Microsoft

Making an impact with Microsoft's carbon fee

Inspiring a virtuous cycle of environmental investment and action

Tamara "TJ" DiCaprio
March 2015

This white paper is a follow-up to our guide The Microsoft carbon fee: theory & practice, which we published in December 2013 to help leaders from the private and public sectors and non-governmental organizations (NGOs) learn more about our carbon fee and how to use it as a model for a similar approach. In this paper, we provide an update on the progress made with our carbon fee since its implementation in 2012 and take a more comprehensive look at the funds collected through the fee. Our goal is to:

- Highlight how the carbon fee has helped us have a measurable impact on our own environmental footprint while enabling us to contribute to the broader good.
- Reveal how, as our environmental initiatives deliver impact, they create even more demand for funding from the fee payers themselves: driving up the carbon fee and uplifting a virtuous cycle of investment.
- Share our vision for future opportunities enabled by our carbon fee fund investments, particularly in the areas of technology innovation.

Contents

Executive summary

At Microsoft, we embrace the opportunity to help people and organizations around the world to improve the environment, and we also recognize that our responsibility begins with our own actions. Effective July 2012, we made a companywide commitment to carbon neutrality. To help us reach this goal, we established an internal carbon fee model that holds our business groups financially responsible for the cost of reducing and compensating for their carbon emissions. With the funds collected through the carbon fee, we have purchased more than 10 billion kilowatt-hours (kWh) of green power, reduced our emissions by 7.5 million metric tons of carbon dioxide equivalent (mtCO2e), had an impact on more than 3.2 million people in emerging nations through carbon offset community projects, and saved more than $10 million per year.

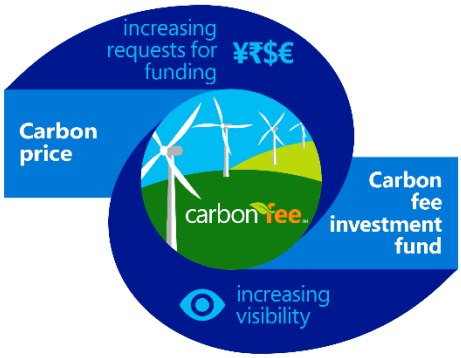
"At Microsoft, we believe technology has tremendous potential to address environmental challenges and attain a clean energy future. We seek to serve as a model in our commitment to environmental sustainability by delivering on our carbon neutrality commitment and uncovering new ways technology can help us better understand our planet."

– Satya Nadella, CEO, Microsoft

Our carbon fee delivers value both to Microsoft and beyond:

- At Microsoft, the carbon fee helps raise awareness and drive accountability with internal stakeholders while supporting measures to increase efficiency, decrease energy costs, and build a transparent and environmentally sustainable operating model. It provides both an incentive and a support system (through grants for carbon reduction and innovation) for teams to take responsibility for reducing our energy costs and carbon footprint. We fundamentally believe that what's good for the planet can also be good for our business.
- To deliver value beyond Microsoft, the carbon fee creates a dedicated fund for supporting innovation in green power. It also enables us to sponsor projects that help offset carbon and build sustainable communities in developing nations around the world. When we invest our carbon fee funds, a guiding principle is to support projects for which technology can accelerate their impact, as we believe technology will play a pivotal role in the transition to a low-carbon economy.

We view the carbon fee as vital to driving the long-term health of our business. Building the cost of carbon into our business decisions demonstrates leadership and a commitment to sustainability for our staff, investors, customers, and other stakeholders. It also helps us to prepare now for increasing legislation in the future. The fee has created a virtuous cycle of environmental responsibility within our organization—inspiring action that delivers results, which in turn raises greater awareness and inspires further action. And by helping us become an environmentally responsible supplier to our customers, it also indirectly helps our customers to grow sustainably. Long term, we hope it will inspire and catalyze other organizations to take similar measures.



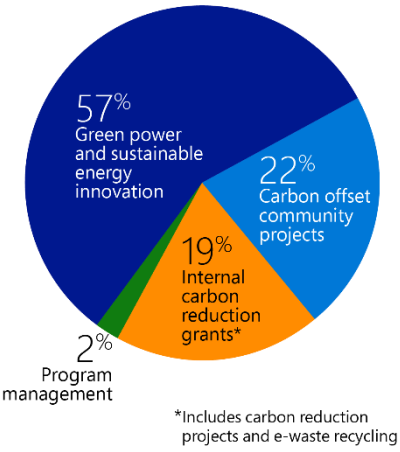
Background:
our vision for the carbon fee

At Microsoft, we believe that environmental sustainability is both a responsibility and an opportunity for our organization—internally in our operations and externally in how we reduce our impact on and increase our contribution to the world's communities. To demonstrate this ideal, we made a commitment from July 2012 (the start of our fiscal year 2013 [FY13]) onwards to being carbon neutral for our data centers, offices, software development labs, and air travel and to procure 100 percent green power equal to the volume of our consumption of electricity. At the same time, we introduced a company-wide internal carbon fee, a mechanism to fund carbon neutrality while raising awareness and driving accountability. Our carbon fee represents a proactive step to make our business groups accountable for their carbon emissions while creating a fund to support efficiency and innovation. Although the contribution by Microsoft to reduce greenhouse gas emissions may be small on a global scale, we hope that our program will serve as a model to other organizations, helping catalyze a movement where the overall benefits are much greater than our individual contribution could ever be.

Our carbon fee begins with tracking and analyzing the carbon emissions across our operations and then applying a carbon price to those emissions. The price sends a signal to help us internalize the external impact of our operations, enabling us to account for the impact on the planet's climate in a very tangible way. Using this price, we make the cost to achieve carbon neutrality a line item in the operating budgets of our business groups across more than 100 countries, engaging employees across our global operations. We use cloud technology to help us accurately collect and analyze the data to support this process. This chargeback structure helps influence the energy and travel choices made both at headquarters and through our local subsidiaries. It also provides an incentive for our business groups to find lower-carbon alternatives and invest in carbon-saving initiatives and innovation.

What makes the carbon fee truly pivotal for our environmental work is the combination of the accountability driven by the price signal and the earmarking of the collected funds for environmental initiatives. To establish the price on carbon, we have a Carbon Neutral Council, a cross-corporate group that provides feedback on and buy-in to the program. We identify projects for internal carbon reduction, e-waste recycling, green power, sustainable energy innovation, and carbon offset community projects. We divide the funds required for these environmental initiatives by our projected emissions to establish the carbon price. The projects that we fund through the carbon fee help us to reduce our gross emissions and operate more efficiently

FY15 carbon fee fund investments



and sustainably as a company, achieve net carbon neutrality, and contribute to the greater good.

