Carbon Footprint & Carbon Accounting Methodology

A report for the Suffolk High Energy Users Network

July 2025

This project is funded by Suffolk's public sector leaders as part of their support for delivering the Suffolk Climate Emergency Plan

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Executive summary

This report looks at a number of most commonly used methodologies used by businesses to measuring carbon footprints. Whilst the use of different types of methodologies appears to make comparisons of emissions by different businesses difficult, the report suggests that use of different methodologies is not a significant issue. Regardless of methodology issues are created when it is not clear what emissions are being measured, if all significant emissions are being measured and if the measurement is consistent and accurate.

The report recommends that GHG Protocol accounting and reporting principles are adhered to, regardless of methodology. It is recognised that adhering to these principles takes times and resources that could arguably be used in taking action to reduce emissions. However, without accurate data about emissions sources it is difficult to know where best to take action.

Background - What is the Suffolk HEN project?

The Suffolk High Energy Users' Network brings together major Suffolk businesses who are at the forefront of reducing greenhouse gases and carbon emissions, with Suffolk Chamber of Commerce, the University of Suffolk and Groundwork East to do even more to reduce industrial and business greenhouse gases and carbon emissions and as a result reduce energy costs.

The Suffolk High Energy Users' Network is funded by the Suffolk Public Sector Leader's Group to enable the businesses to work with the University of Suffolk to identify innovative new solutions to reduce emissions and energy costs. The funding will also be used for Groundwork East to help smaller Suffolk businesses that supply larger businesses, reduce their emissions and energy costs.

Coming together as a network also helps the businesses to share best practice and learn from each other.

Introduction - Why research about carbon footprint and carbon accounting methodology is needed

Businesses, monitoring organisations and regulatory authorities are using a number of different methodologies for calculating the carbon footprints[1] of businesses (carbon accounting – calculating how much greenhouse gas an organisation emits).

All the different methodologies are justified in scientific terms and in terms of national and international guidance. However, the use of different methodologies means that there can be a number of different carbon footprint values reported by different organisations for an individual business or an individual business site.

[1] A carbon footprint is a number, often measured in tonnes, kilograms, or grams, that represents the total amount of carbon dioxide (CO_2) and other equivalent greenhouse gases that are associated with an individual, product, person or even country.
https://www.bbc.co.uk/bitesize/articles/zp27xbk#zpwdqfr

The reporting of different carbon footprint values makes it difficult to determine progress in reducing carbon emissions created by business.

This report reviews a number of the most commonly used methodologies for measuring and monitoring carbon footprints and for setting decarbonisation targets. The aim is to understand the rationale and basis for methodologies and how they differ from each other.

An understanding of the different methodologies will assist in validating and comparing carbon footprint values and decarbonisation targets for different businesses.

When comparing carbon footprint values and decarbonisation targets for different businesses, it is also very important to take into account that Suffolk High Energy Users' Network (HEN) members are from different sectors and are of different sizes. They are also at different stages in their low carbon journey, but all are making good progress. The following section of this report provides some examples of the decarbonisation work and plans of HEN members.

The appendix to this report contains more information about greenhouse gases and the categorisation of emissions.

What are Suffolk High Energy Users' Network members doing to reduce carbon emissions?

British Sugar

British Sugar as part of ABF Sugar, aims to reach net zero greenhouse gas emissions across its entire value chain by 2050. To reach this goal, it has set ambitious targets to reduce Scope 1, 2 and 3 and FLAG (Forest, Land and Agriculture) GHG emissions by 2030. These targets, including its net zero commitment, have been validated by the Science Based Targets initiative (SBTi).[2]

In the summer of 2016, British Sugar completed the construction of a brand new £15m Anaerobic Digestion (AD) plant as part of a new renewable energy business project at Bury St Edmunds.

Now fully operational, the plant produces energy in the form of electricity. While a small proportion is used to power the AD Plant, making it self-sufficient, the majority (up to 5MW) is being exported to the National Grid as clean renewable electricity.

