A NEW WAY HOME

Assessing the design opportunities to replace today's single-use plastic retail bag

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BEYOND THE BAG

Executive Summary

For decades, the single-use plastic bag reigned as the dominant design solution for one of the most common human activities: getting a purchase home. But that popularity comes at a great cost; almost all plastic bags end up in a landfill, are incinerated, or leak into the environment as trash.

How do you replace one of the most abundant objects in our global economy? For starters, by not expecting the answer to be one thing. There are so many sources of inspiration for solving this challenge. This report intends to organize and frame the innovation already underway in redesigning not just the retail carryout bag, but also the actions and behaviors that shape the experience of getting goods home.

This truly is a moment for bold ideas and grand experiments. One when we have the imperative and opportunity to change that status quo. The imperative of consumer demand and increasing regulations on single-use plastic bags in the United States and around the world, and the opportunity for innovation driven by a retail landscape already shifting dramatically due to evolving technology. Building excitement and optimism around potential solutions starts with defining the design moment we're in.

Diagnosing the Issue with Bags Today

The imperative behind solving this massive challenge so quickly is revealed in the assessment of the bag landscape today. Our present array of options all carry tradeoffs—for the environment, for people, for businesses, or all three.

Consumer and regulatory reactions to single-use plastic bags aren't surprising; single-use plastic bags cause harm to our ecosystems and our recycling systems. But paper and today's common reusable options all carry their own set of drawbacks. From production through end of life, no product presently existing at scale offers a tenable, long-term solution.

Framing Design Opportunities

Big challenges like this affect nearly everyone, everywhere, within every walk of the retail industry. Aligning existing businesses, emerging innovations, and consumer behaviors requires a shared set of design considerations. This report begins by establishing some of the constraints that exist across the current bag landscape, and organizes the opportunities that any successful solution will likely need to adhere to.

This includes mapping the types of transactions involving plastic bags today: point-of-sale checkout, in-store pickup, and delivery. It also means outlining the requirements for any successful new system or product: relevance to the problem at hand, ease of integration into existing retail systems, analysis of environmental consequences, and readiness for implementation at scale.

Tracking Emerging Innovations

The world isn't starting from zero. There is already a wide range of existing companies, products, and ideas that can inspire new thinking and further articulate opportunities for great design.

Perhaps most developed already, is the industry around new bag replacements—ranging from bio-based materials, to tech-infused carriers, to new methods of preserving perishable items. When it comes to reusability, there are entire systems to be explored including closed loop delivery, container exchanges, and reverse vending machines. And finally, what design approaches are eliminating the bag altogether? Autonomous vehicle technology, drone deliveries, and zero-waste stores are all experimenting with concepts that do not involve a store-provided form of secondary packaging—the packaging (such as a bag) that a product is transported in from point of sale to final customer destination.

Mapping a Retail Landscape in Flux

The context of retail bags is changing on every level. The act of getting a product home from a local store is experiencing disruption on two prominent fronts: regulation and technology trends.

Regulations, in this arena, come in the form of government taxes, fees, or outright bans on single-use plastic bags.

Global technology trends create conditions that ask consumers to adjust their behaviors. Understanding those behavior patterns can illuminate opportunities for design. Retail trends, meanwhile, tell a story of technology changing the fundamentals of transactions. Brick and mortar stores are now doubling as fulfillment centers, with in-store and e-commerce sales catering to faster, easier, more seamless customer experiences—all of which result in new behaviors.

Looking to History to Find Hope For the Future

Exploring the history of retail bags suggests that our future might be a return to the past. The story of how we grew to become so reliant on single-use plastic bags, if reversed, could contain the answers to making commerce more environmentally sustainable.

The early history of retail reveals a reality we're trying to return to: when a purchase and a bag were not always a package deal; when the question wasn't "Paper or plastic?" but rather "How would you like to get this home?"

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THE BAG PROBLEM TODAY

No Silver Bullet Solution Currently Exists

A bag is at the center of the final interaction at almost any store—be that retail, grocery, or the corner pharmacy. And the decision for consumers, if it even exists, isn't an easy one.

Even for someone wanting to make the most thoughtful choice possible, there is a wealth of confusing language and conflicting information. It's a moment with more complicated questions than easy answers. "Should I use paper or plastic?" "Isn't a tote bag the most sustainable choice?" "Doesn't it all get recycled anyway?"

Without clear guidance, people rely on a hunch or a half-truth to make their decision. Then they make it hundreds of more times each year.

Given the options presently out there, the confused consumer is not wrong. One type of bag may be more environmentally friendly to produce, but far more harmful to dispose of. Another is the inverse. A compostable or recyclable bag may end up in landfills despite the consumer's best efforts, rendering it just as bad or worse than a single-use plastic bag.

The truth is, there is no silver bullet among existing bag choices today. Instead, there are tradeoffs.

The Most Common Bags Used Today

Unless consumers carry a purchase out by hand, they are almost certainly using one of these 5 bag varieties.

When you head out for a shopping trip, bags are so ubiquitous that you may not even notice how often you interact with them. There are bags throughout the store to carry your items to the checkout counter. At the register, the cashier may give you a choice of what kind of bag you want to transport your purchases home: paper or plastic? Maybe you brought your own bag or tote from home. There is a seemingly endless combination of bag sizes and materials.

The number of bags produced each year is staggering. Plastic is, by far, the most abundant material in circulation. The Environmental Protection Agency stated that in 2015 there were 4.1 million tons of plastic bags, sacks, and wraps generated in the U.S.[1] If you distribute that weight across the U.S. population, that would amount to an average of 390 bags per person! Most of these bags are single-use, with an average working life of about 12 minutes before getting tossed out (although some do get a second life as garbage bin liners, etc).[2]

While single-use retail plastic bags are the industry standard, consumers are increasingly trying to make eco-friendly bag choices, or are being forced to make other choices due to regulation. Paper is the common alternative; retail stores across New York began to migrate to paper bags after a state-wide ban on plastic bags in March before ultimately being reversed due to public health concerns. Reusable bags, whether thicker plastic woven 'bags for life' or cotton totes, are also gaining popularity. A 2019 Shelton Group survey reported that 38% of U.S. respondents bring their own bags to grocery stores, and 24% bring their own bags for non-grocery purchases.[3]

AMONG U.S. SHOPPERS

38% BRING THEIR OWN BAGS TO GROCERY STORES

24% BRING THEIR OWN BAGS FOR NON-GROCERY PURPOSES

Examining the Single-Use Plastic Bag

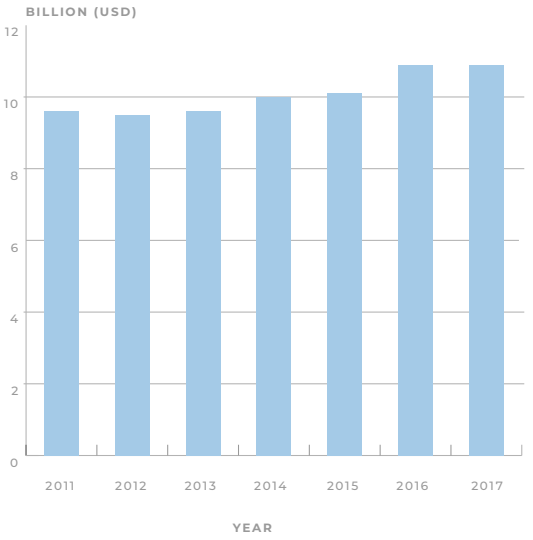
The production and recovery realities of the single-use plastic bag reveals the reasons for its increased regulation.

Easy to scale, cheap to make

Retail single-use plastic bags are commonly made of polyethylene, a plastic sourced from fossil fuels. In their creation, fossil-fuel-derived plastic bags contribute to climate change and greenhouse gas emissions. Once created, a bag will persist for hundreds of years causing harm multiple times over. Once it finally breaks down, it's not necessarily gone and can leave behind harmful microplastics. Polyethylene is a simple polymer that can be arranged in different configurations (e.g., High-Density Polyethylene, Low-Density Polyethylene) to give the material different attributes, like durability, transparency, heat resistance, etc. Beads of polyethylene resin go through a blown film extrusion process to manufacture the bags we see in retail stores.

Polyethylene bags are very cheap to make. Each bag costs only about a penny to produce. In fact, in many cases it is actually cheaper to produce plastic bags from virgin plastic than it is to use recycled plastic (which complicates efforts to reduce the use of fossil fuels). The manufacturing process is also simple and replicable, which has allowed it to scale so successfully. Given how cheap and easy to make they are, single-use plastic bags have unsurprisingly been the stable, go-to choice for retail for decades. The U.S. plastic bag industry revenues have thus remained relatively constant at around $10 billion annually.

INDUSTRY REVENUE OF PLASTIC BAG AND POUCH MANUFACTURING IN THE U.S.