We designed the carbon fee using a simple, repeatable model with the hope that other private and public organizations will adapt it to help meet their goals to drive efficiency, reduce their environmental impact, and support environmental innovations. We remain committed to sharing what we have learned based on our own experiences to help our customers, partners, and other interested groups grow sustainably.

Value to Microsoft:
driving accountability and boosting efficiency

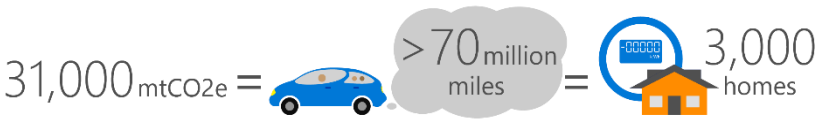
The value of the carbon fee is first and foremost in how it enables us to direct investments toward efficiency internally here at Microsoft. The carbon fee structure puts the funds in place to enable efficiency investments outside the formal budgeting cycle. At the same time, the fee enables and provides an incentive for each business division to take accountability for reducing their contribution to Microsoft's carbon footprint.

Reducing emissions by increasing efficiency

The most impactful way for us to lessen our operational footprint is to reduce our overall emissions. Since we implemented the carbon fee, we have reinvested a portion of the carbon fee investment fund into our company through a range of internal carbon reduction initiatives—such as lighting equipment upgrades, heating, ventilation, and air conditioning (HVAC) systems, mechanical investments, and e-waste recycling. Specifically, part of the cost of energy that we consume from carbon-based sources is ultimately redirected to invest in projects that reduce the environmental impact of our operationally controlled facilities.

Internal carbon reduction projects

Funding for internal carbon reduction projects is inspiring our global offices to reduce their footprints—it is helping make environmental sustainability a fundamental aspect of our business practices. Since the start of the program, we have funded over 60 projects in 23 countries by investing more than $2 million. We estimate that the internal carbon reduction projects funded through our carbon fee in the last two years have saved at least $3 million (net present value) and will lead to lifetime carbon reductions of 31,000 mtCO2e. To put it in perspective, that is the equivalent of the emissions produced from driving an average passenger vehicle over 70 million miles or from the average annual electricity consumption of approximately 3,000 homes.[1] We see these investments as a down-payment on continued footprint reduction. Furthermore, these positive outcomes are just the start. We are confident that this process for identifying and funding



[1] Greenhouse gas equivalencies calculator. US Environmental Protection Agency. http://www.epa.gov/cleanenergy/energy-resources/calculator.html

innovation across our global operations will scale up in the coming years. For example, we are already evaluating options for expanding the use of onsite green power on our campuses globally and have identified opportunities that are candidates for carbon fee funding.

We have a formal grant application process and specific criteria (see table). These criteria help ensure that each funded project contributes directly to our goals, which—beyond helping Microsoft achieve carbon neutrality—include driving engagement across the company, encouraging innovation, and maximizing the impact for our company on the three Ps (people, planet, and profit).

Internal carbon reduction investment projects: selection criteria

Demonstrated carbon reduction
Would not occur without the carbon fee investment
Demonstrated accountability for return on investment (ROI)
High-quality estimates of cost and carbon reduction
Savings vetted by the finance department
Commitment to case study write-up
Acceptable lease terms and conditions (landlord approved)
Includes utility rebates where possible

Internal carbon reduction projects, FY13–FY15

The following sections highlight examples of the initiatives that we have funded through the carbon fee fund since it was established in FY13.

Upgrading lighting in Bogota, Colombia

With 270 employees representing Microsoft central sales operations in Colombia, our 3,000-square-meter office space in Bogota is a center of activity. Through a $71,000 grant from the carbon fee investment fund, our Bogota office has invested in a site-wide lighting upgrade in partnership with General Electric Corporation. Not only is the project expected to save $18,000 per year in combined energy savings and maintenance cost reductions, but it also has had a tangible impact on the employees, who report that improved lighting quality has helped increase their productivity while positive media coverage has created a sense of pride. The office is now saving an estimated 55,000 kWh of electricity and 6 mtCO2e in emissions per year.

Optimizing controls in Santiago, Chile

The Microsoft 2,500-square-meter sales office in Santiago is a critical hub for our business operations in Chile, hosting 200 employees. To boost efficiency, the team received a $120,000 grant from the carbon fee investment fund to implement a building management system (BMS) that optimizes the lighting and HVAC controls. The BMS is expected to save the office $60,000 per year in combined energy savings and maintenance costs and was an integral reason the site was awarded LEED (Leadership in Energy and Environmental Design) certification. Both the LEED certification and the BMS installation have had a positive impact on employee morale and public perceptions. The BMS will save an estimated 50,000 kWh of electricity and 22 mtCO2e in emissions per year.

Operationalizing smart building technology, Puget Sound, WA

The Microsoft facilities team was facing annual energy costs upwards of $55 million. In addition, because the campus consists of disparate building applications and systems, they were experiencing significant waste in operating a portfolio of this scale. The team decided that there must be a better way to lower energy consumption and costs, and so they optimized the buildings using an "Internet of Things meets big data" approach. By creating an analytical software "blanket," they joined together 38,000 assets of disparate, sensor-enabled equipment across the campus's 125 buildings. The system processes 500 million data transactions every day, data that is then compiled and analyzed through graphics, charts, and trending reports to prioritize maintenance and repairs—many of which are funded through the carbon fee—for cost and carbon savings. The solution is an undeniable success, with forecasted energy savings of 10–11 percent and an implementation payback of less than 24 months. We are now expanding the solution to our other campuses with equally good results: the software identified $240,000 of energy savings at our Mountain View, CA campus within the first 30 days of deployment. We are sharing our story with business, government, and industry leaders from around the globe and making similar solutions available through partners to our customers (such as through Microsoft CityNext offerings). With inefficient commercial buildings responsible for upwards of 40 percent of the world's energy consumption, we see the potential for this solution to deliver large-scale, world-changing results.

E-waste recycling

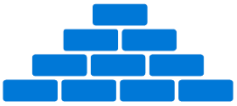
As a technology business, Microsoft generates a reasonable amount of e-waste from our internal operations—from computers, servers, monitors, and phones to network equipment, data storage media, printers, copiers, batteries, and accessories (such as keyboards, mice, and headsets). It is vital that we retire this e-waste appropriately, both to help protect our proprietary data and to ensure that we address any ecological risks from improper disposal. The Microsoft IT Asset Disposition Program was set up to support the recycling and reuse of our internal operational e-waste, helping reduce energy consumption, greenhouse gases, and hazardous waste. To give a sense of the scale of the program, since its launch in FY12 (beginning July 2011) we have recycled over 400,000 assets and reused over 350,000 assets in the United States alone; the program supports additional recycling and reuse in Europe, Middle East, & Africa (EMEA), Asia Pacific, and Latin America.

