North America	3	3	4	4
VOC emissions	199	184	185	170
VOC emissions – Asia	10	3	5	5
VOC emissions – Europe, Middle East, Africa	148	141	133	124
VOC emissions – Latin America	24	23	15	16
VOC emissions – North America	17	16	32	26
PM emissions	7	7	8	8
CO emissions	1,860	1,704	1,721	1,584
Ozone depleting substances	1,330	1,116	579	415

¹⁴ Values have been adjusted to include methodology improvements and structural changes, which have been applied to all years reported in this factsheet.

Appendix B (continued)

Table 10

Other emissions normalized by revenue (metric tons/M\$)

	FY17	FY18	FY19	FY20
NO _x emissions	0.0023	0.0019	0.0017	0.0014
SO _x emissions	0.00014	0.00011	0.00010	0.00009
CH ₄ emissions	0.0005	0.0004	0.0004	0.0004

Table 11

Electricity consumption (MWh)

	FY17	FY18	FY19	FY20
Total electricity consumed	6,344,700	7,357,636	8,744,834	10,244,377
Electricity consumed – Asia	682,713	804,024	1,066,033	1,225,534
Electricity consumed – Europe, Middle East, Africa	971,073	1,265,961	1,654,384	2,102,486
Electricity consumed – Latin America	90,929	106,936	117,222	113,456
Electricity consumed – North America	4,599,985	5,180,715	5,907,195	6,802,901
Non-renewable electricity purchased & consumed – Asia	204,937	–	–	–
Non-renewable electricity purchased & consumed – Europe, Middle East, Africa	17,391	–	–	–
Non-renewable electricity purchased & consumed – Latin America	3,603	–	–	–
Non-renewable electricity purchased & consumed – North America	–	–	–	–
Non-renewable electricity by source – coal	42,746	–	–	–
Non-renewable electricity by source – petroleum	34,058	–	–	–
Non-renewable electricity by source – natural gas	148,643	–	–	–
Non-renewable electricity by source – nuclear	484	–	–	–
Electricity consumption normalized by revenue (MWh/M\$)	66	67	69	72

Appendix B (continued)

Table 12

Renewable energy consumption (MWh)

	FY17	FY18	FY19	FY20
Renewable energy purchased & consumed – Asia	466,243	804,024	1,066,033	1,225,534
Renewable energy purchased & consumed – Europe, Middle East, Africa	941,343	1,265,961	1,654,384	2,102,486
Renewable energy purchased & consumed – Latin America	85,935	106,936	117,222	113,456
Renewable energy purchased & consumed – North America	4,611,239	5,180,715	5,907,195	6,802,901
Renewable energy purchased & consumed – wind	5,974,762	6,919,601	7,742,416	8,588,040
Renewable energy purchased & consumed – landfill gas	–	–	–	–
Renewable energy purchased & consumed – biomass	61,029	47,129	2,347	–
Renewable energy purchased & consumed – hydro	33,174	186,434	309,873	440,834
Renewable energy purchased & consumed – geothermal	–	72,000	461,586	409,511
Renewable energy purchased & consumed – solar	35,795	132,472	228,612	805,992

Table 13

Other energy consumption (MWh)¹⁵

	FY17	FY18	FY19	FY20
Total non-renewable energy purchased & consumed	412,078	423,748	504,527	512,788
Non-renewable energy purchased & consumed – Asia	34,096	20,440	21,975	24,877
Non-renewable energy purchased & consumed – Europe, Middle East, Africa	187,087	177,234	266,221	287,890
Non-renewable energy purchased & consumed – Latin America	23,996	23,239	13,977	13,906
Non-renewable energy purchased & consumed – North America	166,899	202,835	202,354	186,116
Non-renewable energy purchased & consumed – coal	–	–	–	–
Non-renewable energy purchased & consumed – natural gas	107,687	110,863	196,644	218,557
Non-renewable energy purchased & consumed – crude oil/diesel	164,324	152,915	152,034	147,297
Non-renewable energy purchased & consumed – LPG/propane/jet fuel	43,402	50,378	47,437	40,450
Non-renewable energy purchased & consumed – gasoline	46,996	44,604	43,474	43,000
Non-renewable energy purchased & consumed – chilled water	30,121	52,775	52,937	51,026
Non-renewable energy purchased & consumed – hot water/steam	19,549	12,213	12,002	12,458
Scope 3 – Category 3 (transmission and distribution losses)	510,000	600,000	730,000	850,000
Scope 3 – Category 13 (downstream leased assets)	1,700	4,100	1,900	11,200

¹⁵ Non-electricity.

