Apple's Paper and Packaging Strategy

October 2017

Overview

Forests are a wonderful resource for cleaning air, purifying water, sequestering carbon, and sheltering wildlife. As part of Apple's commitment to resource conservation, we designed and run a program to address the impact of our use of paper for packaging. The initiative started with a detailed assessment of Apple's fiber use, which led to a three-part strategy: (1) use paper more efficiently and, where possible, use recycled paper; (2) source virgin fiber responsibly; and (3) protect and create sustainable working forests. The third initiative—though not an obvious course of action at the project's outset—helped ensure that our efforts to source virgin fiber responsibly do not simply take away from the world's supply of paper derived from sustainably managed forests, but also grow the supply. We hope this case study offers a model from which others can learn and inspires action to protect working forests and other resources on which we all rely.

Introduction

To protect the environment for the future, Apple asks bold questions, tackles big problems, and relentlessly innovates to solve them. We strive to make not just the best products in the world, but the best products for the world. Three priorities guide our efforts:

1. Reduce Apple's impact on climate change by using renewable energy sources and driving energy efficiency in products and facilities.

2. Conserve precious resources by using materials efficiently, using more recycled and renewable content in products, and recovering material from products at the end of their life.

3. Identify, develop, and utilize safer materials in our products and processes.

To conserve resources, Apple aims to shift our use of resources from a linear model of extraction, use, and disposal, toward a closed loop. Closed loop efforts apply to both finite and renewable resources. For finite materials, closing the material loop means sourcing recycled materials and enabling those materials to be returned to the recycled market at product end of life. For renewable materials, our focus is on both responsible sourcing and regeneration: sourcing either recycled or responsibly produced materials and, where necessary, creating the equivalent supply of the resource.

Forests harvested for paper pulp represent one of the renewable resources on which Apple relies, and global degradation of forest resources makes them a key target of closed-loop efforts. Overexploitation and deforestation for alternative land uses and illegal logging are contributing to a net decline of global forest resources.[1] The Food and Agriculture Organization of the United Nations (FAO) estimates that from 1990 to 2015 there was a global net loss of more than 300 million acres of forest—an area about the size of South Africa.[2] In the United States alone, working forests, or those harvested for forest products and services, declined by 23 million acres over the last 15 years and an estimated 45 million more acres are currently at risk of development.[3] A limited number of working forests around the world are under

responsible management, defined by the Forest Stewardship Council (FSC) as "operating with a balance of social, environmental and economic outcomes in the current global context."[4] Only an estimated 38 percent of total production forest area is certified for responsible management under the FSC and the Programme for the Endorsement of Forest Certification (PEFC).[5]

The global decline and degradation of working forests is concerning given the increasing global demand for forest products and the additional value that forests provide, including habitat for wildlife, improved air and water quality, climate regulation, and job opportunities.[6]

To play a role in reversing negative resource trends, we are committed to efficiently using and responsibly sourcing materials for our paper packaging, increasing the use of recycled materials, and growing the global supply of sustainably produced paper products by the same amount that Apple consumes. These efforts contribute to closing the loop on Apple's supply chains and improving our environmental footprint.

Apple's Approach

Our three-part strategy to mitigate Apple's impact on current and future forest resources through the use of packaging is to:

• Use paper more efficiently and use recycled paper where possible.

• Source virgin paper responsibly.[7]

• Protect and create sustainable working forests.[8]

The first two components of the strategy seek to reduce Apple's demand for the resource and improve Apple's sourcing practices. However, at Apple we were not confident that responsible sourcing alone would send a market signal that was strong enough to increase supply proportionally. The third initiative—to protect and create sustainable working forests—helps to ensure that Apple is not simply taking responsibly produced material from another buyer, but is instead growing the total global supply for a positive environmental impact.

Paper Footprint

Understanding Apple's fiber use was an essential step toward reducing our impact. In 2015, we calculated a fiber footprint for our product packaging. Starting at the product level, the footprint includes all fiber materials that go into finished goods packaging and protective shipper boxes. The footprint also accounts for yield losses, meaning that fiber waste through die-cutting and other parts of the manufacturing process are included. We then multiplied each product-level result by the number of units sold per product and aggregated across products to measure the yearly product footprint. We then added fiber use by Apple facilities, including fiber used in printing, food, and janitorial services, as well as retail data, to the product data to calculate a total corporate fiber footprint.

