

Sustainable Devices and Packaging

Fiscal Year 2017

Microsoft Devices



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Sustainable Devices and Packaging

Fiscal Year (FY) 2017

In Microsoft Devices, sustainability is integral to our mission to build products that create and complete magical experiences and empower every person and organization to achieve more. From product design and new product introduction through sourcing, manufacturing, responsible delivery, and product end of life, Devices' approach to sustainability furthers our Microsoft mission of empowerment.

To anchor these efforts, we embed sustainability requirements directly into the roles, responsibilities, and business practices of the Devices organization and partners. We ensure our teams and suppliers meet our requirements through active engagement including training, systematic implementation and improvement, and ongoing monitoring of the progress made to address potential impacts. Further, we partner with non-governmental organizations (NGOs) and industry associations to address broader sustainability challenges facing the electronics and other industry sectors.

1 Guiding Principles and Frameworks

Our devices and packaging sustainability efforts are shaped and guided by the objective recommendations and standards published by leading international organizations and experts.

- Microsoft Environmental Principles: We protect natural resources by increasing energy efficiency, using recycled materials and supplies, and participating in recycling programs for electronic products after they have served their useful life.
- Microsoft Global Human Rights Statement: This document is consistent with the United Nations (UN) Guiding Principles on Business and Human Rights (UNGPs) and guides our Supplier Social and Environmental Accountability programs.
- Microsoft Responsible Sourcing of Raw Materials policy: Developed in FY14, this policy formalizes our values and approach to responsible upstream sourcing at the far reaches of our supply chain.

We continuously improve the environmental credentials of our devices and packaging with programs to:

- Improve device energy efficiency
- Use renewable materials and smart packaging

- Increase the sustainability of our supply chain to its furthest reaches including Human Rights and responsible sourcing
- Engage in effective end-of-life practices that put energy and valuable materials back into circulation

While these principles are foundational to our products' sustainability, we have increased our expectations of hardware and packaging supply chain partners. Beyond meeting legal requirements applicable to our products, we require compliance with a more extensive set of requirements for living conditions, safe working practices, and environmental protection, which strengthens our supply chain, improves the lives of workers, and enhances their communities.

By integrating sound environmental practices into all aspects of our business, Microsoft provides products that empower persons and organizations to achieve more while promoting our natural world. You can download and review our legal and sustainable [hardware specifications](#).

1.1 [Global Reporting Initiative](#)

Microsoft follows the Global Reporting Initiative's (GRI) G4 Sustainability Reporting Guidelines for empowering sustainable strategies. The GRI guidelines provide a set of internationally recognized indicators covering social, economic, and environmental impact. This standardized reporting framework originated from a collaboration of experts representing stakeholders from business, labor, investors, NGOs, accountancy, academia, and other groups. Devices measures its operations against the applicable GRI indicators.

1.2 [Management System for Environmental Sustainability](#)

ISO 14001 is an internationally recognized framework that establishes a process for entities to manage and continuously improve their environmental performance. Our operating model for sustainability follows the ISO 14001 standard and management system approach, including ISO 14001 standard's requirement for continual improvement. Device's environmental management system (EMS) is certified, and we require a certified EMS of contract manufacturers and suppliers of critical components.

Here are our F17 EMS objectives, targets and results:

FY17	Objectives	Targets	FY17 Results
Energy consumption	Reduce CO ₂ emissions	<ul style="list-style-type: none"> Analyze and educate on CO₂ emissions generated by air travel. 	Completed
		<ul style="list-style-type: none"> Collect CO₂ emissions data from in-house factories, Tier 1 and 1.5 suppliers for FY16 and 17. 	Completed using CDP for our collection tool
		<ul style="list-style-type: none"> Reduce Surface Hub manufacturing CO₂ emissions/unit by 2 percent from FY16. 	Achieved: reduced by 56 percent
		<ul style="list-style-type: none"> Obtain ENERGY STAR certification for all Surface devices. 	Achieved in June 2017
Device procurement and design	Minimize environmental impacts of devices	<ul style="list-style-type: none"> Maintain Microsoft (non-mobile) global consumer e-waste recycling volume to CY15 levels. 	Achieved: CY16 growth YoY 18.39 percent; CY15 growth YoY 7.58 percent
		<ul style="list-style-type: none"> Embed third-party audit of recyclers into the onboarding and sustaining process of e-waste/battery recyclers to ensure Microsoft's recyclers are in compliance with applicable regulations, certifications, and Microsoft's policy (Environmental Requirements for Proper Disposal). 	Completed
Packaging design	2020 plan to minimize environmental impact of product packaging	<ul style="list-style-type: none"> Increase overall product-to-package size ratio from 29 percent to more than 50 percent. 5 percent average YOY individual programs improvement in product-to-package size ratio. 	For package size, as a ratio of product to package dimensions, size on average increased by 7 percent. An increased level of product protection for distribution was engineered into primary device programs to reduce the potential of damaged products or packaging to our customers and prevent waste in terms of materials and energy within the supply chain.
		<ul style="list-style-type: none"> Reduce overall package weight by more than 10 percent. 	Achieved: reduced by 35%
		<ul style="list-style-type: none"> Increase recycled paper content from 70 percent to more than 90 percent. 	63% recycled paper content
		<ul style="list-style-type: none"> Achieve a minimum of 25 percent recycled content for all plastics and/or 20 percent of plastics to be bio-based alternatives. Ten percent average YOY individual programs increase in recycled content. 	6% - no change YoY
		<ul style="list-style-type: none"> Eliminate elemental chlorine in paper bleaching process. 	Achieved. All bleached paper material for applicable programs are under ECF (elemental chlorine-free process) claimed by supplier.
Waste	Minimize waste from direct operations	<ul style="list-style-type: none"> Increase employee education regarding proper recycling throughout the year by conducting at least two awareness campaigns across all sites. 	Completed
		<ul style="list-style-type: none"> Reduce waste from Devices and MOPR direct operations by 2 percent from FY16 results by the end of FY17. 	Achieved

1.3 The United Nations Sustainable Development Goals (SDGs) and indicators

Our commitment to sustainability is in line with current global aspirations and initiatives. The 2016 Sustainable Development Goals (SDGs)—accepted by the UN General Assembly (193 nations)—call for several bold breakthroughs by the year 2030 across 17 goals aimed at improving people’s quality of life, protecting the environment, and fostering equitable growth. To implement the 2030 agenda for sustainable development, a robust follow-up and review mechanism was developed and submitted for adoption by the United Nations Statistical Commission at its 48th session in March 2017. This framework is known as the “SDG indicators.”

