

Achieving Greenhouse Gas Goals

How Organizations Can Measure Their Carbon Emissions

PRESCOUTER

February 2021

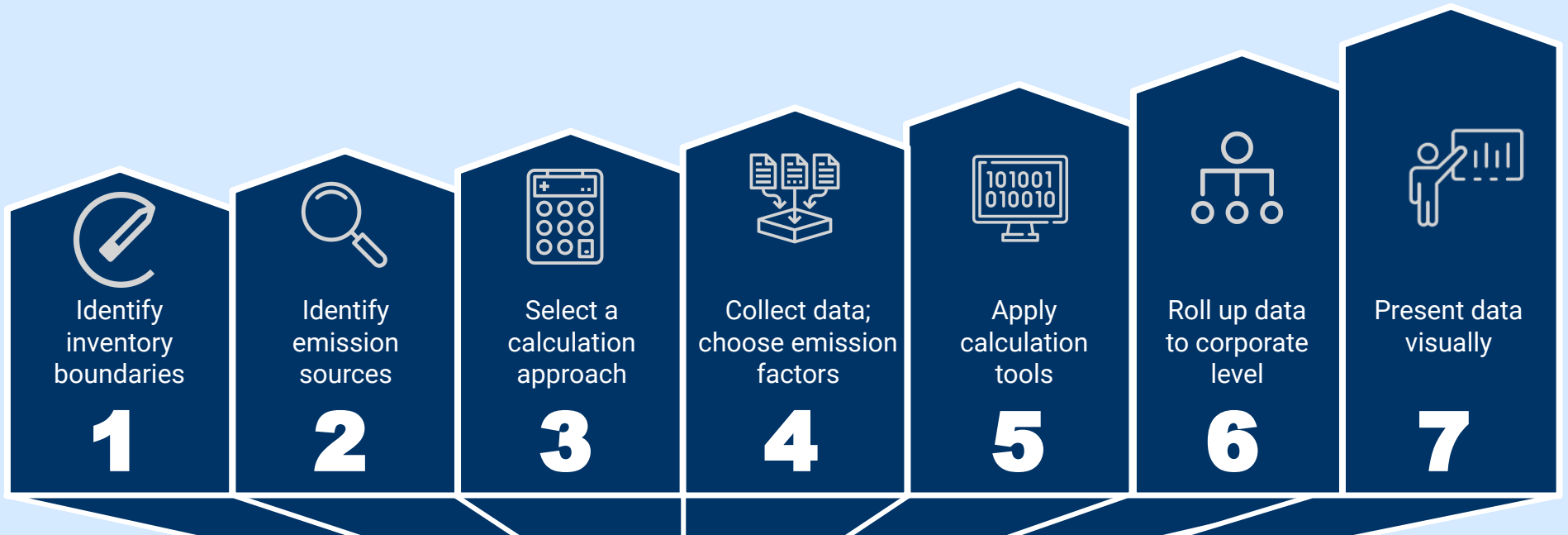




Carbon Accounting - *What gets measured gets managed.*

While carbon emissions (or greenhouse gas) reporting is not mandated in many countries or industries, companies are increasingly expected to know their carbon footprint as well as their financial statements.

A first-level estimate of a company's carbon emissions can be done with data the company already has - such as utility bills - and heuristics for converting this data to a carbon emissions level.