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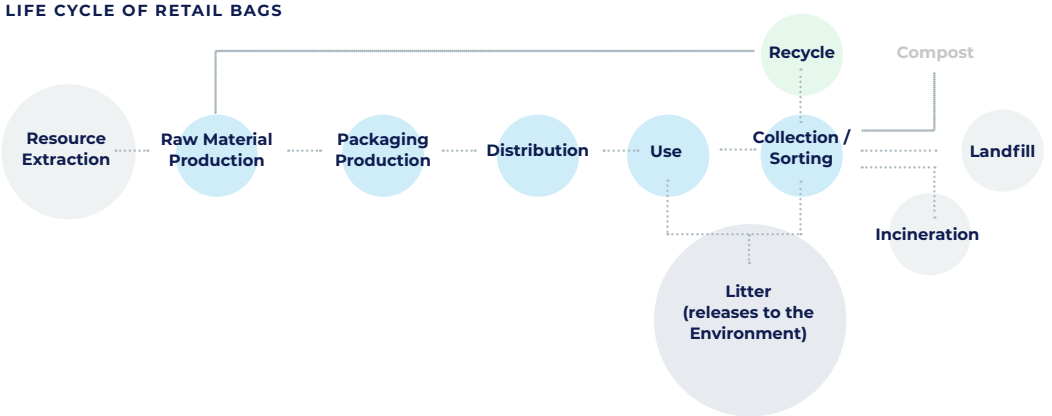
LIFE CYCLE OF RETAIL BAGS



Production and escape: *End of use isn't the end of life*

The industrial-scale production of plastic bags definitely takes a toll on the environment. It's estimated that we use 100 billion plastic bags per year in the U.S., which requires millions of barrels of oil to produce.[4] However, manufacturing plastic bags is not necessarily more harmful to the environment than paper or other alternatives—some studies show that the opposite is true. For example, one study found plastic bag production uses 70% less energy and produces 50% fewer greenhouse gas emissions compared to paper bag production.[5]

The real environmental harm of plastic bags takes place after use. Almost all single-use plastic bags end up in a landfill, are incinerated, or leak into the environment as trash. Every year, plastic retail bags are among the top 10 items found on beaches and waterways worldwide during Ocean Conservancy's International Coastal Cleanup (ICC). In landfills, plastic bags can take up to 1,000 years to decompose[6] (we don't know for sure since they haven't been around long enough to determine in a real-world environment), taking up space as solid waste and slowly releasing toxins as they break down. If they are incinerated, plastic bags and other waste burned have the potential to release toxic fumes that pollute the air and create health hazards for plants, animals, and humans alike. When leaked into the environment, they can clog up our waterways, sewers, and other drainage; increasing the likelihood of flooding or improving the conditions for disease-spreading mosquitoes. They harm wildlife and domesticated animals primarily through accidental ingestion—from whales to sea turtles—and even land-based domesticated animals like livestock, and break down into microplastics that re-enter the food system and our plates.

> Plastic bag production uses 70% less energy and produces 50% fewer greenhouse gas emissions compared to paper bag production

Disposal: *"Recyclable" in name, "contaminant" in practice*

The New York City Sanitation Department collects more than 1,700 tons of single-use carry-out bags every week, and has to spend $12.5 million a year to dispose of them.[7] We've been trained to recycle our plastic waste for decades, so we'd justifiably expect that these bags are collected, cleaned, and processed into some newly minted plastic item. Unfortunately, the truth is more grim. Official figures suggest that less than 10% of plastic bags are recycled annually in the U.S., with some studies suggesting that the total is closer to <1%.[8]

There are lots of challenges with recycling plastic bags. It's an expensive process—facilities require special sorting and processing machinery for plastic bags, which few recycling plants have. Out of 367 U.S. materials recovery facilities that manage recycling for local communities, only 4% are able to recycle plastic bags and even fewer have biodegradable composting capabilities.[9] When people use plastic bags to tie together their recyclables, some municipalities accept them this way, but others don't, so then plastic bags become a contaminant preventing the rest of the items from being recycled. Plastic bags need to be cleaned and dried before processing, and separated out into similar types of plastic. All of this requires complex operational considerations for a limited market. Only a handful of companies collect and convert bags into new materials, for example Trex converts that plastic into deck materials.

When bags are mixed in with other recyclable materials, as they often are, they easily get caught up in the mechanical gears of the machinery and force the process to shut down. These shutdowns happen multiple times per day in an average recycling facility, causing a lost 30-60 minutes of operations at best and a multi-day system repair at worst. And if even a few plastic bags slip into a bale of recycled cardboard, it contaminates the entire bale, which must then be thrown away. Not only are plastic bags costly to recycle, their very presence in the recycling stream can sometimes cause the recycling system to suffer.

Putting these challenges aside, for single-use plastic bag recycling to become a viable end-of-life option, there needs to be a market in place to purchase bales of collected, cleaned, and sorted plastic film. Unfortunately, as of 2020, such a market simply does not exist at scale. Without a market to purchase single-use plastics, plastic retail bags that enter formal waste systems are currently treated as contaminants: they are either kicked into landfill or incinerated. There currently is simply no good end-of-life solution for plastic bags.

Even with In-Store Recycling, It's Leakage, Landfill, or the Bane of any Materials Recovery Facility

It's nearly impossible to find a good end to the story of any plastic bag.

IN-STORE RECYCLING

While in-store recycling is a leading way of recovering single-use plastic bags, lack of awareness, added responsibilities for the consumer and confusion about the recycling process result in less than 10% of all single-use plastic bags being recycled.

LEAKAGE

New York City, alone, spends $12.5 million per year cleaning up plastic bags.[10] Upwards of 100,000 marine creatures and 1 million seabirds die from plastic.[11]

LANDFILL

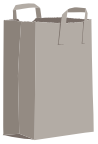
The average American creates roughly 25 pounds of plastic bag trash per year. Bags are either burned, polluting the air, or destined to live 1,000 years in landfills. [12]

MATERIALS RECOVERY FACILITY NIGHTMARE

Plastic film tangles in the axles and spinning discs within recycling facility equipment. SF Recology said, "The only down time we have is maintenance, and the vast majority of maintenance is removing plastic from the screens."

The 3 Most Frequent Alternative Bag Options

If consumers don't use plastic, it's likely they are making one of these trade offs.



Paper

Paper has been a staple alternative for decades and pre-dates single-use plastic bags as the original retail bag. Standard, square-bottomed paper bags are most frequently made from Kraft paper, which is manufactured from wood chips. The wood chips are heated into a pulp, which are screened, washed, and pressed into the durable bags we all recognize. While paper bags are easier to recycle, they typically require more energy and greenhouse gas emissions to produce, at least for virgin fiber, and their reuse rates are low.

Reusable Plastic Bags

Plastic bags with a thickness of at least 2.25 millimeters in most U.S. states are considered reusable, and above 50 microns in the E.U. These bags are becoming popular alternatives for retail stores in jurisdictions where thin, single-use bags are banned. They are slightly more resource-intensive to produce than single-use plastic bags, and would have to be reused between 4 - 11 times before making up for their bigger upfront environmental costs. However, there is skepticism about how many times these types of bags are actually reused-- one study showed that of 740 shoppers using reusable plastic bags, only 4 had actually reused them. [13]

Totes

Tote bags are often made of sturdy cotton (or jute to a lesser extent) and are promoted as eco-friendly alternatives to retail single-use plastic bags. Conventional cotton production requires a lot of pesticides and fertilizers, water, and land, resulting in environmental contamination and pollution, soil erosion and degradation, and other impacts. While these bags have more reuse potential, a study by the UK Environment Agency found that cotton bags have to be reused at least 131 times before they match the carbon output of many retail single-use plastic bags.[14]

The Emerging World of Biopolymers

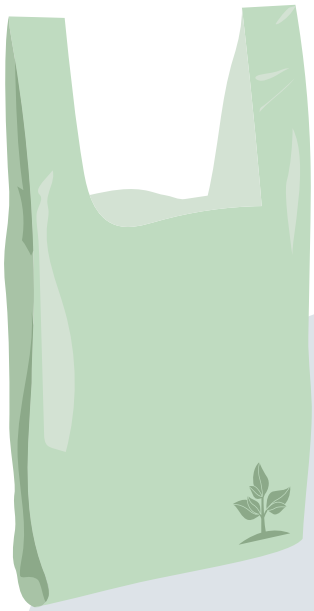
Though often greenwashed, and challenged by recovery infrastructure, biopolymers offer a promising short-term path away from fossil fuel plastics

More recently, as consumers and brands have begun to demand more eco-conscious products, a new category of materials has exploded on the scene: biopolymers. There's a lot of excitement about these new materials, but also a lot of confusion as to what they are and what their actual environmental footprint is.

