

Microsoft®

Becoming carbon neutral



carbon
neutral™

How Microsoft is striving
to become leaner,
greener, and more
accountable

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Executive Summary

At Microsoft, we believe that we have a responsibility to minimize our impact on the environment, and so we have made a commitment to become carbon neutral¹ beginning in our fiscal year (FY) 2013² for our data centers, software development labs, offices, and employee air travel.

The measures that we will put in place to achieve carbon neutrality are intended to lessen our environmental footprint while also helping us to manage risk, increase efficiency, and support the growth of our business. Our approach has three strategic pillars:

- **Be lean.** We are setting targets to drive more efficiency with the energy that we consume in our data centers, labs, and offices as well as to reduce our use of air travel. Technology will play an important role in both how we achieve those targets and how we measure our progress along the way.
- **Be green.** We are purchasing more renewable energy and establishing goals to reduce our waste and water use.
- **Be accountable.** We are quantifying the carbon impact of our operations and driving responsible business decisions around energy use and air travel by setting an internal price on carbon, measuring our emissions, and charging a carbon fee to the teams responsible for those emissions.

Environmental sustainability is an important focus across our organization. Ultimately, we believe that making a commitment to becoming carbon neutral and implementing a carbon fee will be good for both the environment and our business. This is a learning process, and we will evolve our approach over time based on results.

¹ Throughout this document, “carbon” and “emissions” refer to carbon dioxide (CO₂) equivalent emissions (CO₂e).

² Microsoft’s FY2013 begins on July 1, 2012.

Introduction

At Microsoft, we understand that climate change is a serious challenge requiring a comprehensive and global response from all sectors of society. We take our contribution seriously, and therefore we have made a commitment to become carbon neutral. Becoming carbon neutral will help us reduce the impact of our operations on the environment, as well as manage our business risk, increase our efficiency, and set the foundation for growth. This white paper provides an overview of how we are managing our environmental footprint to achieve carbon neutrality.

A rising need for environmental responsibility

Climate change presents significant risks to society, the environment, and our business. By proactively taking responsibility for our environmental impact, we hope to make a contribution to the global effort to reduce carbon emissions. Our carbon neutral commitment, funded by an internal carbon fee, is our way of demonstrating the importance that we place on environmental sustainability. Because we are looking to technology to help us reduce our carbon emissions and track our progress along the way, this approach also reflects our broader policy on climate change: that technology can play an important role in the transition to a sustainable, low-carbon economy. Increasing our efficiency and performance in a resource-constrained world is an important part of our efforts to be a better, more socially minded corporate citizen.

Reducing Microsoft's environmental footprint

Looking back

In March 2009, our CEO Steve Ballmer made a commitment that by 2012, Microsoft would reduce its carbon emissions by at least 30 percent per unit of revenue from our 2007 levels. Our strategy has been to optimize our use of technology to reduce energy consumption and air travel, as well as to increase our investment in renewable energy and carbon offset projects.

In the three years since our initial goal was established, we have reduced emissions associated with our business offices and air travel. However, during that time we have also accelerated the shift in our business strategy to cloud computing and invested more than \$3 billion USD to build facilities and networks globally to support this strategy. This has significantly increased our use of electricity and therefore our gross carbon emissions. To counteract the carbon impact of this change to our business model, we adopted a multi-pronged strategy, including increasing our investments in high-quality, externally verifiable renewable energy and carbon reduction projects. As a result of these investments, we've received [recognition](#) from the US Environmental Protection Agency for our commitment to renewable energy. And with this approach, we earned carbon credits that reduced our net emissions and enabled us to meet our emissions reduction goal.

Our new commitment: carbon neutrality

Our new commitment is to become carbon neutral by fiscal year (FY) 2013: to achieve net zero emissions for our data centers, software development labs, offices, and employee air travel by increasing efficiency and purchasing renewable energy. Through operational governance, we will embed accountability for this goal across the company to help drive systemic changes.

Key stakeholder input

Sustainability is a key part of our internal corporate culture. In setting our new commitment, we collaborated with stakeholders from across our organization. An important part of our approach was to incorporate the office of the CFO into our carbon reduction strategy.

