

EFFICIENT OCEAN SHIPPING

Shipping is responsible for 3% of global GHG emissions.¹ If the shipping industry was a country, it would be the sixth biggest emitter of GHG emissions in the world.² At any given moment, more than 50,000 merchant ships are crossing the oceans, emitting 1.1 billion tons of CO₂e annually.³ Fuel efficient ship design and practices that reduce ships' operating speeds can reduce fuel use by 50%.⁴ Experts are also researching green hydrogen, electricity, and liquified natural gas (LNG) as alternative fuels for shipping.

Green hydrogen, produced by electrolysis using renewable electricity, has no lifecycle GHG emissions and can be produced around the world. Hydrogen ferries and small ships have already been piloted in the U.S. and Europe, and some experts say that existing ships can be retrofitted to run on hydrogen in place of existing fuels.⁵ However, there are several hurdles that need to be overcome, including the development of safe methods of storing and transporting cryogenic hydrogen so that explosions do not occur⁶ and the fact that hydrogen's low energy density means it will take up more room on board vessels.⁷

For short-haul vessels, electrification appears to be a viable option. Many ships are already equipped with diesel-electric transmission systems that use diesel to generate electricity that powers the ships' propellers. These systems save 5-20% on fuel, but they still have substantial GHG emissions.⁸ Hybrid-drive ships have batteries on board in addition to an internal combustion engine that can be switched on when additional power is needed. In hybrid systems, batteries can be recharged by excess power generated by the diesel generator, allowing these ships to travel long distances without needing to stop at port for a recharge.⁹

Fully battery-powered electrical ship engines are already in place in inland waters, but they face challenges for ocean-going transport due to the amount of time needed to recharge batteries and the amount of space that batteries take up relative to their travel range. A startup called

¹ Project Drawdown. Efficient ocean shipping. <https://drawdown.org/solutions/efficient-ocean-shipping>

² Josephs, Jonathan (April 21, 2021). "Climate change: Shipping industry calls for new global carbon tax." *BBC*. <https://www.bbc.com/news/business-56835352>

³ Ship It Zero. <https://shipitzero.org>

⁴ Project Drawdown. Efficient ocean shipping. <https://drawdown.org/solutions/efficient-ocean-shipping>

⁵ O'Neil, Will (April 13, 2021). "Hydrogen: The key to decarbonizing the global shipping industry?" *Center for Strategic and International Studies*. <https://www.csis.org/analysis/hydrogen-key-decarbonizing-global-shipping-industry>

⁶ Frithiof, Nathaniel (July 15, 2021). "Five lessons to learn on hydrogen as ship fuel." *DNV*. <https://www.dnv.com/expert-story/maritime-impact/Five-lessons-to-learn-on-hydrogen-as-ship-fuel.html>

⁷ O'Neil, Will (April 13, 2021). "Hydrogen: The key to decarbonizing the global shipping industry?" *Center for Strategic and International Studies*. <https://www.csis.org/analysis/hydrogen-key-decarbonizing-global-shipping-industry>

⁸ "Why ships of the future will run on electricity." *Infineon*. <https://www.infineon.com/cms/en/discoveries/electrified-ships/>

⁹ "Why ships of the future will run on electricity." *Infineon*. <https://www.infineon.com/cms/en/discoveries/electrified-ships/>

Fleetzero recently came up with an innovative solution called “battery swapping,” in which batteries housed within standard 20-foot shipping containers are swapped out for fully charged batteries when ships come into port.¹⁰ This overcomes the problem of long charging times, but investments in charging infrastructure in every port will still be necessary.¹¹

Currently, about 200 of the world’s 50,000 oceangoing ships are powered by LNG or are in the process of conversion to LNG power.¹² Some are equipped with dual fuel engines that use both LNG and bunker fuel. LNG emits fewer pollutants and GHG emissions than diesel, but it is still a fossil fuel, and GHG emissions can occur from both combustion and methane leakage.¹³

The International Maritime Organization adopted a strategy on the reduction of GHG emissions from ships in 2018. The strategy aims to reduce emissions from shipping by 50% by 2050 and phase them out completely after that.¹⁴ The strategy emphasizes efficiency improvements in the short term. In the longer run, it recommends investments in alternative fuels, such as hybrid, electric, hydrogen, and other fuels.¹⁵ However, some observers say the IMO strategy does not go far enough, and without binding targets, the strategy is purely voluntary.¹⁶ Small island nations who have the most to lose from climate change are advocating for stricter mechanisms, such as a steep carbon tax on shipping.¹⁷