Biopolymers refers to a large family of plastics that are made from a renewable, bio-based feedstock. Depending on their composition, they are compostable, biodegradable or recyclable at the end of their life. Although anything compostable is biodegradable, the inverse does not necessarily apply. Biopolymers can be sourced from food products, food waste, or other organic materials (e.g., algae). The majority of commercial biopolymers are currently sourced from food products such as corn, wheat, potatoes, and sugar beets, though research is underway to scale food waste and other feedstocks which are viewed as more sustainable sources.

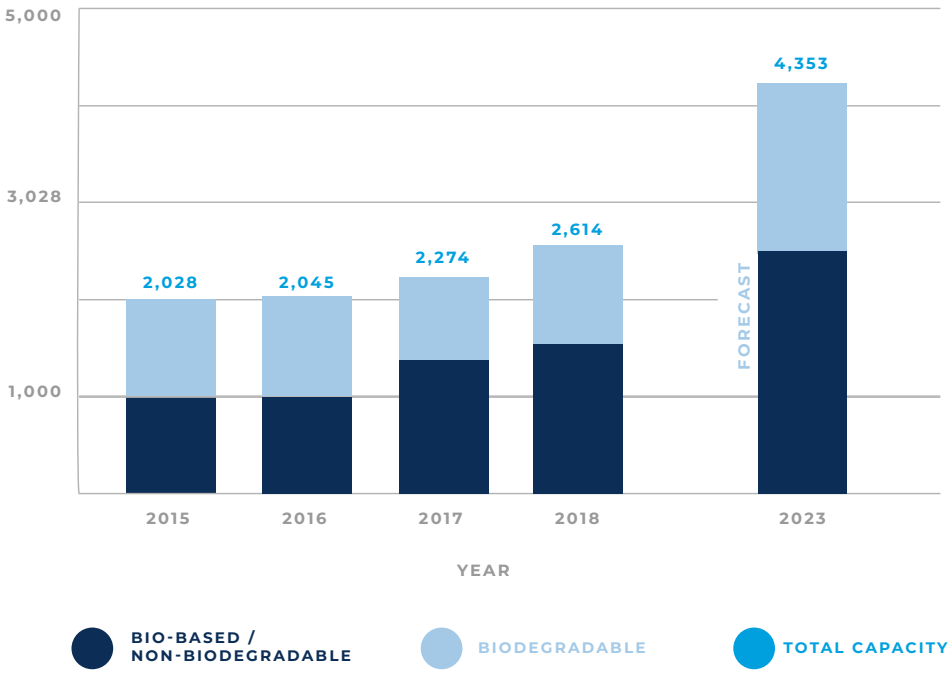
No signs of slowing down

Given the excitement around this new form of plastics, biopolymer products are expected to grow substantially in prevalence over the coming years. Production capacity for various types of biopolymers are expected to almost double over the next 5 years.



Global Biopolymer Production Capacity

2015-2018, 2023 FORECAST



Global biopolymer production capacity by region (2018)

A mixed environmental impact

Despite their increasing popularity, biopolymers are the subject of robust debate surrounding their environmental impact. Proponents of biopolymers cite the potential to reduce the carbon footprint of the production process compared to traditional plastics.

However, studies show that bio-based production raises the potential for greater acidification, eutrophication, and ecotoxicity in the environment. Furthermore, for bio-based feedstocks composed of food sources like corn, there is an argument against diverting valuable resources (land, water, etc.) from food produced to feed people versus growing for packaging or fuel. In summary, environmental impacts from bio-based production are mixed and not necessarily better.

Composting requires specific infrastructure

The rise of biopolymers has brought a range of compostable bag options into the marketplace. The promise of composting as a waste management method is to be able to replace the use of fossil fuel-based fertilizers in agriculture and create a more circular food system where one source of waste helps, in turn, produce more food. However, the reality is more complicated.

The common perception of compostable packaging materials is that they will break down naturally and quickly in any environment, whether in someone's home composting setup in their backyard, in marine environments, or in a landfill. This messaging is largely inaccurate and can lead to the false impression that items labeled 'compostable' can be thrown away and will decompose responsibly regardless of the context.

Composting of certain bio-based plastics requires specific commercial infrastructure. Compostable bags need to break down in an industrially managed composting facility through controlled conditions with the action of microorganisms. Unfortunately, very few locales have commercial waste streams or facilities dedicated to compostable waste, and there is limited incentive for improvement.

Composting packaging can increase the risk of contamination to the final compost product (e.g., microplastics and microchemicals) and increase operational costs. Even for jurisdictions with composting facilities, like San Francisco, the length of time needed for many compostable bags to break down (typically 60-90 days) exceeds the amount of time required by the composting facility (typically 30 days).

But what about compostable items that receive a composting certification? Here, we see the gap between the theory and the practical reality. Composting certifications are conducted in highly controlled lab environments versus in the field. Commercial composting facilities often find products do not break down the way they did in the lab and according to their certification standard. Where composting facilities are not available and compostable bags wind up in the recycling stream, they are often treated as contaminants in materials recovery facilities (MRFs) just like plastic bags and are kicked into landfill where they sit for centuries.

The opportunity in biopolymers is in potentially more recoverable or ethically-sourced feedstock, better labelling, the avoidance of additives that render materials value-less in recovery, and the edges of material innovation towards more natural and faster degradation.

Breaking Down
What's Breaking Down

The 5 leading varieties of biopolymers from an end-of-life perspective.

Compostable
Material breaks down into soil-nourishing organic material in industrial composting machines. (A regulated categorization.)

Biodegradable
Material eventually breaks down into bio units, not just plastic, but provides no nutrients to soil and often takes longer than the 30 days required required for compost streams.

Degradable
Material eventually breaks into tiny pieces of plastic.

Marine Degradable
Material breaks down into tiny pieces of plastic when left in salt water.

Water Soluble
Material dissolves in water, reducing to microplastics. (ex: Tide pods)

SUMMARY GRAPHIC

	RETAIL PLASTIC	PAPER	REUSABLE PLASTIC	TOTES	BIOPOLYMER
ECONOMIC COST*	$.01	$.04 - .05	$.10 - .25	N/A	$.08 - .10
ENVIRONMENTAL REUSE REQUIREMENTS*	Baseline	3 - 43	4 - 52	131 - 20,000	42
PRODUCTION SOURCE MATERIAL	Oil or natural gas Some recycled plastic	Wood pulp Some recycled paper	Oil or natural gas; some recycled plastic	Most commonly cotton; also nylon, polyester, jute, & others	Various organic materials including food (ex: corn), food waste (ex: fruit rinds & peels), & other (ex: algae)
KEY ADVANTAGES	Cheap Light weight Durable Easy to ship, store, & integrate into checkout systems	Cheap Relatively light & compact Biodegradable Easier & more effectively recycled	Reusable Nicer consumer experience Offer branding opportunity	Reusable Cheapest option for retailers (no bag distributed) Consumers feel good using them	Many advantages of plastic, but able to biodegrade or even compost Growing sector for innovation
KEY DISADVANTAGES	Rarely recycled (<10%) Never breaks down High volume of leakage into environment Damages & delays MRF systems Extractive production process	Extractive & energy-heavy production process Less durable & reusable Can't get wet during use	Uses more plastic than retail single-use plastic bags Rarely recycled Lower rates of reuse than cotton totes Damages & delays MRF systems Extractive production process	Extractive & energy-heavy production process Cotton requires lots of water Difficult to recycle or keep out of landfills	Requires natural resources or taps into food resources for production Potential diminished strength or water resistance Current lack of regulation could allow for greenwashing

**Estimated ranges based on multiple sources of data. Estimations are wide ranging due to source material variance within category (recycled or not; abundance of natural resource; etc.).*

DESIGN OPPORTUNITIES

Aligning on the Challenge Ahead

How might we transport goods from retailer to destination in a way that is compatible with diverse retail systems, delivers ease and convenience for customers, and reduces environmental impact?

This guiding question exists at the center of this report. It's an invitation for designers worldwide to see themselves as part of a larger movement. From international retail brands to emerging entrepreneurs, this report should serve as a beacon for anyone interested in shepherding retail into an era beyond the single-use plastic bag.

Emerging regulations and evolving technological capabilities are driving investment and retailer demand, making the moment ripe for focused, collaborative initiatives that support the development and acceleration of solutions at scale.

As more partners align around the need to solve this challenge—for the betterment of businesses, the environment, and people's lives—this chapter presents the opportunities and considerations for intervention. It's a massive problem, but by adhering to this shared set of initial considerations, design can find new ways forward.

The design potential for the challenge of replacing the single-use plastic bag can be broken down into three customer experiences. These three interactions serve as a useful initial framework for categorizing opportunities.

1. Point of Sale Checkout
2. In-Store Pickup
3. Local Delivery from Retailer

1. Point of Sale Checkout

The moment in which customers transition from browsing goods in a store to taking them home is a key design opportunity for companies looking to provide a delightful and memorable customer experience. Changes to this process are rapidly emerging: automated self-checkout is replacing staffed cashier stations. Artificial intelligence is making it possible to anticipate supply needs through smart-shelf-stocking. Retailers exploring new ways of interacting with customers at the point of sale are seeking to leverage the existing physical kiosk space, account for the time constraints associated with the check-out process, and ensure they continue to have the ability to serve a continuous flow of shoppers.