For FY15 (July 2014 to June 2015), the carbon fee fund is contributing $15 per employee to the IT Asset Disposition Program to support our Global Procurement Group with recycling internal operational hardware. Microsoft has approximately 97,000 employees, so this represents nearly $1.5 million. This funding will support the continued expansion of the program globally, helping ensure the removal, reuse, and disposal of Microsoft IT assets in compliance with local and national data security and environmental regulations. Beyond the security and environmental benefits, we are also helping people, businesses, and communities around the world to embrace sustainable technology through the program by working with Microsoft Authorized Refurbishers to rebuild and reuse devices.

Environmental impact of Microsoft US e-waste recycling and reuse since FY12

Energy savings
Electricity to power 32,900 houses for one year

Greenhouse gas reduction
Removing 53,416 cars from road for one year



Hazardous waste reduction
Weight of 2,240 bricks

Reducing our cost to purchase energy

Efficiency and cost reduction are important components of our energy strategy. Where we cannot eliminate electricity-related emissions directly (such as through efficiency projects), we achieve “market-based” carbon neutrality through high-quality green power investments. By matching the volume (in megawatt-hours [MWh]) of our electricity consumption with external green power investments, we have procured 100 percent green power for our global operations. These efforts have been recognized by the US Environmental Protection Agency (EPA) Green Power Partnership, which ranks us as the second largest green power purchaser for US operations through our 100 percent green power commitment.

While we prioritize green power investments in support of our carbon neutral strategy, those investments must deliver both an economic and an environmental return. An example is our focus on purchasing green power directly by signing long-term power purchase agreements (PPAs).[2] PPAs deliver the dual benefits of ensuring a supply of green power in areas where we have substantial infrastructure while also enabling us to hedge our energy pricing for the future.

For example, in November 2013 we announced that we had signed a long-term PPA for wind energy in Texas. Through this 20-year agreement with RES Americas, we will purchase 100 percent of the energy from the Keechi Wind Project, a 110-megawatt wind facility located 70 miles northwest of Ft Worth, Texas. The 55-turbine wind farm is on the same electric grid that powers our datacenter in San Antonio. By signing a 20-year contract up front, we support the development of the project while also locking in a price for our energy use over the long term.

Keechi Wind Project, near Ft Worth, Texas

The economic and zero-carbon advantages delivered by green power PPAs for Microsoft are equaled by their support of broader sustainable energy innovation. See the Innovating with green power and sustainable energy section later in this paper for more information on how PPA investments help directly support the world's transition to low-carbon energy.

[2] The company Altenex helps us to identify suitable PPA projects and negotiate the agreements.

Spurring employee action: a virtuous cycle of impact

One benefit of the carbon fee is that it helps increase awareness among employees of the environmental impact of our business. More and more, individual employees are taking the initiative to incorporate sustainability measures into their daily jobs.

"Every individual has the obligation to protect this planet and bring it into better shape than it was before. Every reduced gram of CO2 pollution counts, and every not-driven kilometer counts as well. I am proud that together with my team and with the help of our business partners we were able to make this planet a bit better by reducing the harmful emissions of company cars by nearly 25% over the last few years—while keeping employee satisfaction with company cars high."

- Michael Pohl, Global Procurement Group, Microsoft

For example, within the Microsoft Global Procurement Group, the European fleet team is on a mission to reduce the emissions associated with company cars. The team started by implementing upper limits on carbon dioxide (CO2) emissions into local car policies. It has worked with car manufacturers and their dealerships to secure the highest possible discounts on their lowest emission engines by model range. The outcome: the average CO2 value of our company cars in this region has dropped from 172 g/km in FY10 to 129.5 g/km in December 2014 (covering >6,600 cars).

In another example, one of our Redmond, WA campus cafeterias is embracing urban farming in what they call a "growing green revolution." Through the project, they grow lettuce under plasma lights in hydroponic towers and cultivate microgreens in a cooler alongside an organic salad bar. The experiment is proving a success with employees. The greens are one of the most popular selections, as our employees are concerned about what's in their food and where it comes from. The project also embraces technology—the plasma units were a suggestion from the Xbox team (they provide a complete light spectrum for better coloration and flavor), and other groups are exploring options for creating apps (such as to remotely measure the progress of the plants). The aim is to grow 100 percent of the company's microgreens in house by July 2015, while also expanding the program to other campus cafeterias. The ultimate goal is 100 percent sustainability.

Our commitment to environmental sustainability is an important facet of Microsoft as an employer that helps us both recruit and retain employees. We engage employees on environmental sustainability in a number of ways, including:

"We see Microsoft as a city, and as we look at that city, we want to meet the needs of our citizens by offering a variety of healthy foods that help make our employees happy and productive."

- Mark Freeman, Senior Program Manager of Dining and Beverage Services, Microsoft

- A grassroots community called MS Green focused on building awareness and education.
- A formal program of Sustainability Champions that encourage energy and waste conservation.
- A global community of internal environmental leaders called Environmental Sustainability Leads who work to raise awareness internally and externally of environmental sustainability issues and activities within our business, including our carbon neutral commitment and carbon fee.

As part of our FY14 employee survey, 81 percent of respondents rated Microsoft an industry leader in protecting the environment (based on measures such as water and energy conservation, recycling, and reporting progress) and 75 percent responded that Microsoft is doing an excellent job when it comes to energy and environmental issues. And while we're pleased with these results, we are continually working to get even better. We hope that environmentally minded individuals will be drawn to Microsoft as a workplace that they are proud to represent.

Driving accountability while better tracking and managing emissions

We dedicate less than 5 percent of the funds collected through the carbon fee to program management expenses. These expenses include:

- Our carbon emission inventory, which provides a solid basis for allocating the associated fees accurately as well as a reliable system of measurement to manage emissions and target reductions effectively.
- Reporting, such as to CDP, an independent not-for-profit organization that publishes annual reports on organizational responses to environmental issues including climate change.

Dedicated funding for program management—using the Microsoft cloud to support data management and analytics—gives us a firm foundation for environmental initiatives at a broad scale across the company.

Value beyond Microsoft:
investing for global impact

We see a significant opportunity to make a contribution beyond the operational boundaries of our organization by helping accelerate the development of the green power market and supporting carbon offsetting and sustainable community development using technology, particularly in emerging nations. Through the fee we can compensate for our remaining emissions by investing in projects that deliver far-reaching benefits in carbon reduction, sustainable job creation, health, education, and biodiversity protection. These project investments come in two forms:

- Innovating with green power and sustainable energy
- Offsetting carbon and building communities

Innovating with green power and sustainable energy

Investing in green power is good for our business, but it's also an opportunity to contribute to the advancement of the quality and availability of green power in the market. Unfortunately, in their current states, both energy markets and energy technology are insufficient to achieve the rates of de-carbonization required to avoid the worst effects of climate change. By investing in green power and sustainable energy innovation, we're supporting the development of both new energy technologies that will be the building blocks for energy transformation *and* clean energy markets that will broaden accessibility and support a more sustainable future. The green power market is still small in comparison with conventional forms of energy, but by enabling transformative innovation, we are directly supporting the world's transition to low-carbon energy.