At Bury St Edmunds, British Sugar are in the midst of a multi-million-pound investment, replicating the Wissington energy reduction project. Construction is underway and this project will help to reduce site emissions by around 20,000 tonnes of carbon a year. British Sugar have also invested in decarbonising animal feed production on site, through improved mechanical pressing performance of the sugar beet pulp material and pre-heating of the dryer air using waste heat from an on-site

[22] https://www.abf.co.uk/responsibility/responsibility-in-our-businesses/sugar/carbon-and-climate

Combined Heat and Power plant. This will reduce emissions by around 6,000 tonnes of carbon per year.[3]

Muntons

Muntons has produced 100% sustainable malt. There was reduction from 226 kg CO_2 per metric tonne of Muntons malt in 2010 to 91 kg CO_2 per metric tonnes of Muntons malt in 2022.[4]

They beat their Science Based Target of a 45% reduction in emissions by 2025 – three years ahead of expectations. The company will be net zero by 2030.

Muntons won the Kings Award for Sustainable Development in 2024.

Greene King

Greene King's Science Based Targets initiative (SBTi) approved emissions reduction targets are to reduce absolute scope 1 and 2 GHG (greenhouse gas) emissions 50% by 2030 from a 2019 base year.

Greene King was the first pub company and brewer to set near-term science-based targets to halve greenhouse gas emissions by 2030 and reach carbon net zero by 2040.

The new brewery at Suffolk Business Park in Bury St Edmunds was granted planning permission in January and is anticipated to be completed in 2027. It will deliver a significant reduction in water usage and energy consumption.

Boormalt

Boormalt is committed to the 1.5C Paris Agreement scenario by reducing their carbon footprint through investing in alternative energy, reducing their need for energy, sourcing renewable energy, and working with their providers and farmers to get to carbon neutral malting barley. Boortmalt intends to achieve a 50% reduction of carbon emissions per metric tonnes produced by 2030.

Plans have been approved for the Boortmalt plant, in Eastern Way, Bury St Edmunds, which would reduce the total carbon emissions of the site by about 9,149 tonnes of CO_2 through heat pump technology.

Boortmalt introduced the first UK electric malt lorry, a 540kW Volvo FH electric bulk tipper 200-mile range on a full charge.

Camstar

Camstar Herbs of Eye are the largest producer of dehydrated parsley in the world, with over 3,000 acres dedicated to parsley and 1,000 acreas to other crops. Camstar have 260,000 square feet of production and storage facilities. A 260 kWp solar

[3] https://www.britishsugar.co.uk/sustainability/cs-Z2v7zYfPbC2M/2024-12-10-decarbonising-our-operations

[4] https://www.muntons.com/wp-content/uploads/2023/08/Muntons-ESG_Sustainability-Report_DIGITAL-VERSION_AW.pdf

photovoltaic system has been installed on the main operating warehouse. The system is intended to generate 243,100 kWh annually.

Camstar achieved Investors in the Environment Silver certification within 12 months. Key achievements over the year were:

- Completed three environmental and social projects – caring for our local area, reducing plastic and paper usages at our operating locations
- Travel Plan for our operations
- Plan for Scope 3 data progression
- Reduced waste to landfill to less than 1%
- Working with our growers to amplify regenerative agricultural practices

Adnams

Adnams was the first UK brewery to calculate the carbon footprint for bottled beer range (followed by undertaking a full life-cycle assessment for water usage) in order to put reduction measures in place.

The Distribution Centre was built in 2006 featuring a living, green roof, lime-hemp walls and wooden glulam beams. Rainwater is harvested from the roof and is used to flush our loos. The thick roof and walls naturally insulate the building meaning that it requires no heating in the winter or cooling in the summer, and we have installed movement-sensor LED lights to reduce our electricity usage.

Using conventional bricks for the building would have emitted at least 300 tonnes of carbon, however, it's estimated that the lime-hemp bricks have locked in between 100 and 150 tonnes of CO2 into the walls in addition to the reduced carbon emissions from the higher operational efficiency of the site.

