

**Report of the
Starbucks Coffee Company/
Alliance for Environmental Innovation
Joint Task Force**

ALLIANCE for ENVIRONMENTAL INNOVATION
A project of Environmental Defense and The Pew Charitable Trusts

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April 15, 2000

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CONTENTS

Executive Summary	3
Objectives of the Starbucks-Alliance Task Force	5
Increasing the use of reusable cups at Starbucks	7
Developing a new disposable hot cup	12
Appendix A	16
Appendix B	20
Appendix C	21
Appendix D	22

Executive Summary

In August 1996, the Starbucks Coffee Company and the Alliance for Environmental Innovation entered into a partnership to reduce the environmental impacts of serving coffee in Starbucks retail stores. The goals were to increase the use of reusable cups in the Starbucks system and to develop a new single-use cup to replace the two nested paper cups that Starbucks frequently used to serve a single hot coffee beverage. The reusable cup initiatives and the new “hot cup” development project described in this report are the result of the two organizations’ joint efforts.

The specialty coffee business grew rapidly in the 1990s, and by 1999, more than 12,000 specialty coffee outlets in the United States had generated an estimated \$5 billion in revenues (Specialty Coffee Association of America, *1999 Coffee Market Summary*). With this growth in business, however, also came more damage to the environment. Accordingly, from growing coffee in ecologically sensitive rainforests to the construction and operation of coffee bars and stores, environmental challenges and opportunities can be found throughout the specialty coffee supply chain.

Starbucks is committed to environmental leadership in all aspects of its business practices and therefore joined the Alliance for Environmental Innovation in an effort to reduce the specific environmental impacts associated with the use of disposable cups.

- **The Task Force, together with the Starbucks Green Team regional coordinators, verified the environmental and financial benefits of reusable cups and glasses for Starbucks.** For customers drinking their beverages in Starbucks stores, using reusable cups can significantly reduce the environmental impacts of serving coffee. In addition, Starbucks can lower its packaging costs with only nominal increases in labor requirements or environmental impacts from running the dishwashers. As of 1999, about 20 percent of Starbucks stores were consistently using reusable cups for in-store beverages. When fully implemented, this policy could save Starbucks more than \$1 million per year in packaging costs (based on Starbucks’ size at the end of 1999). In accordance with this estimate, in-store serveware was implemented systemwide. Prior to the task force study, not all stores carried ceramic cups, and none carried glassware for cold beverages. Now, however, the standard operating procedure is to carry all of these items.
- **The Task Force developed and tested a new, environmentally preferable hot cup.** The Task Force’s rigorous, systematic screening and testing process identified a new alternative to the single-use paper cup, which had to be both a functional and an environmental improvement over Starbucks’ current mix of disposable cups. After more than two years of testing and developing prototypes of this cup, the data did not clearly indicate that the final version would meet all the criteria and could be brought to market within a reasonable time and cost. In addition, Starbucks’ customers had become accustomed to using a single paper cup with a corrugated paper sleeve. The sleeve was developed after the hot cup project began and initially was intended as an interim solution. For the reasons explained in this report, Starbucks’ senior management ultimately decided not to adopt the new design.
- **Focus groups revealed that Starbucks’ customers were highly interested in the environmental aspects of a new hot cup design.** In one set of focus group interviews and two retail market tests, Starbucks added environmental inquiries to the

standard queries about the functional and aesthetic aspects of the different hot cup designs being tested. When two core age groups in Seattle, Chicago, and Boston were asked to state their criteria for an “ideal” hot cup, they all mentioned environmental considerations as a top priority.

- **Market research demonstrated Starbucks customers preference for cups with perceived environmental benefits.** A sample of 317 Starbucks customers participated in a 60-store market test in San Francisco and Washington, DC. Without information about the environmental attributes of the test cups, Starbucks customers significantly preferred the appearance of a cup with a light brown, unbleached/recycled wrapped exterior, compared with both a white, virgin-paper cup of identical design and the standard Starbucks cup with an unbleached paper sleeve. When asked to choose their favorite of these three designs, 58 percent selected the tan, newly designed cup with recycled content; 32 percent selected the same cup with a white, virgin-paper outer wrap; and 10 percent selected the cup and sleeve.
- **The Starbucks-Alliance partnership paved the way for other environmental initiatives at Starbucks.** Even though the Task Force’s focus was on the environmental impacts of serving coffee in the retail stores, the project’s visibility and Starbucks’ access to the expertise of the Alliance for Environmental Innovation staff helped the company move forward on other environmental performance improvement projects. For example, the Company has instituted an environmental purchasing policy that addresses wood and paper procurement criteria, among other considerations. In addition, the benefits of its partnership with the Alliance encouraged Starbucks to engage with another nonprofit organization, Conservation International, to promote sustainable shade-coffee cultivation.

About the partners

The Alliance for Environmental Innovation (the Alliance) is a joint initiative of Environmental Defense and the Pew Charitable Trusts. The Alliance works with businesses to reduce waste and to build environmental considerations into business decisions. By combining the expertise and perspective of environmental scientists and economists with the business skills of leading companies, the Alliance is able to create environmental solutions that make business sense. For more information on the Alliance’s work, please refer to its website, www.environmentaldefense.org/alliance.

Starbucks Coffee Company is the world’s leading retailer, roaster, and brand of specialty coffees. In addition to its retail locations in North America, the United Kingdom, the Pacific Rim, and the Middle East, Starbucks sells coffee and tea products through its specialty sales operations, including its online store at www.starbucks.com. Starbucks also produces and sells bottled Frappuccino® coffee drink and a line of super-premium ice creams through its joint venture partnerships and offers a line of innovative premium teas produced by its wholly owned subsidiary, Tazo Tea Company.

Objectives of the Starbucks-Alliance Task Force

Serving coffee at Starbucks

Starbucks customers can enjoy their hot beverage of choice in a ceramic mug, a durable commuter mug, or a paper cup. The majority of customers take their hot beverages in disposable paper cups lined with polyethylene and topped with a polystyrene lid. In the past, two paper cups were frequently nested together for better insulation. Then in January 1997, Starbucks introduced a corrugated paper sleeve to be used as an insulating layer in place of a second cup. The sleeve, which was made from 60 percent postconsumer recycled fiber and used 45 percent less material than did a second paper cup, was an environmental improvement. The sleeve was originally developed as an interim solution while Starbucks and the Task Force looked for a new single-cup design that would meet its environmental requirements.

Most people who order their drinks “to go” use disposable cups, as do many customers who drink their coffee in Starbucks’ stores. Cold coffee-based drinks such as Frappuccino® and Tiazzis are served in disposable plastic cups made from polyethylene terephthalate (PET).

Starbucks had established reusable-cup programs and products before forming the Alliance partnership. For in-store customers, ceramic mugs were available in most stores for hot beverages. For carryout customers, Starbucks encouraged the sale of reusable acrylic and stainless steel tumblers, thermoses, and mugs by providing a free beverage of choice with their purchase. Starbucks also offered a 10-cent discount on each beverage to customers who brought in their own reusable cups. But despite these programs and products, the low use of reusables by Starbucks customers suggested that there were still more opportunities for increasing their participation.

