DRAFT

Best Practices in Scope 3 Greenhouse Gas Management

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SCIENCE BASED TARGETS
DRIVING AMBITIOUS CORPORATE CLIMATE ACTION

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Executive summary

The need to manage scope 3 emissions

In order to mitigate the worst effects of climate change, the global community most stake swift action to reduce its emissions. At the 21st Conference of Parties, nearly 200 countries pledged to keep global emissions within a 2°C temperature increase above pre-industrial levels and pursue efforts to limit temperature increase to 1.5°C. The business community is responsible for the majority of global emissions and must do its part to meet this goal.

To date, most companies have been focusing on reducing emissions under their direct ownership or operational control (scope 1) and from their purchased electricity, heat and steam (scope 2). However, there is a growing need to reduce greenhouse gas (GHG) emissions wherever possible. This means also reducing value chain emissions (scope 3). Companies may see the division of scopes as justification for not taking responsibility of indirect emissions. Scope 3 falls outside of the company's direct control/ownership. It is more difficult to collect data and the inherent ownership structure can create barriers to reduce these emissions. Indirect emissions are also double, triple etc. counted, which leads to questions of who is responsible for reducing them.

Despite these challenges, addressing scope 3 not only has huge potential to keep temperatures within safe levels, it benefits businesses as well. Companies can mitigate risks within their value chains, unlock new innovations and collaborations, and respond to mounting pressure from investors, customers, and civil society.

Hundreds of companies are already setting scope 3 reduction targets, dozens are in line with best practices according to the Science Based Targets initiative (an NGO collaboration that supports companies in reducing their emissions in line with climate science). There is enormous potential to reduce scope 3 emissions, which would help preserve the rapidly shrinking global carbon budget. This compendium summarizes the latest best practices in addressing scope 3 greenhouse gas emissions, from formulating ambition and reducing emissions to measuring and tracking impact.

Reducing emissions and measuring impact

It is best practice for companies to express their emission reduction targets on both an absolute (a percentage reduction from a base to a target year) and intensity (a percentage reduction formulated in emissions per an indicator from base to target year) basis. This helps to understand the ambition of the target in the tonnes of greenhouse gases being reduced as well as how emissions performance compares to the company's growth. Targets should also be in line with climate science to demonstrate that the company is reducing its share of emissions needed to meet global goals.

Engagement targets are another mechanism to drive emissions reduction throughout the value chain by engaging suppliers and customers. Companies can multiply impact by incentivizing action with many stakeholders at once.

Interventions (activities taken to reduce emissions) are a function of reducing activity and/or improving efficiency. The interventions in this document, though they may seem diverse, employ one or both of these.

It is important to accurately and consistently track and report progress on annual basis to ensure credibility and transparency. Standard Measurement/Monitoring (of emissions, mitigation measures and support), Reporting (in accordance with a standard), and Verification (of accuracy and completeness to establish credibility) can be applied at a sectoral, organizational, facility and/or product level.

Hotspots in the value chain

Emissions are driven by the purchases of the company, produced as a part of its operations, or emitted by a product the company has sold. Within scope 3, nearly all emissions fall under category 1 (purchased goods and services) and category 11 (use of sold products). One company's upstream emissions are another company's downstream emissions. The way to most effectively reduce emissions depends on which role a company plays within a specific value chain.

Upstream

Upstream emissions are those generated from cradle to gate. On average they are approximately 4x that of operations, and so have huge potential for mitigating climate change. For many large companies, supply chain data are sparse and of poor quality. Supply chains can include tens of thousands of suppliers, many of them small and medium-sized enterprises with limited resources. Reducing upstream emissions necessitates actively and effectively engaging the supply chain. The following framework outlines the steps leading companies are undertaking to meet their targets.

Figure 1. Framework for supplier engagement

Stage 1 entails identifying which suppliers to engage. Ideally, this is in terms of emissions impact; however, annual procurement spend is often a proxy due to data limitations. At this stage the company should also identify its resources and constraints to help define what strategic elements to employ and how actively they can engage their suppliers. Ideally, the CEO or CPO would actively promote this strategy within the company.

Stage 2 begins with opening/improving two-way communication with the targeted suppliers to inform them of the desired actions and outcomes as well as collect data to monitor progress and improve processes. The next and arguably most important step relies on collaborating closely with the suppliers. This determines the methods with which the suppliers will be engaged and can be forceful (e.g. standards), voluntary (e.g. promotion), or (competitive (e.g. a rating/scoring system). An effective mechanism to engage a large number of suppliers throughout several tiers of the supply chain is "cascade" which entails suppliers engaging their suppliers to adopt emission reduction targets. Next, actions should be monitored to assess progress. Lastly, the company should employ reinforcement mechanisms, either positive or negative, to incentivize action.

Upstream interventions with limited information

A new Scope 3 Accounting Framework developed by a consortium between the Gold Standard, SBTi, Mars, Danone, and Livelihoods Fund offers supplementary guidance for cases where information about an intervention is available but there is a gap in knowledge needed to link this intervention to a company's specific supply. This new framework, which will be available in 2019, seeks quantify interventions where specific supplier locations, identities, and/or activities — especially those at the grower or producer level — may be unknown or difficult to access.

Downstream

Downstream emissions are emitted after a product or service leaves the company's control/ownership. The most significant of these are related to sold products and services. Downstream interventions are mainly driven by product and service design and behavior change. There is currently no overarching framework that can apply across sectors (such as supplier engagement), and so this guidance focuses on three high-impact sectors: transportation, electrical equipment & electronics, and oil & gas.

Transportation interventions rely on reducing the need to travel, shifting toward cleaner modes of transportation, and increasing the efficiency of vehicles. Additional measures include engaging with regulators to promote cleaner vehicles and exploring new business opportunities in power sector decarbonization and smart grid systems.

Electrical and electronic equipment carbon intensity can be greatly reduced by improving energy efficiency. Numerous standards can help to define performance metrics, though companies can also innovate technologically

to push the envelope. In addition, indirect emissions (though not required by the GHG Protocol) can be influenced by consumer education.

The oil and gas sector currently generates ~50% of global CO2 emissions and must be phased out in order to meet the goals of the Paris Agreement. Regulatory and inventor pressure as well as product and service design will help enable this transition.

Circular economy

Circular economy principles underlie all of the above. *The Circular Economy: A Powerful Force for Climate Mitigation* (2018), estimates that a circular economy could reduce up to 3.6 billion tCO2 in heavy industry per year globally. A more circular economy is needed to net zero emissions in the second half of this century, which is a long-term goal of the Paris agreement. Zero-carbon energy alone is insufficient. Emissions associated with the embodied energy of new materials and their processing must also be substantially reduced. The prevailing linear processes to 'take → make use → dispose' should be redesigned to closed systems, which extend product lifespans and reduce material demand and waste. This can be achieved through increasing product materials efficiency, creating circular business models, and increasing materials recirculation.

Future work

"Fourth Wave" technologies such as data analytics, smart sensors, and blockchain will help companies manage their scope 3 impacts by offering powerful insight into complex, global value chains. These technologies will transform the way businesses connect with suppliers and collect data as well as vastly improve transparency and data quality. Data analytics will translate these into actionable insights. Investors are one of many important stakeholder groups who will be equipped with more robust information to make investment decisions to support positive environmental actions.

Conclusion

For many companies, acting to reduce climate impacts throughout the entire value chain is one of the most important steps that can be taken to fight climate change. Corporations have the opportunity to position themselves as agents of change by aligning their own goals with those of civil society and act as a critical link between consumers and suppliers. As the common link between upstream and downstream sources, and facing increased demand to take climate action seriously, companies can act in their own best interest and for the betterment of the world by addressing emissions up and down the value chain to the greatest extent possible.

1. Introduction

Global need

At the 21st Conference of Parties, nearly 200 countries pledged to keep global emissions within a 2°C temperature increase above pre-industrial levels and pursue efforts to limit temperature increase to 1.5°C. These goals, laid out in what's commonly referred to as the Paris Agreement, aim to keep global temperatures to within safe levels. To achieve this monumental ambition, the global community must take bold action and must do so immediately. Systematic and widespread change is necessary from all actors.

In addition to countries' Nationally Determined Contributions (NDCs), a myriad of actors from cities, states, and regions (CStAR), civil society organizations (CSOs), investors, individuals, and companies are laying out their climate mitigation plans. To date, there are thousands of corporate commitments across 68 countries pledging to six emissions reductions initiatives according to the UNFCCC's NAZCA portal. In addition, there are numerous platforms through which companies can showcase their emission reduction efforts such as We Mean Business, the Science Based Targets initiative, Net Zero 2050, Cement Sustainability Initiative, Global Green Freight Action Plan, Low-Carbon Sustainable Rail Transport Challenge, Oil & Gas Methane Partnership, WWF Climate Savers, and We Are Still In.