If Adnams had not switched electricity supplies to 100% renewable sources emitting zero carbon, their carbon emissions would have been 875 tonnes in 2018. They first began procuring their UK-based zero-carbon energy in 2012. In 2017, they switched the entire business to a 100% certified electricity supply.

Treatt

Treatt has a SBTi (Science Based Target Initiative) validated target of 42% reduction in Scope 1 and 2 by 2030. The company has seen a 52% reduction in its UK Scope 1 emissions, compared to 2020 (486 tonnes of CO2 e), when it solely operated from its old site, as we now see the efficiencies of its new facility at Suffolk Business Park coming to fruition.

Treatt, to support its focus on "acting on climate change", has adopted a new digital carbon management system to enhance the capture, evaluation and validation of our Scope 1, 2 and 3 carbon emissions data. A key benefit of this platform is the array of food and beverage-related databases from which emission factors are selected to ensure greater accuracy of Treatt's carbon footprint. The system also allows for the inclusion of costs for those activities generating the carbon footprint, giving greater clarity on hot spots from both a financial and carbon perspective.

In the UK alongside commencing a solar installation (that will provide approximately 25% to 30% of Treatt's annual UK electricity demand), energy and carbon saving projects include:

- Commencing on converting a large centrally located chiller space into a processing area, installing a smaller chiller space in an alternative area to help maximise capacity and efficiencies.
- Replacing an oversized air compressor with an alternative smaller one, with lower kWh demands.
- Optimising office air conditioning controls to react to departmental occupancy in our large open plan space.

Gressingham

Gressingham is aiming for a 42% reduction in Scope 1 and 2 emissions by 2030.

YThe existing energy system is being made more effective to reduce costs and emissions, with shorter payback periods.

A packaging refresh at Gressingham has streamlined operations and resulted in a carbon emissions saving of 3,400 CO2 in kg per year and saved 24 tonnes of material per year. In terms of carbon footprint, this will reduce by approx 3,400.96 CO2 in Kg per year.

A sludge and caking machine that cleans all of the waste water that is produced at the Redgrave factory, has reduced the amount of HGV lorries on the road by 32 journeys per week and creates green energy.

A solar array, comprising roof and ground-mounted PV panels, with a generation capacity of circa 3.53MW is being constructed for the Redgrave factory

BT Adastral Park

In 2014 BT signed a £26m deal to buy energy for Adastral Park from the nearby 32,500-panel solar farm at Foxburrow Farm.

By March 2031, BT intends to reduce their carbon emissions by 87% compared to 2016/2017 levels. As of 2024/2025, they have reduced their carbon emissions by 61%; becoming a net zero carbon emissions business (Scopes 1 and 2).

BT intend to be net zero for their Scope 3 emissions by 31 March 2041.

What are the different methodologies used to measure and monitor carbon emissions?

Science Based Targets Initiative

The Science Based Targets initiative (SBTi) develops standards, tools and guidance which allow businesses to set greenhouse gas (GHG) emissions reductions targets in line with what is needed to keep global heating below catastrophic levels and reach net-zero by 2050 at the latest.

The SBTi website states:

'Without a common definition, targets can differ in terms of the emissions sources included and the depth and speed of emissions reductions. This has fuelled confusion and accusations of greenwashing.

The SBTi's Corporate Net-Zero Standard addresses this problem by providing a clear, consistent and science-based definition of net-zero. By aligning with this Standard, companies can set science-based net-zero targets to demonstrate their climate action leadership and their commitment to ensuring a habitable planet for all.'

Businesses are required to follow Greenhouse Gas Protocol standards, guidance and tools for calculating emissions

Greenhouse Gas Protocol

Greenhouse Gas Protocol establishes comprehensive global standardized frameworks to measure and manage greenhouse gas (GHG) emissions from private and public sector operations, value chains and mitigation actions.

GHG Protocol provide workbooks that contain emission factors and unit conversions that can be used to estimate emissions. These tools are consistent with those proposed by the Intergovernmental Panel on Climate Change (IPCC) for compilation of emissions at the national level.