The footprint, which can be analyzed based on various factors including product or fiber type, identifies impact hotspots to drive decisions regarding the implementation and tracking of packaging initiatives. For example, we used the footprint to identify the most significant uses of virgin materials throughout packaging products to help guide the search for recycled alternatives.

We also used the fiber footprint to inform Apple's forestry strategy: to measure progress toward our goal to protect and create sustainably managed working forests, we compare the mass of sustainable pulp generated annually from protected forests with the mass of virgin fiber pulp used annually in our packaging (including material loss during the manufacturing process).

The level of detail captured in the fiber footprint facilitates this comparison by quantifying not just the amount of virgin paper used by Apple, but more specifically, the amount of virgin pulp in the paper. Because virgin pulp can represent less than half of paper content—fillers, binders, and pigments making up the remaining amount—the fiber footprint's focus on pulp rather than paper provides a more accurate measure of Apple's use of pulp from trees and a more accurate goal for the sustainable production of the forestry program.

Efficient Packaging
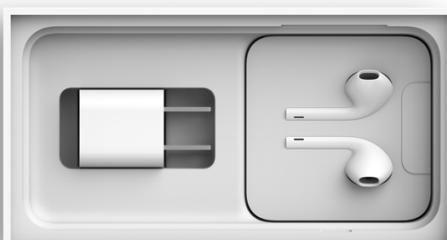
Armed with data from the fiber footprint, we looked critically at the materials used in Apple's packaging. This required asking fundamental questions: Why are we using these materials in these quantities? Is use of these materials essential or is there an opportunity for alternative materials and designs? The strategy that emerged from these questions extended beyond just paper to include moving from petroleum-based plastics to fiber-based materials; reducing use of materials; and replacing virgin with recycled materials.

Implementation required challenging the material and design constraints that previously prevented use of alternative materials and allocating the time and resources to overcome these barriers. Even more essential to finding solutions were the buy-in from teams across the organization and a shared commitment to reducing Apple's environmental impact.

Throughout the process, we chose to make changes that would have the greatest potential for impact based on the amount of material used, the time required to develop an alternative, available expertise, and influence with suppliers. The effort is ongoing as teams continue to address those materials used in lesser quantities to improve the overall sustainability of Apple's packaging.
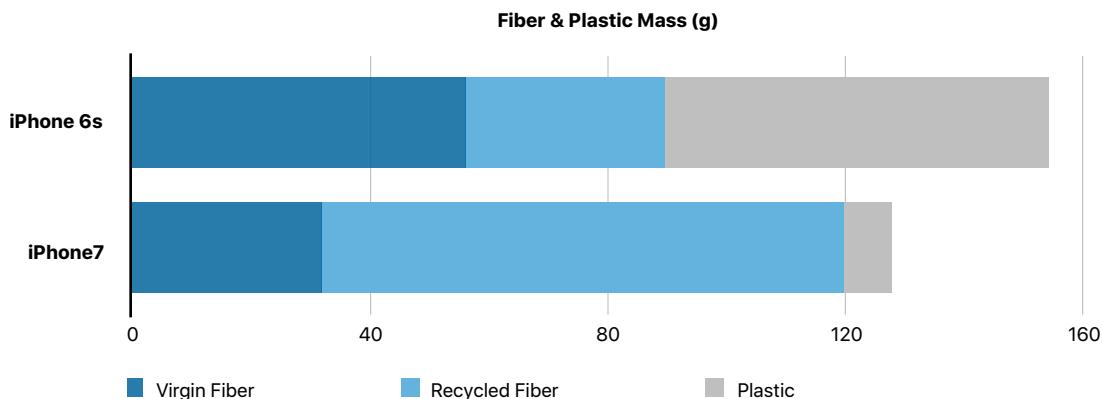
Changes in iPhone packaging from iPhone 6s to iPhone 7 illustrate the significant impact potential of these efforts. With sales of iPhone exceeding 200 million units in fiscal year 2015, iPhone represented a key target for high-impact packaging changes. Apple teams looked for opportunities to change both the quantity and type of materials used in iPhone packaging. For iPhone 6s packaging, we used two stacked plastic trays—one to hold iPhone and the other to secure the accessories. For iPhone 7, a new design allowed a single tray to do the work of two, eliminating the need for a second tray and significantly reducing material use. Apple teams also found a fiber-based material that could be used to make the trays, replacing the petroleum-based plastic previously used.

