BIC Sustainability 101 Guides

BIC Sustainability 101 Guides are a series of short, introductory level, papers on sustainability topics of interest to BIC Members.
If there is a topic you would like to see as a BIC Sustainability 101 Guide, please contact info@bic.org.uk

Guide 4 – Carbon Calculators

This Guide 4 in the series takes a look at carbon calculators, what they are, how they work, what they look like, how to use them and a general overview.

What is a carbon calculator?

A carbon calculator is a dedicated tool, usually (but not always) online, that helps an organisation calculate its carbon footprint. This enables an organisation to streamline the measurement process, and makes the information more readily accessible and actionable for different stakeholders. The carbon footprint is the amount of CO2e generated by activities undertaken by an organisation. An organisation should only need to enter a specific metric per activity or material into the calculator to obtain the amount of CO2e generated by that activity. It should be noted that it is better to use specific metrics rather than a generic value to obtain a more accurate result.

Metrics cover a range such as:

- The specific value of the energy source to heating an organisation's places of work,
- The value for a particular paper as one example of the book manufacturing process,
- Values for the various types of mode of transport to be able to look at the lowest CO2e options for transporting books,
- Another source of information is the BIC Sustainability 101 Guide 3 – Scopes 1, 2 and 3 to help understand what activities fall into the three scopes.

It should be noted that the reader should carry out their own research into what information/calculations a carbon calculator can perform with respect to their organisation's sustainability journey.

Some points (non-exhaustive) to keep in mind when carrying out the research:

1. Depending on the calculator it might not cover all the areas that the user wants to calculate, or it might be specific for only one particular task, or handful of tasks, such as the manufacturing of a book.
2. If the objective is primarily to gain a broad picture of an organisation's carbon footprint and look at reductions, then automated carbon calculators can create a workable picture of an organisation's key impact areas and where they may look to influence reductions. However, bear in mind that some carbon calculators may be limited in scope and use fewer specific data than others, meaning that they are not necessarily suited to all purposes.
3. There are many carbon calculators, including generic tools for any organisation, as well as those specifically tailored for a particular industry or type of organisation. Several of them are specifically licensed by trade organisations to their members, and the free calculators might not be specific enough to measure everything that is required by an organisation.

A list of some carbon calculators has been provided in the 'Directory of information' section at the end of this document as well as their accessibility. It should be noted that BIC is a neutral members organisation and as such this list should not be regarded by the reader as BIC endorsing any of the carbon calculators listed.

How does a carbon calculator work?

In summary, a carbon calculator works by automatically applying emission factors for specific activities. These factors show how much greenhouse gas is linked to different activities. They measure in $kgCO_2e$, (kilograms of carbon dioxide equivalent) which covers all the greenhouse gases and not just CO_2.

There are many carbon calculators available online or through paid subscriptions. The point to note about all of them is that they provide an overall framework, separate categories, and some automatically retrieve emissions factors which would otherwise need to be located/managed manually.

An organisation might decide to create their own methodology and ways of recording the data, in order to calculate their carbon footprint, via the use of spreadsheets, or another internal/proprietary method/format.

This comes with its own challenges.

No matter what an organisation uses to calculate its carbon footprint be that manually or with a calculator they will need to refine the emission factors associated with all the activities they are measuring over time. Carbon Calculators can use generic emission factors, but these can be changed/updated once the specific emission factor is known. An emission factor is a coefficient that describes the rate at which a given activity releases greenhouse gases (GHGs) into the atmosphere. They are also referred to as conversion factors, emission intensity and carbon intensity.

For example, nitrous oxide (N_2O) has a "100-year" warming effect 265-298 times more than CO_2. This relative index is called Global Warming Potential (GWP), which expresses how much warming a gas will provide over a specified time frame. These are typically in 20-, 100- or 500-year terms; the world uses 100-year GWP numbers to assess the climate emergency as this is the timeframe it is typically described over.

For that reason, GHG emissions are often measured in CO_2e (CO_2 equivalents) expressed in weight, normally kg (kilograms) or t (tonne/metric ton). This unit expresses the 100-year warming effect of a given amount of a GHG in comparison to that of CO_2. In other words, for a given amount of any GHG, CO_2e expresses the amount of CO_2 that would warm the atmosphere as much as the same amount of the gas in question, over a 100-year timeframe from the moment of release.