Appendix B (continued)

Table 14

Water (m³)¹⁶

	FY17	FY18	FY19	FY20
Total water withdrawals	5,148,454	6,718,985	7,505,081	7,618,089
Water withdrawals – municipal supply	4,931,662	6,291,706	7,032,580	7,085,228
Water withdrawals – surface water	–	–	–	–
Water withdrawals – ground water	16,517	29,140	34,495	15,636
Water withdrawals – salt/brackish water	–	–	–	–
Water withdrawals – rain water	90,622	103,550	104,148	89,115
Water withdrawals – process water	109,653	294,589	333,858	428,110
Water withdrawals – Asia	972,666	1,244,256	1,482,174	1,532,830
Water withdrawals – Europe, Middle East, Africa	710,744	850,909	1,115,579	1,433,632
Water withdrawals – Latin America	93,291	114,575	113,885	108,617
Water withdrawals – North America	3,371,753	4,509,245	4,793,443	4,543,009
Total water consumption	1,912,934	3,325,664	3,945,783	3,966,639
Water consumption – municipal supply	1,775,047	3,127,918	3,715,190	3,650,118
Water consumption – surface water	–	–	–	–
Water consumption – ground water	2,927	4,020	3,449	1,564
Water consumption – salt/brackish water	–	–	–	–
Water consumption – rain water	25,308	29,833	30,042	24,780
Water consumption – process water	109,653	163,893	197,102	290,177
Water consumption – Asia	421,525	617,291	824,073	932,550
Water consumption – Europe, Middle East, Africa	189,636	383,178	524,209	698,464
Water consumption – Latin America	26,577	66,374	70,546	73,201
Water consumption – North America	1,275,196	2,258,821	2,526,955	2,262,423

Table 14

Water (m³)¹⁶ (continued)

	FY17	FY18	FY19	FY20
Total water discharges – municipal treatment	3,235,520	3,393,321	3,559,298	3,651,450
Water discharges – Asia	551,142	626,965	658,101	600,280
Water discharges – Europe, Middle East, Africa	521,107	467,731	591,370	735,168
Water discharges – Latin America	66,714	48,201	43,339	35,416
Water discharges – North America	2,096,557	2,250,423	2,266,487	2,280,586

¹⁶ For more information on our water data, please see our CDP Water response at www.cdp.net.

Appendix B (continued)

Table 15

Verification

	FY17	FY18	FY19	FY20
Scope 1 – GHG emissions	Yes	Yes	Yes	Yes
Scope 2 – location-based GHG emissions	Yes	Yes	Yes	Yes
Scope 2 – market-based GHG emissions	Yes	Yes	Yes	Yes
Scope 3 – business air travel GHG emissions	Yes	Yes	Yes	Yes
Scope 3 – GHG emissions from all categories	No	No	Yes	Yes
Total energy consumed	Yes	Yes	Yes	Yes
Total electricity consumed	Yes	Yes	Yes	Yes
Total renewable electricity consumed	Yes	Yes	Yes	Yes
Total offsets purchased	Yes	Yes	Yes	Yes
Total water withdrawals	Yes	Yes	Yes	Yes

Appendix C

Materiality— identifying what matters

Our material issues articulate what matters most to our business and our stakeholders. This awareness is crucial to identify and manage our risks and opportunities, and to respond effectively to our stakeholders.

Approach and process

In 2020 we worked with an external agency to carry out a materiality assessment, following a six-step process:

Step 1

Identifying issues

We initiated our materiality assessment by identifying a long list of potentially material topics by using the expertise of our external agency, relevant sustainability frameworks (including GRI and SASB), as well as Microsoft's business and sustainability mission and priorities.

Step 2

Refining the list

We carried out research to refine the long list of issues for stakeholders to consider and rank.

Our research comprised an assessment of recent media and social media conversations related to the environment, as well as relevant trends and emerging issues.

Step 3

Understanding internal and external stakeholder perspectives

Next we conducted a series of internal and external interviews and surveys with key stakeholders to gain their perspectives on top issues.

The stakeholders were selected based on their expertise and knowledge of Microsoft's business.

Step 4

Scoring the issues

We applied prioritization criteria and weighting to the results of our stakeholder interviews and surveys to support issue scoring.

