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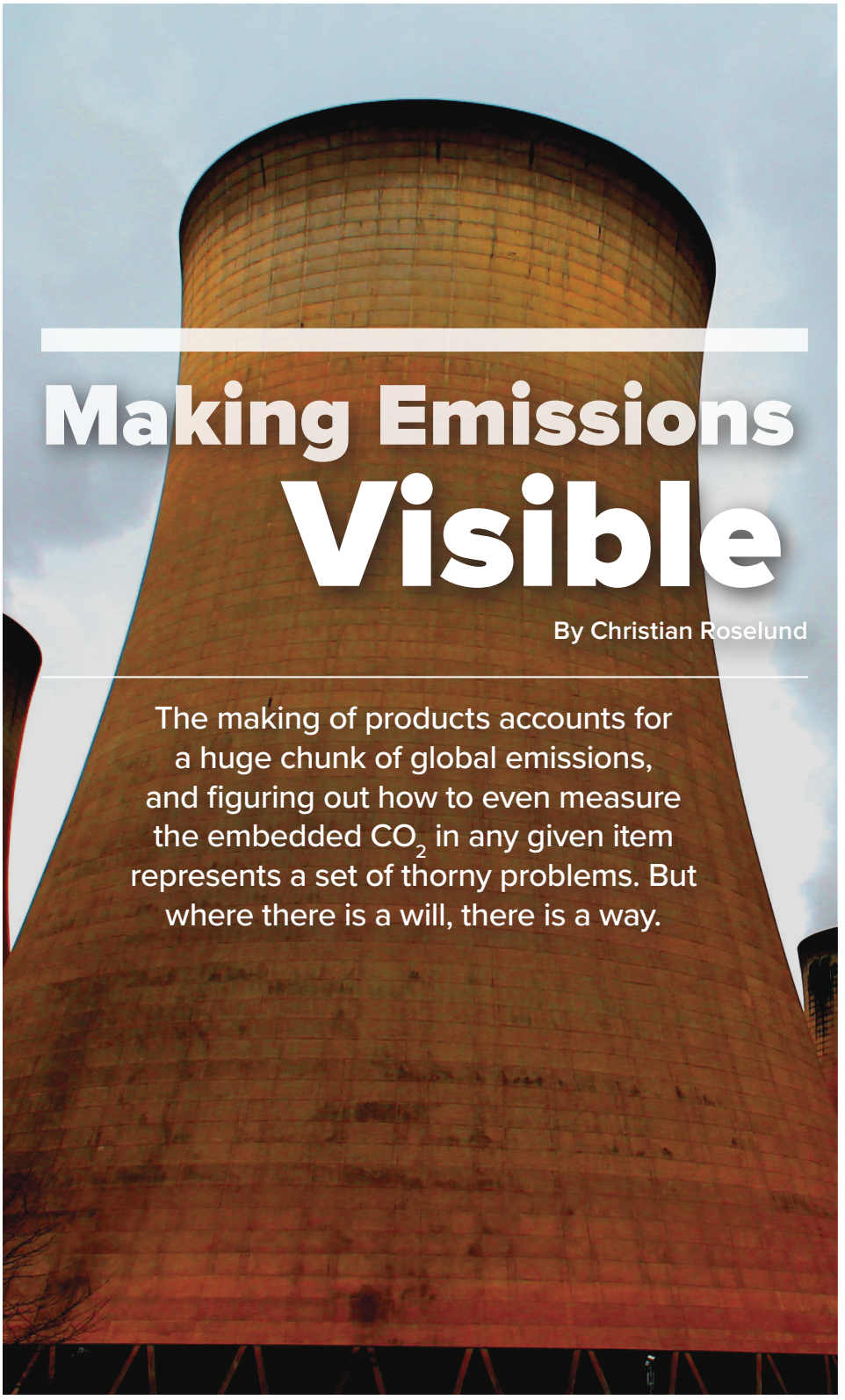


Making Emissions Visible

By Christian Roselund

The making of products accounts for a huge chunk of global emissions, and figuring out how to even measure the embedded CO_2 in any given item represents a set of thorny problems. But where there is a will, there is a way.

Last November, German Economist Hans Werner Sinn published an article in The Guardian that claimed that electric vehicles (EVs) cause more CO_2 to be emitted than gasoline-powered vehicles. In the article, Sinn alleged that so much carbon is emitted during the manufacture of EVs, and particularly their batteries, that combined with relatively dirty grid power this overcomes the advantages of not burning petroleum-based fuel.

