

# Bags to Bags

## Wicked Problems

The world is growing increasingly complex. New discoveries lead to vast changes in the way we perceive the world around us. As we continue to collaborate across national borders, we find that many countries are facing the same wicked problems. By working together, we can come up with comprehensive solutions. We believe that for every wicked problem, there is a wicked solution.

## Wrapping the world in plastic

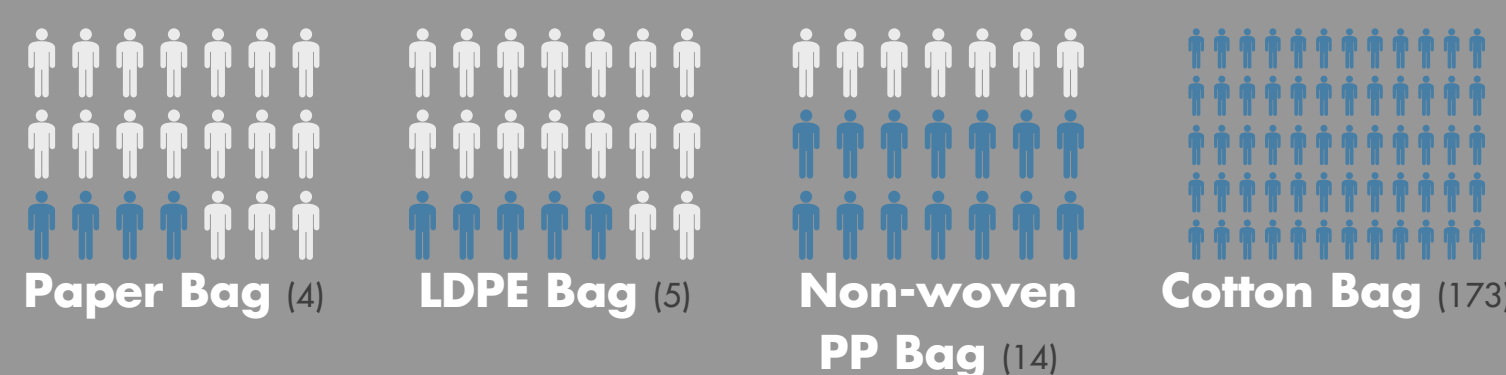
Each year, there are 500 billion to 1 trillion bags consumed worldwide, which equates to one million plastic bags used per minute.<sup>[17]</sup> According to The Wall Street Journal, the U.S. alone goes through 100 billion plastic shopping bags annually at an estimated cost to retailers of \$4 billion. The issues related to plastic grocery bags can no longer be ignored. They provide huge amounts of litter and trash, especially in urban areas; "after a busy weekend, you can see bags overflowing from the trash cans. The bags end up clogging our streets, littering our public parks, and costing taxpayers millions of dollars in cleanup and waste removal."<sup>[4]</sup> These bags also litter oceans and streams and can be extremely harmful, if not lethal, to the fish, sea turtles and other animals that often mistake them for food. Looking at the current end of life solution, which can be seen to the right, most bags will be landfilled and remain intact for thousands of years to come. Worldwide, only 1 to 3% of plastic bags are recycled.<sup>[20]</sup> That is a huge volume of increased waste for us and following generations to leave in the landfills.