We also understand that our efforts will not have the greatest possible impact if we work in isolation. We regularly connect with external stakeholders and organizations that influence our approach:

- An informed external perspective has been both helpful and essential in setting our carbon neutrality commitment. We have solicited and incorporated feedback from our customers and a variety of experts in the environmental sustainability field.
- We maintain ongoing relationships and dialog with a number of non-governmental organizations (NGOs), such as the Carbon Disclosure Project (CDP), the Environmental Defense Fund (EDF), Greenpeace, the US Environmental Protection Agency (EPA), the World Resources Institute (WRI), the National Resource Defense Center (NRDC), and the World Wildlife Fund (WWF).

Microsoft's environmental sustainability footprint stakeholder map



Microsoft's Strategy to Become Carbon Neutral

Our strategy to reduce our environmental footprint and achieve carbon neutrality at Microsoft starting in FY2013 encompasses three strategic pillars: be lean, be green, and be accountable.

Our strategy at a glance

<div style="text-align: right; font-size: 2em; font-weight: bold;">+</div> <h2 style="margin: 0;">Be lean</h2> <p style="margin: 10px 0;">by reducing energy use and air travel through technology-driven efficiency</p> <ul style="list-style-type: none"> <li style="margin-bottom: 10px;">  Setting targets for reducing energy consumption in our data centers, labs, and offices <li style="margin-bottom: 10px;">  Setting targets for reducing air travel by using Microsoft collaboration technology  Controlling energy use in our offices with an enterprise-wide energy management program 	<div style="text-align: right; font-size: 2em; font-weight: bold;">+</div> <h2 style="margin: 0;">Be green</h2> <p style="margin: 10px 0;">by making more environmentally responsible choices with our energy, waste, and water</p> <ul style="list-style-type: none"> <li style="margin-bottom: 10px;">  Signing long-term renewable power purchase agreements <li style="margin-bottom: 10px;">  Investing capital in new renewable energy projects <li style="margin-bottom: 10px;">  Connecting data centers directly to innovative renewable energy sources <li style="margin-bottom: 10px;">  Purchasing market renewable energy certificates (RECs) and carbon offsets  Establishing reduction goals for waste and water 	<div style="text-align: right; font-size: 2em; font-weight: bold;">=</div> <h2 style="margin: 0;">Be accountable</h2> <p style="margin: 10px 0;">by quantifying our carbon impact and holding groups responsible</p> <ul style="list-style-type: none"> <li style="margin-bottom: 10px;">  Setting a price signal on carbon to internalize the external impact of our operations <li style="margin-bottom: 10px;">  Charging the teams responsible for emissions from data centers, offices, labs, and air travel <li style="margin-bottom: 10px;">  Improving transparency using emission-tracking software and Carbon Disclosure Project (CDP) reporting  Engaging employees through environmental sustainability programs 	
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Strategic pillar #1:

Be lean

Being efficient in our operations is foundational to our environmental sustainability approach. Our “be lean” strategy pillar is about using technology to increase energy efficiency and decrease our reliance on air travel.



Driving energy efficiencies in our facilities

The use of electricity is the primary source of carbon emissions from our internal operations. Microsoft has a number of initiatives to help reduce energy consumption in our data centers, software development labs, and offices.

Data centers

Key metrics: We are evolving our targets for [power usage effectiveness \(PUE\)](#), [carbon usage effectiveness \(CUE\)](#), [water usage effectiveness \(WUE\)](#), and server utilization rates.

Our average power usage effectiveness (PUE, a measure of energy efficiency) in 2011 was 1.40 across all of our cloud infrastructure properties, compared with an estimated industry average of 2.0 (the theoretical best achievable PUE is 1.0). Our goal by the end of 2012 is to construct new data centers that average 1.125 PUE and use 30–50 percent less energy than traditional industry data centers.

Some examples of how we are improving the efficiency of our existing and new data centers include:

- Increasing the efficiency of our cooling systems. For example:
 - Our Dublin, Ireland, Des Moines, Iowa, and Boydton, Virginia, facilities use outside air and airside economizers for cooling. The Dublin data center maintains a PUE of 1.25 while also improving energy efficiency by approximately 50 percent and using only 1 percent of the annual water consumption of a traditional industry data center.
 - Our Chicago, Illinois, data center uses water-side economizers, which enable us to cool the facility without requiring the high levels of electricity typically needed to power large chillers.
- Operating our servers at higher temperatures—within the range specified by the manufacturer but higher than is typical—so that we can use free air cooling instead of extensive air conditioning.
- Retrofitting our existing data centers with more efficient systems, such as custom LED lighting, economizers, compressor energy reduction, and HVAC (heating, ventilation, and air conditioning) containment and airflow reduction systems.