Responding to the concerns of both customers and partners (employees), Starbucks decided to explore ways of expanding the use of reusable coffee cups in its system and also to develop one or more new single-use hot cups to reduce environmental impacts. This project also presented opportunities for Starbucks to make environmental improvements that extended beyond its own operations and influenced practices in the specialty coffee and other “to go” beverage industries.

The Starbucks-Alliance Task Force

The Starbucks-Alliance partnership was established early in 1996. Reducing the environmental impact of using disposable cups seemed like a good project for the Alliance and Starbucks, given the Alliance’s expertise in packaging issues and its experience in working with companies to find innovative solutions to environmental concerns. In March 1996, a meeting between Starbucks’ senior management and the Alliance led the two organizations to draw up a joint work plan.

The Starbucks-Alliance Task Force was formally established by a memorandum of agreement signed in August 1996 by the president and chief operating officer of Starbucks, the director of the Alliance, and the executive director of Environmental Defense (formerly the Environmental Defense Fund). This memorandum defined the Task Force’s goals and operating procedures (see appendix A). Under the agreement’s terms, Starbucks and the Alliance would each pay its own expenses for the project.

Both parties pursued their business and advocacy activities as they saw fit, and both were free to withdraw from the project at any time.

In the Task Force's daily operations, Starbucks was represented by Sue Mecklenburg, director of environmental and community affairs; Karen Humphrey, environmental and community affairs manager, who was succeeded by Ben Packard, environmental affairs manager; Jan Hagestad, senior buyer; and Steve Schmidt, market research project manager. The members of the Task Force were appointed by Starbucks vice presidents of marketing, retail operations, and supply chain operations, departments that had committed to support the Task Force. Representatives from the Alliance included Ralph Earle, a former director of the Alliance; John Ruston, an economic analyst; Deborah Falcone, a mechanical engineer; and Linda Tsang and Kevin Bryan, both environmental engineers. When necessary, the Task Force called on additional staff resources from the Alliance and Starbucks.

The Task Force's objective was to reduce significantly the environmental impacts of each beverage that Starbucks sold. The Task Force set out to achieve this by simultaneously increasing the use of reusable cups and reducing the environmental impacts of using disposable hot cups.

Increasing the use of reusable cups at Starbucks

The first step in reducing the environmental impact of serving coffee was to increase the use of reusable cups. To realize the environmental, economic, and customer benefits from reusing cups, the Task Force instituted new programs to make reusable cups attractive, functional, and convenient for Starbucks customers. Its tests demonstrated that reusable cups not only created environmental and economic benefits but also pleased the customers.

In-store reusables pilot test, August 1997

During July and August 1997, the Task Force conducted a pilot test in three Boston-area stores in which Starbucks' partners (employees) asked customers if their drink was "for here or to go" at the point of sale. Those customers who purchased their beverages "for here" received their hot drink in a ceramic cup unless they requested otherwise. Cold beverages were served in glassware, a new addition to the stores, instead of plastic polyethylene terephthalate (PET) cups. Signage and cup displays also encouraged customers to choose reusable cups and glassware for in-store service. During the pilot program, labor, dishwashing, and reusable cup and glass use were monitored by Task Force members in the store and by Starbucks partners. In addition, during the final week of the pilot test, an independent market research group conducted a detailed and statistically significant customer survey on in-store and take-out reusable cups.

The in-store reusables pilot test showed that noteworthy environmental and economic benefits could be achieved from even minor changes in store operations. For example, the use of reusables in the test stores increased overall from an average of 18 percent before the test to 57 percent during the pilot test.

In addition, the glassware used in the pilot stores for cold beverages was very well received by customers. As a result of this pilot test, glassware for cold beverages was made available to all Starbucks stores in North America.

Green Team in-store reusables test, August 1998

In the summer of 1998, Starbucks' Environmental Affairs Department deployed its Green Team regional coordinators, a group of Starbucks store managers with environmental responsibilities, to determine whether they could replicate the earlier pilot test results. The Green Team conducted an eight-week test in 13 stores in which all customers ordering beverages after 10:00 A.M. were asked if they would like their drink "for here." The store managers were asked to track all reusable drinks served and paper cup inventories and to assess the effect on the partners' morale and the customers' satisfaction.

With as few as three or four reusable cups used per hour, the Green Team estimated that an average Starbucks store could save hundreds of dollars per year in paper cup costs alone. Furthermore, the test stores reported anecdotal evidence indicating an increase in customer satisfaction and associated purchases as a result of the reusables option.

The Green Team regional coordinators worked with their regional management teams to communicate the findings of the in-store test and to promote the program. A posttest audit conducted by Starbucks' Finance and Planning Department verified the results of the pilot test.

Evening program

The Environmental Affairs team has also been working closely with the Retail Operations business unit to incorporate reusable cups and glasses in a new program aimed at boosting business during evening hours. The company tested the use of more attractive, colored ceramic cups in 30 stores in two markets and then introduced this program to more than 300 stores. The Task Force's research and the Green Team's subsequent pilot test helped gather information about customers' interest in more attractive serveware as a way to promote its usage.

Environmental benefits of reusable cups

Numerous studies indicate that reusable cups such as ceramic mugs and glasses offer important environmental advantages over disposable cups and that those advantages multiply with each use. Although the magnitude of environmental benefits depends on the type of reusable cup and the number of times it is used, according to most environmental measures, reusable cups are preferable at typical reuse rates.

The Alliance conducted an environmental analysis of the full life cycle of ceramic, paper, glass, and polyethylene terephthalate (PET) plastic cups, from the extraction of raw materials to their manufacture, use, and disposal. The Alliance found that the breakeven point beyond which environmental benefits began to accrue was approximately 70 uses for ceramics and 36 uses for glass. Given that a reusable cup may be used, on average, 1,000 times or more (and is generally designed for 3,000 uses), the environmental benefits of using reusable cups in terms of reduced energy use, air and water pollution, and solid waste can be tremendous.

The Alliance research revealed that reusable cups and glasses can provide the following environmental benefits over disposable serveware during their anticipated lifetime:

- **Energy Use:** Using glasses in place of disposable PET plastic cups reduced energy use by 98 percent based on 1 million beverages served in glasses, including environmental impacts of manufacturing, using and washing glasses.
- **Water Pollution and Usage:** Both ceramic and glass reduced water pollution by 99 percent. Ceramic reusables reduced water usage by 64 percent.
- **Air Pollution:** Ceramic reusables reduced the amount of air particulates by 86 percent and of greenhouse gases by 29 percent. The use of glass cut the amount of volatile organic compounds (VOCs) by 99.7 percent and of nitrogen oxide (NO_x) and sulfur oxide (SO_x) emissions by 99 percent.
- **Solid Waste:** Ceramic reusables reduced solid waste by 86 percent, and glass reusables cut solid waste by 88 percent, by weight.

As reflected in these large reductions, the glass-manufacturing process is much less environmentally harmful than the PET-manufacturing process. For example, the amount of energy needed to make glass is 93 percent less than that needed to make

PET.¹ In addition, when one considers that the glasses are reused and washed and that each PET cup and lid are thrown away, the glasses have very desirable environmental benefits.

