

Maritime Summary Note n°226 – December 2020

« Zero-Carbon strategies for the maritime sector »

Currently, maritime transport is responsible for 2% to 3% of global greenhouse gas (GHG) emissions. According to the OECD, international freight volumes are projected to multiply by more than 4 by 2050. Within the international maritime community, environmental issues have never been as intensely debated as in recent years. In April 2018, the IMO set a target to reduce annual GHG emissions from shipping by at least 50% by 2050 and to improve carbon intensity performance by 40% by 2030 compared to 2008 levels. The widespread adoption of slow steaming by shipowners following the 2008 economic crisis, along with energy efficiency optimizations in naval architecture and marine engines, will not be sufficient to decarbonize shipping.

We are witnessing an acceleration of the timeline, a tightening of measures, and an attempt to regionalize the "greening" of shipping, particularly within the European Union (EU) with the Green Deal championed by Ursula von der Leyen, President of the European Commission. The maritime sector as a whole must reinvent itself; ports must decouple themselves as much as possible from carbon-based energies and supply shipowners with alternative fuels. What strategic trade-offs have ports and shipowners made to respond to this "green" turning point?

Greening of ports: European and local initiatives

Ship and port performance indices

Environmental commitment beyond regulatory requirements helps forge a positive brand image and fits into a CSR (Corporate Social Responsibility) framework. This is precisely what the Environmental Ship Index (ESI) offers. Established in 2010 and entering into force in 2012 by the IAPH (International Association of Ports and Harbors) and the ports of the Northern European Range, this label is encouraged by 56 ports¹ worldwide and applies to more than 8,400 vessels. Initiated by ports, it financially rewards shipping companies that operate vessels with a low environmental footprint, taking into account the reduction of atmospheric emissions (CO₂, SO_x, NO_x) and airborne noise (ESI-noise). Vessel performance must exceed IMO recommendations. Based on an eligibility threshold defined by each port, with scores varying from 0 to 100, vessels can obtain benefits such as port dues reductions at each of their calls. The parameters include the quality of the fuels used, engine performance, as well as on-board equipment (energy efficiency, shore-power systems, etc.). It is an incentive-based system founded on voluntary participation and self-declaration. The shipowner must report their vessel's performance indices. No verification by an external organization is currently required, though this is expected to change with a transition toward audits conducted by independent experts.

Another label exists: Green Marine, founded in 2007 in North America, whose European iteration is currently being developed. Its scope of action is broader, as it is designed to evaluate ports, shipowners and their vessels, terminals, and shipyards alike. Here, there is no financial counterpart. Environmental performance is evaluated annually using the comprehensive self-evaluation guides of the Green Marine environmental program. Every two years, an accredited verifier reviews the supporting documentation certifying performance and issues a certification valid for 2 years. Participants' progress is assessed annually on a scale from 1 to 5 (level 1 indicates regulatory compliance, while level 5 reflects environmental excellence and leadership) using thirteen performance indicators tailored to whether the participant is a shipowner, a port authority, or a terminal operator. For instance, a shipowner's evaluation is based on seven criteria: invasive aquatic species, atmospheric emissions (SO_x, PM), NO_x emissions, greenhouse gases, oily water, waste management, and underwater noise. The program encourages its

¹ In France, the ports of Le Havre, Rouen, Paris, La Rochelle, Marseille, La Réunion, Bordeaux, and Dunkirk are part of the ESI network.

participants to reduce their environmental footprint by adopting concrete and measurable measures, prompting shipowners to be proactive.