Software Development Labs

Key metric: We are evaluating energy efficiency targets for our labs.

In 2010, we completed a highly efficient, centrally managed facility called Redmond Ridge 1 that uses 27 percent less energy and creates 27 percent less carbon than our decentralized labs. Over 26,000

servers were moved to this facility from less efficient labs in office buildings. With a hot aisle containment design, 48 airside economizers, and a focus on server virtualization, the facility has reduced the carbon footprint from our Puget Sound, Washington, lab infrastructure by 4.4 percent while using 90 percent less water than a similarly sized facility using air conditioning. It has a PUE of 1.16. Our carbon neutral commitment and carbon fee model will provide an incentive for product groups to increase their use of this more efficient facility (versus their own labs in office buildings).

As an additional financial incentive, to encourage software development teams to consider the energy implications of their work, last year we also implemented a program in Puget Sound to charge energy costs back to the product groups based on their actual energy usage. This program will help encourage product groups to take advantage of the efficiency afforded by Redmond Ridge 1 and the reduced energy consumption of virtual machines. By combining this with a carbon fee, we expect to accelerate our efficiency gains.

Offices

Key metric: We are evaluating a target based on emissions per housed employee per square foot. "Housed employee" reflects both employees and contractors assigned a physical office location.

Managing our use of energy within our office buildings starts with being efficient at detecting and diagnosing faults and responding to alarms. Being able to identify when critical equipment will or has failed helps us keep systems running efficiently and makes our energy use more predictable.

In 2011, Microsoft initiated an energy-smart building management system pilot on our Redmond, Washington, campus. Currently, this campus represents 15 million square feet of space across 118 buildings and includes 35,000 pieces of mechanical equipment generating 500 million data points daily.

The pilot aimed to tie our buildings together with a single software-based solution that required no physical retrofit of building equipment and no disruption to building occupants. This same system is being used to feed real-time data to our enterprise performance management system. Based on the results of this pilot, we expect an additional 6–10 percent energy savings across the campus on top of the savings that we have already achieved through physical infrastructure renovations. We have begun implementing building energy management technology in additional locations around the world. To learn more about our pilot and energy-smart buildings, download our [Energy-Smart Buildings white paper](#).

In addition to energy-smart building management, we also continually look for opportunities to reduce energy use in our offices. For example:

- In FY2011, we reduced energy consumption for our Puget Sound, Washington, facilities by 3.8 percent through our Energy Conservation Measures (ECM) program, which includes initiatives to retrofit buildings with more efficient lighting and mechanical equipment.
- Individual subsidiaries run their own programs as well. Our subsidiary in Ireland recently reduced emissions from its operations by over 50 percent, earning it the Microsoft FY11 Global Environmental Action Award, and our subsidiary in The Netherlands has reduced carbon emissions by 30 percent per employee in the last year.

We are also implementing policies and solutions that will reduce the energy consumption of the IT systems that our employees use every day. For example, we are using a life-cycle management approach to ensure that employee PCs and peripherals:

- Are designed for efficiency (meet ENERGY STAR, Climate Savers, and EPEAT requirements)
- Operate efficiently and consume power only when needed
- Are disposed of responsibly

In addition, using the power-saving capabilities built into Windows 7 and the ability to manage the Windows desktop using Microsoft System Center, we reduced our PC energy consumption by more than 32 percent in FY2011—an annual savings of \$956,000 and 10.62 million kilowatt hours (kWh) in energy—with little to no impact on users. The carbon reduction from this is equivalent to removing about 2,000 passenger vehicles from the road for one year.



Reducing air travel

Key metric: We are evaluating a target based on air travel miles per employee.

We are increasing our use of Microsoft collaboration technology as an alternative to traveling for meetings. Using the unified communications capabilities in Microsoft Lync with the collaboration capabilities built into Microsoft Office and Microsoft SharePoint helps us reduce our use of air travel, particularly for internal meetings and conferences.