While the companies committed to the aforementioned platforms are demonstrating that they endeavor to mitigate climate change, the majority of the private sector still needs to step up to do its part. Eventually there will be a standard to align emission reductions with climate models, enabling businesses with the comprehensive information they need to address their share of the carbon budget. Those that have not begun to reduce their environmental impact now will have more difficulty adjusting in the future.

The Science Based Targets initiative's (SBTi) goal is to make science-based target setting standard business practices and have a critical mass of companies set science-based targets (SBTs) by the end of 2020. This collaborative effort by CDP, WRI, WWF, and UNGC, has already received commitments from hundreds of the world's largest companies to set their emission reductions in line with climate science. It provides resources and guidance that companies in nearly every sector can apply across their emissions scopes.

Emissions scopes

Part of the global challenge is defining responsibility. The level of influence and control each company has over its emissions is classified by scopes:

- Scope 1: direct emissions from owned or controlled sources.
- Scope 2: indirect emissions from the generation of purchased energy
- Scope 3: all indirect emissions (not included in scope 2) that occur in the value chain of the reporting company, including both upstream and downstream emissions

BOX 1. Avoided emissions

At times confused with scope 3, avoided emissions occur *outside* of a product's life cycle (e.g. low-temperature detergents, building insulation). Scope 3, on the other hand, covers the product lifecycle upstream and downstream of the company. Products that avoid emissions provide a lower-emissions alternative to those that are more intensive. These can also potentially reduce large volumes of emissions and the low-carbon economy is increasing demand of these types of products. However, there is currently no standard to account for these emissions.

Who is responsible?

Scope 3 emissions are the largest source of company's emissions in most sectors, often accounting for several times the impact of its scope 1&2 emissions. In fact, approximately 40% of global GHG emissions are driven or influenced by companies through their purchases (i.e. purchased goods and services) and through the products they sell (i.e. use of sold products) alone.[1]

To date, most companies have been focusing their efforts on scopes 1 and 2, where they have more direct control. However, as the remaining global carbon budget is being rapidly depleted, there is a growing need to reduce greenhouse gas (GHG) emissions wherever possible as well as mounting levers being created to drive and enable action. This means also reducing value chain emissions (scope 3).

Companies may see the division of scopes as justification for not taking responsibility of indirect emissions. Scope 3 falls outside of the company's direct control/ownership. It is therefore more difficult to collect scope 3 data and the inherent ownership structure can create barriers to reduce these emissions. However, the inherent nature of how scopes are classified may divide emissions and activities in somewhat arbitrary ways. For example, one might expect Apple and Samsung to have similar emissions profiles. Yet, since Apple outsources much of its manufacturing - some of it to Samsung - Apple has a much higher portion of emissions in scope 3 than in scopes 1 and 2 compared to Samsung (over 99% and ~61% of total emissions respectively).[2] For further details on accounting challenges see the box on page 9.

Indirect emissions are also double, triple etc. counted. One company's direct emissions are the upstream and downstream emissions of others. This could be used as an excuse for inaction - if one company's emissions inventory overlaps with those of one or more other companies or consumers, who is responsible?

At the same time, this overlap creates collaborative opportunities that increase the likelihood of success both in preserving the global carbon budget and in meeting company goals. For example, if two companies request a supplier to disclose to CDP, there is a 68% probability that supplier will respond. If three companies send a response request, then there is a 76% likelihood they will respond. The more requests a supplier receives, the more likely they are to take action and the more likely it is for these companies to achieve their shared supply chain emission reduction goals.

Companies are already demonstrating that it is possible to address scope 3 emissions. Over 2800 companies that report to CDP already report scope 3 emissions, of which 26.7% have calculated emissions for all categories they consider relevant. Moreover, 368 companies have publicly listed scope 3 emission reduction targets in their 2017 CDP response and over 100 companies have had their targets approved as 'science-based' by the Science Based Targets initiative, of which ~90% of which had ambitious scope 3 targets. The opportunity for companies to use their influence within value chains to act as catalysts for the deep decarbonization of the global economy is immense, particularly those segments that other drivers for reductions have difficulties reaching.

Company benefits

In addition to the opportunity this presents in preserving the remaining carbon budget, there are several benefits for companies reducing scope 3 emissions as well.

Improve risk & cost management

The GHG-intensive segments of a value chain are inherently more vulnerable to risk from increasing resource prices and a changing regulatory landscape, such as increasing production costs of key suppliers that they pass on to their customers, tightening efficiency standards for products, or taxation on carbon emissions. The mapping and

[1] Global Supply Chain Report 2018 - CDP

[2] Hugh Sawbridge, Dr. Paul Griffin: Technical Annex IV: Scope 3 Overview and Modelling CDP Full GHG Emissions Dataset 2016

mitigation of these risks requires a sophisticated understanding of key sources, hotspots, and drivers of GHG emissions across a company's value chain. In a world committed to ambitious climate action, a robust system for scope 3 accounting and management is therefore an essential component of a company's strategic risk management and a valuable tool to proactively address value chain risks.

Unlock business opportunities and innovation

As the global economy decarbonizes, existing markets are disrupted, and new markets emerge. Staying competitive in this changing landscape means offering solutions that are fit for a low-carbon world. The map of GHG emission hotspots created through scope 3 accounting can dramatically improve companies' ability to forecast these changes and thus identify emerging business opportunities, as well as at-risk business segments, early.

Taking scope 3 into account also helps companies understand its value chain from a systems perspective, thereby unlocking opportunities for improved design and collaborative innovation with suppliers. Innovation is further catalyzed by ambitious long-term reduction targets, helping companies to shift their focus from incremental improvements to transformative change.

Respond to external pressures

Pressure on companies from investors, customers, peers, suppliers and civil society to fully measure, manage and reduce their impact on the climate continues to increase. Consequently, reporting and reducing scope 3 emissions has become an integral aspect of reporting frameworks like the CDP climate change questionnaire and the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD), as well as initiatives to drive ambitious corporate action like the Science Based Targets initiative and WWF's Climate Savers program.

Scope of this paper

To help address the growing need for companies to reduce their scope 3 emissions, this guidance document summarizes the latest best practices in addressing scope 3 greenhouse gas emissions, from formulating ambition and reducing emissions to measuring and tracking impact.[3]

2. Reducing emissions and measuring impact in scope 3

It is important to first quantify scope 3 emissions in the company's inventory - if you can't measure it, you can't manage it. Companies should conduct a screening to determine which scope 3 categories are relevant, then collect primary on hotspots that are the most relevant and able to be influenced. The GHG Protocol Scope 3 Standard describes how to calculate value chain emissions impact and identify where to focus reduction activities. The focus of this paper is on the steps that follow: formulating ambition (target setting) and measuring and tracking impact.

Formulating ambition

Absolute and intensity targets

In terms of preserving the global carbon budget, the most meaningful are absolute targets, which reduce specific quantities of emissions relative to a base year (e.g. a 30% reduction in emissions by 2030 from a 2018 base-year). However, they do not show impact relative to the activity of the company. A company may shrink in size and reduce its emissions correspondingly without improving its emissions performance. Intensity targets (a.k.a. normalized targets) reduce emissions per an activity indicator that is physical (e.g. tonne of paper produced) or economic (e.g. value added). They help to demonstrate ambition while taking growth and output into account (e.g. a 30% reduction

[3] These actions assume that companies have followed the Greenhouse Gas Protocol Scope 3 Standard to create its inventory.

in CO2e/tonne of steel produced by 2030 from a 2018 base-year). However, these may lead to an increase in absolute emissions if activity growth is greater than the reduction rate. It is best practice to set both absolute and intensity targets for maximum transparency.

Targets should also be in line with climate science. Science-based targets tell companies how fast and how quickly they need to reduce their emissions in line with global goals (e.g. well-below 2°C as defined in the Paris Agreement). The Science Based Targets initiative provides guidance and tools to support companies in setting these targets. Their criteria and recommendations also define other meaningful aspects of targets such as their timeframe and boundaries.

Engagement targets

Another type of target is to engage with suppliers or customers to reduce their emissions. This in some ways passes some responsibility onto other entities, but empowers companies with relationships with many stakeholders to generate a "cascade," to propagate action and multiply impact throughout the value chain (see Section 4).

Interventions

An intervention is an umbrella term for any activity that introduces a change to a technology, or practice or switches supply to reduce emissions. In essence, interventions can be projects, programs, business decisions or other actions, which either reduce the level activity or improve efficiency and result in emissions reductions, as in the figure below:

Figure 2: Levers for reducing emissions

All of the guidance below, though they may seem diverse, can be categorized as one or both of these types of interventions.

Measuring and tracking impact

Measuring and tracking impact is essential to demonstrate progress against a low-carbon pathway. Measurement is needed to identify emissions hotspots and trends, while reporting progress against reduction targets and verification is essential for assuring credibility and transparency. The company's inventory and progress toward its targets should be published on an annual basis. There are different ways to collect the information. While companies with most emissions from purchased goods and services might need to engage with several tiers of suppliers to collect data, other corporations with energy consuming products could use surveys and polls to map customer behaviors. Consequently, while companies need to work on specific solutions individually, the main principles and processes remain the same for all entities.

