SKIP THE SLIP

Environmental & Human Health Impacts of Paper Receipts

2020, 3rd Edition

SKIP THE SLIP

Green America®

TABLE OF CONTENTS

Co-Authors: Beth Porter & Ayate Temsamani, Green America
Editor: Todd Larsen, Green America
Report design: ninebar

Green America
1612 K Street NW, Suite 600
Washington, DC 20006
GreenAmerica.org

Skip the Slip Report, Version 3, published October 20, 2020. (Version 1 was published May 10, 2018)
Contact Beth Porter at bporter@greenamerica.org with questions.

This report was produced with the generous support of the Lisa and Douglas Goldman Fund. None of the companies listed within the report have contributed any funding to its production.

WHY RECEIPTS?

Every year in the United States, receipt use consumes over three million trees and nearly 9 billion of gallons of water. Production and disposal of receipt paper generates unnecessary waste and emits the carbon equivalent of over 400,000 cars on the road[1]. Extraction and use of these resources take a toll on the climate, a reminder that we need to continue replacing outdated, wasteful items with innovative solutions.

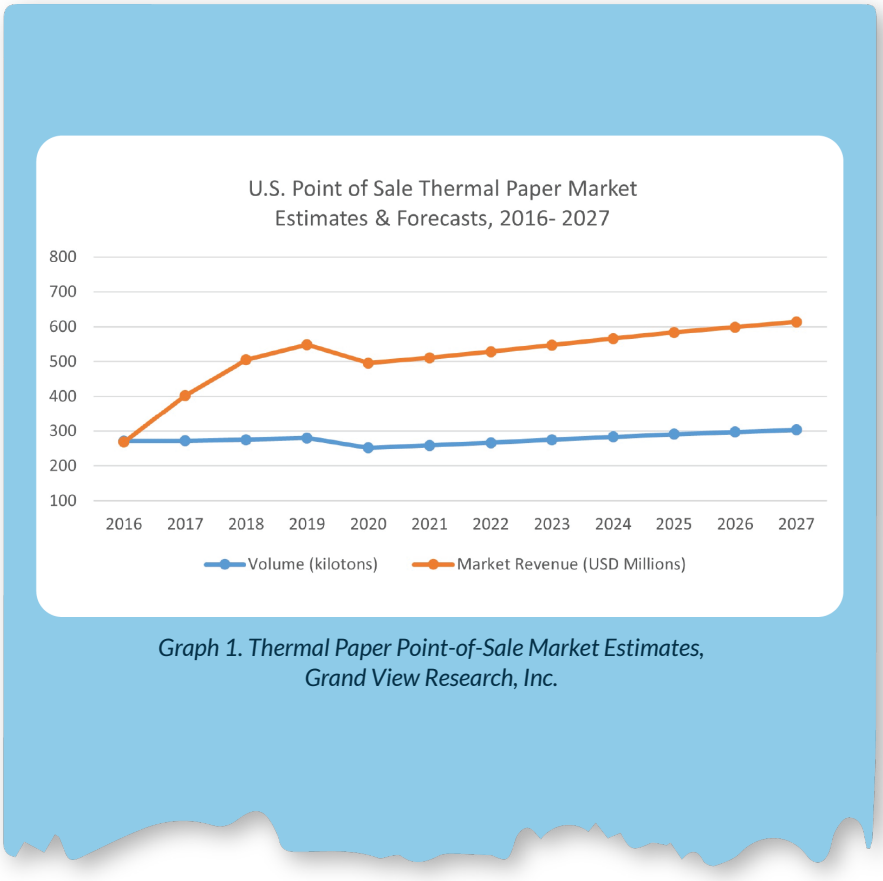
Receipts also pose health risks to people who are regularly in contact with them. An estimated 93 percent of paper receipts are coated with Bisphenol-A (BPA) or Bisphenol-S (BPS), endocrine-disruptors which serve as color-developers to make the text appear on receipts[2]. When we touch receipts, the chemical coating is absorbed into our bodies through our hands. BPA impacts fetal development and is linked to reproductive impairment, type 2 diabetes, thyroid conditions, and other health concerns. Companies have sought out "non-BPA" paper, but the replacement is commonly BPS, a similar chemical which research indicates has similarly detrimental effects as BPA[3].

Retail employees experience the highest levels of exposure, as studies show workers who have regular contact with receipts have over 30 percent more BPA or BPS found in their bodies, and many employees may exceed the European Union's limit for the safe amount of BPA to absorb in a day (4 micrograms per kilogram of body weight per day)[4]. While it is uncertain precisely how much of this BPA and BPS in workers' bodies is directly influenced by contact with thermal paper receipts, retailers are exploring options for moving away from using these papers in stores.

There are many existing solutions which eliminate the need for phenol-coated paper and can reduce paper waste, however some communities experience barriers to accessing these solutions. In this report, we discuss these barriers, different receipt solutions, some suppliers of these alternatives, and retailers successfully using them.

RECEIPT CONSUMPTION IN THE US

Analysis from Grand View Research shows that the consumption of thermal paper for receipts has increased in the United States and worldwide but decreased in 2020 due to the COVID-19 pandemic. Additionally, the cost of thermal paper has increased each year due to a critical shortage of leuco dye from 2017, essential for producing thermal paper. Major suppliers of leuco dye, were temporarily shut down due to exceeding limits of hazardous fine particulate matter in their emissions. This cut leuco dye production by an estimated 80%, which led to drastically higher prices[5]. This cost increase is one reason why reducing the automatic printing of unwanted paper receipts can save a business money over the long-term. Retail stores are the largest users of thermal paper for receipts and in 2019 the sector spent more than $312 million on receipt paper: a high cost for paper that is mostly discarded or lost by customers after leaving the store.



Graph 1. Thermal Paper Point-of-Sale Market Estimates, Grand View Research, Inc.

IMPACTS OF COVID-19

The coronavirus pandemic has impacted thermal paper consumption in the United States as markets saw a dip in demand for receipt paper and related market revenue. In 2019, the US used 280,000 metric tons of receipt paper, which decreased to an estimated 252,000 tons this year. Consumption is projected to increase in subsequent years, although it's possible contactless payments will become more the norm for the long-term and potentially impact that growth.