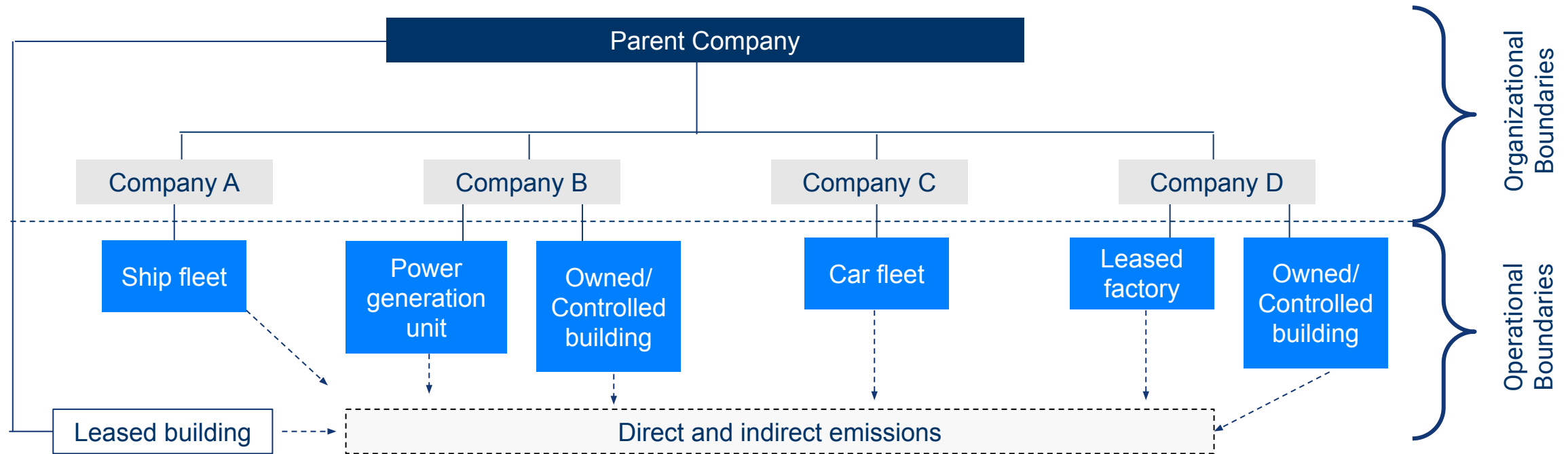




Identify inventory boundaries

The first step to GHG reporting is identifying inventory boundaries. This entails:

- Determining your **organizational and operational boundaries**, which refers to the sites and emission sources within each site, respectively.
- Choosing a **base year** to start with against which future emissions will be tracked.



An example of organizational and operational boundaries. Source: [GHG Protocol](#)



Identify emissions sources

There are three types of emissions, which can be explained as follows (examples are provided in the figure below).

- **Scope 1:** Direct GHG emissions that occur from sources that are owned or controlled by the company; for example, emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.
- **Scope 2:** GHG emissions from the generation of purchased electricity consumed by the company.
- **Scope 3:** All other indirect emissions that are a consequence of the activities of the company but occur from sources not owned or controlled by the company.

SCOPE 1: Direct Emissions	
Fuel Combustion (furnaces, turbines, boilers, etc.)	Process Emissions (cement, aluminium, waste processing)
Owned Transportation (cars, trucks, trains, ships, airplanes)	Fugitive Emissions (air conditioning and refrigeration leaks, methane leaks)
SCOPE 2: Indirect Emissions	
Consumption of purchased electricity, heat, steam, and cooling	

SCOPE 3: Other Indirect Emissions	
UPSTREAM ACTIVITIES	DOWNSTREAM ACTIVITIES
Purchased goods and services	Downstream transportation and distribution
Capital goods	Processing of sold products
Fuel- and energy-related activities	Use of sold products
Upstream transportation and distribution	End-of-life treatment of sold products
Waste generated in operations	Downstream leased assets
Business travel	Franchises
Employee commuting	Investments
Upstream leased assets	

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Select an emissions calculation approach

To calculate the GHG emissions associated with each activity for Scope 1, Scope 2, and Scope 3, the data needs to be converted using emission factors. The standard equation is:

example

Greenhouse gas emissions = Your Data x Emission Factor (region specific)

GHG emissions [kgCO₂] = Natural gas consumption [scf] x 0.05444 [kgCO₂/scf]

*Emission Factor for
Natural Gas as per EPA,
March 2020*

There are two options to calculate emission factors:

1. Using government's greenhouse conversion factors. Websites are annually updated and are available for free at: [EPA \(US\)](#), [ECCC \(Canada\)](#), [DEFRA \(UK\)](#)
2. Using an online calculator. Online calculators estimate the amount of GHG you incurred for the reporting year, and many can be found online for free use, such as those provided by Carbon Trust, EPA (US), ECCC (Canada) and DEFRA (UK).

HELP



Need help understanding how to select a calculations approach or how to define your inventory boundaries or emission sources? We're here to help you get started for free, if you'd like to do your own GHG accounting. Contact [Eric Joyce](#) to schedule the call.

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Collect activity data and choose emission factors

After you have defined inventory boundaries, selected emission sources, and chosen a calculation method, you can now start collecting the required data according to scope, as illustrated below.