A wide range of academics, analysts, and other experts immediately came forward to thoroughly debunk Sinn's claim. They brought with them numerous reports (including some from Rocky Mountain Institute) that showed very different results, with the implication that Sinn was using highly questionable assumptions in his inputs.

But as is the case with the best industry propaganda, this one started off with a grain of truth. Even the studies which were used to correct Sinn's claim themselves found substantial emissions from EVs, before they even roll off the lot—just not enough to make them worse than internal combustion engines. Not only is the manufacture of automobiles energy intensive, but their components—including steel, aluminum and glass—involve substantial emissions on their own.

And this problem is not limited to EVs. When you add up resource extraction, manufacturing, and the transportation emissions to bring products to market, the manufacture of goods makes up as much as 40 percent of total global emissions.

And as companies attempt to decarbonize their operations to meet climate goals, they often find that greening their supply chains is more complicated than it seems. One of the central challenges is getting accurate data on emissions.

Direct Emissions

The 21st century has seen a major shift in the way that corporations relate to their consumers and investors. No longer content to merely sell goods, attract funding, and sell stock, corporations are now trying to develop deeper and better relationships with their customers and investors, which has led many to the new field of environmental and social governance (ESG).

As part of this, an increasing number of corporations have set goals to reduce greenhouse gas emissions, with RE100 listing 221 global companies that have set commitments to become 100 percent powered by renewable energy. Over the last decade this has been led by the large technology companies, with Apple and Google among the first to set 100 percent renewable energy targets, and Google the first company of its size to achieve full decarbonization of its electricity supply.

These renewable energy commitments have become so popular that for the past several years voluntary corporate purchases have been one of the largest drivers of the US solar market.

And in addition to the electricity that they buy, a number of other companies are taking steps to reduce the greenhouse gas emissions from their direct activities. These sorts of commitments come in all shapes and sizes, from the use of LEED or net-zero facilities to switching fleets to more efficient and/or electric vehicles. Like renewable energy purchases, the scale of these efforts has been increasing over time, and Amazon's announcement last September that it would buy 100,000 electric delivery vans from start-up Rivian set a new bar.