There's been a large increase of online shopping during the health crisis, resulting in an increased demand for paper packaging[6]. A surge in toilet paper demand during the pandemic has also prompted the rise in fiber production. As a consequence, the price of fiber is increasing exponentially along with the increase in demand[7]. The price of paper was already increasing pre-pandemic era, and now it's even higher, which should incentivize offices and retail stores to fully digitize their receipts.

For health precautions, many stores have begun asking if the customer wants a receipt before printing, to reduce physical touch between the employee and customer. Also, as many companies were forced to move to remote work, sectors that relied on in-person transactions and manual processes for billing and paper invoices are looking for ways to greater automate Accounts Payable (AP) operations and invest in technologies that fill the gap between manual processes.

These changes are reducing paper waste and the costs associated to it. In an economy where people avoid physical interactions as much as they can, it is the ideal time to transition to an economy that relies on e-receipts and make it the status quo even in the post-pandemic era. Digital receipts remove the need for physical contact with people as well as protect cashiers from the toxins found in thermal paper receipts coated with BPA and BPS. Payment automation also reduces paper use and associated costs.

Another reason to avoid paper receipt, especially at this time, is the fact that the virus can survive on surfaces for several hours or even days depending on the surface[8]. There is a potential risk of transmission after touching a paper receipt that the cashier has touched prior to that[9]. Retail stores should use this time to introduce e-receipts or promote them if they already have them in place.

PROGRESS FROM CVS ON RECEIPTS

In 2017, our Skip the Slip campaign began urging CVS to address its wasteful, BPS-covered paper receipts. Thousands of individuals signed our petition requesting that CVS switch to phenol-free paper and boost its digital receipt program reduce paper waste. This campaign led to a dialogue between Green America and CVS on receipt alternatives, including reducing the length of receipts, providing digital opt-in prompts for customers to sign up for digital receipts, and switching to phenol-free, recyclable paper.

This year, CVS implemented phenol-free paper in all 10,000 stores to replace its previous receipt paper which contained Bisphenol S. The company has increased promotion of its digital receipt option and CVS reports that 5.9 million customers have signed up, 1.1 million of which signed up in 2019. CVS estimates that in 2019, 58 million receipts were sent digitally and it reports that the digital option has saved 48 million yards of receipt paper - more than enough paper to circle the globe[10]. Customers can sign up in store or on the **CVS app** and in store. Green America encourages CVS to go further and provide an option on its website for customers to sign up for digital receipts to increase participation. CVS has also stopped providing paper instructions on prescription refills. The company estimates that in 2019, it saved $50 million in reduced paper expenses by cutting waste and boosting digital communication. However, just 9.5 percent of CVS' 62 million Extracare members have opted into digital receipts. The above numbers prove the significant paper and cost savings of increasing digital participation, and Green America advises CVS to continue expanding promotion of its digital option.

While these are positive steps, the pharmacy can do more to reduce its paper waste. For example, only 4 percent of CVS' direct mail contained recycled content. We urge the company shift towards using high recycled content, certified paper for its direct mail using **Canopy's EcoPaper Database** and develop strategies to reduce direct mail overall.

REDUCING PAPER WASTE

Despite a decline in some paper products use due to the rise of digital technologies, we are still producing mountains of the material. Paper use is going up globally, exceeding 400 million metric tons per year. China, the U.S., Japan, and Europe are the largest consumers[11]. In North America, we consume on average 215 kg per person (four times the global average). By comparison, Africa accounts for only 2 percent of global use and a mere 7 kg/person[12].

Individuals and institutions are going paperless in some ways, but when we decrease our paper use in one area, the consumption can shift to another product. For example, we are using less office paper, but online shopping and delivery packaging has increased. Paper production, from deforestation to manufacturing processes, can pose consequences to the environment and communities.

Pulp and paper companies acting irresponsibly have even violated lands rights of indigenous peoples and communities[13]. Worldwide impacts on communities from production can include environmental degradation, pollution, destruction of sacred lands and negative impacts on local economic sectors like fishing and tourism[1415]. The worldwide paper recycling rate hovers around 58 percent, and while the U.S. recycling rate is above the global average at 64 percent, it trails Australia (85 percent), Japan (80 percent), Europe (72 percent), and Canada (70 percent)[16]. Recycling rates can be challenging metrics since different definitions and methods of measuring may be employed. However, these numbers offer some insight into the ways that paper recycling has improved and how much more progress is needed.

ENVIRONMENTAL IMPACTS

The following environmental impacts compare the past two years of thermal paper use for receipts in the United States. Grand View Research data shows that, in 2019, the U.S. consumed 280,000 metric tons of Point of Sale (POS) receipts. However, based on changes to receipt use since the start of the COVID-19 pandemic, Grand View estimates that in 2020, U.S. consumption will decrease to 252,000 metric tons.

Using this data and the Environmental Paper Calculator[17], Green America estimates the following environmental impacts:

	2019	2020
OVERALL VOLUME	280,000 metric tons	252,000 metric tons
WOOD USE	3,630,000 trees	3,270,000 trees
WATER CONSUMPTION	9,920,000,000 gallons (equivalent to over 7 million clothes washers operated/yr)	8,930,000,000 gallons (equivalent to over 6 million clothes washers operated/yr)
GREENHOUSE GAS EMISSIONS	5,110,000,000 pounds of CO2e (equivalent to 464,000 cars/yr)	4,600,000,000 of CO2e (equivalent to 418,000 cars/yr)
ENERGY USE	8,620,000 million BTUs (equivalent to over 10 million refrigerators operated/yr)	7,760,000 million BTUs (equivalent to over 9 million refrigerators operated/yr)
SOLID WASTE FROM PRODUCTION & DISPOSAL	330,000,000 pounds (equivalent to waste of 75 million people/day)	297,000,000 pounds (equivalent to waste of 67 million people/day)

**Per the advice of industry experts, our analysis included a 20 percent average of recycled content in thermal paper. We also used the supercalendered grade in the Paper Calculator, which is a category of printing & writing paper, which only sees 8 percent recycled fiber use globally. For this reason, it was determined that 20 percent would be a very conservative estimate.*

The annual estimate of thermal paper for receipts represents less than 1 percent of the 71 million metric tons of paper used in the US. But consider that receipt paper use in the U.S. alone has the same greenhouse gas impact as over 400,000 cars on the road each year for paper receipts that many customers don't even need[18]. The short-term aim of Green America's Skip the Slip campaign is to address the wasteful impacts and health risks associated with paper receipts. A larger goal is to raise awareness to the complex impacts of commonplace materials we engage with every day, and the varied ways individual actions and corporate responsibility influence our waste streams.