Issue scoring also included inputs from our external agency based on their industry knowledge, best practice, and expectations.

Step 5

Prioritizing the issues

We prioritized Microsoft's key issues using two parameters:

- The importance of each issue to stakeholders.
- The importance of each issue on business success.

Step 6

Validating the outcomes

We held a workshop that included the company's environmental sustainability experts, including the Chief Environmental Officer, where the group reviewed, refined, and ultimately affirmed the materiality results.

Appendix C (continued)

Materiality matrix

We used the results of our materiality assessment to generate a sustainability materiality matrix.

The outcomes of the materiality assessment reflect environmentally-focused material topics from across our value chain that consider social and governance aspects of environmental performance.

While the placement of issues on the matrix provides insight into our priorities, the relative importance of an individual issue often differs by business unit, geographic location, and stakeholder group.

Environmental ●

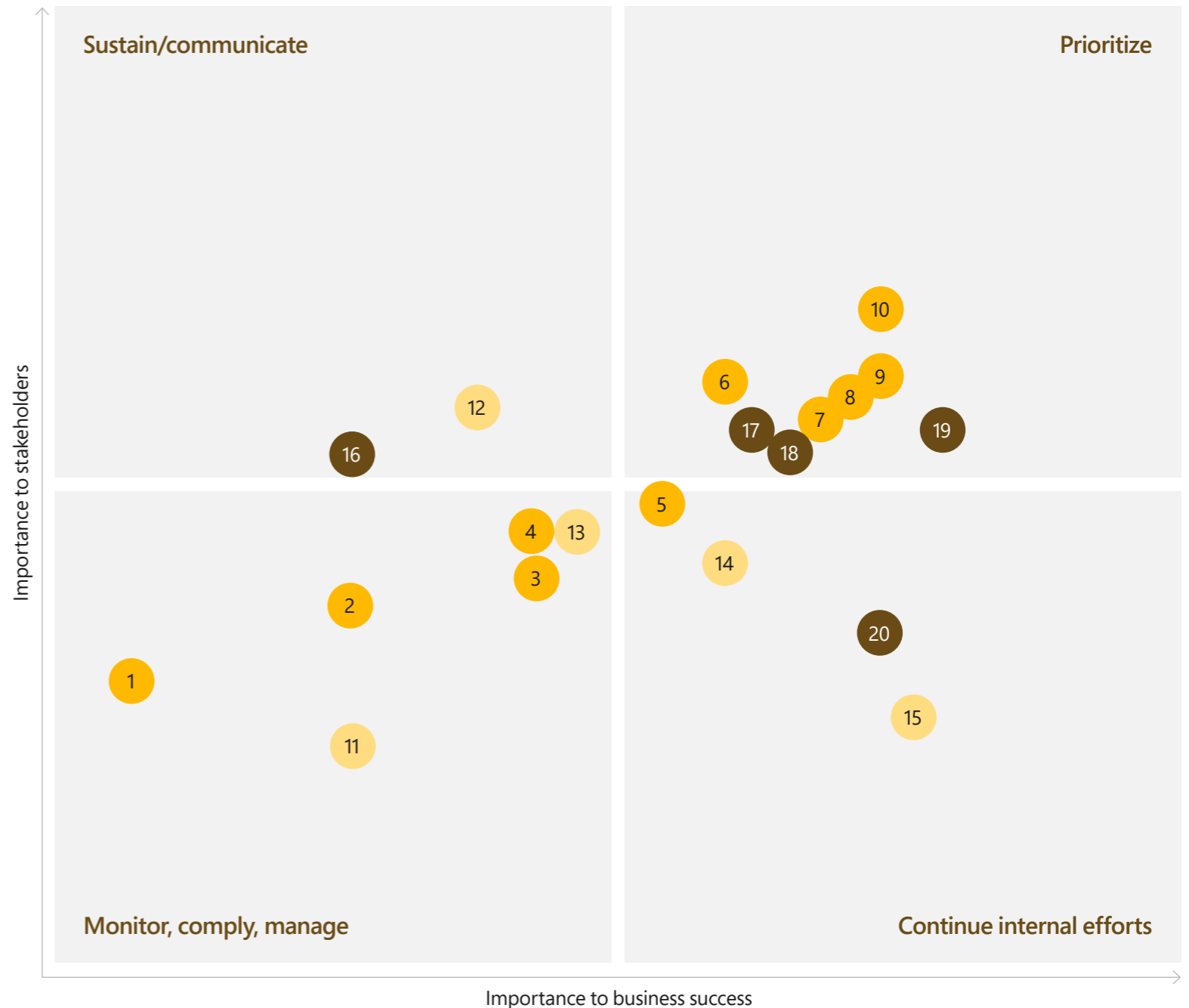
- 1 Air quality
- 2 Ecological impacts
- 3 Waste and hazardous materials management
- 4 Water and wastewater management
- 5 Environmental policy or management system and compliance
- 6 Climate change risk
- 7 Tech solutions for societal challenges
- 8 Energy management
- 9 GHG emissions
- 10 Product lifecycle impacts