Our policy is that air travel should be considered a last option for meetings with colleagues and partners. The corporate travel policy provides the following guidance to employees:

- Microsoft expects employees and managers to carefully evaluate the business benefit of traveling before incurring travel expenses.
- Microsoft expects employees and managers to consider the impact on the environment before booking travel. The average business trip generates more than 2,200 pounds (or more than 1 metric ton) of carbon.
- Employees are encouraged to examine low-cost alternatives, such as using Lync.
- For a richer and more lifelike virtual meeting experience, Microsoft has also invested in Telepresence rooms in major business hubs such as Seattle, Reading, Beijing, and Hyderabad. These rooms can provide the feel of a face-to-face meeting without the cost and time lost due to travel. There is no cost to the business user to use Telepresence rooms.

Since 2007, increased use of our collaboration products and operational control measures have helped us reduce our carbon footprint from air travel by more than 30,000 metric tons.

Strategic pillar #2:

Be green

Microsoft is committed to increasing our purchase of renewable energy and reducing waste and water use.



Investing in renewable energy and offset projects

Emissions associated with electricity consumption represent a significant portion of our greenhouse gas (GHG) emissions. Furthermore, although our cloud services should reduce the net energy consumption and emissions associated with the use of our technology globally, as we absorb computational workloads from less efficient sources, Microsoft will become an increasingly energy-intensive company. It is essential that we take measures to reduce the emissions impact of this energy intensity. We recognize that we will need to look to industry expertise and research to ensure that we are using the best technology and strategies available.

While the first step is to reduce our consumption through energy conservation and efficiency improvements, another important factor is the source of the energy that we purchase. We have purchased renewable energy certificates (RECs) and carbon offsets, and we are expanding our scope where possible into the regions in which we have data centers, labs, and offices. For the purchase of renewable energy, we prioritize:

- **Credibility**—Is the project well managed and funded?
- **Verifiability**—Does the project offer certified and independent verification for claims and retirement? For example, does a renewable energy project conform to the [GHG Protocol Power Accounting Guidelines](#)?
- **Additionality**—Will the project lead to net-new emissions reductions? Will it reduce global GHG emissions?

As we transition away from non-renewable energy, we are considering a portfolio of approaches, including:

- **Signing long-term renewable power purchase agreements**—We are investigating options for signing long-term, fixed-price renewable power purchase agreements to both support renewable energy projects and provide a hedge against rising energy prices.
- **Investing capital in new renewable energy projects**—We are evaluating investments to support the supply of new renewable energy within the right environment. For example, we are considering investing in wind farm and methane-capture projects.
- **Connecting data centers directly to innovative energy sources**—We are considering a pilot for on-site renewable energy generation, such as methane-powered fuel cells. By consuming the zero-emissions output from these alternative energy sources, we can directly reduce the amount of electricity that we purchase from the commercial electrical grid.

We are engaging in discussions with some of the top global power generation companies to help us identify and execute low-carbon energy projects. In addition, as we seek to identify the most promising technology for use in the data center environment (for example, distributed generation,

battery storage), we are also partnering with research institutions and the venture capital community, with the goal of providing both capital and an environment for prototyping new technology.



Establishing reduction goals for waste and water

We have a number of initiatives across our company to reduce our waste and water use. For example:

- Each month we recycle an average of 673,360 pounds (or 305 metric tons) of material at our Puget Sound campus, including glass, plastic, aluminum, electronics, cardboard, paper, organic waste, wood pallets, and copper wire. In FY2011, we increased our total waste diversion rate from 63 percent to more than 80 percent overall and 95 percent within our dining facilities, helping us to win the [2012 Washington State Recyclers Association \(WSRA\) Recycler of the Year award](#). We have a goal to reach zero cafeteria waste at our corporate headquarters by 2015.
- In the second half of 2011, we recycled or reused the equivalent of over 3 million pounds (or 1,480 metric tons) of technology hardware in the United States. To cover the costs of recycling the electronic hardware used in our operations, we are implementing a recycling fee that will be charged to our business groups at the time of future equipment purchases. We have a zero landfill policy for retired technology hardware in the United States, and we are expanding our technology recycling program to other large sites outside of the United States, starting with Canada, Ireland, The Netherlands, and the United Kingdom. So far, our PC recycling program has removed 394,000 pounds (or 179 metric tons) of e-waste from the solid waste stream, equal to the waste from 123 US households in a year. To better manage these efforts, we are currently implementing a centrally managed IT asset disposition (ITAD) program that will consolidate the many hardware recycling programs in place at Microsoft locations around the world.
- We are working continuously to reduce the impact of our data centers. With our latest designs, our new data centers use only 1 percent of the water used by traditional data centers in the industry.
- In FY2011, we added water use to our corporate inventory and reporting system and will be setting reduction goals to more effectively manage our water consumption.