Under the auspices of ESPO (European Sea Ports Organisation), a code of environmental best practices for ports emerged in 2011 through the EcoPorts network. It integrates environmental management standards such as ISO 14001 alongside ESPO's Port Environmental Review System (PERS)—the only certification specific to the port sector, whose compliance is assessed by Lloyd's Register. It also includes EMAS (Eco-Management and Audit Scheme), a management and audit instrument developed by the European Commission for companies and other organizations to evaluate, report, and improve their environmental performance. These various certifications are grouped under the EcoPorts network. Today, 23 ports are PERS-certified, 57 are ISO-certified, and 7 are EMAS-certified. Barcelona possesses all three certifications, but most ports simply comply with the ISO 14001 standard. Based on the data gathered by the EcoPorts network, ESPO publishes a report² on the environmental performance of seaports. The top priorities for port authorities are air quality, followed by energy conservation, and finally—a recent development—taking climate change into account. Regarding vessel services, more than half of the ports offer shore-power supply (both high and low voltage), and one-third provide LNG bunkering capabilities³. Additionally, 24% of ports noted ongoing infrastructure installation projects for LNG bunkering.

For quayside electrification, technical hurdles remain—such as frequency discrepancies between ports and vessels (50Hz vs. 60Hz)—as well as financial obstacles linked to the price gap between marine fuel and electricity, which vary from one State to another. Furthermore, marine fuels benefit from tax exemptions, whereas a vessel connected to shore power must pay the energy tax applied to electricity. A preferential tax treatment at the EU level should be considered for shore-side vessel electricity. A reduced taxation rate has been introduced to this end by Germany, Sweden, Spain, and Denmark, and is currently being implemented in France. In parallel, a growing number of ports (56%) offer fee reductions for vessels that exceed regulatory standards. Port cities are economic actors that must give meaning to port actions by fully integrating environmental preservation into their development plans. What are the different eco-energy strategies offered by ports to maritime operators?

Here are a few port examples.

A pioneer in environmental awareness, the Port of Long Beach in California has conducted a dedicated environmental policy for over 20 years. The port has implemented a Clean Air Action Plan (CAAP) since 2006 in partnership with the Port of Los Angeles. This plan targets the reduction of GHG emissions at the source by encompassing vessels, trucks, cargo handling equipment, trains, and harbor craft. For vessels, this plan utilizes a financial incentive program to reward the cleanest engines, encourages slow steaming within the port waters, and mandates certain ships to connect to shore power or deploy an alternative technology approved by CARB (California Air Resources Board). This progressive mandate, which previously applied only to container ships, cruise vessels, and refrigerated cargo ships, was expanded last summer to include Ro-Ro vessels and tankers. If compliance with this standard proves impossible, operators must contribute to a compensation fund benefiting neighborhoods adjacent to the port. For trucks, the strategy consisted of a progressive ban on older engine models. The ports of Long Beach and Los Angeles are studying a tariff structure designed to incentivize the modernization of the truck fleet operating in the San Pedro Bay to further reduce air pollution emissions. The goal of the CAAP is to achieve 100% zero-emission trucks entering and leaving the ports by 2035.

The San Pedro Bay collects atmospheric and meteorological data in real time at the ports of Long Beach and Los Angeles, providing valuable information on air quality that tracks ozone, CO₂, SO₂, and NO₂, as well as particulate matter (PM 10 and PM 2.5) present within the port zone. Since 2005, these strategies have achieved emission reductions of over 85% for particulate matter, 50% for nitrogen oxides, and 95% for sulfur oxides. These ports make progress reports available through dedicated working groups.

At the Port of Hamburg, the energy transition will hinge on the supply of LNG, with a dedicated infrastructure project at the Brunsbüttel terminal. In partnership with the EU, the port is conducting a program aimed at reducing CO₂ emissions generated by trucks within the port area: Smooth Ports Interreg Europe. The objective is to optimize road traffic flows across the port zone, notably by

² Espo environmental report, EcoPorts in Sights 2019

³ This represents a 10% increase since 2016. LNG is primarily supplied by trucks (90%) and by barges (10%).

streamlining cargo customs clearance through the use of ICT (Information and Communication Technologies) and ongoing discussions regarding alternative fuels.

The Port of Rotterdam also aims to transition into a carbon-neutral port phased over several years. This will be achieved through the energy efficiency of its infrastructure (recovering residual heat from buildings and industries, carbon capture) and the use of new energy sources such as hydrogen, solar, geothermal energy, and biomass. The logistics sector servicing the port is also being evaluated for a sustainable supply chain, with a zero-emission target by 2040 (incentive programs, container transport via electric trucks).