How might new solutions create value, while also diminishing friction for customers, cashiers, and retailers?

How do new, automated capabilities on shelfs and at checkout open opportunities for efficiency in transferring products?

2. In-Store Pickup

An increasing number of consumers are buying online and then picking up in-store—whether at a dedicated kiosk, curb-side in their vehicles, or via retail or third-party-owned storage lockers. An overlapping trend nested within is the rise of the option to return goods to stores, which provides new opportunities to design reusable bags and systems.

What opportunities might be afforded with this lead time between requesting products and beginning to transport them?

How might the digital experience suggest or incentivize a transaction free of single-use plastic bags?

How might reusable bags or bag alternatives be designed into these new physical spaces within and beyond the store where customers are making a return?

3. Local Delivery from Retailer

The emerging appetite for localized community delivery services for everything from grocery to wellness takes bag and bag alternatives entirely beyond the retail environment—from moving goods from the store to their destination, to the return or disposal of secondary packaging—the packaging (such as a bag) that a product is transported in from point of sale to final customer destination. An increasing number of retailers are converting excess space in their stores into micro-fulfillment centers. While some retailers have their own delivery systems, a number of third-party gig services are also acting as a bridge, getting goods to customers quickly, but also creating challenges in consistency and control for single-use plastic bag alternatives.

How might the different modes of transit—gig couriers, delivery fleets, autonomous vehicles, and beyond—create new possibilities that were previously unavailable to the consumer when transporting goods from point-of-sale to destination?

What circular opportunities might be created as goods move from place to place within a localized community, or in the return and disposal of a bag or bag alternative?

Innovation Considerations

In evaluating bag interventions for investment, implementation, and scale, design constraints take many forms. In designing new solutions, the upstream (feedstock) and downstream (end-of-life) impacts are critical, while solutions must meet operational constraints and needs at every stage of the value chain, including:

CUSTOMER PERFORMANCE

Solutions are designed to delight the customer and enhance or maintain the customer experience compared to existing solutions. Solutions must also meet the highest performance standards.

RETAILER PERFORMANCE

Solutions seek to integrate into retailer environments and maintain or enhance the employee experience by supporting safe and efficient workflows and adding value (e.g. process flow, marketing, foot traffic).

ADAPTABILITY

Solutions are designed for near-term commercial viability, and also are adaptable to the rapidly changing infrastructure, technology—such as self-checkout— and policy of tomorrow.

FEASIBILITY

Solutions are technically realizable and offer an attainable path forward towards broad implementation and adoption.

VIABILITY

Solutions create sufficient value for the retailer (e.g. operational flow, costs, sustainability, marketing, brand-value) to cover operational costs and necessary capital investments.

MARKETPLACE

Solutions are viable in a wide range of retail environments, and can be designed for broad implementation or consider a regional marketplace approach that is scalable long-term.

SOURCING AND PRODUCTION

Solutions use sustainably and ethically sourced materials (whether virgin and/or recaptured materials), are non-toxic and minimize harmful impact (e.g. significant water, energy use, GHG emissions) in manufacturing.

USE

Solutions seek to minimize harmful outputs (e.g. greenhouse gas emissions, toxins, microplastics) during use and where possible be reusable.

RECOVERABLE

Solutions seek to enable the recovery of raw materials at their highest possible value across multiple relevant infrastructure systems (e.g. recycling, composting) while not adding to contamination. Solutions have the potential to be separated via a joint collection stream into the relevant end-of-life path (e.g. reuse, recycling, composting), and consideration should be given to any required infrastructure changes needed to enable recovery.

ACCESSIBILITY AND INCLUSIVITY

Solutions are considerate of all customers and employees of all abilities and ages.

HEALTH AND SAFETY

Solutions must consider human health and safety, and be in compliance with all local, state and federal regulations in their country of origin.

To create change at the systems level, the world needs to support solutions that can be implemented both now and in the future. An ideal solution will move us entirely away from environmental harm, and it may require iteration and maturation to perfect over time. But we need interventions that can replace single-use plastic bags today, integrating into the current realities of retail and recovery constraints, and be manufacturable at scale using current processes.

EMERGING INNOVATIONS

A Future Already Unfolding

This ambitious effort isn't starting from nothing. Innovators and brands are already using developments in technology, materials, and behavioral science to reimagine retail and grocery bags.

In searching for points of design inspiration, other industries often provide analogous examples of solving similar problems. This approach also helps broaden the thinking around plastic bags. The goal isn't simply to replace the plastic retail bag, but to improve the means by which goods move from a retailer to a consumer's home without harming the planet.

The following pages contain promising territories for design, interesting provocations, and examples of companies already experimenting within their emerging domain. It's unlikely that anything here is ready to be magically scaled into a cure-all, but design is a process of honing and organizing. The following territories of innovation feel most worthy of further exploration.

INNOVATIVE MATERIALS

Bio-Based Bags
Perishable Item Wraps

REUSABLE MODELS

Closed Loop Delivery
Zero Waste Stores
Container Exchanges
Reverse Vending Machines

BAGLESS SOLUTIONS

Autonomous Vehicle Delivery
Drone Delivery
Innovative Carriers

Innovative Materials

Innovative materials are breaking the traditional paper vs. plastic paradigm for secondary packaging. Experimental production methods are becoming less resource-intensive, and technology is opening up new opportunities to deliver value to consumers through the bag itself.

TO KEEP IN MIND

Environmental Impact
Any single-use plastic alternative needs to account for the consequences of its production and disposal. The feedstock source needs to be sustainable, and recycling or degradation needs to feel tenable without introducing new harms.

Cost per Unit
Raw materials need to be produced at scale while considering a realistic price per bag for retailers and end-users.

Customer Experience
If it looks like a bag, and gets treated like a bag, it needs to perform like the bag it's replacing. Consumers should be able to rely on a relatively seamless transition without dramatic behavior changes.

Ease of Integration
Every bag is part of a larger business ecosystem. It will be shipped, stored, and integrated into the in-store checkout experience. Bags need to be easy for retailers to stock and distribute to customers.

Sector Maturity
Some solutions are more radical and long term, but single-use plastic bags are already disappearing fast. Retailers need new options sooner rather than later.

Bio-Based Bags

Rather than oil and natural gas, new organic source materials hold promise to break down faster and cleaner while maintaining a lot of the positive attributes of traditional plastics. The number of experiments within feedstock types and production methods are rapidly evolving and ever-expanding.

Few territories are as robust and exciting as this, but amidst all the rapid development comes a lot of new questions, concerns, and a potential for unsubstantiated claims—new innovations in this realm should be evaluated accordingly.

PRODUCT SPOTLIGHT

Plastic Film from Fish Waste

MarinaTex, a British startup, has created a flexible film out of fish waste, and they claim the film is stronger than LDPE and is home compostable. The utilization of fish waste exemplifies the growing focus on using byproducts of other processes as feedstocks.

OTHER INNOVATIONS

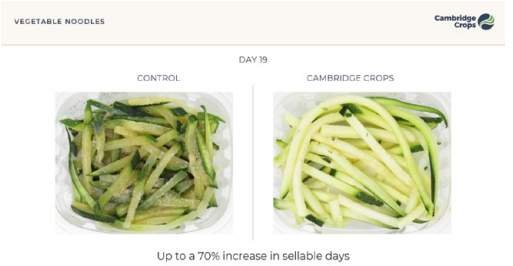
Cassava-Based Bags
AvaniEco, a growing Indonesian company produces a line of varying cassava-based bags.

Corn-Based Biodegradable Film
Mondi, a global packaging group, has created a corn-based biodegradable film used for the 'Terra Bag' in close collaboration with cement producer Ciments Calcia, film extruder Barbier, and cereals producer Limagrain.

Waste and Residue-Derived Diesel Fuel
Neste, the world's largest producer of renewable diesel fuel from waste and residues, and LyondellBasell, one of the largest plastics, chemicals, and refining companies in the world, produced a bio-based polypropylene and bio-based low-density polyethylene at a commercial scale with partnerships to create film.

Perishable Item Wraps

Beyond the checkout line there are a number of single-use plastic bags that have an equally short life span. We can look to their emerging materials for inspiration, particularly in contexts where their preservative qualities might add value to the grocery retailers who adopt them in the form of a retail plastic bag.



COMPANY SPOTLIGHT

Mori

Founded in 2016, Mori is a Boston-based company that is commercializing a silk-based and edible coating that extends shelf life of fresh food and reduces food spoilage and waste. The coating can be applied to vegetables, meat, seafood and prepared food.