We track our progress against our waste and water use reduction goals on a quarterly basis.

Strategic pillar #3:

Be accountable

Our first two strategic pillars address the need to increase our efficiency and make our operations more “green.” Our third strategic pillar focuses on the critical element of accountability across the business.



Setting a price signal to internalize the external impact of our operations

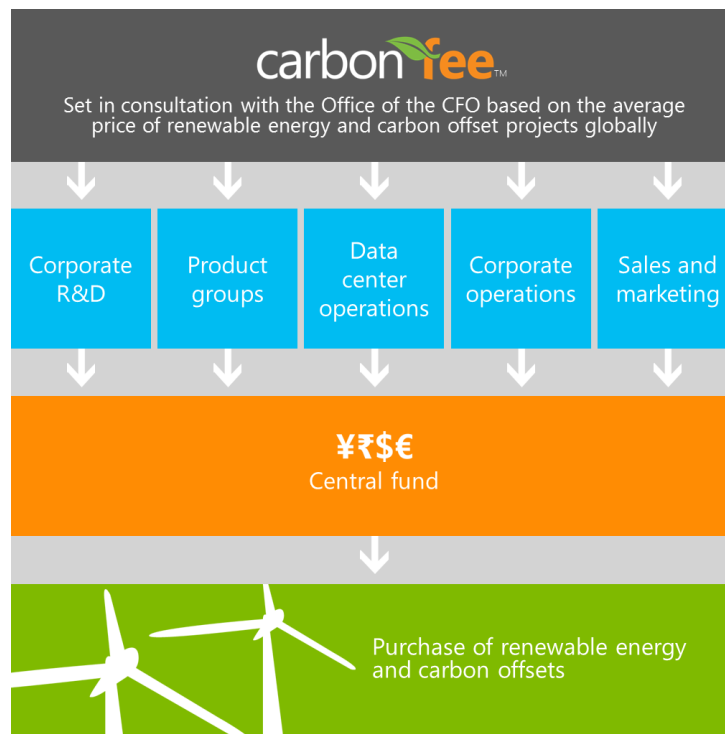
Internally at Microsoft, we have established a price for carbon—reflecting true cost accounting—that will provide a new perspective on the cost of emissions. For instance, with this model, the internal cost for electricity use includes not only the price we pay the utility for electricity, but also the price

we pay to offset the carbon emissions associated with our electricity use. For air travel, the cost includes not only the price we pay the airline for the airplane ticket, but also the price we pay to offset the carbon emissions associated with the flight. By embedding the cost of carbon in our financial systems, we have a direct way to measure and drive behavior change in a company-wide, systems-based way. When a potential emissions reduction project costs less than the fee for the carbon that would otherwise be emitted, it encourages responsible—and sustainable—business decisions.

carbon fee Charging the teams responsible for emissions

Setting an internal carbon price alone, however, isn't sufficient to drive behavior change and achieve carbon neutrality. Therefore, starting in FY2013, Microsoft is implementing a carbon fee chargeback model for emissions associated with data centers, software development labs, offices, and air travel. The chargeback, which will be administered through the corporate finance department, will be applied across more than 100 countries. By charging an internal fee for carbon emissions to the business groups responsible for incurring the emissions, we will build an investment fund that can be used for a variety of [renewable energy and offset projects](#). These projects, in turn, will enable Microsoft to reduce net emissions and be carbon neutral.

Keeping the chargeback model simple is critical. Where possible we are embedding the carbon fee within existing corporate chargeback models for shared services to the business groups.



We hope that through this model, we can raise awareness and establish a discipline at scale across the business, guiding the energy choices made both at our corporate headquarters and through our local subsidiaries. Microsoft has a decentralized organization, with operations in over 100 countries; the chargeback model should provide an incentive for local offices to determine the best way to reduce their energy use and related carbon emissions through a mix of energy efficiency initiatives

and renewable energy purchases. This approach will be an evolving process, and we look forward to sharing what we have learned and the results we have achieved along the way.