Business benefits of reusable cups

Using reusable cups offers many economic benefits, including cost savings and, possibly, greater customer satisfaction.

- **Cost Savings:** The Task Force’s research showed that for in-store sales, the increased use of reusables eliminated the cost of disposable cups with only a minimal incremental cost. Furthermore, the greater use of in-store reusables did not measurably increase dishwasher use. During the pilot test, the additional step of asking customers “for here or to go” and busing tables did not seem to require more labor. The cost breakeven point for ceramic cups was approximately 15 to 20 uses and, for glassware, about 25 uses.
- **Increased Customer Satisfaction:** Starbucks customers in in-store market research and focus groups consistently stated that they preferred reusable cups, noting that they insulated coffee well, were attractive, and prevented waste. Eighty-two percent of the Starbucks customers surveyed liked the idea of reusable cups, and when asked what they liked most about them, 59 percent noted the environmental benefits. The information received during the reusables project and from the specific reusable programs will help Starbucks continue its efforts to satisfy customers by addressing their environmental concerns.
- **Enhanced Brand Equity:** Building brand equity is critical to Starbucks. In market research, Starbucks customers consistently reinforce the assumption that the company’s environmental leadership can add value to its brand. Such sound environmental practices as reusable cup programs and the overwhelmingly positive customer response to them will help Starbucks to achieve this goal.

Financial and environmental benefits of reusable cups for coffee shops

The following, “Reusables Analysis: Universal Coffee Shop” (see chart on following page) outlines the financial and environmental benefits of reusable cups for coffee shops and restaurants, based on the results of Starbucks tests.

¹ Tellus Institute, *Energy Implications of Integrated Solid Waste Management Systems*, prepared for the New York State Energy Research and Development Authority, Albany, NY, report no. 94-11, July 1994; Tellus Institute, *Assessing the Impacts of Production and Disposal of Packaging and Public Policy Measures to Alter Its Mix*, prepared for the Council of State Governments, the U.S. Environmental Protection Agency, and the New Jersey Department of Environmental Protection and Energy, May 1992, report no. 4, “Impacts of Production and Disposal of Packaging Materials—Methods and Case Studies,” chap. 2; Franklin Associates, “An Energy Study of Plastics and Their Alternatives in Packaging and Disposable Consumer Goods,” prepared for the Society of the Plastics Industry, November 1992; Alliance calculations.

Reusables Analysis: Universal Coffee Shop

ASSUMPTIONS:

\$0.15	Cost of disposable packaging (cup, lid, and insulating sleeve)
\$1.25	Cost of 16-oz. reusable ceramic cup (cup only)
1,000 uses	Lifetime of reusable ceramic cups
12 hours	Number of hours the coffee shop is open per day

RESULTS:

No. of reusable cups used per hour	Daily cost savings*	Annual cost savings [†]
2	\$ 3.57	\$1,285
4	\$ 7.14	\$2,570
10	\$17.85	\$6,426

No. of reusable cups used per hour	Annual water Savings (gal.) [‡]	Annual greenhouse gas reduction (lb.) [‡]	Annual solid waste reduction (lb.) [‡]
2	1,631	226	252
4	3,262	452	504
10	8,155	1,130	1,260

CRITICAL SUCCESS FACTORS:

Excess Washing Capacity: The Starbucks-Alliance research indicated that the system had unused dishwashing capacity.

Storage: The store needs to have storage space for a small supply of cups near the service area and additional storage for dirty dishes before they are washed.

* = no. of reusable cups used per day (cost of disposable packaging (cost of reusable serveware/1,000.

[†] Multiply by 360 days.

[‡] Based on the use of a 16-oz. ceramic mug in place of a 16-oz. cup with sleeve, by weight.

Increasing the use of reusable cups by take-out customers

A large percentage of Starbucks' customers purchase take-out beverages and they use disposable cups largely for convenience. Some customers bring their own reusable cups for functional reasons (e.g., insulated cups keep coffee warm during a long commute), to reduce environmental impacts, or as part of their daily routine.

To persuade more to-go customers to switch from disposable to reusable cups, they must be given a meaningful incentive and/or a significant convenience benefit. The Task Force presented several ideas listed below to promote the use of reusable cups with these goals in mind. As of this writing, these ideas have not been tested or adopted.

Affinity Cup: Market research shows that Starbucks customers are generally concerned about many social, cultural and environmental issues. Moreover, Starbucks has a long-standing corporate commitment to giving something back to those communities where it does business. The Affinity Cup program would support the interests of

Starbucks and its customers, while promoting the use of reusable cups, by donating money to a designated local community organization instead of offering a 10-cent discount for using a reusable cup.

Loyalty Cup: Starbucks customers expressed a desire for loyalty rewards. Accordingly, by combining a loyalty reward with using a reusable cup, the Task Force could create two benefits with one program. The Loyalty Cup program would soften the environmental impact by providing incentives to reuse cups, such as free beverages and/or coffee merchandise based on the number of purchases made with a reusable cup.

Smart Cup: The Task Force also looked to new technology as a means of increasing the use of reusable cups. This idea envisions a “smart cup” with a hidden electronic transponder in its base that would allow customers to deduct purchases from a debit account. Similar to the recently introduced toll booth payment systems, the Smart Cup is an innovative retail concept that would provide convenience while allowing Starbucks to gather information about customers’ preferences and then to design its marketing and promotions accordingly. Most important, it would promote a retail technology that would benefit both the environment and business.

Developing a new disposable hot cup

The majority of Starbucks' beverage business is take-out, with most of those drinks sold in disposable cups. All of the double cups or cup-and-sleeve combinations used by Starbucks and its customers affect the environment through their production, distribution, packaging, and disposal. Thus, another of the Task Force's priorities was to develop a single-use hot cup that would be an environmental and functional improvement over using a second cup.

At the project's outset, the Task Force decided on the following criteria for evaluating different designs for a new disposable hot cup:

- Environmental performance
- Functional attributes of the cup and lid
- Performance in retail operations
- Market appeal
- Economic and production feasibility

Setting goals and a testing process

In September 1996 the Task Force drafted a letter requesting interested designers, cup manufacturers, and inventors to consider producing a single, disposable hot cup alternative for Starbucks. This letter was mailed to more than 40 individuals and organizations. Enclosed with the letter were a one-page description of the "Task Force's Criteria for a New Disposable Hot Cup System for Starbucks" and the "Task Force's Time Line."

The time line forced the Task Force to draw up a short list of design candidates by the end of the year. Then the Task Force planned to present the most promising designs, as well as the Starbucks current cup and sleeve, to Starbucks customers in focus groups across the United States. Ultimately, the Task Force intended to put the top three designs into Starbucks stores for a series of market tests.

Parties interested in submitting prototype designs were directed to contact a Task Force member by mid-October 1996 and to arrange a meeting with the Task Force in November or December 1996. Thus began the process of evaluating a variety of disposable hot cup designs. The Task Force met with approximately 25 individuals, organizations, and companies. The meetings, in Seattle and Boston, served as a preliminary screening of the various designs. Candidates were encouraged to present cups, lids, prototypes, and drawings and also to address issues such as the environmental impacts and feasibility of producing their cups.