OTHER INNOVATORS

Ooho
UK-based Ooho is a flexible packaging for beverages and sauces made from Notpla, a material combining seaweed and plants.

Bee's Wrap
A reusable wrap made of GOTS-certified organic cotton, sustainably sourced beeswax, organic jojoba oil, and tree resin.

Apeel Sciences
Apeel Sciences is a California-based company that adds a layer of edible, plant-derived protection to the surface of fresh produce which limits the water loss and oxidation processes that cause spoilage, thus extending the life of produce.

Reusable Models

Instead of giving out bags and other containers for consumers to use and throw away, brands are experimenting with new models of maintaining ownership of a vessel throughout its life cycle. Higher quality packaging can move back and forth between retail brands and consumers within a user-friendly system.

By creating a process in addition to a product, brands can deliver greater impact. These solutions aren't just eliminating waste, but reinforcing behavior change away from single-use habits.

TO KEEP IN MIND

Environmental Impact
New data will be required to ensure products are reused at a rate that offsets the production requirements of longer lasting reusable options. The ultimate end-of-life circularity of these new products must also be considered.

Cost Per Unit
Integration of a system will carry a large up-front cost, but stands to increase its benefits each year. It will require new models of value as these systems scale.

Customer Experience
New systems mean new behaviors, and that puts a burden on ensuring the new option is easier, more enjoyable, or more valuable. In some way, a reward needs to be baked into the experience.

Ease of Integration
All these directions require integration of new systems and workflows. They might be better once initiated, but the adjustments must be accounted for.

Sector Maturity
From the system design through to the physical hardware it might depend on, there are more cumulative pieces to have prepared for integration into retail locations.

Closed Loop Delivery

By dropping off and picking up goods directly at a customer's home, retail brands are able to take greater control of the reusable system. Proprietary bags and containers also become a way to increase brand value, and turn the purchase into more of a relationship with subsequent visits built into the dynamic.

COMPANY SPOTLIGHT

FillGood

A skincare and cleaning product store, FillGood delivers their products in reusable glass jars, bottles and durable bags. Customers place empty containers in the bag and leave it outside on delivery days for the company to pick up again. The vessels are cleaned and refilled for subsequent reuse. Customers can also use their own bottles, and choose to drop off empty bottles at FillGood's physical store.

OTHER INNOVATORS

GoodEggs
This grocery delivery service utilizes compostable produce bags and boxes as their primary packaging material.

Wally Shop
In this Berkeley, CA-based shop, customers pay a deposit for proprietary packaging containers filled with bulk goods, returned when finished by UPS or FedEx.

Zero Waste Stores

Many stores around the world and U.S. are quite simply transferring the packaging and transporting prerogative to customers. It's the shopper's responsibility to bring their own bags, boxes, jars, or other receptacles to fill with bulk supply items. Once this dynamic flips, it opens brands to begin innovating and exploring new means of providing bulk goods to consumers.

COMPANY SPOTLIGHT

Algramo

Algramo is a Chilean company founded in 2013 that distributes vending machines full of bulk staples such as rice, beans, lentils, and sugar. Algramo fills the machines, installs them for free in small neighborhood stores, and splits the profit evenly with shopkeepers. If customers use provided containers they get a discount when they return the packaging. The company also operates an electric mobile dispensary vehicle that offers broader access to staples.

OTHER INNOVATORS

RefilleryLA
This Los Angeles van service filled with wholesale goods drives to neighborhoods for residents to fill up.

Nada
Vancouver, BC-based zero-waste grocery store.

Package Free Shop
A Brooklyn, NY-based zero-waste home goods store.

Container Exchanges

Some third-party services are partnering with larger brands to manage user-friendly return systems for various bags and packaging. Most early innovations are experimenting with shipping models for returning their containers and bags.

COMPANY SPOTLIGHT

RePack

RePack is a reusable packaging service for online retailers and shoppers. RePack's delivery packages can be returned for reuse via the local postal system anywhere in the world. When the empty packaging has been returned, the reusers receive a voucher via email that can be used at any online store that is partnering with RePack.

OTHER INNOVATORS

Loop

Terracycle's Loop, now in use with retailers including Kroger and Walgreens, delivers products in reusable containers and totes to homes, then picks up the packaging.

Returnity

Creates custom-designed durable reusable shipping bags and boxes for e-commerce retailers.

Reverse Vending Machines

The biggest behavior change for all reusable systems is asking customers to take the additional step of getting a product back to a provider. Another way of creating this incentive is by offering users cash or rebates in exchange for items and packaging they physically return into the system.

Solutions of this type are commonly developed for bottles, cans, and other forms of recycling, but early experiments with reusable bags that could be washed and put back into use are being explored.

COMPANY SPOTLIGHT

Tomra

Tomra is the largest reverse vending machine provider globally and a leading provider of sensor-based sorting solutions for the food, recycling and mining industries.

OTHER INNOVATORS

Incom Group
This company leads mass production of China's first internet reverse vending machine.

Ake Teknoloji
Operating since 2014 in Denizli, Turkey, this company produces reverse vending machines.

Bagless Solutions

What if the solution to the world's bag problem isn't to replace them, but to eliminate them altogether? On the smallest, shortest-term level, this could be as simple as creating an incentive for consumers to carry their products bag-free. On the biggest, longer-term level, this could mean systems and technology-driven solutions such as drones and autonomous vehicles.

The responsibility here shifts dramatically in one of two directions. It's either entirely on the brand to get an unpackaged delivery to somebody's doorstep, or it's on the customer to pick up their product and get it home on their own.

TO KEEP IN MIND

Environmental Impact
This solution type may at first appear to be the most promising from an environmental standpoint, but increased emissions and other unintended consequences need to be considered for whatever new behavior replaces the traditional transaction.

Cost Per Unit/Use
Eliminating all bags stands to reduce costs, but increased investment in technology and security could prove to be significantly more expensive up front.

Customer Experience
Fundamentals of the buying experience will change in almost any one of these directions. Solutions must consider the behavior change being asked of stakeholders, and seek to maintain ease and convenience whenever possible.

Ease of Integration
New technologies require an entirely new line of expertise within retail settings. What would be the operational requirements of any near- or long-term solution?

Sector Maturity
While exciting, the more disruptive and revolutionary a solution, the more obstacles it will encounter on its path to integration into day-to-day operations.

Autonomous Vehicle Delivery

These rolling, autonomous locker-like concepts truncate a customer's journey with a product to the distance of their driveway to their front door. They also stand to put significantly more control into the hands of consumers who can schedule or re-route the delivery of their food or goods at their convenience.

CREDIT: NURO

COMPANY SPOTLIGHT

Nuro

Nuro has developed a self-driving vehicle for local goods transportation. The car is fully electric and can conduct deliveries at all hours of the day. The company was founded in 2016, but has already raised $1B in funding and has a pilot relationship established with Kroger within the Houston, TX area.

OTHER INNOVATORS

UDelv
The first custom-made, public-road autonomous delivery vehicle.

Neolix
Self-driving logistics startup based primarily in Beijing, ramping up production for autonomous delivery vehicles.

Drone Delivery

Unmanned aerial vehicle (UAV) technology has made significant strides and continues to see incredible amounts of investment. Several large-scale brand partnerships are already underway, and it feels all but certain that lighter, short-distance drone deliveries will be a reality within a matter of years, not decades.

COMPANY SPOTLIGHT

Flirtey

Flirtey provides drone delivery service of retail and e-commerce items to consumer homes. The company was the first to conduct an FAA-approved drone delivery in the U.S., the first to perform a fully autonomous drone delivery to a home and the first to launch a commercial drone delivery service. Founded in 2013, the company has conducted pilots with Domino's and 7-Eleven.

OTHER INNOVATORS

Manna
Custom-developed aerospace grade drones delivering directly from restaurants and centralized kitchens to consumers' homes.

Wing
Alphabet's drone delivery system to improve environmental impact of transporting goods.

Innovative Carriers

Expanding beyond the familiar store-provided checkout bag, there are entirely new containers and carrying vessels already available to customers. These new products can offer businesses opportunities to integrate technology into the consumer experience, or they can simply make the shopping experience more enjoyable and efficient for customers—all while reducing waste.

COMPANY SPOTLIGHT

Caper

Caper focuses on compacting Amazon-Go's technology (image recognition, sensor fusion and artificial intelligence) into a smart shopping cart, allowing each shoppers to throw their groceries into the cart and self-checkout without cashiers. The technology is looking to fundamentally transform physical retail and quickly integrate into existing grocery stores.

OTHER INNOVATORS

Twyst
Allows the anonymous tracking of shoppers as they move through the store, capturing consumer behavior via data that has never been captured before.

Tally
An inventory robot that autonomously roams a store capturing inventory data that its platform can use to create action items and analytics.

A SHIFTING RETAIL REALITY

How Change Opens New Possibilities

A shifting regulatory landscape and emerging retail technology trends seem likely to be the two biggest drivers of behavior change within the retail bag landscape for the foreseeable future.