An example of impact tracking initiatives is the Assessing low-Carbon Transition (ACT) project by ADEME and CDP. The initiative estimates, rates and classifies organizations' progress in transitioning to a low-carbon economy, including measuring progress toward targets. It predicts future trends based on recent data with sector specific methodologies. The evaluation is based on five aspects of low carbon transition: 1) commitment to a low-carbon vision, 2) transition plan to achieve targets, 3) present actions to decrease emissions in the short-term and in the long-term, 4) impact of past decisions, and 5) strategy consistency with emission reduction targets. The method

combines quantitative and qualitative information in order to rate the organizations based on performance, assessment and trend ratings.

Standardized Measurement, Reporting and Verification (MRV) process provides support for keeping Nationally Determined Contributions on track or the European Union Emissions Trading System to operate effectively in a robust, consistent and accurate form. Corporations with ambitious emission reduction targets need to measure and disclose the actual state of their GHG reductions goal to recognize gaps and to inform stakeholders.

MRV process involves three steps:

1. Measure or monitor (direct or estimation) of emissions, mitigation measures and support.
2. Report the interpreted data and findings in accordance with a standard.
3. Verify accuracy and completeness to establish credibility.

MRV can be applied to GHG emissions at national, sub-national, sector, organization, facility and product level. It includes measuring or estimating, reporting and verifying emission over a reporting period. MRV can also provide insights of progress and effectiveness of mitigation measures by assessing emission reductions, projects and actions.[4]

BOX 2. Creating an inventory and associated challenges

Creating an inventory is not always straightforward. Firstly, according to the GHG Protocol Scope 3 Standard it is at the discretion of the company to choose between one of three different consolidation approaches to draw the boundaries of the inventory. While the flexibility allows the company structure to be considered, this also provides difficulty in aggregating data as well as inconsistency in reporting and issues of comparability. As noted above, classification of scopes may vary significantly within the same sector depending on how the company choose to draw its boundaries. In addition, emissions can move from one scope to another, leading to reductions in a particular scope, without changing total emissions.

Similarly, the criteria for identifying relevant scope 3 activities are qualitative, which leads to ambiguity in their interpretation (see Table 6.1 of the GHG Protocol Scope 3 Standard). Using models to estimate what companies are reporting vs. the emissions of a given sector or activity, companies can conduct a gap analysis to determine where they consider their activities relevant versus what is inferred by sector information. Many companies tend to report more emissions in categories where it's easy to collect information (e.g. business travel) despite it being insignificant compared to other categories. Primary vs. modeled data can also produce substantially different results.[5] As a first step, companies can use the Environmental Extended Input-Output (EEIO) approach (e.g. Quantis'/GHG Protocol's Scope 3 Evaluator Tool) to build a screening level scope 3 inventory based on easily accessible and commonly available economic data. This high-level estimation allows companies to identify hotspots in scope 3 emissions. Further steps should be aiming for improvement of data quality of the most relevant scope 3 categories with LCA data.

Despite these challenges, the framework described in the GHG Protocol Scope 3 Standard provides the most comprehensive and widely used guidance to create a corporate inventory. And, though primary data may sometimes be limited, there is information on where hotspots in a particular sector lie. Figure 3 illustrates the average breakdown of scope 3 emissions in each of the GHG Protocol scope 3 categories for the highest emitting sectors. Companies can use modelled information to determine where to focus measurement efforts.

[4] WRI: MRV 101

[5] Hugh Sawbridge, Dr. Paul Griffin: Technical Annex IV: Scope 3 Overview and Modelling CDP Full GHG Emissions Dataset 2016

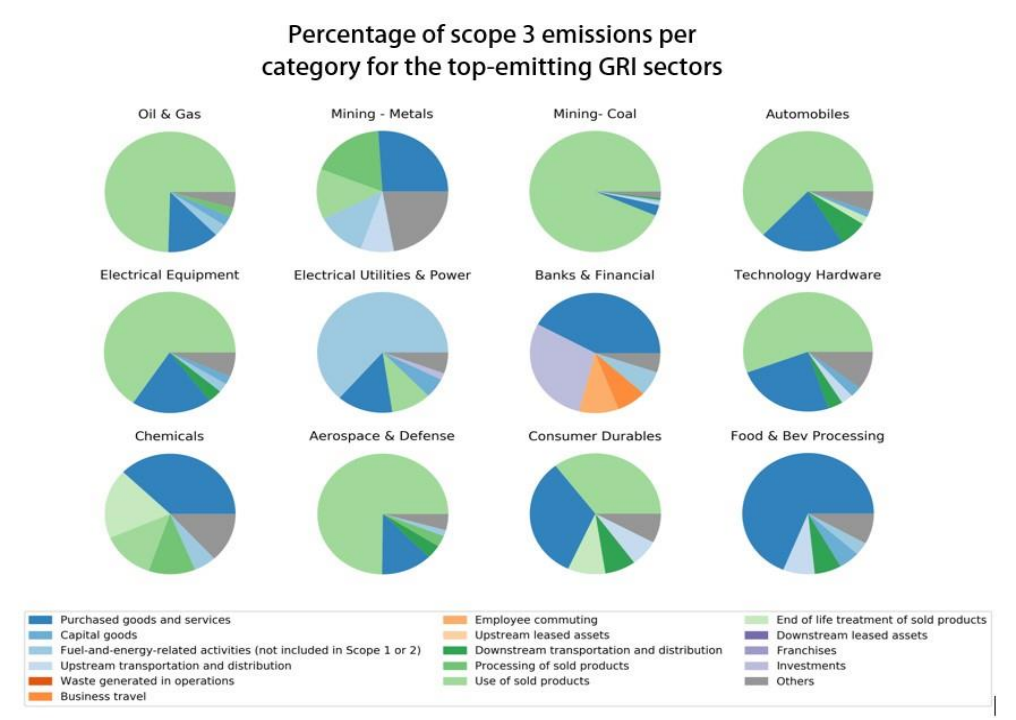

Figure 3: Percentage of scope 3 emissions per category

Emission hotspots in the value chain

The emissions are driven by the purchases of the company, produced as a part of its operations, or emitted by a product the company has sold. One company's upstream emissions are another company's downstream emissions. The way to most effectively reduce emissions depends on which role a company plays within a specific value chain. The following sections provide an overview of best practices in addressing upstream and downstream scope 3 emissions, with a focus on categories 1 and 11. As shown in Figure 4: Scope 3 emissions estimated by CDP Figure 4, the majority of upstream scope 3 emissions fall under category 1 (purchased goods and services) and the majority of downstream emissions fall under 11 (use of sold products).

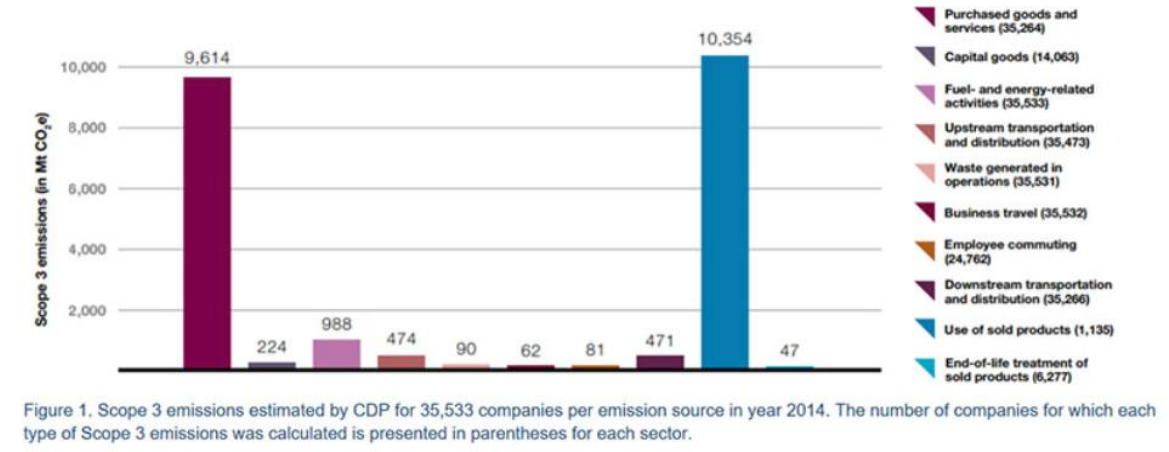

Figure 1. Scope 3 emissions estimated by CDP for 35,533 companies per emission source in year 2014. The number of companies for which each type of Scope 3 emissions was calculated is presented in parentheses for each sector.

Figure 4: Scope 3 emissions estimated by CDP

3. Upstream emissions

Within a company's value chain, upstream emissions are those generated from cradle to gate (i.e. the portion of a product's lifecycle from extraction through the factory) and are accounted under scope 3 categories 1 to 8. According to CDP's 2018 supply chain report, on average supply chain emissions are approximately 4x that of operations.[6] For most companies, they are a reservoir of untapped potential for mitigating climate change. A large number of companies are engaging with their supply chain and the number is quickly growing.