Seattle, Chicago, and Boston focus groups, February, 1997

After the final design presentations, the Task Force rated the cups according to its criteria and narrowed the options to seven designs plus the current cup and sleeve. Focus groups composed of Starbucks' core customers were convened in Seattle, Chicago and Boston. They brainstormed about their vision of "the perfect disposable hot cup" and also responded to the moderator's questions about the look, feel, and performance of the eight cup options. The customers were not told the company's reasons for designing a new, single hot cup. Indeed, many commented that Starbucks was probably try-

ing to cut its expenses or improve the appearance of the cup to improve marketing. Although only a few groups cited the cup's environmental impact as the principal motivation, each focus group did include an environmental attribute such as "recycled or recyclable" as one of the top three items on its list of the characteristics defining the perfect hot cup. Many customers in the focus groups also mentioned their dislike of polystyrene cups.

The Task Force was surprised to learn that the Starbucks focus groups in all three cities favored the same designs. The most popular cup was designed by Sue Mecklenburg, Starbucks' director of environmental and community affairs, in discussions with the Alliance staff. This cup came to be known as the "Saleni cup" (from Starbucks-Alliance for Environmental Innovation). Mecklenburg took advantage of the insulating benefits of a long-available paper-forming technique, embossing, which was used on a second layer of paper wrapped around a standard paper cup. Using an embossed pattern to create an air space between the paper layer in contact with the coffee and the second layer in contact with the customer's hand was one way to enhance the cup's thermal protection. If the cup's outer wrap were made from a different type of paper than that of the inner cup, the raised pattern of the cup's outer layer could also have aesthetic appeal. The team therefore worked with a graphic designer to combine the technique of debossing with creative design considerations to produce an attractive and environmentally preferable outer layer of paper that insulated the customer's hand from the coffee. (Debossing is the opposite of embossing. In debossing, the pattern is pressed into the paper, away from the viewer, whereas in embossing, the pattern is pressed out toward the viewer.)

The other two cup designs favored by the focus groups were already being manufactured. The first was on the market but not widely distributed. The second was a product extension of a disposable hot soup cup and had received very limited testing in the marketplace as a beverage hot cup.

At the conclusion of the focus groups' meetings, the Task Force agreed to market-test a 16-ounce version of the three top designs after evaluating customers' opinions of the current cup and sleeve. The market tests were planned for a group of 18 stores, six each in the same three markets as the focus groups.

Starbucks asked Solo Cup Company, Starbucks' current hot and cold cup supplier, to handle production of the Saleni cup for the market test. Saleni had been very well received by Starbucks customers and ranked high on all of the Task Force's criteria. Questions regarding commercial production, thermal and environmental performance, and costs, however, had yet to be answered.

Deciding on a design: July–October, 1997

The first market tests were conducted over four months, from July through October 1997. All the test cups were made of paper with polyethylene linings. Two of the cups, including the Saleni cup, had an additional layer of paper wrapped around each cup for insulation. The third design incorporated a second layer of expanded polyethylene for insulation. Both the inner cup and the outer wrap of the Saleni cup used in these market tests were made from 100 percent white virgin paperboard. The Task Force had discussed using a cup wrapped with a brown or tan-colored outer layer, as well as an all-brown cup, and had produced prototypes of each. The manufacturers, however, were not able to produce cups in time for the market test using

tan-colored paper, so the Task Force decided to conduct the test using standard white paperboard.

A random selection of Starbucks customers were interviewed during each wave of the market tests and were asked to evaluate the cup's performance and appearance. A second group of customers, the "Star Panels," participated in each wave of the research and therefore judged all the cup designs.

The Saleni cup emerged as the clear winner from the market research, just as it had in the focus groups. Customers believed that it was an environmentally friendly solution to double cupping. In fact, this design evoked such comments as "Great design—continues to differentiate Starbucks."

This market research was presented to Starbucks' senior management in November 1997. The president and the chief operating officer then requested an additional round of tests to address two issues that had come up in both the focus groups and earlier market tests. First, even though prototypes of tan and brown cups made with recycled paper had tested well in the focus groups, Starbucks wanted more assurance that a nonwhite cup would be acceptable to its customers. Second, Starbucks wanted to ensure that the cup would satisfy the insulation criteria.

In fact, many questions remained, including the feasibility of commercial production and the costs of developing and introducing the Saleni cup. Dealing with a set of interdependent unknowns was a challenge for the team, but the Task Force and Solo had enough enthusiasm and conviction to warrant going forward.

Starbucks' senior management asked the Task Force to work with Solo on the commercial production of the Saleni cup and to run an expanded market test in a larger number of stores. The test would enable the Task Force to evaluate a cup that had been commercially produced on a relatively large scale and to achieve environmental gains by incorporating an unbleached outer wrap into the design.

Testing the Saleni Hot Cup: March–April, 1999

After 18 months of research and development and production cup testing with Solo, Starbucks found a cup that met the thermal performance criteria outlined in the original plan. The test was conducted in 30 stores in San Francisco and Washington, DC, for three weeks in the 16-ounce (Grande) size only.

The market research had two elements: a self-administered survey to be returned to the store and an in-store "imagery" interview comparing the brown Saleni used in the test, a white Saleni, and the current cup and sleeve. Customers were rewarded with a free beverage in exchange for their participation. The objectives of the test were to make sure that customers would accept the unbleached brown color and to find out their perception of the cup's thermal performance. Customers were also asked about the cup's overall performance.

The results of this market test were mixed. The majority of customers liked the unbleached paper and quickly recognized the design's environmental friendliness, but a minority felt the cup was still too hot. Unfortunately, the paperboard used to manufacture the cups had a defect that was not discovered until the cups were being tested. Specifically, the faulty paper allowed liquid to "wick" out of the cup along the seam at the rim, leading to some flimsy cups and, in a few cases, leaking. This situation had a negative effect on the results of and attitudes toward this cup although the problem with the paper had nothing to do with the new design elements of the Saleni cup.

The results of the “imagery” interviews indicated that Starbucks’ customers did not insist on a white cup and in fact appreciated the company’s move toward a more “natural” recycled or unbleached appearance (see appendix B).

Even though the customers’ reactions to the new cup were overwhelmingly positive, doubts about production and the economic feasibility of the Saleni design, combined with uncertainty about reducing the incidence of double cupping, ultimately led Starbucks’ senior management to end this research project. Furthermore, since the introduction of the sleeve, customers’ comments about insulation and double cupping had subsided significantly. Starbucks’ current plans are to use a corrugated paper sleeve made from 60 percent postconsumer material to provide insulation.

The Task Force thoroughly analyzed the Saleni cup’s potential environmental and business benefits. Although more development work is necessary to bring this concept to market, it is clear that the Saleni cup design offers an opportunity for innovation.