The Port of Antwerp is likewise collaborating with chemical sector players⁴ on carbon capture to achieve carbon neutrality for the port. The objective of the *Antwerp@C* project is to cut CO₂ emissions in half by 2030. Funding requests have been submitted to the Flemish authorities and the European Innovation Fund under the Green Deal framework.

At the Port of Le Havre, this greening is embodied in the "Territorial Pact" for ecological and industrial transition. On its zero-emission roadmap, the port promotes quayside shore-power connections, green hydrogen for industry, decarbonized transport, and a progressive rollout of natural gas for heavy goods vehicles. To the 10 existing electrical charging stations installed between Paris and Le Havre, 70 additional stations will be deployed along the Seine, which, according to the port, will save 5,300 tonnes of carbon equivalent per year. The Port of Le Havre is currently conducting technical studies for the electrification of the *Pointe de Floride* berths, where cruise ships dock. This service will allow them to plug into shoreside electricity, preventing them from keeping their engines running and ultimately reducing pollution generated at the berth.

In Dunkirk, a land-based LNG bunkering station is operational, alongside shore power at the Flanders container terminal, with two additional connections currently planned. For the near future, the port is also considering other energy sources such as photovoltaics, green hydrogen, heat recovery, and offshore wind power. Marseille has also been committed since 2017 to a shore-power approach for passenger vessels (notably *La Mériidionale*, and soon *Corsica Linea*) and for container ships by the end of 2022. A ship-to-ship LNG bunkering project is expected to launch by 2021. The Port of Marseille is also positioning itself in the hydrogen sector for industrial use.

Regarding Overseas France, Martinique is scheduling the commissioning of shore-power at the *Pointe des Grives* berths for container ships by 2022. The port intends to capitalize on its high solar exposure to generate electricity from photovoltaic panels. These latest examples are integrated into the Government's Stimulus Plan, thereby benefiting from an additional investment effort of €200 million phased over the 2020–2022 period.

An energy transition for shipowners: Between individual strategies and international coalitions

The variety of propulsion modes and alternative fuels is broad. We could distinguish them into two sub-categories: on one hand, conventional-alternative fuels, including low-sulfur fuel, scrubbers, and LNG, which meet the requirements of the 2020 Global Sulphur Cap; on the other hand, hydrogen, biofuels, electricity, ammonia, methanol, and wind propulsion, whose commercial applications are currently being developed. The ultimate objective is to comply with today's regulatory mandates while anticipating those of tomorrow.

The trade-offs depend on various parameters: bunkering availability, compatibility with existing engines, carrying capacity, and operational costs. The Covid-19 crisis has further crystallized these strategic choices. In a European Commission document entitled "*FuelEU Maritime – Green European Maritime Space*," which aims to increase the use of sustainable alternative fuels in maritime transport, several pitfalls are highlighted. The assessment is as follows: conventional fuels such as heavy fuel oil, gas oil, and diesel remain overwhelmingly dominant. LNG accounts for only 3% of the total volume of fuel used, while renewable fuel represents a negligible share.

Given that a vessel's lifespan reaches 25 to 30 years, capital locked up for its construction binds operators to a long-term horizon; the lack of both technological and regulatory visibility makes investment choices all the more complex. Within this context of uncertainty, a wait-and-see approach among shipowners can prevail, thereby slowing down the adoption of these alternative fuels. As a knock-

⁴ The consortium consists of Air Liquide, BASF, Borealis, ExxonMobil, INEOS, Fluxys, the Port of Antwerp, and Total.

on effect, supply is impacted, resulting in stagnant production that drives up prices compared to alternative fuels. We find ourselves in a classic chicken-and-egg paradox.