UK Government conversion factors for company reporting of greenhouse gas emissions

The UK Government Conversion Factors for greenhouse gas (GHG) reporting are suitable for use by:

- UK-based organisations of all sizes
- international organisations reporting on their UK operations

The factors can be used for Streamlined Energy and Carbon Reporting. The factors may also be used for other purposes.

The Streamlined Energy and Carbon Reporting (SECR) regulations require all UK quoted companies to report on their global energy use in addition to greenhouse gas emissions in their annual Directors' Report. There are also requirements for large

unquoted companies and limited liability partnerships to disclose their annual energy use and greenhouse gas emissions and related information.

Government guidance on reporting can also help all organisations with voluntary reporting on a range of environmental matters, including greenhouse gas (GHG) reporting and the use of key performance indicators (KPIs).

In order to report the greenhouse gas emissions associated with an organisation's activities, the carbon emissions need to be converted into 'activity data' such as:

- distance travelled
- litres of fuel used
- tonnes of waste disposed

The conversion factor spreadsheets provide the values to be used for such conversions, and step by step guidance on how to use them.

A new set of conversion factors each year, together with a methodology paper explaining how the conversion factors are derived, and a paper explaining the major changes in the latest year's factors.

The UK GHG Conversion Factors have been developed as part of the NAEI (National Atmospheric Emissions Inventory) contract, managed by Ricardo.

National Atmospheric Emissions Inventory

The (NAEI) is made up of the Greenhouse Gas Inventory (GHGI) and the Air Quality Pollutant Inventory (AQPI). The NAEI is compiled and reported consistently with international guidance from the IPCC and European Monitoring and Evaluation Programme - European Environment Agency.

The NAEI receives detailed data on individual sources in the industrial and commercial sector, also called 'point sources'. A point source is an emission source at a known location.

Emissions from point sources across the UK may be either collectively responsible for the full national total emission for that sector (such as coal-fired power stations where the sector is made up of large operational facilities for which emission reporting is mandatory) or in part (such as combustion in industry, for which only the larger combustion plant within the sector are required to report emissions).

Emissions for the point sources are compiled using a number of different data sources and techniques. For convenience, the point source data can be divided into four groups:

- Point sources, largely regulated under the Integrated Pollution Control (IPC) or Integrated Pollution Prevention and Control (IPPC) regulatory regimes, for which emissions data are available to the NAEI from the Environment Agency's Pollution Inventory (PI), from Natural Resources Wales' Welsh Emissions Inventory (WEI), from the Scottish Environment Protection Agency's Scottish Pollutant Release Inventory (SPRI), from the Northern

Ireland Environment Agency Pollution Inventory (PIV), from the European Pollutant Release and Transfer Register (E-PRTR), or direct from process operators or trade associations.

- Point sources registered with and trading emission credits under the EU Emissions Trading Scheme (ETS) or UK ETS.
- Point sources, regulated under Local Authority Pollution Control/Air Pollution Control (LAPC/APC) in England and Wales, and in Scotland respectively, for which emissions data are estimated by Ricardo Energy & Environment on the basis of detailed, site-specific data collected from regulators in the late 1990s and early 2000s.
- Point sources where emissions are modelled by distributing national emission estimates over the known sources on the basis of capacity or some other 'surrogate' statistic.

The United Kingdom Emissions Trading System (UK ETS)

UK ETS provides a regulatory emissions scheme designed to address and control greenhouse gas (GHG) emissions within the UK and applies to energy intensive industries, power generation and aviation sectors.

The UK ETS applies to regulated activities which result in greenhouse gas emissions, including combustion of fuels on a site where combustion units with a total rated thermal input exceeding 20MW are operated (except in installations where the primary purpose is the incineration of hazardous or municipal waste).

Emissions trading schemes usually work on the ‘cap and trade’ principle, where a cap is set on the total amount of certain greenhouse gases that can be emitted by sectors covered by the scheme. This limits the total amount of carbon that can be emitted and, as it decreases over time, will make a significant contribution to how the UK meets its Net Zero 2050 target and other legally binding carbon reduction commitments.

