



Achieving Greenhouse Gas Goals

How Organizations Can Measure and Reduce Carbon Emissions

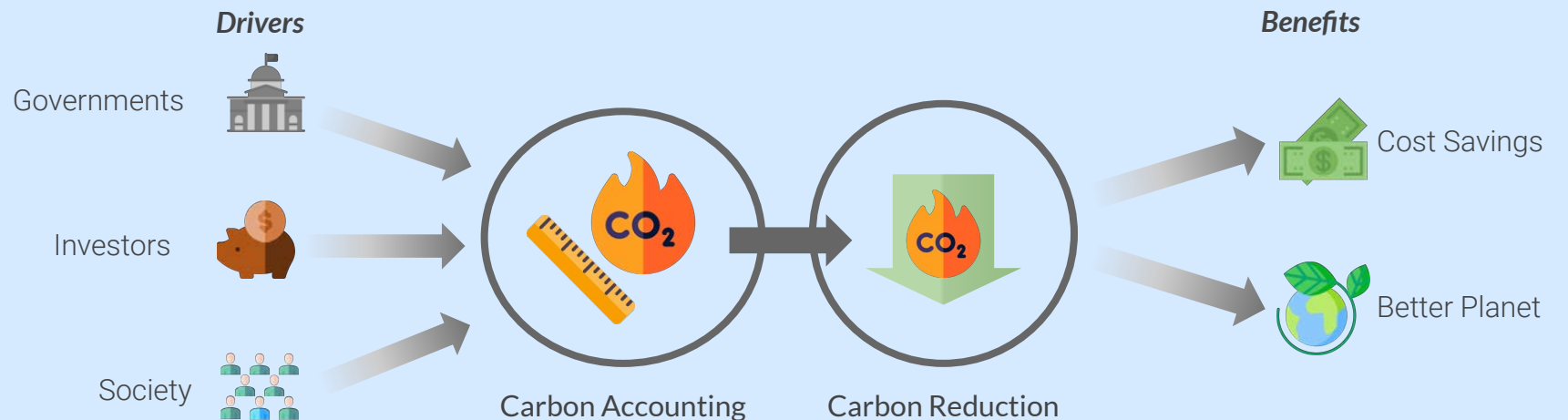
PRESCOUTER

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This is not the decade for action; this is the year for action. The once gentle nudges from governments, investors, and society are becoming painful taxes, investment blacklists, and consumer protests. To survive and thrive in the coming decade, companies can follow the steps we outline in this report to account for and reduce their carbon emissions.

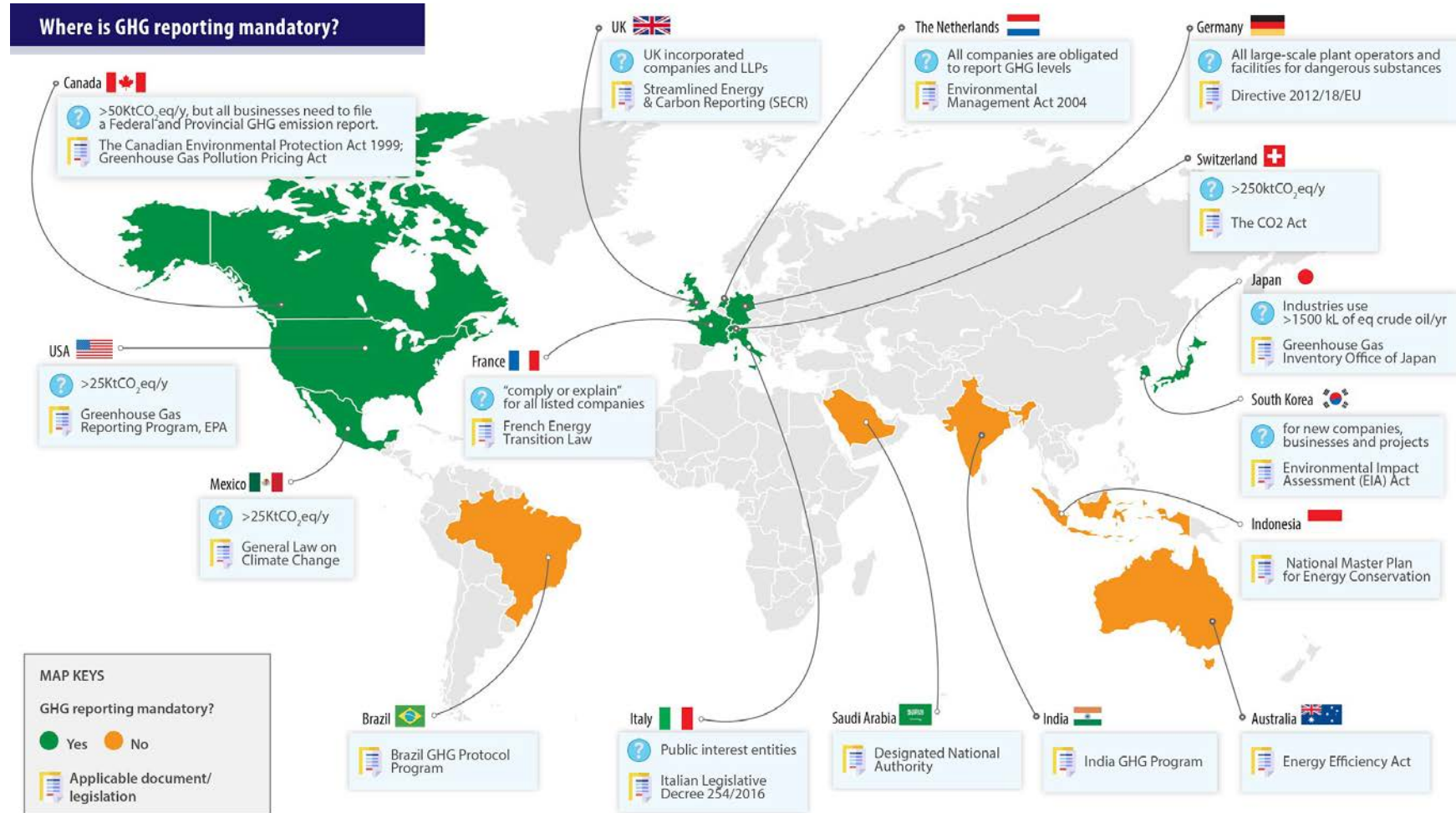
Becoming carbon neutral or achieving net-zero emissions is not an easy task. It certainly cannot be achieved overnight. Nevertheless, there is increasing evidence that companies embarking on this path are finding greater profitability while making the planet better.