Our industry has an essential role in enabling achievement of the SDGs.

As digital solutions are indispensable to achieve all 17 SDGs and more than half of the 232 SDG indicators, Devices has a key role in ensuring we deliver computing solutions that enable this transformation sustainably. Through Devices’ membership in the Global e-Sustainability Initiative (GeSI), Microsoft sponsored the 2016 report, [System Transformation: How Digital Solutions Will Drive Progress towards the Sustainable Development Goals](#).



Digital solutions can:

Improve people’s quality of life	Digital solutions provide better access to education for 450 million people.
Foster equitable growth	Digital solutions unlock \$9 trillion in economic benefits globally.
Protect the environment	Digital solutions enable a 20 percent cut in global CO2 emissions.

(GeSI, 2016)

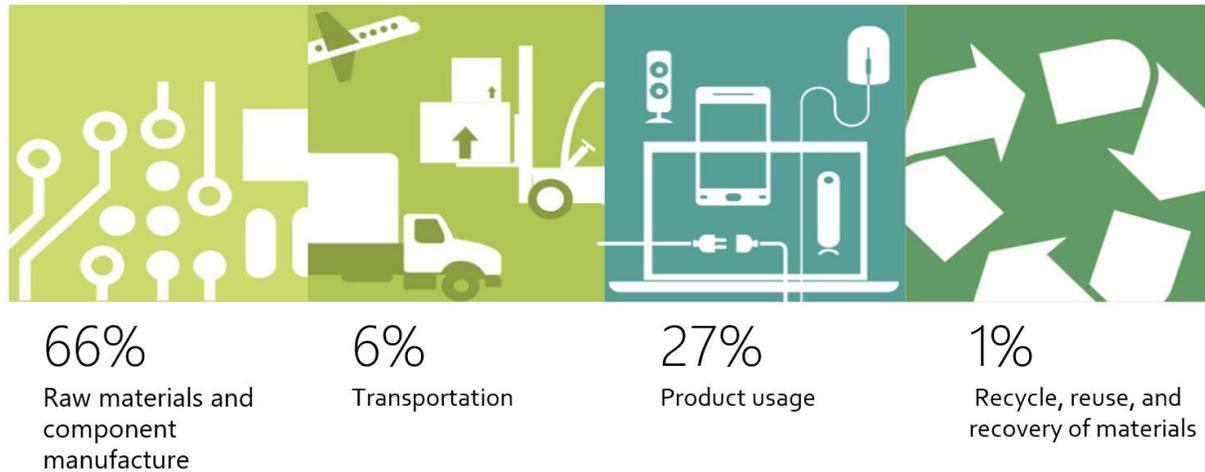
2 Sustainability in devices design

Our sustainability implementation framework is based on the product life cycle and value stream. These set the basis for the product sourcing and design and help us continuously improve the environmental aspects of our products and processes through product end of life.

2.1 Life Cycle Thinking

What gets measured, gets managed. We apply life cycle assessment (LCA) methodology for calculating the environmental impact of our devices and activities through use of GaBi digital technology—a software tool that runs exclusively on the Windows platform. The main goal of the LCA calculation is to understand the relative environmental impacts of product characteristics. Our calculations include the entire product life cycle, from raw material acquisition to product recycling and disposal. The LCA results can be used internally to help identify the key stages in the device life cycle, such as where the largest sources of emissions and energy use occur, and where we should act to minimize these impacts.

Greenhouse gas emissions across the life cycle of Surface Pro 4



2.2 Design for Green

Microsoft balances functionality with environmental criteria as part of a Design for Green initiative. Working with technical experts, design groups evaluate and encourage energy efficiency, design for recyclability, materials selection, post-consumer materials content, size and weight reduction, and power or battery type.

Since FY15, Microsoft has certified all eligible consumer device lines with [ENERGY STAR](#) and [EPEAT](#) eco-certifications where applicable. These evolving standards guide improvements in our sustainability performance and related efficiencies over time. In FY17, we achieved the highest EPEAT Gold rating for our Surface Pro 4 device. EPEAT Gold-rated products must meet all required criteria and at least 75 percent of the optional criteria. Also in FY17, three new products were added to the registry at the second highest Silver rating: Surface Studio, Surface Pro 5, and Surface Laptop. We are now seeking to up-level eligible devices to the Gold rating.



In pursuit of greater transparency in communications with our customers and other stakeholders, we publish environmental data for our consumer device lines including the Xbox console and Surface line of products in our Ecoprofiles. The Ecoprofiles provide information about the materials, energy efficiency, packaging, environmental impact, and recycling of our products. For a more detailed view, see our [Ecoprofiles](#).