Advancing the development of new sustainable energy technology

At Microsoft, we are actively focused on identifying, piloting, and commercializing new technologies that are radically more efficient than anything that has come before. For instance, we are working with the Department of Energy (DOE) Advanced Research Project Agency-Energy (ARPA-E) to evaluate and pilot the next generation of fuel cell technology. We are also working with a number of partners across the industry to identify technologies that have the potential to have a transformative impact, not just on datacenters but on the energy sector as a whole. This has led to the development of a number of pilot projects focused on technologies such as fuel cells and micro turbines.

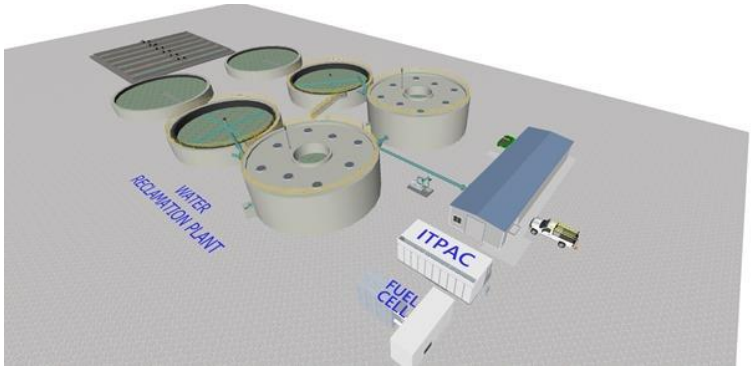
Our focus does not end with the technology itself. We are also looking at how to design systems that efficiently apply and integrate these new technologies. For instance, one of our strategies to minimize the energy impact of our datacenters is to evaluate opportunities for them to use green power generated onsite. We are currently running a pilot program to use biogas from the

Dry Creek Water Reclamation Facility in Cheyenne, Wyoming to power a small datacenter. The biogas, a byproduct of waste from a collocated wastewater treatment plant, powers the servers in the datacenter (or "data plant"). Any excess heat is sent back to the sewage treatment facility to be used in anaerobic digesters to break down waste matter into energy. This 200-server datacenter is the first ever zero-carbon datacenter. It effectively turns waste into data—while also returning 150 kilowatts of heat energy to the sewage treatment plant to offset its energy needs. Once we complete this pilot phase, we will have the data needed to explore expanding the concept to more locations where biogas resources are readily available.

"[The biogas-powered datacenter project] brings the power plant inside the datacenter, effectively eliminating most of the energy loss that otherwise occurs between the generator and the datacenter, doubling the efficiency of traditional datacenters."

- Sean James, Senior Research Program Manager, Microsoft

We're also working on another project to integrate fuel cells directly into the server racks of a datacenter. We have worked with the National Fuel Cell Research Center at the University of California, Irvine, to build a successful demonstration project—boosting the efficiency of our fuel cell system from 39.8 percent to 53.3 percent by cutting out much of the electrical conditioning systems. The model has the potential to cut out numerous points of failure that occur in traditional electrical transmission.



These projects can help double the energy efficiency of traditional datacenters. Not only will they help us reduce the carbon impact of our cloud business, but they also have the potential to help transform the industry as a whole, by demonstrating a new way of thinking about powering our technology-obsessed world.

Developing green power markets

Our progress in supporting the development of green power markets has taken three distinct steps:

1. The first was to gain buy-in internally that green power is important to our business. We achieved this in 2012 with the implementation of our carbon fee and the associated shift to compensating for 100 percent of our power consumption with an equal volume of green power purchases.
2. The second was to deepen our commitment to green power by actively participating in the creation of new green power projects. We have done this by making long-term financial commitments to purchase energy from new wind projects, enabling the financing and development of projects that would not have occurred otherwise. We also support projects that started five to seven years ago and that depend on cash flow from the sale of their green attributes to support the ongoing development of the green power market.
3. Finally, we are working with key stakeholders in the energy market to consider how to extend the opportunities to purchase green power to more companies. Many companies want to use green power but face often insurmountable hurdles. A combination of inadequate policy, antiquated market designs, and inequitable price subsidies are just a few of the barriers that limit the wider deployment of green power across the grid. We regularly talk to companies that want more green power supply but simply have not been able to navigate the complexities. This is still a nascent effort, but we are working on strategies that will help address some of the key barriers to broader market participation, which will also spur new energy projects.

Although we have a lot of progress yet to make, the following demonstrates some of the success that we have had in spurring the development of markets for green power.

Long-term contractual commitments

As discussed in the Reducing our cost to purchase energy section earlier in this paper, a major focus for Microsoft is to invest in long-term green power PPAs. These PPA investments directly support our carbon neutral commitment while also locking in future energy pricing. However, they also directly support the development and delivery of green power. The energy generated from the projects funded through PPAs is "additional," which means that our PPA purchases bring new green power onto the electric grid—helping displace conventional high-carbon energy and driving additional investment in green power.

When we look at our long-term green power investments, we emphasize projects that take advantage of technology for greater efficiencies—such as wind farms. One of the challenges facing the sector is the significant cost associated with starting up new projects. The long-term purchase commitment of a PPA helps make it possible for these companies to get the funding to initiate projects such as the Keechi Wind Project—they simply wouldn't happen without the kind of contractual agreement that we have made. However, PPAs require a substantial commitment and are simply not feasible for smaller investors or individuals. We see a need

within the industry to create more of a "liquid market," one that enables smaller consumers to come together and aggregate funding so that they can participate in these projects.

Short-term green power purchases

Each year we purchase green power through renewable projects—from the same markets in which we operate—to compensate for any residual emissions associated with our electricity consumption. After accounting for onsite and PPA green power, we purchase the equivalent amount of green power to match our electricity consumption (in MWh). The majority of these investments are made in the United States, which is also where we consume the most electricity, through renewable energy certificates (RECs). We invest in similar green power projects to compensate for our electricity consumption in other markets, such as Guarantees of Origin in Europe. These investments are essential to our achieving carbon neutrality. By making such substantial investments in green power, however, we are also helping drive development of the green power market, which will ultimately help make green power more widely accessible around the world.

