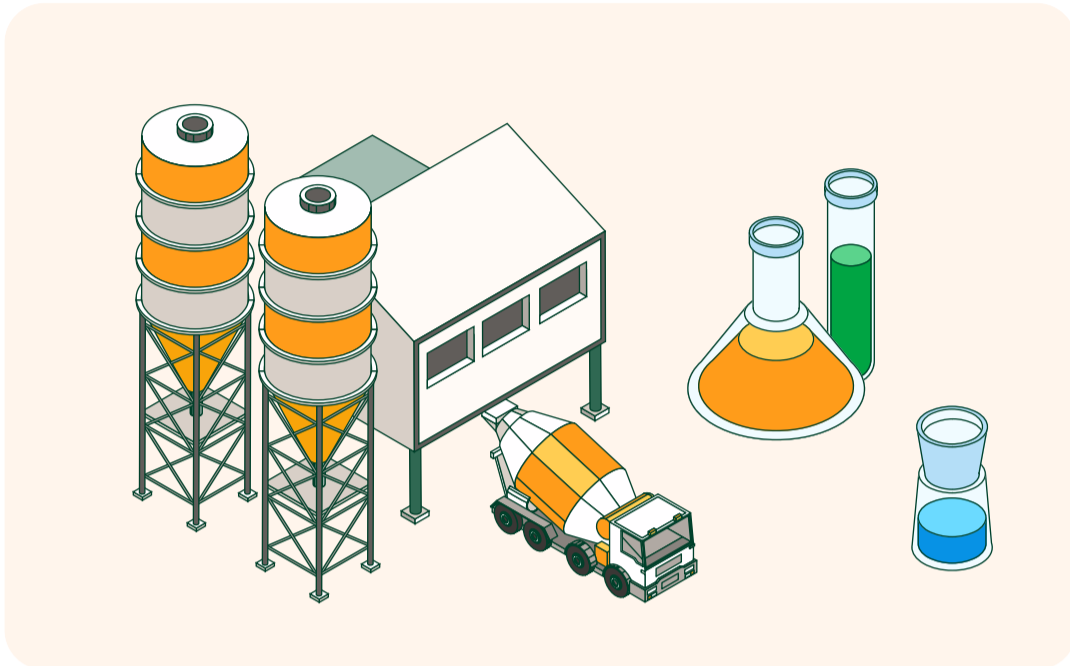


# Which sectors are hard to decarbonise?

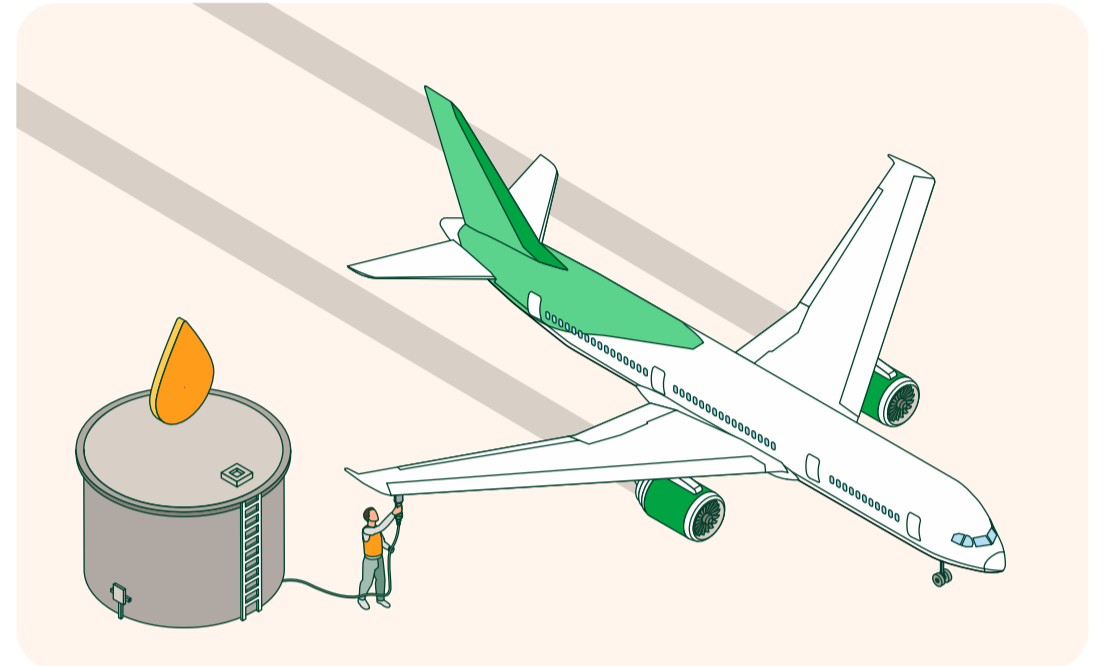
The hard-to-abate or hard-to-decarbonise sectors represent a major challenge for emission reductions due to their high dependence on fossil fuels and the complexity of their industrial processes. In heavy-duty transport, vehicles emit a quarter of the entire transport sector's CO<sub>2</sub>; in heavy industry, the production of steel, cement and chemicals requires high temperatures that generate emissions. What's more, sectors such as aviation and shipping, which are critical to the global economy, present difficulties for the transition to cleaner energy alternatives due to the energy density required.

