Photo by Amaya De La Hoz
Kearney, Madrid

How chemical companies can reduce scope 3 emissions now

KEARNEY

With 75 percent of their greenhouse gas emissions coming from external sources, chemical companies should reform their approach to purchased goods and services.

Corporate boards around the world are taking action on sustainability and decarbonization. But they rarely focus on scope 3 greenhouse gas emissions. They grasp the need to address scope 1 (emissions caused by the company itself) and scope 2 (indirect emissions from purchased electricity, heating and cooling, and so on). But they incorrectly view scope 3 (indirect emissions upstream and downstream of company's operations) as a more distant, less urgent problem.

In fact, scope 3 requires immediate analysis and action. In the chemicals industry, at least 75 percent of emissions come from scope 3. Thus, to reduce carbon emissions, chemical companies need to address purchased materials that account for almost half of scope 3 emissions. And make no mistake, the demand to reduce carbon will come—from customers, regulators, and investors—sooner than most people expect.

If you are in the chemicals industry, you will face challenges in this new area. You will need to find and measure good data, increase visibility, and engage a wide array of stakeholders in deeper relationships. The good news: there is a clear, logical path to overcome these challenges. As in many other business initiatives, you gather data, set priorities, identify feasible options, and implement your plan. This paper discusses how.

In the chemicals industry, at least 75 percent of emissions come from scope 3.

Why start reducing carbon emissions now?

Emissions disclosure rules are becoming more strict. They now focus on emissions that the company's operations are directly causing (scope 1 and 2). But they will soon shift to examine total emissions (including scope 3).

For example, the Science Based Targets initiative is slated to finalize its scope 3 target-setting methods and criteria by the end of 2022. It will offer specifics for decarbonization in the chemicals industry and various subsectors by early 2023. The US Securities and Exchange Commission (SEC) has also proposed that companies publish their scope 3 emissions as part of their financial reporting process.

Management teams' success will be measured by their ability to set and meet emissions reduction targets. And total emissions means that chemical companies will have to look for targets up and down the value chain.

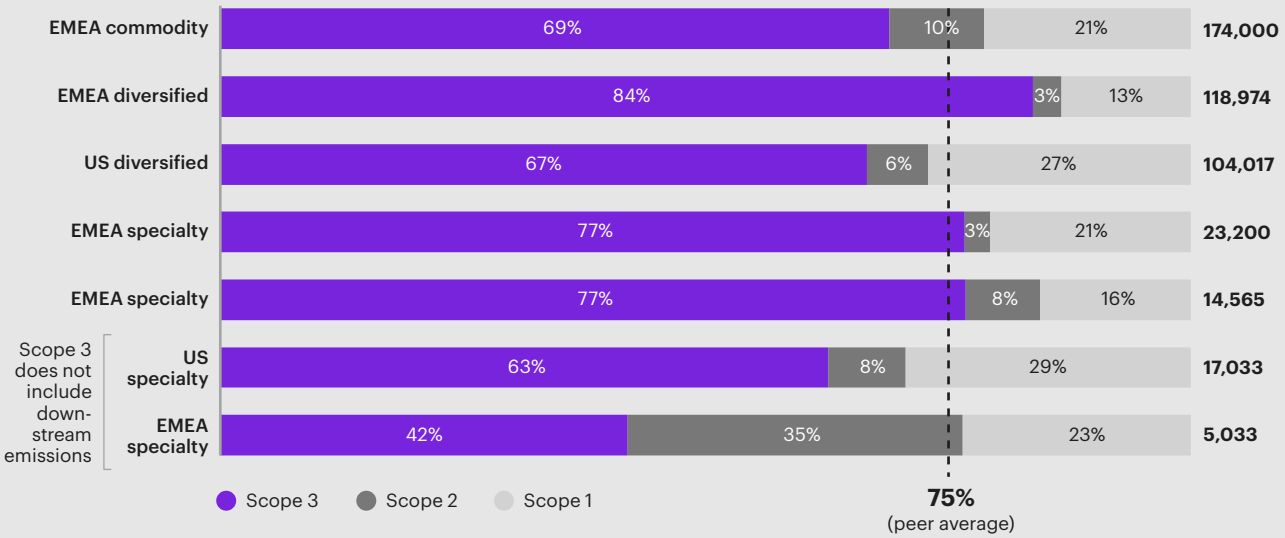
Individual situations can vary. But across specialty and diversified chemical producers, in both Europe and the United States, a sizable majority of chemical company emissions are scope 3 (see figure 1).

Chemical companies have not yet faced much pressure to decarbonize. That's because they're positioned higher up the value chain from end consumers. For example, if you make a tiny plastic endpiece for an iPhone cord, you don't face the same pressure that Apple does to be sustainable. Yet.