Governments are increasing carbon reporting requirements for organizations.

While the earliest carbon reporting regulations date back to 2003 in the European Union and 2004 in Canada, many of the top 20 countries by GDP have now implemented reporting requirements.

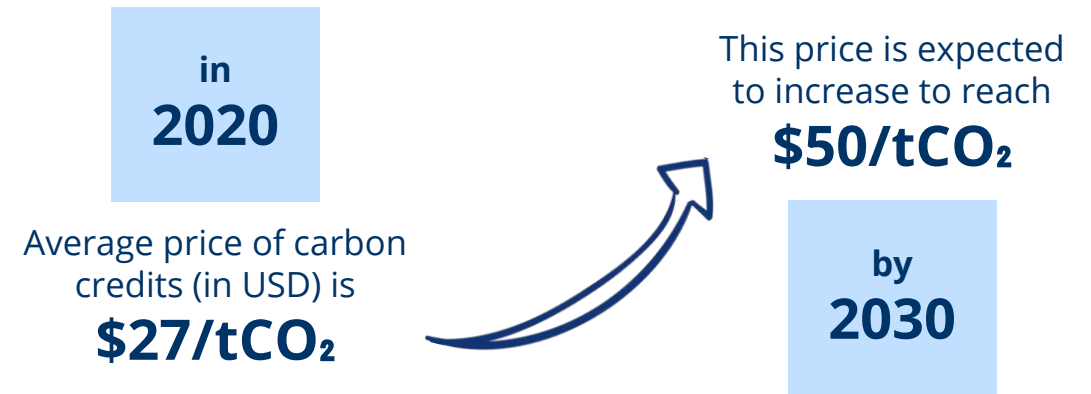
These reporting requirements have typically targeted industries with the greatest emissions but are expected to expand to wider groups of companies over the coming decade.



Beyond reporting, governments will likely use carbon taxes to drive organizations to meet carbon emission targets.

Globally, 40 countries already use carbon pricing, with 64 initiatives implemented or scheduled for implementation.

Carbon credits could cost 85% more in 2030 than they do today. The price of carbon credits has seen an increase in the past few years, with high variability today, ranging from as low as US\$1/tCO₂ to a maximum of US\$139/tCO₂ but averaging around US\$27/tCO₂. Forecasts place it up to US\$50/tCO₂ in 2030, even as some countries are already setting targets >\$100/tCO₂ (e.g., Canada)



Relying on carbon credits will represent paying **85% more** for those same emissions by 2030

which translates to an extra **USD 800 Billion** to the total CO₂ emissions ten years from today.



The price of carbon credits is going up, and paying them can only be a short-term solution. Relying on carbon credits alone is not a sustainable long-term solution.

Investors are increasingly using environmental impact to evaluate companies.

During the COVID-19 pandemic, emphasis on climate change became an even greater focus among investors, who piled into the stocks of sustainable companies. This drove up the values of companies like Tesla and doubled the money invested in sustainability-oriented mutual funds.

What is important about 2050? As pension fund holders whose funds mature beyond 2050 become the majority, concern is increasing about the impact of climate change on companies in these investment portfolios. Fund holders are also concerned with how these companies are aiming to reduce their contributions toward climate change.



TCFD, championed by **Michael Bloomberg**, provides a standard for voluntary and consistent climate-related financial risk disclosures in mainstream company filings. In November 2020, the UK announced that climate risk reporting aligned with TCFD will become mandatory for large companies and financial institutions.



Christopher Hohn, a billionaire hedge fund manager, is financing a campaign to force at least 100 of the companies in the S&P 500 stock index to publish their carbon emission reduction plans and put them up for a shareholder vote.



