Commodity Markets Begin to Price Carbon Risk

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The science of climate change argues that there is a limit to how much additional carbon dioxide that can be pumped into the atmosphere, known as the carbon budget. Go over this limit and it's likely that the negative impacts from climate change may accelerate, with each additional threshold leading to non-linear impacts.

In response to this threat, signatories to the 2015 Paris Agreement have backed a long-term target of limiting global average temperatures to "well below 2°C", requiring emissions to reach net zero by 2050.

The tragedy of the commons means that no single emitter is incentivized to cut their emissions. In the absence of a reason for markets to self-correct, the sensible solution is to price carbon emissions. A carbon price sends a signal to consumers about which goods and services are carbon-intensive; it signals to producers of products and services which inputs and activities they should switch towards to reduce their carbon costs; and it signals to innovators and entrepreneurs that demand for low carbon alternatives are likely to rise.

There are two ways in which governments can introduce a price on carbon: via a carbon tax, or by way of an emissions trading scheme (ETS). A carbon tax involves the government setting a price on the carbon emissions associated with the production and consumption of goods and services, raising the price relative to less carbon intensive alternatives. However, the government cannot be sure that the tax is set sufficiently high enough to be sure of cutting emissions. In contrast, an ETS typically involves the government or another institution imposing a cap on emissions. This is achieved through the issue of allowances denominated in tonnes of carbon. The emissions cap is typically reduced by a fixed percentage each year to move those covered by the scheme towards a long-term target of emissions cuts.

Almost one-quarter of global emissions are covered by some form of carbon pricing; 17% is covered via an ETS (often known as compliance markets, or cap-and-trade schemes) with some 6%-8% of greenhouse gas emissions covered through a carbon tax. Many countries, especially those in Europe combine both carbon taxes and cap-and-trade schemes, covering different sections of the economy (ICAP, 2023).

Although the price of carbon emission allowances in Europe (the oldest and most established ETS) have reached €80-€100 per tonne (equivalent to US$85-US$110), the price of allowances in other jurisdictions covered by an ETS tend to be substantially lower. Overall, the global ETS market-weighted average carbon price in 2021 was just US$28 per tonne. Outside of those countries with a tax or an ETS, the other three-quarters of global GHG emissions are effectively starting from zero cost of carbon. On a global basis this means the price of carbon is low, less than US$5 per tonne. Global carbon prices need to be well north of US$75 per tonne if the world is to decarbonize in the timescales set out by the 2015 Paris Agreement.

Capital markets have of course been taking things into their own hands, anticipating what climate policies are likely to mean, even in the absence of global transparency and coordination on carbon pricing. For example, the spread in the cost of capital between hydrocarbon and renewables widened by ten percentage points between 2015 and 2020, according to Goldman Sachs. The investment bank estimates that this is equivalent to a global carbon tax of US$80 per tonne CO2e (Goldman Sachs Research, 2021).

Nevertheless, the scope of global GHG emissions covered by carbon pricing is expected to grow substantially over the next decade. In a recent interview with S&P Global Commodity Insights, the president of the International Emissions Trading Association (IETA) estimated that 60%-70% of emissions are likely to be covered by an ETS by 2030. The price of carbon in other ETS's is also likely to increase as countries adopt aggressive emission reduction targets like Europe and look to avoid being subject to carbon border taxes on their carbon intensive exports (S&P Global, 2023).[2]

In the following, I discuss how carbon pricing is beginning to be felt across various commodities, including (a) the drive to cut emissions from the Canadian oil sands, (b) the growing demand for electric vehicles and the need to mine more nickel, (c) the role that agriculture can play in increasing the sequestration of carbon from the atmosphere, and (d) the impact carbon risk will have on the movement of commodities around the globe.

Underpinning all these examples is the growing need from other parts of the industrial supply chain for information on the provenance of commodities. The environmental performance of fossil fuel producers, metal miners and farmers are likely to become a key differentiator, with strong leadership on emissions reduction also likely to be rewarded by institutions allocating capital to the sectors. Across the various commodity industries discussed below, I also demonstrate how firms are responding to the price incentives, *i.e.*, investing in decarbonization and implementing more efficient practices.

Decarbonizing the Canadian Oil Sands

Canadian oil sands are far more emissions intensive to produce (*i.e.*, Scope 1 emissions) than most other fossil fuels. In 2020 the average emissions intensity of Canadian heavy oil projects was estimated to be ~70 kgs CO2e per barrel, compared with 15-50 kgs CO2e per barrel for most other crudes.

Canada is targeting a cut in its carbon emissions of at least 40% by 2030, before achieving net zero emissions by 2050. To do that the Canadian government is calling for the country's oil and gas sector (both upstream and downstream) to cut emissions by 42% (85 Mt CO2e), by 2030 compared with 2019 levels. Oil sands production will be required to share in that burden, cutting emissions by 34% (28 Mt CO2e) by 2030.