In the meantime, voluntary efforts are being led by partnerships among nonprofits and shipping corporations. Shipping giant Maersk has announced that its ships will be carbon-free by 2050.¹⁸ The Ship It Zero coalition, which is made up of environmental groups, public health advocates, scientists, shipping experts, and shoppers, has set a target to push some of the world’s largest retail shippers (e.g., Amazon, IKEA, Target, and Walmart) to ship all products on zero-emissions

¹⁰ Caminiti, Susan (October 2021). “Why the next electric battery boom may be in cargo ships.” *ESG Impact*. <https://www.cnbc.com/2021/10/26/why-the-next-electric-battery-boom-may-be-in-cargo-ships.html>

¹¹ “Why ships of the future will run on electricity.” *Infineon*. <https://www.infineon.com/cms/en/discoveries/electrified-ships/>

¹² Caminiti, Susan (October 2021). “Why the next electric battery boom may be in cargo ships.” *ESG Impact*. <https://www.cnbc.com/2021/10/26/why-the-next-electric-battery-boom-may-be-in-cargo-ships.html>

¹³ Wikipedia. “Marine LNG Engine.” https://en.wikipedia.org/wiki/Marine_LNG_Engine

¹⁴ International Maritime Organization (April 13, 2018). “UN body adopts climate change strategy for shipping.” <https://www.imo.org/en/MediaCentre/PressBriefings/Pages/06GHGinitialstrategy.aspx>

¹⁵ International Maritime Organization. Initial IMO GHG strategy. <https://www.imo.org/en/MediaCentre/HotTopics/Pages/Reducing-greenhouse-gas-emissions-from-ships.aspx>

¹⁶ Stockbruegger, Jan (August 12, 2021). “The U.N. climate report is dire. So why are there no limits on maritime shipping’s carbon emissions?” *Washington Post*. <https://www.washingtonpost.com/politics/2021/08/12/un-climate-report-is-dire-so-why-are-there-no-limits-maritime-shippings-carbon-emissions/>

¹⁷ Stockbruegger, Jan (August 12, 2021). “The U.N. climate report is dire. So why are there no limits on maritime shipping’s carbon emissions?” *Washington Post*. <https://www.washingtonpost.com/politics/2021/08/12/un-climate-report-is-dire-so-why-are-there-no-limits-maritime-shippings-carbon-emissions/>

¹⁸ O’Niel, Will (April 13, 2021). “Hydrogen: The key to decarbonizing the global shipping industry?” *Center for Strategic and International Studies*. <https://www.csis.org/analysis/hydrogen-key-decarbonizing-global-shipping-industry>

ships by 2030.¹⁹ In October 2021, Amazon and IKEA, in partnership with the Aspen Institute, announced a commitment to use only zero-carbon shipping fuels by 2040.²⁰

- Fishery friendliness: Efficiency measures that reduce the amount of energy needed to move cargo and people at sea can reduce the amount of energy generation needed, including energy that is produced in fishery-unfriendly ways. Electrification of shipping represents an electrification of previously non-electrified transportation, and the fishery friendliness of electric ships will depend in part on the friendliness of the electricity sources that power them. Batteries produce some lifecycle GHG emissions and can have environmental impacts associated with mining and manufacturing. With hydrogen-powered ships, impacts to fisheries are determined by the source of energy that is used to produce the hydrogen, which can be renewable, fossil fuel-based, or nuclear.
- Co-benefits: None.
- Environmental externalities: Batteries produce some lifecycle GHG emissions and can have environmental impacts associated with mining and manufacturing. Electrification of shipping represents an electrification of previously non-electrified transportation, and the environmental impacts of electric ships will depend in part on the electricity sources that power them. With hydrogen-powered ships, impacts to the environment are determined by the source of energy that is used to produce hydrogen, which can be renewable, fossil fuel-based, or nuclear.
- Policy catalysts: Efficient, electric, hydrogen, and LNG shipping can be promoted through international agreements, carbon pricing, and government-sponsored research and development. Necessary charging or refueling infrastructure can be promoted through investment in “make-ready” infrastructure, development of charging or refueling infrastructure plans, and financial incentives such as tax credits, loans, and grants.
- More information:
 - [Drawdown: Efficient ocean shipping](#)
 - [Ship It Zero](#)
 - [Stockbruegger, Jan \(August 12, 2021\). “The U.N. climate report is dire. So why are there no limits on maritime shipping’s carbon emissions?” *Washington Post*.](#)

Continue reading at <https://fisheryfriendlyclimateaction.org/solutions>

¹⁹ Ship It Zero. <https://shipitzero.org>

²⁰ Saul, Jonathan (October 20, 2021). “Amazon and others commit to using zero-carbon shipping fuels by 2040.” *Reuters*. <https://www.reuters.com/business/sustainable-business/amazon-others-commit-using-zero-carbon-shipping-fuels-by-2040-2021-10-19/>