CIBO TECHNOLOGIES

The Definitive Guide To Carbon and Climate Commitments

How to Choose and Report on Your Sustainability Initiatives

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Carbon Overload!

Every day we hear something new about climate change, greenhouse gases, carbon credits, cap-and-trade markets, carbon footprints, sequestration, environmental regulation, and so on. And we hear the names of many organizations that are taking action: the UN releasing a report; the California Air Resources Board setting emission rules for cars sold in California; Apple or PepsiCo saying they will reduce their greenhouse gas inventory by half in 10 or 15 years; or a power generation company using carbon credits to offset a portion of their emissions to meet requirements under a cap-and-trade system.

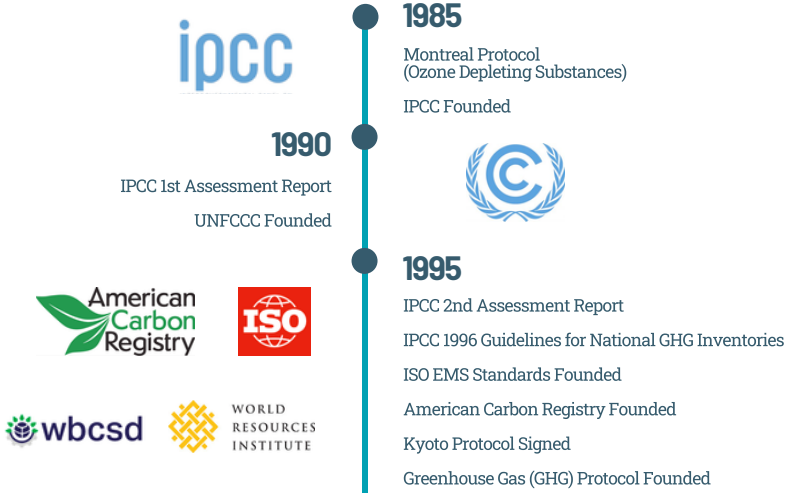
How do all of these organizations and systems relate to each other? As a representative for your company, which pieces of the puzzle matter most to you? What can you expect when your company needs to take action on its emissions?

The general principles are simpler than you might think. And until recently, implementing changes needed to reduce emissions has probably been about as difficult as you think it would be. Although a lot of work remains to be done, new standards and organizations have been evolving to simplify and accelerate implementation. Most of the focus for the last 30 years has been on power generation and transportation. CIBO has been working to do this for agriculture. In this publication, we will look at how the pieces all fit together.

How We Got Here

To understand how things are organized today it helps to look at where we have been. There are three different phases of environmental awareness and action: the time leading up to 2000 when the impact of global emissions was first being recognized and worldwide action was started; 2001-2012 when carbon trading markets matured and major corporate involvement started; and the time since 2013 featuring the Paris Agreement, increasing alarm over the need to accelerate emission reduction actions, and growth of corporate initiatives to take action on emissions.

Part 1: Recognition & Government Action (1970s - 1999)



For this primer, we will start in the mid-1980s, when the world was taking action to reverse damage to the ozone layer. This layer of the earth's stratosphere absorbs more than 95% of the sun's high-frequency ultraviolet light that might otherwise be harmful to life on earth. Researchers first observed in 1973 that ozone in this layer was being depleted.

In the following years, more evidence was collected, and an understanding of why it was happening was developed: man-made gases released into the atmosphere -- including chlorofluorocarbons (CFCs) used in refrigeration systems -- were steadily destroying atmospheric ozone. In 1987 the Montreal Protocol, a treaty designed to protect ozone by phasing out the use of CFCs and other ozone-depleting substances, was universally ratified by the members of the UN. This was huge, and by UN standards very fast: only 14 years from the first discovery to a worldwide treaty. By 2012, 98% of the ozone-depleting substances targeted in the Montreal Protocol had been phased out, ozone levels in the stratosphere were shown to be improving, and climate models showed the ozone layer was expected to return to its 1980 levels by 2070.

Score one for mankind!

By the time the Montreal Protocol was signed, other human-induced atmospheric changes were also being observed. Researchers were warning of climate change in general and global warming in particular caused by other common gas emissions: carbon dioxide, methane, nitrous oxide, and several other gases that became collectively known as “greenhouse gases”. These gases worked either directly or indirectly to enhance the greenhouse effect, which caused more of the sun’s energy to be retained in the atmosphere, effectively warming the planet.

On the heels of the Montreal Protocol, the Intergovernmental Panel on Climate Change (IPCC) was formed by the UN in 1988. The IPCC’s mission was to report on the science of climate change: data collection and reporting; climate change causes; how can we expect things to change in the future; etc. Two of the main products of the IPCC have been a series of six Assessment Reports (1990-2021) that provide assessments of the latest data and model predictions available from the scientific community, and three Guidelines for National Greenhouse Gas Inventories (1996, 2006, 2019) that provide a framework for calculating a country’s greenhouse gas inventory.