Waste reduction includes identifying processes or items that can be replaced with environmentally preferable alternatives. By making changes to curb waste, we can reduce consumption at the source and institute a longer-lasting replacement. These changes can pave the way for reducing waste by addressing a variety of items. Reducing unnecessary waste can save more than the material itself. Resources are used to produce even the smallest of items and when those are produced in the billions, there is ample reason to explore their usefulness.

FORESTS

Forest ecosystems are essential to a healthy, functioning planet. Forests produce fresh oxygen and are also powerful agents of carbon sequestration. By absorbing roughly 40 percent of global fossil fuel emissions every year forests contribute greatly to battling climate change[19]. At the same time, deforestation accounts for 25 percent of global carbon emissions caused from human activities[20]. In short, deforestation is slicing away at forests' potential to sequester much more carbon.

When we log forests to produce paper and wood products or to clear land for agriculture, these carbon sinks become carbon emitters. As Dogwood Alliance reports, logging is diminishing the net forest carbon sink in the US by at least 35 percent, and if soil emissions from logging were included, this number would be "significantly higher"[21]. Globally, forests are pulling enough carbon from the atmosphere to equate to 25 percent of anthropogenic emissions, but in the United States, forests are only removing 13 percent of our country's annual emissions[22]. Dogwood Alliance also reports our nation's forests are still operating at a carbon deficit, since new growth has not absorbed past emissions from forest loss.

To satisfy paper and wood demands, tens of millions of acres of biologically diverse forests have been destroyed and converted to monoculture tree plantations made up of one species[23]. A wider range of tree species, as we see in natural forests, sequesters more carbon than single-species forest[24]. Planting trees is a noble effort that yields positive results and is a valuable tool in addressing climate issues, but it is still a mitigation strategy. Proposals to plant trees to counteract emissions from removal ignore the fact that we'd have to use unsustainable volumes of water and land to maintain these carbon sequestering tree plantations[25]. To address the root of the problem we must cut overall emissions, which means reducing pressure on forests by curbing production of wasteful materials and leaving diverse, natural ecosystems intact.

WATER

Water sustains ecosystem functions, such as nourishing the plants which produce oxygen. We need fresh water for our food production and to maintain sanitary conditions in communities. Every living thing on the planet needs water to survive. Less than one percent of fresh water on the entire planet is suitable for human use and consumption[26]. Water insecurity is already impacting communities worldwide, as 783 million people currently do not have access to clean water[27]. The UN estimates by 2030, our need for water will surpass the steady supply by 40 percent[28]. To meet these growing pressures for fresh water, and to address the additional pressures on supply that result from climate change, we will need to greatly reduce water waste.

We could save nearly 9 billion of gallons of water every year by reducing paper waste such as unwanted paper receipts.

GREENHOUSE GAS EMISSIONS

Greenhouse gases are released through each phase of extracting new resources used to produce thermal paper receipts, including the emissions to transport and distribute them. From harvesting and processing the wood pulp to producing the millions of gallons of oil used in their production, paper receipts have unnecessary climate impacts. Emissions also result from the waste generated by paper production and the disposal of the paper itself.

Many municipalities advise putting receipts into the trash as they are considered a contaminate in recycling streams. The Minnesota Pollution Control Agency reports that the chemicals used in thermal paper are water-soluble, so the majority leach out into wastewater during the recycling process. While much of the BPA is removed during treatment, wildlife could still be endangered by wastewater discharges, and the paper industry has been observed to be a "major BPA contributor to the influent of the waste water treatment plant"[29].

The remaining 10 percent of BPA that does not leach out in wastewater remains in fiber used for new recycled products, and the bisphenol levels found in new paper products varies greatly between paper grades[30]. Seventh Generation, which sells a wide range of recycled paper products, has addressed this issue on its website. It periodically tests household paper products for BPA and it reports the testing has uncovered a small amount of the substance was found in those products. The company states, "our research shows that the likely source of this BPA is the thermal papers used for cash register, ATM, and other receipts, which are often made with BPA[31]."

As for landfill disposal, it's observed that over time BPA contaminates landfill leachate at a wide range of concentrations. However, there is limited data available to assess concentrations from US landfills and research shows that BPA can be effectively removed through treatment of leachate from landfills. Based on this information, it is recommended to dispose of thermal paper receipts in the trash[32].

HUMAN HEALTH IMPACTS

Paper receipts are not only wasteful, but they can also negatively impact human health. Thermal paper requires heat and a coating to display purchase information on the receipt. Ecology Center estimates that 93 percent of receipts in the U.S. are coated with phenol chemicals, Bisphenol-A and Bisphenol-S (BPA and BPS), which serve as color developers of the paper[33]. These substances are easily transferred to anything that touches the paper, including our hands and into our bodies, where they act as endocrine disruptors. BPA impacts fetal development and is linked to reproductive impairment, type 2 diabetes, thyroid conditions, and other health concerns. The Environmental Working Group has reported that the total mass of BPA on a receipt is up to 250 to 1,000 times greater than the amount of BPA found in a can of food or in plastic bottles[34].

In 2018, Ecology Center found that 75 percent of tested receipts were coated with BPS, and 18 percent were coated with BPA[35]. In response to public concerns around BPA, companies began printing receipts with BPS-coated thermal paper, a similar chemical. A 2018 study found that BPS is as significant of an endocrine-disruptor as BPA, even though there is less awareness surrounding its potential harms amongst the public[36]. As of 2014, nearly 81 percent of Americans were shown to have detectable levels of BPS in their urine, and nearly 90% of human exposure to BPS is from thermal paper receipts coated with the substance[3738].

Workers regularly touching receipts have over 30 percent more BPA in their bodies than other adults, based on urine tests[39]. Many employees may be regularly exceeding European BPA exposure limits due to their frequent contact with thermal paper receipts[40]. The "tolerable daily intake" (TDI) represents the maximum amount of a substance that humans can safely absorb. In 2015, the European Food Safety Authority declared previous TDI limits for BPA (50 micrograms per kilogram of body weight per day) were set too high and lowered the limit to 4 micrograms[41]. In early 2018, the European Commission issued a ban on BPA in thermal paper to begin in 2020 and has asked the European Chemicals Agency to study the effects of BPS[42].