Partnership Agreement

Agreement between Starbucks Corporation and the Alliance for Environmental Innovation to establish a Joint Environmental Task Force

1. Starbucks Corporation, doing business as Starbucks Coffee Company (Starbucks), and the Alliance for Environmental Innovation, a project of the Environmental Defense Fund and The Pew Charitable Trusts (the Alliance), agree to establish a joint Task Force (Task Force) to develop programs and initiatives that will create substantial environmental benefits and enhance Starbucks' business performance. This agreement sets out the terms on which Starbucks and the Alliance will work together.
2. This project will be an integral part of Starbucks' ongoing programs to improve its environmental performance and leadership. The initial goal of the Task Force will be to develop environmentally preferred approaches to serving hot coffee to Starbucks' customers. These approaches will reduce the environmental impact of current cup materials and practices and will meet Starbucks' performance, financial and marketing requirements. Specifically:
 - a. The Task Force will develop proposals for significantly expanding the use of reusable coffee cups in the Starbucks system and by Starbucks' customers.
 - b. The Task Force will develop one or more new single-use cups for hot beverages (hot cups), considering materials and cup designs that minimize environmental impacts.
3. Within six months, the Task Force expects to make a public announcement regarding progress on the hot cup project. Providing that sufficient progress has been made on hot cup solutions, Starbucks and the Alliance will determine whether and how to proceed in jointly developing a broad, long-term program for Starbucks' environmental initiatives. This potential program will address mutually agreed-upon areas where Starbucks' business has significant environmental impacts, and will include measurement, reporting and public communication components.
4. The Task Force will be composed of three Alliance staff and four Starbucks staff with a broad range of appropriate expertise. The Alliance team will include the director of the Alliance, a senior economic analyst and a research associate. The Starbucks team will include representatives from Environmental Affairs, Marketing, Retail Operations Services and Supply Chain Operations. Additional Alliance and Starbucks staff will be available as needed.
5. The Task Force will require priority efforts and time commitments by both parties. The attached schedule provides a general guideline for the timing and tasks required by the project.

6. In order for the Task Force to work effectively, it will be necessary for Starbucks to disclose certain information considered confidential by Starbucks. The Alliance agrees that all information identified by Starbucks as confidential or by its nature is clearly proprietary and confidential, whether or not specifically identified as such will remain confidential and will not be disclosed or used by the Alliance, except as required by law, other than in connection with this project. This confidentiality obligation will remain in place until Starbucks informs the Alliance in writing that the information is no longer confidential.
7. Where possible, information needs of the Task Force will be met using expertise within or accessible to the Alliance and Starbucks. Where outside expertise is needed, the Task Force will mutually agree upon and direct the work of expert consultants.
8. Starbucks and the Alliance will each separately and independently pay for expenses incurred by their participation in the Task Force. Meeting locations will be chosen to result in roughly equal travel expenses for the two parties. In addition, both parties will take all steps necessary to avoid any and all financial conflicts of interest. In particular, the Alliance acknowledges and agrees to abide by Starbucks' policy on insider trading.
9. In order to maximize the environmental benefits from the Task Force, Starbucks and the Alliance agree that innovations that arise as a result of their work together should be made widely available. In the event that the Task Force identifies or develops any product, process, manufacture or improvement (Invention), including Inventions made by retained consultants and outside experts, title to such Inventions, whether or not patentable, shall be in Starbucks. Starbucks agrees to make such Inventions available to other organizations at fair market value.
10. The Task Force will jointly prepare a concise report summarizing the environmental, economic and other advantages of the new cups and systems for serving coffee. This report will be jointly released by Starbucks and the Alliance. The cost of designing and printing the report will be shared.
11. If Starbucks and the Alliance significantly disagree on data interpretation or particular conclusions drawn in the report, the report may contain separate statements written by each party. Each party will have the opportunity to review and offer non-binding comments on these statements.
12. In the event that little or no agreement can be reached on the Task Force's recommendations, either party may withdraw from the Task Force at any time. If the project is disbanded, a joint announcement of this action will be made that reflects both parties' consent.
13. Each organization may communicate with its directors, shareholders, members, employees, and, for the Alliance, potential or existing funders, about the Task Force, subject to any restrictions on proprietary information. Neither Starbucks nor any of its agents will refer to its work with the Alliance in any marketing, advertising, promotional or point-of-sale material directed at customers or the public without the written approval of the Alliance.

14. As the work of the Task Force proceeds, both parties will pursue their business and advocacy activities on environmental issues as they see fit.

15. Following the conclusion of each phase of the project, Starbucks and the Alliance will be free to state and pursue their own views and perspectives with respect to the report and Task Force. If new written materials about the project are published by project team members within two years following the project's conclusion, each party will be provided with the opportunity to review these materials and offer non-binding comments. The Alliance and Starbucks will name their official public and Task Force spokespersons on all matters covered by this agreement.



Orin Smith
President and Chief Operating Officer
Starbucks Corporation

Date: August 9, 1996



Fred Krupp
Executive Director
Environmental Defense Fund

Date: 8/5/96



Ralph Earle
Director
The Alliance for Environmental Innovation

Date: 8/5/96

Projected task force schedule

MONTHS 1–3: INITIAL ACTIVITIES AND SCOPING

- Alliance staff learn about Starbucks' business.
- Develop criteria for evaluating materials and designs for hot cups and coffee delivery systems, including environmental impact, functional performance, marketing considerations, impact on operations, cost, and potential for commercialization.
- Scope operations and design options for expanding the use of reusable cups.
- Scope materials and design options for reinventing the coffee cup.
- Identify and engage individuals, companies, or organizations that can potentially assist in developing or commercializing different hot cup and reusable cup options (ongoing).

MONTHS 3–6: DEVELOPING AND EVALUATING COFFEE CUP OPTIONS

- Combine materials and design options to bring under consideration an array of new options for hot cups.
- Initiate evaluation of different cup designs and material combinations using criteria developed by the Task Force.
- Initiate evaluation of reusable cup options using the criteria developed by the Task Force.
- Assess steps to commercialization of new cup designs and reusable cup systems.
- Select a “short list” of potential reusable cups and hot cup options for further in-store testing.
- Potentially announce cups and reusable systems selected for further testing.

MONTH 6: DETERMINE WHETHER TO PROCEED ON JOINTLY DEVELOPING A BROAD ENVIRONMENTAL PROGRAM FOR STARBUCKS

- Scope topics to consider as part of this potential initiative.
- If a decision is made to proceed, formally determine the objectives, work, and timing required.

MONTHS 6–12: TESTING OF CUP DESIGNS AND COFFEE DELIVERY SYSTEMS, MAKING DECISIONS TOWARD SYSTEM-WIDE IMPLEMENTATION

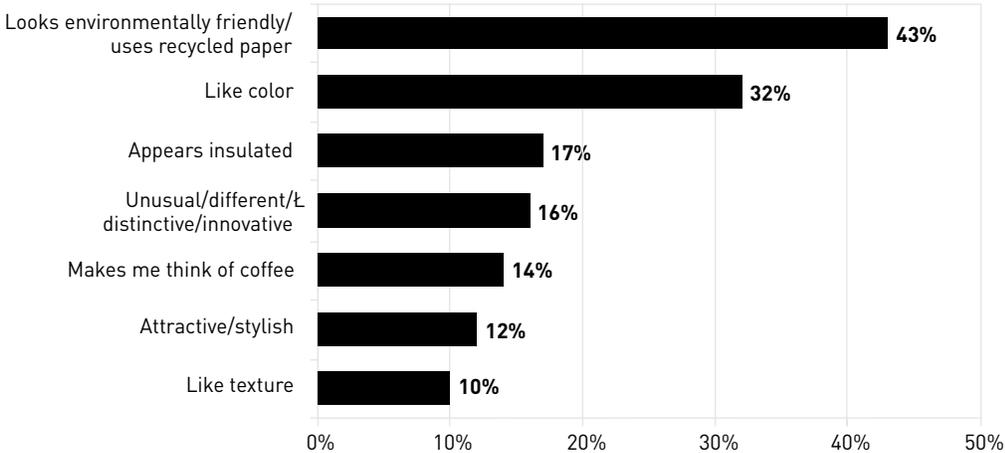
(Note: The actual schedule for this work depends on the time required to produce a sufficient volume of cups for broader testing and evaluation within the Starbucks system.)