We purchase five types of green power through short-term investments:

- Biomass
- Geothermal
- Hydro
- Landfill gas
- Wind

When we invest in green power, our selections are guided by both standards requirements and our own defined best practices. Under the new GHG Protocol Scope 2 guidelines, green power purchases must be made in the same market that the electricity emissions are generated in to obtain the carbon reduction. Based on the availability of green power projects in the regions in which Microsoft currently has facilities, we are able to purchase and therefore claim a reduction for 94 percent of our electricity-based emissions through green power investments.

Our best practices (see table) are additional guidelines that we follow over and above any requirements established by the GHG Protocol. We believe that these best practices are essential to the credibility of our carbon neutrality strategy while also helping us advance the quality of the world's green power market.

Green power investment best practices

Eligibility	
Certification	Green-e or as close as possible
Regulatory alignment	No regulatory double counting (i.e. must not be used to meet energy or carbon regulations)
Location (for US RECs)	Prioritizing those from regions with high greenhouse gas emissions

Vintage	Project installation online date of five years or newer
Additionality	Level of performance significantly better than the average of recently undertaken practices or activities in the geographic area

Green power investments, FY13–FY15

The following examples highlight some of the green power projects that we have invested in since we made our carbon neutrality commitment. We continue to expand our geographical reach as we match markets with our operations.[3]

[3] We work with third-party firms including Sterling Planet, Renewable Choice, and The CarbonNeutral Company to identify and purchase green power options that align with both standards requirements and our best practices.

- **Developing an independent, community-based wind energy project.** The PaTu Wind Farm in Oregon was the first wind energy project in the state developed without corporate support. Oregon set a mandate in 2007 that 25 percent of the state's energy come from renewable sources—a goal that this project directly supports. The Green-e Energy–certified project is a 9-megawatt farm with six 1.5-megawatt wind turbines. It produces approximately 30 million kWh of green power annually, or enough to power approximately 3,000 average US homes.

PaTu Wind Farm, Wasco, Oregon

- **Making inroads in a coal-dominated region.** The Hoosier Wind Project is helping break the mold of coal domination in a state that relies on coal to meet roughly 95 percent of its electricity needs. The Green-e Energy–certified project is a 106-megawatt project with fifty-three 2-megawatt wind turbines. It produces approximately 279 kWh of green power annually, or enough to power approximately 29,000 average US homes. The project saves an estimated 286,700 mtCO2e in emissions each year.

Hoosier Wind Project, Fowler, Indiana

- **Building the capacity to power an entire community solely from wind power.** The Loess Hills Wind Farm provides all of the power used by the local community of Rock Port, Missouri—the first community that is powered 100 percent by "homegrown" wind power—with additional energy to spare for nearby areas. The Green-e Energy–certified project is a 5-megawatt project with four 1.25-megawatt wind turbines. It produces approximately 16 million kWh of green power annually, or enough to power approximately 1,400 average US homes.

Loess Hills Wind Farm, Rock Port, Missouri

- **Taking advantage of Iowa's "wind belt."** The Whispering Willow Wind Farm takes advantage of the consistent windy conditions of the region. This Green-e Energy–certified wind farm is a 200-megawatt project with 121 wind turbines. It produces a massive 525 million kWh of green power annually, or enough to power approximately 33,000 average US homes. The project saves an estimated 370,000 mtCO2e in emissions each year.

Whispering Willow Wind Farm, Franklin County, Iowa

- **Tapping into geothermal energy in Iceland.** Microsoft has purchased green power from a geothermal facility installed in Iceland. This green power is in surplus of any regulatory requirements and provides Microsoft with 600 million kWh of green power, or enough to power approximately 37,000 average US homes. Hellisheiði Geothermal Plant, the largest geothermal power station in the world, is situated in the Hengill area in Southwest Iceland and provides electricity and hot water for space heating in the industrial and domestic sectors. Production capacity is 303 megawatts of electricity and 133 megawatts of thermal energy. Geothermal activity in the Hengill system is connected with three volcanic systems. The Hengill system is part of the wider Hengill region, which covers 112 square kilometers and is one of the most extensive geothermal areas in Iceland.

Hellisheiði Geothermal Plant, Hengill, Iceland

As we continue to evolve our approach to environmental sustainability, we see a significant opportunity to expand our impact beyond the operational boundaries of our organization. By supporting innovation that accelerates the development of new sustainable energy technologies, we will help the world achieve the rates of de-carbonization required to avoid the worst effects of climate change.

Offsetting carbon and building communities

Whereas we invest in green power to account for our electricity consumption, for emissions from air travel and diesel consumption and any electricity-based emissions that can't be mitigated through qualifying green power investments, we turn to community investments through carbon offset projects. By investing in these community projects, we can support emerging nations in accelerating sustainable development in a low-carbon economy. These projects represent a holistic approach to driving social, economic, and environmental progress in parallel. For example, projects that finance the planting and preservation of trees also support the creation of jobs, which in turn supports education and healthcare.

Here's how it works: A carbon offset is a credit for negating the impact of emitting a metric ton of carbon dioxide. The credit is received from financing a project that absorbs or avoids the release of carbon emissions elsewhere.

As with our green power investments, we make our project selections according to standards requirements, as this helps us ensure the maximum impact. Third-party, independent verification of the quality of the projects helps to ensure that they deliver the emissions reductions they claim. At a minimum, any carbon offset community projects that we invest in must be certified to one of the following standards:

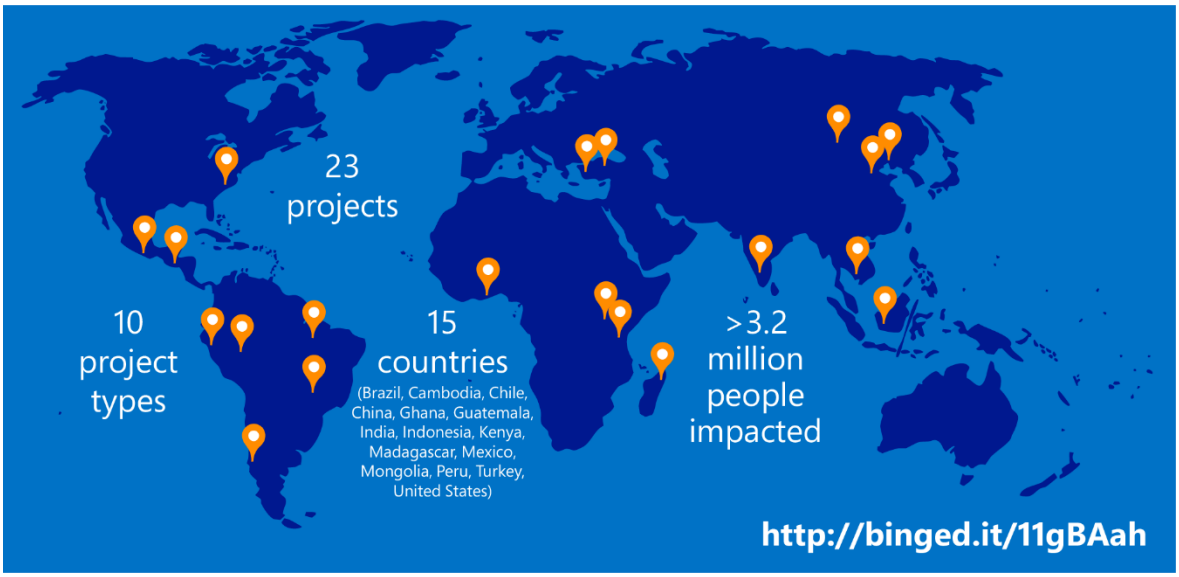
- Verified Carbon Standard
- Gold Standard
- Climate Action Reserve
- American Carbon Registry
- United Nations Clean Development Mechanism

We also use our own best practices (see table) to guide our investment decisions and help ensure the credibility and performance of our selections.