U.S. POLICY ACTION

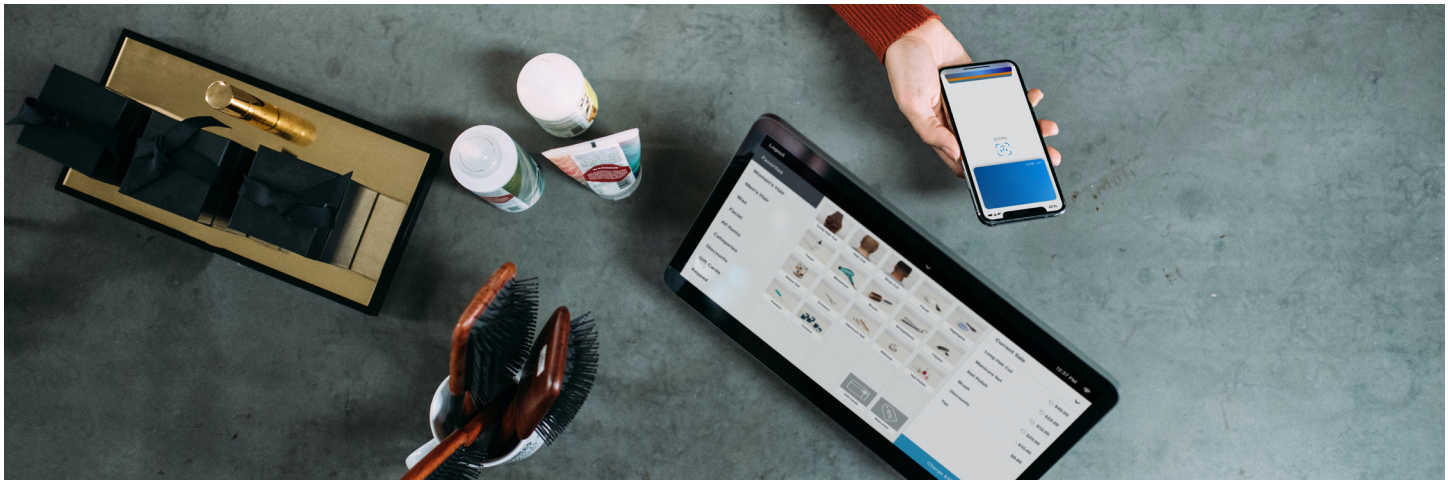
In 2018, after the U.S. National Toxicology Program released part of a long-term, multi-year study on BPA, the FDA declared BPA exposure had "minimal effects," but did so without adequate scientific evidence to back up the claim[43]. The study data was not peer reviewed, and the methodology of the study was not designed to detect endocrine disruption. There has been no announced U.S. national initiative to tackle phenols in thermal paper, such as the EU ban.

On the state level, Connecticut was the first in the U.S. to ban BPA in receipt paper on the grounds of health concerns in 2011[44]. Other states have banned BPA in baby bottles and similar containers, and the FDA banned the use of BPA in baby bottles nationwide in 2012[45]. But no federal policy initiatives exist to end phenols in thermal paper, and no other states have enacted bans except Connecticut. The Environmental Working Group

reports that the total mass of BPA on a receipt is 250 to 1,000 times greater than the amount of BPA found in a can of food or baby formula, or in plastic baby bottles[46].

In January 2019, California Assemblymember Phil Ting introduced a new bill with the aim of reducing paper receipt waste. Inspired by Green America's Skip the Slip campaign, AB 161 would require businesses to offer a digital receipt option and provide a paper receipt upon customer request. The legislation exempted cash-only businesses, small businesses as defined by the state, and businesses using short-form receipts on paper free of BPA and BPS[47][48].

AB 161 was approved by the assembly but failed to pass the State Senate. Assemblymember Ting's office has stated that they plan to reintroduce it in the near future[49]. That said, the bill inspired other states to follow suit. New York City council has announced that it is considering a package of bills that could restrict the use of bisphenol A (BPA), require stores to offer e-receipts, and require businesses to use recyclable receipt paper. However, legislation requiring digital receipts as the only proof of purchase is not advised, due to the lack of access to tech for some. Furthermore, racial profiling and harassment by store employees and security guards is a significant barrier for many customers in switching to digital receipts.



BARRIERS TO DIGITAL RECEIPTS

DIGITAL DIVIDE: LACK OF ACCESS

The global pandemic has further exposed gaps in internet access within communities. Although Green America advocates for more digitization and e-receipts, we recognize that there are customers who don't have access to the internet or digital devices. According to a 2018 Pew Research study, nearly one-third of Americans still do not have internet access at home[50]. The digital divide is mainly experienced among older populations and less affluent ones[51]. Roughly three-in-ten adults with household incomes below $30,000 a year don't own a smartphone, and households headed by persons 65 years and older continue to fall behind in both computer ownership and internet use[52].

Additionally, the digital divide is widely felt in rural areas of the country that tend to have fewer connectivity choices and slower internet connections[53]. According to the Pew Research Center, 33 percent of Americans in urban areas and 42 percent in rural locations have no access to broadband internet making digital receipts an unsuitable option[54].

Subsequently, the COVID-19 outbreak has revealed the urgent need to close the digital divide. Digitization enables innovations such as telemedicine, teleworking, and online education to proliferate. It is important to note that this "new" normal of the increased digital world will likely continue throughout and beyond the pandemic. In a world where technological innovations are becoming more significant every day, all individuals should have easy access to the internet. Digitization is a powerful lever for transformation in individual and collective development. To address the problem, the FCC created in February 2017 the Connect America Fund allocating up to $4.53 billion over 10 years to advance high-speed 4G LTE wireless internet service primarily in rural areas[55]. The FCC is also launching the Rural Digital Opportunity Fund, which would direct up to $20.4 billion to expand broadband in unserved rural areas[56].