Social ●

- 11 Climate misinformation
- 12 Supplier's environmental and climate performance
- 13 Environmental and climate justice
- 14 Just transition
- 15 Employee activism

Governance ●

- 16 Responsible sourcing of raw materials
- 17 Compliance
- 18 Public policy engagements
- 19 Responsible product innovation
- 20 Risk and opportunity management



Importance to business success

Appendix C (continued)

Materiality topic index

As the focus of this report is on Microsoft's environmental sustainability strategy and our four focus area commitments, our materiality topic index provides links to this report or other Microsoft documents where you can access the most detailed information for each material topic.

Material topic	Location in this report	Other location
Air quality	We intend to report on this in the future.	
Climate change risk	Appendix D – Governance	
Climate misinformation	We intend to report on this in the future.	
Compliance		Environmental Compliance
Ecological impacts	Ecosystems – Taking responsibility for our land footprint	
Employee activism	Waste – Getting to zero waste	
Energy management	Carbon - Getting to carbon negative	
Environmental and climate justice	Carbon - Getting to carbon negative	
Environmental policy or management system and compliance	Carbon - Getting to carbon negative	
GHG emissions	Carbon - Getting to carbon negative	
Just transition	Carbon - Getting to carbon negative	
Product lifecycle impacts	Carbon - Getting to carbon negative	Microsoft Devices Sustainability Report FY20

Material topic	Location in this report	Other location
Public policy engagement	Carbon – Enabling systems change Water – Enabling systems change Ecosystems – Enabling systems change	
Responsible product innovation and use	Carbon – Driving innovation Water – Driving innovation Waste – Driving innovation Ecosystems – Driving innovation	Microsoft Devices Sustainability Report FY20
Responsible sourcing of raw materials		Microsoft Devices Sustainability Report FY20
Risk and opportunity management	Appendix D – Governance	
Supplier environmental climate performance	Carbon - Getting to carbon negative	Microsoft Devices Sustainability Report FY20
Tech solutions for societal challenges	Carbon – Driving innovation Water – Driving innovation Waste – Driving innovation Ecosystems – Driving innovation	
Waste and hazardous materials management	Waste – Getting to zero waste	Microsoft Devices Sustainability Report FY20
Water and wastewater management	Water – Getting to water positive	



Appendix D

Governance

Key area	Description of work	Source location
Board oversight of climate risks	<ul style="list-style-type: none"> The charter for the Regulatory and Public Policy Committee of our Board of Directors includes the responsibility to provide guidance to management on environmental matters. Climate change is included under the umbrella of “environmental sustainability,” and therefore this Committee is responsible for reviewing and providing guidance on the company’s climate-related policies and programs. The Regulatory and Public Policy Committee meets three times a year with a varied agenda including updates on the company’s commitments to environmental sustainability, climate, and renewable energy procurement. Our President and Chief Legal Officer (CLO), together with our Chief Environmental Officer, presents to this Committee on these topics, including climate change, as appropriate. 	 Download here
Senior management assessment and managing risks and opportunities	<ul style="list-style-type: none"> The President and Chief Legal Officer (CLO) is responsible for our Corporate, External and Legal Affairs (CELA) group, which monitors climate-related issues and the company’s progress toward climate objectives. Our Chief Environmental Officer leads our corporate Environmental Sustainability team, leading our overall environmental sustainability vision, strategy, and program execution. Our Carbon Program Manager, part of the Environmental Sustainability (ES) team, leads Microsoft’s carbon mitigation efforts, which include energy efficiency, renewable energy, carbon offsetting, identification of additional energy and carbon reduction opportunities, and assessment and management of climate risks. The charter of the corporate ES team includes assessment and management of issues related to climate change. By focusing on operations, products, partners, and policy, the team strives to reduce our company’s environmental impact while empowering societal change through technology. For guidance on globally changing dynamics, this team engages with experts around the world, including internal finance, regulatory/policy, technology and environmental professionals, as well as external subject matter experts. <i>Environmental Compliance and Climate Risk + Resilience (CR+R) Lead, part of the ES team, leads our new CR+R Working Group to oversee our CR+R Plan. The CR+R Working Group holds representation from across the business.*</i> <i>In FY20, Microsoft established a Climate Council, comprising a number of executives from across the company charged with monitoring climate-related risks and opportunities and coordinating and providing oversight for sustainability initiatives across the organization.*</i> 	 Download here <i>*italics denotes new disclosures not included in 2020 CDP Response</i>