A similar exploration of new materials and design led to innovations in the EarPods carrier. For iPhone 6s, a plastic carrier had been designed to discreetly wrap cables and hold the EarPods in place. For iPhone 7, Apple developed a paperboard-based solution to leverage a functional set of folds and cuts that elegantly secured the EarPods and cable. Changes to the tray and EarPods carrier contributed to an 84 percent decrease in plastic usage for iPhone 7 packaging compared with iPhone 6s.[9]

iPhone 7 packaging

Last, an exploration of virgin fiber hotspots led our teams to address the outer iPhone packaging box wrap itself, which used significant amounts of virgin fiber–based solid bleached sulfate (SBS). With the launch of iPhone 7, a recycled content paperboard replaced a layer of SBS, contributing to an approximately 30 percent increase in recycled fiber content between iPhone 6s and iPhone 7.

Fiber & Plastic Mass (g)

Virgin Fiber   Recycled Fiber   Plastic

Changes to packaging from iPhone 6s to iPhone 7 reduced the amount of plastic used and increased the use of recycled fiber.

Continued pursuit of improvements for iPhone 8 packaging shows Apple's attention to detail and ongoing commitment to making smaller and often more difficult changes. For iPhone 8, this meant pursuing an alternative to a polypropylene wrap that protected the power adapter. Finding a fiber alternative proved challenging since fiber naturally expands and contracts with changes in humidity. The significant number of suppliers and locations through which the power adapter wrap would pass made controlling the humidity of the environment impossible. This required Apple to take a very hands-on approach, working directly with the supplier to alter aspects of the manufacturing process to create a fiber wrap that would meet technical needs. While the power adapter wrap is a small piece of the iPhone packaging, it represents a significant amount of material given the number of iPhone units sold. This detail is one of many that make packaging more uniform, reduce environmental impact, and create a better experience for the customer.

Responsible Sourcing

Because virgin fiber remains necessary to meet Apple's structural and design requirements, responsible sourcing of this fiber is an essential piece of our environmental strategy for paper and packaging. To support our responsible sourcing goal, we recently enhanced Apple's fiber specification for even more responsible and transparent sourcing practices for all fibers used in product packaging or print applications, whether from wood, non-wood, or recycled sources.

Specification Requirements

An important question in writing and updating our specification was which forest certification schemes to include in Apple's standard. To maintain flexibility for our suppliers, we opted to leave the choice of which forest certification scheme to use with the supplier, as long as their management practices met the requirements to achieve certification and comply with Apple's requirements. The updated specification requires that "all wood and non-wood fibers used in packaging or print applications be derived entirely from sources certified to or endorsed by the Forest Stewardship Council (FSC), the Programme for the Endorsement of Forest Certification (PEFC), FSC Controlled Wood, or another specification that has been approved by Apple."[10]

In addition to full FSC and PEFC certifications, Apple teams also chose to include FSC Controlled Wood and any certifications "reviewed and approved by Apple." Together, these options provide suppliers some flexibility in meeting our requirements. As of October 2017, however, no Apple suppliers have needed an alternative to the FSC or PEFC certifications, or to FSC Controlled Wood.