The Montreal Protocol was a single agreement negotiated through the UN. To handle the broader needs of negotiating new treaties for addressing climate change the United Nations Framework Convention on Climate Change (UNFCCC) was established in 1992. After several years of discussion and negotiation guided by the UNFCCC, the Kyoto Protocol was signed in 1998. The Kyoto Protocol laid the groundwork for many future carbon programs, both public and private:

- It implemented a cap-and-trade system for nations to meet their emission targets and two mechanisms for funding emission reduction projects between nations: the Clean Development Mechanism (CDM); and the Joint Implementation (JI). These provided the first large-scale mechanisms for one organization to pay for greenhouse gas reductions elsewhere which in theory would have a bigger impact than if they had reduced their own emissions.

- Methodologies were developed within the CDM and JI to define many processes for predicting, measuring, validating, and reporting the actual emission reductions expected from emission-reduction projects. Eventually, the CDM and JI would also highlight how accounting oversights by well-intentioned actors and deliberate gaming by others could distort the benefits of carbon credits and reward bad actors. This led to policy refinements needed to reduce risk and build or maintain confidence in the credits offered by carbon programs. The lessons learned in the CDM and JI programs strongly influenced future greenhouse gas programs.

- It established commitments for ratifying nations to reduce their greenhouse gas emissions while recognizing the differences in nations' technical and financial abilities at different stages of development. Industrialized countries had larger, more advanced economies and were responsible for most historical and current emissions, so they were expected to make more significant financial contributions and steeper emissions cuts. Developing nations were given more runway to continue the energy-intensive development of their economies.

- It focused reduction efforts on the most important greenhouse gases:

    - Carbon dioxide (CO2)
    - Methane (CH4)
    - Nitrous Oxide (NO2)
    - Hydrofluorocarbons (HFCs, a group of related gases common in industrial use)
    - Perfluorocarbons (PFCs, a group of related gases common in industrial use)
    - Sulfur hexafluoride (SF6)
    - Nitrogen Trifluoride (NF3, added in 2012 as part of the “Doha” amendment to the Kyoto Protocol)

The gases other than CO2 were included because they are far more powerful as greenhouse gases than CO2, so even small amounts of them can have a dramatic impact. Methane, for example, has a 100-year “global warming potential” of ~25, meaning a ton of emitted methane will absorb about 25 times as much energy as a ton of emitted CO2. Thus, the global warming potential of SF6 is nearly 23,000.

Part 2: Growing Experience & Commercial Involvement (2000-2012)

Until the late '90s, most climate change activities had focused on growing the scientific body of knowledge and developing international cooperation frameworks. Since then, those activities have continued and even accelerated. The Kyoto Protocol became effective in 2005, and its first "commitment period" -- the window in which signatories were to meet the emission targets they had agreed to under the treaty -- began in 2007. After that, the CDM and JI began operating, enabling funding for emission reduction projects worldwide.

During the early 2000s, other carbon trading systems were also being established. The EU Emissions Trading System became active in 2005, new regulatory schemes went into effect for California (2004), and in certain industries in the northeastern U.S. (2009), and many others.

But attention was also shifting to action in the corporate world. In 2001 the Greenhouse Gas Protocol, which had been founded in 1998 by the World Resources Institute and the World Business Council for Sustainable Development, published the GHG Protocol Corporate Standard. This standard created a framework for corporations (or any organization) to use in creating robust, transparent, and meaningful greenhouse gas inventories (also known as carbon footprints).

The Corporate Protocol also introduced the concept of emission scopes (described later) that became a widely-adopted shorthand for classifying a company's emissions. After several years of publishing foundation standards establishing rules and language, the ISO began publishing the first of its greenhouse gas accounting standards in 2006, followed by more from the British Standards Institution in 2008. Since then, the standards published by these groups have converged and today are very similar in most respects.

Another organization formed in 2000 was the Carbon Disclosure Projects, now known simply as CDP. CDP provides a platform through which organizations can publish their greenhouse gas inventories and scores for companies and cities. Those whose carbon disclosures score highest are included in annual "A-Lists".

The early 2000s also saw the formation of several new greenhouse gas registries, such as Climate Action Reserve, Gold Standard, and Verified Carbon Standard (now called Verra). The American Carbon Registry had been founded in 1996 as a private carbon trading system, but its published protocol documents appear to date from 2009.

Early on, these registries played important roles in regulatory programs, especially in California. They also created voluntary programs where emission-reduction projects could be funded by organizations looking to voluntarily offset any emissions they were unable to eliminate. These markets started off slowly due to a lack of demand.

Insetting vs. Offsetting

Let's say you are the Chief Sustainability Officer of Acme, Inc., an electricity producer in California. Your main responsibility is to lower Acme's emissions below the limits assigned to Acme under rules set by the California Air Resources Board (CARB). Last year Acme performed an audit of all of its greenhouse gas emissions. When performing this audit you learned a lot about where Acme's emissions are coming from. As expected, they are dominated by Acme's various production plants. So what will you do? The simplest approach would be to use insetting first to reduce emissions when costs and investment for internal changes are reasonable, then offsetting for the rest. Let's look at a couple of simple examples.