BlackRock is arguably the world's most powerful investor, controlling nearly \$9 trillion in investments. BlackRock chief **Laurence D. Fink** is calling on all companies "to disclose a plan for how their business model will be compatible with a net-zero economy". BlackRock plans to adjust its investment process for its actively managed funds, scrutinizing and flagging companies for climate risk.

WHAT DOES A 3% INCREASE IN TEMPERATURE MEAN?



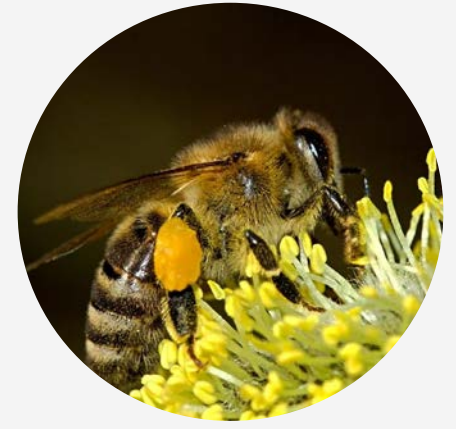
All arctic summer ice will be gone, and higher temperatures will also exacerbate rapid polar melting, causing further havoc in the climate system.



All coral reefs will die & the associated global tourism industry will dwindle.



Global food production & availability will be at high risk.



>30 % of the insect population will die, therefore destabilizing much of the required biodiversity that protects our agriculture systems.

Organizations are also facing increasing societal pressure.

Protests

Inspired by Swedish schoolgirl Greta Thunberg, over 4 million people, many of them school children, participated in a climate strike in September 2019 to demand action by political leaders to prevent climate change. Smaller scale protests are now a regular occurrence across the globe. Fridays For Future reports that 79,000 strikes across 7,800 cities have taken place since early 2019.



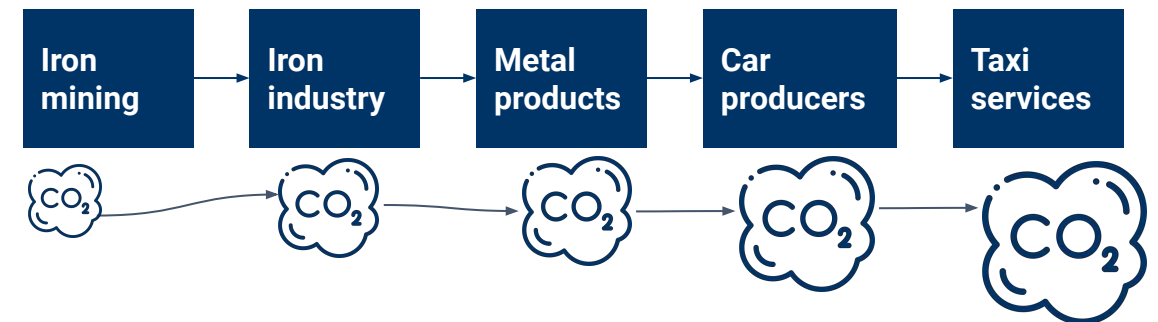
San Francisco Youth Climate Strike - March 15, 2019
Image: WikiCommons

Changing Customer Preferences

Between 2013 and 2018, products marketed as sustainable grew 5.6 times faster than those that were not, with Unilever claiming that its “sustainable living” brands now deliver 70% of its turnover growth. As customers modify their preferences to reduce their own emissions, these changes could boost or erode demand for all types of products.

The Reconfiguring Supply Chain

As consumers move to more sustainable products and services, companies will look at shifting their entire supply chain to reduce their emissions from their supply chain. This example is for logistics services.