Appendix D (continued)

Strategy

Key area	Description of work	Source location
<p>Climate-related risks and opportunities</p>	<ul style="list-style-type: none"> • At a company level, the corporate ES team brings leaders from across the business together to identify which short-, medium- and long-term climate risks and opportunities could have substantive financial or strategic impact on the organization. This is complemented by formal identification and assessment processes. • Microsoft Treasury assesses property risks (short-term) annually to value the global property insurance program using industry-standard risk models to estimate the probable impact from hazards like hurricanes, floods, and fires, each of which may be subject to increasing frequency and severity due to climate change. • The Microsoft Enterprise Business Continuity Management (EBCM) program's Business Continuity Standard and Service Resilience Standard identify the baseline requirements for implementing business continuity disaster recovery and overall resilience at Microsoft, to help ensure our capability of recovery and preparedness in the event of a major or catastrophic business disruption that affects our ability to meet customer expectations. • At an asset level, business groups within our operating segments have their own processes. • <i>In FY19, we initiated quantitative and qualitative physical (medium-term) and transition (long-term) risk and opportunity assessments for key Microsoft regions. In addition, we are assessing our alignment with the Task Force on Climate-related Financial Disclosures (TCFD) to ensure we are properly managing these risks and opportunities within our business and adequately planning for the future.*</i> 	<p> Download here</p> <p><i>*italics denotes new disclosures not included in 2020 CDP Response</i></p>
<p>Impact of climate-related risks and opportunities</p>	<ul style="list-style-type: none"> • The ES team brings leaders from across the company together to align on management decisions to mitigate, transfer, accept, or control the identified climate-related risks and opportunities. To make decisions on risk, we use our enterprise risk management (ERM) risk prioritization criteria in the context of business continuity and service resilience, which include the scope of impact (e.g. reputational, regulatory, and cost), potential return on investment, and time and resources required to implement changes. • The EBCM program works with the ERM program to ensure consistent alignment among risks and risk prioritization criteria and, ultimately, the final risk ratings. • In FY19, we committed to powering our datacenters with 70 percent wind, solar, or hydropower energy by 2023, and in FY20, we extended that commitment companywide and to 100 percent by 2025. • <i>One method we use to respond to climate-related opportunities is our Sustainability Grants program, which drives climate-related energy and technology innovation; this program awarded more than \$10 million in FY19 to projects or programs focused on better managing climate-related business activity.*</i> 	<p> Download here</p> <p><i>*italics denotes new disclosures not included in 2020 CDP Response</i></p>

Appendix D (continued)

Strategy (continued)

Key area	Description of work	Source location
<p>Resiliency across scenarios for organizational strategy</p>	<ul style="list-style-type: none"> • A physical and transition risk assessment was conducted on 400 of Microsoft's most important facilities. Two scenarios were considered in this analysis: 1) a business as usual scenario where the world warms over 4°C above pre-industrial temperatures; and 2) a 2°C aligned scenario. The analysis quantified, in financial terms, the top climate-related risks and opportunities. The analysis quantified climate risk in financial terms by: <ul style="list-style-type: none"> - <i>Integrating climate and business data from multiple sources including governmental, academic, public, and commercial.</i> - <i>Translating this data into consistent formats mapped onto coherent spatial and temporal grids.</i> - <i>Statistically processing data into probability distribution functions at each point, allowing the hazard data to be coupled to econometric models, producing financial impact curves.</i> - <i>Translating this into financial terms to provide decision-relevant information.</i> <p><i>The software used has global coverage, spans decadal time periods from 2010 to 2100, and is aligned with the TCFD framework*.</i></p> • The top 400 Microsoft facilities were included in the analysis—facilities selected for highest value and high-energy consuming sites and covering all geographies. The selection included datacenters, retail stores, offices, and executive suites. • The analysis findings revealed that we may experience significant impacts. These findings warrant that we act now to mitigate the risks, build adaptive capacity, maximize our opportunities, and enhance the resilience and equity of our enterprise and the communities where we live and work. • We are currently assessing the adaptive capacity of our most at-risk facilities to the identified climate risks and identifying opportunities to enhance resilience. 	<p><i>*italics denotes new disclosures not included in 2020 CDP Response</i></p>