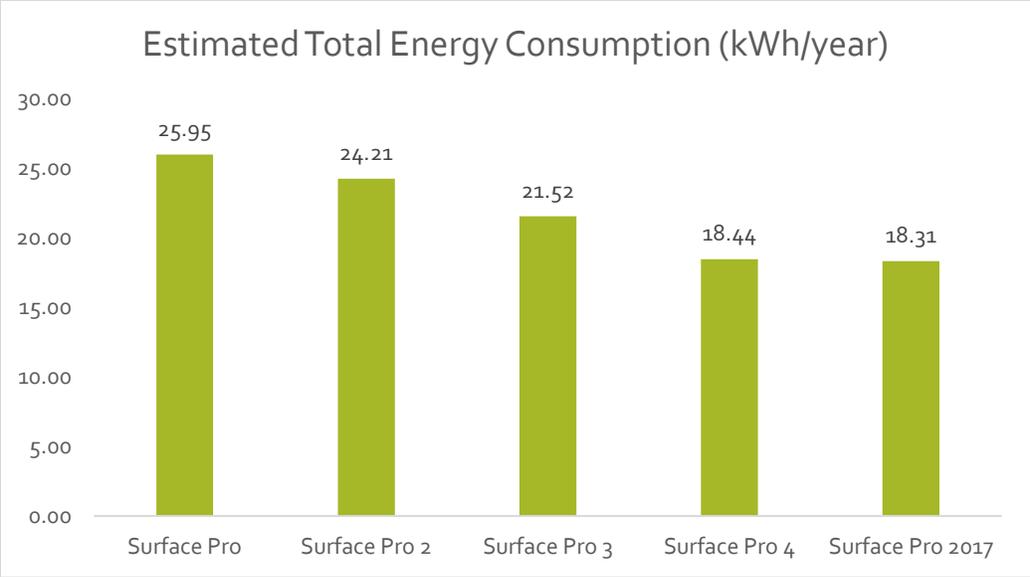
2.3 Energy performance of Devices

Microsoft is committed to reducing the impact of the energy used by our products. Energy efficiency is important at all life cycle stages, and our design teams have made substantial progress in the design phase.

Surface Pro energy savings

Microsoft Surface 4—ENERGY STAR and EPEAT Gold certified—demonstrates that a powerful, full-function computer can operate using no more energy than less functional tablets on the market.

Progressive energy data for the Surface Pro line of computers shows the headway Devices is making with respect to lowering energy consumption. The following chart provides the estimated total energy consumption (ETEC) using Commission Regulation (EU) No. 617/2013 method.

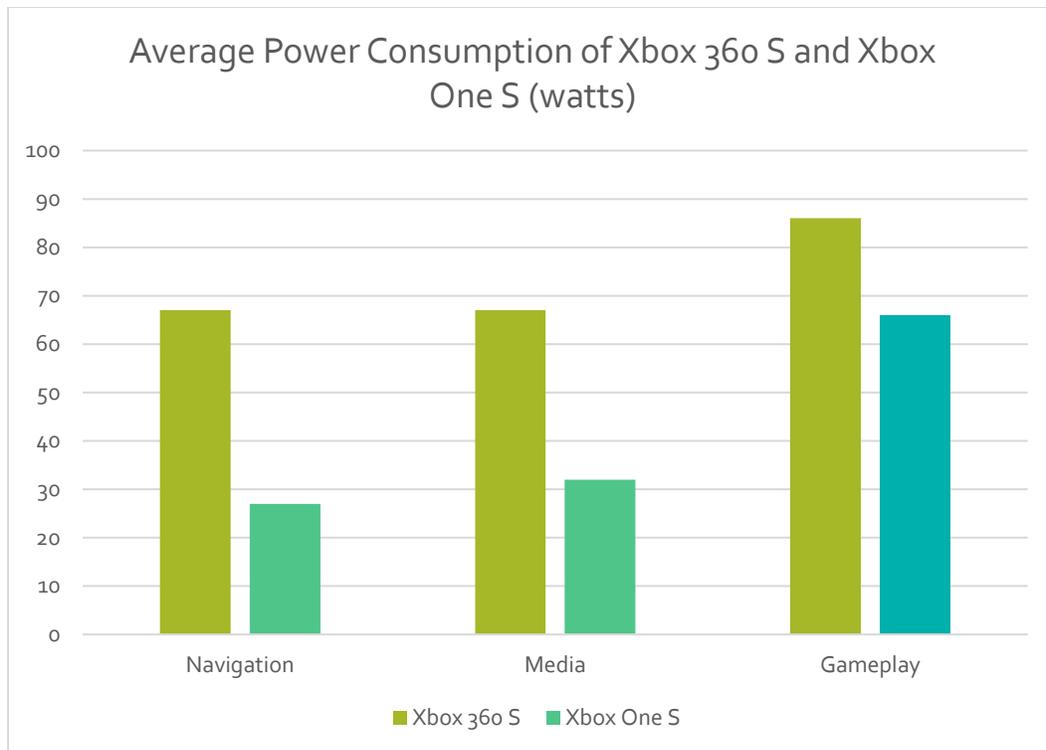


The latest Surface Pro uses less energy than the Surface Pro 4 even though the newer version has a faster CPU and display with accelerated inking.

[Xbox energy savings](#)

The Xbox product engineers similarly have improved the Xbox product line to maintain or even increase computing power while conserving the energy needed to provide a magical gaming experience. By 2010, the typical energy consumption for an Xbox 360 S console had been reduced from 148 kilowatt-hours per year at launch to 99.

The design of Xbox One, launched in 2013, continues the commitment to increase energy efficiency. Although Xbox One provides eight to ten times the processing power of Xbox 360, typical energy consumption went from 99 kilowatt-hours per year to 52 in energy-saving mode. Further improvements brought this number down to 46 kilowatt-hours per year in energy-saving mode for Xbox One S—less than one third the energy required to power the Xbox 360 when launched in 2005 as seen in the chart below.



Microsoft, working with other game console manufacturers, entered a voluntary agreement in 2015 with the EU Commission to improve game console efficiency throughout the industry. The agreement set aggressive but achievable limits for power used in various modes, along with circular economy provisions. This voluntary agreement is estimated to deliver collective energy savings in the EU of 1 TWh per year by 2020. This corresponds to the annual electricity consumption for more than 250,000 households. Our current Xbox consoles fully comply with the requirements in the agreement.

With significant reductions in product energy usage, we are increasing our focus on energy efficiency during the product manufacturing phase.

2.4 Restricting the use of harmful substances

We aim to be fully aware of all the substances in our products – not just those that raise concerns. Although our [restricted substances specification](#) tells you, which materials are NOT in our products, we take disclosure a step further and require our suppliers to provide full material declarations for each component of our products prior to launch. Full materials disclosure means we can respond swiftly if new concerns arise about any substance we use and conduct thorough evaluations to ensure our devices are safe.

Our approach to substance management

We view meeting health and environmental regulatory requirements as a minimum baseline. Our approach to restricting substances from our products is science-based and shaped by the precautionary principle. When we have reasonable grounds for concern regarding possible damage to human health or the environment, a lack of full scientific evidence is not an obstacle to action. We restrict certain substances in excess of regulatory requirements when appropriate, based on this principle. We also work with third-party toxicologists in the design phase to ensure that our restricted substances specifications reflect current and up-to-date thinking.