But this is why regulators are focusing on scope 3 emissions. Companies need to pass that pressure up the value chain. Your customers, shareholders, and board will soon demand plans for emissions reduction.

Figure 1
Scope 3 emissions represent most chemicals industry emissions

Scope 1, 2, and 3 emissions proportions for sample companies (2020 reporting year[1])
(Total emissions, metric tons of CO_2e, thousands)



[1] Due to data availability, for two companies, we used the 2019 reporting year, and for one company, 2021.
Notes: CO_2e is carbon dioxide equivalent. EMEA is Europe, Middle East, and Africa.
Sources: Bloomberg and company corporate sustainability reports; Kearney analysis

Upstream emission reduction—and risks

In some industries, downstream emissions dominate scope 3. In the classic example, gasoline doesn't emit much carbon until after an oil company has sold it to a consumer. In the chemical industry, only 20 to 50 percent of emissions are downstream, resulting from consumer use or disposal. Rather, the majority of emissions—50 to 80 percent—are upstream (see figure 2).

Indeed, about half of all chemical industry scope 3 emissions come from purchased goods and services. For example, if you make plastics, a supplier's emissions to produce your propylene count as scope 3 emissions.

About half of all chemical industry scope 3 emissions come from purchased goods and services.

Figure 2

Scope 3 emissions come primarily from upstream purchased goods and services

Scope 3 category emissions of major chemical companies
(% of scope 3 reported)

Lower GHG emissions → Higher GHG emissions

	Scope 3 categories	US specialty	EU specialty	APAC diversified	US diversified	EU diversified	EU specialty	US diversified	EU specialty
Upstream	1. Purchased goods and services	>45%	>45%	>45%	Not reported	15–30%	>45%	>45%	>45%
	2. Capital goods	<15%	<15%	<15%	Not reported	<15%	<15%	Not reported	<15%
	3. Fuel and energy-related activities	<15%	Not reported	<15%	<15%	<15%	Not reported	Not reported	Not reported
	4. Upstream transportation and distribution	Not reported	<15%	<15%	Not reported	<15%	<15%	Not reported	<15%
	5. Waste from operations	Not reported	<15%	<15%	Not reported	<15%	<15%	Not reported	Not reported
	6. Business travel	<15%	<15%	<15%	<15%	<15%	<15%	Not reported	Not reported
	7. Employee commuting	<15%	<15%	<15%	Not reported	<15%	<15%	Not reported	Not reported
Downstream	8. Upstream leased assets	Not reported	<15%	<15%	Not reported	<15%	<15%	Not reported	Not reported
	9. Downstream transportation and distribution	Not reported	Not reported	<15%	Not reported	<15%	Not reported	Not reported	Not reported
	10. Processing of sold products	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported
	11. Use of sold products	Not reported	Not reported	<15%	Not reported	15–30%	Not reported	<15%	15–30%
	12. End of life treatment of sold products	Not reported	15–30%	15–30%	Not reported	<15%	Not reported	<15%	<15%
	13. Downstream leased assets	Not reported	Not reported	Not reported	<15%	<15%	Not reported	Not reported	Not reported
	14. Franchises	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported
	15. Investments	Not reported	Not reported	Not reported	Not reported	<15%	Not reported	<15%	Not reported

Sources: Company sustainability reports; Kearney analysis

You could wait for that supplier to decarbonize. (After all, to that company, these are scope 1 emissions.) But this assumes that your supplier shares your ambition level for emissions reduction. This assumption is all but certain to be incorrect, and can result in supply risks:

— **The existing supply could be phased out.** Carbon pricing or other environmental policies may shut down manufacturing of emissions-intensive materials. This risk increases for materials that can be made from different feedstocks (for example, olefins can be made from coal, naphtha, or natural gas). The highest-emitting source will be eliminated first. At that point, will you have sufficient qualified sources?

— **The market could be undersupplied.** An emissions reduction program will happen, regardless of companies' timeline choices. When it does, will there be sufficient supply of low-emission alternatives? If not, will that put your finished goods portfolio at risk? For example, in the methanol market at the end of 2023, about 1 percent of supply is expected to come from a low-carbon alternative (with another 2.1 percent of capacity additions planned further in the future). If you are a major consumer of methanol, do you need to secure some of this supply now?

As you respond to these supply risks, you face a non-negligible first-mover risk. The faster you move to decarbonize supply, the less time you give suppliers to achieve economies of scale in production. Decarbonizing is the correct course of action, but it involves a delicate balancing act. To best achieve that balance, you need to learn a lot about decarbonization pathways. This knowledge will help you see opportunities to achieve ambitious emissions reductions efficiently.

In short, supply bases for any given material will shift. You may not need to be a first mover, but you must be ready to act as a fast follower.