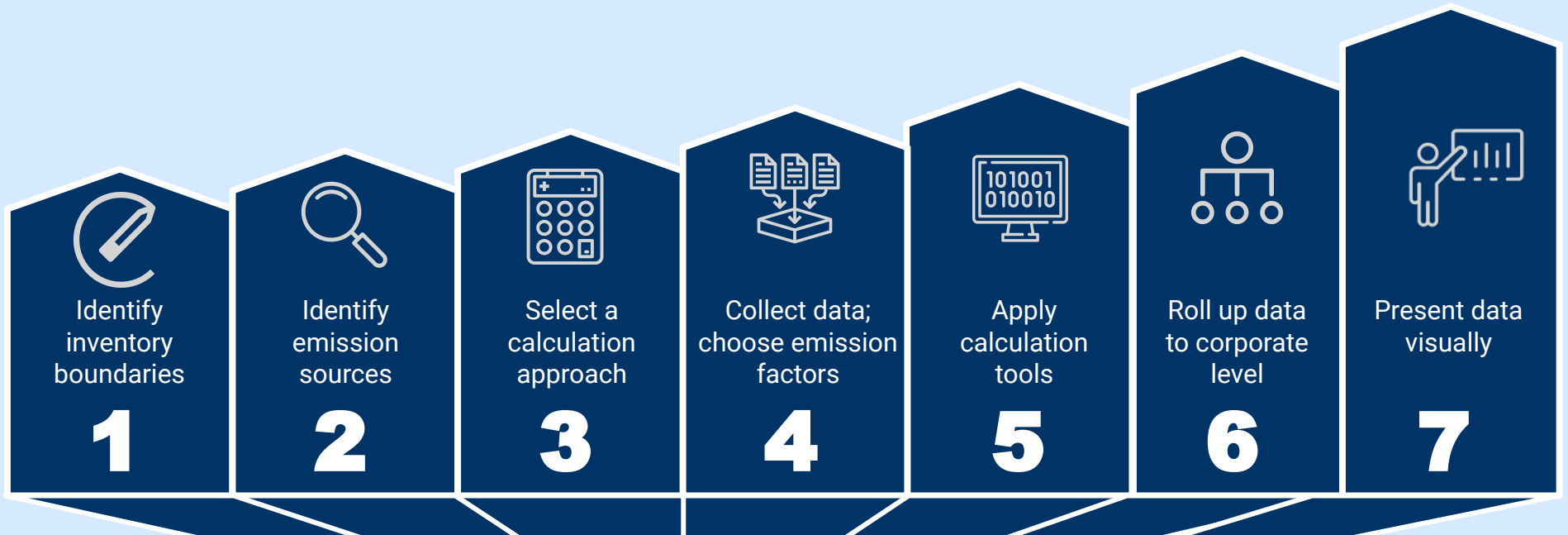




Carbon Accounting - *What gets measured gets managed.*

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.

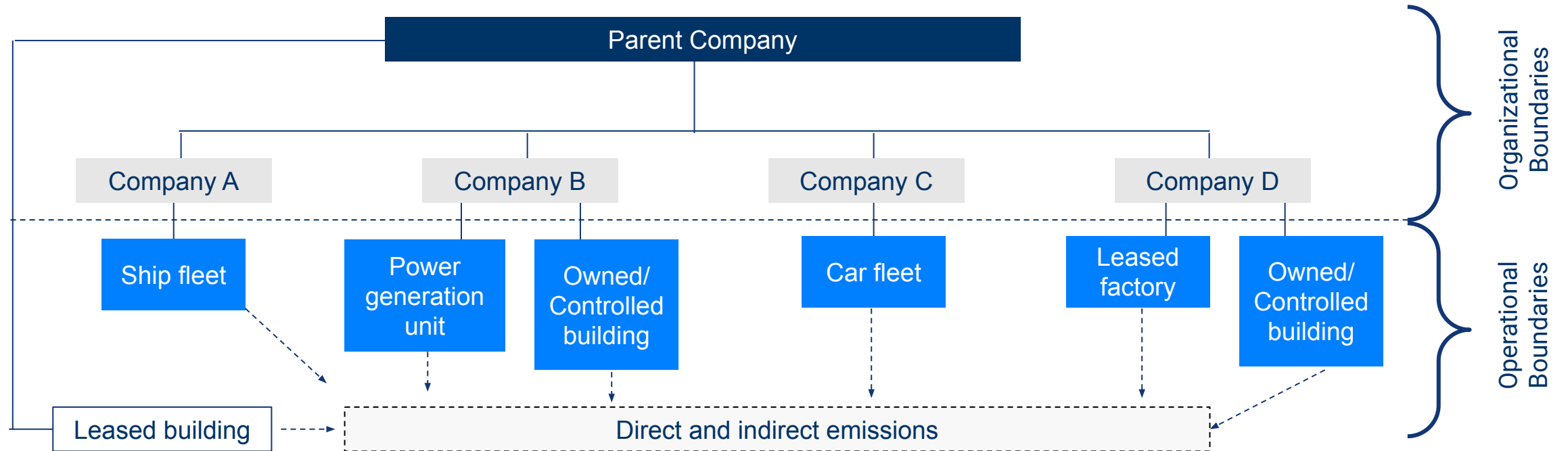




1 Identify inventory boundaries

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](#)