Within this cap, participants receive free allowances and/or buy emission allowances at auction or on the secondary market, which they can trade with other participants as needed.

Each year, installation operators and aircraft operators covered by the scheme must surrender allowances to cover their reportable emissions. The cap is reduced over time, so that total emissions must fall.[5]

Annual emissions reports must be verified by an accredited organisation.

ISO 14064

ISO 14064 builds on many of the concepts introduced by the GHG Protocol. However, it is a more procedural framework, outlining the steps for quantifying, reporting, and verifying GHG emissions. It also allows organisations to

[5] UK ETS

choose calculation methodologies based on their specific needs. Verification by a third-party verifier is mandatory for organisations seeking public disclosure or certification under ISO 14064.

A business may use the GHG Protocol to identify and calculate their GHG emissions and removals, and then use the ISO 14064 to report and verify them.[6]

Investors in the Environment Award Scheme

Investors in the Environment (iiE) is a national environmental accreditation scheme. There are three Investors in the Environment levels – bronze, silver and green. Bronze requires calculating a carbon footprint for buildings, silver requires calculating carbon footprint for buildings and transport, and green requires calculating carbon footprint for buildings and transport and includes some Scope 3 emission impacts.

Carbon footprints are measured using UK the GHG Conversion Factors.

[6] https://plana.earth/glossary/greenhouse-gas-ghg-protocol

Conclusions and recommendations - How do the methodologies differ and what does this tell us?

The review of carbon footprint measurements methodologies initially indicates there are not as many differences in the main methodologies as the differences in carbon footprint estimates suggest.

- GHG Protocol tools are consistent with those proposed by the Intergovernmental Panel on Climate Change (IPCC) for compilation of emissions at the national level.
- The NAEI is compiled and reported consistently with international guidance from the IPCC and European Monitoring and Evaluation Programme - European Environment Agency.
- The UK GHG Conversion Factors have been developed as part of the NAEI.

It is possible that differences may result from inconsistencies in the implementation of the methodologies. GHG Protocol accounting and reporting is based on the following principles:

RELEVANCE Ensure the GHG inventory appropriately reflects the GHG emissions of the company and serves the decision-making needs of users – both internal and external to the company.

COMPLETENESS Account for and report on all GHG emission sources and activities within the chosen inventory boundary. Disclose and justify any specific exclusions.

CONSISTENCY Use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document any changes to the data, inventory boundary, methods, or any other relevant factors in the time series.

TRANSPARENCY Address all relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose any relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used.

ACCURACY Ensure that the quantification of GHG emissions is systematically neither over nor under actual emissions, as far as can be judged, and that uncertainties are reduced as far as practicable. Achieve sufficient accuracy to enable users to make decisions with reasonable assurance as to the integrity of the reported information.[7]

It could be argued that if these principles are not fully complied with, there will be inaccuracies in carbon footprint measurement results – whatever measurement methodology is used.

[7] https://ghgprotocol.org/sites/default/files/standards/ghg-protocol-revised.pdf

However, research led by the University of Bath[8] concludes that multiple systems increase costs and prevent well-meaning companies from effectively counting their carbon emissions, while creating loopholes that can be exploited by others.

Like this report, the University of Bath researchers noted that several standards, including the Greenhouse Gas (GHG) protocol, ISO & BSI and Science-Based Targets initiative (SBTi), are currently used in carbon accounting. The researchers say these varying approaches have their own methodologies, tools and variations in flexibility, which lead to inconsistency – especially as the complexities of the systems increase.

The research concludes inconsistencies in reporting and disclosure mean extra cost to companies, and ultimately an inability to compare products and systems, and their impact on climate change.

Seven key principles of a unified framework are detailed in the report by the research team - central to these is the need for a system to be accurate, verifiable and transparent. Other requirements include the equitable distribution of credits and burdens; the incorporation of global trade emissions; a capability to handle emissions and storage over time; consistent data requirements; accessibility to non-experts; and adaptability to meet future needs.