Carbon offset community investments: project selection best practices

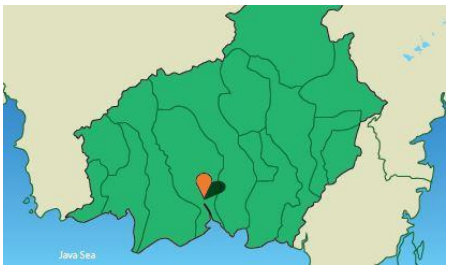
Established within the last two years
Based in less-developed countries
Incorporates technology (for example, cookstoves, forestry, water filtration, wind, solar)
Is community based and provides socioeconomic benefits
Operates on a large scale

Carbon offset community investments, FY13–FY15



The following sections highlight just a few of the projects that we have supported through our carbon offset community investments around the world.

Halting deforestation for palm oil plantations



The Rimba Raya REDD+ Biodiversity Reserve project, in Borneo, Indonesia, is dedicated to preserving approximately 47,000 hectares of carbon-dense tropical rainforest peat swamp at risk of deforestation to make room for palm oil plantations. Local community engagement is a key focus with the project, helping to improve food security, income opportunities, healthcare, and education while concentrating on biodiversity conservation (in particular, the Borneo Orangutan).

A recent development in the project has been the adoption of smartphone technology to help field personnel and local community members to document discoveries that they are making in the course of their work (such as illegal logging activities). Using Microsoft mobility technology, they can add geolocation tagging to their photos and link them to accompanying comments and data-mapping applications. The consumer-grade technology makes the process easy, affordable, and accessible for on-the-ground teams while enabling local community members to bring day-to-day issues to life for the outside world and other members of the community.

Planting trees to sequester carbon

The Meru & Nanyuki Community Reforestation project based in Kenya has a dual focus on sequestering carbon through tree planting while improving access to food and creating additional sources of revenue beyond subsistence farming for local communities. Through this project, local farmers receive annual payments for each tree they voluntarily plant on their property; as those trees grow and sequester carbon, the farmers will also collect additional carbon revenues.

The project's model is based on creating a structure for communities to learn from each other, share best practices, and make decisions that are appropriate for their particular circumstances. Improving food and financial security through conservation farming to increase crop yields and planting fruit and nut trees are particularly successful elements of the program. Farmers participating in these initiatives have seen significant increases in income as a result and report that the money is primarily spent on food, school fees, and educational materials.

The project takes advantage of technology to help assess the carbon value of the trees that are planted by the members. The team collects data on tree growth and monitors progress using a combination of battery-operated palm computers, phone-based Wi-Fi hotspots, Global Positioning System (GPS) receivers, and data and image Internet uploads.

Reducing fuel cost and respiratory and water-borne disease

The Guatemala Water Filtration & Cookstoves project makes affordable water filters and improved cookstoves available to households in Guatemala. The goal of the project is to both lower the cost of wood fuel and reduce the incidence of respiratory and water-borne disease, which have been identified as national priorities. The water filter removes 99 percent of pathogens, making the water safer for drinking and cooking, and the improved cookstoves reduce harmful indoor air pollution. Furthermore, by reducing the need to boil water and reducing the quantity of biomass fuel by an estimated 65 percent, households can realize significant savings on the purchase of fuel. In addition to the improvements to community health and well-being and environmental benefits of reducing deforestation for fuel use, the project aims to employ 800 people throughout the supply chain and empowers women by saving them time cooking and collecting wood.

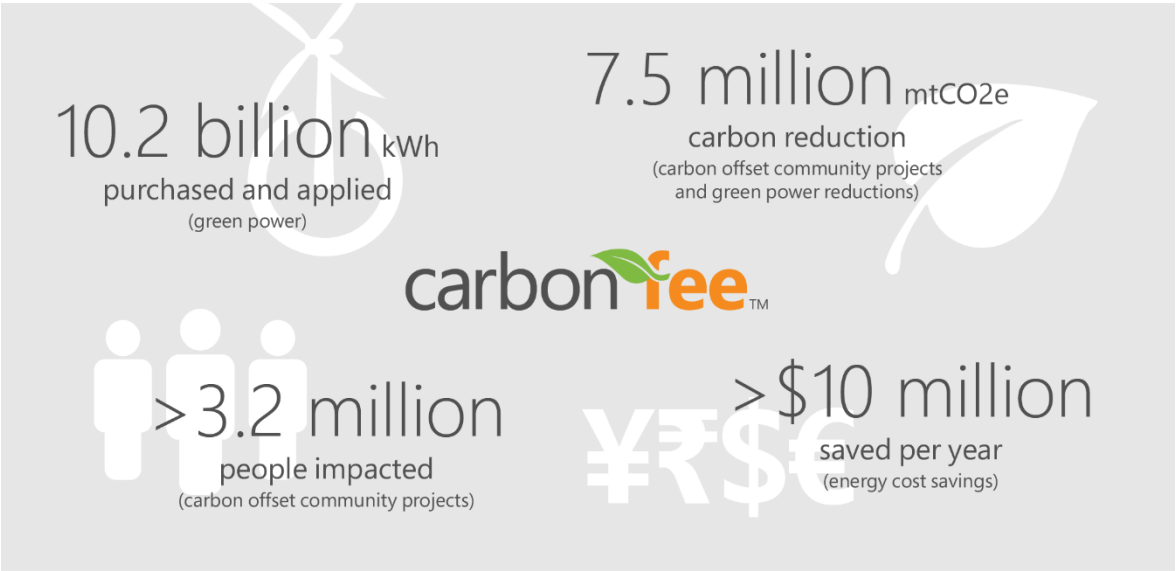
Reducing the need for heating fuel

The goal of the Mongolian Insulation and Efficient Stoves project is to help reduce heating fuel requirements and costs by an estimated 60 percent. The project focuses on helping those poorest households living in a "ger" (portable felt-covered dwellings) in Ulan Bator, the world's coldest capital. The project has set up a supply and distribution network for a five-layer ger insulation "blanket" and four types of fuel-efficient stoves. In addition to reducing heating fuel requirements by up to 60 percent, the project helps reduce indoor smoke by at least 80 percent and has a significant impact on the health and well-being of each family. The project supports local production in the supply, sale, and installation of the projects and has created 240 new jobs. It has already reached 167,000 households and is expected to double its impact in the next three years.

