

What is a carbon offset?

A carbon offset is a credit that a person or organization can buy to decrease its carbon footprint. When the number of carbon offset credits obtained is equal to an individual or organization's [carbon footprint](#), that person or organization is carbon-neutral. Revenue generated from the purchase of carbon offsets is often -- but not always -- invested in environmentally friendly projects, like investments in [green computing](#) technologies.

More generally, carbon offsetting is any reduction of greenhouse gas ([GHG](#)) emissions to make up for emissions that occur elsewhere. Carbon offset credits show that an organization or person has reduced its emissions. The term *carbon offset* is used to describe both the credit and the act of carbon offsetting.

A carbon offset credit represents an emission reduction of 1 metric ton of carbon dioxide. The goal of carbon offsetting is to reduce all or a portion of a carbon footprint.

What are carbon footprints?

A carbon footprint is the total amount of carbon dioxide and other GHGs the activities of a person or organization generates. It includes both direct and indirect emissions.

A direct emission originates from a source the reporting entity owns. An example is carbon dioxide produced from fossil fuel combustion inside a delivery vehicle a company owns. Indirect emissions result from the reporting entity's activities but originate from sources the

reporting entity does not own. These are also referred to as *upstream* or *downstream activities*.

Producing a T-shirt creates indirect [emissions at various points in the supply chain](#). These include growing the cotton and shipping raw materials and the final product, as well as later decomposition of the material in a landfill. These indirect emissions contribute to both the producer's and the consumer's carbon footprints.

The Environmental Protection Agency (EPA) and other websites provide [free carbon footprint calculators](#). Individuals can use these calculators to calculate their carbon footprint.

How does carbon offsetting work?

Organizations and individuals pursue carbon offsetting voluntarily or to comply with regulations.

An individual or company can pay a broker to remove a portion of carbon from the atmosphere, often in another part of the world. The customer [calculates their emissions level](#), and the broker then charges a fee based on that level. The broker will then invest a portion of that money in a project that reduces carbon emissions.

For example, an individual may take a flight that will release a certain amount of GHG into the atmosphere. The person uses a tool to calculate the emissions released on that flight and then buys a carbon credit from a broker to offset that amount of emissions. The broker subtracts its fee and uses the rest of the money to invest in an emissions project, such as a reforestation effort.

Carbon credits cost \$3–\$5 per ton of carbon emissions today. The price is expected to rise dramatically in the next decade.

The individual or organization receives a certificate or some other proof that they've purchased a carbon offset. They can then use this as proof they've demonstrated compliance.

Another example involves GHG emissions. An organization may [monitor GHG emissions](#) generated from cloud usage with a tracking tool and then purchase a carbon offset to comply with decarbonization standards.

An example of a regulation promoting offsetting is the [British Standards Institution's Publicly Available Specifications 2060](#). It details how to demonstrate carbon neutrality and develop a carbon management plan.

Steps to offset carbon emissions

An organization can take the following three steps to offset its carbon emissions:

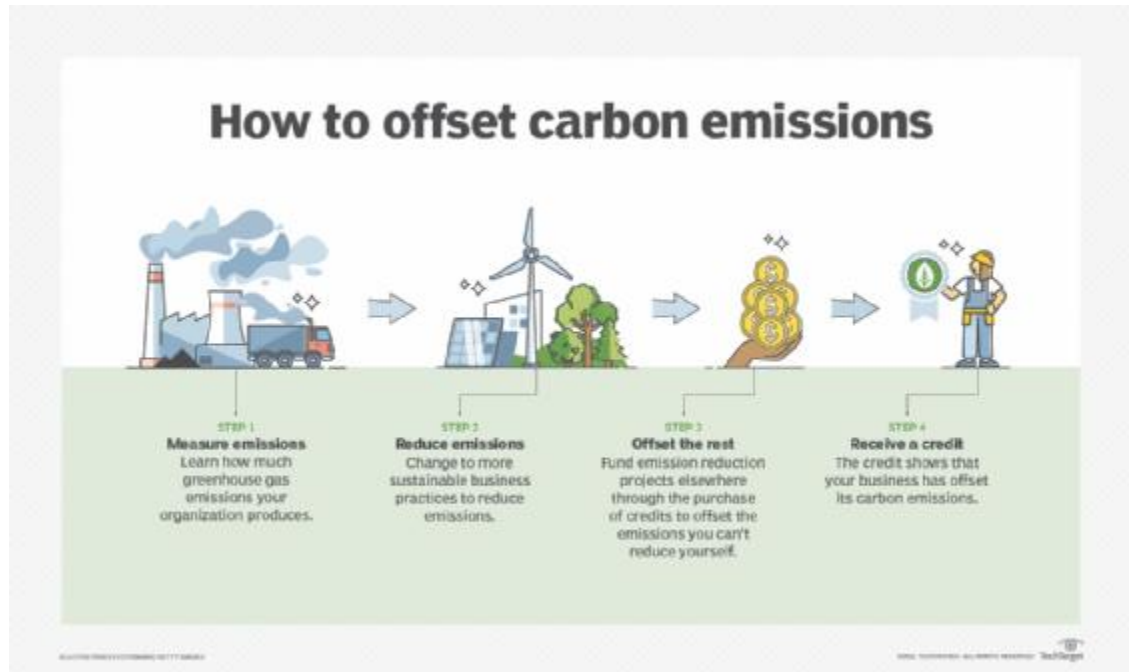
1. **Calculate and measure emissions.** There are specific protocols to help companies do this. For instance, the GHG Protocol is an internationally recognized accounting standard that helps organizations measure and manage GHG emissions. The protocol divides emissions into three areas or scopes:
 - Scope 1 is direct emissions from sources an organization owns or controls.
 - Scope 2 is indirect emissions from electricity, steam, heating and cooling resources an organization buys.
 - Scope 3 is other indirect emissions that come from an organization's value chain.