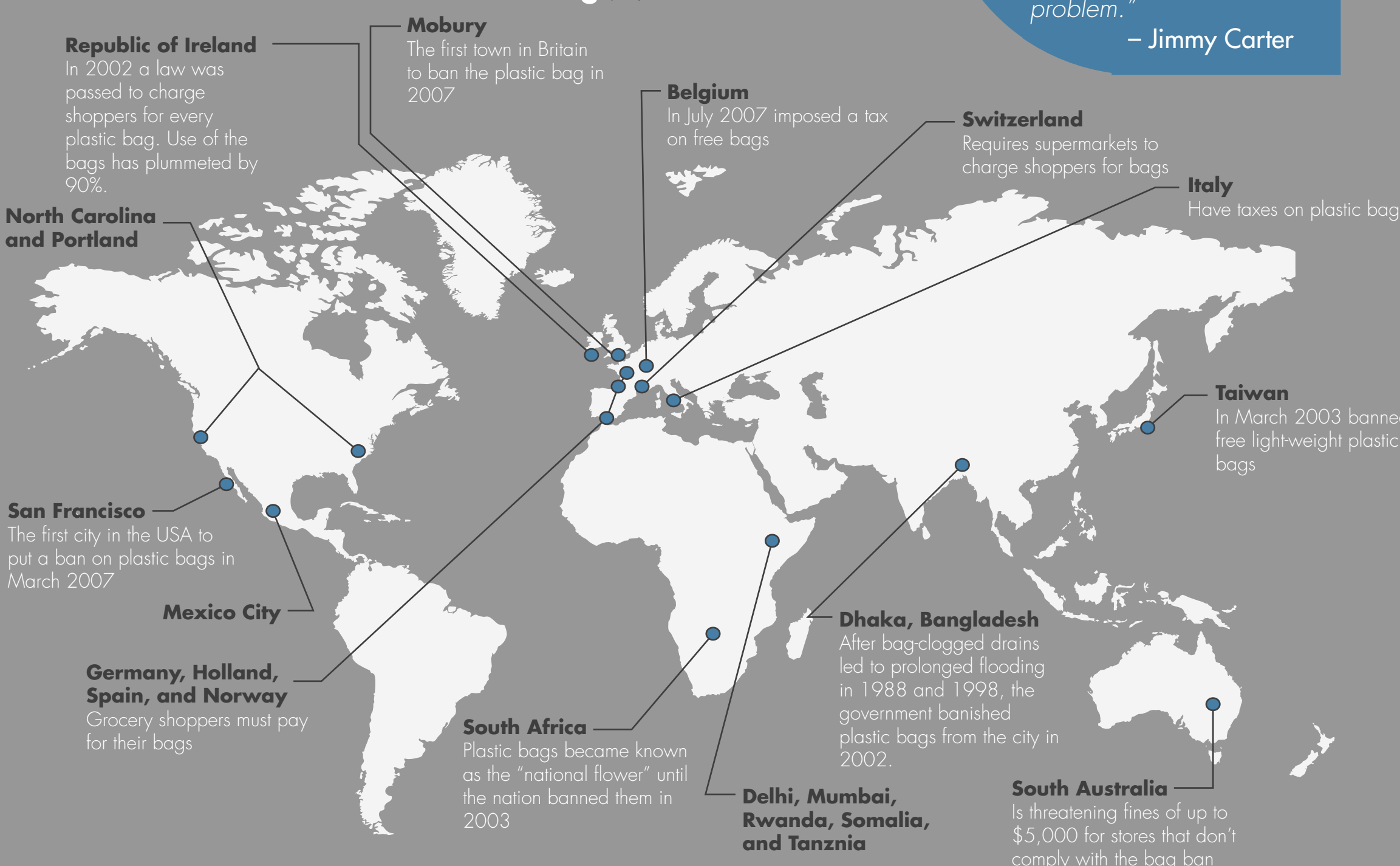
## What's being done?

It's true that plastic bag pollution and use is a global problem and many countries have taken steps to reduce or eliminate their use. Ireland, the first European country to impose a tax on plastic bags, has been able to reduce their consumption by up to 90%.<sup>[17]</sup> In other locations around the world, government legislation has outlawed their use completely, relying on the use of reusable and paper bag solutions. Reusable bags have many benefits that make them an acceptable choice for addressing this issue. The most commonly used reusable bags are manufactured from polypropylene. They are strong and durable, and can hold more than a conventional single use LDPE grocery bag. Other options include organic materials such as cotton. Whatever type of bag is used, the key to reducing the impact is to reuse it as many times as possible, but how many times do you need to reuse those bags to offset the global warming potential of that bags creation?

The amount of primary use required to take reusable bags below the global warming potential of HDPE bags:



"Solid wastes are the discarded leftovers of our advanced consumer society. This growing mountain of garbage and trash represents not only an attitude of indifference toward valuable natural resources, but also a serious economic and public health problem."  
— Jimmy Carter



## The Wicked Solution

As we have discovered, taxing and making single-use LDPE plastic bags illegal has created new, unintended consequences. Instead of fighting the use of plastic bags we need to redesign them with new high-tech materials that utilize renewable resources, stops consuming petroleum, and supports a circular economy. This wicked problem requires a wicked solution. The answer lies in the plant based polymer known as polylactic acid or PLA. PLA is manufactured from fermented plant starches, usually corn, and is quickly becoming a popular alternative to petroleum-based plastics.<sup>[12]</sup> PLA is not only made from renewable resources, it can effectively be reprocessed while maintaining its molecular integrity. Currently, this plastic is being used largely in packaging and plastic bottles. It has proven its value in being a reprocess-able material. However, making the plastic bags from this material is only a part of the solution. Because this plastic is organic based, it can not be recycled with the petroleum based plastics. Therefore, the value in PLA plastic warrants its own recycling stream in order to maintain the material's potential. Our wicked solution is creating a circular system that allows customers to use these new PLA bags and return them to the store. The store then returns the materials to be made into new bags, supporting a circular economy. PLA plastics are the technical and economical solution to the wicked problems associated with the use of petroleum based plastics.