## 1 Heavy industry



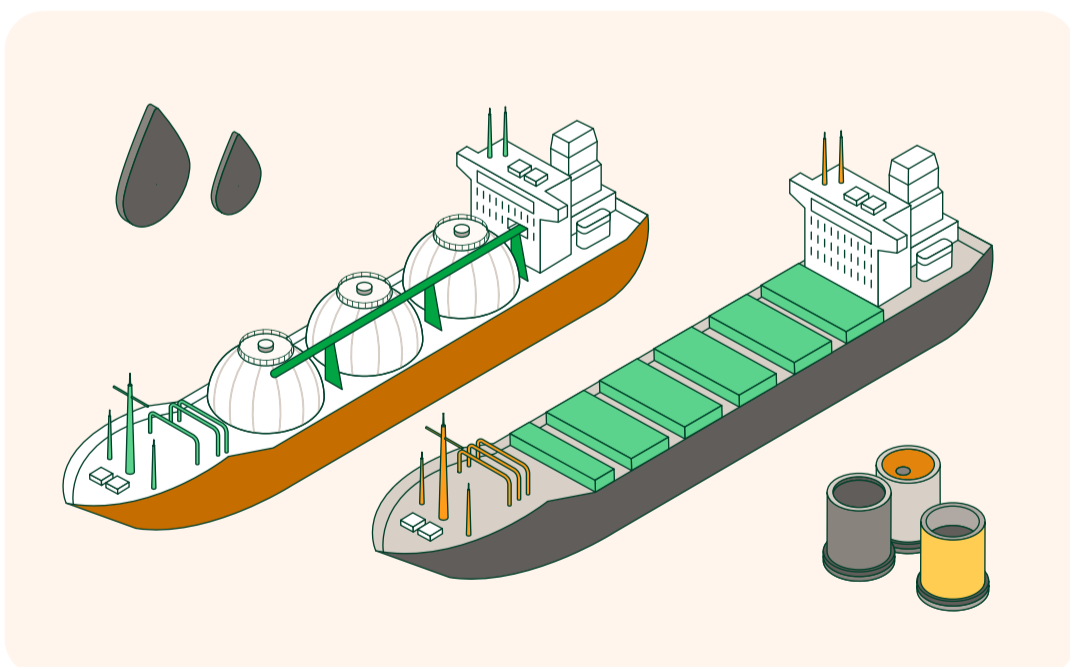
In this sector, the production of steel, cement and chemicals produces hard-to-abate emissions, both from the energy that is required to produce the high temperatures needed for these processes, as well as the chemical reactions involved. Clinker, for example, is one of the main ingredients in cement. It is produced by heating limestone to extremely high temperatures, an action that releases the carbon in the stone. This element then combines with oxygen in the atmosphere, forming the greenhouse gas carbon dioxide (CO<sub>2</sub>).