Improving transparency using emission-tracking software

Technology is key to enabling us to proactively measure and manage environmental performance within our organization, which in turn is key to enabling us to accurately administer the carbon fee.

In early 2012, Microsoft selected the [CarbonSystems](#) cloud-based Enterprise Sustainability Platform, based on Microsoft platform technology, to help manage our energy and environmental performance. The system is being rolled out in more than 600 facilities in more than 100 countries and will provide real-time visibility into our energy use and emissions, as well as monthly updates on air travel data.

Through CarbonSystems, business groups will be able to monitor their emissions level and associated carbon fee. Furthermore, access to up-to-date data will enable us to integrate environmental footprint management into the rhythm of our business, including monthly and quarterly business reviews across the organization. It will also enable us to provide more transparency to the executives and business leaders responsible for making business decisions that will have an impact on the environment.



Engaging employees through environmental sustainability programs

To successfully establish a culture of environmentally sustainable operations and achieve our commitment to carbon neutrality, it is critical that we have the support and participation of our employees. Today at Microsoft, we have a number of programs designed to [increase our employees' awareness of environmental issues and engage them directly in sustainability work](#). A few examples include:

- **Environmental Sustainability Leads.** We have a global community of environmental leaders who help to manage Microsoft's sustainability work in their country or region. Environmental Sustainability Leads focus primarily on reducing employee travel, driving energy efficiency improvements in their local offices, engaging with customers and partners on the role of technology in environmental sustainability, and connecting with local policymakers to help advance the use of IT in enabling a low-carbon economy.
- **Sustainability Champions.** Employees who volunteer as Sustainability Champions play an active role in reducing our energy consumption, conserving water, and diverting waste from landfills. They encourage their colleagues to make environmentally conscious choices and educate them on sustainable practices (such as turning off lights and computers and recycling waste). The goal of the program is to reduce controllable energy consumption by 3–10 percent per building at the plug level.
- **MS Green.** As part of a grassroots community group, members of MS Green focus on increasing the environmental awareness of employees and educating them about programs such as mass transit, energy conservation, organic farming, and other local resources.
- **Environmental Action Award.** Each quarter, we recognize a team or individual employee who has made a significant contribution to reducing the environmental impact of Microsoft or our products. Winners of the quarterly award receive a \$1,000 donation to the environmental charity of their choice.

■ Learnings and Closing Thoughts

Our experience in establishing our carbon neutrality commitment and working towards a cultural change across our organization to support that commitment has already taught us some key lessons:

1. Understand the needs of the business to make the discussion relevant to your audience.
2. Take the initiative as the designated team leading a cross-corporate effort to drive integrated efficiency and renewable energy projects.
3. Develop a strategy based on mutual goals across the company: How can your effort benefit the whole organization? How can each group do its part to help make the organization successful?
4. Develop a stakeholder map with decision makers and influencers to facilitate bottom-up and top-down feedback. Include mentors and supporters of sustainability, the office of the CFO, key revenue groups, and strategic emission impact areas as stakeholders.
5. Focus on financial benefits but don't forget the other goals such as risk mitigation, citizenship commitments, and branding.
6. Communicate early and get feedback often.
7. Empower influential stakeholders to promote the strategy within their area of the business.
8. Continually refine the strategy and ensure that teams understand how their efforts contribute to the organization as a whole.
9. Use governance to drive accountability over time.
10. Don't let naysayers derail a good strategy.

Closing thoughts

We hope that our carbon neutral commitment will support a culture of innovation and efficiency at Microsoft. We believe that it will help us drive operational excellence to make our business thrive and reduce our impact on the environment. We are taking the initiative in promoting the efficient use of resources and purchasing renewable energy, and we hope to set an example by driving accountability through our internal carbon pricing and chargeback model.

Realistically, this type of project would not be possible if it did not benefit the overall productivity and profitability of our organization. However, we also believe that the growth of our business must incorporate the greater needs of society. We want our strategy to be more than just catchy slogans tied to business outcomes—we want it to help our organization demonstrate environmental responsibility and contribute as part of the global response to climate change.

We hope this white paper has provided you with some ideas for how to carry a similar vision forward in your organization.

Our environmental footprint at a glance