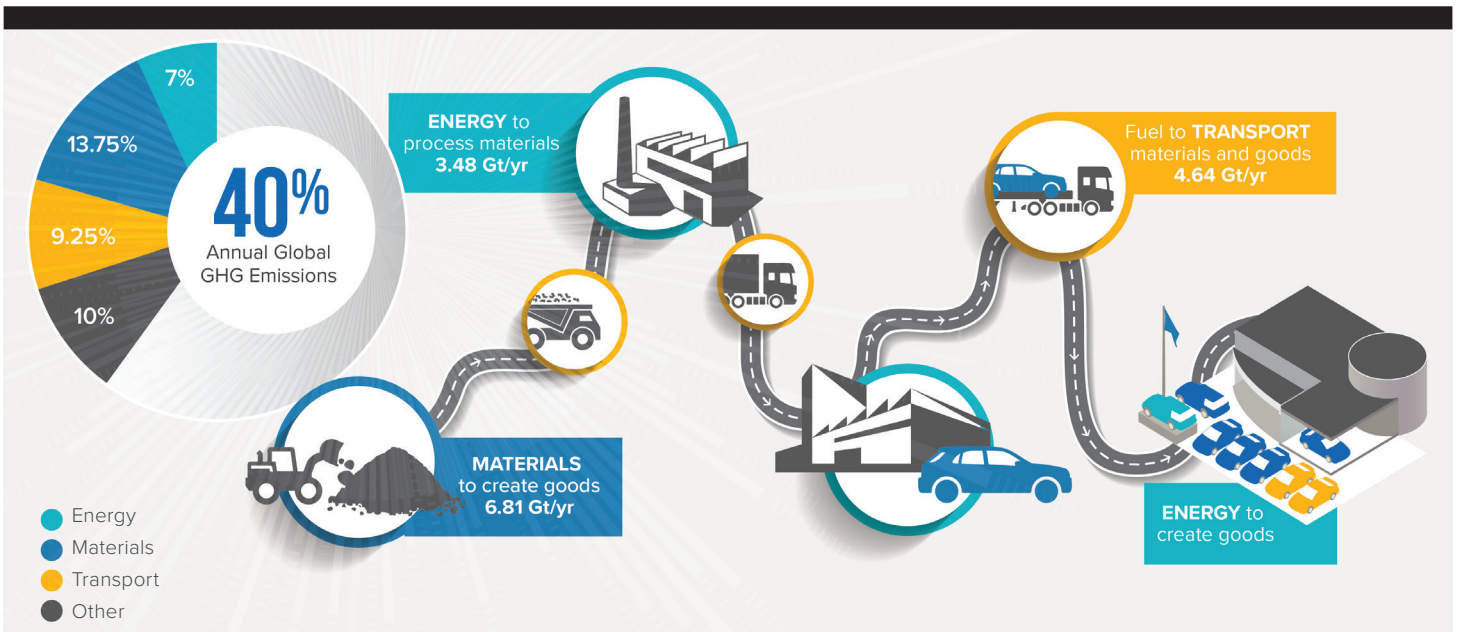
Down the Rabbit Hole

However, these moves do not capture all of the greenhouse gases associated with these businesses. A wide variety of products—from cars to computers to furniture, even to a can of coke or a LEED Platinum Building—also involve emissions from their manufacture, from the materials that supply them, and from their use and final disposal.

The various actors working in carbon accounting have for some time recognized the need to account for these other emissions, with World Resources Institute and the World Business Council for Sustainable Development establishing the Greenhouse Gas (GHG) Protocol as a tool to measure and manage emissions. This is one of several efforts in this space, including the CDP (Carbon Disclosure Project, formed in 2002), and The Financial Stability Board's Task Force on Climate-related Financial Disclosures (TCFD), formed in 2016.

In the parlance established by GHG Protocol, direct emissions are Scope 1 emissions and purchased electricity falls under Scope 2. These other emissions—whether from the components that go into products or their use and disposal—are labeled Scope 3. In 2011, GHG Protocol wrote a standard for measuring Scope 3 emissions, including boundaries around what does and does not qualify, steps to collect data and allocate emissions, and guidelines to set targets for reduction.

A major portion of this is supply chain emissions, which means accounting for the goods, components, and materials



that a company purchases, to be manufactured and/or sold to consumers. "For many companies, supply chain emissions can make up 90 percent of their corporate carbon footprint," states Suzanne Greene, a researcher with the Massachusetts Institute of Technology (MIT) Sustainable Supply Chain Initiative. "The climate impacts are very significant."

And the task is not simple. For many companies, such as automobile and electronics manufacturers, this can mean hundreds or thousands of individual components—many of which have gone through several steps of processing, with materials traveling around the world. Furthering these complexities is the inherent challenges of a changing system. "It isn't a static system," explains Greene. "The suppliers are always changing. And with that, the carbon footprint is always changing."

Emissions from the Ground Up

If you pursue these supply chains to their end, they can often be traced back to ores, sands, and other mineral products including fuels. And this is where Paolo Natali has spent much of his career.

Natali is the leader of Rocky Mountain Institute's Materials Initiative, and for more than four years he worked on Sunshine for Mines, a program to reduce carbon emissions in the mining industry. He says that while that work resulted in meaningful adoption of renewable energy, there were also inherent limits.

"There were not enough incentives in companies to take decarbonization as seriously as alignment to Paris Agreement-level climate goals would require," recalls Natali. This led him to look into the systems of accounting for emissions, and he also found limitations in existing carbon assessment approaches. One problem identified by Natali is the practice of utilizing industry

average numbers for embedded emissions in various products, instead of trying to determine actual emissions.

"The GHG Protocol doesn't go into the specifics of how you account for emissions in an aluminum smelter," explains Natali. He says that this lack of specific assessments is leading different companies to use different approaches and different metrics, making apples-to-apples comparisons across companies impossible.

These sorts of challenges have led RMI to lead the formation of the Coalition on Materials Emissions Transparency (COMET), an effort which includes The Colorado School of Mines, the Columbia Center on Sustainable Investment, and the MIT Sustainable Supply Chain Initiative. COMET aims to create a standard methodology for deeper measurement of emissions in materials, with the aim of making emissions reporting reliable and comparable across commodities and along supply chains.

COMET's initial focus is on minerals, with iron, steel, aluminum, and copper some of the first commodities to be explored.

The Whole Life Cycle

However, a product's emissions do not only involve what goes into it. There is an entire, separate problem of what happens to products that are sold and used in the wider world. And this is not only a concern for automakers, but also for others including appliance and electronics retailers.

Daniel Katzenberger came through the glass doors of Best Buy right out of graduate school in March of 2018 through an EDF Climate Corp Fellowship. He found an organization that had already taken a lot of steps to address its greenhouse gas emissions, including setting its first carbon goal in 2010, and later increasing its ambition to reduce emissions 60 percent by 2020 and to become carbon neutral by 2050.