The specification defines separate requirements for Apple-selected and supplier-selected materials. For the former, we have the ability to engage with the supply chain directly and review documentation that shows the movement of products from forests to final packaging. For the latter, however, our visibility into the materials' upstream sources is more limited. Thus, we decided to require an additional FSC or PEFC chain of custody certification for supplier-selected materials to ensure that forest products could be traced back to the forest of origin. The chain of custody represents all steps a material goes through from the time it leaves the forest or is recycled to the time the material is sold with a claim of responsible production.[11] Because materials may change ownership many times throughout processing and distribution, tracing materials to their source requires diligence. Both FSC and PEFC offer verifications that a product has been successfully traced back through the steps in the chain of custody, providing a valuable assurance.[12]

Finally, the updated specification includes requirements for other fiber sources as well. For non-wood fibers from waste products, such as bagasse from sugarcane, the specification requires evidence of responsible sourcing to ensure that these materials come from renewable sources grown without significant environmental consequences like deforestation or loss of critical ecosystems. The specification also considers the end-of-life impact of materials by requiring that non-wood fibers from waste products be recyclable with the mixed-paper stream. For fibers from recycled sources, the specification requires that recycled content meet the minimum standards of IEEE 1680.1.[13]

Implementation of the Specification

The updated Sustainable Fiber Specification is made more effective by Apple's willingness to invest in compliance. To ensure that suppliers are meeting the specification, we not only require a signed declaration of conformity and proof of certification, but also conduct audits to further confirm compliance.

Each year, Apple carries out a three-step audit process. First, suppliers perform a self-audit, mapping supply chains and submitting relevant sourcing information and documentation to Apple. Second, Apple audits each supplier to confirm that submitted documentation can be substantiated. These audits go so far as to include a fiber test that reveals any pulp from endangered species or from species with a high risk of unsustainable management practices. Finally, in the case of noncompliance or insufficient documentation, a corrective action plan with a timeline is created for the supplier.

After releasing our specification in 2015, we worked hard to make sure that suppliers knew about our requirements and how to comply. As forest certification is increasingly viewed as a market entry requirement, many suppliers' processes already met the specification's standard at the time of its implementation. Suppliers did experience a learning curve, however, as they sought to understand what evidence and documentation they needed to share with Apple. The top two findings from the audits performed in 2016 resulted not from the lack of compliance, but from the lack of sufficient documentation.

To help educate suppliers about the evidence required for the specification, Apple created supporting guidance available in English and Chinese. In addition, we use audits as opportunities to further teach suppliers about the process.

Mapping our supply chain proved highly valuable to Apple. The greater visibility revealed that complex paper supply chains were, in many cases, diamond shaped, with many suppliers sourcing from the same paper mills. This leaves the door open for even more efficient future sustainability interventions targeted at the mill level.

Compliance with the Specification

Despite the relatively recent implementation of the specification, nearly all of the materials Apple sources are in compliance: more than 99 percent of the paper used in Apple's packaging and corporate offices in 2016 came from either responsibly managed forests, controlled wood, or recycled sources. And we continue working to eliminate the small amount of paper use, from acquisitions and sale of previous-generation products, that represents the less than 1 percent of our packaging materials that are noncompliant.

Reducing use of paper materials, increasing use of recycled materials, and responsibly sourcing the remaining virgin material certainly improved Apple's direct resource use. However, the ultimate goal guiding our teams was not limited to improving Apple's environmental impact in isolation—we wanted to create a positive global impact on forest resources. Although we were mitigating Apple's footprint, we questioned whether forest resources were truly better off or if, by reducing the world's supply of responsibly and sustainably managed paper, we had simply shifted the impacts to other buyers. This debate led to an additional forest initiative beyond the scope we had originally imagined.

Creating and Protecting Sustainable Working Forests

Concerned that our responsible sourcing efforts might simply strain a limited global supply of product, Apple sought to protect and expand the number of responsibly or sustainably managed working forests to cover all its product packaging needs. This effort helped ensure that Apple did not displace another willing buyer of responsibly produced fiber, but instead increased the total amount produced.