Opportunities and challenges for procurement in the chemical industry

The concentration of scope 3 emissions in purchased materials creates an opportunity. A chemical company can drive emissions reduction efforts using procurement teams in collaboration with business and technical teams. Depending on your organizational dynamics, the procurement function may not take the lead in this effort. The leaders may instead be profit-and-loss owners, supply chain managers, operational executives, and sustainability teams. But if you demand action, proven procurement tools should be able to help fulfill your goals.

Chemical companies will face many challenges in reducing scope 3 emissions. Some of these challenges resemble those faced in other types of procurement. For example:

— Visibility along decarbonization pathways plays a vital role in addressing scope 3. Some materials have well-defined options, but other materials' reduction pathways are opaque. Some pathways are mature enough to be ready immediately, while others are still at lab scale (see figure 3 on page 5). For example, to decarbonize ammonia production, you could switch feedstocks or pursue carbon capture, utilization, and sequestration (CCUS). But zero-emission ammonia feedstocks are still at lab scale, while CCUS is a more mature technology. For each priority category, you can look at the emission reduction potential and execution time frame of the decarbonization pathways. If you have limited visibility into viable decarbonization pathways, you may want to model the impacts of different scenarios. That will help you navigate the risks of moving either too fast or too slow.

Figure 3

Different materials present different decarbonization pathways, with different time frames

Non-exhaustive

- Lab scale
- Pilot plant
- Small-scale commercial
- Full-scale commercial

	Material	Estimated global emisssions (MT CO_2e)	Decarbonization pathways	Techno-logical maturity
C1	**Ammonia**	700	FS switching	◔
			CCUS	●
	Methanol	600	FS switching	◔
			CCUS	●
C2	**Ethylene**	180	FS switching	◑
			E-cracking	◔
			CCUS	●
C3	**Propylene**	320	FS switching	◕
			E-cracking	◔
			CCUS	●
			PTX	◔
Aromatic	**Benzene**	210	FS switching	◑
			E-cracking	◔
			CCUS	●
Other	**Chloralkali**	275	Power supply switching	●
			CCUS	●

→ See figure 4

Notes: FS is feedstock. CCUS is carbon capture, utilization, sequestration. PTx is power to "X" (in other words, power to olefins). MT CO_2e is mega-tonnes of carbon dioxide equivalent. C1 chain is chemistry of one-carbon molecules. C2 chain is chemistry of two-carbon molecules (for example, ethylene and its derivatives). C3 chain is chemistry of three-carbon molecules (for example, propylene and its derivatives).

Source: Kearney analysis

— Good data is the key to setting and achieving emissions reduction goals. Unfortunately, good data can be hard to find. Thus, some companies rely on materially inaccurate global average emission factors. But the materials matter. For example, when propylene is made from coal as the feedstock, Kearney estimates that average global emissions are 12 kilograms of carbon dioxide equivalent (CO_2e) per kilogram. That's 2.5 times higher than when the propylene is made from naphtha, and 6.5 times higher than when it's made from methanol (see figure 4 on page 6). With data like that in figure 4, you can make smart decisions to balance cost and emissions. But you need the proper granularity in emissions data. Suppliers may not want to provide this data, because they fear losing sales to same-cost, lower-emission competitors. To overcome the data gap, your buying teams can turn to specialty data services. Their emissions databases give you the granularity you need to build your baseline. You can even customize these databases to show plant-specific emissions rates by manufacturer.

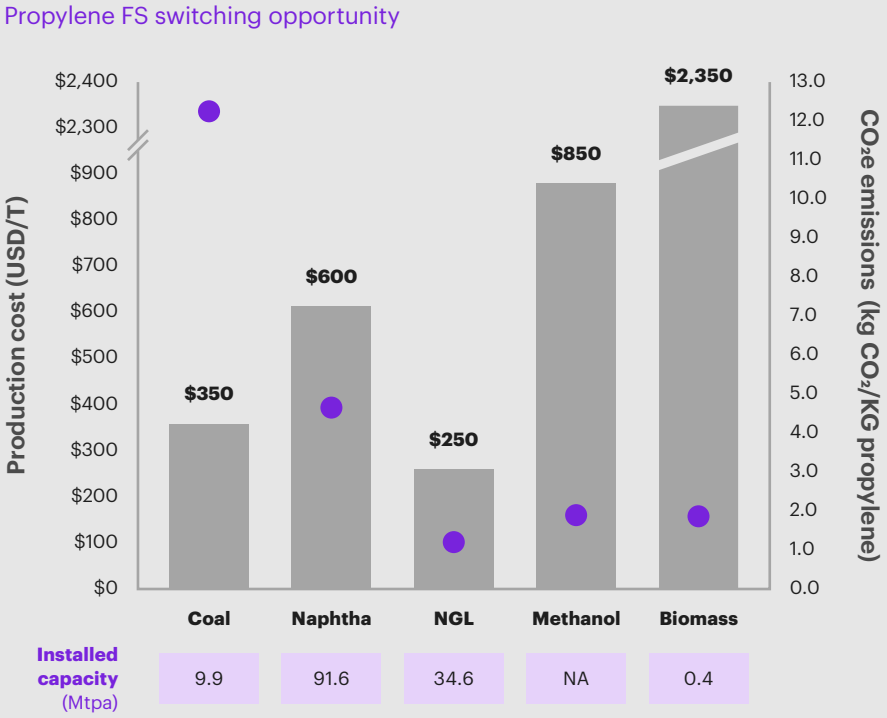
— Engaging stakeholders is a particular challenge for scope 3 reductions. A wider universe of stakeholders includes academic researchers and nongovernmental organizations (NGOs). They create new opportunities to use external knowledge that may lead to new ways of lowering emissions. But these opportunities require new ways of partnering. They may also involve a focus on collaboration ahead of coercive techniques.