- Insetting: making changes in the company's value chain that reduce your own greenhouse gas emissions. An example might be closing a coal-fired power plant that emits more CO2 per megawatt-hour than any other plant in Acme's portfolio. Or if this plant still has a lot of usable life left in it, converting it to use natural gas, which emits much less CO2 per megawatt-hour than coal.

- Offsetting: Paying others to reduce their emissions, then discounting your emissions by the same amount. Let's say you have done all the insetting that your schedule and budget will allow this year, but Acme is still above its CARB-mandated emissions cap. You have learned of a relatively inexpensive opportunity to pay for a project that promotes the use of regenerative agriculture practices. The project was created specifically to provide these "carbon credits" for companies like Acme, and it is administered through a CARB-certified registry (Verra, Climate Action Reserve, or American Carbon Registry) that ensures the project and its greenhouse gas reductions are genuine. You buy enough of these credits from the project proponent and then "retire" them to offset Acme's emissions below the cap set by CARB.

Regulatory Markets vs. Voluntary Markets

Offsets are most known as tools in regulated markets where organizations are legally compelled to comply with emission limits. The Kyoto Protocol, EU Emissions Trading System, and California cap-and-trade programs were the first large-scale regulated markets, but now there are many others all over the world. In regulated markets, carbon credits often play a significant role since in theory, they provide an efficient means to reduce emissions across organizations and nations.

In voluntary markets, emissions reductions are driven not by legal requirements but by other factors:

- Investors who require environmental awareness and action in the companies they invest in
- Consumers preferring products from companies with a lower greenhouse gas footprint
- The marketing advantages of offering products that are more “green” than those from competing companies, etc.

A company that is not legally bound to reduce its emissions might still seek to reduce its emissions to entice investors or make its products more appealing to environmentally conscious consumers. In the mid 2010s, it was hypothesized that corporate sustainability goals could help business. These hypotheses have since been proven. Forbes outlines 6 ways in which corporate sustainability helps business. These include creating additional brand value and competitive advantage, especially as more than 65% of consumers have demonstrated willingness to pay more for similar, sustainably produced products. Harvard Business Review has performed even deeper analysis and found that incorporating sustainability and regeneration into business decreases risk, improves financial performance and fosters innovation. Such companies will face the same insetting vs. offsetting options as a company in a regulated market. But lately, organizations looking to reduce their emissions voluntarily are being called upon to achieve reductions without the use of offsets.

Part 3: IPCC Sounds the Alarm & Paris Agreement (2013-Present)

This brings us to the early 2010's. The Kyoto Protocol was in effect and would be renewed in 2013 (though without some of the initial parties) and standards bodies and registries continued to develop new standards and protocols while also refining older ones based on new information and lessons learned.

In 2014 the IPCC published its Fifth Assessment Report (or "AR5"). The AR5 described many findings from recent climate change research and drew a number of conclusions that would prove pivotal in the coming years:

- The atmosphere and oceans were warming and it was extremely likely (>95% probability) that human influence was the dominant cause.
- Atmospheric greenhouse gas concentrations were higher than in the last 800,000 years.
- The Greenland and Antarctic ice sheets were losing mass. The arctic ice sheet was shrinking and northern hemisphere snowfall was decreasing.
- Global average surface temperature was likely (>66% probability) to exceed 1.5°C above pre-industrial levels by 2100, and in many scenarios would exceed 2.0°C.
- Even if all CO2 emissions ended immediately, global average surface temperatures would continue to rise for years.

At about the same time, a new treaty was being negotiated under the auspices of the UNFCCC. This treaty, which was intended as a successor to the Kyoto Protocol, became known as the Paris Agreement and was signed in 2016. The main outcome of the Paris Agreement was a commitment to keep the global temperature rise "well below 2°C" relative to pre-industrial levels. A strong push had been made to make this "below 1.5°C", but that was unsuccessful.

Then in 2018, the IPCC published another report, Special Report on Global Warming of 1.5°C. Among other things, the report warned of dire consequences if the average global temperature rises above 1.5°C: rising sea levels, dramatic weather changes, collapsing ocean ecosystems, etc. The report renewed a drive to limit the temperature rise to 1.5°C.

Meanwhile, efforts to encourage corporate action gained momentum. In 2015 an organization called Science Based Targets (SBT) was formed by several international organizations. SBT provides a platform on which organizations can publicly declare their intentions to reduce their emissions. If SBT determines that the declarations are science-based -- that is, that they are aligned with scientifically-supported recommendations for limiting climate change -- then the company is certified as having a science-based target. SBT quickly adopted terms from IPCC recommendations and the Paris Agreement to identify specific targets.

For example, as of August 2021, a company's emissions reduction target must be consistent with limiting the global temperature rise to "well below 2.0°C" to be considered science-based. These criteria (there were 24 as of April 2021) are modified over time based on the latest climate science. A reduction target declared after June 2022 will be certified as science-based only if it is consistent with recommendations to limit global warming to 1.5°C.