Look closely enough at these two shifts, and it's not hard to see a future of most people getting products into their homes without ever coming into contact with a plastic shopping bag—or perhaps any bag at all.

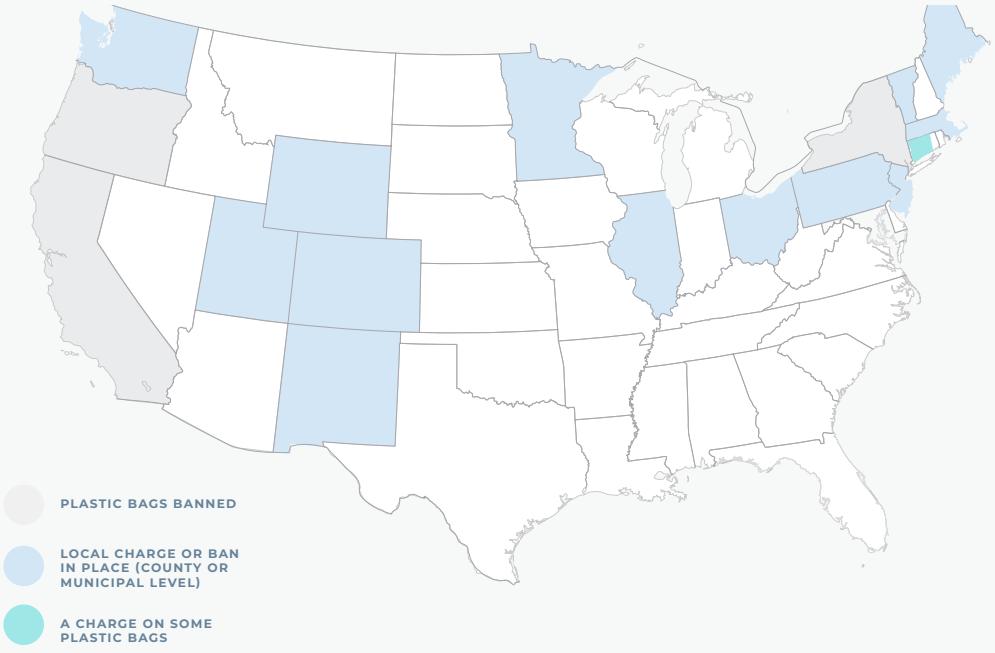
Regulation is the first, most obvious reason for such changes. When single-use bags are banned or carry a fee, people find other ways to carry their purchases. Add in technology, and the rise of a more localized form of e-commerce, and you begin to see the nature of transactions evolving entirely. And the hand off to consumers changes with it—occurring at different times, in different places, with wholly new types of interactions.

These two shifts are the carrot and the stick of consumer behavior change with bags. Regulation inflicts the stick of fees or forced removal of bagging options. Emerging technologies present the carrot of new value in the form of ease and efficiency.

Both these trends set the table for the design opportunities ahead.

Regulations Today: In the U.S. and Around the World

Examining the history of plastic bag policies and their results.



Regional Case Studies

More than 66% of nations around the world have some form of legislation on single-use plastic bags. The majority of those regulations have been enacted within the past five years.[15]

Countries in Asia, Africa, and Europe have led the way in progressive measures dating back to 2002. Every country in the E.U. currently has bag regulations with high levels of consumer adherence, several African countries have the most strict laws in the world but enforcement remains complicated—in some cases with plastic bag black markets subverting the legislation. Asia's bans continue to escalate, but their abundance of informal street markets and vendors hinder enforcement. North America, Latin America, and Oceania are still playing catch up on the global shift away from single-use plastic bags. Without a U.S. national policy, state and city officials are leading local regulation, creating a disjointed and sometimes contradictory patchwork of policy and recovery infrastructure capabilities.

Here are some particularly noteworthy case studies that offer a glimpse of how regulation does (or does not) impact consumer behavior.

UNITED STATES

Montgomery County, MD in 2012 (5-cent fee)
Researchers observed the number of people using disposable bags reduce from 82% down to 40%. The number of bags used per trip also went down. Montgomery saw close to a 70% decrease in plastic bag litter in streams and parks. [16, 17]

San Jose, CA in 2012 (plastic ban, 10-cent fee for paper)
Reusable bag use jumped from about 4% to 62%, while the portion of people who used no bag doubled. The average number of bags used per customer fell from three to fewer than one. Litter surveys also showed bag litter reduced by 89% in storm drain systems, 60% in creeks and rivers, and 59% in city streets.

Washington DC in 2010 (5-cent fee)
In the Potomac River, the number of plastic bags removed by volunteers dropped by almost three-quarters.[18]

BANGLADESH

The first country ever to enact a plastic bag ban in 2002, Bangladesh has struggled to enforce the regulation, especially with a lack of viable alternatives. The government estimates that 410 million polyethylene bags are still used in the capital Dhaka each month.[19] In recent years, innovation has centered on burlap, jute, and other organic materials.

KENYA

Attempts to fully ban import and manufacture of plastic bags in 2007 and 2011 failed after businesses threatened to pass costs on to consumers. Because of immense environmental and health costs, the country did not relent and finally passsed the most strict regulation in the world in 2017. Offenders now face stiff fines or upwards of 4 years imprisonment. Though harsh, the volume of plastic bags in the environment has visibly decreased dramatically.[20]

HONG KONG

A levy introduced in 2015 has resulted in a 90% reduction in plastic bag use. The strict clamp down has Hong Kong among the global leaders in total elimination of plastic consumer bags.

UNITED KINGDOM

England has seen an 85% reduction in plastic bag usage since introducing a 5p fee in 2019.[21] Collectively, retailers across the UK have raised $29M by donating bag fees to charity.[22]

IRELAND

A €0.15 tax introduced in 2002, one of the world's earliest. Because not many plastic bags were previously escaping into the environment, changes in litter were minimal, but 90% of consumers turned to reusable bag options within a year.

AUSTRALIA

While the country does not ban plastic bags, all but one state have their own bans in place. After the two largest supermarket chains in Australia implemented their own phase out of plastic bags, national consumption of plastic bags dropped by 80% in three months.[23]

THAILAND

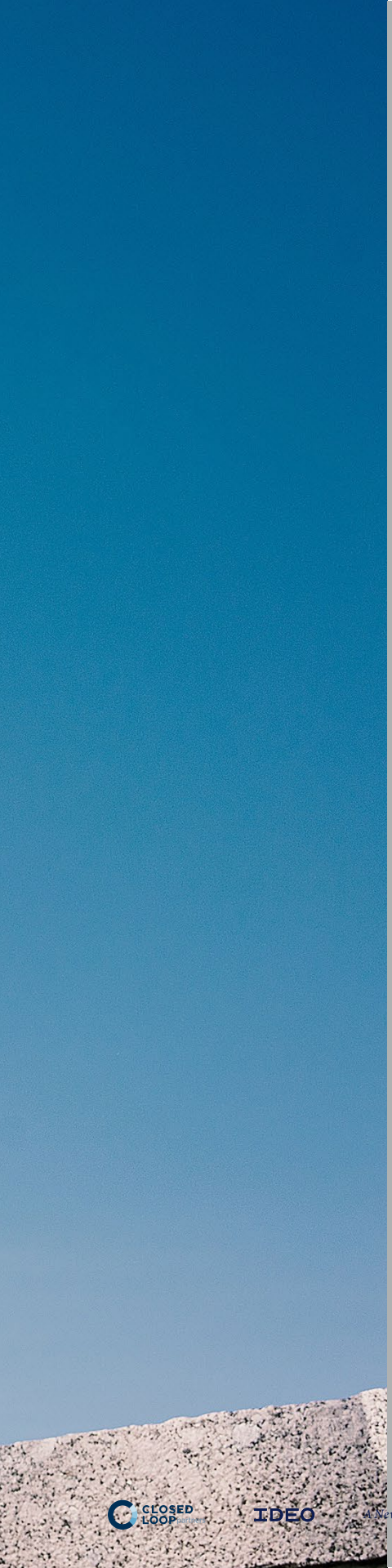
A ban that began Jan 1, 2020 has sparked a rush of recycling and biopolymer investments. The country is specifically hoping to leverage its ability to grow cassava and sugar cane in production of new, more biodegradable polymers. The ban is part of a wider plastics campaign that has dropped Thailand from 5th to 10th in global ocean polluters in 2019.[24, 25]

What can we learn from regulation around the US and the world?

It works.
On the whole, plastic bag usage behavior changes and waste is reduced when cities, states, or countries crack down.

Paper bag usage goes up.
Overall, there's a global shortage of viable alternative options — one of the biggest reasons behavior doesn't change in certain places. Paper is the most common single-use replacement for plastic, but, as many life cycle analyses show that does not necessarily mean it's better.