The emission factors are either a custom number that has been calculated by a supplier for an activity or they are a sector average figure quoted by the DEFRA emission factors.

What does a Carbon Calculator look like?
The following screen shots have been provided by the BPIF and are reproduced here with their permission. These screenshots are so the reader has an idea of what a calculator might look like, the parameters it is based upon and finally the breakdown of what an actual calculation might look like, even if based on an imaginary printer and imaginary publisher's title.

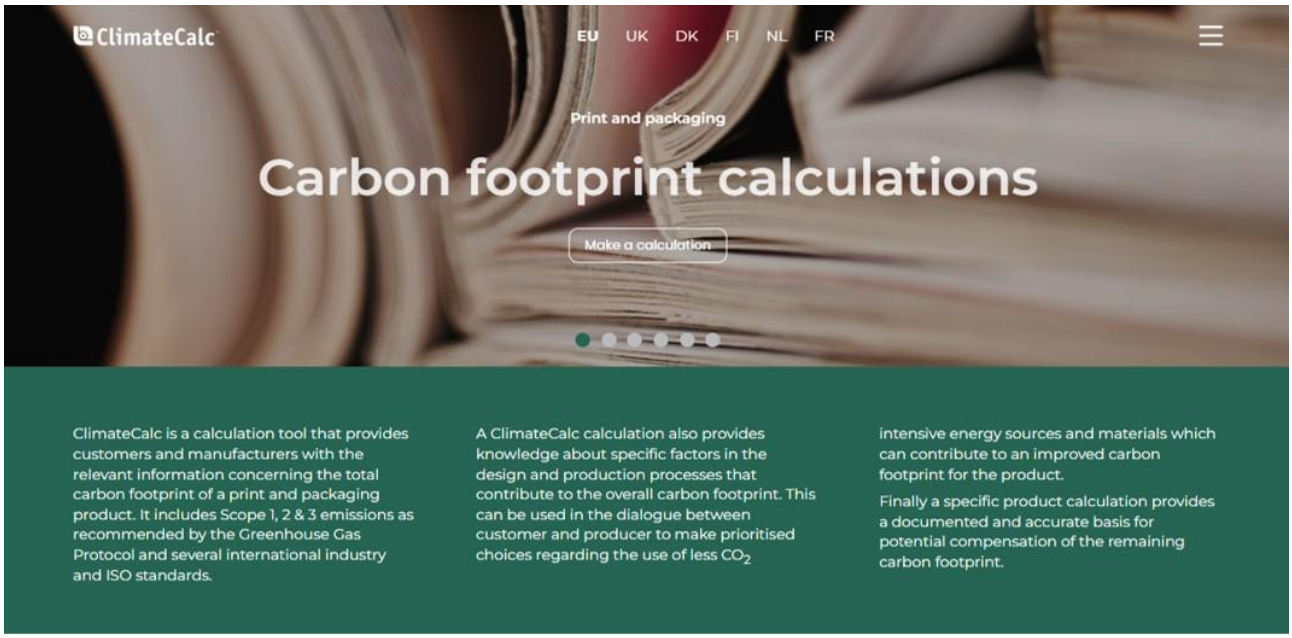


Fig 1. Screenshot of the ClimateCalc landing page

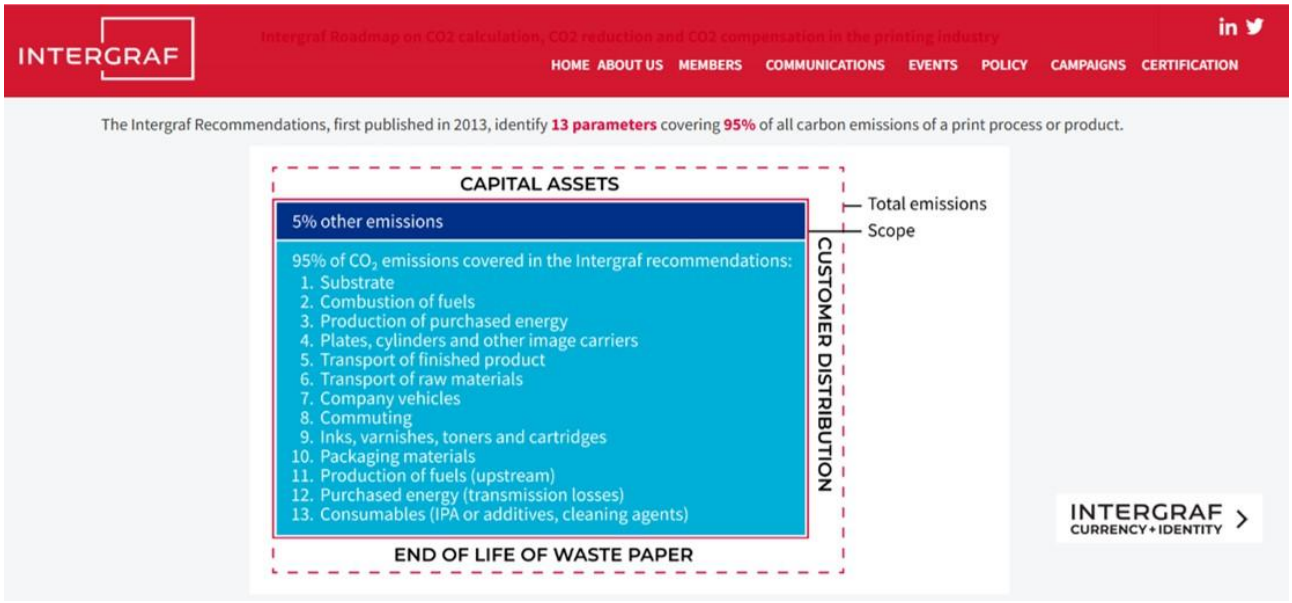
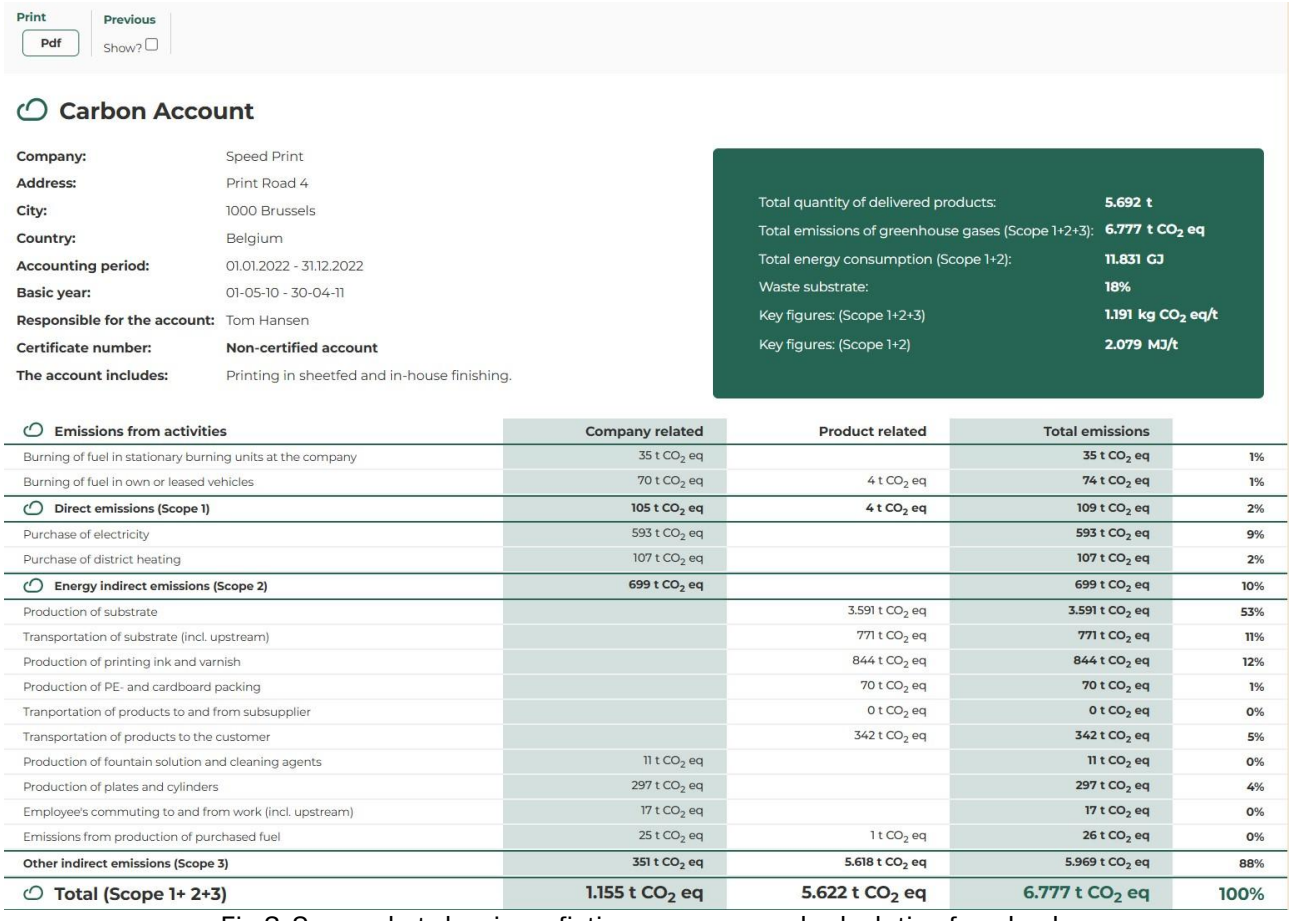