Though originating from a focus on forest products, the effort considered the broader value of forests, including important contributions to habitat for wildlife, carbon sequestration, and air and water quality. We tapped into the expertise of partners to take these factors into account in designing strategies with the greatest opportunity for impact.
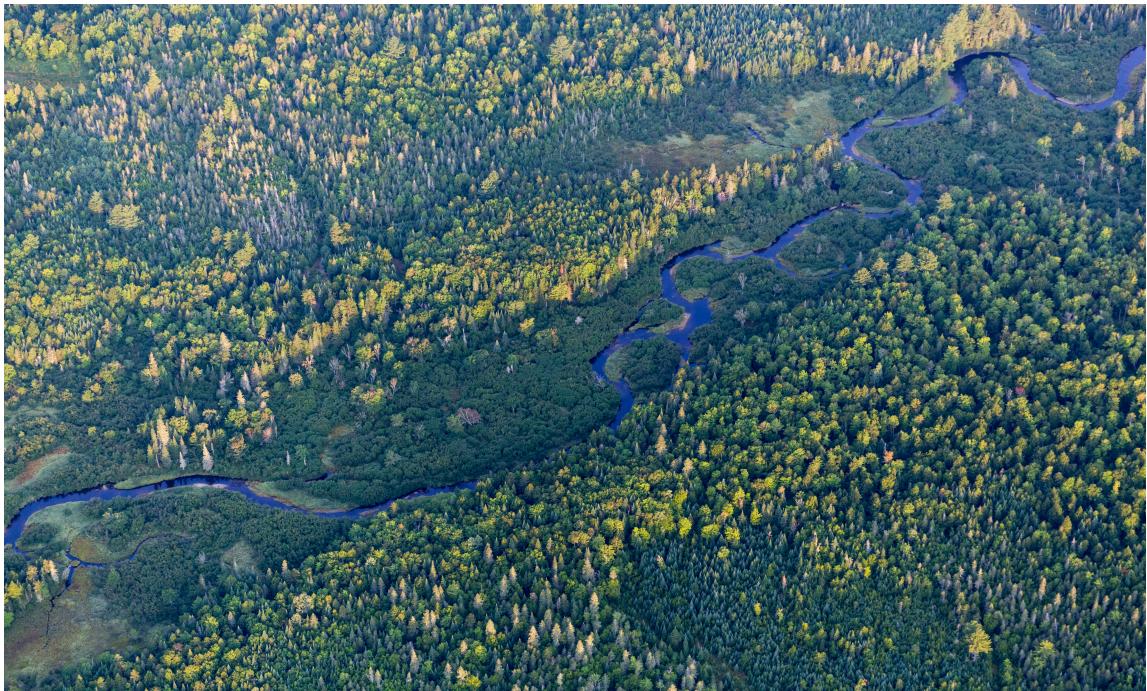
Because Apple aimed to achieve a positive impact on the global commodity market, the initiative targeted forests harvested for paper pulp and recommended by expert partners, whether or not these forests were part of Apple's current supply chains. Linking these long-term efforts to our own supply chains, which often change, would not have created significantly different environmental impact—and it was unnecessary to meet our design and engineering requirements.

The initiative launched in the United States in April 2015 and soon expanded to China, covering two countries whose regulatory and political structures required significantly different approaches to forest management and protection.

United States

In the United States, the key challenge was finding a model that would improve the management of working forests, generate further supply of responsible pulp, and ensure the protection of forest resources into the future. Apple selected The Conservation Fund (the Fund) as a partner for their experience and for their Working Forest Fund® model, which offered an innovative approach to decrease forest-based supply chain risks and halt the loss of the last big, intact, privately held forests in the United States.

Through its Working Forest Fund, the Fund aims to ensure the vital role of forests in providing clean air and water, wildlife habitat, and economic benefits for communities across the United States. With support from Apple, the Fund identifies and purchases working forests with ecological and economic assets that were threatened by large-scale fragmentation or development. The Fund then places a conservation easement on the land to ensure that it is sustainably managed and protected from development in perpetuity. Once appropriate partners are found, the Fund transfers the easement to a qualified holder responsible for its enforcement, and sells the forest in the open market. After the sale of the property, they reinvest funds from the sale to protect additional working forests, boosting local economies by maintaining jobs and creating a supply of responsibly managed forest products.[14]

Apple and The Conservation Fund are protecting Reed Forest in Maine. (EcoPhotography/Jerry Monkman)

Since 2015, Apple and The Conservation Fund have protected more than 36,000 acres of working forest in the eastern United States, including Brunswick Forest in North Carolina and Reed Forest in Maine—both at risk of development or fragmentation before the collaboration. So far, the project has generated enough sustainably produced pulp to make a stack of iPhone 6s boxes more than 1,500 times as tall as Mt. Everest.