- Begin testing alternatives to disposable cups in Starbucks stores.
- Obtain prototypes and small-scale production for further evaluation and in-store testing by Starbucks.
- Select “finalist” designs for reusable cup systems and hot cups.

APPENDIX B

Results of image portion of hot cup market research

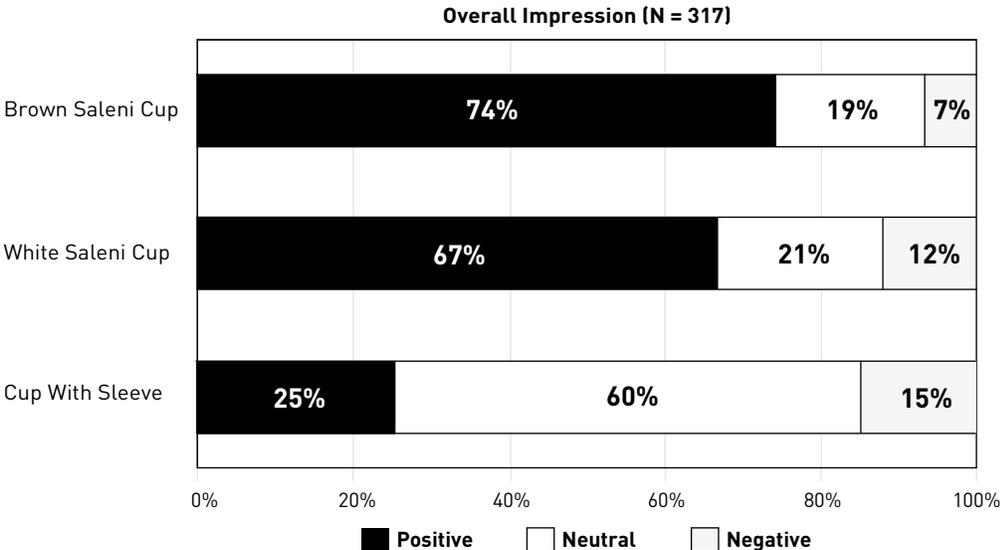
FIGURE 1



Main reasons for choosing Brown Saleni cup—unaided (base = those choosing Brown Saleni cup; n = 185). Among those choosing the Brown Saleni cup, the primary reason appears to be related to environmental advantages (43%) followed by color (32%).

The Research Department, Inc./Saleni Hot Cup Performance and Image Research (S12-99001)

FIGURE 2



When asked to give their overall impression of each cup, more customers (74%) rate the Brown Saleni Cup positively than the White Saleni Cup (67%) or the Cup with Sleeve (25%).

The Research Department, Inc./Saleni Hot Cup Performance and Image Research (S12-99001)

Universal coffee shop analysis

[Excerpt from the Green Business Letter, September 1999]

STARBUCKS SHOWS REUSABLES MAKE DURABLE PROFITS—The coffee company shows how small improvements can change a latte.

An experiment by Starbucks Corp. shows how small improvements can change a latte. The Seattle-based chain of coffee outlets has been testing reusable coffee mugs and glasses for beverages consumed in-store.

The results: Even a few reusables an hour can add up, yielding economic, environmental, and aesthetic benefits.

The company has partnered with the nonprofit Alliance for Environmental Innovation (AEI) since 1997, when it conducted pilot tests in three Boston-area stores. During the test, employees asked customers if their drinks were “for here or to go.” Customers ordering “for here” received ceramic mugs (for hot beverages) or glassware (for cold ones). Labor, dishwashing, and serveware use were monitored, and an independent market research group conducted a customer survey. More than 8 in 10 customers said they liked the idea of reusable serveware, with many citing the environmental benefits.

The test “showed that significant environmental and economic benefits were achievable through rather minor changes in store operations,” says Sue Mecklenburg, Starbucks’ director of environmental and community affairs.

Last year, the company conducted an 8-week test in 13 stores, asking all customers ordering beverages after 10 A.M. if drinks were “for here.” With as few as 3 to 4 reusables per hour, the company estimated that an average Starbucks store could realize savings of hundreds of dollars per year.

One helping factor was that the stores already had excess dishwashing capacity, so adding reusables didn’t require more dishwashing. The benefits have implications for the 9,500 café-style restaurants in the U.S. that could offer reusable serveware, says AEI’s Deborah Falcone. Even a few reusable “events” per hour, she says, can pay off.

Says Mecklenburg: “That was what surprised us: how quickly the savings could mount up.”

Environmental methodology for comparing hot cup designs

This appendix describes the methodology that the Alliance for Environmental Innovation and Starbucks used to evaluate and compare the environmental impacts of different hot cup designs.

Environmental criteria for the new hot cup

When members of the Task Force set out to find an alternative to double cupping, they agreed on the criteria for the new disposable hot cup system for Starbucks. These criteria addressed functional attributes of the cup and lid, in-store operational issues, environmental impacts, marketing and customer response, and economic and production feasibility.

For the environmental criteria, the following three measurable standards were established to give potential cup suppliers and Starbucks purchasing staff simple, clear and specific guidance in developing a new cup:

- **The new disposable cup will not exceed 1.5 times the weight of a current single cup.** As long as the cups being compared were made primarily from the same materials (i.e., paper), the weight of the paperboard was an appropriate indicator of the magnitude of the environmental impact associated with the paper of the cup. At the time this standard was set, Starbucks was double-cupping approximately 60 percent of its drinks. The slightly tighter standard of 1.5 times the weight of the cup was intended to help ensure that the new cup would be an environmental improvement. If the new cup was too heavy, it would require more material than is used in a combination of single cups for some drinks and double cups for others, an environmental step backward for Starbucks and for other companies that might use the new cup.
- **The total virgin content of the new disposable cup will be less than or equal to that of a current single cup.** Minimizing the amount of virgin material used in the cup would help ensure no net increase in ecological, health, or natural resource impacts of paper not fully characterized by the life-cycle inventory data.
- **The new cup will avoid using environmentally hazardous compounds in the manufacturing process, for example, chlorine compounds used to bleach paper pulp.** This standard applied to materials that create environmental hazards in certain plastics production processes (e.g., vinyl chloride, benzene, styrene) and in pulp and paper manufacturing (chlorine compounds such as elemental chlorine and chlorine dioxide).

These standards represented the minimum environmental thresholds and design guidelines for cup suppliers developing the new disposable cup. Meeting these standards provided reasonable assurance that when the full environmental analysis was completed, the new cup would constitute a net environmental improvement for Starbucks. However, meeting the standards was not a substitute for actually comparing all options to determine their relative environmental preference. The remainder of this section describes this methodology and how it was applied to different hot cup designs.