And while Best Buy is on track to meet these goals, they only include Scope 1 and Scope 2 emissions. The company brought on Katzenberger to take on the Scope 3 emissions, a process that revealed that the large majority of the emissions associated with Best Buy's operations happened after products that they sold left the store.

"That one category—use of sold products—was approximately 30 times larger than our Scope 1 and Scope 2 emissions combined," notes Katzenberger. And working under the methodology of Science Based Targets Intiative (SBTI), he then did a deep dive on calculating those emissions.

This involved a number of nuances. "We figured out that if we sell a refrigerator in Ohio, it is going to have higher emissions than a refrigerator sold in California," explains Katzenberger. And in the end, it meant that one of the most important strategies for Best Buy to reduce emissions was to shift product lines to feature a higher portion of energy-efficient models.

However, Katzenberger also stresses that the current state of accounting for emissions is somewhat speculative. "When you are doing Scope 3 calculations, you have to give up some precision," he notes. "You collect the best data you can, when you can collect it."

He also notes that the uncertainty in the emissions from some products are lower than from others. In addition to his work at Best Buy, Katzenberger also lectured on Scope 3 emissions at the university level. One of his students has launched a business advising companies on Scope 3 emissions, with customers including a large beverage manufacturer.

In this case, the company is refrigerating its products for up to eight months from production to final consumption, and any refrigeration system inevitably involves some level of leakage of highly potent greenhouse gases. Katzenberger notes that compared to electricity use, refrigerants are much more complicated. "That one calculation of the refrigerant impact through the supply chain could take weeks for that company."

It's not clear if any of these refrigerators are from Best Buy, which brings up another wrinkle in emissions accounting: one company's Scope 3 emissions are inevitably the Scope 1 and 2 emissions from another company—which may or may not be calculating them.

Investors and Consumers

If corporations are taking emissions more seriously, it is in large part because those funding them are demanding this. As such there is an overlap between the work that nonprofits are doing around improving emissions tracking and the emerging field of climate-aligned finance, which attempts to align investment decisions with what is needed to put the world on a pathway to limiting warning to 1.5°C.

But investors are not the only party pushing product makers to reduce their emissions. Consumers can also be a powerful voice, and here carbon accounting is falling behind social concerns. While one can easily find a "fair trade" certification for products imported from the developing world, carbon is another matter. "There is no label that shows what the carbon footprint of an item is," notes MIT's Suzanne Greene.

Greene posits that consumers—including businesses on the buying side—can play an important role in helping to create demand for better assessments of embedded emissions. "People need to ask for the numbers, and then we will very quickly see change," she declares.

Ultimately such pressure from consumers and investors could help advance new industrial processes. Many of the materials like steel, glass, and chemicals that are in the products that we use every day have huge carbon footprints, much of which goes into the high-temperature process heat that is required. There are alternatives including "green" hydrogen for supplying this heat—and in the case of steel, for replacing coke as a reduction agent—but these are more expensive.

As such, RMI's Materials Initiative has stressed that accurate assessments could be greatly helpful for the development of these technologies, by providing a way for makers of "green steel" and other decarbonized products to charge a premium for their environmental attributes. "If there was a full visibility of climate attributes such as carbon footprint along supply chains, buyers would be able to demand materials that are built with less CO_2, and investors would be better able to fund technologies that align decarbonization pathways," explains Natali. He also notes that you can't value what you can't measure.

Natali's colleague in RMI's Materials Initiative, Charles Cannon, notes that rigor is essential in this process, particularly for funders. "You can't set up a differentiated financial market without the appropriate amount of scrutiny," he states.

COMET Launches

RMI and partners will officially launch COMET at the World Economic Forum in Davos this January, and Natali says that he expects incremental growth, particularly in the mining sector. He also notes that COMET's work is not meant to replace any of the existing methodologies, such as those advanced through GHG Protocol, SBTI, or CDP. Instead, he says that they are meant to be an additional layer to add to the work that has already been done. "We need to give the GHG Protocol an applicability to specific supply chains," notes Natali.

Governments also have a role to play, and one motivating factor is the potential for additional regulations, particularly in the European Union. "Companies are realizing that if a tax goes on embodied carbon, like what is being discussed in Europe, or if a carbon tax comes along, they need to be able to figure it out," says Suzanne Greene of MIT.

Ultimately, for RMI's Paolo Natali this is part of the much larger work of giving a clearer picture of emissions globally. "We need to solve the riddle and provide a common language," he declares.