RACIAL PROFILING IN STORES

Paper receipts can serve as an immediate proof of purchase, and Black and Brown shoppers are demanded by store employees to prove purchase at disproportionally higher rates. According to a 2018 Gallup poll based on 6,000 U.S. adults, more Black customers reported to be treated less fairly than white customers while shopping[57]. Such experiences can include everything from slights, like being ignored in favor of a white patron, to serious attacks on dignity and liberty, like being detained and questioned after making a purchase or handcuffed on suspicion of shoplifting[58]. Racial profiling in stores should not be seen simply as inconvenient for people; it can lead to the arrest of an innocent person, physical harm, and even escalate to life-threatening situations. Such discrimination can also affect people's mental health. Studies have shown that discrimination is uniquely painful for Black people, increasing the likelihood of depression and suicide[59].

In some cases, employees are told to follow people of color, which demonstrates that the issue is reinforced by and contributes to systemic racism[60]. The problems with bias generally flow from the top of the organization and it can even be unconscious, which make prescriptive bias trainings largely ineffective. Instead, corporate leadership needs to issue clear policies prohibiting racial profiling and ensure compliance through third-party reviews of practices. Companies should provide easily accessible channels for employees or customers to file complaints if they see or experience racial profiling and harassment and have a process to respond to allegations with immediate action.

Because of accusations of racial profiling, some stores that used to check customer receipts upon leaving are putting an end to this policy. For instance, Lowe's suspended its receipt checking practice nationwide after customers complained Lowe's was only checking receipts in specific stores in "high-theft" and "inner-city" locations[61].

All customers have a right to shop in a store, including exiting the store, without fear of harassment or racial discrimination. This shift in retailer practices needs to happen to create an environment that allows all customers to feel safe in requesting or opting-in for digital receipts. Until these issues are tackled, electronic receipts cannot be a viable option for many, exposing them to human health risks from paper receipts coated in toxic chemicals. Green America will urge retailers to adopt anti-discriminatory practices and advocate for a more equitable and inclusive society.

CUSTOMER SURVEYS

In 2019, Green America surveyed Americans on receipt preferences and learned that 89 percent of respondents would like retailers to offer digital receipts as an option[62].

- Nearly 40 percent of respondents have already signed up for digital receipts from stores that offer that option. The largest support for digital receipts came from those identifying as 44 years old or younger.
- The primary reasons people cited for why they prefer digital receipts are the environment and ease of receipt storage.
- Over 50 percent of respondents stated they throw away or lose between half and all of the paper receipts they receive, even ones they intended to keep.
- A third of all respondents want to see companies do more to reduce receipt waste.

These findings are in line with the goals of Skip the Slip. We want retailers to offer a digital option, phenol-free paper receipts by customer request, and an option for no receipt so that customers can have the choice. Forward-thinking retailers are already looking to offer paperless options, as preferred by many younger customers. By offering these options, stores can reduce paper waste and save money by not printing receipts people do not want. Digital receipts can provide greater opportunities for records retention and security, it's good for the environment and the bottom line.

The survey was conducted by Censuswide, with 1,011 General respondents in the U.S. between July 11-15, 2019. To see full survey results, please visit ***greenamerica.org/receipt-survey.***

THE SOLUTIONS

Innovative companies offer a digital receipt option or allow customers to skip receipts altogether. The most common drivers for switching include customer convenience, corporate goals to reduce paper use, consumer protection (digital receipts are easier to trace and result in less identity theft), and other cost-saving needs. But many retailers continue to only provide paper receipts, most of which are made using BPA or BPS. Retailers can take steps to improve receipt practices and ensure transactions are efficient, secure, and better for workers and the environment. *This is an overview and not an exhaustive list of all retailers and software providers offering these solutions.*

OFFER A "NO RECEIPT" OPTION

For some transactions, particularly at convenience stores, cafes, or fast-food restaurants, where there is little potential for customer returns, offering an option for no receipt has the lowest environmental impact. At the beginning of each transactions, customers can be asked, "Will you need a receipt?" Then retailers would only print (or email) a receipt to customers that answer affirmatively.

Digital receipts still have an environmental impact, as an average email (including one for a digital receipt) is estimated to have a footprint of 4 grams of carbon dioxide[63]. Since a mature tree can absorb roughly 21,772 grams of carbon dioxide every year, by keeping trees in forests rather than using them for unwanted paper receipts, Green America estimates that one tree can accommodate the emissions of over 70 individuals emailing every year.

Additionally, if companies abandon fossil fuel contracts and shift to powering networks and data centers with clean energy, the impacts of digital receipts will be even smaller. While the environmental impacts of a paper receipt vary depending on length of receipt and other factors, in general paper receipts have a higher environmental footprint than digital. Retailers can contact their point of sale (POS) system supplier to disengage the auto-print option.

DIGITAL RECEIPTS

Green America recommends offering digital receipts as a primary option when a receipt is needed to curb environmental impacts and offering phenol-free paper by request. Customers can choose to have a copy of their receipt emailed to them, which eliminates the need for paper receipts and improves the security and efficiency of transactions. By offering this service as the primary alternative to "no-receipt", customers are encouraged to take a simple, convenient step that can go a long way in reducing waste.

Digital receipts also provide benefits to consumers and protect merchants. With an electronic receipt system, it's much easier for the customer to retain their receipts. It improves customer convenience and reduces fraudulent activities. Digital receipts are easier to track as they are directly linked to the point of sale system. Paper receipts can fall out of bags or pockets, which opens the door to fraud if a receipt falls into the wrong hands.

Digital receipts can be used to enhance record-keeping, especially since the IRS has allowed digital receipts to be provided in response to audits since 1997[64]. For business owners as well customers, record-keeping can easily become a digitized process. Digital systems allow individuals to total up expenses for the past year and search for receipts easily when filing taxes or responding to an audit. For businesses, digital systems help maximize tax deductions and protect them if they are audited. Available software for digital record-keeping includes Shoeboxed.

It is important to promote digital receipts to customers and make it easy to participate. If a digital program is designed as an opt-in with multiple steps or is not promoted, companies might not see a large percentage of customers participating if the program.

Digital receipts are also price-competitive with paper–based receipts. Digital receipts require machinery that many businesses already own, such as registers, point of sale equipment, computers, tablets or smartphones. Some digital receipt options require the purchase of card readers or special plug and play products, yet such products remain price competitive and many involve a one-time investment. In the following sections, we provide sample price points for digital and non-toxic paper options.

There are different types of digital receipts depending on the uses a company needs to fill or the distribution it prefers using (sending the e-receipt to email, an app, etc.).

