Carbon Footprint: A Complete Overview

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As climate change accelerates, understanding and managing greenhouse gas emissions has become essential for individuals, organizations, and countries. At the heart of this effort is a key concept: carbon footprint. This enables us to measure, reduce, and ultimately offset our carbon emissions, making them crucial elements of any sustainability strategy.

This article explores the basics of carbon credits, how carbon footprints are calculated, and the role these elements play in helping businesses meet their decarbonization goals.

Good reading!

What is a Carbon Credit?

A carbon credit is a tradable certificate representing the reduction or offset of one metric ton of carbon dioxide (CO_2) emissions in the atmosphere.

It acts as a metric to quantify the amount of greenhouse gas emissions that have been either reduced or captured through a certified project, relative to a predetermined standard.

Such initiatives can include efforts like improving energy efficiency in homes or industries, producing renewable energy, reforesting areas, or capturing methane emissions from landfills or livestock operations, among other examples.

Corporations naturally have a carbon footprint and are increasingly committing to reducing or even neutralizing these emissions. As they work towards their decarbonization goals and related technologies evolve, carbon credits provide a means to meet their short-term targets.

Additionally, these projects present an opportunity to channel investment into the least developed countries, benefiting indigenous or marginalized communities through job creation, benefit sharing, infrastructure improvements, and other positive impacts.

What is a Carbon Footprint?

A carbon footprint is the total amount of greenhouse gasses (GHG), especially carbon dioxide (CO_2), that are emitted directly (like those from burning fossil fuels in car engines or heating buildings) or indirectly (related to electricity consumption, for example) by human activities.

In the United States, the average person has a carbon footprint of 16 tons per year, making it one of the highest in the world. By comparison, the global average is closer to 4 tons. To prevent a global temperature increase of 2°C, the average carbon footprint per person needs to fall below 2 tons annually by 2050.

The concept of carbon footprint helps individuals and organizations understand the environmental impact of their actions and decisions, from daily routines to industrial processes. Reducing the carbon footprint is crucial in mitigating climate change by lowering greenhouse gas emissions.

Company Carbon Footprint

A company's carbon footprint is a key indicator of its environmental impact. It serves as an indirect measure of the energy, products, and services consumed and quantifies the carbon emissions associated with the company's operations or products.

Product Carbon Footprint

The carbon footprint of a product encompasses the greenhouse gas emissions generated throughout its entire life cycle, from the extraction of raw materials to its disposal as waste.

Carbon Emissions Inventory Across the Board

Supply chains often contribute to more than 90% of an organization's total GHG emissions when considering their overall climate impact.

In the past decade, organizations across all industries aiming to reduce their global carbon footprint have needed to calculate, reduce, and manage their GHG emissions in order to achieve the ultimate goal of becoming Climate Neutral.

Calculating a carbon footprint involves identifying and measuring the various sources of emissions, both direct and indirect. Several approaches can be used, depending on the level of detail and accuracy required.

Here are the main standards for measuring greenhouse gas emissions:

Greenhouse Gas (GHG) Protocol

The GHG Protocol is an internationally recognized standard for measuring and managing greenhouse gas emissions. It divides emissions into three categories, or “scopes,” which help organizations understand their carbon impact:

- **Scope 1:** Direct emissions from sources that a company owns or controls. This includes emissions from fuel combustion in company-operated vehicles, provided they aren’t electric.
- **Scope 2:** Indirect emissions generated from the production of energy that the company purchases and uses.
- **Scope 3:** All other indirect emissions within a company’s value chain that it neither owns nor directly controls.

These emissions come from upstream activities, such as raw materials and employee commuting, as well as downstream activities, like emissions from products sold, and fall outside the company’s direct operations and energy use.

IPCC Guidelines for National Greenhouse Gas Inventories

Developed by the Intergovernmental Panel on Climate Change (IPCC), these guidelines offer comprehensive methodologies for estimating emissions and removals across sectors like energy, industrial processes, agriculture, and waste.

The guidelines are often used by national governments to report emissions under international agreements such as the Paris Agreement.