This initiative not only provides a steady supply of sustainably harvested wood to paper and pulp mills, but it also prevents forest habitat fragmentation, addresses climate change, and enhances local water and air quality. Protection of the Reed Forest, for example, supports a robust forest industry employing more than 38,000 people in the state and adds to conserved lands and interconnected forests that extend into Canada.[15] Third-party forest certification provides measures for the protection of wildlife, which is particularly important given the presence of six rare species, including the Canada Lynx, in the area.[16]

China

Expansion of the initiative to China represents an important step in Apple's long-term commitment to the country. We also chose China because of the significant national demand for pulp and paper and the low supply of wood in the country for making pulp and paper products. Though the National Forest Conservation Program[17] has been working to protect state-owned forests, net forest loss in China between 2001 and 2015 is estimated to exceed 18 million acres.[18]

Expanding to a country with different environmental regulations, approaches to land ownership, and strategies for conservation presented significant opportunities and challenges for Apple. In particular, China's approach to property law meant that the easements used in the United States weren't feasible, requiring that Apple find a different model for long-term forest protection.

Apple elected to partner with World Wildlife Fund (WWF) because of the NGO's technical expertise, experience in partnering with the Chinese government and other regional partners, and previous work in generating the supply of and demand for responsibly produced forest products. Through a proposed initiative designed to increase demand for responsibly produced forest products, as well as to improve forest management practices and national forest management policies, WWF offered the long-term focus adapted to the Chinese market that Apple sought.

The WWF China "Green Me" campaign video asks, "The forest is part of our life. How can we give back to it?"

The Apple and WWF China initiative, now in its third year, aims to catalyze responsible forestry and trade in China, particularly in semi-natural working forests and plantations that supply China's pulp and paper sector. Through pilot projects and strategic engagement, the project endeavors to demonstrate best forest management practices and, ultimately, aims to assist in China's efforts in improving its forest policies and regulations.

Integrated into WWF China's broader forestry strategy, Apple's collaboration with WWF has three primary objectives:

1. **Increase responsible management of working forests in China by creating up to 300,000 acres of FSC–certified forests and up to 700,000 acres of forests under improved management.** This objective seeks additional impact by improving management of those forests unable to obtain FSC certification because of previous management practices or other disqualifying factors.

2. **Improve China's policy framework to encourage responsible forest management.** This objective capitalizes on the lessons learned in forest management to inform government policy and share best practices. One example of this work is the creation of a best management practice guide based on an assessment of current challenges, case studies of exemplary management, and global best practices. Supporting effective policies enables the initiative to create a ripple effect and to help forest management improvements endure.

3. **Establish long-term market incentives in China for responsibly sourced paper.** Increasing the supply of responsibly sourced products has a limited effect if demand for these products does not increase proportionally. Growing consumer awareness can help unlock lasting demand for these products. To achieve this objective, WWF China has launched a "Green Me" awareness-raising campaign focused on FSC certification, among other efforts.[19]

Approximately 320,000 acres of forest have received FSC certification as part of the initiative, exceeding the initial goal. WWF China has also secured commitments from eight forestry companies, representing more than 450,000 acres, to improve their forest management practices. The permanence of these improvements depends on government and forest manager actions over the long term, further highlighting the importance of the relationship-building and broader awareness-raising components of the initiative.

Through the U.S. and China initiatives, Apple has met its goal to protect and create enough responsibly managed forests to cover all of its product packaging needs. As paper demands grow and change, we are prepared to continue protecting and improving the management of the world's forests.

Conclusion

Our paper and packaging initiative represents the efforts of a single corporate consumer of fiber in the global market for forestry products. Yet it has the potential for much greater impact, triggering positive ripple effects both inside and outside of Apple.

Since the introduction of our program in 2015, its successes have inspired us to rethink our approach to other key materials and begin pursuing closed-loop supply chains for the finite resources we use to make our products.