Carbon Credits: Efficient Tools or Licenses to Pollute? Useful GHG Reduction Incentives or Harmful Distractions?

One of the main motivations for the use of carbon credits came from a simple economic argument: they provide an efficient mechanism to fund emission reduction projects that a) deliver larger emission reductions at less cost than other alternatives; and b) would not happen without the injection of additional funding.

Consider another example for Acme, Inc. Let's say Acme finds that the best option for reducing its own emissions would cost $50 per tonne-year of reduced emissions, and that another organization, Trash Removal Services (TRS), has a proposal to reduce their emissions at a cost of only $10 per tonne but cannot fund the project itself. So for the same cost of reducing their own emissions by one tonne, Acme's $50 could instead pay for TRS to reduce their emissions by five tonnes. That's a lot more efficient, right? Simple!

As often happens, it's not that simple:

- The $10 per tonne cited by TRS was a prediction. What if the prediction was wrong? History has shown it could be wrong for many reasons: innocent mistakes by well-meaning actors trying their best to predict the future; errors in assumptions about future savings; deliberate gaming by bad actors; and simple bad luck (market swings, weather effects, etc.)

- Acme's estimate of $50 per tonne-year to reduce its own emissions is also an estimate. What if this estimate turns out to be high, as might happen if a new technology is unveiled that reduces the cost of capturing emissions to $30 per tonne-year? Or if the estimate is low, as might happen if it turns out Acme's analysis of the complexity of capturing emissions was incomplete? Such uncertainties are common and create a risk that the company's capital might either be applied where it isn't needed or insufficiently applied where it is most needed.

- Climate science tells us that Acme will need to reduce its net emissions to zero in the next 30 years. Would it be better for Acme to invest its $50 per tonne in achieving this longer-term goal?

- Are there better ways to pay for TRS's emission reductions? Landfills perform a trash disposal service. Charging additional fees to the service users (towns, cities, companies, etc.) could pay for the emission reductions while also incentivising reductions in waste. If TRS were to do this on their own they would run the risk of making their services more expensive than those of competitors, which might threaten their business. Could fees be mandated for all organizations delivering waste to landfills?

Dealing with these questions and ambiguities has led to the creation of standards and practices that attempt to level the field for all players.

Standards and Protocols: Comparing Apples to Apples & Ensuring Value

Nearly every corner of modern industry is affected by standards that allow regulators, investors, companies, consumers, and other entities to easily exchange products and information.

Consider a few examples:

- Generally Accepted Accounting Principles (GAAP) ensure that anyone looking at audited financial statements can build a basic understanding of a company's financial status without having to delve into the obscure details of how each company happens to classify its assets, debt obligations, and transactions. GAAP ensures consistent treatment of each, and certified auditors provide assurance the company has been faithful to the standards.

- Thousands of standards govern the interoperability of computing systems: WiFi, USB, HTML, IP, programming languages, monitors, printers, keyboards, etc.

- ISO 9000 certifications tell investors and consumers that a company's products are produced with processes that satisfy widely-held quality criteria.

- Food label standards ensure consumers can compare similar products by providing the same information for each product.

- ISO alone has developed nearly 24,000 international standards that cover a very wide variety of fields and topics.

With the rising importance of environmental accounting over the last 20 years, standards have also been developed for defining, measuring, and monitoring environmental processes, including emissions. Consider a partial list of questions that stakeholders must address when accounting for and reducing emissions:

- What is included in "our" emissions?
  - If our factory burns fuel and emits CO2 it's clear. What if the fuel we're burning is a biofuel? (answer: Yes, but biofuel combustion is reported separately from other emissions.)
  - What about the CO2 produced when generating the electricity we buy to run our plant? (ans: Yes, this almost always needs to be tracked.)
  - What about the CO2 emitted by products after they leave our production facility (cars, for example)? (answer: It depends. Do the people receiving your emission statements want this included? Such requests are becoming more common.)
  - What about our suppliers' emissions, for example, the nitrous oxide released when nitrogen fertilizer is used to grow the corn we use in our products? (answer: same as above)
  - What about our subsidiaries? (answer: It depends on ownership and/or control fraction of the subsidiary.)

- How do we know whether a company's reported emissions are accurate?

- If someone is selling credits because they reduced their emissions, how do we know that their claimed emission reductions actually happened?

- How do we know the credits we're buying weren't also sold to someone else ("double-counting")?

- How do we know that the emissions reduction claimed by one project didn't result in an emission increase elsewhere ("leakage")?

- How do we know the credits we are buying are funding new emission reductions, and not emission reductions that would have happened anyway ("additionality")? For example, if TRS is proposing to reduce its emissions by capturing the methane emissions from its new landfills, but new landfills are already legally required to capture methane emissions, then this reduction is not "additional". It would have happened anyway.