The Canadian government already has a national carbon tax. In November 2020, the Canadian Prime Minister announced that the carbon tax will increase by C$15 per tonne each year, rising from C$50 per tonne in 2022 (equivalent to US$37 per tonne) to C$170 (US$125) per tonne in 2030. The national carbon tax allows the governments of Canada's provinces and territories to set their own carbon taxation if it meets the minimum federal standard. The Canadian government is consulting on options to increase the

pressure on the fossil fuel sector through carbon pricing - either taking the form of an additional carbon tax imposed on the industry, or an industry cap-and-trade scheme.

Either way, the pressure on Canadian fossil fuel producers to cut emissions is only just getting started.

Today, crude price differentials typically reflect the value that the refiner expects to achieve from processing various grades of crude oil. The density of the crude, the sulphur content, its acidity, the cost of transportation and refining all influence the price that a refiner is willing to pay for a particular crude.

Under a carbon constrained world, high carbon intensity crudes will be at a big disadvantage compared with lower carbon intensity crudes. Crudes with relatively high carbon intensities could see their price discounts widen even further if they do not reduce their emissions intensity significantly.

For upstream oil producers in Canada, the introduction of carbon pricing should accelerate action to decarbonize their upstream operations. The top producers may be able to close the gap, or even overtake, their low carbon global competitors. Given the pressure that companies are under from governments, investors, and consumers, those producers that can demonstrate their low carbon credentials are likely to be rewarded by the market.

"Green" Nickel

Demand for commodities essential to the green energy transition are expected to rise fourfold by 2040 if we are to reach the goals of the Paris Agreement, *i.e.*, climate stabilization at "well below a 2°C global temperature rise." To achieve net-zero globally by 2050, six times more commodity inputs will be required by clean energy technology in 2040, according to the International Energy Agency (IEA).[3]

However, the average growth in commodity demand does a disservice to the growth requirements of certain niche metals essential to the energy transition. For example, demand for nickel, cobalt and graphite are all projected to grow 20-25 times under the IEA's Sustainable Development Scenario (SDS) by 2040. Despite delivering an overwhelmingly positive environmental outcome in the growth of electric vehicles, nickel cannot escape its own carbon footprint being scrutinized by manufacturers of power cells, automobile manufacturers and investors. Indeed, buyers are increasingly willing to pay a premium to ensure that the material has been secured sustainably.

Indonesia is in pole position to supply battery grade nickel to power the electrical vehicle (EV) transition. However, it has a carbon problem. Firstly, Indonesia's nickel reserves are primarily in the form of abundant laterite ore. Compared to the increasingly scarce sulphide ore found in Canada, Russia and Australia, laterite ore requires significantly more processing. That would be less of a problem if Indonesia's grid was powered by solar and wind, but instead thermal coal accounts for over half of Indonesia's electricity supply, and that means the power used by nickel miners and refiners is very carbon intensive. Overall, processing results in between 20 and 60 tonnes of CO2e per tonne of nickel, 2-6-times more than sulphide ore processing depending on the process used (IEA, 2022).

In February 2023, the Indonesia government launched the first phase of their emissions trading scheme covering coal powered electricity generators. At first only the largest coal facilities (those with a capacity of at least 100MW) will be covered by the scheme, before being rolled out to smaller coal and other fossil fuel power plants later. The energy ministry's own analysis indicates that the price of allowances is expected to be in the range of US$2-US$18 per tonne, much lower than that necessary to incentivize a switch away from thermal coal. Even if the ETS is successful in decarbonizing much of the nation's grid by 2030, it is still likely to be more carbon intensive than other nickel suppliers (*Reuters*, 2023).

Carbon Farming

Although governments and industry recognize that everything must be done to reduce emissions first, it is very unlikely that we will meet net zero without carbon removal. And so, carbon markets are not only putting a price on emissions, but they are also increasingly incentivizing the sequestration of carbon from the atmosphere too, via the carbon credit market. Carbon credits are a way for governments, corporations and even individuals to direct finance to where it can make the most difference to the climate.

Rewarding the sequestration of carbon into the soil via the carbon credit markets is becoming an increasingly attractive option. Soil carbon storage plays a vital role in regulating the amount of carbon dioxide that gets into the atmosphere. In addition, it improves soil fertility which enhances agricultural yields; it improves water storage and the supply of clean water; and finally, it also helps to maintain and enhance biodiversity.

Carbon sequestration practices include planting seeds without disturbing soil, spreading nutrient-rich compost over fields, and rotating where cattle graze. The role of soil carbon sequestration in cutting carbon emissions is gaining traction in the United States and in Australia in particular. In part this is due to supportive policies, but it is also due to the existence of large farm sizes in both countries, enabling carbon sequestration techniques to benefit from economies of scale.

For many parts of the world, however, carbon markets are being used to protect vast stores of carbon sequestered in tropical rainforests. Commodities are the primary driver of tropical deforestation, and typically involve the permanent conversion of forests to graze cattle, or to grow oilseeds such as soy and palm oil. When forests are cut down, vast quantities of carbon are released, while the carbon sequestration potential is lost. Halting deforestation is critical to meeting the 2050 net zero targets. Indeed, there is no pathway to limit global warming to 1.5°C without immediate action to halt deforestation (ETC, 2023).