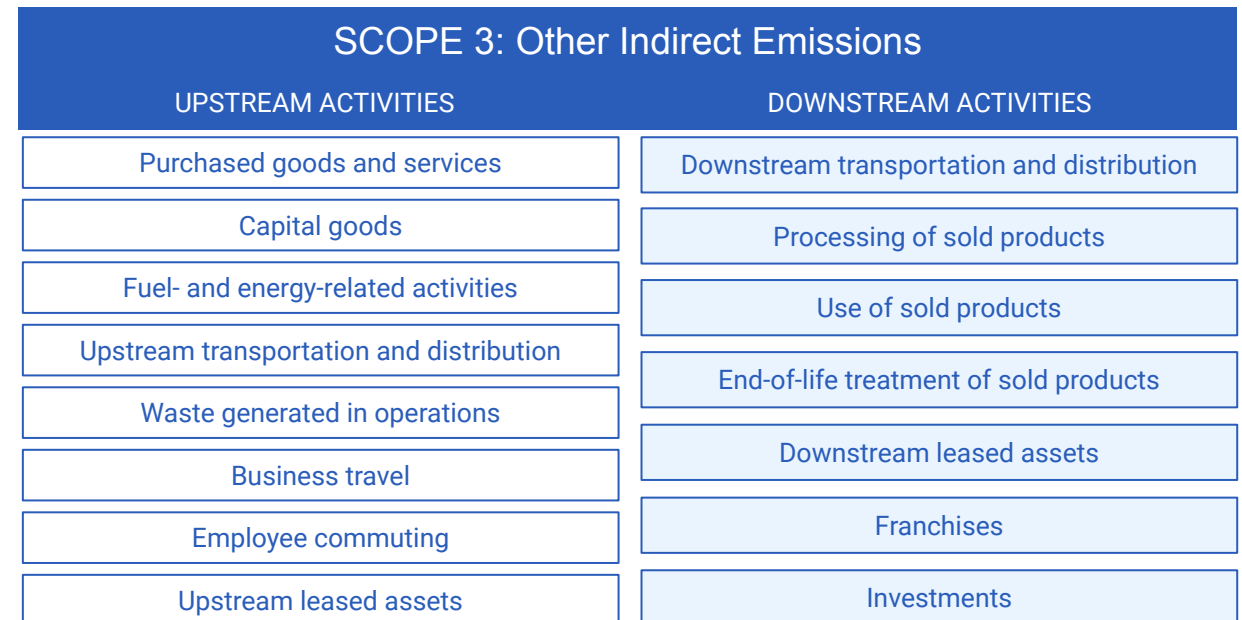
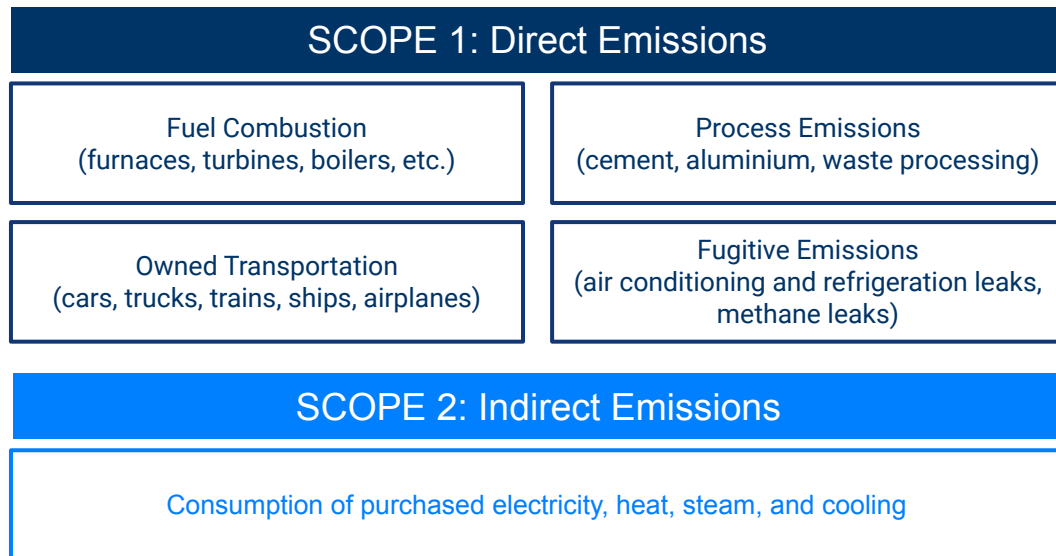
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Identify emissions sources

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.



3



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:



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).



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

5



Apply calculation tools

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

$$\text{Your Data} \times \text{Emission Factor (region specific)}$$

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:

$$\text{GHG due to use of natural gas} = 2,400 \text{ MCF} \times 0.0549 \text{ metric tons CO}_2/\text{Mcf} \\ = \mathbf{132 \text{ metric tons CO}_2/\text{year}}$$

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:

$$\text{GHG due to electricity used} = 900,000 \text{ kWh} \times 0.000707 \text{ metric tons CO}_2/\text{kWh} \\ = \mathbf{636.3 \text{ metric tons CO}_2/\text{year}}$$

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.

5



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)

$$= (250,000 \text{ kg} * 0.25) + (50,000 \text{ kg} * 0.12) + (70,000 \text{ kg} * 0.08)$$

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

$$= 74,100 \text{ kg eq CO}_2$$

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](#)

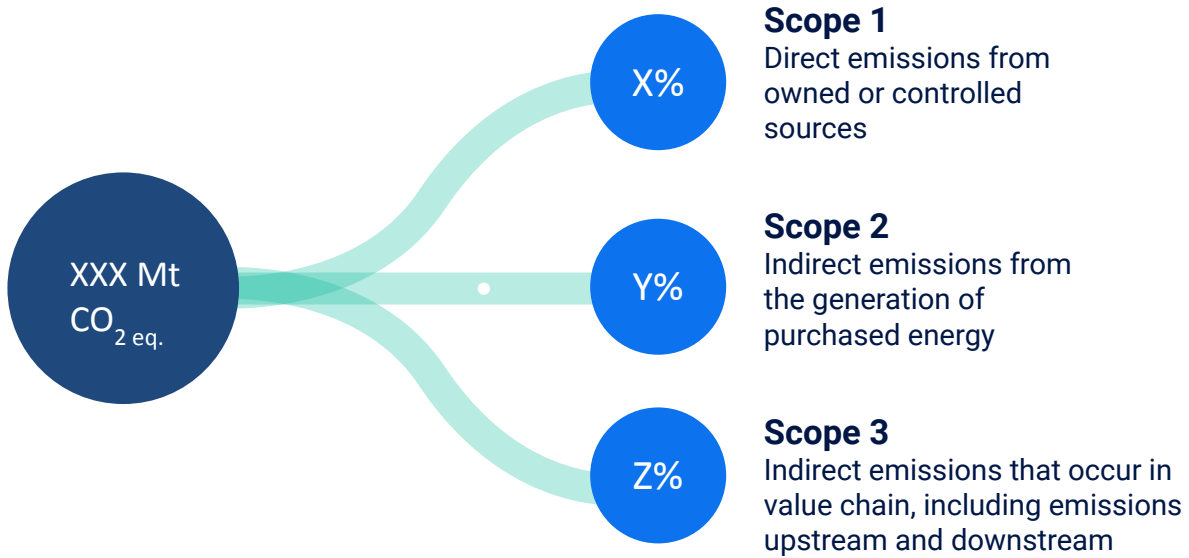
Some reporting categories are common to both the centralized and decentralized approaches and should be reported by facilities to their corporate offices. These include:

- 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



Present your data visually, making it more accessible

This is an example of how PreScouter makes client data actionable

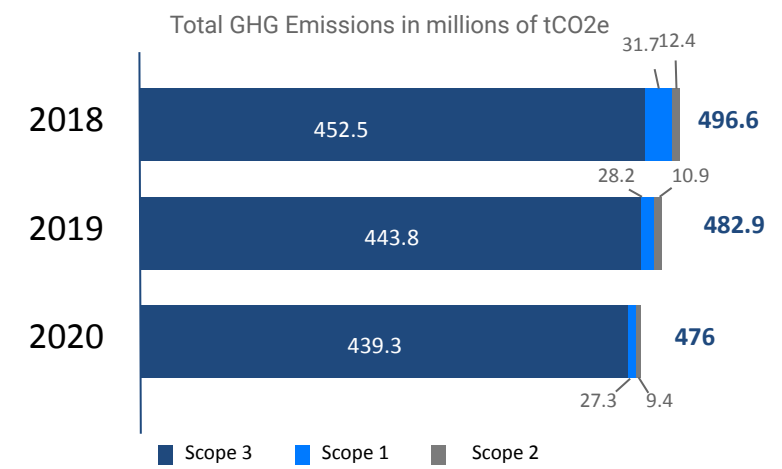
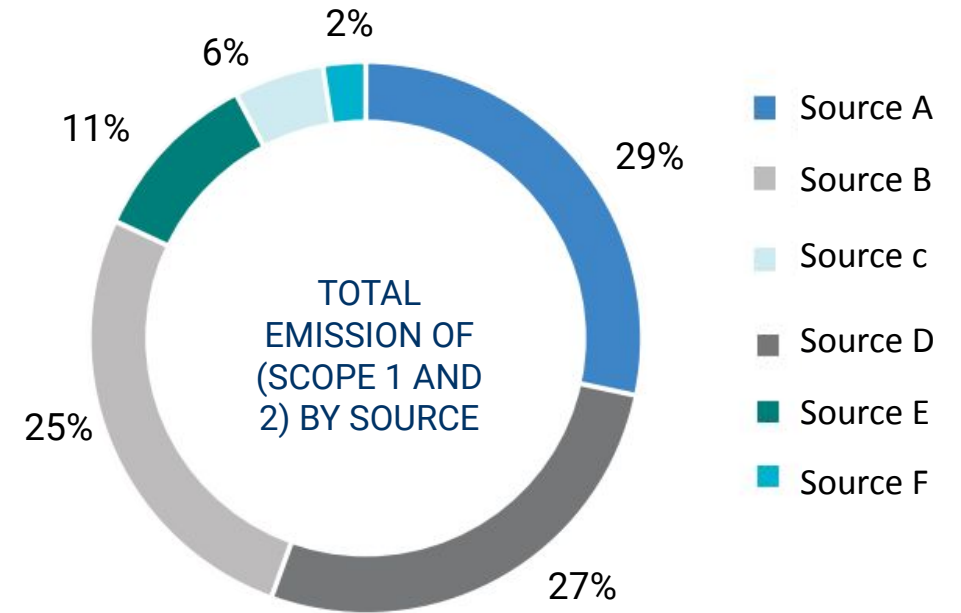


Acme Corp's measure of:

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.

