

SCB FEATURE

## Wind and Water Could Usher in a New 'Intermodal' for Post-Carbon Freight



*Schooner Apollonia. Photo: Center for Post Carbon Logistics*

August 16, 2023 *Helen Atkinson, Managing Editor*

A greater adoption of waterborne freight, powered by low-carbon energy alternatives, could take the industry into a future where freight is no longer a [sustainability pariah](#).

A reversion to wind power for oceangoing vessels, at least as an assist, has been championed for decades, and could certainly help. But there are other plans afoot, and favoring waterborne over road is the way forward for the freight industry in general, according to Andrew Willner, executive director at The Center for Post Carbon Logistics.

### **Ships Could Take Freight Off the Roads**

The new, sustainable version of “intermodal” could mean combining road and rail with coastal and inland water whenever possible. Willner even envisions the emergence of a new class of freight service provider, a low-carbon third-party logistics provider, or LC3PL.

The stated mission of The Center for Post Carbon Logistics is to research and assist in the implementation of appropriate post-carbon maritime technology needed to keep commerce and transportation viable in a “carbon-constrained” world.

It has its work cut out for it. American commerce remains addicted to trucking — the number of trucks on the road has relentlessly increased, from just over 4.5 million in 1970 to nearly 13.5 million in 2020, according to the [Bureau of Transportation Statistics](#).

Worse, BTS says long-haul freight truck traffic on the National Highway System is projected to increase from 311 million miles per day in 2015 to 488 million miles per day by 2045. Ozone and fine particulate matter from vehicle emissions in 2016 led to an estimated 7,100 premature deaths in the Northeast and Mid-Atlantic regions of the U.S., according to the [Harvard T.H. Chan School of Public Health](#).

The cost isn't just bad air quality and heat domes. An average of 5,000 people a year are killed in crashes involving large trucks, a death toll that has soared by almost 50% since 2011, according to the non-profit news service [ProPublica](#). Tens of thousands more have been injured.

### **Real Possibilities, Many Obstacles**

Taking freight off the roads is not only desirable for multiple reasons; it is also attractively feasible.

A great example: The Hudson River, which is navigable by cargo ships with a draft of up to 29 feet from New York City, up the densely populated Hudson Valley, to the state capital of Albany and beyond. At present, one sees only the occasional heating oil or project cargo barge, pushed by tugboats, lumbering up and down the river. But 100 years ago, this mighty waterway, which connects via a huge system of canals to the Great Lakes and the St. Lawrence River, was one of the main cargo arteries of North America.

Then, of course, river traffic was powered by coal, contributing to life-threatening pollution, not just CO<sub>2</sub> emissions. Today, it's possible to haul up to 24 twenty-foot equivalent units (TEUs) of cargo via ready-to-build “[electric clippers](#),” which combine wind, solar and battery power, reaching speeds up to 10 knots.

Add in human-electric powered cargo tricycles, or “trikes” for last-mile delivery, and there's an opportunity to reach tens of millions of consumers within a day without a single diesel-powered truck in sight.

So far, there is only one maverick vessel attempting to achieve this vision: the 64-foot-long [Schooner Apollonia](#), which since 2020 has been transporting cargo on the Hudson River and in greater New York

Harbor by wind, current, and tide alone.

Willner says a large obstacle in the way of a post-carbon freight future that favors water wherever possible is a reluctance to embrace both new and old technologies – not just sail, but solar, battery, methane and biofuel. With a shift in thinking, Willner sees an opportunity to move massive amounts of medium-range freight deliveries, in particular, off roads and onto waterways.

But a lack of vision is only part of the problem; there are also the tough realities of economics. U.S. roads are built and maintained with [\\$204 billion](#) in government funds per year (more than is spent on police), but rail freight infrastructure and waterways receive nothing. “If this had the same subsidies we have to ship by road, we could do this next week,” Willner says.