Without standards, entities will answer these questions in different ways, making it much more difficult for one entity (e.g., an investor) to understand the emissions report of another (e.g., the greenhouse gas inventory released by a company). To fix this a wide variety of standards and protocols have been published to answer these questions in a consistent way and ensure that everyone is speaking the same language:

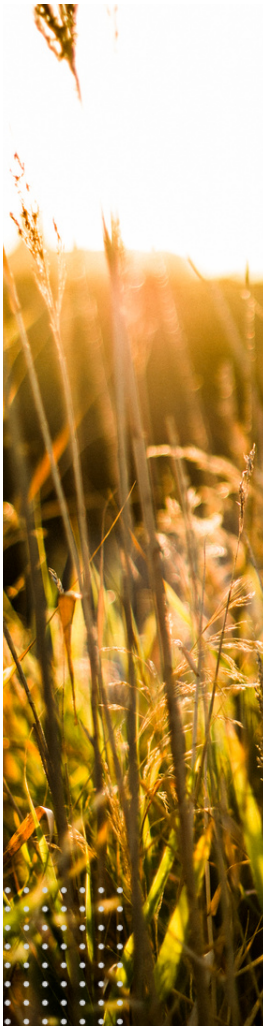
- Standards from organizations such as the IPCC, Greenhouse Gas Protocol, ISO, and the British Standards Institution focus mainly on defining rigorous processes that ensure high-quality and low waste while avoiding policy-related topics that affect how a standard is used. Standards, for example, rarely make statements concerning leakage or additionally.

- Protocols by carbon programs like the Clean Development Mechanism, Verra, Climate Action Reserve, CIBO, and many others also include requirements like those provided in standards, often by ensuring compliance with an existing standard. But these organizations must also ensure the results of the process capture real value: credits will be bought only if buyers believe they represent real emission reductions. So carbon programs design their protocols with policies to build buyer confidence.

Let's continue our Acme, Inc. example. Acme needs to know that the credits it is buying from TRS to offset its own emissions represent actual emission reductions (i.e., that there is real value behind the asset it is purchasing). The simplest way to do this is by buying the credits from a third-party registry (Verra, American Carbon Registry, Climate Action Reserve, etc.) that has done the work to insure the credits are genuine (because an independent third party has certified that the credits were created through strict adherence to one of the registry's protocols).

The process would look like this:

- TRS registers its project with the registry.
- TRS contracts with a registry-approved third-party verifier that will ensure TRS adheres to the rules of the registry's protocols.
- TRS executes the project, reducing its emissions.
- The third-party verifier audits the project. They certify the project was executed as expected and that the emission reductions have been proven to be real.
- TRS submits its report to the registry, including the certified third-party audit results.
- The registry issues credits to TRS for the proven emission reductions.
- Acme buys the credits from TRS. In some cases the registry provides the market in which this sale takes place. In other cases the sale happens outside of the registry, and TRS arranges with the registry to assign ownership of those credits to Acme.
- Acme retires the credits it purchased from TRS to offset its emissions.



Who Certifies the Certifiers? Who Audits the Auditors?

As with most asset valuing systems, ensuring trust is vital to most greenhouse gas programs, especially those involving carbon credits. Modern programs include extensive checks and validation requirements to reduce the risk of confidence-sapping events caused by methodological errors and bad actors that have been seen as programs have matured over the last 30 years.

But who ensures that the rules are followed? How do we know that all of those checks and validation requirements were faithfully followed? The most common features of programs looking to secure the trust of all stakeholders are transparency and third-party audits.

Consider some examples:

- Bodies like ISO create standards but do not certify who is following them. Only independent third-party companies that are themselves certified to audit a specific standard can certify that the standard is being followed.

- ISO doesn't even certify which companies can audit a standard: that is done by a national accreditation bodies such as ANSI in the United States. Thus the ISO organization itself receives no direct financial rewards when organizations use their standards. (To be clear, organizations and individuals who contribute to a standard are often closely involved with the standard's subject and might benefit from the standard's adoption.)

- Carbon registries like The Gold Standard, Verra, American Carbon Registry, Climate Action Reserve and others require that their protocols must be developed in open, transparent processes where industry experts and the public can comment and challenge aspects of the proposed protocol. Responses to these comments are generally required before the protocol is adopted and often result in changes to the protocol.

These registries also require independent third-party verification at several stages of their processes:

- Certification that new protocols adhere to relevant standards and are complete, relevant, consistent, accurate, and transparent.

- Certification that emission reduction project proposals adhere to relevant protocols and will result in valid credits if executed as described. This includes ensuring that leakage and additionality requirements are satisfied.

- Certification that before credits are issued, the emission reductions have actually taken place, including verification of any physical measurements needed.

These registries generally publish a list of accepted independent third-party verifiers and criteria that must be satisfied to add new organizations to the list.

- The Carbon Disclosure Project provides a well-known platform for companies to report their greenhouse gas inventories and progress against public reduction targets. The CDP also provides a yearly list of scores of the companies' reports, including an "A-List" for companies that are reporting the best results and displaying the most leadership in their industry. To qualify for the best scores and inclusion on the A-List, a company's disclosed greenhouse gas inventory must be certified by an independent third party.

Scopes: Which Emissions Count?