For many large companies, supply chain data are sparse and of poor quality. Supply chains can include tens of thousands of suppliers, many of them small and medium-sized enterprises with limited resources. Reducing upstream emissions relies on reducing supply chain emissions, which necessitates actively and effectively engaging the supply chain. While the downstream section of this guidance document provides more sector-specific best practices, the following section provides a sector-neutral framework that can be employed by a wide-range of companies to address their upstream emissions.

Supplier Engagement

The framework below describes how to develop and implement a supply chain engagement strategy. Options are provided at each step and include recommendations for when to use them. Companies may choose to adopt one or more. These best practices are based on an analysis of approaches used by the first 105 companies that set science-based targets. Approximately 90% of the companies with approved SBTs, have targets to reduce their upstream scope 3 emissions.

Figure 5: Supplier engagement framework

Stage 1: Develop a supply chain engagement strategy

In the decision stage, companies decide which suppliers to engage and determine the key elements of their supplier engagement strategy. These decisions are based on the company's resources and priorities of the companies as well as the characteristics of their suppliers. Supplier targets can be summed up in the hierarchy shown in Figure 6, as outlined by Ecofys, a Navigant Company.[7] Best practices are at the top of the ladder, with suppliers of suppliers setting science-based targets according to the SBTi. For suppliers who are not at this stage in their target setting journey, the ladder can define intermediate targets needed to meet this end goal. The model may be also used to

[6] CDP: Closing the Gap

[7] Ecofys: Looking for a chain reaction

help determine how to engage with suppliers at different stages of emissions management and incentivize action by providing scaled procurement benefits.

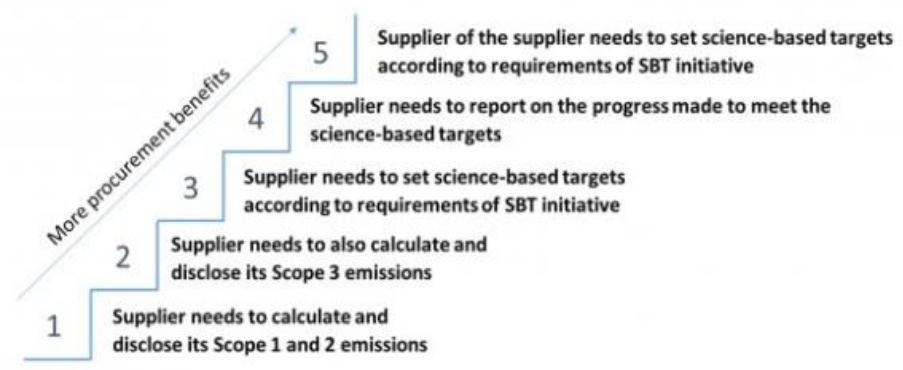

Figure 6: The Ladder Approach to Supplier Emissions Reduction Targets

Step 1. Identify suppliers

Suppliers that are the most relevant in terms of meeting GHG reduction goals are those that have the most emissions impact, regardless of their tier or revenue. In practice, companies have the greatest influence on and are able to measure tier 1 suppliers that comprise the largest portion of their spend, and so this is typically the focus of their engagement efforts. Of the sample, most of these companies only engage their direct (tier 1) suppliers (85%), while some companies also target suppliers higher upstream (21%). The range of suppliers included in engagement strategies can range from all suppliers, to those above a certain spend threshold, to those that fit certain criteria. Factors include: risk of not meeting the company's expectations, willingness to cooperate, desire to build a strategic relationship, and location (e.g. regions with less advanced environmental standards). Efforts to reduce emissions beyond tier 1 can be achieved directing efforts on intermediary suppliers, who in turn are expected to engage with their suppliers. The apparel and food sector are examples of sectors where intermediary suppliers and the purchasing companies are active to reduce emissions beyond tier 1 suppliers.

Step 2. Determine approach

The engagement strategy is largely determined by the company's resources and goals. Companies have preferences regarding the amount of time, money and effort they are willing to put into influencing their suppliers. The preferences are directly linked to the potential outcomes and benefits of an engagement strategy. Additional benefits of supplier engagement are building better relations that influences communications, product development and sourcing, more transparency of the supplier's operation leads to lower risks, etc.

At this stage it is also important to consider how to engage with the suppliers, e.g. enforcing, being passive, or wanting to induce competition among suppliers. To help ensure success, the approach and resources should have CEO/CPO buy-in or, preferably, a mandate.

Stage 2. Implement the supplier engagement strategy

It is important to understand that the following methods & approaches for implementing a supplier engagement strategy, are not mutually exclusive and that many of them can be combined.

Step 3. Communicate

Once the major strategic elements are defined, companies should engage their suppliers in two-way communication. The company implementing the strategy must to acquire information its targeted suppliers' inventories, targets, and emissions reductions activities. At the same time, they should communicate their

expectation of those suppliers in successfully implementing their strategy. Common communication methods and recommendations on when to use them are listed below.

- **Online platform** – not for suppliers with limited access to technology
- **Non-interactive contact** – not for suppliers with limited knowledge of sustainability
- **Open events** – best for companies with engaged, informed suppliers
- **Interactive meetings** – best for companies that have a few suppliers that can drive significant emissions impact
- **Webinars and videos**- suitable for informing a wide-range of suppliers if periodically updated

Step 4. Collaborate

This is arguably the most important element of the engagement strategy. The different types of agreements tend to differ in terms of how they wish to influence the behavior of the suppliers they are targeting. Methods can be forceful ('company-set standards', 'third party standards' and 'tailor-made contracts'), voluntary ('promotion of GHG reduction') or competitive ('rating/scoring system'). The two other agreements, 'joint venture/project' and "Cascade', are mostly considered to be complementary agreements because they are most often found in combination with one of the other five types of agreement.

Table 1: Seven collaboration methods each with a company example

Types of agreements	Definition	Recommended use	Company Examples
Company-set standards	General minimum requirements set for suppliers, for example with a code of conduct or section in the contract.	Companies with goals distinct from those described in third-party standards	Capgemini Group: every supplier has to accept and acknowledge the Supplier Standards of Conduct. Capgemini only works with suppliers and partners who accept and operate under its core principles.
Promoted action	Promote action for GHG emission reduction by supplier, usually without obligations. This includes marketing, informing, communicating expectations, and lobbying. A soft agreement, that can be applied to direct and indirect suppliers.	For companies that want a less direct/ forceful approach, perhaps with suppliers who are not as far along in their emissions reduction journey	Tesco: informs suppliers through the Tesco Supplier Network, an online engagement platform, Tesco employees and expert organizations. An active online community of suppliers, who are engaged on the issue of carbon reductions, in which practical advice on carbon reduction and sustainability are shared.
Joint venture/ project	A project regarding GHG emission reduction measures, undertaken in equal cooperation by a company and supplier, retaining their distinct identities.	For companies with intertwined activities with the supplier e.g. in emissions sources, location, operations, equity	Suez: as a player in the circular economy, SUEZ collaborates with upstream and downstream partners in its value chain and therefore engages them in SUEZ's strategy.

Types of agreements	Definition	Recommended use	Company Examples
Third-party standards	Minimum requirements set for suppliers, as defined by an external independent organization, such as ISO.	For companies who seek established recognition and want to invest limited time in developing bespoke requirements	Coca-Cola HBC: recognize supplier certifications as per international standards (ISO9001,14001,50001, FSSC2200 & OHSAS18001).
Rating / scoring system	A comparative assessment of supplier standards, quality, GHG emissions reduction performance and progress, creating competition (e.g. CDP's supply chain questionnaire).	For companies that want to engage large numbers of suppliers and assess them against widely-recognized best practices	Hewlett Packard Enterprise: HPE's manufacturing spend has a social and environmental responsibility scorecard. It prefers suppliers with science-based targets in place; this creates a long-term commercial incentive for suppliers to set their own targets.
Cascade	A process where a company encourages a number of suppliers to take certain measures, which require the supplier to request a similar action from their suppliers.	For companies where most emissions stem from beyond tier 1	SGS SA: suppliers will be strongly encouraged to promote the requirements of the Supplier Code of Conduct within their own supply chains, and SGS give recognition to suppliers who do this. Suppliers are also expected to encourage their own contractors and subcontractors to follow these practices.
Tailor-made Contract	Minimum requirements set for individual suppliers, dependent on the characteristics of the supplier.	For companies that want to emphasize specific actions from key suppliers, especially those that have a high potential to drive emissions impact	Konica Minolta: environmental experts visit supplier production sites and propose energy, resource and waste management improvements, including their cost reduction benefits and investment rationale.