Fig 2. Screenshot showing the 13 parameters that ClimateCalc is based upon.



Emissions from activities	Company related	Product related	Total emissions	
Burning of fuel in stationary burning units at the company	35 t CO_2 eq		35 t CO_2 eq	1%
Burning of fuel in own or leased vehicles	70 t CO_2 eq	4 t CO_2 eq	74 t CO_2 eq	1%
Direct emissions (Scope 1)	**105 t CO_2 eq**	**4 t CO_2 eq**	109 t CO_2 eq	2%
Purchase of electricity	593 t CO_2 eq		593 t CO_2 eq	9%
Purchase of district heating	107 t CO_2 eq		107 t CO_2 eq	2%
Energy indirect emissions (Scope 2)	**699 t CO_2 eq**		699 t CO_2 eq	10%
Production of substrate		3.591 t CO_2 eq	3.591 t CO_2 eq	53%
Transportation of substrate (incl. upstream)		771 t CO_2 eq	771 t CO_2 eq	11%
Production of printing ink and varnish		844 t CO_2 eq	844 t CO_2 eq	12%
Production of PE- and cardboard packing		70 t CO_2 eq	70 t CO_2 eq	1%
Tranportation of products to and from subsupplier		0 t CO_2 eq	0 t CO_2 eq	0%
Transportation of products to the customer		342 t CO_2 eq	342 t CO_2 eq	5%
Production of fountain solution and cleaning agents	11 t CO_2 eq		11 t CO_2 eq	0%
Production of plates and cylinders	297 t CO_2 eq		297 t CO_2 eq	4%
Employee's commuting to and from work (incl. upstream)	17 t CO_2 eq		17 t CO_2 eq	0%
Emissions from production of purchased fuel	25 t CO_2 eq	1 t CO_2 eq	26 t CO_2 eq	0%
Other indirect emissions (Scope 3)	**351 t CO_2 eq**	**5.618 t CO_2 eq**	5.969 t CO_2 eq	88%
Total (Scope 1+ 2+3)	**1.155 t CO_2 eq**	**5.622 t CO_2 eq**	**6.777 t CO_2 eq**	**100%**

Fig 3. Screenshot showing a fictious company and calculation for a book.

All of these can be found and accessed at www.climatecalc.eu. In brief ClimateCalc is based on the 13 parameters recommended by Intergraf, covering 95% of those emissions. Intergraf is the European printing industry association, representing employers in the graphical sector. ClimateCalc comes in two forms:

- Basic for easy use
- Full for a more comprehensive coverage (but takes more effort to input data). And crucially the full version allows the user to input papers of different emissions factors, as paper is the largest part of a printing companies footprint, therefore getting a lower figure for overall footprint compared to using just one standard factor. And finally, it offers a carbon footprint for each job, and an ability to offer those customers a lower carbon footprint by choosing a lower emissions paper.

