



# The rise of digital shipping technologies

There's a significant buzz around digitalization and decarbonization in the maritime sector. Frequent trade show attendees can confirm the tremendous growth in digital technology showcases. Only a few years ago, events primarily featured hull and machinery. Now everyone from design companies to class societies, shipyards to paint manufacturers, and engine developers to ECDIS manufacturers are keen to highlight their digital offerings. Currently, many shipping shows reserve dedicated floor space for digital technology vendors.

And there is a good reason for it. The drive towards net zero emissions is seen across all stakeholders — from beneficial cargo owners to charterers to ship owners. The supporting stakeholders, like class societies, marine insurance companies, and financial institutions that fund the maritime industry, also have their net zero targets — and for all these stakeholders, ships are the primary source of emissions. So, if ships emit less GHG, all stakeholders come closer to their net zero targets.

In this context, it makes sense that regulations — such as EEDI, EEXI, CII, EU ETS, and others — were made to ensure ships reduce emissions. At the same time, the non-regulatory demands, which often come from the public and investors, take various forms in initiatives like Clean Cargo, Sea Cargo Charter, and Poseidon Principles. The result is unprecedented pressure on ship owners and ship operators. All eyes are on them to reduce emissions.

**Decarbonizing shipping is a mammoth task that requires a multidisciplinary approach. The main goals are to:**

1. Increase visibility into shipping-related emissions across the supply chain.
2. Optimize shipping operations to minimize emissions.
3. Employ hardware top-ups to reduce emissions from existing ships and new builds.
4. Find economically viable green fuels that produce significantly fewer emissions.
5. Develop engines that can run efficiently on green fuels.
6. Scale green fuels bunkering infrastructure to support the shipping industry's massive scale.
7. Build supporting policies that incentivize green fuel use in shipping.

Without the use of green fuels in shipping, net zero targets cannot be achieved at scale. It will only be possible if we can meet goals three through seven on the list above. In the meantime, while researchers, policymakers, and corporations work hard toward commercializing green fuels, significant short-term gains can be made with minimal investment — if we focus on the first two goals on the list. Let's explore them more closely.

## **Increase visibility into shipping-related emissions across the supply chain**

How can every maritime stakeholder access ship emissions data? One option is officially reported IMO DCS data. Marine insurance companies and financial institutions that have signed up to have Poseidon Principles collect IMO DCS data from all the ships in their portfolios; this is a one-time annual exercise for year-end emission reporting, as required by Poseidon Principles.

The other supply chain stakeholders are beneficial cargo owners (BCOs), freight forwarders, and non-vessel operating common carriers (NVOCCs). They are also interested in shipping emissions, which fall into part of scope three for these organizations. A great example is the Clean

Sensing an opportunity, private industry and entrepreneurs quickly jumped to help ship owners and operators reduce scope one emissions. They're also assisting other stakeholders — who often can't access actual ship emission data — in measuring and optimizing scope two and three emissions.

Cargo initiative organized by Smart Freight Centre. It is a collaborative partnership between ocean container carriers, freight forwarders, and cargo owners focused on tracking and reducing greenhouse gas emissions from container shipping.

Under this initiative, all carriers submit data annually to calculate:

- Vessel-specific emission factor: the specific performance of an individual vessel.
- Carrier-specific trade lane-average emission factor: the average of all vessels operated by the carrier sailing on a specific trade lane, weighted by TEU\*km per vessel.
- Industry average per trade lane: the average of all vessels operated by all carriers sailing on the respective trade lane, weighted by TEU\*km per vessel.

As the market evolves, stakeholders may want a more real-time view of emissions from their shipping activities. This would allow them to proactively manage deviations from their climate alignment goals rather than waiting for the year-end report.

At DTN, we are working to facilitate this with a bottom-up modeling approach. The key requirements are:

**High-quality vessel digital twin models:**

these are physics-based, semi-empirical models that can estimate a vessel's fuel consumption and emissions based on its design parameters, sailing speed, and encountered weather and currents.

**AIS tracks:** these are used to calculate a vessel's speed and course along its route, and to correlate its positions with hindcast weather and current data.

**Accurate hindcast weather data:** wind, waves, and current have a large impact on fuel consumption and emissions. Hindcast weather is a critical input parameter to accurately calculate emissions on a particular voyage.

**A cloud-based scalable and secure**

**infrastructure:** our design and infrastructure greatly automate emission calculations for the entire merchant fleet. For every vessel subscribed to our service, we automatically fetch a track each day, add hindcast weather data on every track point, and then use our digital twin models to calculate fuel consumption and emissions between every AIS position. The data is stored in the cloud and is accessible to our Vessel Insights API customers.

**An API endpoint:** all the calculated emissions data is accessible to our customers via our Vessel Insights API endpoint. They can simply query the endpoint with an IMO number and a time range to get an estimate of emissions made by the vessel in that range.

With this API endpoint, any stakeholder — including marine insurance companies, banks, class societies, BCOs, NVOCCs, regulators, and more — can get real-time access to emissions data for the entire merchant fleet.

## Optimize shipping operations to minimize emissions

With the unprecedented pressures ship owners and operators face around emission reduction and the lack of commercially viable green fuels, many are asking how mature, commercially available technology can help.

That's where digitization shines. The shipping industry has been a slow adopter of the technology, and for a good reason. Historically, connectivity onboard has been poor and costly. Until recently, only a handful of forward-thinking companies were bearing the fruits of digitalization. With the increased decarbonization pressures, most ship owners and operators are more open to digitalization than ever before.

A study published by sat comms giant Inmarsat in August 2022 revealed that data use on commercial maritime vessels jumped more than threefold since 2019. With increased connectivity, ship owners and operators can fully utilize digital technologies to optimize vessel operations. It also facilitates greater data sharing

between ship and shore, boosting visibility into shipping operations for shore-based stakeholders, and empowers shore-based operators in day-to-day operations. This shared mental model also creates new optimization levels across the supply chain.

As a voyage optimization leader, DTN facilitates the creation of this shared mental model. Our strategy supports voyage optimization with:

- **Onboard voyage optimization:** as a leader in onboard weather routing, more than 5,000 ships use our SPOS software.
- **Shore-based voyage optimization:** a market innovator, we support the increased demand for shore-based routing with our Vessel Routing API, allowing shipping customers and SaaS platform providers to easily integrate voyage optimization on the front end.
- **Expert weather room guidance:** our team of skilled meteorologists and master mariners offer expert voyage optimization guidance through our RouteGuard service.



As one of the world's largest private weather companies, DTN has been a natural weather routing partner for the shipping industry for almost three decades. Through digitization, we can move beyond weather routing to true voyage optimization — integrating speed management, just-in-time arrival, bunker planning, freight rates, and more — for end-to-end commercial optimization on every single voyage.

The GreenVoyage2050 project of IMO lists various energy efficiency technologies on the market today, as well as their maturity level according to uptake across the maritime industry and degree of proven technology and principle. The adoption of many of these technologies will accelerate with increased connectivity onboard.

DTN supports digital shipping technologies with years of weather routing experience, high-quality, in-house hindcast and forecast weather data, a team of master mariners and meteorologists, and state-of-the-art vessel digital twin models developed in partnership with MARIN. Add in our data science, AI, and ML capabilities, and we are ready to help you quickly reach your emissions reduction and operational optimization goals.

**Advance your shipping digitalization journey**

**Explore our technology today**

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