Conclusion:
looking ahead

Is our carbon fee a success? From where we stand, the answer is a resounding yes. It has helped our organization, from executive leadership to the operational teams, become accountable for our carbon footprint. It is helping us make a difference internally in reducing the environmental impact across our global operations. It is also enabling us to support low-carbon projects to help mitigate the impact of climate change and create new opportunities for people around the world. Looking ahead, we will continue to refine and grow the carbon fee model to help us maximize its impact, both within our business and in our broader contribution to our planet.

Microsoft carbon fee impact, FY13–FY15

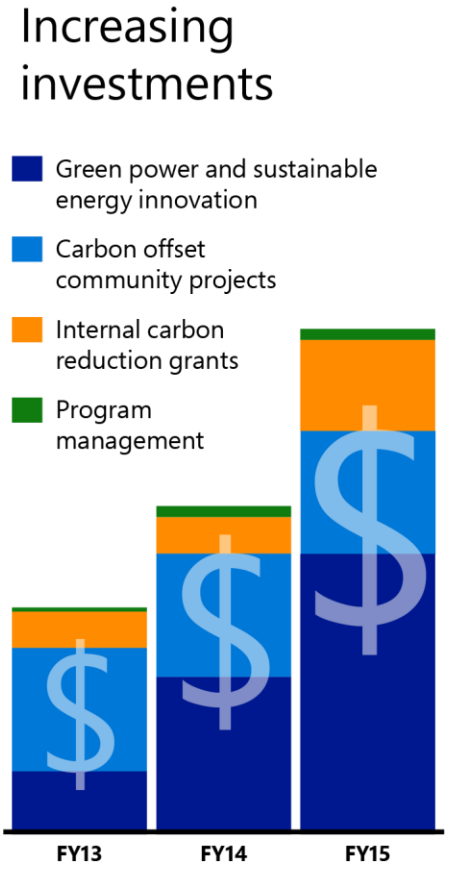


Uplift from a virtuous cycle

Driving accountability and making an impact internally and externally were the benefits we aspired to, but they are not the only or the most surprising outcomes of our carbon fee. What we are seeing today is how the fee is generating a virtuous cycle of investment and action. The price signal delivered by the fee provides the incentive for business groups across our company to drive efficiencies and reduce resource consumption, while the fee itself generates the funds to support environmental sustainability initiatives. In doing so, the carbon fee is raising awareness of, helping the company think proactively about, and generating excitement in the potential for greater efficiencies and innovation. This is driving demand for more funding to

explore those opportunities—funding that often needs to come from outside the typical financial planning cycle, which in turn increases the price on carbon!

We see tremendous opportunity to increase the size of the carbon fee investment fund and the potential of the program. Where there is demand for greater investment, we simply increase the carbon price. In effect, those paying the carbon fee are seeing the value in the program and supporting funding for new projects and opportunities.



Delivering customer value through environmental responsibility

The environmental performance of suppliers is becoming an increasingly important consideration for many organizations, and our customers are no exception. Our commitment to carbon neutrality and the choices that we make with the carbon fee investment fund offer value to our customers as well.

As our customers look to grow their businesses, Microsoft is a carbon neutral business partner that can help them grow sustainably. Sourcing computing power from a carbon neutral cloud services provider can be an effective alternative to expanding private datacenter capacity (and the associated expanded carbon footprint). Microsoft is carbon neutral and purchases green power equivalent to 100 percent of our total electricity consumption (covering datacenters, software development labs, and offices). Furthermore, through the investments that we fund through the carbon fee, our customers are indirectly helping enhance our operational energy performance and supporting jobs, education, and healthcare in developing nations.

We are committed to sharing best practices based on our own experiences to help our customers grow sustainably. For example, we:

- Offer information on how we have used technology and tapped into big data to create a smart campus and achieve energy savings and other efficiency gains.
- Deliver smart building solutions through our partners that build on our experience in implementing our smart campus. Through Microsoft's CityNext initiative, we bring cloud, big data, mobile, and social technologies together to empower cities to put people first—

whether by optimizing energy and water use or increasing resource productivity across large value chains.

- Provide guidance on best practices for datacenter sustainability and publish details on sustainability measures in our own datacenters.
- Share step-by-step guidance of how other organizations can adapt our carbon fee model for their own use.

"An increasing percentage of the world's population is moving to cities, and nearly 80 percent of the world's energy is consumed in and for cities. Our commitment to carbon neutrality has helped expand our thinking on how IT will be increasingly used to help cities around the world to better manage not only energy, but all of their resources."

– Rob Bernard, General Manager, Cities and Sustainability, Microsoft

Accelerating innovation and the role of technology

As we look to the future and the best way to direct our carbon fee investment fund, our focus is on projects that will accelerate innovation. From developing new ideas internally—with the aim of piloting and proving their value before sharing them more broadly—to investing funds in support of external projects and research, we hope to help the world transition to a low-carbon future while we address our own carbon footprint. We believe that technology will play a pivotal role in the transition to a low-carbon economy, and it is a primary focus for our investments.

Looking at our work with datacenters, the impact of the carbon fee is clear. By driving awareness across our organization, the fee has made carbon a consideration at every point along the way—from design to procurement to operation. When we investigate new technologies to generate power within our datacenters, we also look at how we can integrate those investments with the grid. We partner with other companies—such as up-and-coming fuel cell startups—to develop new, more efficient technologies and get those technologies to proliferate as quickly as possible.

"The carbon fee gives us insight into our own operations while opening up the opportunity to think bigger: How can we drive efficiencies across the entire electrical grid? How can we influence the way utilities think about the future of energy? How can we support other companies in participating in the transition to green energy? As we introduce new technologies and come up with more efficient ways to operate our own environment, we hope to share our learnings and innovations for global impact."

–Brian Janous, Director of Energy Strategy, Microsoft

In 5 or 10 years, Microsoft's energy future will look a lot different to today. We'll have new technologies physically integrated into the datacenters—like fuel

cells, micro turbines, and other efficient ways of siting onsite power. For example, as described earlier, we're already seeing the potential to reduce by half the energy consumption of datacenters by integrating fuel cells with server racks. If we can bring to market a successful design, this will have the potential to transform datacenter power generation for companies around the world.