It spurs the development of alternatives to plastic bags in some markets, but not others.
China and Thailand's bans inspired government construction of new plants, Bangladesh to start a major jute bag manufactory following their ban, and the E.U. and UK's policies have transformed them into hotbeds of materials and system innovation for bag alternatives. Yet many countries aren't seeing this kind of market reaction.



China's National Sword Policy Renews Attention on Recycling in the U.S.

The entire global recycling network upended in 2018 when China enacted its National Sword policy. The country that had long been the world's leading purchaser of used paper and plastic dramatically adjusted what it was willing to buy and implemented near impossible purity standards before accepting materials. Several common materials were banned, including mixed paper and mixed plastics. This dramatic policy change left the U.S. recycling market in dissarray, with local municipalities suffering from declining revenues and struggling to sell their recyclables.

LOOKING AHEAD

No nation wants to be the dumping ground for another country, and a silver lining of China's National Sword policy is the renewed attention on recycling in the United States. It's laid bare the current limitations of the system and in doing so accelerated the momentum and impetus for improvements. Increasingly, people desire local, closed loop systems that keep valuable recyclables in circulation and out of landfills.

4 Unintended Consequences of Bag Bans & Fees

PREEMPTIVE BAG LAWS

The rise of bag bans has introduced a new category of regulations called "preemptive bag laws." These laws are often pushed at the state level, and restrict cities and counties from implementing bag specific laws. Such laws currently prevent 71 million Americans in 11 states from enacting bag ordinances.[26]

HEALTH AND SAFETY

Particularly in grocery environments, some regulations have been met with food safety and human health concerns. If a solution has a material that interfaces with food, safety considerations such as washing systems or nonpermeable surfaces should be considered. Sanitation and cleanliness of reusable vessels and bags is critical to ensure all bag solutions meet the highest health and safety standards.

SECONDARY USE OF PLASTIC

While no objective, exhaustive data could be uncovered for this report about the rate of reuse for plastic bags, there are common secondary uses including lining trash cans or picking up pet waste. These uses still result in plastic bags entering landfills, but the elimination of single-use plastic bags could result in customers purchasing alternatives to serve those current functions.

IMPACT ON LOW-INCOME COMMUNITIES

Fees, in particular, can disproportionately challenge lower income consumers if the charge is passed along to them. Customer convenience and income must be taken into consideration when evaluating any potential consumption tax.

Bans & Fees Are Only the Beginning

Plastic bags represent only one piece in a larger global initiative against single-use plastics of all varieties.

Despite the inevitable difficulties of enforcing a large-scale phase out, evidence suggests that taxes, fees, and outright bans have been effective at curbing the massive flow of single-use plastic bags into cities and countries around the world. This is only likely to escalate as dozens of countries—including China, Canada, Indonesia, Thailand, and the E.U.—plan to fully institute bans on lightweight plastics within the next 2-3 years.

Looking at trends towards banning or limiting use of other ubiquitous items—such as plastic straws, cutlery, carryout containers, cigarette butts, etc.—it's reasonable to expect that regulations on single-use plastic bags won't just spread, but intensify. The following are some ways in which policies related to lightweight plastics might evolve in coming years.

Increased Transparency and Accountability

Proposed U.S. legislation from fall 2019[27] may indicate key ways policy may be evolving and uniting at a national level. Led by Senator Tom Udall of New Mexico and Representative Alan Lowenthal of California, it proposes a national carryout bag fee which would cover states that have not yet created their own bans. Extended Producer Responsibility is also built in for single-use plastics, wherein, as a condition of sale, producers will be required to design, manage and finance end-of-life programs for products and packaging. This could mean that retailers are implicated in tracking for producers, but it could also mean bag producers are helping to provide critical financing for collection infrastructure. Industry will also be incentivized to develop more sustainable alternatives. It also introduces new labeling requirements; consumer products would require clear, standardized labeling indicating the correct disposal method. It proposes to assist local governments in identifying pollution hotspots with smart technologies and social media to implement source reduction solutions.

Looking to waste regulation in adjacent materials, it is worth noting that in Vancouver's unprecedented January 2020 legislation, retailers have to report the number of units of single-use cups purchased annually.[28] It's not hard to imagine this could soon apply to single-use plastic bags and the retailers who use the most of them. In fact Oregon is starting to collect information from stores on customer usage.[29]

Collection Infrastructure Investments

Previously proposed U.S. policy would introduce nationwide container deposit requirements demanding beverage retailers to install and operate reverse vending systems. As an investment in collection infrastructure, non-refunded deposits would go into a federal fund towards this purpose. While this would initially focus on major beverage retailers, conceivably it could spark conversations about similar policy for the retail bag.

The E.U.'s 2019 Single-Use Plastics Directive mandates that 90% of bottles are collected by 2029 and more recycled plastic to be used in packaging.[30] This has already translated into a significant growth in collection systems, which could catalyze infrastructure investment elsewhere in the world. QY Research states that the reverse vending machine market was worth US$343.6M in 2018 and is expected to be worth US$685.1M by the end of 2025.[31]

Product Design Requirements

New domestic and national policies around the world mandate that bags be made of an increasing percentage of post-consumer content.

California has led domestic plastic bag policy rigor. For example, if a customer sees a product sold in California marketed as "biodegradable," "degradable," "decomposable," or any form of those terms, a customer can send an information request to the manufacturer or supplier and the manufacturer or supplier is legally obligated to respond.

Intensified Consumer Engagement

Recently proposed U.S. legislation also would direct funds to awareness-raising measures. States would be encouraged to educate consumers on the impact of single-use plastics as well as available reuse systems and waste management options.[32] If implemented at the national level, this could be a strong force in the changing tide of consumer preferences and awareness.

CASE STUDY

Denmark, An Early Adopter

Denmark's long and thoughtfully-led journey phasing out bag waste may offer a vision for the rest of the world.[33] In 1993, the country passed the world's first bag tax. Danes have continued restructuring the fees, and today, thin plastic bags are nearly entirely unavailable.

Generally, the population has been supportive, with polls indicating 68% support for plastic bag refund systems.[34] Even for the thicker plastic bags available for purchase, Denmark's Environmental Protection Agency conducted life cycle assessments to offer recommendations on what to supply, how many times to use them, and how to dispose. [35]

There's no slowing down, either. A new policy coming in 2020 expands the ban to other types of carrier bags with handles, such as paper. [36]

How Technology is Redefining the In-Store Experience

As the nature of shopping evolves, it carries untold impacts on how consumers get their products home.

There's a drive to create more frictionless experiences for customers within stores. Many of these efforts relate directly to the ways people find, carry, and pay for products.

In 2019, two-thirds of shoppers listed convenience as one of the top things they look for in a retail experience—using the product is more important than purchasing it. But that desire doesn't mean consumers are abandoning in-person shopping for e-commerce. Brick and mortar accounted for nearly 90% of all retail sales in the third quarter of 2019,[37] according to the U.S. Census Bureau. Technology investments track with this trend as well, with e-commerce investments dropping by 8% from 2018 to 2019, while total dollars invested into in-store retail technologies grew by 60% over the same period.[38]

So what does this potentially mean for bags? There is opportunity to be uncovered as brands begin to experiment more ambitiously with new business models, store designs, operations, and technologies intended to deliver seamless interactions.

> Every reexamined touchpoint within a store is an invitation for designers and innovators to reimagine the mode by which products ultimately reach the consumer's home or other destination.

Automated or Mobile Checkout

Since the first automated teller machine in London in 1967, retailers have been experimenting with self-checkout, a payment and bagging flow where the customer interacts with a kiosk independently to complete a purchase. Cameras and sensors promise to make the experience easy and intuitive, and key retailers expect their offering of self check out to increase dramatically. From big brands to individual pilot stores, technology is beginning to truly make cashierless checkout easy and intuitive. Amazon Go recently made its checkout technology available to other brands, and independent startups like Zippin have reached the point of opening cashierless stores in downtown San Francisco.

IMPACT ON BAGGING

Getting the product out of the store becomes the customer's responsibility, and businesses can control what tools are provided to them. It presents a chance for messaging, alternative bag options, or implementation of entirely new systems.

AI "Smart" Stocking

The very role of a store shelf, what needs to be stocked, and how its organized, is all being reconsidered. As in-store tracking and other forms of consumer data grow in leaps and bounds, brands have an opportunity to reinvent the most fundamental aspects of how customers interact with the products inside a store. Some stores today serve as glorified showrooms, while others find ways to directly cater to each customer's unique needs.

IMPACT ON BAGGING

Many bags exist just to get products off a shelf and into a shopping cart—as is the case with produce—but new stocking systems could give brands greater control over how those products are transferred. And if certain retail experiences are optimized for speed and efficiency, the task of handing off products may disappear from their operations altogether. Lugging the purchases home, after all, is one of the least convenient parts of any purchase.