It is not surprising that the two methods 'company-set standards' and 'promoted action' are the most commonly used since influencing suppliers to reduce emissions is a new working field, and these two methods can augment existing sustainability strategies. For example, if a company has already set certain standards for their suppliers, like a code of conduct, including greenhouse gas emissions reduction can be relatively easier to add.

Step 5. Support

Companies can provide financial support, resources, or information to help suppliers meet their agreements. Some methods are more time and labor intensive to carry out than others. As an example, Tetrapak provided all its base material suppliers with training, support and material for data collection. The interaction is handled by the purchasing organization as an integral part of their ongoing partnership. The types of support listed below are grouped by the source of support:

- **Company to supplier:**
  - Workshop / training
  - Goal setting
  - Financial support
- **Supplier to supplier**:
  - Knowledge sharing
- **Third party to supplier**:
  - Workshop / training
  - Tools (e.g. frameworks or software)

Step 6. Monitor

This step tracks whether or not parties are sticking to the agreements they made with the company. Methods include:

- **Private reporting of supplier to company** - reporting information can be tailored to the company's specific needs
- **Public reporting** - established mechanisms and questionnaires can streamline information asks to suppliers from multiple purchasers
- **Audits** - costly and time consuming but the most accurate

Step 7. Reinforce

This important step involves providing incentives for the suppliers to uphold their end of the agreement. They choose to enforce positive or negative consequences as a response to the failure or success by a supplier in carrying out an agreement. Common reinforcement mechanisms include:

- **priority in contract procurement** - more likely effective for suppliers who are farther along in their target setting journey and for customers that are able to shift their purchases
- **improvement program** - mandatory implementation of an improvement program to measure and reduce climate impact of the supplier
- **switch supplier** - likely a last resort for failure to comply
- **private appraisal** - formal assessment of the measures to reduce GHG emissions.

Case study in progress: collaborating with peers to standardize supplier targets and achieve better results

Interventions with limited information

Engagement efforts aren't always easy to measure. As part of their scope 3 emission reduction strategy, companies may employ projects, programs and business decisions ("interventions") that drive sustainability and reduce emissions in key areas of their supply chain. In some cases, the effects of supply chain interventions are directly measurable using the GHG Protocol Scope 3 Standard. However, others are more challenging, for example, because specific supplier locations, identities, and/or activities—especially those at the grower or producer level—may be unknown or difficult to access.

A new scope 3 Accounting Framework developed by a consortium between the Gold Standard, SBTi, Mars, Danone, and Livelihoods Fund supported by Climate KIC offers supplementary guidance for cases where

information about an intervention is available but there is a gap in knowledge needed to link this intervention to a company's specific supply. It is also intended to address cases where the supply affected by an intervention is unlikely to be that received by an intervening company but is from the same production market as where the intervening company sources, or the "supply-shed."

This Framework, which will be available in 2019, enables recognition of these reduced emissions and sequestration in reporting towards performance targets. Using the guidance, companies can account for interventions, include them in emissions reporting to the maximum credible amount and account for and communicate about the remainder for both emissions reductions and carbon sequestration to capture "net emissions change."

Case study in progress: applying the scope 3 intervention framework

4. Downstream emissions

Downstream emissions are generated after a product or service leaves the company's control/ownership. These emissions span scope 3 categories 9 to 15. The most significant of these are related to sold products and services (category 11), but other significant categories including the processing, distribution, use and disposal of products, i.e. categories 9, 10 and 15.

One immediate challenge in managing downstream emissions is the limited influence a company has over how its products are used, transported, and disposed of once they leave its direct sphere of control. A company can design its products for a high degree of use efficiency and with principles of circularity in mind. In addition, corporates can influence consumers to positively influence behavior to promote intended and expected use patterns. However, these behavioral changes can have significant impact as shown in Figure 7.[8]

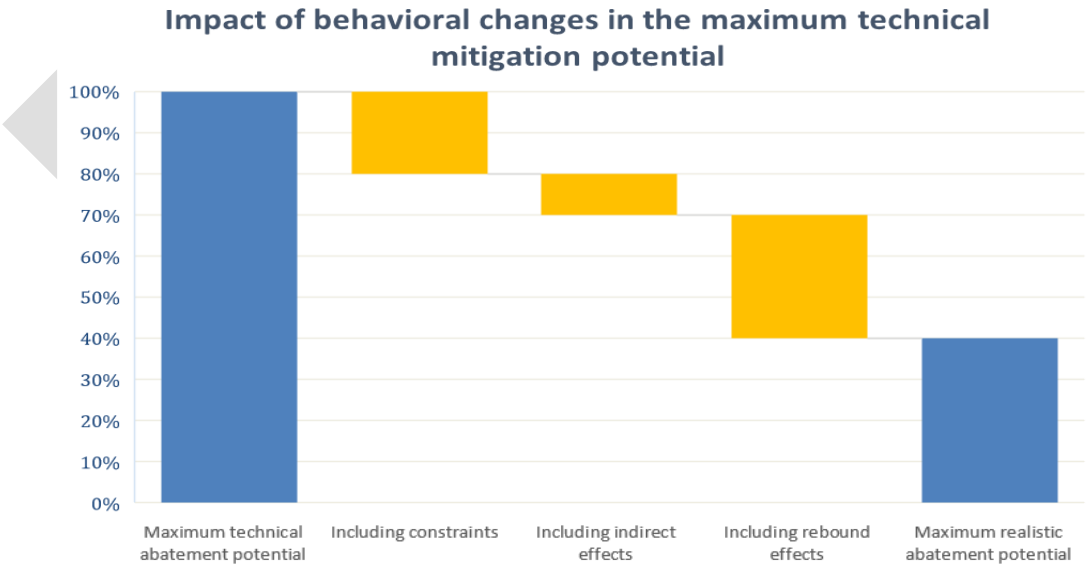

Figure 7: Impact of behavioral changes in the maximum technical mitigation potential

[8] CE Delft 2012. "Behavioural Climate Change Mitigation Options and Their Appropriate Inclusion in Quantitative Longer Term Policy Scenarios"

Another complication distinguishing between direct use-phase emissions (e.g. the use phase of an auto manufacturer's car) and indirect use-phase emissions (e.g. the wash cycle from a fast-moving consumer goods company's (FMCG) detergent). The vehicle manufacturer has more control over the fuel efficiency and fuel type used during vehicle operation than the FMCG company. What distinguishes it as direct emissions is that the fuel use is within the lifecycle of the car. The FMCG in this case has less control over the intensity of the wash cycle and the indirect emissions associated with heating and transporting water for the wash are not part of the detergent's lifecycle emissions. Nevertheless, some design considerations can be made to reduce indirect use phase emissions such as creating a cold-water detergent.

Consequently, specific best practices for addressing scope 3 downstream emissions may vary widely between different sectors, and in some cases, best practice is yet to be established. This should be seen as an opportunity for companies to take leadership, rather than a barrier to the implementation of ambitious scope 3 reduction strategies. However, as the purpose of this compendium is to highlight existing best practice, the following sections will focus on the downstream emissions of several high impact sectors with well-established best practices.

Intervention approaches for downstream emissions

Amongst the heterogeneity of sector-specific interventions for downstream emissions, two central elements emerge:

1) **Product and service design innovation** to lower GHG intensity during use-phase and end-of-life (e.g. technology shifts in product mix, energy efficiency improvements, fuel switching and/or electrification, material efficiency and product recovery management)
2) **End-user education and behavioral change efforts on the company's side, to encourage** less GHG intensive utilization patterns (e.g. product/user-interface design, consumer engagement campaigns, or collaboration with downstream segments of the value chain that foster circular end-of-life treatment of products and downstream logistic efficiency).

BOX 3. Driving behavioral change

End-user behavioral changes are an important component in reducing emissions by complementing technological changes and allowing emission reduction targets to be reached more cost-effectively overall. A reduction in GHG emissions via energy efficiency in household and organizational settings encompasses a wide range of relevant interventions that stimulate behavioral changes including recycling, domestic heating, mobility, and appliance utilization.

While incentives for environmental behaviors have historically relied on financial or policy-based approaches using principles of reward and punishment, nowadays business are also turning to social science methods to mobilize individuals and communities towards target behaviors, colloquially called "nudging."[9] By providing tailored information and giving feedback to users, commitment making (pledging) and goal setting, recruiting leaders from within social networks, and using a variety of other social influence strategies (e.g. social comparison, gamification, community based programs), companies can successfully motivate long-term climate-friendly behavior.

[9] Pacific Institute for Climate Solutions 2016. "Social Mobilization: How to Encourage Action on Climate Change"

Reducing downstream emissions in high impact sectors

Addressing scope 3 downstream emissions is critical for energy and manufacturing sectors, as over 50% of their total emissions can occur within category 11 Use of Sold Products[10]. As shown below in Figure 8, sectors with the greatest hotspots in use-phase emissions include coal mining, the aerospace and defense industry, road vehicle manufacturing, oil and gas extraction, and production of electrical equipment/machinery. Since climate scenarios phase out coal and corporates in the aerospace & defense industry are heavily reliant on government demands, this guidance focuses on the three next highest emitting sectors: vehicle manufacturers, electrical equipment & electronics, and oil & gas.