Phasing out substances of concern

We proactively evaluate substances and phase out substances from the entire product range when feasible and environmentally preferable alternative materials are available. Our product specification regarding [restricted substances](#) is publicly available and describes the approach to substances of concern. Each time we introduce a new restricted substance, we are able to quickly identify the components containing the substance along with the related suppliers by simply searching our database of declarations.

Both external and internal stakeholders are trained to understand and implement these changes. By working together with the supply chain as well as other key stakeholders, we ensure that best practices are adopted, promoted, and thus can make a wider impact across our industry sector. This approach to substance management is also actively communicated to policy makers, regulators, NGOs and other interested parties.

Lead, mercury, cadmium

We phased these substances out from our products in compliance with the European Union's Restriction on the Use of Hazardous Substances Directive (RoHS) Directive in EU, but also went even further with stricter Microsoft requirements for cadmium.

Halogenated flame retardants

We have restricted and limited many halogenated flame retardants as specified in [restricted substances specification](#). We not only meet legal requirements, but we have voluntarily phased out many halogenated flame retardants in certain applications.

Nickel

All our devices comply with strict global safety and quality standards. Some metal alloys used on product surfaces such as stainless steel do contain nickel, but standardized testing

has shown that these do not cause nickel sensitivity in the general population. We use nickel at levels well within current legal and safety limits. We offer a wide range of devices without stainless steel on their surfaces as well.

Phthalates

Use of certain phthalates in our products has been restricted since 2005. We now restrict the use of a broad set of phthalates in all our equipment, including those referenced in EU RoHS, EU Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH) and the chemical warning and disclosure law, California Proposition 65.

2.5 Ozone-depleting chemicals

The ozone layer of the atmosphere prevents harmful ultraviolet radiation from reaching the earth's surface. Most nations adopted the Montreal Protocol in 1987 and agreed to phase out the production and use of ozone-depleting chemicals (chlorofluorocarbons). Devices restricts the use and release of ozone-depleting chemicals (ODCs) in the production of our devices and packaging in both owned and supplier facilities. Our supplier specifications ban the use of ODCs in the manufacture of our products and packaging. We also require annual supplier declarations of conformity from Tier 1 suppliers of taxable imported products and high-risk Tier 2 suppliers. In addition, we implement independent auditing of suppliers with operations that may use ODCs to verify their compliance.

2.6 Recycled Content

We have clear requirements and processes for the use of recycled metals and plastics, which aim to increase the ratio of recycled content in our packaging and products. Recycled content is provided in the product Ecoprofile. Through extensive research and development, testing and concepting, we ensure that all our devices – regardless of the materials used – meet exacting standards of quality, reliability and longevity.

2.7 Verification

We voluntarily submit our products for independent, third-party testing during the development and manufacturing processes to verify supplier declarations related to restricted substances with an elevated risk of being present. This testing program continues through the product life cycle. As an additional precaution, third-party auditors monitor suppliers for proper implementation of controls to maintain compliance with Microsoft's restricted substances specification during the device manufacturing phase.

3 Designing for Sustainable Packaging

Our packaging environmental footprint continues to decrease through a science-based approach and collaboration with our supply chain and industry partners. Integrating sustainability into our packaging designs and measuring results is a business priority consistent with developing premium customer experiences. Opportunities for sustainability in packaging include using less packaging, optimizing manufacturing processes, using the right materials for the environment, and sharing our measures, progress, and knowledge. Integrated with that strategy is the development of “2020 goals” into Microsoft business operations. Packaging sustainability creates business value, drives innovation in the materials used, and supports an efficient and sustainable supply of raw materials.

3.1 Our packaging strategy

We deliver on our strategy by aligning our goals across three key areas of contribution that support sustainable management:

Financial	Design sustainable packaging that optimizes the supply chain, is cost viable, is compliant with regulatory requirements, and increases our corporate value.
Environmental	Commit to our customers that our design and engineering delivers packaging materials that achieve measurable sustainability gains. Optimize, through data analysis, the use of renewable and/or recoverable materials plus process efficiencies.
Social	Assume global responsibility for packaging to mitigate risks for the human community. Create a positive impact on brand and contribute to business value through internal and external partnerships.

3.2 Global packaging 2020 goals

In 2016, Microsoft Global Packaging developed 2020 goals across six key indicators of packaging’s environmental impact. Our packaging program’s goals and metrics continue to encourage right-sized packaging, increased use of recyclable content, and a reduction in the amount of packaging materials.



We track targets for materials that include increased recycled content, light-weighting and size reduction of designs, reduction of green-house gases and fossil fuels use, and ease of recycling. Our development of 2020 goals and aligning sustainability measures integrates sustainability deeper into development process.

3.3 Measuring our packaging sustainability

When measuring the sustainability of our packaging designs, earlier is better. As part of early design concept reviews, we measure and compare weight, size, and recyclability of each different concept. Bringing sustainability to the forefront of development engages stakeholders where they can make the most difference and provides a sustainability perspective in helping to shape business decisions.

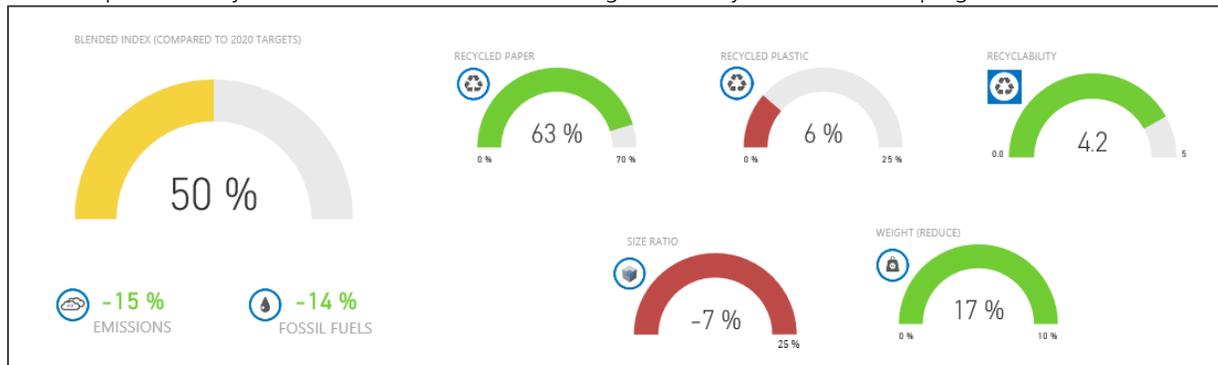


Where multiple alternative concepts are evaluated, we use three key measures to compare the designs before selection. Using package weight, size, and materials recyclability scoring, we assess the relative environmental impacts of design concepts using data and

visual scorecard representations. We also compare these environmental scorecards against earlier design versions as benchmarks.