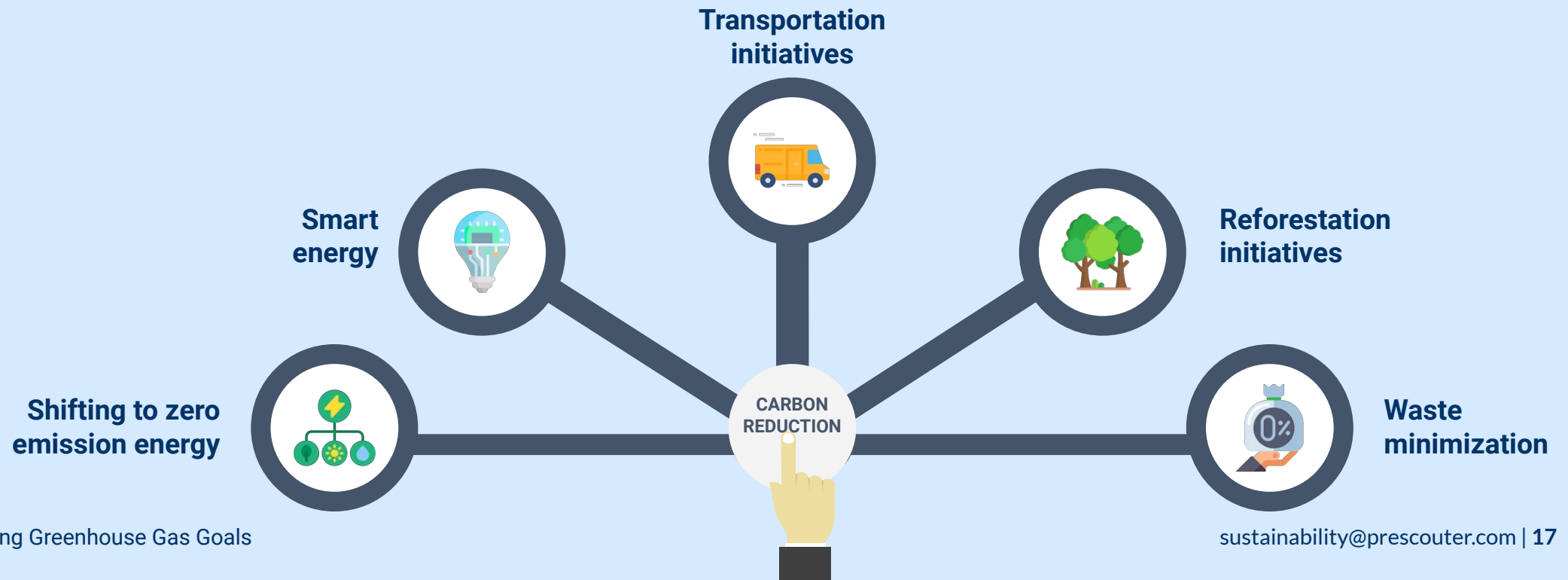
Scope 3 is represented by Z% of total global emissions.

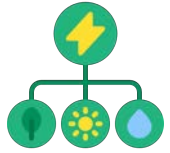




Carbon Reduction - *Finding what works for your business.*

The carbon management strategy that best suits each company is highly dependent on the type of service and/or product a company offers. However, there are five broad carbon reduction strategies that have shown results for the early leaders in carbon reduction. Companies should test and experiment with these - and other - strategies until they find approaches that work best for achieving their carbon reduction goals.



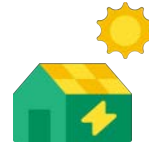


Shifting to zero emission energy

Renewable energy can provide a 90% reduction in energy-related GHG emissions. Coupled with improved energy efficiency, renewables can significantly bring down energy costs/expenditures.

Solar and wind power are currently the least expensive green energy alternatives and the “lower-hanging fruit” when it comes to shifting to non-emitting energy.

Emerging technologies in those spaces involve **multi-rotor wind turbines** (with higher efficiency than conventional turbines) and **solar glass and solar cladding** construction materials (which provide an incentive for users concerned about balancing aesthetics and functionality).



Solar rooftop installations represent one strategy many companies have adopted. Examples include Target, Walmart, IKEA, Kimco, and General Motors.



Wind farms are another investment to provide a green source of energy. Advances in turbine technologies are improving the output and lifetime of parts. IKEA Canada purchased two wind farms in 2013 and 2017 that account for 4X more than the total energy they use across Canada.



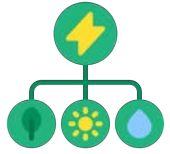
The solar-wind alliance: Relying on both these sources is the most sound strategy to cover most, if not all, energy requirements. Walmart is collaborating with Schneider Electric for more than 8GW of wind & solar power.



Get started by:

1. Identifying local renewable energy providers
2. Vetting each solution for suitability and cost. You'll also need to reach out for a quote.
3. Comparing each solution, keeping in mind ROI and make a choice.

PreScouter has helped dozens of clients make this shift. It certainly isn't a one-size-fits-all type of solution. [Shoot us an email](#) and let's discuss what's best for your business.



Shifting to zero emission energy



Multi-rotor turbines produce 2% more electricity than conventional turbines. Image Source: [Power Technology](#).



Installation of Mitrex Solar Cladding Building Materials. Image source: [Mitrex](#).



Smart energy

Artificial intelligence (AI) has the potential of reducing global GHG emissions by **4% by 2030**.

However, the **combination of AI and the Internet of Things (IoT)**, being dubbed as AIoT, is bringing enhanced capabilities for better energy management. Such capabilities include curbing energy waste, increasing energy production and improving an organization's overall energy infrastructure.

EXTRA READING



Tapping into AI has never been easier with the advent of 3rd wave AI. Enjoy [this free resource](#) that shows how companies are tapping into the benefits of 3rd wave AI today.