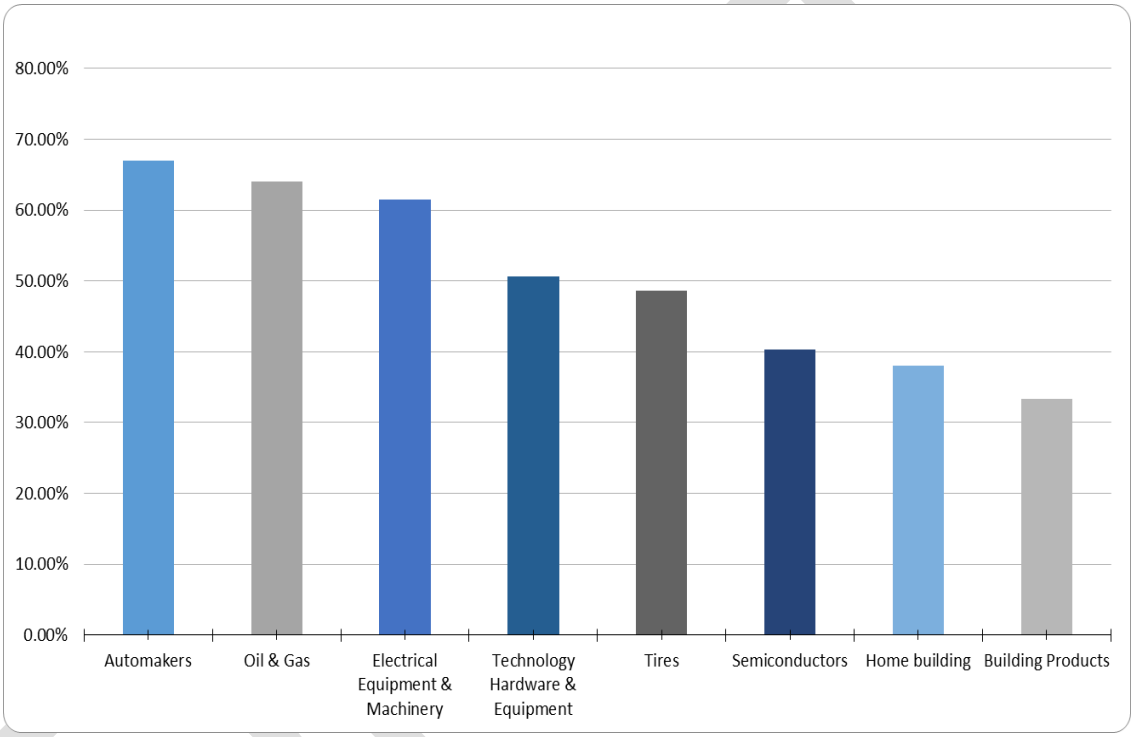

Figure 8: Share of use-phase emissions (category 11) relative to total GHG emissions for selected sector categories.

Vehicle manufacturers

Transport accounts for 28% of global final energy demand and 23% of global carbon dioxide (CO2) emissions from fuel.[11] If unchecked, transport emissions could increase 60% by 2050 largely owing to increased use of road transport for freight and passenger.[12] Vehicle manufacturers have a crucial role in enabling a transition to low-carbon transport, particularly since most (~80%) of cradle-to-grave emissions for road vehicles happen during the use-phase and are generated from fossil fuel combustion, or in the case of electric/hybrid drivetrains, emissions from electricity generation. However, the quality of disclosure and management of scope 3 emissions is still low

[10] CDP 2016 data

[11] IEA. "Energy Technology Perspectives 2017 - Catalyzing Energy Technology Transformations." https://www.iea.org/etp2017/

[12] OECD/ITF. "Transport Outlook 2017". https://www.itf-oecd.org/transport-outlook-2017

and lagging in the automotive sector and a push towards better accounting practices in the sector is urgently needed.[13]

GHG emissions from passenger and freight road vehicles can be reduced by a range of both technological and behavioral interventions:

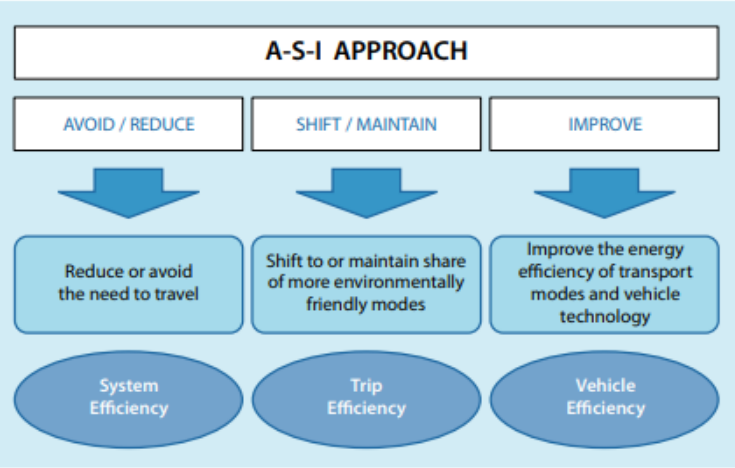

Figure 9: The A-S-I approach

- **Avoid/reduce** trips when possible – achieved by actions such as investing in Transport Demand Managements solutions, improving freight logistics systems, providing options for telecommuting from home and shared-work spaces, communication technologies (ICT) for travel, etc.
- **Modal shift** to lower-carbon systems – achieved mainly by increasing investment in mass transit systems and walking and cycling infrastructure that allows people to travel time and cost efficiently.
- **Improve** the carbon intensity per passenger kilometer or ton kilometer by switching to powertrain technologies that run on renewable electricity, biofuels or hydrogen produced from renewable energy sources; improving fuel economy (e.g. lightweighting, better aerodynamics, better tire rolling resistance).

In addition to the ASI approach, vehicle manufacturers can:

- Engage with regulators to promote demand of more efficient low or zero carbon vehicle types.
- Explore new business opportunities arising from road transport electrification, related to investments for decarbonizing the power sector and development of smart grid systems (including vehicle-to-grid technologies).

Electrical and electronic equipment (EEE)

The key drivers for emissions from the use of EEE are the products' energy efficiency and the carbon intensity of the electricity consumed. However, fugitive emissions from these products can also be a significant emission source for some product categories (e.g. leaked refrigerants from HVAC systems).

These drivers also represent the key levers for interventions to reduce use phase emissions from EEE. Depending on the market manufacturers operate in, energy efficiency standards and labelling may already set a floor for equipment performance. However, there are several ways for EEE manufacturers to push the envelope:

[13] CDP. "Bridging low-carbon technologies." http://cdp.net/en/reports/downloads/3668

- Align measurement of performance with energy efficiency ratings and aim for the highest levels of ratings.
- Focus on improving aspects of the equipment that might not be captured by some standards, e.g. reducing baseload demand by optimizing standby and auto switch-off settings.
- Market equipment based on lifecycle costs, rather than upfront investment costs, to encourage customers to purchase efficient equipment, even if at higher upfront cost.

Companies should further establish Eco-Design principles to reduce life cycle emissions by identifying opportunities for optimization between different product characteristics like energy and material efficiency, weight, durability, substitution of hazardous materials or refrigerants, and opportunities of end-of-life treatment (e.g. product recovery management). Since emissions from the use-phase of EEE these emissions are part of indirect use phase, interventions should focus on levers available to the respective company such as campaigns to influence consumer energy-efficiency behavior (e.g. opting for lower temperature wash cycles, efficient use of heating and cooling appliances, or by participating in standard-setting processes).

In addition, sourcing renewable energy (e.g. PPAs, RECs, direct contracts etc.), or committing to RE100 (100% renewable energy procurement) are a few ways to send a signals to the market and thus positively influence average grid emission factors.

BOX 4. Opportunities in efficient cooling

According to the IEA, using air conditioners and electric fans to stay cool accounts for nearly 20% of the total electricity used in residential and commercial buildings around the world today, putting an enormous strain on electricity systems as well as driving up GHG emissions. With global demand for air conditioners (A/C) expected to triple by 2050 (Figure 10)[14], curtailing the growth of cooling related energy demand and emissions is critical amidst rising global average temperatures and the threat of heat waves.