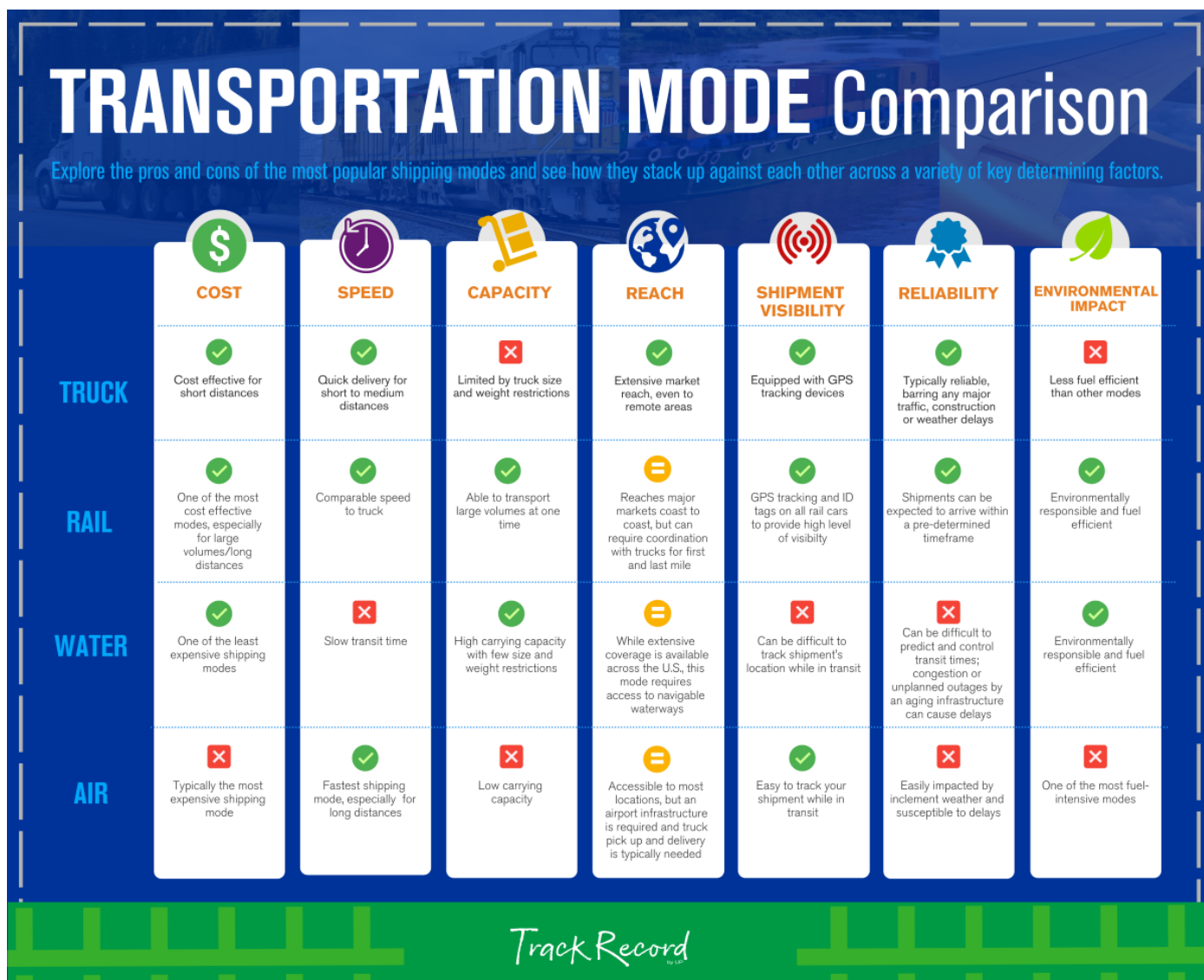


Chart: Union Pacific

### Land Ahoy!

The trick to making waterborne freight vessels viable is to connect them with low-carbon land-based transport at both ends. Recent changes in consumer habits open new opportunities. The growth of e-

commerce, which generally trends toward smaller deliveries, means alternatives to full-size trucks — small enough to be run on something other than an internal combustion engine — are very attractive.

UPS is successfully combining human and electric power by deploying tricycles (UPS Cargo Cruisers and Cyclo Cargos, which are both conventional and electrically assisted) in Hamburg, Dublin and Munich, and is testing this concept in other European cities. A UPS spokesperson says these tricycles are ideal for navigating dense, highly trafficked areas, delivering from container depots in the middle of the delivery area in each city. As such, they replace delivery trucks to reduce congestion and carbon emissions, and can even operate in pedestrian zones.

Another example is Austrian logistics firm [Gebrüder Weiss](#), which announced in August that it's using electric tricycles for deliveries to private homes and companies located on the Croatian islands of Rab and Lošinj.

But progress in adopting low-carbon, short-haul freight vehicles in the U.S., compared to Europe and Asia, is slow. The U.S. Department of Transportation announced in May that it's testing a four-wheeled, battery-powered pedal assist cargo bike it intends to deploy later this summer on bike lanes and other roadway projects in New York City. But these and other projects remain small-scale and tentative. They also tend to focus, understandably, on densely populated areas where the last-mile could be a few hundred yards. That explains, at least partly, why Europe is ahead — population density in the EU is 300 persons per square mile, versus 81 persons in the U.S. All the same, pilot programs are delivering hopeful results.

“When it comes to the U.S., we're looking to our extensive urban solutions network outside the U.S. as potential blueprints for reimagining our industry here,” the UPS spokesperson says. “There is no one-size-fits-all solution when it comes to sustainable last-mile deliveries in busy city centers. Every city has different challenges and requirements, and we are taking the learnings from our previous projects as we continue to explore various innovative urban logistics solutions to best serve our customers while working alongside cities, state and federal government partners.”