Carbon credits go some way to offset the opportunity cost of deforestation faced by local landowners and other agents as they consider whether the forest is worth more to them alive, or more if they strip it bare and use it for agriculture. So called "Reducing Emissions from Deforestation and forest Degradation" (REDD+) credits help to finance activities that focus on the sustainable management and conservation of at-risk mature forests. Although they have typically been purchased by corporates in the past, governments with significant tropical forests on their land (*e.g.*, Guyana, Gabon) are increasingly looking

to issue sovereign REDD+ credits that protect their land from deforestation. A viable carbon credit market helps companies sourcing commodities from regions at risk of deforestation avoid their products being tainted by the perception that they have contributed to the destruction of the rainforest.

What Price Decarbonized Shipping?

Responsible for sending around 3% of global greenhouse gases into the atmosphere, the shipping sector emits more than the aviation industry, and about the same as the Japanese economy. Maritime emissions are forecast to increase over the next few decades as global trade in energy, commodities and goods continues to grow.

Given the shipping sector's major role in facilitating the global trade in commodities, climate related policies including carbon pricing are likely to have a major impact on commodity markets. First, by affecting the cost of moving resources around the globe, and secondly, by opening trade routes as new commodities seen vital to the energy transition (such as hydrogen produced using renewable energy, so-called "green hydrogen") are increasingly shipped to across the world.[4]

The International Marine Organization (IMO) sets regulations for the international shipping industry. IMO 2030 is designed to sharply reduce the shipping industry's carbon intensity and aim at forcing older, less-efficient ships off the market. However, beginning in 2024, the shipping sector will be subject to carbon pricing for the first time. Ships travelling within the EU (intra-EU voyages) will be required to pay for all their emissions, while for voyages to or from a non-EU destination, half of the emissions will be covered. Overall, some 10-15% of international shipping emissions are likely to be affected (Thomas, 2023).

The most straightforward way for ship owners to cut carbon emissions is to slow-steam - *i.e.*, deliberately sail at a reduced speed to cut fuel costs. Reducing the speed at which ships travel by 10% could reduce fuel usage by almost one-third. This will impact the availability of vessels in the region and lead to higher freight rates as charterers bid for the dwindling supply of vessels. Of course, there is a limit to how slow vessels can reduce their speed and continue to provide a reliable service.

In the longer term, ship owners must invest in decarbonizing their fleet. However, there is considerable uncertainty over what technological solution to pursue. For example, it is unclear whether hydrogen, ammonia or another candidate will provide the best low carbon option at an affordable cost. This could result in ship owners delaying placing orders, which might lead to a tightening in the supply of ships.

Pricing Carbon Risk

The rise of carbon markets and the increased cost of compliance is forcing commodity markets to respond. The carbon risk facing commodity markets is acute, including (a) the emissions associated with the extraction, refining and combustion of fossil fuels, (b) the energy required to dig and process ore into metal, and (c) the risk of deforestation and high emissions associated with carbon intensive agriculture.

In addition to the increased regulatory burden, companies are having to face up to much greater scrutiny as to the provenance and the emissions associated with their products.

But as this article also demonstrates, the commodity industry is not sitting idly by. Industry has a rich capacity to innovate in the face of these new and emerging pressures. Indeed, carbon markets and increased pressure from stakeholders has sparked a wave of innovation and new practices.

There is much more to be done, but commodity markets are now beginning to put a price on carbon risk.

Endnotes

All views expressed in *CID* articles are those of individual authors.

1 The *Carbon Risk* newsletter is available at https://carbonrisk.substack.com/.

2 The world's first levy on the importation of carbon intensive products is scheduled to be introduced in Europe. The levy, otherwise known as the Carbon Border Adjustment Mechanism (CBAM), seeks to address the problem of "carbon leakage." This is whereby firms located in the EU might lose market share to more carbon intensive products exported into the EU by firms located elsewhere in the world. Other jurisdictions including the United States, United Kingdom and Australia have discussed introducing similar carbon border taxes.

3 The IEA's Sustainable Development Scenario (SDS) is consistent with the goal of meeting the Paris Agreement, *i.e.*, climate stabilisation at "well below a 2°C global temperature rise."

4 Approximately one-third of the overall dry bulk trade (iron ore, coal, grains, and minor bulks such as fertilizer) and around 60% of the world's oil and products are transported by ship.

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Before launching *Carbon Risk* in November 2021, Peter Sainsbury was the Chief Economist for WRAP, a global environmental non-governmental organization (NGO). He is the author of four books including *Commodities: 50 Things You Really Need to Know* and has a B.Sc. in Economics with Honors from City, University of London, U.K.

Carbon Risk's mission is to help investors navigate "the currency of decarbonization."