

Good health and fortune

What are the health and environmental consequences of the coming shift in bunker demand? S&P Global environmental data and risk analysis firm Trucost assesses the impact.



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The latest IMO regulation is designed to reduce sulfur emissions by lowering the sulfur emissions cap to 0.5%. To comply, vessels can either install exhaust gas treatment systems – or scrubbers – or switch to using alternative lower sulfur fuels. There are a number of challenges linked to the availability and cost of scrubbers, as well as a high spread in fuel prices and engine modifications required to adapt them for alternative fuels like LNG.

Trucost has assessed the impact of this regulation on human health and climate change based on the projected mix of the most likely solutions to be implemented in 2020. The bunker fuel mix included high sulfur fuel oil used with and without scrubbers, existing low sulfur fuel oil, new fuel blends, marine gasoil and LNG.

Human health impact

Bunker oil is generally a low quality, low-grade fuel, which is considered highly toxic and harmful. The shipping

industry is one of the highest contributors to global air pollution, and sulfur emitted during bunker fuel combustion is particularly damaging to human health. Effects of sulfur dioxide start immediately after inhalation, causing coughing, wheezing, shortness of breath, and can result in long-term respiratory diseases like asthma. Recent studies by the World Health Organisation and a number of research institutions are highlighting a correlation in long-term exposure to sulfur (over 24 hours) and cause-specific mortality rates.

The shift towards lower sulfur solutions is directed at reducing adverse effects of HSFO combustion by either capturing the end of pipe emissions or using lower sulfur content fuels. The resulting decrease in sulfur emissions can be assessed in absolute terms, by measuring the emissions trend over time. However, it is also useful to understand the impact this decrease in sulfur emissions may have on human health in monetary terms. Monetary

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valuations can help quantify the external cost savings of air emission reductions by considering the increased productivity and better health outcomes of the population.

Trucost has evaluated the external cost of air pollution caused by three pollutants: sulfur dioxide, nitrogen oxide (NOx) and particulate matter (PM). It is worth noting that, while lower sulfur fuels reduce the amounts of PM, only the use of LNG as an alternative fuel leads to a significant reduction of NOx emissions. Both NOx and PM cause respiratory diseases and thus their contribution should not be taken out of the equation.

The current external cost of bunker fuel emissions has been estimated to be \$128.54 billion per year. Between now and 2020, we expect to see this number decrease by 27%, mainly due to the reduction of HSFO use on vessels with no scrubbers from 64% of total fuel use last year to 4% in 2020. For comparison, the external cost of sulfur emissions is expected to reduce from \$21.43 billion last year to \$3.68 billion in 2020, driven by a larger proportion of lower sulfur blends in use.

Climate change impact

According to the International Council on Clean Transportation, the global shipping sector is responsible for approximately 3% of global greenhouse gas (GHG) emissions, emitting one billion tons of GHG emissions per year on average. In comparable terms, this is slightly higher than the annual emissions of Germany.

One of the key climate change impacts of the shipping sector is its contribution to global warming as

a result of GHG emissions from fuel combustion. The current mix of bunker fuels is largely fossil fuel based, with only 2% of LNG, and thus is highly carbon intensive. While the shift from HSFO over the period 2020 to 2035 will decrease the sulfur levels, it appears that there will only be a marginal decrease in GHG emissions based on fuel mix projections.

Trucost has quantified the net benefit of changing the current bunker fuel mix towards low-sulfur options. GHG emissions from the current fuel mix have been taken as the baseline, and this has been compared to the forecasted fuel demand to identify the trend.