### About PLA

- Polylactic acid plastics are made from natural plant starches which are a renewable source of materials.<sup>[17]</sup>
- The chemical composition of PLA plastics can easily be broken down into recyclable or compostable materials.
- When purified, the recycled components can be used in the manufacturing of new PLA bags with no loss of original properties.<sup>[13]</sup>
- PLA plastics do not require any fossil fuels to manufacture.



## Related Industries

A good comparison for our system is the bottle bills that have been enacted in certain states throughout the US. The bottle bill is the general name for the law that requires most plastic bottles and aluminum cans purchased to have a deposit added to the price of each item. Later the consumer can return the bottle or can to the retailer where it was purchased or sometimes a variety of retailers. The customer will be reimbursed for the deposits paid and the materials will be collected for future production. A variety of studies have been done to measure the success of the bill. The deposit systems collect more of their target materials than curbside programs.<sup>[11]</sup> The monetary value associated with these bottles and cans have caused consumers to change their behaviors. Clearly, this program has been a win-win for cans and bottles, and could be used for the new PLA grocery bags.



## A Bright Future Ahead

There is an expanding global market for PLA productions. Environmental awareness has increased the global demand for these biobased and biodegradable plastics.<sup>[18]</sup> Governments around the globe are imposing bans on the use of fuel-based polyethylene bags, and are providing incentives for bio-based PLA productions. This has pushed the development of new plants, and the retooling of others, to adjust to this high-tech polymer.<sup>[19]</sup> Currently the cost is the only negative factor in this changing market. PLA plastics are more expensive than LDPE plastics. In the early 2000's when PLA hit production, it cost over \$200 to create a pound. Since then the prices have dropped to below \$1 per pound because of market growth and manufacturing advancements. Still PLA is more expensive, but why wouldn't it be? This plastic has amazing potential when set into a closed recycling system, a true cradle to cradle material. LDPE plastics have been in production for over 100 years, and its time to change our standards to protect the environment and to push the advancement of new technologies. Banning plastic grocery bags is not the answer. Creating a plastic grocery bag from a material that is environmentally, economically, and socially friendly is what we need to fix this wicked problem.



## Why reusable bags are not the final solution..

While it is generally accepted that reusable bags are a good alternative to single-use LDPE grocery bags, simply banning them is not the solution. For example, a study conducted in Australia, found their ban has resulted in an increase in the number of reusable shopping bags per household. Half the participants in that study had thrown out at least one of those reusable bags within the last six months. The study also addressed the rated average lifespan of a cotton reusable bag at 1.5 years.<sup>[11]</sup> However, a cotton bag needs to be used for 2.5 years (at one use per week) in order to ensure it has a lower global warming potential than a normal shopping bag.<sup>[12]</sup> This means that most bags are not used long enough to justify using them over other bags.

Cross contamination is a large problem with reusable grocery bags. In a California grocery store, large numbers of bacteria were found in almost every reusable bag brought into the store; and E. Coli, a bacteria that can cause food poisoning, was found in 12% of the bags.<sup>[13]</sup> In the three months following the bag ban, there was a 46% increase in deaths from food-borne illness, in San Francisco.<sup>[15]</sup> Through proper washing, the bacteria could be removed, however less than 3% of consumers report washing their bags.<sup>[13]</sup> The bacterial risk of reusable bags clearly cannot be ignored.