Appendix D (continued)

Risk management

Key area	Description of work	Source location
Identification and assessment of climate-related risks	<ul style="list-style-type: none"> • Subject matter leadership on climate change risk resides with our Environmental Sustainability (ES) team, led by our Chief Environmental Officer. This team assesses Microsoft's climate-related physical and transition risks and opportunities across the business portfolio using quantitative and qualitative scenario analysis, along with other risk assessments (including the use of internal company methods). • The results from these analyses are assessed and validated through consultation with subject matter experts across the company and then used to inform Microsoft's formal, robust, and rigorous enterprise risk assessment process led by the Enterprise Risk Management (ERM) program. • The ERM program's formal risk assessment process is used to assess the size, scope, financial impact, and relative significance of any risk that Microsoft may face, today and into the future, including those related to climate change. • The process involves categorizing risks according to their inherent impact on a scale of 1 (minimal) to 5 (critical) in four categories: trust or reputational; operational scope; legal, compliance, or environmental; and enterprise value. Risks are then rated according to their inherent likelihood on a scale of 1 (remote) to 5 (expected). These two ratings are used to produce an inherent risk score and are then aggregated with a management action/control effectiveness rating for a residual risk calculation. 	 Download here
Organizational processes for managing climate risks	<ul style="list-style-type: none"> • <i>The quantitative climate risks analysis focused on seven climate physical hazards (chronic temperature increase effects on energy demand, extreme temperatures, heat storms or waves, sea level rise, flood intensity, drought frequency, and drought length) in 2030 and 2060 and several transition risks and opportunities (energy efficiency, energy resilience, materials efficiency, renewable price stability, water efficiency, employee impacts from climate change).*</i> 	<i>*italics denotes new disclosures not included in 2020 CDP Response</i>
Processes for identifying, assessing, and managing risks in risk management strategy	<ul style="list-style-type: none"> • To determine our enterprise risks related to climate change, we use our enterprise risk management (ERM) risk prioritization criteria in the context of business continuity and service resilience, which include the scope of impact (e.g. reputational, regulatory, and cost), potential return on investment, and time and resources required to implement changes. • An example of a physical risk managed through this process is the risk of facility damage from an acute weather event, such as flooding. To mitigate this risk, the Microsoft Enterprise Business Continuity Management (EBCM) program uses its relevant standards to help ensure the existence of effective, reliable, well-tested plans, systems, and processes during such a disruptive event to support the continuity and resilience of business operations and services and minimize adverse impacts. • The EBCM program works with the ERM program to ensure consistent alignment among risks and risk prioritization criteria and, ultimately, the final risk ratings. 	 Download here


Appendix D (continued)

Metrics and targets

Key area	Description of work	Source location
<p>Metrics for assessment of climate-related risks and opportunities</p>	<ul style="list-style-type: none"> • From July 2012, we began charging a fee based on the emissions associated with our operations. In FY19 (the reporting period), we applied the carbon fee to Scope 1, Scope 2, and Scope 3 business air travel emissions across the company. As of FY21, the carbon fee will apply to all Scope 1, Scope 2, and Scope 3 emissions, with the Scope 3 fee starting at a lower amount and increasing to meet the Scope 1, Scope 2, and Scope 3 business air travel fee over time. Our internal carbon fee isn't a "shadow fee" that is calculated but not charged. • Our fee is paid by each division in our business based on its carbon emissions, and the funds are used to pay for sustainability improvements. By charging business groups based on the emissions they generate, we help to drive efficiency initiatives and innovation across our business. The carbon fee affects investment decisions by providing an incentive, the financial justification, and in some cases the funds for climate-related energy and technology innovation. The fee also helps drive culture change by raising internal awareness of the environmental implications of our business and establishing an expectation for environmental and climate responsibility within the company. In FY19, the carbon fee fund was used to support investments in: <ul style="list-style-type: none"> - 8,741,807 MWh in renewable electricity globally (the US portion of which earned Microsoft the US EPA Green Power Partnership as the number two US purchaser). - Offset purchases in five countries to reduce more than 750,000 mtCO₂e, preserve forests, and grow the low-carbon economy in developing nations. - Technology innovation projects that formed the basis of our AI for Earth program. - More than 50 internal emissions reduction and energy efficiency projects. 	<p> Download here</p>
<p>Disclosure of GHG emissions and risks</p>	<ul style="list-style-type: none"> • We annually disclose our Scope 1, 2, and 3 emissions as part of CDP and sustainability reporting. • We also annually disclose our water consumption as part of our CDP and sustainability reporting. • Through our Reporting Hub, we also disclose our annual data factsheets with environmental indicators covering: (1) greenhouse gas emissions (absolute values and normalized by revenue), (2) energy use, (3) carbon neutrality and greenhouse gas emissions balanced by carbon offsets, (4) water metrics including withdrawals, consumption, and discharge, (5) waste generation, and (6) electricity consumption. 	<p> Download here</p>