It includes Tiered Approaches (Tier 1, Tier 2, Tier 3), where Tier 1 offers default values, while Tiers 2 and 3 require more complex, country-specific data.

Tier 1: Basic Approach

Tier 1 uses globally standardized default emission factors provided by the IPCC and minimal data inputs like basic activity data (e.g., fuel use, livestock numbers).

This method provides rough estimates and is suitable for initial inventories in countries with limited resources or technical expertise.

Tier 2: Intermediate Approach

Tier 2 improves accuracy by using country-specific data and refined activity inputs to better represent

local conditions.

This method adjusts emission factors to align with national practices and technologies, offering more reliable estimates than Tier 1 and suitable for countries with better data collection capabilities.

Tier 3: Advanced Approach

Tier 3 uses complex models or direct measurements with high-resolution, country-specific data for maximum accuracy.

This approach includes continuous monitoring and detailed models that account for regional and technological variations, ideal for nations with advanced infrastructure and the need for precise emissions reporting.

ISO 14064 Standards

The ISO 14064 series offers a standardized approach for quantifying, monitoring, and reporting greenhouse gas emissions.

It includes ISO 14064-1 (for organizational emissions), ISO 14064-2 (for GHG reduction projects), and ISO 14064-3 (for verification and validation).

ISO standards are especially valued in regions or sectors where rigorous third-party verification and consistent methodology are required.

Calculating Carbon Footpints

Calculating a business’s carbon footprint involves assessing and quantifying the greenhouse gas emissions associated with its activities.

The specific methodology can vary depending on the industry and the level of detail desired, but here are the general steps typically involved in calculating a business’s carbon footprint:

Data collection

Calculating their carbon footprint has become a crucial step for medium and large companies across various industries, especially for large publicly listed companies that need to demonstrate their commitment to combating climate change in their Sustainability Reports.

The first step is to identify and catalog all potential emission sources, ranging from production facilities and offices to data center servers and vehicle fleets, while gathering the most accurate data available for each source.

This involves extracting data from electricity and water bills, tracking fuel purchases and vehicle mileage, recording the weight of different types of waste disposed of, and more.

For a farm, this would include counting livestock and tracking the amounts of fertilizer and pesticides used (both of which have a notable carbon footprint).

In the case of a tech company that uses substantial data storage, it would need to account for the cloud storage space utilized.

Emission factors

Emission factors are key to calculating a company’s carbon footprint, representing the amount of greenhouse gasses emitted per unit of activity or energy use (e.g., per kilowatt-hour or liter of fuel).

These factors can be sourced from government agencies, industry associations, or environmental databases, and help convert data like energy consumption or fuel use into measurable emissions.

Accurate emission factors are crucial for understanding and reducing a business’s environmental impact.

Calculation

Multiply the activity data (e.g., energy use, fuel consumption) by the corresponding emission factors to calculate the greenhouse gas emissions associated with each activity. Perform calculations separately for each scope (Scope 1, 2, and 3) to account for different emission sources.

Conversion

Convert the emissions from each greenhouse gas (e.g., carbon dioxide, methane, nitrous oxide) into a common unit, typically carbon dioxide equivalent (CO_2e). This step involves applying global warming potentials (GWPs) that express the relative impact of each gas compared to carbon dioxide.

Aggregation

Sum up the emissions from all relevant activities within each scope to obtain a total carbon footprint for the business. This total can be expressed in absolute emissions (metric tons of CO_2e) or normalized by a suitable metric, such as revenue or production output, to provide intensity measures.

Verification

It is advisable to have the carbon footprint assessment verified by an independent third party to ensure accuracy and credibility.

Reporting

Communicate the results of the carbon footprint assessment in a transparent and standardized manner. This may involve preparing a comprehensive report, disclosing the findings in sustainability reports, or sharing the information with relevant stakeholders.

Reliable Tools

Calculating a carbon footprint is a complex task, and businesses may seek the assistance of sustainability consultants or specialized software tools to streamline the process and ensure accuracy.

Viridios AI is a reliable tool to understand the carbon market and opportunities to leverage it to offset emissions and meet goals in the short term.

Learn more about carbon footprint and the VCM by **booking a demo with our specialists**!