As our packaging becomes standardized, comprehensive scorecards of our product lines allow comparison of design platforms and identification of focus areas for improvement. We measure both relative to actual value and distance to achieving our goals.

FY17 comprehensive system-level scorecard and our 2020 goals—newly introduced FY17 programs



3.4 Packaging sustainability highlights in FY17 for all programs

Year over year, we are making strong headway regarding our packaging.

	Sixty-one percent of packaging is from recycled materials.	In FY17, the recycled content of all paper types, by volume, was 64 percent. For plastics, which include both flexible films and rigid forms, the overall recycled content by volume was 6 percent. However, our rigid plastics, which are more readily recycled, contain an average of 30 percent recycled content.
	Recyclability of packaging remained flat in FY17 at 84 percent of maximum score (4.2 on a scale of 1 to 5).	Recyclability is based on an evaluation of different materials used in the package and average global recycling availability of those materials. The ease of recyclability of our package design and materials is important to evaluate end-to-end environmental impact and support a circular economy. In FY17, overall package designs maintained consistency of recyclability with the prior year while we work toward a 20 percent improvement by 2020.
	Packaging weight is lighter by 17 percent.	Size and weight of packaging is included as a measure across all programs. On average, package weight was reduced by 17 percent through a combination of right-sizing packaging to the product and introducing new lightweight materials. These new materials were engineered to reduce total package weight while optimizing the performance of the design.
	Volume of packaging materials is reduced by 27 percent while package size increased by 7 percent.	Represented as weight of packaging materials, there was a reduction in overall volume of paper and plastic packaging materials for FY17 programs. For package size, as a ratio of product to package dimensions, size on average increased by 7 percent. An increased level of product protection for distribution was engineered into primary device programs to reduce the potential of damaged products or packaging to our customers and prevent waste in terms of materials and energy within the supply chain.
	Greenhouse gas emissions are 15 percent less.	Based on life cycle assessment (LCA), FY17 program designs presented an end-to-end reduction of greenhouse gases when considering materials type, manufacturing processes, and recyclability used in determining environmental impact.
	Fossil fuels usage is down 14 percent.	Life cycle assessments (LCAs) also showed that materials and processes used for FY17 programs represented a reduction in fossil fuel usage in terms of materials type and energy consumption.

3.5 Australian Packaging Covenant

The packaging development process is based on our commitment to the Australian Packaging Covenant (APC), which Microsoft voluntarily signed in March 2009. As one of the original signatory members, we agreed to reduce the environmental impact of consumer packaging by encouraging improvements in packaging design, higher recycling rates, and better packaging stewardship.

Every year, we report our packaging sustainability improvements against an action plan to reach our goals. In 2016, we met and exceeded a number of key performance indicators (KPIs) under the APC Action Plan. Microsoft goals and KPIs are shown in the following table. [Download the most recent official APC report.](#)

Highlights from FY17 include:

- Updated our sustainability strategy, which incorporates expanded metrics and goals for 2020, allowing evaluation of packaging based on a broad range of metrics.
- Added environmental design scoring at concept reviews with stakeholders and leadership, enabling earlier environmental impact evaluations.
- Developed a standardized supplier strategy and an R&D function within packaging for partnering on new materials knowledge within our supply base.
- Continued improvements in key packaging metrics across our packaging portfolio for reduction of packaging weight, package size, and increased use of paper materials versus plastics.
- Achieved packaging development and sustainability targets as part of our ISO 14001 working group.
- Increased our participation and support of the Sustainable Packaging Coalition (SPC) to collaborate in developing an effective sustainability strategy.

Below is a table that summarizes the action plan results from FY17 with assigned ratings.

Goal	KPI for Microsoft	Target	Last year's achievements against action plan	Rating (5 best / 0 worst)
1. Design	KPI 1: Percentage of signatories with documented policies and procedures for evaluating and procuring packaging using the SPGs or equivalent.	Retail package designs are evaluated using our environmental design guide (equivalent to SPGs) and environmental scorecards.	<ul style="list-style-type: none"> Each design was measured using an environmental scorecard and reviewed throughout the ie2e package design and development process, to ensure that targets are met. Get more information in the latest report. 	5
2. Recycling	KPI 3: Percentage of signatories applying on-site recovery systems for used packaging.	One hundred percent of the transport packaging or any packaging from loose load breakdown is recycled.	<ul style="list-style-type: none"> Recycled 681 Kg of wrapping film waste, and 7,568 Kg of transport packaging cartons were reused in packaging for shipment to customers. Get more information in the latest report. 	3
	KPI 4: Signatories implement formal policy of buying products made from recycled packaging.	Continue strategy with suppliers and packaging buy policies to include a minimum of 25 percent recycled content on plastics and 70 percent or better recycled content for paperboard.	<ul style="list-style-type: none"> Sustainability strategy and environmental reporting are reviewed with suppliers. Quarterly reporting of materials content has been implemented with tool development to aggregate and compare supplier data. Get more information in the latest report. 	4
3. Product stewardship	KPI 6: Percentage of signatories with formal processes to work collaboratively on packaging design and/or recycling.	Environmental protocol for package design specifies packaging reviews at product launch and periodic reviews of existing packaging as benchmarks to new packaging. Reviews are conducted in collaboration with marketing, reliability engineering, supply chain, and with a third-party consultant to evaluate regulatory compliance and life cycle impact of the packaging. Benchmarking is used to compare sustainability with other products, and we are participating members of the Sustainable Packaging Coalition.	<ul style="list-style-type: none"> Collaborate directly with reliability team to test and verify the performance of the packaging in order to identify materials reduction opportunities and prevent waste. Evaluate and rank the relative recyclability efficiencies of the different packaging materials, allowing designers and engineers to select materials on the basis of lowest impact to recycling capabilities. Collaborate with suppliers on alternative materials such as bio-based plastic and certified paperboard. Employ peer collaboration and use of third-party LCA tools to evaluate package designs and materials to reduce environmental impact. Get more information in the latest report. 	3
	KPI 7: Percentage of signatories showing other product stewardship outcomes.	Participation in the ISO 14001 Environmental Management System working group. Publish annual updates and APC highlights online, in an internal Microsoft-only sustainability brochure as well as an external environmental website.	<ul style="list-style-type: none"> APC Action Plans and the latest highlights in Packaging Sustainability activities were published in the Sustainable Devices website. Get more information in the latest report. 	3
	KPI 8: Reductions in packaging items in the litter stream.	As part of package design development, review the number and type of packaging components used. Conduct stakeholder and user reviews to identify ease of package opening and separation of components for recycling. Materials environmental markings are included on each packaging component to facilitate end user recycling.	<ul style="list-style-type: none"> Our 2020 environmental goal is to improve our package recyclability score by 20 percent, as measured by our packaging environmental scorecard metrics. Maintain and update Specification, Agency Marks for Packaging, to include all agency and material marking requirements. One hundred percent of packaging artwork is reviewed by Design, Artwork, Compliance group. Get more information in the latest report. 	4