The results can be best presented by comparing a “typical ton” of fuel over time, where a “typical ton” represents the global bunker fuel mix for each of the years assessed. Following the anticipated increase in



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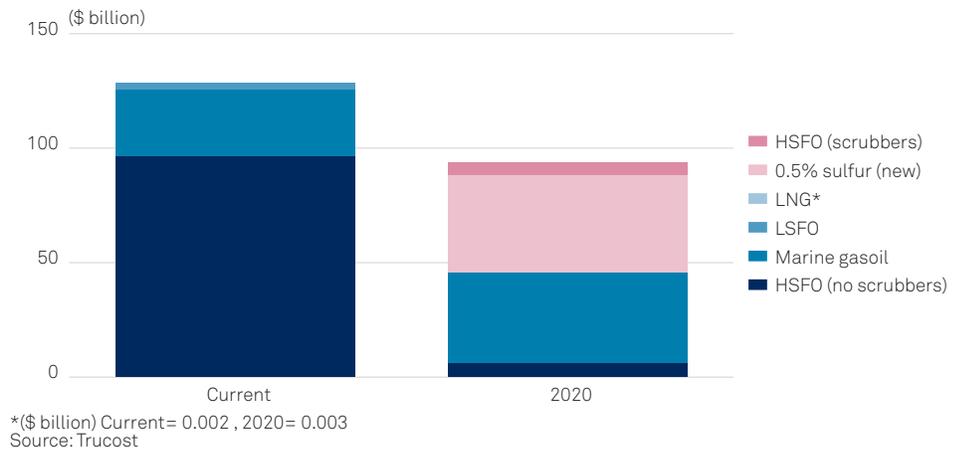
scrubber installation demand, and switching to lower sulfur fuels, Trucost estimates that GHG emissions per ton of fuel would decrease by 13.2% – from 3.23 tons of CO₂-equivalents in 2018 to 2.80 tons of CO₂-equivalents in 2023.

However, as the fuel demand is expected to increase annually by approximately 2.5%, the absolute level of GHG emissions is going to increase as well. By 2035, 90% of fuel would remain fossil fuel based, with a third of this amount being HSFO used on vessels with scrubbers. While the scrubbers help minimize sulfur and PM emissions, their installation does not reduce GHG emissions, and sometimes may even lead to GHG emissions increasing by 1.5-2%.

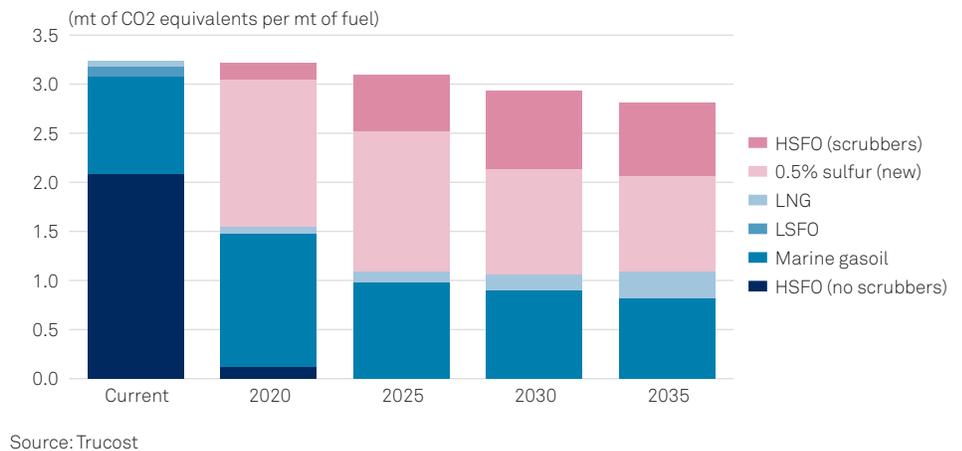
This means that the industry will need to identify solutions to reduce GHG emissions. One option would be increasing the energy efficiency of the vessels' equipment and engines. The IMO's Energy Efficiency Design Index specifies the minimum energy efficiency requirements per capacity mile depending on the vessel type and size. Another option is exploring alternative fuels that are sulfur free and more environmentally friendly, such as algae fuel, methanol, HDRD, and pyrolysis oil.

With regulation on GHG emissions and environmental impacts intensifying globally, it is important that companies and their investors consider environmental and social benefits alongside the traditional financial returns on their investments. This will help companies and investors capitalize on low-carbon opportunities and help direct capital to those business models that are well positioned for the transition to a low carbon economy.

HUMAN HEALTH IMPACT



GHG INTENSITY OF A 'TYPICAL TON'



GLOBAL GHG EMISSIONS