A) Dynamic Digital Receipts

Companies can provide either a simple e-mail, with no additional marketing information, or provide a dynamic email receipt. Dynamic receipts are used to provide future promotions and offers to the customer, gather relevant feedback, and develop digital marketing strategies.

They can also provide another stream of communication between the customer and the retailer but is most beneficial for all involved when customers are explicitly asked to opt into further messages from the company. Green America supports receipt practices that are centered on customer preference and needs.

Transaction Tree, a company specializing in digital receipts, requires that customers opt in for marketing features. It warns retailers of the repercussions from using "intrusive marketing efforts[65]." A quick way to lose the respect of a customer is by bombarding them with unsolicited messages. A customer opting in for digital receipt is not automatically opting for additional marketing or further messages. A single digital receipt can include any marketing, coupons, or survey opportunities.

Software Vendors: FlexReceipts, NeatReceipts, Square, Inc., Transaction Tree.

B) Card Readers (with e-receipts) for Smartphones and Tablets

Another digital solution is using a card reader for mobile devices. Vendors can accept credit cards and provide customers with receipts instantly, making transactions seamless and speedy. Such card readers are compatible with any mobile device, like smartphones and tablets. The readers send e-receipts and ensure secure transactions. As the customer's card is swiped or inserted, the information is securely sent to merchant bank which obtains the charged amount from the customer's bank or credit card account. Services like Apple Pay utilize contactless payments, which don't require customer information to be given to the retailer when the smartphone is held over the reader to begin the transaction.

In 2018, MasterCard, Visa, American Express, and Discover stopped requiring merchants to obtain signatures for most credit card purchases. Merchants using chip technology have seen fraudulent charges drop 70 percent from 2015 and 2017[66].

Card readers allow for businesses of all sizes to benefit from using digital receipts. **Green America's Green Business Network**, comprised of 3,000 small-to-mid-size businesses, often demonstrates that small businesses are sustainability innovators in their fields. Green America helps all small businesses go green, and we are encouraging our business members to adopt Square or Apple Pay as an easy way to lower their environmental impacts.

Contactless Software Vendors: Apple Pay, Android Pay
Mobile card reader vendors: Square, Inc., Clover Go, PayPal Here, Spark Pay

C) Integrations with Existing Registers

One of the easiest ways for a company to move from paper receipts to digital is to use a product that can integrate with the company's existing registers. Point of Sale (POS) systems provide the software and hardware that allows both e-receipts or paper receipts to be generated. The POS hardware includes a screen and keyboard at the check-out register, a barcode scanner, credit card reader, and a printer for receipts. The software is what distributes the receipt, and it can "live" on-site through a business' computer system or can be cloud-based and operate through the internet. A cloud-based system avoids the extra cost of upgrading software or paying for licensing fees. The system relies on the internet, but sales are still tracked when a connection falters and will sync up once it reconnects. POS systems differ from credit card terminals, which are the machines with a keypad for pin numbers and a pen for signatures, since terminals only function is to process payments whereas POS provides a wider range of services.

A POS software system records and tracks when goods or services are sold and can track inventory and manage personnel information. The software obtains data from the register's printers, so all the receipts being sent to the printer can instead be configured into a PDF and then the receipts are sent as emails to customers. The hardware will be the same whether a company uses software that processes receipts through an on-site computer system or the cloud. POS digital receipt systems work for companies using compatible print drivers.

Another option utilizes a "plug and play" system that provides both software and hardware to retailers. Retailers unplug receipt printers and then plug the printer into a device where the digital receipt appears on the screen. Once plugged in, the receipt goes into the cloud and no app needs to be downloaded by the customer because they receive the receipt via email. This technology can capture receipts before they're printed and digitizes them. These systems provide analytics to retailers that track customers' spending patterns.

An additional method is "tap and go", like contactless payments which have become extremely common throughout Europe. Mastercard reported in 2018 that Europe saw a 97% increase in contactless transactions from the previous year[67]. By contrast, only 3.5% of U.S. cards are contactless[68]. Contactless allows customers to pay by tapping their cards onto the store's checkout terminal. Similarly, "tap and go" transactions connect directly to POS terminals and does not require customers to give their email addresses for a digital receipt. The customer can tap their NFC enabled card or phone (Near Field Communication, which is a short-range wireless connectivity standard that allows communication between two devices once touched together) and have the receipts sent to cloud-based storage tied to the ID of their NFC card of phone. The digital receipts are securely stored, and customers can then retrieve their receipts at any time directly through an app on their iPhone or Android-based smartphone if that is their preference.

Software & Hardware Vendors: FlexReceipts, FuturePRNT POS Receipt Printer, Receet, TillBilly.

NON-TOXIC PAPER

The Pew Research Center notes that in 2017, 77 percent of Americans owned a smartphone, which was a large jump from only 35 percent in 2010[69]. While smartphone usage is becoming the norm, as noted above, there are still millions of customers who do not have smartphones or lack access to the internet. Additionally, customers may have access and still prefer paper receipts. If consumers request a paper receipt, companies should opt for non-toxic papers that don't contain BPA or BPS. There are a range of available alternatives to toxic paper receipts and a growing number of phenol-free paper receipts on the market. Generally, they use polymeric or Vitamin-C based coatings, which are safer for human health but also better for the environment, as they are recyclable in most areas.

Phenol-Free Vendors

- **Appvion POS Alpha Free** – This paper uses a vitamin C mixture for its coating, which gives a subtle shade of yellow to receipts. The yellow tint does not affect the visibility of the text.
- **BASF Pergafast 201** – This color developer is an alternative to using phenols as developers and was the first commercial alternative to BPA when it was released in 2011. Pergafast could potentially present some developmental hazards, but is not easily absorbed through the skin, in contrast to BPA and BPS[70].
- **Iconex 2ST™** – This new dual-printing process allows printing on both sides, which decreases the amount of paper rolls needed by 50 percent and reduces the cost of buying paper rolls. It is also BPA-free, BPS-free.
- **Koehler– BLUE 4EST** – Phenol free and uses polymeric coating that doesn't come off the paper like BPA/BPS. This paper uses a physical reaction to make text appear. When printing, heat applied to this paper activates the carbon black paper underneath which results in print appearing. Unlike phenol thermal paper, there is no chemical reaction involved. Koehler states this is the first thermal paper to be approved for direct contact with food.
- **Koehler KT 48PF** – Phenol-free paper that can be used with most thermal printers and provides receipts that last up to 10 years.
- **Plan It Green Printing** – This company supplies a 100% post-consumer recycled content, dissolvable receipt paper.