Other calculators will have their own parameters and way of displaying the data, what has been provided here is purely an example of the possibilities a carbon calculator can provide the user.

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Maintenance of a carbon calculator

Depending upon the type of carbon calculator an organisation decides to use there can be a requirement to maintain the data within it. For publishers and printers this could be with regards to the data on various papers that are loaded into the calculator - these will/might need changing over time as new products come on the market and others are removed, such as paper types.

Similarly, carbon calculators need to be designed, so that it is easy to regularly update the emissions factors associated with different activities. For example, the emissions from electricity may change year-on-year as more renewables are integrated into power systems, or as printers and suppliers work to reduce their emissions. This enables an organisation to accurately track progress and align its strategic focusses.

Whatever calculator is used needs to be flexible and the results obtained repeatable. The data entered into a carbon calculator may need to be derived from multiple different sources in different formats, therefore an organisation may first need to consolidate this data before entering it into a tool to ensure consistent comparisons over time.

If an organisation is using their own Excel spreadsheets to make their calculations rather than a specific 3rd party calculator, they will still be faced with the same maintenance issues and requirements.

Challenges using a carbon calculator

An organisation's position in the book industry supply chain can add other complications and cost to the use of carbon calculators, especially if there is a requirement to use more than one calculator. Depending upon what the calculator is designed to do, say calculate the CO2e of a printed book, then an organisation might need another calculator to work out the CO2e for transportation of books. For a lot of organisations this is just not financially feasible. An organisation needs to weigh up alternatives for calculating a carbon footprint based on its objectives, in view of the anticipated opportunities and requirements from its customers, regulations, internal reporting and other expectations.

Organisations may be asked to report carbon footprint data in a variety of formats to fulfil different internal, customer, industry, or regulatory reporting requirements often with varying levels of detail required. The output of carbon calculators may not always allow users to easily manipulate carbon footprint information to suit these needs. Where possible, they should allow for flexibility and adaptability for an organisation's objectives.

Many of these reports may also require additional contextual information on how a given carbon footprint figure has been produced. For instance, what methods have been used and how emissions factors have been sourced. Carbon calculators should be fully transparent about the way carbon footprint figures are calculated to maximise transparency when providing the figures to stakeholders.

Directory of information

Government conversion factors for company reporting of greenhouse gas emissions
Green House Gas Protocol
GEODIS
British Printing Industries Federation (BPIF) carbon calculator – members only
Publishers Association (PA) – members only
Independent Publishers Guild (IPG) – carbon calculator for IPG members only, licensed through The PA
BIC Sustainability 101 Guide 3 – Scopes 1, 2 and 3
BIC's Sustainability and Environmental Data Reporting, Part One: Current Practices in the Industry

Glossary

Acronym	Full name	Description	Further notes
	1.5°C	Science has made it clear that we must limit global temperature rise to 1.5°C above pre-industrial levels. We are currently at 1.1°C and are on track for 2.7°C according to the UNDP's Emissions Gap Report 2021. Every fraction of a degree matters. Wildfires, heavy flooding, intense heat, drought, and storms are becoming more frequent and devastating. Every bit of warming we avoid will reduce the climate risks we face. We need to keep global warming to 1.5°C to have a fighting chance of having a habitable and a thriving planet for all of us.	Net-Zero Jargon Buster - a guide to common terms - Science Based Targets
	Carbon neutral	Although often used interchangeably with 'net-zero', the two are not the same. In general, when companies claim carbon neutrality, they are counterbalancing CO2 emissions with carbon offsets without necessarily having reduced emissions by an amount consistent with reaching net-zero at the global or sector level. This may conceal the need for deeper emissions reductions that are in line with what the science requires for the world to keep global warming to 1.5°C. Carbon neutrality claims also do not necessarily cover non-CO2 GHGs. The SBTi does not validate carbon neutrality claims.	Net-Zero Jargon Buster - a guide to common terms - Science Based Targets
	CarbonNeutral®	CarbonNeutral® mark indicates you have followed The CarbonNeutral Protocol, which is the global standard, managed for over 20 years, to deliver clear, credible, and transparent carbon neutral programs.	https://www.climateimpact.com/business-solutions/carbon-offsetting/
	Climate change adaptation	Policies and measures which make societies and companies more resilient to the impacts of climate change such as flooding and heatwaves.	List of Sustainability Definitions - CDP
	Climate change mitigation	Policies and measures which aim to reduce greenhouse gases from companies and governments with the intention of lessening the global impacts of climate change, such as reducing the amount and intensity of fossil fuel burning.	List of Sustainability Definitions - CDP
	Carbon footprint	A carbon footprint is the total amount of greenhouse gases (including carbon dioxide and methane) that are generated by our actions.	The Nature Conservancy