Applying life-cycle data to different hot cup designs

The Alliance for Environmental Innovation used a life-cycle inventory approach to conduct an environmental comparison of the disposable hot cup designs. While still being refined as an analytical tool, the life-cycle inventory is an excellent way to compare different products across a broad range of environmental indicators. More important, life-cycle inventories are also very useful for indicating where the design of individual products can be improved.

The cups' environmental profiles were quantified according to environmental data developed by the Paper Task Force (Duke University, the Environmental Defense Fund, Johnson & Johnson, McDonald's, The Prudential, and Time Inc.). This group conducted a three-year investigation of the environmental, economic, and functional issues in purchasing paper that both reduces environmental impacts and meets business needs. The process required more than 400 meetings with paper manufacturers and other experts, including more than 50 visits to paper mills, recycling facilities, and forestry sites, as well as multiple peer reviews by numerous scientists in academia, government, and the paper industry. The environmental database from this project was updated by the Alliance for Environmental Innovation.

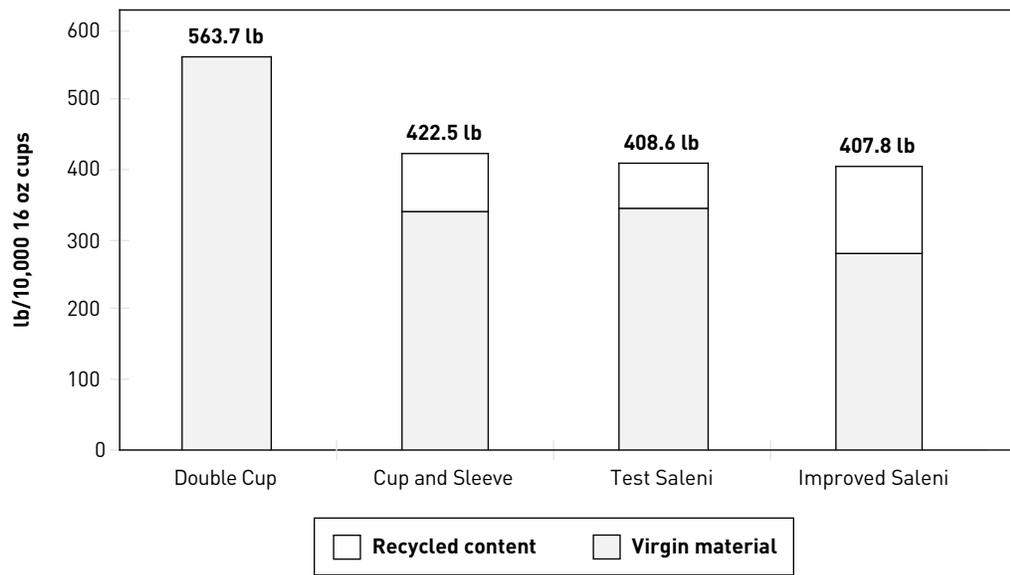
Environmental impacts that may not be fully revealed by life-cycle inventories were captured in the second and third standards regarding virgin content and hazardous compounds. Hazardous compounds may be released in small quantities in the manufacturing and disposal processes, thereby posing a public health concern. Damage to natural ecosystems caused by, for example, strip-mining or the conversion of natural forest to tree plantations is also usually outside the boundaries of life-cycle inventories.

Environmental comparison of the cup designs

By focusing on the paperboard, the largest material component of the final cup designs, the Alliance was able to identify most of its environmental impact. Using weights and data provided by Starbucks and Levin Brothers for the sleeve (Figure 3), a final environmental comparison of the paperboard was made for the following hot cup designs:

- **Double cup:** Two single cups made from 100 percent solid bleached sulfate (SBS) paperboard. At the start of the project, the double cup was the status quo cup used at Starbucks.
- **Cup and sleeve:** A single cup made from 100 percent SBS paperboard with a corrugated sleeve made from 40 percent unbleached virgin paperboard and 60 percent postconsumer material from old corrugated cartons. During our project, the cup and sleeve were used in conjunction with double cupping.
- **Test Saleni:** A two-layer debossed paper cup. The inner cup consisted of 100 percent SBS paperboard with an outer wrap made from 100 percent recycled paperboard, which consisted of 50 percent postconsumer material. This was the final prototype used in the June 1999 market test.
- **Hypothetical Improved Saleni:** A hypothetical, light-weight Saleni design with 6 percent less material used in the inner cup and an outer wrap made from 100 percent postconsumer material. This was used in the comparison to illustrate the change in environmental impact with a slight weight reduction and an increase in postconsumer material.

FIGURE 3



Weight of paperboard components (total weights in **boldface**).

Environmental profiles of the various cup designs were created by multiplying the weights of each type of paperboard (see Figure 3) by the appropriate life-cycle data on a per-ton basis. Then the individual contributions of each type of material were summed into a final environmental indicator. The complete environmental profiles showed energy use, air and water emissions, and solid waste impacts (see table 1).

The cups were compared with one another to keep the analysis as simple and clear as possible so that different and frequently changing weighting factors associated with the Starbucks serving mix could be applied. To allow for consistent and manageable data, all environmental comparisons were based on 10,000 16-ounce cups. Other cup manufacturing issues will be addressed later.

A look at energy consumption

Energy consumption is used in this appendix as an example of how the Alliance’s environmental database was applied to the different cup designs. The analysis of energy consumption was designed to cover most factors in the cup’s full life cycle, from the harvesting of trees, through pulp and paper manufacturing, to the disposal of the cup in landfills and incinerators. Tables 2 and 3 explain these individual factors for the virgin solid bleached sulfate (SBS) paperboard and recycled fiber system.

In examining energy use, the focus was on total energy use, that is, energy generated from combustion from all types of fuels, including those derived from wood by-products, as well as electricity purchased from utilities, measured in Btus. Purchased energy consumption, included in the total energy use, represents only that energy generated from the combustion of purchased fossil fuels and purchased electricity. The following total energy data assume the national proportions of waste managed by landfilling (79.7%) and incineration (20.3%).

TABLE 1
Environmental comparison of final cup designs

(data in boldface indicate the lowest environmental impact)

	Double Cup	Cup and Sleeve	Saleni	Hypothetical Saleni
Energy Usage				
(MBtu/10,000 16-oz cups)				
Total	11.10	7.12	7.47	6.66
Purchased	4.99	3.66	3.73	3.63
Fossil Fuel Derived	3.97	2.96	2.97	2.90
Air Emissions				
(LB/10,000 16-oz cups)				
ENERGY RELATED				
Total Greenhouse Gases	4052.63	2479.03	2592.55	2205.23
Net Greenhouse Gases	1577.20	1065.63	1078.75	975.66
Nitrogen Oxides	5.21	3.52	3.66	3.38
Particulates	3.30	2.12	2.25	2.03
Sulfur Oxides	7.30	5.10	5.28	4.98
PROCESS RELATED				
Hazardous Air Pollutants (HAPs)	0.68	0.42	0.42	0.34
Volatile Organic Compounds (VOCs)	1.61	0.96	1.04	0.87
Total Reduced Sulfur	0.11	0.07	0.07	0.06
Water Emissions				
(LB/10,000 16-oz cups)				
Biochemical Oxygen Demand (BOD)	1.72	1.11	1.25	1.04
Chemical Oxygen Demand (COD)	22.83	12.26	14.84	11.50
Suspended Solids	2.76	1.62	1.91	1.48
Effluent Flow				
(gal/10,000 16-oz cups)				
	5777.79	3288.09	4150.39	2993.08
Solid Wastes				
(LB/10,000 16-oz cups)				
	619.21	386.05	415.59	343.27

Explanations of specific contributions to total energy consumption for the virgin SBS system in Table 2 are as follows:

Tree Harvesting/Transport: Energy consumed in the process of felling and transporting trees to the mill.