Retail As Returns Depots

In July 2019, Kohl's completed a nationwide rollout of its Amazon returns program in the United States. According to data published by inMarket, foot traffic to Kohl's stores increased nearly 24% in the first three weeks since the rollout.[39]

IMPACT ON BAGGING

As the options to return products to stores potentially increases, it begins to reinforce the behavior of dropping items off at retailers—not simply picking them up. This carries opportunities to consider reusable bagging options that customers could pick up and drop off each visit.

E-Commerce on the Local Level

In-store pickup and delivery are turning stores into partial fulfillment centers, and redefining the role of bags.

Most of the history of e-commerce has relied upon shipping as the means of delivery, but some of the fastest growing trends in retail are turning consumers' computers and phones into the primary interface with their local department store, pharmacy, and supermarket.

Many common, day-to-day transactions such as groceries, prescriptions, home goods, and electronics still thrive within close proximity of a customer's home. Funneling those purchases through digital platforms offers opportunities for personalization and convenience. Considering the innate behavior changes within the new purchasing mechanisms, there may not be a more ripe opportunity for rethinking the necessity of a carryout bag than these two e-commerce trends: in-store pickup and local delivery.

In Store Pickup

Nearly half of Americans have already used an in-store pickup service, and that number is expected to keep climbing. It's most popular among parents (age 35-54), but even among older and younger generations the usage remains above 40%.

This type of purchase is most commonly used to collect electronics (44%), clothing (39%), groceries (26%), and housewares (25%).[40]

This new type of transaction presents a series of touchpoints in a product journey:

1. Customer selects items and completes purchase online.
2. Store employee or gig worker receives order and collects products from store.
3. Products are scanned and stored for customer
4. Customer arrives to pick up purchases in most instances in one of these ways:
    - A dedicated kiosk or counter staffed by a store employee, where the products are rung up and bagged in a traditional fashion.
    - Curb-side pickup where products are already rung up and bagged by employees, and customers only have to drive up and load bags into their car.
    - A storage locker contains products that are paid for and bagged by employees, requiring customers only enter a code and remove the bags.

Design Opportunities

How might we utilize the digital interface to expand customer choice or incentivize a bagless transaction? (Especially for smaller purchases of 1 or 2 items.)

How might we devise bagless systems that improve the customer experience when products are placed directly into their car, how they get from the car into the house, and for people using public transportation?

How might we incorporate reusable models into kiosk, curb-side, or locker interactions that customers are likely to interact with more regularly?

Local Delivery

Many retailers have been shipping purchases directly to consumers for years, but what's emerging today is a model that feels less like e-commerce and more like a traditional pizza delivery order. Grocery stores are leading the charge on this new form of quickly-fulfilled-and-delivered-to-your-door transaction, but every retailer that plays a vital role in local community commerce is following suit.

This is a more distributed landscape, with a large number of third-party services like DoorDash, Postmates, Task Rabbit, Instacart, Shipt, and others filling the game between retail/grocery stores and their customers. That said, an increasing number of retailers are converting excess space in their stores to micro-fulfillment centers, especially in densely populated areas, as they shift to more e-commerce-friendly operations. One likely hurdle, however, could be redesign limitations due to clauses in existing leasing agreements, thus, pushing more redesigns to owned storefronts.

The product journey in these cases presents an even wider array of crucial sustainability decisions:

1. Customer selects items and completes purchase online.
2. Store employee or gig worker receives order and collects products from store or fulfillment center.
3. Products are bagged, boxed, or otherwise packaged up for delivery.
4. The purchase is queued according to its delivery window and the location it's being delivered to.
5. Package(s) are picked up, loaded into a vehicle, and delivered.
6. Package(s) are handed directly to the customer, or left on their doorstep.
7. The customer unpacks the boxes/ bags and is responsible for returning or disposing of the packaging.

Design Opportunities

How might we embrace non-bag solutions that were previously unavailable to the consumer when transporting goods from point-of-sale to destination?

How might we account for the new challenges of delivery— such as cardboard, styrofoam packaging, and bubble wrap— in environmentally friendly ways?

76% of consumers would, if they had access to same day delivery, be more likely to order household items locally.[41]

OUR PAST IS OUR FUTURE

How History Reveals a Playbook in Reverse

"Paper or plastic?"

It's the most ubiquitous choice associated with the shopping bag, but it's a question with a brief history and a dwindling future. These two options presuppose the presence of a store-provided bag, which itself is a custom little more than half a century old. There is a bigger, more appropriate question that spans back to the dawn of the public marketplace and stretches forward into the future of all physical retail.

"How would you like to get this home?"

Before the 1950s, this was the proverbial question that accompanied any transaction. For as long as people had traveled somewhere to shop, they brought baskets, bowls, or bags of their own to carry their purchases home. Stores had little to offer in regards to helping customers carry their purchases home—the best they could do was create a paper cone to collect loose goods or wrap the products and tie the bundle with string to serve as a makeshift handle.

Around the turn of the 20th century, a cotton-mill worker named Margaret Knight invented a machine that could efficiently produce paper bags at scale. After winning a lawsuit over a man who attempted to steal her idea, she established the Eastern Paper Bag Company. Within two decades, a Minnesota grocer had improved the design, creating a reinforced paper bag with handles capable of carrying 75 pounds. He patented the product and sold each one for 5 cents, or roughly $1.12 today. By 1915 he was selling 1 million bags per year. It represented the first iteration of the modern shopping bag.

By the 1950s, paper bags were far cheaper to produce and most grocers and retailers provided them for free to customers with every purchase. Department stores seized the marketing opportunity and began branding their bags. But this notion to treat the transportation of purchases as an opportunity for advertising had been prototyped long before. The bag was not the first store-provided option to help customers get their products home. As far back as the 1800s, there was another alternative to carrying the goods home yourself: delivery.

Many stores managed and executed their own delivery services, often offering the option for free as a marketing tool. As gas-fueled trucks began populating city streets, these delivery vehicles became moving advertisements. The precursor to Bloomingdale's Big Brown Bag (debuted in 1973) was the department store truck parked out front of the neighbor's home.

The 1950s and '60s ushered in an era of "throw away living" that celebrated the novelty and ease of single-use products over the toil of cleaning, preserving, and storing multi-use alternatives. By 1965, a Swedish company called Celloplast filed for the patent to the perfect product for the dawning disposable era. The retail single-use plastic bag was lightweight, thin, strong, water resistant, and, most important to the businesses who would buy it, cheap. By 1979 the single-use plastic bag dominated 80% of the market in Europe, and American businesses began to take notice.

In 1982 both Safeway and Kroger, two of the largest grocery stores in the U.S., switched entirely to plastic bags. From there, broader industry adoption moved quickly. By the end of the decade, plastic bags had replaced paper around most of the world. Almost any typical transaction wasn't the acquisition of one thing, but two: the product itself and the plastic bag that carried it.

For several decades, there was no question how the customer would like to get their purchase home. There wasn't even a question of paper or plastic. The single loaf of bread at the grocery store, the pack of AAA batteries at the convenience store, the pack of cigarettes at the gas station, the candy bar at the pharmacy... they dropped into a single-use plastic bag not destined to be used for more than 12 minutes on average.[42]

The Moment We're In

We've reached a point where today we use an estimated 100 billion plastic bags per year in the U.S. alone, and fewer than 10% of these are recycled.[43] It's an untenable situation, and the world is awakening to a new reality that is destined to re-open that age-old question of commerce: "How would you like to get this home?"

It's now 2020 and the planet is flooded with bags made of plastic film. Plastic bags are found in the Marina Trench—the deepest depth of the ocean—at the top of Mount Everest, and on both polar ice caps. Countries around the world spend hundreds of millions of dollars on their cleanup. Society has never been more aware of this product's harm, and yet it remains—by far—the most abundant solution to how consumer goods are sent home with customers.

The tide is going out. Around the world, governments are enacting regulations, businesses are shifting practices, and consumers are adjusting their behavior. Change is coming.

> We use an estimated 100 billion plastic bags per year in the U.S. alone, and fewer than 10% of these are recycled

Design is a journey that begins with the needs of everyday people, and ends somewhere better. Somewhere new, but comfortable. Somewhere cleaner and more efficient, with a benefit for society.

The single-use plastic bag is a product that did its job so well, we stopped considering the underlying purpose it served. There was no more verb to innovate around—no "transport" or "carry" or "schlep" or "haul." Only a single noun made of a single material. Bag. Plastic.

The design challenge before us today removes the noun, and returns us back to the verb. In a world without the single-use plastic bag, how do we get our purchases home? And how do we do it better? Can we solve this problem by reducing harms and increasing benefits? Can we leverage the opportunities presented at checkout, pickup, or delivery, and ensure everyone can transport (or carry or schlep or haul) their goods in a manner that improves lives, heals the planet, and helps businesses be the agents of that better future?

Design is a journey, and so is the challenge before us. It begins with a need, and we're confident it will end somewhere better. It's a journey we're taking together.

It's a new way home.

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