Appendix D (continued)

Metrics and targets (continued)

Key area	Description of work	Source location
Targets to manage risks and opportunities	<ul style="list-style-type: none">• In FY20, we made a commitment that by 2030 we would be carbon negative, both for our own operations and across our value chain, and by 2050 we would remove from the environment all the carbon the company has emitted either directly or by electrical consumption since it was founded in 1975.• To reach our carbon negative commitment, we will invest in a portfolio of negative emission technologies (NETs) potentially including afforestation and reforestation, soil carbon sequestration, bioenergy with carbon capture and storage (BECCS) and direct air capture (DAC).• We recently announced a target to be water positive in our direct operations by 2030, which will consist of reducing our water-use intensity and replenishing the water we consume through our operations in water-stressed regions.	 Find out more here

Appendix E

Policy

Microsoft supports carbon, clean energy, and sustainability policy efforts at the state and national level in the US, the European Union, and elsewhere. The table on pages 91–94 outlines key sustainability policy and advocacy actions Microsoft has taken over the past five years.

Date	Market	Description
04/2016	US	Filed amicus brief in support of Clean Power Plan
04/2016	EU	Joined Advisory Board of EU Parliament Network on Energy Solutions
09/2016	Global	Participated in statement in support of Montreal Protocol Amendment to phase out HFCs
11/2016	Virginia	Joined letter to Virginia State Corporation Commission asking for more options to purchase renewable energy
11/2016	Global	Attended UN COP22 Climate Meeting in Morocco
04/2017	Japan	Joined letter to Japanese METI to encourage more renewable energy options
05/2017	US	Participated in advocacy for US to remain in Paris Agreement
06/2017	US	Issued Microsoft statement opposing US exit from Paris Agreement
07/2017	Washington	Secured regulatory approval of contract to self supply Microsoft campus with 100 percent zero carbon energy
09/2017	US	Filed comments to US Federal Energy Regulatory Commission to protest Notice of Proposed Rulemaking (NOPR) for coal and nuclear bailout
11/2017	Global	Participated in UN COP23 Climate Meeting in Germany
11/2017	Ireland	Filed comments on design of a new Renewable Electricity Support Scheme in Ireland, issued by the Department of Communications, Climate Action & Environment
12/2017	EU	Joined letter in support of EU Renewable Energy Directive
01/2018	Washington	Testified in support of legislation to establish an economy-wide carbon fee in Washington state
02/2018	Virginia	Participated in letter to Virginia Legislature in support of bill to remove restrictions to 100 percent renewable energy purchasing

Appendix E (continued)

Policy

(continued)