SCOPE 1: Direct Emissions

Detailed annual information of fuels related expenditures used. Examples include:

- *Gas consumption*
- *Coal consumption*
- *Petrol consumption*
- *Diesel consumption*
- *LPG (petrol) consumption*

SCOPE 2: Indirect Emissions

Detailed annual information of energy related expenditures used. Examples include:

- *Electricity usage*
- *Usage of heat, steam, and cooling, if applicable*

SCOPE 3: Other Indirect Emissions

Companies may either use primary data (data from specific activities within a company's value chain) or secondary data (data not from specific activities within a company's value chain).

Primary data examples:

- Meter readings
- Purchase records
- Utility bills
- Engineering models
- Direct monitoring
- Mass balance
- Stoichiometry

Secondary data examples:

- Downstream transportation and distribution
- Processing of sold products
- Use of sold products
- End-of-life treatment of sold products
- Downstream leased assets
- Franchises
- Investments

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Apply calculation tools

Using your selected calculation tools, GHG emissions are calculated as follows:

Your Data x Emission Factor (region specific)

SCOPE 1: Direct Emissions

Example: A company operates in a large building (100,000 square feet) and consumes 24 cubic feet of **natural gas** per square foot annually, which results in 2,400 MCF of natural gas consumed per year.

From equation above:

GHG due to use of natural gas = 2,400 MCF * 0.0549 metric tons CO₂/Mcf
= **132 metric tons CO₂/year**

This amount of emissions corresponds to **Scope 1 "direct GHG emissions"** because it occurs from a source (furnaces) owned by the company. Therefore, it needs to be reported.

Estimations for the consumption of gasoline, diesel, coal, or any other source of energy that is either produced or consumed by the company are similarly calculated.

SCOPE 2: Indirect Emissions

Example: A company operates in a large building (100,000 square feet) and consumes 9 kWh of **electricity** per square foot annually, which results in 900,000 kWh of electricity consumed per year.

From equation above:

GHG due to electricity used = 900,000 kWh * 0.000707 metric tons CO₂/kWh = **636.3 metric tons CO₂/year**

This amount of emissions corresponds to **Scope 2 "indirect GHG emissions"** because it results from an organization's activities but is actually emitted from sources owned by other entities. Therefore, it needs to be reported.



Apply calculation tools

SCOPE 3: Other Indirect Emissions

Example: Purchased goods (tangible products) and **services** (intangible products) category. The category includes all upstream (i.e., cradle-to-gate) emissions from the production of products purchased or acquired by the company.

From equation on the previous page:

GHG emissions from purchased goods and services = \sum (quantities of good purchased x Supplier-specific Emission Factor of purchased good)

Goods	Supplier	Amount acquired (kg)	Emission Factor*
Cement	Supplier X	250,000	0.25
Paint	Supplier Y	50,000	0.12
Timber	Supplier Z	70,000	0.08

**Supplier-specific Emission Factors are used only for illustration purposes*

Total emissions for reporting company is calculated as follows:

GHG emissions from purchased goods and services = \sum (quantities of good purchased x Supplier-specific Emission Factor of purchased good)

= (250,000 kg * 0.25) + (50,000 kg * 0.12) + (70,000 kg * 0.08)

= 62,500 + 6,000 + 5,600

= 74,100 kg eq CO₂

Thus,

GHG emissions from Purchased goods and services = 74,100 kg eq CO₂
(to be reported as part of Scope 3)

Note: Estimations using emission factors are also required to be determined in terms of gases such as CH₄, N₂O, HFCs, PFCs, and SF₆.

6 Roll-up data to corporate level

There are two basic approaches for gathering data on GHG emissions from a corporation's facilities:

	SITE LEVEL		CORPORATE LEVEL
CENTRALIZED	Activity data	→	Sites report activity data (GHG emissions calculated at corporate level: activity data x emissions factor = GHG emissions)
DECENTRALIZED	Activity data x emission factor = GHG emissions	→	Sites report GHG emissions

Source: [GHG Protocol](#)