For the energy sector as a whole, technology is fundamental to progress. The sector today is limited by inefficient information sharing—poor integration means it is challenging to get the right data to the right people at the right time to enable optimal investments for efficiency. Modern cloud-based systems present new ways of operating that have the potential to dramatically improve integration, enabling much greater efficiency than was previously possible with traditional IT systems.

And finally, the role of technology isn't specific to the energy sector or green power innovation. Technology likewise plays an important role in the carbon offset community projects that we support through our carbon fee investment fund. For developing nations, Internet technology will help transform education and healthcare, while mobile devices (tablets and mobile phones) can help small communities easily disseminate and share information. By increasing access to technology, developing the technological skills of community members, and supporting technology innovation, these projects will not only reduce carbon emissions but also help drive economic growth and new opportunities for these communities. Our Microsoft Research organization provides input to help identify opportunities to support ecosystem diversity through technology; for example, see a recent article published by members of the team entitled "Building robust conversation plans."

A call for action

We're committed to continuing our carbon reduction investments and supporting projects around the world that tackle the very real problem of climate change. However, we also know that our efforts are a small drop in the bucket of possibility. Perhaps the greatest impact that we can achieve will be if we can inspire other organizations—from private enterprises and public sector organizations to startups, NGOs, and educational institutions—to make their own commitments to minimize their carbon impact and support the transition to a low-carbon economy.

- Have you evaluated the potential risks to your business from climate change? Do you have a plan to respond to these risks?
- Have you measured the impact of your organization's energy consumption, travel, water usage, and waste and set targets to reduce that impact?
- What is the carbon footprint of your supply chain? Have you considered implementing standards to minimize its impact?
- Have you investigated or committed to purchasing green power for your organization, to both minimize your own impact and help build the market for renewable energy?

- How are your organizational activities having an impact on communities around the world?
- Have you considered an internal carbon fee to help drive education, awareness, and culture change to support your carbon reduction targets?
- Are you taking advantage of technology to reduce the environmental impact of your organizational processes and activities?
- Have you considered an internal carbon fee to help drive education, awareness, and culture change to support your carbon reduction targets?
- Are you taking advantage of technology to reduce the environmental impact of your organizational processes and activities?

Appendix:
green power, carbon offset, and consulting resources

Altenex

http://altenex.com

Chris Hayes, Managing Partner (chris.hayes@altenex.com, Tel: 617-517-3209)

- Altenex is an energy management network that helps companies source clean energy for their power portfolios. It helps Microsoft identify and evaluate cost-effective clean energy projects.

Murdoch Services

Ken Machtley, Managing Consultant (ken.machtley@murdochservices.com, Tel: 206-853-3856)

- Murdoch Services helped Microsoft develop the carbon neutral policy and carbon fee model and supports the Microsoft environmental sustainability team by co-authoring white papers and coordinating the Microsoft climate change, water, and supply chain responses for CDP.

Renewable Choice

http://www.renewablechoice.com/business-sustainability-climate-service-provider-consultants.html

Jay Pawlak, Business Development Director (jpawlak@renewablechoice.com, Tel: 303-551-7599)

- Renewable Choice offers renewable energy, carbon offset, and education and outreach services. Its subsidiary, Mosaic Labs, offers services in areas of carbon accounting and disclosure, supply chain sustainability assessments, and scorecard programs. Renewable Choice collaborates with businesses of all shapes and sizes around the globe from small and mid-sized companies to leading Fortune 500 organizations.

Sterling Planet

http://www.sterlingplanet.com

Robert A. Maddox, Chief Sustainability Officer (bmaddox@sterlingplanet.com, Tel: 203-266-7973)

- Sterling Planet is the largest provider of renewable energy certificates (RECs) and carbon offsets to Fortune 500 firms. Founded in 2000, Sterling Planet has a network of projects that allows it to provide customized solutions to meet any need.

The CarbonNeutral Company

http://www.carbonneutral.com

Mark LaCroix, Executive Vice President, Americas (Mark.LaCroix@carbonneutral.com, Tel: 616-682-4881)

- From renewable energy, to carbon emissions measurement and offsetting, to water stewardship, building supply chain resilience, and protecting biodiversity, The CarbonNeutral Company delivers solutions to their clients' wide-ranging environmental requirements. The company works with Microsoft on its purchase of carbon credits to support sustainable development projects and renewable energy instruments such as Guarantees of Origin in key markets.

WSP

http://www.wspgroup.com/sustain

Dan Sobrinski, Practice Leader, WSP Sustainability and Energy (dan.sobrinski@wspgroup.com, Tel: 610-573-0662)

- WSP provides multidisciplinary expertise that helps its clients navigate a complex sustainability and energy landscape. It focuses on unlocking opportunities to reduce cost, create brand value, and mitigate risk across the value chain. WSP's breadth of technical expertise in sustainability strategy, greenhouse gas (GHG) and resource management, sustainable energy, sustainable products and supply chain, and climate preparedness supports client needs across sectors and geographies. WSP's innovative carbon management initiatives have helped Microsoft design, implement, and execute all aspects of its carbon fee program.

About the author

As Senior Director of Environmental Sustainability at Microsoft, TJ DiCaprio is the chief architect responsible for designing and managing Microsoft's internal carbon fee. Her efforts drive accountability while supporting innovation in efficiency, green power, and low-carbon economic development in emerging nations.

Recently TJ received the 2014 C.K. Prahalad award for Global Business Sustainability Leadership. In 2013, TJ was recognized by the US Congress through the Individual Leadership award from the US Environmental Protection Agency (EPA) and was listed in the Top 35 Women Leaders in Sustainability by Triple Pundit and the Guardian's Unlikely Climate Heroes. She was also invited to speak at the White House Women and Environment Summit.

TJ has worked for Microsoft for 15 years and has 25 years of experience in designing innovative global business models for corporations such as Intel and Merrill Lynch. She brings an education background in environmental studies and energy from the University of California at Santa Barbara (UCSB), where she regularly returns as a guest lecturer. She also holds an MBA in Sustainable Business and Government Policy Administration from Marylhurst University.

On a personal note, TJ is a certified pilot and enjoys sailing. She has led several expeditions piloting aircraft across the Americas and Africa and sailed extensively off the coasts of Croatia, Polynesia, North America, and Turkey. TJ is a member of the Steering Committee for the Environmental Studies Department at UCSB, a keystone founding member of the Santa Barbara Maritime Museum, and an active member of the Explorers Club—through which she recently participated in a flag expedition to digitize pre-historic petroglyphs in the Marquesas archipelago.

To provide feedback or comments on this paper or share your own experiences with voluntary organizational carbon fees, please contact TJ at tjdicap@microsoft.com and follow her on Twitter @TJDiCaprio.