The emissions are expressed in tons of carbon dioxide equivalent and include other GHGs, such as methane and nitrous oxide. Organizations should regularly assess their

carbon footprints and include them in sustainability reports and other financial reports.

At least 40 countries require some sort of emissions reporting. In the United States, companies that emit 25,000 or more metric tons of carbon dioxide must report those emissions to the EPA annually. The reporting threshold is lower in California -- 10,000 metric tons.

2. **Reduce emissions where possible.** Once an organization measures its emissions and identifies the sources, it can develop a sustainability strategy. Guidelines for reducing emissions are detailed in the Science Based Target initiative (SBTi), which aligns with the goals of the [Paris Agreement](#). The SBTi advises companies to use 80% renewable electricity by 2025. Carbon reductions can also be achieved in smaller ways through individual action, like changing to a more sustainable diet or switching to greener transportation, such as electric vehicles and trains with hybrid locomotives.
3. **Offset remaining emissions.** Emissions that cannot be reduced outright can be offset. Reduction projects are ones where carbon dioxide is absorbed or removed. A project must be certified to issue carbon credits. Some examples of international certifications include the following:
 - Climate Action Reserve
 - Gold Standard
 - Plan Vivo



Carbon reduction is the ultimate goal of offsetting. Businesses should reduce what they can of their own emissions before offsetting.

Once certified, third-party monitoring organizations verify that a project meets criteria, such as the following:

- **Net-positive emission removal.** Credits must represent emission removal or reduction that would not have happened otherwise. This requires monitoring organizations to inspect and ensure a project is using verified methodologies and science in their calculations.
- **Leakage-free.** Creating carbon credits must not result in emissions elsewhere. For example, if one forest is protected as part of a project, another unprotected area cannot see an increase in deforestation as a result.
- **Permanent.** Credits represent emission reductions that cannot be reversed. For example, projects may seek to store carbon underground. There is a low

likelihood this carbon makes its way back into the atmosphere.

Organizations should choose a certified offset project that generates credits that meet these criteria. In addition, they should choose projects that meet their own environmental and social criteria, such as supporting biodiversity.

Once purchased, organizations should be transparent with stakeholders about their offsetting strategy and the projects they are supporting. Transparency is important to avoid greenwashing accusations. Greenwashing is marketing spin used to convince people that an organization's products, goals and policies are environmentally friendly.

Can carbon offsetting solve climate change?

Offsetting has some value in stopping climate change, but it is only one of many climate solutions necessary to save the climate. In offsetting, the carbon emission still takes place, but someone else offsets it. Reducing, eliminating and reversing GHG emissions is a more effective approach to reducing emissions.

Offsets do not encourage polluters to stop producing GHGs; they encourage them to [fund other entities to do so](#). Still, offsets do encourage improved carbon policies and implementation of them where there previously was none.

Carbon offsets will not solve climate change unless leading carbon emissions producers commit to carbon neutrality. This requires developing a sustainable supply chain and a commitment to using renewable and clean energy sources.

Examples of carbon offsetting

Some examples of carbon offsetting projects are the following:

- **Forestry.** Tree planting projects restore areas facing deforestation. Trees absorb and hold carbon. Without them, that carbon would be in the atmosphere, making global warming worse.
- **Agriculture.** Farmers grow crops using technology and techniques to maximize resources and reduce waste when growing crops.
- **Aviation.** Airline operators [optimize flight paths with AI](#) to minimize creation of contrail clouds.
- **Renewable energy.** These projects replace fossil fuel use with clean, renewable energy, such as that generated from a wind farm.
- **Water management.** Projects get clean water to areas with polluted or otherwise contaminated water so that they can reduce the need to chemically treat or boil water.
- **Waste management.** Projects capture the methane generated in landfills from waste disposal.
- **Carbon sequestration.** Projects use [carbon capture and storage](#) to put carbon in places where it's unlikely to be released back into the atmosphere. They [take carbon out of the air and store it in soil](#), in swamps, in trees and even in rock.
- **Energy efficiency.** Projects aim to improve the efficiency of existing infrastructure by upgrading building insulation, for instance.

Find out how [AI and machine learning can have a mixed impact on climate change prevention efforts](#).