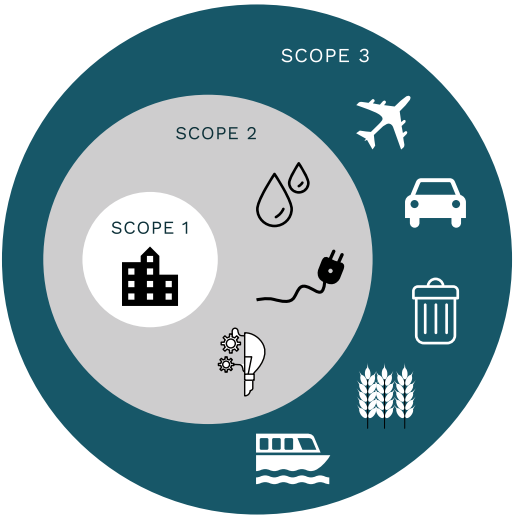
As mentioned earlier, the “scopes” originally defined by the Greenhouse Gas Protocol have become a popular way of categorizing emissions.

The three scopes are:

1. Scope 1: All direct emissions from a company’s operations except emissions from the combustion of biomass (biodiesel, etc.).

2. Scope 2: Indirect emissions associated with electricity purchased by the company.

3. Scope 3: All other indirect emissions. These are split into 15 separate categories and include both upstream emissions (e.g., from suppliers, employees commuting to work, capital goods, etc.) and downstream emissions (distribution of goods, end-of-life disposal of goods, etc.). Scope 3 emissions are generally the most difficult to measure since they require coordination and information exchange with entities both upstream and downstream of a company’s value chain. Measuring them requires those companies to develop their own emission inventories, which not everyone is ready to do.



In addition, direct emissions from biologically sequestered carbon (e.g., from combustion of biofuels) are expected to be reported separately from the scopes. Because these emissions directly affect natural carbon pools and thus might be considered sustainable depending on how they were extracted, accounting for them separately adds transparency to a report and avoids comingling with emissions from sources that are not considered sustainable (coal, oil, etc.).

In all cases the “Kyoto Seven” gases described earlier must be tracked. Standards and protocols allow optional tracking of other emissions as well.

Greenhouse Gas Statements: What Is Being Counted?

When discussing greenhouse gas accounting three types of document are frequently cited: a corporate greenhouse gas inventory, a product inventory, or a reduction project report. Note that “footprint” is often used as a synonym for “inventory”.

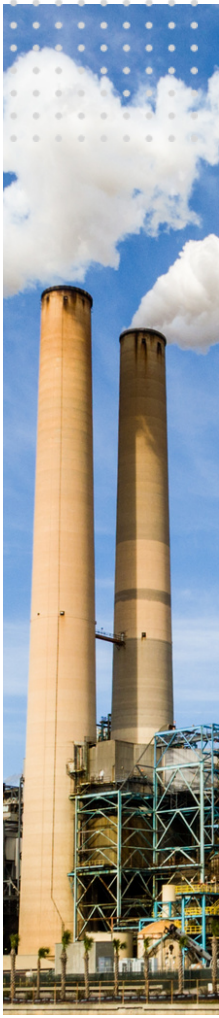
Corporate Greenhouse Gas Inventory

A corporate inventory is an accounting of the greenhouse gas emissions a company is responsible for. One of the first requirements in documenting the inventory is to choose the organizational and operational boundaries:

- Organizational boundary: Which parts of the organization should be included? Any operations directly owned and operated by the company are obviously included. For other operations there are two approaches (“Equity share” and “Control”) with rules for determining whether they should be included and what portions of each operation’s emissions to include.

- Operational boundary: in essence, this is a statement of which scopes should be included in the inventory. Scopes 1 and 2 are generally required. Whether Scope 3 is included depends on the purpose of the inventory and who will be looking at it. In the past the inclusion of Scope 3 emissions was often optional, but at the time of this writing (August 2021) the importance of Scope 3 emissions is rising and they are increasingly required.

Once the boundaries are selected, the work of actually measuring and reporting the emissions begins. Many organizations provide guidance on how to do this, and a wide array of consultancies are available to accelerate the learning and execution processes. And new approaches and technologies -- such as those developed at CIBO for agriculture -- are being developed to independently quantify and validate ag-related emissions and simplify the process of assessing Scope 3 emissions.



Well-known Corporate Greenhouse Inventory Standards

- Greenhouse Gas Protocol: Corporate Accounting and Reporting Standard

- ISO 14064-1: Greenhouse gases. Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals

In most cases, a company that meets one of these standards will also meet the other. If you are pursuing certification under one of these standards, the additional cost of certifying yourself under both is likely minimal and might placate stakeholders that prefer one over the other.

Product Greenhouse Gas Inventory

A product inventory -- often called a product carbon footprint, or PCF -- is an accounting of the greenhouse gas emissions required in the lifecycle of a product. Which parts of the life cycle are included depends on the type of inventory. The most common types are these:

- Cradle-to-grave: from raw material extraction to disposal
- Cradle-to-gate: from raw material extraction to leaving the “factory”
- Cradle-to-cradle: from raw material extraction to recycling/reuse

Because these inventories include emissions both upstream (cradle) and downstream (grave, or back-to-cradle) of the company that makes the product, they effectively include portions of the company’s Scope 1, 2, and 3 emissions. In theory, combining product inventories from all of a company’s products and services should give the corporate inventory. But in practice, this is difficult and not required.