4 Sustainable Manufacturing

Whether manufactured in-house or via our contracted supply chain, the underlying integrity of Microsoft products is foundational. Our industrial design and development engineering teams work with their manufacturing partners to seek opportunities to improve product recyclability, decrease product and packaging materials use, increase post-consumer materials, avoid use of toxic substances, and increase energy efficiency.

The Devices sustainability programs apply to Microsoft-owned and contracted factories. The programs are aligned because Microsoft-owned factories are required to meet all Microsoft policy and regulatory requirements, including the standards applicable to our contracted suppliers under the Microsoft Supplier Social and Environmental Accountability program (SEA) described in the Responsible Sourcing section of our Corporate Social Responsibility (CSR) report. Both Microsoft-owned and contracted supplier factories undergo internal and third-party audits to verify conformance to our requirements.

Following are some of the ways we are working toward our goal of end-to-end sustainability.

4.1 Substance management

Working with suppliers regarding their substance management means we can introduce new environmental requirements more quickly. Suppliers must record the material content of products they supply and are required to provide supporting records to us along with testing data prior to product manufacture. We check that they are complying with these requirements and other social and ethical standards through audits and inspections.

If we find a supplier is failing to comply, we ask them to take corrective action and verify their completion. We work with our suppliers to help them make improvements, offering examples of best practices, training and other support. If a supplier were to refuse to address issues, we would reconsider our business relationship.

4.2 Managing process chemicals

We are also restricting the use of certain chemicals in our supply chain. The restricted chemicals are identified in our [restricted substances specification](#). In FY17, we improved the program by implementing a software solution to manage the inventory of chemicals used in manufacturing processes. Microsoft's owned factories implemented the software.

To ensure the success of the restrictions with our suppliers, we established a Process Chemical Management program to educate suppliers on chemical safety and management, improve their understanding of chemicals used and associated risks, promote substitutions with safer chemicals, and improve reporting and tracking of

chemical inventories. We are closely working with our suppliers to determine their conformance to the restricted process chemicals and drive improvements where needed.

In FY17, we made substantial progress in improving the management of chemicals by our suppliers:

- Suppliers began implementing the same software solution used by the Microsoft owned manufacturing site to track the inventory of chemicals used in manufacturing processes of our suppliers.
- To build our suppliers' capabilities, we hosted onsite chemical management trainings in Suzhou and Guangzhou. Approximately 100 suppliers attended.
- We completed the review of our suppliers' chemical inventories and sampled chemicals from 100 suppliers to confirm component level analysis and compliance with our specification.

In FY18, we plan to verify that the required chemical management system is in place for another set of suppliers and conduct further chemical assessments to identify additional chemicals that may need to be either restricted or phased out from the manufacturing process. We will also continue to invest and help our suppliers achieve the requirements for self-management, which will demonstrate that they can systematically manage risks associated with chemical hazards and provide a better environment for the workers and the factory communities.

4.3 Reducing greenhouse gas emissions

The annual Microsoft CDP disclosure includes a calculation of carbon dioxide equivalent (CO₂e) emissions as a byproduct of our device and packaging manufacture, transport, use, and disposal. Our goal is to understand our operating baseline, establish systems to routinely measure and monitor sustainability indicators, and then establish and work toward improvement goals that reduce the GHG impact of our business. For more information, please see the Microsoft [CDP reports](#). The Microsoft CDP report includes emissions associated with our direct manufacturing and, at a minimum, 80 percent of our suppliers by spend.

We are making progress toward reducing the CO₂e emissions associated with manufacturing. In FY17, we reduced the CO₂e emissions associated with the manufacture of the Surface Hub by 2 percent per unit.

Life cycle assessments of our devices indicate we have been successful in significantly reducing emissions associated with the use phase of the devices through increased energy

efficiency. Most emissions associated with the Surface devices are associated with energy use during the manufacturing phase. Therefore, Devices is focusing on reducing greenhouse gas emissions associated with the manufacture of our products with our supplier factories.

We can enable significant improvement at our supplier factories. In FY17, we conducted third-party energy efficiency audits resulting in more than 100 completed actions to reduce supplier energy use. We also initiated a factory transformation project to increase a primary factory's energy efficiency through using Microsoft cloud technology and in addition, creating an on-site source of renewable energy. We will report on the results of this project in next year's report.

4.4 Using resources responsibly

Beyond energy efficiency, we believe there is much we can do to address scarcity of resources using capability building with our suppliers and creative use of our own digital technology.

