

## Which bag should you use?

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You've filled up your cart and made it to the front of the grocery line when you're confronted with yet another choice: what kind of **bag** should you use? If you've seen the images of plastic bags **strewn across** the ocean, it might seem obvious that plastic is bad for the environment. Surely a **paper bag** or a **cotton tote** would be the better option. But is that really true?

Each of these three **materials** has a unique **environmental impact** that's **determined by** its **carbon footprint**, its **potential to be reused and recycled**, and its **degradability**. So, to get the full story on these **grocery bags** we need to look at how they're **made**, how they're **used**, and where they **ultimately go**.

Let's start with **plastic**. The typical **thin** and **flimsy** plastic bag is made of **high-density polyethylene**, commonly known as HDPE. Producing this material **requires extracting petroleum** from the ground and **applying extreme heat**. The resulting **polymer resin** is then **transported** alongside additional polymer resinlike titanium oxide and **chalk** to a bag manufacturing plant. Here, **coal-powered** machines **melt** the materials down and **spin** them **into sheets of plastic**, which are then **folded** into bags. By the time a bag **reaches** its final destination, it's **contributed** an **estimated 1.6 kg of carbon dioxide to the atmosphere**.

That's the same **amount of carbon** a **car** produces, driving a little over 6 kilometers. But the **alternatives** actually possess a much larger carbon footprint. Paper is made from **wood pulp**, and when you **account for** the **carbon cost of removing trees** from their **ecosystems**, a single paper bag can be **responsible for** about 5.5 kg of carbon dioxide. Meanwhile, growing cotton is an extremely **energy and water-intensive** process. The production of a single **cotton tote** emits an **estimated 272 kg of carbon dioxide**.

When we **compare** carbon footprints, plastic bags are the **clear winner**. But **environmental impact** is also **determined by** how the bag is used. **Reusing or recycling** these bags significantly **offsets their environmental toll** by **reducing demand for new**

production. To quantify that offset, we can **divide** the bag's carbon footprint by the number of times it's reused. For example, if a typical paper bag is reused three times, it has a **lower net impact** than a **single-use** plastic bag. The carbon footprint of a cotton tote can similarly be lowered, if it's reused 131 times.

Of these three options, **durable cloth totes** are most likely to be reused. Evidence shows paper bags are quickly discarded due to their **tendency to tear**. This issue plagues HDPE plastic bags as well. But even when they're made to **avoid tearing**, their **widespread availability** makes it easy to treat them as **single-use** items. Fortunately, researchers estimate that 40% of HDPE bags are **reused at least once for throwing out waste**.

Recycling these bags also offsets their **carbon footprint**, but it's not **universally possible** for each material. Many countries **lack the infrastructure** to efficiently recycle plastic bags. Cotton totes are perhaps even more difficult to **break down** and **process**, but since they're often reused for long periods, they're still least likely to end up in **landfills**.

Whenever these bags aren't recycled, the third **factor** in calculating environmental impact comes into play: **degradability**. Since HDPE bags are **heat-resistant** and **insoluble**, they stick around long after we're done with them. Partially **broken-down** plastic can **circulate in ecosystems** for centuries. Cotton on the other hand **degrades substantially** in a matter of months, and paper bags **break down completely** in just 90 days.

So, which bag should you use? It turns out the most **environmentally friendly** bags have features of several materials we've discussed. They're **durable** and **reusable**, like cotton, but **made of plastic**, which has a **lower carbon footprint** than cotton or paper. These **sturdy** shopping bags **consist of** polyester, vinyl, and other **tough** plastics, and are already used worldwide. Most importantly, they should **last a lifetime**—making them the best option for the planet, and your groceries.