SELECT RETAILERS RECEIPT PRACTICES

A OFFERS DIGITAL AND PHENOL-FREE PAPER RECEIPTS

Best Buy	Ben & Jerry's	Apple
CVS	Target*	

B OFFERS PHENOL-FREE PAPER; NO DIGITAL PROGRAM

Whole Foods Market*	Trader Joe's
Costco	Lidl Grocer

C HAS OPTIONAL DIGITAL PROGRAM; USES BPA OR BPS PAPER

Lowe's	Banana Republic	Nordstrom*
Kmart	GAP	Starbucks
Macy's	In-N-Out Burger	Walmart
TJX Companies	Aldo*	

D NO DIGITAL PROGRAM; USES BPA OR BPS PAPER

Walgreens	7-Eleven	Panda Express
Burger King	Safeway	Taco Bell
Petco	Subway	Rite Aid
Family Dollar	Claire's	Aldi
Chipotle	McDonald's	Wendy's

Table 1. Select companies and associated receipt practices

**This denotes a company that offers a no receipt option or is exploring other alternative receipt practices.*
This is a selection of retailers, and not an exhaustive list.
Data for the scorecard was gathered from: direct contact with company, publicly available information, or research published by The Ecology Center or the Center for Environmental Health

HOW TO TAKE ACTION

Green America's "Skip the Slip" campaign is one of the first initiatives in the United States to analyze environmental and human health impacts of receipt usage and waste, propose solutions for businesses, and engage consumer action. Our goal is to reduce the unnecessary use of resources for receipts by promoting paperless options. For customers that do request paper receipts, we urge that non-toxic paper options be provided to them. Below are concrete steps you can take to address paper receipts:

If you're a consumer:

- At the start of a transaction, let the cashier know you don't want a paper receipt, and feel free to remind them towards the end.
- Request digital receipts when possible. You could also create a special folder for emailed receipts or even use a separate email address for digital receipts.
- Urge companies you patronize to adopt paperless options and non-toxic receipt paper. You can advocate in person or ask via social media or email.
- Fold receipt with the printed side in if you need to take a paper copy. This will lessen BPA/BPS exposure, since the back of thermal paper is often not coated.
- Be mindful of the products you purchase since everything we buy has an impact on the planet.
- If you get a long receipt, you can tweet a photo of it and tag the company to urge them to #skiptheslip.

If you're an employee:

- Ask customers if they'd like a receipt rather than automatically printing it.
- Confirm with your employer if the paper in your workplace has BPA or BPS coating or contact the paper supplier. Encourage your company to explore phenol-free options.
- Encourage the store manager to disable automatic printing and to make digital receipts optional.
- Share information on environmental and health impacts of paper receipts with other employees.
- Wear nitrile gloves to decrease BPA/BPS exposure to thermal paper receipts.
- Wash your hands after touching receipts using soap and water instead of alcohol-based hand sanitizers or lotion (which increase BPA/BPS absorption).

If you're a business owner:

- Issue clear, zero tolerance policies prohibiting racial profiling and ensure compliance by employees and store security through third-party reviews of store practices. Provide easily accessible channels for employees or customers to file complaints if they see or experience harassment and develop processes to take action on these complaints.
- Look into digital receipt and non-BPA/BPS paper options. Green America is glad to assist in strategizing the best receipt practices for your company. Please contact us to learn more.
- If you offer digital receipts, promote them to your customers. Make it a part of cashier training to ask if the customer wants a receipt, and then ask if they'd like paper or digital. Promote the paperless option on company website, app, and in-store signage at check-out.

SOURCES

1 Environmental impact estimates were made using the Environmental Paper Network Paper Calculator Version 4.0. For more information visit www.papercalculator.org.

2 Ecology Center, Ann Arbor, MI, Gillian Zaharias Miller and Lauren Olson. January 17, 2018 https://www.ecocenter.org/healthy-stuff/reports/receipt-paper-study-2018

3 Johanna R. Rochester and Ashley L. Bolden, Environ Health Perspect; DOI:10.1289/ehp.1408989, https://ehp.niehs.nih.gov/1408989/

4 Miller, Olson, Ecology Center, ibid.

5 Grand View Research, 2019, www.grandviewresearch.com.

6 WASTEDIVE, 2020, https://www.wastedive.com/news/covid19-fiber-recycling-tissue-ecommerce-occ/575824/

7 Waste 360, 2020, https://www.waste360.com/financials/more-covid-19s-twists-and-turnsfocusing-recycling-and-sustainability

8 WebMD, 2020, https://www.webmd.com/lung/how-long-covid-19-lives-on-surfaces

9 https://medium.com/zeipt/covid-19-yet-another-reason-why-paper-receipt-are-outdated-c8177847c069

10 https://cvshealth.com/sites/default/files/2019-csr-report.pdf

11 FAO Yearbook of Forest Products 2010-2014, p 186, http://www.fao.org/3/a-i5542m.pdf

12 FAO, Ibid

13 Watson, Evans, et al. NATURE ECOLOGY & EVOLUTION, Vol 2, April 2018 | 599–610 https://www.nature.com/articles/s41559-018-0490-x.epdf

14 Blakkarly, Jarni Apr 2015, Al Jazeera, https://www.aljazeera.com/indepth/features/2015/03/malaysia-indigenous-hit-hard-deforestation-150329101349832.html

15 Castello, Leandro, Virginia Tech, https://vtnews.vt.edu/articles/2017/12/cnre-amazonfisheriesyields.html

16 Environmental Paper Network, 2018, http://environmentalpaper.org/wp-content/uploads/2018/04/StateOfTheGlobalPaperIndustry2018_FullReport-Final-1.pdf

17 Environmental Paper Network Paper Calculator, ibid

18 Environmental Protection Agency, https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.

19 Lewis, Dr. Simon, University of Leeds, https://www.leeds.ac.uk/news/article/2246/forests_absorb_one-third_of_global_fossil_fuel_emissions

20 Moomaw, Mill and Smith, Danna. Dogwood Alliance, The Great American Stand Report, 2018 https://www.dogwoodalliance.org/wp-content/uploads/2017/03/The-Great-American-Stand-Report.pdf

21 Moomaw and Smith, ibid.

22 Ryan, M. G., Birdsey, R. A. & Hines, S. J. Forests and Carbon Storage. (2012). Available at: https://www.fs.usda.gov/ccrc/print/topics/forests-carbon.