Virgin Manufacturing Energy: Energy consumed to debark and chip the trees, pulp the chips, bleach and wash the pulp, and press and dry the pulp on the paper machines.

Collection Vehicle and Landfill Equipment/Municipal Solid Waste Collection: Energy consumed during the acquisition and consumption of fuels used by collection vehicles and landfill equipment.

TABLE 2

Percent contribution of total energy for the Virgin SBS Fiber System

Tree Harvesting/Transport	4.85%
Virgin Manufacturing Energy	97.53%
Collection Vehicle and Landfill Equipment	1.07%
Municipal Solid Waste Collection	0.15%
Waste-to-Energy Combustion Process	0.40%
Avoided Utility Energy Releases	-4.03%
Ash Landfill Disposal	0.03%
Total Energy (per ton of SBS paperboard)	39.4 million Btu

Waste-to-Energy Combustion Process: Energy consumed to operate the incinerator and associated equipment, including energy consumed in acquiring fuels used during the incinerator's operation.

Avoided Utility Energy Releases: Energy generated by burning paper in an energy-recovering incinerator. Because the electricity generated by burning paper displaces utility-generated electricity, it is "credited" against the energy requirements of the incineration process.

Ash Landfill Disposal: Energy consumed by ash transport vehicles and ash landfill equipment, as well as the energy consumed in acquiring the fuels.

Explanations of specific contributions to total energy consumption for the recycled fiber system in Table 3 are as follows:

Paperboard Collection: Energy consumed during the acquisition and consumption of fuels used by recycled collection vehicles.

Material Recovery System Process: Energy in the form of fuels consumed by equipment used to process recovered paper, including energy consumed in acquiring fuels used during equipment operation.

Residue Landfill Disposal: Energy consumed during the acquisition and consumption of fuels used by residuals transport vehicles and residuals landfill equipment.

Transportation to Market: Energy consumed during the acquisition and consumption of fuels used by vehicles transporting processed recovered paper to market.

TABLE 3

Percent contribution of total energy for the recycled fiber system

Paperboard Collection	5.65%
Material Recovery System Process	1.61%
Residue Landfill Disposal	0.24%
Transportation to Market	1.17%
Recycled Manufacturing Energy	91.33%
Total Energy (per ton of recycled paperboard)	17.5 million Btu

Recycled Manufacturing Energy: Energy consumed during the acquisition and consumption of fuels used by utilities to generate the electricity used to operate recovered paper-manufacturing processes.

The differences in the total energy consumption data for the different cup designs reflect the energy differences among the various types of paperboard integrated in the cup, not just the total weight. Recycled paperboard consumes 56 percent less total energy than that required for SBS paperboard. Unbleached paperboard (which eliminates the use of chlorine compounds in the bleaching process) used in the cup and sleeve uses a total of 28.3 million Btus per ton of paperboard, 28 percent less than the total energy use for SBS paperboard.

Note that the large total energy reduction indicates the greater consumption of wood resources and not the difference in purchased energy (fossil fuel consumption) between recycled and virgin paperboard. The fossil fuel consumption for recycled paperboard is equivalent to that for virgin paperboard. The increased consumption of wood-derived fuels in virgin paperboard has environmental implications for forestry resources and management. For instance, the manufacture of 100 million SBS cups would require 4,300 tons of trees.

In examining the energy impacts of the cup designs, the comparable energy consumption reflected the similarity in design and material content of the cup and sleeve and the Saleni designs. Essentially, both designs use a SBS cup with a recycled wrap. Even though the Saleni design is lighter than the cup and sleeve, the energy consumption of the cup and sleeve is 4.7 percent less because it incorporates more recycled content than does the Saleni (see Figure 3).

The hypothetical Improved Saleni design shows that changes in the weight of the Saleni inner cup and the additional postconsumer content in the outer wrap would result in the lowest energy consumption—and all other environmental indicators—of all the cup designs. Although this cup was not produced for the market test, the lightweight inner cup was used in a previous market test.

Other environmental impacts of the hot cup

The other components of the hot cup, such as the polyethylene used in the cup, the cup's fabrication and printing, and its transportation in the distribution system, were addressed in a preliminary environmental analysis. A full life-cycle environmental analysis of these components was not conducted, since the initial analysis suggested that including these factors would not change its conclusions.

For example, switching from the double cup to the current Saleni design would eliminate one polyethylene lining. But according to data from Starbucks' supplier, the low-density polyethylene lining accounts for less than 1.2 percent of the current single Solo cup's total weight. At 1.2 percent of the cup's weight, the energy used to make one polyethylene lining is 0.69 million Btu per 10,000 single cups. Compared with double cupping, the total energy consumption for both the cup and sleeve and the Saleni cup is decreased by 9 percent. Even with this reduction, the relative comparison of all the cup designs remains the same. In regard to other environmental impacts based on the current research available on plastics, polyethylene is relatively benign, especially when compared with polystyrene and polyvinyl chloride (PVC).

The cup-making process, including its actual fabrication and printing, was similar for all the cup designs. Overall, the differences are unlikely to have a significant net environmental effect on any of the designs, especially when comparing the Saleni cup with the cup and sleeve. Although the cup-and-sleeve design required additional energy to manufacture the sleeve, the Saleni cup required additional energy to deboss the outer wrap. It was assumed that the difference in the impact of printing between the cup and sleeve and the Saleni cup would be negligible.

The energy impacts associated with transportation in the distribution system are a relatively insignificant part of the total energy consumption. The manufacturing process consumes the most energy, more than 90 percent for both virgin and recycled paperboard. As shown in tables 2 and 3, the energy associated with transportation to market in the recycled fiber-based system accounted for 1.2 percent of the total. Assuming that the transportation energy for the Starbucks' system was comparable, its impact was relatively small.

Conclusions

Although all life-cycle inventories show both advantages and disadvantages, the results here were robust enough to draw several conclusions:

- The paperboard-manufacturing process has by far the largest environmental impact.
- Virgin SBS paperboard has a significantly greater manufacturing impact than does recycled or unbleached paperboard.
- For the Saleni cup to be an environmental breakthrough beyond that already achieved with the cup and sleeve, the cup's weight and composition must be similar to those of the Improved Saleni.
- Taking into account the effects on the ecosystem due to forest management and the production of hazardous compounds in the manufacturing process, these conclusions favor recycled and non-SBS virgin paperboard.

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