Acronym	Full name	Description	Further notes
GHGs	Greenhouse gases	Gases that absorb and trap heat (i.e. infrared radiation) from the Sun in the Earth's atmosphere. Includes the following gases that are covered by the UNFCCC/Kyoto Protocol: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF6) and nitrogen trifluoride (NF3). These gases are the direct cause of climate change. The term "GHGs" is often used interchangeably with "all UNFCCC/Kyoto GHGs," and these gases must be covered by targets set under the Net-Zero Standard. Water vapor is also a GHG but is not covered by the UNFCCC/Kyoto Protocol or GHG emissions targets because concentrations of this gas are self-limited by the atmosphere and thus not a direct cause of global warming.	Net-Zero Jargon Buster - a guide to common terms - Science Based Targets
	Greenwashing	The practice of falsely promoting an organisation's environmental efforts, or spending more resources to promote the organisation as green than are spent to engage in environmentally sound practices	List of Sustainability Definitions - CDP
	Net-zero	A state of balance between anthropogenic emissions and anthropogenic removals. In most cases, it is important to specify either net-zero CO2 emissions or net-zero GHG emissions, which also includes non-CO2 GHGs. Net-zero GHG emissions must be achieved at the global level to stabilise temperature increase, and targets set using the Net-Zero Standard must cover all UNFCCC/Kyoto GHG emissions. The SBTi's Net-Zero Standard outlines what companies need to do to enable the global economy to achieve net-zero. The Standard makes clear that for corporate net-zero targets in line with keeping global warming to 1.5°C require rapid and deep emission reductions. Companies must take action to halve their emissions by around 2030. Likewise, long-term deep emissions cuts of at least 90% before 2050 are crucial for net-zero targets to align with science.	Net-Zero Jargon Buster - a guide to common terms - Science Based Targets
	Paris Agreement	A legally binding international treaty on climate change, adopted at COP21 in Paris in 2015. Its goal is to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels.	List of Sustainability Definitions - CDP
	Scope 1	Direct GHG emissions occurring from sources that are owned or controlled by the company, for example, emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc. or emissions from chemical production in owned or controlled process equipment.	Net-Zero Jargon Buster - a guide to common terms - Science Based Targets

Acronym	Full name	Description	Further notes
	Scope 2	Emissions from purchased electricity, heat, and steam for use in business operations. Scope 2 emissions physically occur at the facility where electricity is generated, and so would fall into the scope 1 category for the power generator.	Net-Zero Jargon Buster - a guide to common terms - Science Based Targets
	Scope 3	Scope 3 is a reporting category that allows for the treatment of all other indirect emissions. Scope 3 emissions are a consequence of the activities of the company but occur from sources not owned or controlled by the company - typically as a result of supplier or customer activities. These can be up or down the value chain - for example, transport and distribution, or the disposal of goods or services after they reach the consumer. Some examples of scope 3 activities are extraction and production of purchased materials; transportation of purchased fuels; and use of sold products and services.	Net-Zero Jargon Buster - a guide to common terms - Science Based Targets
SDGs	Sustainable Development Goals	17 social goals established by the United Nations Department of Economic and Social Affairs to promote prosperity while protecting the planet. The goals are: No poverty; zero hunger; good health and wellbeing; quality education; gender equality; clean water and sanitation; affordable and clean energy; decent work and economic growth; industry, innovation and infrastructure; reduced inequalities; sustainable cities and communities; responsible consumption and production; climate action; life below water; life on land; peace, justice and strong institutions; and partnerships for the goals	List of Sustainability Definitions - CDP

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