23 Moomaw and Smith, ibid.

24 Isbell, Forest, et al. Nature volume 526, pages 574–577 (22 October 2015) doi:10.1038/nature15374 https://www.nature.com/articles/nature15374
25 Harvey, Chelsea. Scientific American. March 2018. https://www.scientificamerican.com/article/tree-farms-will-not-save-us-from-global-warming/?wt.mc=SA_Twitter-Share
26 United States Geological Survey. https://water.usgs.gov/edu/earthwherewater.html
27 Conservation International. https://www.conservation.org/what/Pages/fresh-water.aspx
28 United Nations Environment Programme. 2016. https://www.unenvironment.org/news-and-stories/press-release/half-world-face-severe-water-stress-2030-unless-water-use-decoupled
29 https://www.researchgate.net/publication/12484562_Bisphenol_A_Emissions_from_point_sources
30 Minnesota Pollution Control Agency, 2015, https://www.pca.state.mn.us/sites/default/files/p-p2s10-14.pdf.
31 Seventh Generation. https://help.seventhgeneration.com/hc/en-us/articles/222427887-Seventh-Generation-paper-products-and-BPA-
32 https://pprc.org/2015/pprc/should-we-recycle-thermal-receipts-that-contain-bpa/
33 Miller and Olson, ibid.
34 Lunder, Sonya et al. Environmental Working Group. 2010. https://www.ewg.org/research/bpa-in-store-receipts#.Wu8a9ogvzQB
35 Miller and Olson, ibid.
36 Hunt, Patricia, Washington State University, 2018 https://www.cell.com/current-biology/fulltext/S0960-9822(18)30861-3?_returnURL=https%3A%2F%2Flinkinghub.elsevier.com%2Fretrieve%2Fpii%2FS0960982218308613%3Fshowall%3Dtrue
37 Vaidyanathan, ibid.
38 Environ. Sci. Technol., 2012, 46 (12), pp 6515–6522 https://pubs.acs.org/doi/10.1021/es300876n
39 Lunder, et al, ibid.
40 Miller and Olson, ibid.
41 European Food Safety Authority. http://www.efsa.europa.eu/sites/default/files/corporate_publications/files/factsheetbpa150121.pdf
42 European Union. 2016. http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uris-erv:OJ.L_.2016.337.01.0003.01.ENG&toc=OJ:L:2016:337:TOC
43 vom Saal, Frederick et al. 2018. http://www.ehn.org/fda-flawed-statement-science-bpa-2542621453.html
44 State of Connecticut. 2011. https://www.cga.ct.gov/2011/ACT/PA/2011PA-00222-R00SB-00210-PA.htm
45 Tavernise, Sabrina. New York Times. 2012. https://www.nytimes.com/2012/07/18/science/fda-bans-bpa-from-baby-bottles-and-sippy-cups.html
46 Lunder, et al, ibid.
47 http://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=GOV&sectionNum=11342.610
48 https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201920200AB161

49 Los Angeles Times, 2019. https://www.latimes.com/california/story/2019-08-30/long-paper-receipts-california-lawmakers-reject-ban
50 ConsumerAction, 2019, https://www.consumer-action.org/news/articles/paper-or-digital-winter-2018-2019
51 Pew Research Center, 2019, https://www.pewresearch.org/fact-tank/2019/05/07/digital-divide-persists-even-as-lower-income-americans-make-gains-in-tech-adoption/
52 U.S. Census Bureau, 2018, https://www.census.gov/content/dam/Census/library/publications/2018/acs/ACS-39.pdf
53 ThoughtCo., 2019, https://www.thoughtco.com/sociology-of-the-internet-4001182
54 Pew Research Center, 2019, https://www.pewresearch.org/fact-tank/2019/05/07/digital-divide-persists-even-as-lower-income-americans-make-gains-in-tech-adoption/
55 Federal Register, 2017, https://www.federalregister.gov/documents/2017/03/28/2017-05665/connect-america-fund-universal-service-reform-mobility-fund
56 Federal Communications Commision, 2019, https://www.fcc.gov/document/fcc-proposes-204-billion-rural-digital-opportunity-fund-0
57 GALLUP, 2018, https://news.gallup.com/poll/1687/race-relations.aspx
58 The Guardian, 2019, https://www.theguardian.com/commentisfree/2019/jun/24/shopping-while-black-yes-bias-against-black-customers-is-real
59 https://www.newswise.com/articles/racial-discrimination-linked-to-suicide
60 Buzzfeed New, 2020, https://www.buzzfeednews.com/article/venessawong/anthropologie-employees-allege-racial-profiling-in-stores
61 https://www.washingtonpost.com/news/business/wp/2018/06/14/accused-of-racial-profiling-lowes-ends-policy-of-checking-customer-receipts-as-they-leave/
62 Green America, Receipt Survey 2019, https://greenamerica.org/receipt-survey
63 Tsukayama, Hayley. Washington Post. 2017. https://www.washingtonpost.com/news/the-switch/wp/2017/01/25/how-bad-is-email-for-the-environment/?noredirect=on&utm_term=.0741d39acbd9
64 International Revenue Service, https://www.irs.gov/businesses/small-businesses-self-employed/what-kind-of-records-should-i-keep
65 Weisbaum, Herb. CNBC. 2014. https://www.cnbc.com/2014/01/23/paper-or-email-pros-and-cons-of-digital-receipts.html
66 The Week Staff. 2018. http://theweek.com/articles/766883/end-paper-receipt
67 Mastercard, 2018, https://newsroom.mastercard.com/eu/press-releases/europe-leads-contactless-adoption-as-almost-1-in-2-transactions-are-now-contactless/
68 The Ascent, 2020, https://www.fool.com/the-ascent/research/contactless-payments/
69 Smith, Aaron. Pew Research Center. 2017. http://www.pewresearch.org/fact-tank/2017/01/12/evolution-of-technology/
70 Healthy Stuff. 2018. https://www.ecocenter.org/healthy-stuff/pages/receipt-paper-study-2018/recommendations