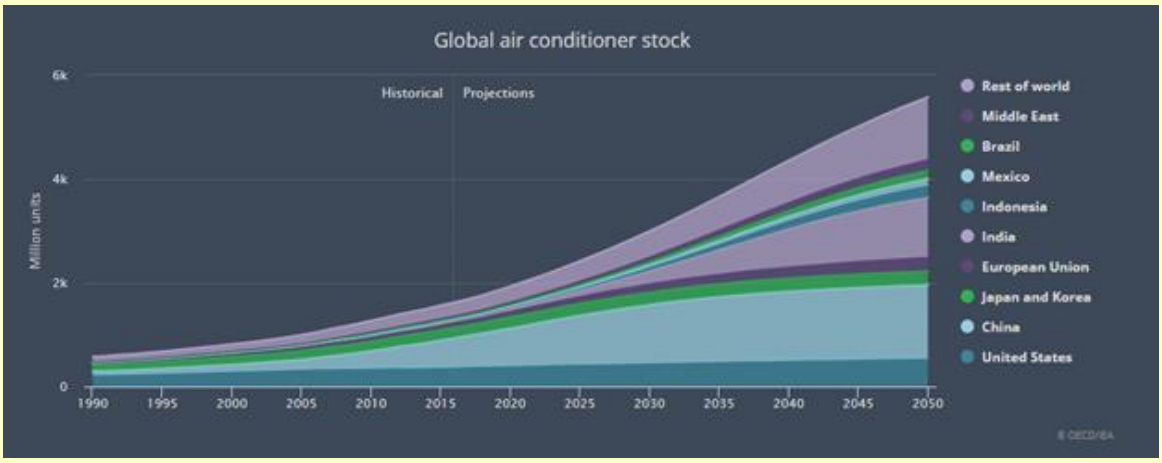

Figure 10: Projected growth in A/C stocks

Fortunately, manufacturers have already begun developing alternatives and innovating to overcome these challenges[15]. Product costs and lifecycle cooling costs have steadily declined due to improved, higher-volume

[14] IEA 2018. "The future of cooling"

[15] U.S. DOE 2016. "The Future of Air Conditioning for Buildings"

manufacturing and higher energy efficiency driven by R&D investments and efficiency policies and labeling programs. Alongside energy demand, manufacturers can seize intervention opportunities for reducing direct and indirect GHG emissions from A/C by:

- Accelerating development of low-GWP refrigerants and advanced cooling technologies through cooperation with research organizations, government regulators, international bodies, and other stakeholders.
- Supporting the implementation of refrigerant policies that aim to minimize emissions of high-GWP gases during installation, maintenance, and end-of life reclamation.
- Supporting the adoption and strengthening of minimum efficiency performance standards that incentivize cost-effective and high-efficiency A/C systems.

Thus, by 2050, measures to make A/C more energy efficient, coupled with decarbonization of power generation, can lead up to 87% reduction in GHG emissions related to space cooling in the power sector from a 2016 level (with the added benefit of improved air quality from less-polluting power generation technologies).

Oil and Gas sector

Combustion of oil and gas accounts for 50% of global CO_2 emissions. Consequently, reducing scope 3 emission from the oil and gas sector is essential to the successful delivery of the Paris Agreement. While the sector has a homogeneous structure (one or a small number of processes and common output expressed as barrels of oil equivalent), O&G companies may also engage in transport and storage operations (midstream), petroleum refining (downstream) and chemicals manufacture, as well as integrate with the power sector. As such, scope 3 category 11 'use of sold products' typically accounts for more than 60% of an upstream oil and gas company's full GHG emissions inventory (i.e. emissions from the combustion of oil and gas in buildings, electricity generation, industry and transport).

Considering that it is not possible to decouple oil and gas product emissions from oil and gas production, the Oil and Gas sector cannot continue to grow without exceeding the carbon budget available to limit climate change in line with the goals of the Paris Agreement. It is critical for regulation and investor pressure to drive the oil and gas sector to take ownership of the downstream impact of its products. Companies in this sector must lead the transition away from coal, oil and gas, and toward low-carbon energy sources such as renewables.

- **Economic signals:** Fossil prices will continue to raise in the long-term as economically viable resources are becoming depleted Consequently, investments in energy from renewable sources becoming consistently cheaper thanks to falling costs and improvements in solar PV and wind technologies.[16]
- **Stranded fossil fuel assets:** According to a 2015 study in Nature, an estimated third of oil reserves, half of gas reserves and more than 80% of known coal reserves should remain unused in order to meet global temperature targets under the Paris Agreement.[17]
- **Electrification:** Primary energy supply is determined by the energy demand. Due to this firm connection, the efforts to electrify the downstream sectors, such as transport, are already successfully decreasing indirect emissions of the fuel extraction and refinement industry as well.
- **Divestment:** Oil and gas companies can reduce their emission intensity by diversifying away from fossil fuels and producing more energy from other sources. Investors have already started to divest from fossil fuels to manage the risks and opportunities associated with the transition to low-carbon economy. From 2015 to 2016, energy efficiency investments rose by 9% and spending in electricity networks rose by 6%,

[16] IEA's World Energy Investment 2017

[17] https://www.nature.com/articles/nature14016

while investments in upstream oil and gas continued to fall, according to IEA's World Energy Investment 2017. An ambitious and sound strategy to shift to low-carbon energy is key to enhance investor trust.[18]

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Reducing downstream transport and distribution emissions

For producer, downstream transport and distribution of goods can often account for a significant share of scope 3 emissions. A common metric for the activity level of shipping goods is tonne-km, which measures the weight of goods shipped, as well as the distance they travel. Companies therefore have three key levers to reduce GHG emissions from downstream transport and distribution: 1) reducing the weight and volume of goods shipped, 2) reducing the distance these goods travel, and 3) reducing the GHG intensity of a tonne-km in their distribution system. The specific nature of opportunities for reductions will vary by sector and often require collaboration within the value chain. Some key opportunities are provided below:

- Reducing weight and volume of goods shipped
  - Focus on reducing weight and volume of products during design stage
  - Avoid, reduce and light-weight packaging materials
- Reducing the distance goods travel
  - Optimize logistics network, e.g. through intelligent route planning systems, strategic placement of warehouse and distribution centers, minimizing intermediate storage
  - Strategically locate new production sites close to key customers/consumption centers
- Reducing the GHG intensity of a tonne-km
  - Improve efficiency of transport network e.g. through increasing back-haulage, loading capacity, and load factors
  - Encourage modal shift towards less GHG intense modes of transport, e.g. from road haulage to rail or air freight to sea freight
  - Shift logistics contracts to operators focusing on reducing GHG intensity, e.g. by replacing vehicles with combustion engines with electric/hybrid vehicles, through eco-driver training, etc.

The Global Logistics Emissions Council (GLEC) Framework for Logistics Emissions Methodologies[19] provides detailed guidance on accounting for the GHG impact of logistics and shipping. Further guidance for designing interventions to reduce emissions from logistics and shipping can be found in the Low Carbon Freight program of the Low Carbon Technology Partnerships initiative (LCTPi).[20,21]

Creating synergies with the power sector

It is important to recognize the relevance of the power generation sector, whose activity will more than double from 24,000 TWh in 2014 to 50,000 TWh in 2060. Decarbonizing the power sector is key to help decarbonize commercial and industrial sectors, which account for over half of the world's final electricity demand. Major uses include the electricity needed in manufacturing, mining, agriculture and construction; the operation of industrial motors and machinery; and servicing heating and cooling, lighting, ventilation and air conditioning systems for their operations. With the on-going electrification of sectors such as transport, absolute demand in the commercial and Industrial sectors will grow from 13 500 TWh in 2016 to 22 000 TWh by 2050. In order to stay in a 2-degree decarbonization

[18] IEA's World Energy Investment

[19] Smart Freight Centre. GLEC Framework

[20] WBCSD LCPTi. https://lctpi.wbcsd.org/portfolio-item/low-carbon-freight/

[21] WBCSD. "Road Freight Lab" https://lctpi.wbcsd.org/wp-content/uploads/2016/11/Road-Freight-Lab-GHG-reduction-report.pdf

pathway, energy demand must shift away from energy sources with higher carbon content (e.g. fuel switching). Additional solutions include adopting a systems integration approach that can optimize the synergies between energy supply and demand from end-users.[22]

Fortunately, as more private companies, from various sectors and geographic areas, increase their sourcing of renewable electricity (through both procurement and self-generation), they have the potential to drive investment in renewable energy capacity thus creating a positive feedback loop and accelerating a global energy transformation.

Companies wanting to engage in procurement of renewable electricity can consider the following recommendations:[23]

- Adopt a target and renewable energy sourcing strategy deliberating on ambition and types of claims.
- Consider renewable energy sourcing options that carry a higher level of additionality.
- Report transparently on renewable electricity consumption claims.
- Drive corporate procurement innovation and global change management across private and public sectors.

5. The circular economy

A circular economy can achieve large improvements in environmental performance by redesigning systems and business models to simultaneously reduce upstream and downstream emissions. Prevailing linear processes consume resources and generate waste ('take → make → use → dispose'). By closing the loop and recirculating materials, companies extend product lifespans and reduce material demand and waste. There are three main principles of the circular economy: preserve and enhance natural capital; optimize resource yields by circulating products, components and materials; and foster system effectiveness to minimize negative externalities.[24]

According to *The Circular Economy: A Powerful Force for Climate Mitigation*, a more circular economy is essential in meeting the Paris Agreement's long-term goal of net zero emissions. Zero-carbon energy alone is insufficient. Emissions associated with the embodied energy of new materials and their processing must also be substantially reduced. Industry currently accounts for approximately 40% of global emissions and demand is expected to increase two to four-fold by 2100. Most of the emissions reduction potential lies on the demand side, calling for innovative methods to reuse/recycle existing materials that have already been produced. The report estimates that a circular economy could reduce up to 3.6 billion tCO2 in heavy industry per year globally. Actions are classified under materials recirculation, product materials efficiency, and circular business models. [25] Or, more simply put -- reduce, reuse, recycle.