A Marriott hotel in Halifax, Nova Scotia, installed an AI solution for **HVAC energy efficiency** in June 2020. Five months later, Marriott reported a 24.5% reduction in natural gas consumption and 3% for electricity.



Shell and Microsoft have formed an alliance to help meet carbon goals. One aspect of this alliance is to continue working together on AI. As of Sept. 2020, Shell has announced the deployment of 47 AI-powered proprietary applications across its businesses. Technologies such as Real-Time Production Optimization have already shown potential to reduce CO2 emissions in Shell's liquefied natural gas (LNG) operations.



mCloud employs IoT sensors to bring data from connected assets into the cloud, where AI and analytics are applied to maximize their performance through the Company's AssetCare solution. This solution is ideal for curbing energy usage in older buildings, where implementing a complete HVAC system update is not cost effective. Chinese-based Heiwado Shopping Center deployed AssetCare and reported 25% savings in HVAC energy usage and an 8% net reduction in energy use overall.



Transportation initiatives

16.2% of energy consumption comes from transport leading to GHG emissions. Constant and rigorous initiatives are being taken, including direct support for electric vehicles (EVs), installation of more charging stations for EVs, hydrogen fuel cell technology, and minimizing travel.



If applied in the transport of goods, AI can enable more accurate traffic prediction, autonomous vehicles, and real-time journey planning. If you'd like to learn more about how to shift toward more sustainable supply chains, [contact us here](#) for a free consultation.



Clean diesel fleet: Meijer lowered its carbon footprint by 60% by using a selective catalytic reduction technology in the exhaust engine of its trucks to eliminate nitrogen oxide emissions.



Minimizing travel: Nike resorted to shipping via ocean, thereby eliminating 14,000 truck journeys per year.



Fuel cell electric vehicles: Toyota and Hino USA are jointly developing a Class 8 fuel cell electric truck. These hydrogen-powered trucks will offer heavy-duty capabilities and clean emissions. The first demo vehicle is expected in mid 2021.



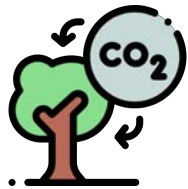
Fleet electrification: Many companies are already working on electrifying part or all of their fleet. Walmart intends to electrify 20% of its fleet by 2022 & run its entire on alternate power by 2028. GoFor plans to electrify its California fleet, followed by expansion across North America, with a goal of electrifying half of its fleet by 2025. Curbtender partnered with XL Fleet to electrify Curbtender's refuse trucks.



Reforestation initiatives

In order to offset the carbon footprint in cases where emissions are impossible to reduce, companies have resorted to achieve zero carbon by expanding and **supporting forest policies.**

According to [Ecosystem Marketplace](#), “offsets from tree-planting projects increased 342% from less than 2 metric tons of carbon dioxide equivalent (MtCO2e) in 2016 to 8.4 MtCO2e in 2018 and were distributed around the world.”



A single hectare of mature trees absorbs approximately 6.4 tonnes of CO2 per year



Approximately equal to the amount produced by driving a midsize car with an average fuel efficiency rating of 7.5L per 100 km more than 30,000 km



ENDURA

Sports apparel brand Endura set plans to plant over **one million trees annually** to completely offset their carbon footprint by 2024. Hence, through reforestation only, Endura aims to become a carbon-negative company.



Volkswagen is investing in reforestation and aims to **protect and restore 2.47M acres** of endangered forests in the tropics and subtropics.

Lundin
Energy



Lundin Energy will invest about \$35M to plant **over 8M trees** across 11,000 hectares between 2021 and 2025, capturing about **2.6 million tonnes of CO2.**



Waste minimization

Companies are moving toward incorporating **LED lightning** systems, reducing excess **water usage**, minimizing waste, and developing or using more **bio-based alternatives** in their products.

Better energy efficiency can easily be achieved by switching to LED or CFL lighting. In 2017, over 1 billion LED and CFL lights were installed in the United States --> saving 142 million tons of CO2 emissions per year, at a cost of about \$7 per ton of avoided CO2^[2].

EXTRA READING



What promising and innovative zero-waste technologies and initiatives are fueling a more circular economy? [In this Intelligence Brief](#), PreScouter looks at 10 companies offering a zero-waste technology or initiative, with the greater focus being on those directed toward plastics.



Waste heat recovery systems (such as those provided by GE, MAN Diesel and Turbo, Tmeic, and Sigma Thermal) are usually used by industries to recover the heat lost from exhaust stacks of installations such as furnaces, kilns, or generators. The waste heat is often captured and converted to electric power in a generator, thereby improving the efficiency of the overall system, reducing emissions, and cutting costs.



Many companies are aiming to partner with **packaging** companies that source sustainably and support recycling. For example, Walmart (as part of its sustainability hub) aims to achieve 100% recyclable packaging by 2025. Some grocery companies are also switching to more sustainable ways of selling their products by completely eliminating standard packaging. An example is Zero Waste Bulk store - a store for local, organic, and sustainable groceries in Waterloo, Ontario.

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

500+
CLIENTS
WORLDWIDE

4,000+
RESEARCH
REPORTS CREATED

150,000+
HOURS OF RESEARCH
COMPLETED FOR CLIENTS

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