The researchers are now working with a range of industrial partners, including Tata Steel, and bodies including the Energy Systems Catapult, through UKRI Industrial Decarbonisation Research and Innovation Centre (IDRIC) to facilitate simpler carbon accounting and emissions reduction at scale.

In support of the University of Bath's research the UKRI funded report Enabling Net Zero: A Plan for UK Industrial Cluster Decarbonisation which contains the national vision and strategy for UK industrial cluster decarbonisation, has the following recommendation:

Recommendation 5: Define and prescribe standardised methodologies for decarbonisation impact estimating - The public sector has funded the IDC, including the development of the cluster plans, to accelerate decarbonisation. To understand the contribution that the cluster plans, and other publicly supported efforts, will collectively make to achieving the national target, it is important that the estimated impacts of the projects can be aggregated. Projects using standardised reporting methods for their impacts, both of GHG emissions and economic benefits, would also enable like-for-like comparison of projects in the pipeline. To facilitate this, common methodologies for decarbonisation estimating need to be identified and adopted to allow decisions to be made based on consistent information, and in doing so, increase the effectiveness of delivering the UK's emissions targets.[9]

An Energy Systems Catapult report, reviewed options for policymakers to support a more consistent and coherent approach to the monitoring, reporting and verification (MRV) and accounting of greenhouse gas (GHG) emissions in industry.

[8] https://royalsocietypublishing.org/doi/full/10.1098/rsta.2023.0260#d6948318e1
[9] Enabling net zero: a plan for UK industrial cluster decarbonisation

The report recommended establishing a national carbon accounting framework for industry with Government providing steer to simplify and strengthen carbon accounting practices across industry. The report considers that the UK Emissions Trading Scheme could act a starting point for this framework, targeting the MRV of emissions at the installation level with complementary mechanisms developed to consider supply chain emissions and opportunities for innovation as part of a whole systems approach to decarbonising industry and the wider economy.

The report also recommends that to support carbon accounting in industry, explore establishing a Carbon MRV and Accounting Regulator. Such a body would be responsible for ensuring MRV is consistent and comparable across mechanisms, including mitigating double counting.[10]

According to the report, the benefits of a carbon regulator include:

- Support growth and innovation, by creating a level playing field for competition
- Increase investor confidence and companies' access to finance
- Reduce the reporting burden for companies, introduce a single point of disclosure and facilitate data exchange
- Produce a clearer picture of carbon flows across the UK economy

What does this report mean for the Suffolk High Energy Users' Network?

A 'one size fits all' carbon footprint measurement/carbon accounting methodology for industrial commercial emissions may seem the prefect solutions in removing differences in reported emissions. A single methodology for all would assist and enable more accurate comparisons of the emissions of businesses of similar size in the same sector. It would also provide greater confidence in the accuracy of historical trend data for an individual business or business sector.

However, standardisation of methodology will involve substantial cost in terms of researching and recommending a methodology that is appropriate for businesses of all sizes and sectors and in terms of the cost to businesses of implementing the standard methodology. There will also need to be a rebasing of data to reflect the move from the calculation of emissions data being done using a number of different methodologies. A rebasing would create issues in reviewing historical trends.

It is not for the Suffolk HEN project to recommend that there is a Carbon MRV and Accounting Regulator. Businesses already have to deal with a considerable amount of emissions regulation (e.g. UK ETS, Streamlined Energy and Carbon Reporting, CBAM). Also, businesses will incur additional costs if additional regulatory requirements are introduced.

This report therefore recommends that whatever carbon footprint/carbon accounting methodology a business uses, it conforms with GHG protocol principles in that the methodology is:

[10] Carbon Accounting in Industry: Learning From the South Wales Industrial Cluster to Develop a Consistent and Coherent National Framework

Verifiable – There is a reference to the way in which the methodology has been devised.

Relevant – The methodology is appropriate to the business size and sector and provides that the business can use for its decarbonisation plans.

Transparent – It is clear what emission categories (1,2 and 3) are being fully or partly monitored and measured.