Well-known Product Greenhouse Inventory Standards

- Greenhouse Gas Protocol: Product Life Cycle Accounting and Reporting Standard
- ISO 14067: Greenhouse gases. Carbon footprint of products. Requirements and guidelines for quantification and communication
- British Standards Institution PAS 2050: Specification for the assessment of the life cycle greenhouse gas emissions of goods and services

Greenhouse Gas Reduction Projects

Corporate and product inventories are designed to assess the total emissions associated with their subjects. An emission reduction project is intended to measure how much emissions are reduced when specific actions are taken. This is an important difference: projects are designed to connect a cause (e.g., reduced fertilizer use in agriculture) with its effect (reducing NO2 emissions).

As used in the emissions reductions world, a project is something that can be funded in order to reduce emissions. They are used extensively in carbon credit systems that tie the cost of changes (such as reducing fertilizer for growing corn, including any impacts on crop yield) to the value of resulting carbon credits (the effect). Whenever cost is less than the resulting value, there is potential for carbon credit buyers to fund these projects to reduce emissions.

Any credits that emerge from a project are real assets. Real money is spent to buy them. Buyers and auditors must be assured that the credits are worth what they are paying for, namely an assurance that the project lowered net emissions. To provide this assurance, most carbon programs delivering credits require that each project satisfy several criteria before getting started:

Additionality: Proof that the emission reductions would not have happened anyway. The following, for example, would not be considered additional:

- Changes that are legally mandated, such as EPA-manded emission controls at power plants.
- Changes that are already widely adopted: if a practice is already widely used, and the project proposes to apply that practice in a business that has lagged behind in adopting it, then the project is typically not considered additional since the business would likely have adopted it anyway. Programs differ in how they define “common practices”, but each has specific rules.
- Changes that reduce operating costs or increase profits: if a practice change would pay for itself without additional funding from carbon programs, then businesses will typically adopt it anyway.

Leakage (or “secondary effects”)	Proof that reduced emissions do not result in higher emissions elsewhere. A common example is a practice change that reduces productivity, such as crop yields. Reduced productivity means the shortfall will be met by other, likely higher-emitting, producers. Or additional land will be converted from forest or other natural ecosystems to cover the shortfall, resulting in destruction of natural carbon pools and higher emissions. There are many ways emissions can “leak”, and most carbon programs have rules to prove that these secondary effects are understood and quantified.
No other harm	Proof that the practice change will not cause some other environmental or social harm. For example if a proposed project reduces emissions but leads to unavoidable water security or pollution problems, most carbon programs will not accept it.

Well-known Project Standards and Protocols

- Greenhouse Gas Protocol for Project Accounting
- ISO 14064-2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements
- Verra: VCS Program Guide, VCS Standard, and related documents
- The Gold Standard: Principles and Requirements, and related documents
- Climate Action Reserve: Reserve Offset Program Manual, and related documents
- American Carbon Registry: American Carbon Registry Standard, and related documents

Inventories vs. Projects: Reductions are Reductions. Right?

Let's say Acme, Inc. needs to reduce its net emissions. After reporting its own greenhouse gas inventory it has a deep understanding of its own emissions and where they originate. Think about the short- and long-term differences between these two scenarios:

1. Acme has identified projects within its own value chain that can reduce 40% of its emissions at a cost of $30 per tonne-year for the first three years. Once implemented these changes will also reduce all its future emissions by the same 40% at a cost of only $10 per tonne-year saved. It has intimate knowledge of how these reductions will be implemented and how emissions will be reduced.

2. Acme can purchase carbon credits from participants in a well-known registry for $30 per tonne. These credits were generated by project proponents who worked hard to create valuable credits by working with emitters, regulators, and the registry over several years. The credits will offset Acme's emissions for this year but they won't do anything for future emissions.

Note option 1 corresponds to "insetting" and option 2 would be "offsetting". One benefit of the insetting approach is that it avoids the extensive bureaucracy required by carbon credit programs to ensure the authenticity of the credits. And it is not subject to policy-related concerns like additionality.

What should Acme do? In reality, there will be many more facets to the decision, but recent developments in climate science tell us it is increasingly important to ensure all organizations adopt long-term zero-emission targets. This suggests it is important for Acme to embark on reducing its own emissions, and for finding ways to fund emission-reduction measures in businesses that otherwise would not be able to make those changes.

Publicity: How to get credit for our investments?

Acme is doing it! You have started down the road to reducing emissions. You have a plan to cut them in half in 10 years and have even discussed net-zero targets by 2045. Great!

One of the benefits of reducing emissions is having other people know about it. Investors, consumers, and other stakeholders often want to know whether a business is active enough in reducing its emissions. How do you realize the benefits of your investments?