— Adapting to fast-changing conditions is never easy when you lack control. Famously, scope 3 gives you responsibility for supplier activities that are outside your control. But there's another unpredictable variable as well: the rate of technological change. If you commit to being a first mover, you're willing to invest in production technology while it is still relatively high on the cost curve. But if your company has a slower-moving culture, overcoming cost concerns will be a significant undertaking.

Figure 4

Propylene presents opportunities to cut emissions and costs by switching feedstocks

Non-exhaustive



Notes: FS is feedstock; NGL is natural gas liquids; Mtpa is metric tons per annum. Production costs are global averages and are the current estimates as of May 2022, according to Kearney's India Research Center.

Source: Kearney analysis

In markets with fast-changing technologies, you can't let innovation paralyze you into inaction. Instead, you can pragmatically evaluate the state of the market now and in the near future. Then reach commercial agreements to lock in emissions reductions now while still being able to realize cost savings as technology improves.

In scope 3 reduction, obtaining results will take longer than a quarter, or even a budget cycle. Your supplier relationships will need to evolve. As you work with partners to invest in new technologies or processes, you may ultimately develop whole new ways of operating. Given the complexity of these undertakings, you need to plan for sufficient time to see the outcomes flow through the operations. Such benefits may not arrive immediately, but they will last longer. You can use the transformation to build supply resilience.

Finally, scope 3 emissions reductions pose joint questions of what to measure, and what to report. At most companies, measurement and reporting procedures are less robust for scope 3 than for scopes 1 and 2. Furthermore, universal standards do not yet exist. Different organizations have created different ways of reporting emissions, and different emissions measurements for product substitutes. Nevertheless, some reporting is always good. You should select a method of measurement and reporting, and then remain consistent to that method over time.

The decarbonization journey requires consistent progress, not grand steps

The first step in reducing emissions is to know your baseline scope 3 emissions and sources. That's why it's valuable to recognize that chemical companies' scope 3 emissions come mostly from raw materials—you can narrow down this process. Compiling information from various data sources and mapping it across the company's spend, you can compare the carbon intensity of each material. This baselining exercise should show materials' emissions by category and supplier.

This information helps your buyers make decisions. They can choose how best to support near-term scope 3 reductions while also prioritizing the largest long-term reduction opportunities. That's why it's important to apply a standardized approach to emissions measurement. That way your leaders can be confident that they are setting realistic goals. Furthermore, when those goals can be clearly measured, teams will understand the mechanisms by which reductions will be achieved.

Once the baseline has been established, you can set priorities. You should focus your efforts on areas where you can influence your suppliers—whether that influence is collaborative or coercive. To choose who and how to engage, first consider the size and type of relationship. If you are a major purchaser of a material, or if you have established collaborative relationships with a supplier, you can use specific levers to create mutual benefits. By contrast, if you're a minor purchaser, or have a newly established relationship, your options will likely skew toward material substitutions.

Then you determine technical and commercial feasibility. You compile lists of alternative supply methods for priority direct materials categories, similar to that in figure 3. Some categories have more viable emissions reduction options than others. For example, current investments in bio-methanol could soon create carbon-negative methanol supply options. By contrast, propylene requires vast amounts of energy for cracking; commercial-scale alternative methods such as electric crackers are still at least a few years out. The interplay between the priority and the availability of alternatives will guide your goal setting.

Reducing scope 3 carbon emissions can have far-reaching benefits

Addressing scope 3 emissions is a complex problem. It will require involving a cross-section of internal and external stakeholders and finding new ways of collaborating to move toward a purposeful set of decarbonization initiatives. In taking on the challenge, individual chemical companies can lower their own emissions and help set the overall industry on an improved path to sustainability.

It's important to apply a rigorous approach to emissions estimation and measurement.

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