Date	Market	Description
03/2018	Virginia	Sent letter to Virginia Governor Northam to adjust new cap on projects qualifying for renewable energy tax credit
04/2018	US	Testified at US Federal Energy Regulatory Commission technical meeting in support of distributed energy resources
05/2018	US	Selected as Leadership Circle for US We Are Still In coalition in support of Paris Climate Agreement
05/2018	US	Submitted comments to US Department of Energy to protest Notice of Proposed Rulemaking (NOPR) for coal and nuclear bailout
06/2018	US	Filed comments to US Federal Energy Regulatory Commission to allow storage and distributive energy resources to participate in wholesale markets (This docket formed the foundation for FERC Order 2222 approved in 2020 which opens wholesale markets to distributive energy resources such as solar panels, batteries, fuel cells)
07/2018	US	Joined CERES Business for Innovation Climate & Energy Policy Network
08/2018	California	Participated in California Clean Energy Lobby Day
09/2018	California	Participated in letter to California Governor Brown to sign direct access bill to allow more choice for renewable energy
09/2018	Washington	Advocated for I-1631 to establish an economy-wide carbon fee in Washington state
10/2018	California	Testified to California Public Utility Commission on customer choice
11/2018	US	Filed comments to US Federal Energy Regulatory Commission on pricing of the PJM regional market to reflect corporate renewable energy purchases
12/2018	Global	Participated in UN COP24 Climate Meeting in Poland
01/2019	Virginia	Joined letter to Virginia Legislature in support of bill to remove restrictions to 100 percent renewable energy purchasing
01/2019	Virginia	Participated in Virginia Clean Energy Lobby Day
02/2019	US	Joined letter calling on US to ratify Montreal Protocol Amendment to phase down HFCs

Appendix E (continued)

Policy (continued)

Date	Market	Description
04/2019	Washington	Supported legislation to create 100 percent zero carbon grid in Washington state
04/2019	US	Joined Climate Leadership Council to advocate for a robust federal carbon price
05/2019	Virginia	Joined letter to Virginia State Corporation Commission protesting utility's IRP due to low assumptions for renewable energy and storage penetration
05/2019	US	Participated in US Congressional Carbon Pricing Lobby Day
06/2019	EU	Joined letter to EU Commission to remove regulatory barriers to corporate renewable energy purchasing across the EU
10/2019	US	Submitted comments to US House Energy & Commerce Committee on policies to address climate change
10/2019	Singapore	Submitted comments to Singapore National Climate Change Secretariat on low carbon strategy
11/2019	Virginia	Joined letter to Virginia State Corporation Commission protesting utility's renewable energy tariff due to participation restrictions and unnecessarily high cost
11/2019	US	Submitted comments to US House Select Climate Crisis Committee on policies to address climate change
11/2019	Global	Participated in UN COP25 Climate Meeting in Spain
12/2019	US	Joined CEO and labor union letter to reiterate support for Paris Climate Agreement and deepen climate action
01/2020	Virginia	Participated in letter to Virginia Legislature in support of bill to remove restrictions to 100 percent renewable energy purchasing
01/2020	Washington/Oregon	Joined letter in support of carbon pricing mechanism in the US Northwest
03/2020	Virginia	Participated in letter in support of bill that authorizes Virginia to join the Regional Greenhouse Gas Initiative carbon pricing mechanism
04/2020	EU	Joined the European Alliance for a Green Recovery in support of including climate goals in recovery plans

Appendix E (continued)

Policy

(continued)

Date	Market	Description
05/2020	US	Participated in US Congressional Carbon Policy and Pricing Lobby Day
06/2020	US	Organized and issued statement to support passage of Great American Outdoors Act (S.3422) to permanently fund the Land & Water Conservation Fund, which was passed into law in August 2020
06/2020	US	Participated in statement in support of the Growing Climate Solutions Act under consideration in the US Congress
06/2020	EU	Filed submission to the EU public consultation on the review of the Non-Financial Reporting Directive
07/2020	EU	Filed submission to the EU public consultation on the Renewed Sustainable Finance Strategy
08/2020	US	Submitted Trillion Tree pledge; joined US Trillion Tree stakeholder committee
09/2020	EU	Joined letter in support of increasing EU 2030 GHG emissions reduction target to at least 55 percent net GHG emission reductions compared with 1990 levels
09/2020	EU	Joined Corporate Leaders Group Europe to advocate for progressive public policy that supports progress towards net zero in Europe
09/2020	US	Participated in letter in support of American Energy Innovation Act (later named Energy Act of 2020)
09/2020	EU	Joined Water Europe to advocate for smart water policies in the EU
10/2020	Virginia	Participated in letter to Virginia SCC to require utility to incorporate more cost-effective clean energy in its investment plan
10/2020	EU	Submitted comments to EU public consultation on "Empowering the consumer for the green transition"
11/2020	US	Filed comments to US Federal Energy Regulatory Commission in support of FERC issuing policy guidance on integrating state carbon pricing into power market design

Appendix F

Sustainability data assurance statements



Microsoft GHG and energy verification statement

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Microsoft water verification statement

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