### **Future-Proof Liberty Ships**

Willner looks forward to a proliferation of the Electric Clippers, and cites various compelling advantages of the ships, aside from their low-carbon profile. First, they're American built. That means they can ply not only international routes, but also qualify under the U.S. Jones Act, which requires goods shipped between U.S. ports to be transported on ships that are built, owned, and operated by U.S. citizens or permanent residents. They can, therefore, deliver freight between U.S. coastal destinations (and inland ones too). Willner calls them “[future-proof Liberty ships](#).”

Further, one of the caveats of electric-powered vehicles, even if the electricity is generated by “clean” sources, is that lithium-ion batteries are problematic in multiple ways, including difficulties with safe disposal, and raw materials coming from [questionable sources](#). But the old, lead-acid batteries are four or five times heavier, and on other forms of transport tip the scales against efficiency and

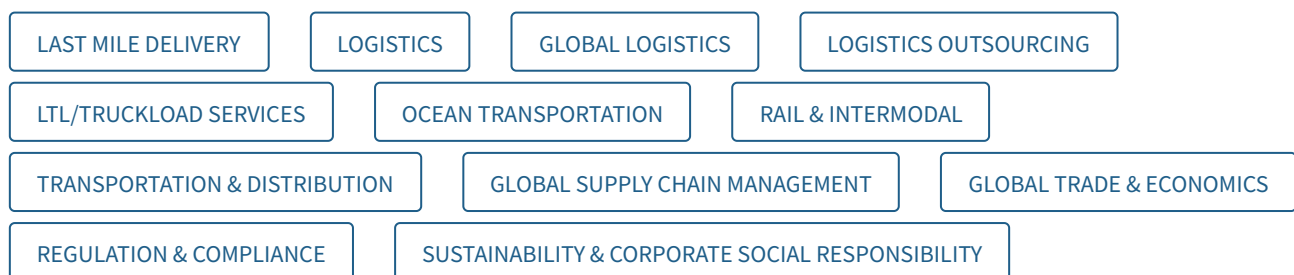
therefore sustainability. However, they're more than welcome on a ship, Willner points out. "We want the ballast!"

## Meanwhile, Back at Sea

Large, oceangoing freight vessels with sails seem to be actually becoming a commercial reality. According to [The Conversation](#), Japanese bulk carrier MOL is operating a [wind-assisted ship](#). American food giant Cargill is working with Olympic sailor [Ben Ainslie](#) to deploy [WindWings](#) on its routes. Swedish container line Wallenius is aiming for [Oceanbird](#) to cut emissions by up to 90%. The French start-up Zephyr & Borée has built the [Canopée](#), which will transport parts of European Space Agency's Ariane 6 rocket this year.

In January 2021, the London-based International Windship Association and its 150-plus members declared a "[Decade of Wind Propulsion](#)." Association secretary Gavin Allwright says the initiative, after a delay caused by the COVID-19 pandemic, is now getting wind in its sails. There are currently 23 large ships — including two very large crude carriers (VLCCs) — fitted with some form of wind propulsion. More importantly, Allwright says, it took 12 years to get to 23; the number will double in the next 12 months.

And sometimes, the old ways offer a fresh alternative. The BBC reports that Dutch company [Ecoclipper](#) in June ran a voyage on a 1912 traditional two-mast Dutch sail barge, carrying mixed loads that included cheese, wine and olive oil, from Amsterdam to Porto in Portugal and back again, with stops in Spain, France and England. Chief executive Jorne Langelaan told the BBC he hopes to build a fleet of up to 25 wind-powered cargo ships in the future, utilizing the latest design technology, and capable of carrying 700 metric tons of cargo, at a cost in the region of €9 million (\$9.85 million) each. A greater use of wind-powered freight is the only way long-distance transport and travel will remain feasible in the future, Langelaan said. "The big goal of Ecoclipper is to connect the continents [with] emission-free cargo shipping."



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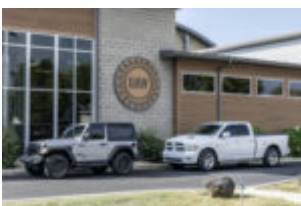
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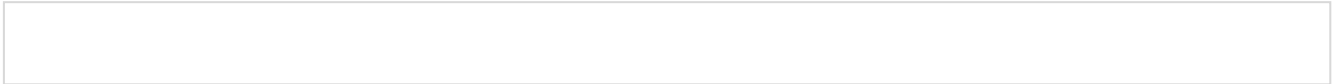


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Last Mile Delivery

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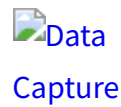
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