Mindful water consumption

Water scarcity is an emerging risk for many companies globally, but is not a major risk for our owned factories and supplier base. In general, the manufacturing of electronics is not water-intensive, but we monitor our owned factories' and suppliers' water management practices and wastewater compliance to ensure water risks are minimized. We respond to an increasing number of information requests from internal and external stakeholders related to water use measurements and water scarcity risks.

Devices has collected water consumption data from our direct manufacturing operations and, in addition, all Tier 1 and certain Tier 2 suppliers since 2009. Our data collection and analysis are based on the [CDP Water Disclosure](#), GRI and EICC standards, and the [Global Water Tool](#). The Global Water Tool maps our water use and assesses risks relative to our global operations and supply chains and is maintained by the World Business Council for Sustainable Development. We also used the World Resources Institute (WRI) [Aqueduct Water Risk Atlas](#) to assess water-related risks.

Although none of our suppliers have identified their own operations as significantly affecting water sources, using the WRI Water Risk Atlas, we determined that some of our supplier factories are in high-risk areas. We continue to work with these suppliers to understand the risks, their water management practices, and whether further improvements are needed.

Digital manufacturing

Through Microsoft’s commitment to digital transformation, we gained new visibility into the supply chain in FY17 that extended to improving manufacturing sustainability. The manufacturing organization employs digital technology and improved business practices to minimize waste. This lowers the cost to manufacture while avoiding the landfilling of solid waste and disposal of useful production materials.

Reducing waste is good for the environment and our business. At a major Tier 1 manufacturer, we can monitor our critical process equipment using machine learning and data analytics. This connected digital supply chain results in reduced returns, higher yields, and better productivity. For example, applying digital sensors and analytics to our edge band machines helps us to reduce scrap material and see higher yields in the attachment of the Alcantara® fabric to the Surface Laptop.

How do we do it? By using Azure, IoT, and Power BI, we have connected data across our factory and critical supplier for real-time factory floor and product life cycle analytics. This has significantly improved the scale of data we can capture and analyze and the speed of data accessibility. It also enables proactive alerting and predictive analytics that identify real-time shifts in factory processes before they result in failures and material scrap. Visibility into our operations is globally accessible in real time, on any screen and at any time, not only to the factory teams, but also to our teams around the globe.

Improved scale and speed of manufacturing data services in FY17

	Before implementation of our connected data systems	After implementation
Scale	Capture 1 billion data points/day; analyzed <1%	Capture up to 10 billion data points/day; ability to analyze 100%
Speed	Accessibility to data measured in hours/days	Accessibility to data measured in minutes/seconds

In a HoloLens manufacturing machine learning project, we demonstrated the power of enabling data and analytics to improve yield and reduce scrap in FY17. The result was an approximately 30 percent yield improvement and a value of \$2 million in scrap reduction.

Refurbishing, harvesting, and recycling to divert potential waste streams

The Surface Hub field return program and internal unit sales program have delivered roughly \$500,000 in savings from the refurbishment of units and parts, and the recovery of units with cosmetic or other defects that did not impact functionality, which otherwise may have been scrapped.

At all steps of the Surface Hub manufacturing, process scrap is minimized by close management of parts for rework and harvesting. The manufacturing team recovered roughly \$1.5 million worth of parts including cover glass with black mask defects, heat sinks needing rework, and brackets requiring screw hole drilling. Teams extracted \$250,000 in high value reclaim materials including boards and other electronics.

Surface Hub production line segregates all recyclables for efficient transfer to offsite recycling containers. Approximately 400,000 kilograms of metal, wood, cardboard, rigid plastic, plastic film, and block Styrofoam were recycled in FY17 with local providers while nearly 100,000 kilograms of electronic waste were recycled with R2 certified recycler.

4.5 Ensuring adherence to environmental requirements

Microsoft owned factories and our contracted suppliers must comply with environmental requirements. In our Responsible Sourcing section of our CSR web pages, we describe in detail our program to ensure the environmental compliance of our suppliers.

In addition, we ensure the correction of regulatory violations that pre-exist a supplier's relationship with Microsoft. Since 2012, we have been collaborating with the [Institute of Public & Environmental Affairs \(IPE\)](#) to identify our contracted suppliers listed by IPE as current or past violators of China environmental regulations. We work with the listed suppliers to ensure that all environment-related violations are effectively remediated. We monitor and track these corrective action activities in the same way we track issues identified through our third-party audit program or onsite assessments.

We have worked with 39 factories to successfully close violations and validate corrective actions since the beginning of the program. In FY17, we worked with four listed factories and successfully closed out all issues.

5 Sustainability in Distribution

One of the components of the Devices strategy is to reduce our carbon footprint and improve environmental sustainability is to move toward more efficient shipping modes.

To continue improving the energy and environmental efficiency of our freight operations, we partner with SmartWay®, a public and private collaboration between the US

Environmental Protection Agency (EPA) and the freight transportation industry. Through this partnership, we can accelerate the availability and adoption of advanced, fuel-efficient

technologies and operational practices. As a certified SmartWay Transport Partner with the US EPA, we continue to improve fuel efficiency and overall environmental performance.

Our emphasis on the use of ocean and rail transport rather than air and parcel shipment reduces our carbon footprint through fuel efficiency. We have also moved from parcel shipping to less than load (LTL) shipping, which increases load efficiency. More than 80 percent of our shipping volume is transported using the more efficient transport modes.



6 End of Life Management of Devices and Packaging

Recycling devices and packaging at the end of their useful life is a key phase of our end-to-end sustainability strategy. We are committed to ensuring that useful materials in our products are recovered, recycled, and kept out of the landfill at the end of their useful lives.

We manage the complexity of the return and recycle phase by partnering with collection schemes and Microsoft-contracted recycling partners, and working with Microsoft Stores and our OEM partners to enable our consumers to return and recycle our devices and packaging.

Microsoft also gives new life to consumer electronic products through the [Refurbished PCs program](#), which helps communities around the world. The combined efforts of a network of organizations and members of the Microsoft Refurbished PCs program brings affordable access to computer technology through favorable pricing on Windows and reuse of computers. Millions of PCs and all types of consumer end-of-life electronics are being refurbished and reused through this network.

Where the computers may not be reused, the Refurbished PCs network assists with making appropriate computer asset disposal decisions.