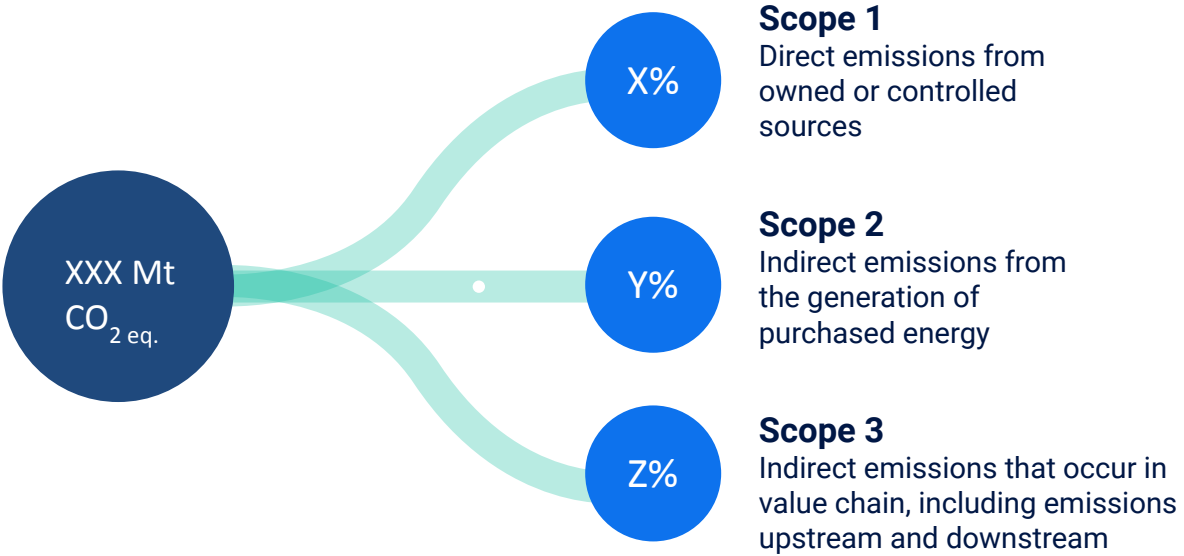
Some reporting categories are common to both the centralized and decentralized approaches and should be reported by facilities to their corporate offices. These include:

- A brief description of the emission sources
- A list and justification of specific exclusion or inclusion of sources
- Comparative information from previous years
- The reporting period covered
- Any trends evident in the data
- Progress toward any business targets
- A discussion of uncertainties in activity/fuel use or emissions data reported
- A description of events and changes that have an impact on the reported data



7 Present your data visually, making it more accessible

This is an example of how PreScouter makes client data actionable

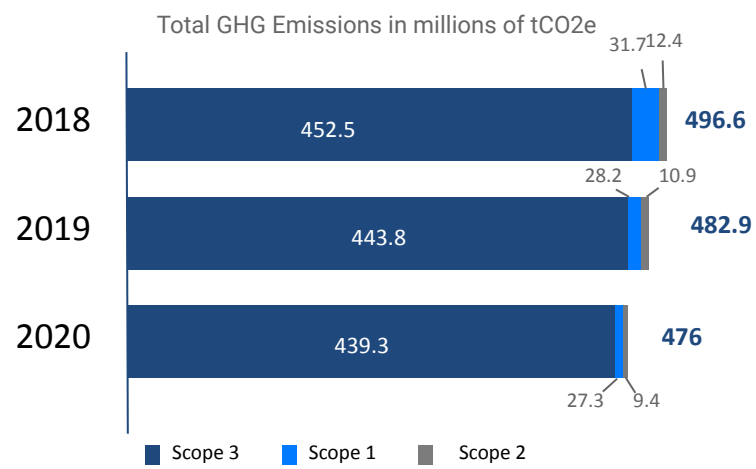
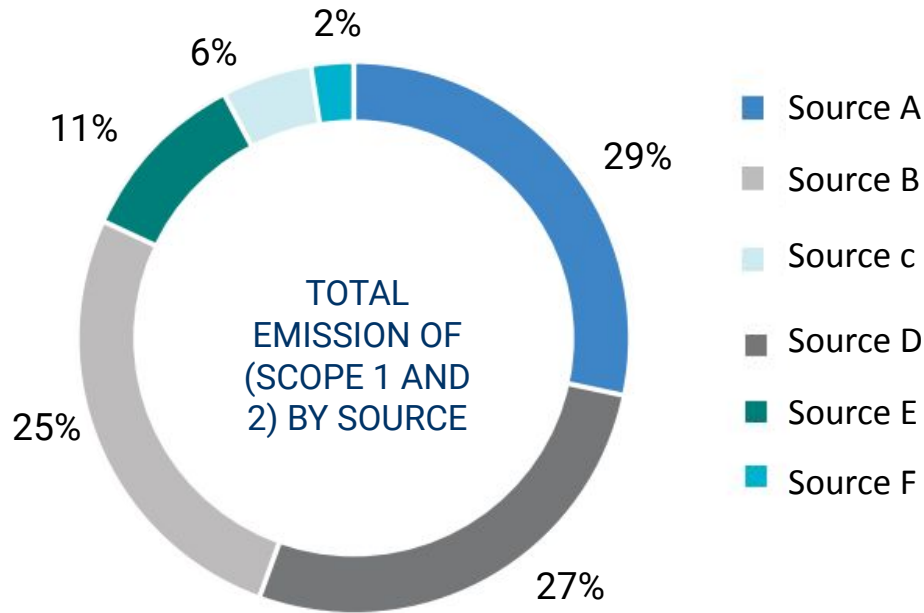


