

## Which bag should you use?

- Luka Seamus Wright and Imogen Ellen Napper

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**.