Aside from conventional marketing and making sure your story is told, many organizations funded by nonprofits and NGOs have been created to give leading companies a stage from which to declare their progress. Here we will look at two, the Carbon Disclosure Project (now branded as just “CDP”) and the Science Based Targets initiative (SBTi).

CPD

CDP was founded in 2000 as a platform for organizations to publicly disclose their greenhouse gas inventories and progress toward reduction commitments. CDP now also accepts public disclosures on forests and water security. It has a scoring system for each area and publishes annual “A Lists” for companies and cities that earn an “A”.

CDP Climate Change disclosures take the form of questionnaires that explore the details of the company’s activities. It provides a description of its scoring system which includes factors relating to completeness, awareness, management, and leadership. To earn an “A” a company has to score well in all areas and publicly disclose a greenhouse gas inventory that has been certified by an accredited, independent third-party auditor.

Science Based Targets initiative

The Science Based Targets initiative was founded in 2015 in the leadup to the approval of the Paris Agreement. The organizations behind it include the World Resources Institute, World Wildlife Fund, the UN Global Compact, and CDP.

While the CDP accepts public disclosures of a company's current status and progress toward goals, the SBTi provides a platform for companies to declare future targets for reducing their emissions. SBTi then judges whether the company's targets are science-based, meaning they satisfy criteria that prove the targets are "in line with what the latest climate science says is necessary to meet the goals of the Paris Agreement - to limit global warming to well-below 2°C above pre-industrial levels and pursue efforts to limit warming to 1.5°C." Companies whose targets pass the SBTi acceptance criteria are recognized publicly by SBTi.

The specific targets needed for a target to be "science-based" are subject to change based on new climate change research. And in the future, companies will need to revise their targets every five years to satisfy the then-current criteria. This has already happened at least twice:

- When SBTi was founded, a target could be considered science-based if it was consistent with limiting global warming to 2.0°C.
- Today, only targets consistent with "Well below 2.0°C" are accepted, and "Below 1.5°C" is strongly recommended.
- Starting in July 2022, only "Below 1.5°C" targets will be accepted as science-based.

As of April 2021 there are 24 criteria and 13 recommendations for determining whether a target is science-based. For example, to be science-based a target must...

- ...include at least 95% of all Scope 1, Scope 2, and biogenic emissions.
- ...include at least ⅔ of all Scope 3 emissions, if they are 40% or more of the total.
- ...be science-based (have sufficient "ambition").
- ...have a target date 5-15 years away (targets submitted after July 2022 will need to have target dates 5-10 years away). Longer-term targets are recommended.

The SBTi is also a sponsor of Business Ambition for 1.5°C, an initiative to promote aggressive emission reduction targets, in particular for net-zero emissions by 2050.

Commercial Support & Consulting

This primer is intended to provide a high-level overview of greenhouse gas programs. You probably know there is an entire industry of organizations who play a role in these programs, and that many of these organizations offer consulting services to assist you with developing plans for reducing emissions. Many times these services are required, such as third-party certification by companies like Aster Global, SCS Global, or dozens of others. Most can readily supply a list of partners they work with.

Final Thoughts

Hopefully this primer into greenhouse programs has been helpful in understanding some of the history and the relationships between different organizations and processes when taking action on climate change. Many specific organizations have been referenced here, mostly as helpful examples and to make connections to names you are likely to have heard already. We do not specifically endorse those organizations and encourage readers to learn about alternatives before engaging with any of them.

About CIBO

CIBO achieves the sustainability goals of our partners by leveraging our scaled software platform to develop, deploy and manage sustainability programs that combine advanced, science-based, ecosystem modeling, AI enhanced computer vision, MVR capabilities, and the most complete programs engine to connect growers, enterprises and ecosystems.

Further Topics & Reading

- Greenhouse Gas Protocol documents. These are well-written and, as standards documents go, are easily readable. Many include helpful sections of guidance in addition to the standards that they were written to define.

- The ISO 14xxx standards focus on environmental management systems. For standards covered by both ISO and the Greenhouse Gas Protocol (e.g., on greenhouse gas inventories and project accounting), it probably isn't necessary to read both. The Greenhouse Gas Protocol documents are free and, in this author's opinion, more readable. Some ISO standards such as those that govern the processes of validating and verifying environmental claims do not have Greenhouse Gas Protocol equivalents.

- Science-Based Targets initiative criteria

- Marginal Abatement Cost Curves can be a useful way to look at the cost vs. benefit analysis of different emission reduction projects a company might pursue. Think of it as a visual description of all possible emission reduction approaches:

    - On the left are the least expensive approaches. Often there are projects that would reduce the company's costs and reduce emissions. Win-win!

    - On the right are projects that would cost a lot of money compared to the impact on emissions, often because they take a long time and/or require significant process change. These are the projects that require the most planning, development of new technologies, or negative emissions (carbon capture and storage/sequestration) elsewhere to compensate for unavoidable emissions.

CIBO applies advanced technologies to promote sustainable solutions in order to mitigate climate change, secure the food supply and improve grower outcomes.