Acme Corp's measure of:

Scope 1 (direct emissions) was represented by (I) **Source A** (e.g., fuel consumptions); (II) **Source B** (e.g., from industrial processes); (III) **Source C** (e.g., fugitive emissions from refrigerant gases); (IV) **Source D** (for e.g. emissions from agriculture and land use)

Scope 2 (Indirect emissions) were related to the usage of electricity and mobile combustion.

Scope 3 is represented by Z% of total global emissions.



Climate change is the biggest existential challenge of our times that can potentially disrupt business as usual scenarios. Climate change related catastrophes costed the US economy \$240 billion in 2018.

Early adopters will find that holistic carbon management makes business sense too for their profit & loss statement.

So, going forward climate-related financial disclosures from businesses will be scrutinized by investment firms.

Get in touch with PreScouter today to see how we can help you achieve your GHG goals in the easiest and most profitable way possible.



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Christian leads projects in the Natural Resources and Energy vertical by bringing solutions that align with our clients' sustainability, efficiency and financial goals. He ensures PreScouter clients receive the latest insights into any disruptive or groundbreaking technology within Carbon Capture & Utilization, Waste Management, Biofuel Developments, O&G, Mining, Renewable Energy generation and storage, among others.

Baishakhi Sengupta

PreScouter Sustainability Expert

Baishakhi has two decades worth of in-depth technical experience in undertaking Carbon Footprints, designing bespoke carbon management systems that drive the right KPIs for businesses to achieve decarbonisation. Baishakhi has worked across many sectors, received a number of awards for her work and is widely known in the industry for her expertise in sustainability.

Shruti Biyani

PreScouter Researcher

Shruti is currently a Ph.D. candidate in Chemistry at Purdue University. She is a synthetic organic chemist by training. She has collaborated on diverse research areas including analytical chemistry, machine learning, reaction optimization, and technology-based new lab development.

Srilakshmi Gopal

PreScouter Researcher

Srilakshmi is a researcher with broad interests in green energy, life cycle assessment, circular economy, sustainable energy and renewables. She has a double masters degree from the Royal Institute of Technology, Sweden and Instituto Superior Técnico, Portugal (InnoEnergy program on sustainable energy systems). She has also worked as a research engineer with the Center for Study of Science Technology and Policy, India, on solar energy projects.

Jorge Hurtado

PreScouter Researcher

Jorge has a broad interest in sustainability and development issues that can generate positive changes in the lives of local communities. He is also involved in communicating science to specialized and general audiences, and still diverges most of his efforts to work with indigenous communities and volunteers to teach kids the importance of keeping in touch with nature.

About PreScouter

PRESCOUTER PROVIDES CUSTOMIZED SUSTAINABILITY AND ENVIRONMENTAL CONSULTING

Carbon Accounting

- Scope 1,2, and 3 emissions inventory mapping
- GHG emissions calculations
- Life-cycle assessments
- Mass, energy and carbon flows
- Material tracing/transparency
- Regulations and policy framework

Carbon Reduction

- Develop heat maps to pinpoint highest emission sources
- Scoping suitable technologies for emission reduction
- Draw out briefing on what a Netzero aspiration would mean for the business
- Supplier search/assessment

Long-Term Carbon Management

- Identify process flow analysis that helps crystallise long term carbon management program
- This should dovetail with client overall business plan and drive process efficiencies
- Water/energy/resource management