6.1 Our philosophy on individual and extended producer responsibility

Collection and recycling of end-of-life consumer electronic devices are often organized with other manufacturers through collective arrangements. Recycling may be delegated to a producer responsibility organization (PRO).

Wherever enacted legislation is in place and PROs are not available, Microsoft supports Individual Producer Responsibility (IPR) as a strategy to comply with our regulatory obligations. Microsoft supports incorporating end-of-life recycling costs into the cost of new products to encourage producers to find innovative ways to design more sustainable products that can be easily disassembled, recycled, or reused.

6.2 Mandatory recycling

Microsoft is a member of 151 recycling schemes or PROs worldwide, covering electronics, batteries, and packaging. Extended PRO schemes play an important role in promoting sustainable production through the efficient recycling of vast quantities of materials and creating awareness of sustainable disposal options among consumers. PROs act exclusively on behalf of their member companies to collect and recycle electronics waste in an environmentally sound manner and operate in full compliance with all applicable laws and regulations. The PROs use the best available treatment recovery and recycling techniques.

	Americas	Asia-Pacific	EU	Total Schemes
WEEE	41	7	32	80
Battery	12	3	30	45
Packaging	8	3	15	26
Total	61	13	77	151

6.3 Voluntary electronics recycling programs

Microsoft offers two types of free, voluntary electronics recycling programs. These voluntary programs are provided to make recycling easier and convenient for our customers in jurisdictions where mandatory recycling programs have not been established.

By mail in the United States: Consumers can visit our [recycle device page](#), send an email to weee@microsoft.com, or phone 866-217-7329 and we will generate a postage-paid e-label for return to our contracted recycler.

Consumer electronic devices trade-in and recycling: Microsoft Stores offer trade-in and recycling of Microsoft and non-Microsoft branded electronic devices turned in by consumers at select locations. Learn more at www.microsoftstore.com/recycle.

6.4 Voluntary recycling initiatives in developing countries

Recycling efforts in Africa: The goal of the Alliance for E-Waste Solutions in Africa is to collaborate with governments and NGOs to create or expand sustainable framework policies and long-term solutions for end-of-life product management in key African countries. As one of the founding members of the Alliance and as part of the mission to expand and improve the recycling practices, Microsoft contributed to supporting emerging recycling legislation and operations in several countries such as Nigeria and Kenya. The Alliance continues to work in supporting emerging legislation in several countries including Tanzania, Uganda, Rwanda, and Ethiopia.

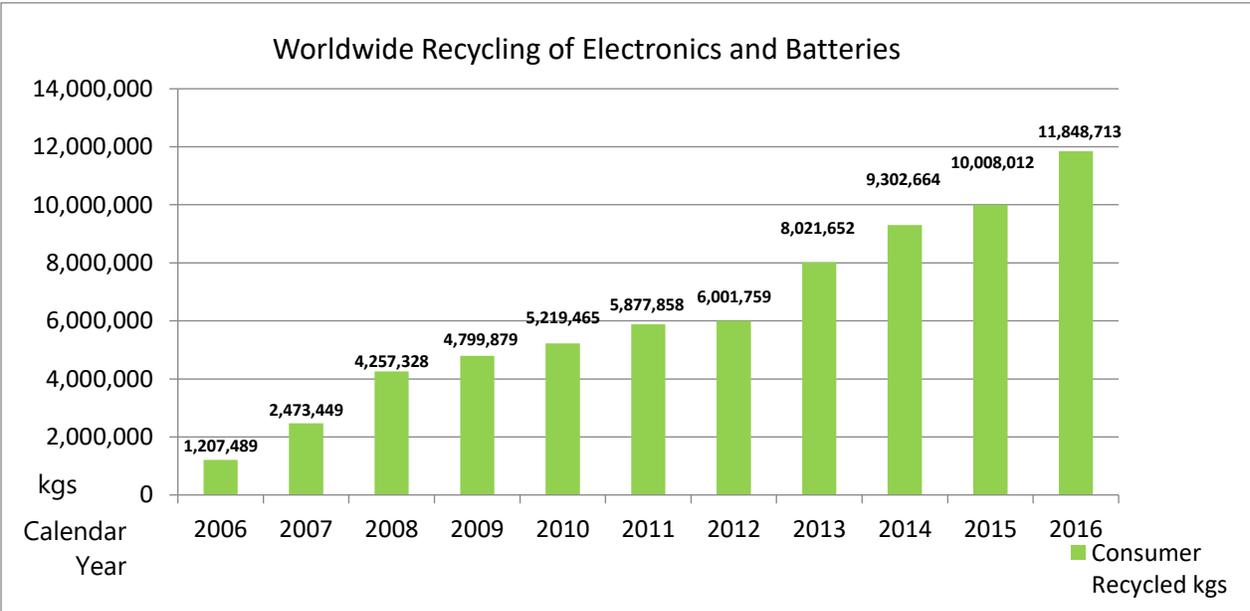
6.5 Requirements for vendors

Recycling vendors directly contracted by Microsoft must meet the specifications in [Supplier Conformance Standards for environmental health and safety](#) (EHS). This standard bans the

landfilling or exporting of our devices. Microsoft-contracted recyclers must also be certified to various internationally recognized standards such as ISO 14001, R2, or E-Stewards, conduct assessments of their downstream partners, track the material types and quantities that they process to final disposition, and provide a certificate of destruction.

6.6 Increasing recycling volumes

We are working globally to make recycling options more accessible. In calendar year 2016, Microsoft collected and recycled more than 11.8 million kilograms of electronic products through its consumer recycling programs. Since 2006, Microsoft has recycled more than 69 million kilograms of consumer e-waste.



Please Remember this when Recycling

Appropriate collection and recycling is essential. The materials in your devices can be used to make new products or generate energy.

According to the reports in relation to the EU Waste Electrical & Electronic Equipment (WEEE) Directive, two thirds of e-waste disappears into non-official disposal channels where it may be either sold or disposed of as part of general waste.

We encourage you to responsibly recycle your electronics and packaging. Please find Microsoft sponsored recycling opportunities in your area that will enable you to recycle your hardware for free. If a recycling solution is not yet listed, please contact your local city/municipal office, your household waste disposal service, or [email us](#).