Product materials efficiency

As a first step, companies should consider where to reduce material inputs. This includes using more efficient materials as well as designing products that require less material. This eliminates any lifecycle emissions associated with the material. Examples include high-strength steel in construction, design and logistics systems that minimize material needed for packaging and creating smaller cars that are more suitable for fewer passengers which are expected to be in higher demand as shared ride services become more popular.

[22] IEA ETP 2017

[23] IRENA. Corporate Sourcing of Renewables: Market and Industry Trends

[24] Ellen MacArthur Foundation: https://www.ellenmacarthurfoundation.org/

[25] Material Economics: The Circular Economy

Circular business models

Companies can shift their business profile by offering services instead of products. Data-driven improvements can also reduce unnecessary maintenance and improve infrastructure and planning in a circular economy. Additionally, product life spans should be extended. This may increase the lifecycle emissions of each product. In these cases, companies may express their achievements through intensity measures (emissions/use of product). Examples include shared flat services, short-term urban car rentals, and reusable (as opposed to disposable) coffee pods.

Materials recirculation

Shifting from primary to secondary materials in production cuts waste. This is contingent upon designing products so components can be disassembled and sorted for recycling. To be ready for recycling the material would ideally maintain its quality, be free of contaminants, and be easily sorted and collected. Materials not fit to be recycled can be repurposed. Examples include creating footwear soles from used tires and converting organic waste from a biogas plant into fertilizer.

Considering the product or service's lifecycle is essential. Progress in one area may compromise another and so tradeoffs should be carefully evaluated. For example, slimmer electronic devices may use adhesives in places of screws. While related product material efficiency may increase, this may encourage replacement rather than repair (shortening the product life span) and make material recirculation more challenging by creating a potentially more toxic material and a phone whose parts more difficult to separate for recycling. There are companies (e.g. Fairphone) that have found innovative solutions to these challenges.

Companies should look beyond their own boundaries as well. The European Union is providing resources that stimulate its shift toward a circular economy and has a published an Action Plan at the EU level. The European Commission provides a guidance packages to support this transition as well as a monitoring framework to measure progress. Partnerships combine resources and coordinate efforts of multiple actors to achieve common goals. The Platform for Accelerating the Circular Economy helps its partners scale change by developing financing models, enabling policy frameworks to address barriers, and provide a platform to bring the private and public sectors together.

All of the best practices in this paper illustrate innovations that redefine how people think of the value chain by creating new connections, finding better and more efficient purposes for waste materials by linking material flows of different sectors, and closing the loop to create a burgeoning circular economy.

Case study in progress: applying circular economy principles

6. Future work

By addressing GHG emissions across the entire value chain, companies have the opportunity to establish themselves as climate leaders, positioning themselves at the forefront of the transition to a low-carbon economy and multiplying the effects of their sustainability commitments. The best practices described in this compendium can help companies improve both their emissions accounting and engagement with customers and suppliers. In applying these practices, companies will face substantial challenges, as well as opportunities to leverage emerging technologies and develop solutions that are good for business and the environment.

Fourth wave technologies

"Fourth Wave" technologies such as data analytics, smart sensors, and blockchain will help companies manage their scope 3 impacts by offering powerful insight into complex, global value chains. These technologies are playing

an increasingly important role in business innovation, and business executives agree that implementing new technologies will not only improve their companies' environmental footprints, but also their bottom lines.[26] A key step in unlocking the potential of emerging technologies is to identify areas where business and environmental goals align. For example, the use of smart sensors in manufacturing and transportation can improve efficiency and provide greater supplier transparency, while also enabling companies to produce more accurate scope 3 emissions inventories and track progress toward goals.

With hardware spending on the "Internet of Things" (IoT) expected to reach almost $3 trillion for business applications alone in 2020, companies that utilize digital infrastructure to monitor external services will have the opportunity to connect with suppliers to track production activity and transportation in almost real time.[27] Smart sensors will facilitate the collection and sharing of various streams of data, enabling multinational corporations to engage with suppliers and assess their progress toward meeting scope 3 targets. Similarly, IoT technology and Artificial Intelligence can be incorporated into end products that adapt to usage patterns and automatically schedule tasks to optimize energy efficiency. Data analytics will translate these into actionable insights for reporting corporations, suppliers, and consumers alike. To provide the greatest degree of transparency, operational data should conform to a "Single Source of Truth" (SSOT) model, where possible. Blockchain is one example of an SSOT technology because each transaction is securely validated with a digital "signature" and all parties access information from the same, immutable database.

Online sharing platforms are an increasingly important way that companies can drive cooperative action, facilitating collaboration and communication between purchasing companies and suppliers, as well as the sharing of best practices amongst both suppliers and consumers. Companies have the opportunity to implement transparent data analytics into these platforms, increasing trust between parties and enabling participants to reduce their own emissions more easily. These benefits are not limited to a corporation and its tier one suppliers: sharing platforms can be used to link suppliers, operators, and consumers up and down the value chain, empowering a vast network of actors by providing greater transparency and highlighting shared values. The tech startup Provenance, which uses blockchain to log primary data at every step in the supply chain to be shared with consumers,[28] is just one example of how fourth wave technologies may enable companies to improve not only their environmental impact, but also their service offerings and reputation.

Investments

Institutional investors, as well as companies involved with production and distribution, can drive economic growth and climate action by implementing the same practices outlined in this report. These strategies build upon established responsible investment principles by not only filtering out companies with poor environmental performance, but by also incentivizing portfolio companies to enact proactive business measures that mitigate risk and generate opportunities. Facing increased pressure to address climate risks from global organizations such as the Financial Stability Board's Task Force on Climate-related Financial Disclosures (TCFD) and civil society,[29] institutional investors are encouraged to enact scope 3 best practices for their own value chains and to use their influence to encourage companies to set science-based targets.

[26] EDF: Business and the fourth wave of Environmentalism

[27] WEF: Impact of the Fourth Industrial Revolution on Supply Chains

[28] Provenance: https://www.provenance.org/how-it-works

[29] TCFD: "Recommendations of the Task Force on Climate-related Financial Disclosures"

7. Conclusion

For many companies, acting to reduce climate impacts throughout the entire value chain is the most important step that can be taken to fight climate change. Corporations can position themselves as agents of change by aligning their own goals with those of civil society and act as a critical link between consumers and suppliers. Moreover, by considering the strategies described in this compendium from a holistic perspective, corporations will unlock innovation opportunities and resilient business practices with a wide range of benefits. Investors, too, can take greater responsibility for the environmental impacts of their financial practices and to improve their economic profile during the transition to a green economy.

It is becoming standard practice for companies to measure and manage value chain emissions, and the advantages of doing so are clear: nearly two-thirds of business executives from companies that are setting science-based targets say that setting SBTs has already driven innovation and over half of executives say that their science-based targets have boosted investor confidence.[30] Over 500 companies have committed to setting targets through the Science Based Targets initiative, and of the 133 targets that have been approved at the time of writing, ~90% address value chain emissions. As more and more companies join the new wave of action, it will become easier to engage with suppliers and to achieve circular economic goals.

Each company will have a different journey to achieve their scope 3 aspirations, but they will all begin with a commitment to act and an analysis of value chain emissions, trends, and hotspots. Where data availability may pose a challenge, companies are encouraged to utilize estimation models and publicly available tools to perform scope 3 screenings and to compare the results with sector averages of scope 3 breakdowns. With this knowledge, companies will be better equipped to integrate value chain considerations into their high-level planning. There is a wide-range of options available for companies to address their upstream and downstream emissions and to move toward circular economic business models. Companies should consider their relative engagement capabilities, as well as the relative magnitude of emissions associated with different upstream and downstream sources, to decide on a set of approaches.

Companies are faced with an immense amount of potential to drive progress in the global effort to fight climate change and achieve the goals of the Paris Agreement. Recent initiatives that have been implemented at subnational, national, sectoral, and global levels demonstrate the commitment that companies have already taken to address their own emissions, but there is still a long way to go. Because they often fall outside a company's direct control, scope 3 emissions present both challenges that must be addressed and opportunities to develop collaborative solutions. As the common link between upstream and downstream sources, and facing increased demand to take climate action seriously, companies can act in their own best interest and for the betterment of the world by addressing emissions up and down the value chain to the greatest extent possible.

[30] Science Based Targets initiative: "Six Business Benefits of Setting a Science Based Target"