Complete – The carbon footprint report should account for all significant emissions. It is also important that it is recognised that the structure of emission sources will change over time (e.g. one production process may produce lower emissions but another process may produce higher emissions).

Consistent – Methodologies are not frequently amended and if there are amendments, the reasons why amendments have been made are clear and there is indication of how the amendment will affect emissions values and how past values would have changed if calculated using the amended methodology.

Accurate – Sufficient resources and a robust process are in place to accurately measure emissions in accordance with the preferred methodology.

It is recognised that adhering to these principles takes times and resources that could arguably be used in taking action to reduce emissions. However, without accurate data about emissions sources it is difficult to know where best to take action.

This report has been prepared by Toby Warren, Head of Policy, Suffolk Chamber of Commerce with the support of Faraz Gul – University of Suffolk under-graduate research intern, working with the Suffolk High Energy Users' Network.

Appendix

What are greenhouse gases?

The gases act like the glass walls of a greenhouse – hence the name, greenhouse gases. Without this greenhouse effect, temperatures would drop to as low as -18˚C (-0.4˚F); too cold to sustain life on earth.

But human activities are changing earth's natural greenhouse effect with a dramatic increase in the release of greenhouse gases. Scientists agree greenhouse gases are the cause of global warming and climate change.

Since the Industrial Revolution, humans have been releasing larger quantities of greenhouse gases into the atmosphere. In the past century that amount has increased dramatically, with the knock-on effect of global warming. Global temperatures have accelerated in the past 30 years and are now the highest since records began.[11]

In general terms, the largest contributor to global warming is carbon dioxide which makes it the focus of many climate change initiatives. Methane and nitrous oxide contribute to a smaller proportion, typically <20%, and the contribution of F–gases (fluorinated cases) is even smaller (in spite of their high Global Warming Potentials) at <5% of the total.[12]

Categorising emissions

When it comes to reporting progress in reducing greenhouse gas emissions, the terminology '**Scopes 1, 2 and 3 emissions'** is often used.

The three scopes are a way of categorising the different kinds of emissions a company creates in its own operations and in its wider 'value chain' (its suppliers and customers). The name comes from the Greenhouse Gas Protocol, which is the world's most widely used greenhouse gas accounting standard.

As the Greenhouse Gas Protocol itself puts it: "Developing a full [greenhouse gas] emissions inventory – incorporating Scope 1, Scope 2 and Scope 3 emissions – enables companies to understand their full value chain emissions and focus their efforts on the greatest reduction opportunities".

Definitions of scope 1, 2 and 3 emissions

Essentially, scope 1 are those direct emissions that are owned or controlled by a company, whereas scope 2 and 3 indirect emissions are a consequence of the activities of the company but occur from sources not owned or controlled by it.

Scope 1 emissions

Scope 1 covers emissions from sources that an organisation owns or controls directly – for example from burning fuel in a fleet of vehicles (if they're not electric).

[11] National Grid
[12] National Atmospheric Emissions Inventory

Scope 2 emissions

Scope 2 are emissions that a company causes indirectly and come from where the energy it purchases and uses is produced. For example, the emissions caused when generating the electricity that we use in buildings would fall into this category.

Scope 3 emissions

Scope 3 encompasses emissions that are not produced by the company itself and are not the result of activities from assets owned or controlled by them, but by those that it's indirectly responsible for up and down its value chain. An example of this is when a company buys, uses and disposes of products from suppliers. Scope 3 emissions include all sources not within the scope 1 and 2 boundaries.

Quantifying emissions

It is easier to quantify emissions for Scopes 1 and 2. For energy use, for example, companies can source the data needed to convert direct purchases of gas and electricity into a value for the associated greenhouse gases.

However, for many companies, Scope 3 emissions can account for the highest proportion of total emissions[13]. Unfortunately, these are also usually the hardest to reduce. Some of the actions a company can take to reduce these is to work with existing suppliers and their customers on solutions to reduce their emissions.

[13] Greenhouse Gas Protocol