The cost must be shared among various economic actors, even though the final customer will ultimately foot the bill. These greening measures will increase shipping costs and will go hand in hand with vessel modernization and the use of new propulsion methods (involving R&D and investments in production and infrastructure). It is to be hoped that this new challenge will stimulate research and innovation, contributing to the enhancement of the EU's energy security. Maritime employment will have to adapt, requiring the training of seafarers to maintain and operate these new technologies. Employment in the R&D departments of equipment manufacturers and engine designers will also expand.

According to Alphaliner data from September 2020, regarding container ships, 87.8% of the fleet relied on low-sulfur fuel, 12.1% utilized scrubbers, and 0.2% operated on LNG. Among the market-leading companies, CMA CGM demonstrated a preference for LNG, with five units, whereas Maersk and MSC primarily equipped themselves with scrubbers. This choice ultimately did not prove economically relevant in the short term, given the collapse of oil prices caused by the Covid-19 crisis. The competitive advantage of HFO became less obvious. At the end of 2019, CMA CGM positioned itself in the biofuel segment through a framework agreement signed with Shell. Maersk is studying various options to reduce its carbon footprint, including electric batteries.

A containerized battery energy storage system is being tested to improve the efficiency of on-board electrical systems. This test will help prove the potential of this technology while improving its performance and applications. On the South Korean side, the ammonia pathway is being explored through the commitment of the Malaysian shipping company MISC Berhad, Samsung Heavy Industries shipyards, the Lloyd's Register classification society, and the engine manufacturer MAN within an R&D program dedicated to building an ammonia-powered tanker. An ammonia tank vessel is reportedly under study at the DSME and Samsung Heavy Industries yards. As can be observed, there is no single solution. The panel is broad and is now embodied in a pooling of resources and expertise, marked by the emergence of public-private actor coalitions that encompass issues related to energy (production, distribution), infrastructure (storage and bunkering), and finance. With their sights set on the IMO objectives, the goal is to deploy commercially viable solutions by 2030. This is precisely what the "Getting to Zero" coalition embodies, bringing together no fewer than 120 members from the maritime sector, banks, energy providers, States, and port authorities. The objective is the commercial deployment of viable zero-emission vessels by 2030. Charterers also wish to push boundaries through the "Sea Cargo Charter," in which they commit to integrating climate considerations. Signatories will be required to publish their emissions annually.

It is also worth noting the European research and development program, Horizon 2020, which promotes the expansion of alternative fuels and innovative technologies in energy and transport (such as electric ferries, the promotion of wind propulsion, or renewable H₂). The banking sector is likewise evolving. Eighteen financial institutions, through the Poseidon Principles, have committed to aligning their loans with projects aimed at shipping decarbonization in accordance with IMO mandates. Signatory banks pledge to measure the carbon intensity of their shipping portfolios and to publish the results annually. These shipping loans represent approximately \$150 billion, accounting for more than one-third of the global ship finance portfolio. Paradoxically, a tanker shipowner was the first to secure such a loan. Given the scale of the challenges and funding requirements, it would be highly relevant for this type of initiative to focus on project developers who are truly innovative and embody the paradigm shift that the maritime sector appears willing to initiate.

Concurrently, the International Chamber of Shipping (ICS) warns of a massive requirement for worldwide R&D investment, alongside public sector support. Without this, the IMO's GHG reduction targets will not be achieved. Technological breakthroughs are necessary if the industry is to live up to the commitments made. According to the ICS, funding needs are evaluated at one trillion dollars over the next 30 years. The looming prospect of the EU Emissions Trading System (EU ETS), which could enter into force by January 1, 2022, is causing deep concern among shipowners. International regulations combined with "European zeal" in this matter are pushing operators, willy-nilly, toward an eco-energy transition. Ports, for their part, stand at the crossroads of this energy transition and can become decarbonization hubs for our economies. They house industrial zones and host renewable energy infrastructures, such as wind turbines and photovoltaic panels.

It will be essential to pool knowledge and resources in order to collectively overcome these technological hurdles and thus achieve ecologically sustainable and economically viable transport. However, this will

carry a cost. Are we ready to restore true value to products manufactured at the other end of the world and to reconsider our very lifestyles?

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