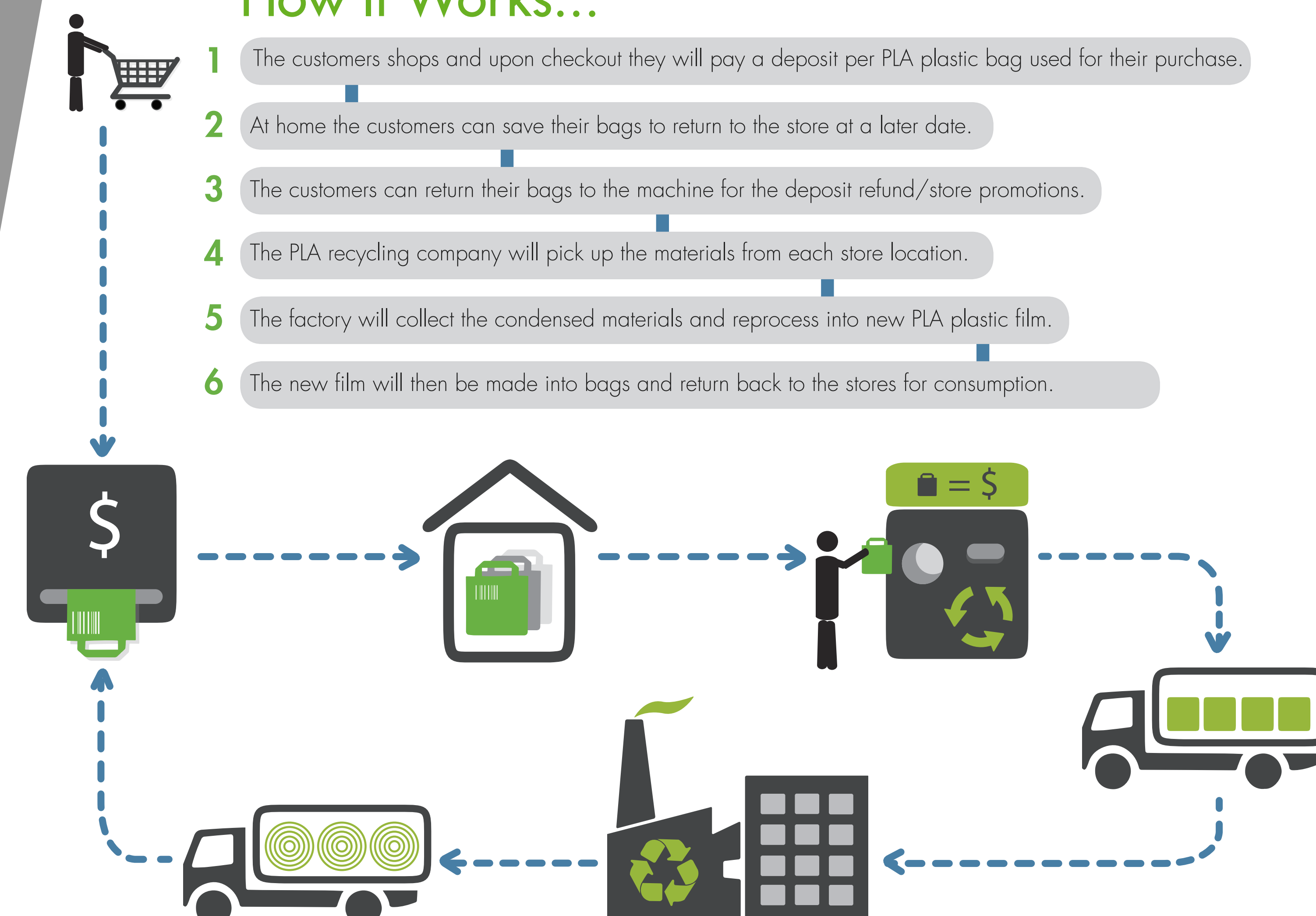
Some bags are made with post-consumer recycled material, which is much better for the environment, but comes with its own issues. Many bags had to get recalled due to potentially harmful levels of lead.<sup>[16]</sup> This can be prevented by ensuring a pure recycling stream. In order to do that, consumers must be knowledgeable on the most appropriate way to recycle these bags.

While reusable bags are acceptable, they come with some unintended consequences. In Ireland plastic bags have been reduced 90% but caused paper bag use to increase 60%. This is the case for most locations that have taxed or banned plastic bags. Paper production emits air pollution, specifically 70% more pollution than the production of plastic bags.<sup>[11]</sup> Producing cotton bags have harmful side effects as well. The amount of water needed, pesticides, refining and transportation involved with cotton bags create a huge environmental footprint.



## How It Works...

- The customers shops and upon checkout they will pay a deposit per PLA plastic bag used for their purchase.
- At home the customers can save their bags to return to the store at a later date.
- The customers can return their bags to the machine for the deposit refund/store promotions.
- The PLA recycling company will pick up the materials from each store location.
- The factory will collect the condensed materials and reprocess into new PLA plastic film.
- The new film will then be made into bags and return back to the stores for consumption.



5%  
The amount of reusable bags recycled