We also hope that our program highlights a process for others to take responsibility for their impact on global resources and work with external stakeholders to protect the environment. The evolution of the initiative over time reveals questions that may be valuable for others to ask themselves: What makes up our fiber footprint? What are the hotspots that can be addressed first? Given our reliance on partners in the supply chain, to what degree are we willing to leverage our influence and invest to ensure improved practices? Perhaps most interesting is the question that led Apple to consider whether efficient use and responsible sourcing were sufficient: Are we truly leaving global resources better off than we found them?

Underpinning this debate and the solutions that emerged is a larger sense of purpose shared by the Apple teams involved. With an internal, short-term focus alone, the project could have succeeded with efficiency and responsible sourcing efforts that would have reduced Apple's direct environmental footprint. Instead, a broader commitment resulted in changes that were not obvious from the project's outset but were essential to meaningful global impact. Allowing this broader environmental commitment to drive initiatives may be key to creating fundamental and necessary shifts in the use of global resources.

Acknowledgments

1 Food and Agriculture Organization of the United Nations. *Global Forest Resources Assessment 2015: How Are the World's Forests Changing? Second Edition.* Rome: Food and Agriculture Organization of the United Nations, 2016.

2 Ibid.

3 Jackson, Lisa P. "Why Apple Is Permanently Protecting Working Forests." *Medium,* 2015. https://medium.com/@lisapjackson/why-apple-is-permanently-protecting-working-forests-6f49a7d4bef5.

4 Forest Stewardship Council. *Global Strategic Plan 2015 - 2020 Delivering Forests For All Forever: A Bolder, Stronger, More Effective FSC.* 2015. https://ic.fsc.org/en/fsc-global-strategic-plan-2015-2020.

5 There are 4 billion hectares of forests globally, according to the Food and Agriculture Organization's *Global Forest Resources Assessment 2015: How Are the World's Forests Changing? Second Edition*, 1.24 billion hectares of which are production forests according to the Food and Agriculture Organization's *Forest Products: Annual Market Review 2015–2016.* Of the production forests, 196 million hectares are FSC certified and 271 million hectares are PEFC certified according to 2017 data from the two organizations, yielding a total of 467 million hectares of production forests certified, or 38 percent of the total.

6 Food and Agriculture Organization of the United Nations. *Global Forest Resources Assessment 2015: How Are the World's Forests Changing? Second Edition.* Rome: Food and Agriculture Organization of the United Nations, 2016.

7 Virgin materials indicate those that do not come from a recycled source, not materials that come from a virgin forest.

8 In this context "creating" a sustainable supply means converting to sustainable management an existing working forest.

9 For more information on iPhone 7 packaging, see Apple's *Product Environmental Report: iPhone 7.* 2016.

10 For more details, see Apple's *Sustainable Fiber Specification, Version C.* 2016. https://www.apple.com/environment/pdf/Apple_Sustainable_Fiber_Specification_April2016.pdf.

11 Forest Stewardship Council. "Chain of Custody Certification." 2017. https://ic.fsc.org/en/what-is-fsc-certification/chain-of-custody-certification.

12 Ibid.

13 IEEE. "IEEE 1680.1: IEEE STD 1680-2009, IEEE Standard for Environmental Assessment of Personal Computer Products, Including Laptop Personal Computers, Desktop Personal Computers, and Personal Computer Monitors." 2009.

14 For more information on the Working Forest Fund, see https://www.conservationfund.org/our-work/working-forest-fund.

15 Maine Forest Products Council. "Maine's Forest Economy." 2014. http://maineforest.org/wp-content/uploads/2014/04/Maines-Forest-Economy.pdf

16 World Wildlife Fund: Global Forest & Trade Network. "The Impact of Forest Stewardship Council (FSC) Certification." 2014. http://d2ouvy59p0dg6k.cloudfront.net/downloads/fsc_research_review.pdf.

17 Also translated to National Forest Protection Program.

18 World Resources Institute. "Global Forest Watch: China." 2015. http://www.globalforestwatch.org/country/CHN.

19 WWF China. "Green Me! Campaign Video." 2017. https://vimeo.com/214545724.