## 2 Aviation



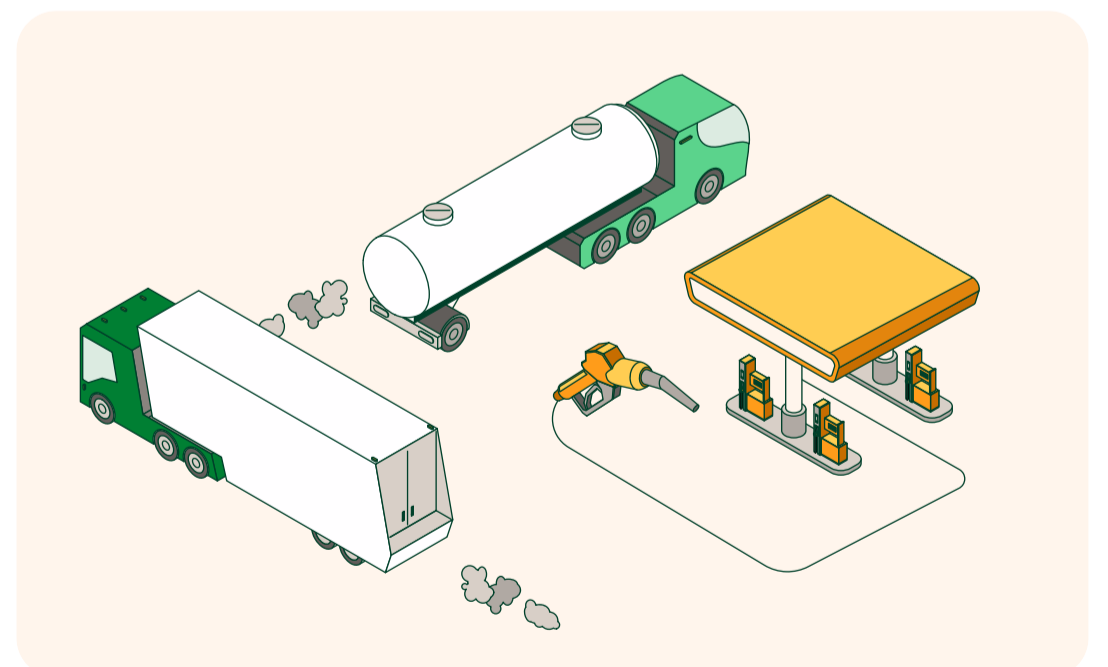
Passenger planes and cargo aircraft require highly energy-dense fossil fuels, such as kerosene. According to Irena, the global aviation sector accounted for 10% of the world's transport-related energy consumption in 2022, and 3% of total global energy consumption. As a result, the sector is a major contributor to CO<sub>2</sub> emissions, equivalent to 2 to 3% of global emissions and 10% of all transport-related emissions, according to Irena. The formation of contrails – vapour trails composed of water in the form of ice crystals – from plane engines also contributes to global warming, as they trap radiation from the Earth and reflect solar radiation.

## 3 Shipping



The shipping sector is currently very dependent on low-grade fossil fuels such as heavy fuel oil (HFO) and marine diesel oil, but is actually among one of the least carbon-intensive modes of transport. That said, the sector is still a major emitter of greenhouse gases given its sheer scale. Shipping accounts for 3% of total global energy consumption, and 10% of all transport-related energy consumption, according to Irena.

## 4 Heavy-duty trucking



Vehicles used for transporting goods emit almost a quarter of all the carbon dioxide emissions from the transport sector, outstripping the international aviation and shipping industries combined. Heavy-duty trucks use almost exclusively energy-rich fossil fuels such as diesel, petrol and natural gas.