CURRENTS

The magazine of a port in motion

#1

1st half-year 2024

PORTS AND NEW FUELS: AN OBVIOUS PARTNERSHIP?

HAROPA PORT
Le Havre
Rouen
Paris

WHAT DO WE MEAN BY "NEW FUELS"? WHY DEVELOP THEM?

THREE KEY WITNESSES SHARE THEIR VISIONS AND THEIR ANALYSES
Clément Beaune, delegated minister for Transports,
Thibault Cantat, chemist and researcher,
and Mikaa Blugeon-Mered, a specialist in the geopolitics of hydrogen

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editorial

It is with pleasure that I introduce Courants, HAROPA PORT's new thematic magazine. Its title, which translates into English as "currents", is a reflection not only of the river and maritime universe, but also of the currents of thought and forces at work in transforming our societies. Indeed, in an increasingly complex world, confronted as we are with critical issues, it is essential to take the time to explore such "currents".

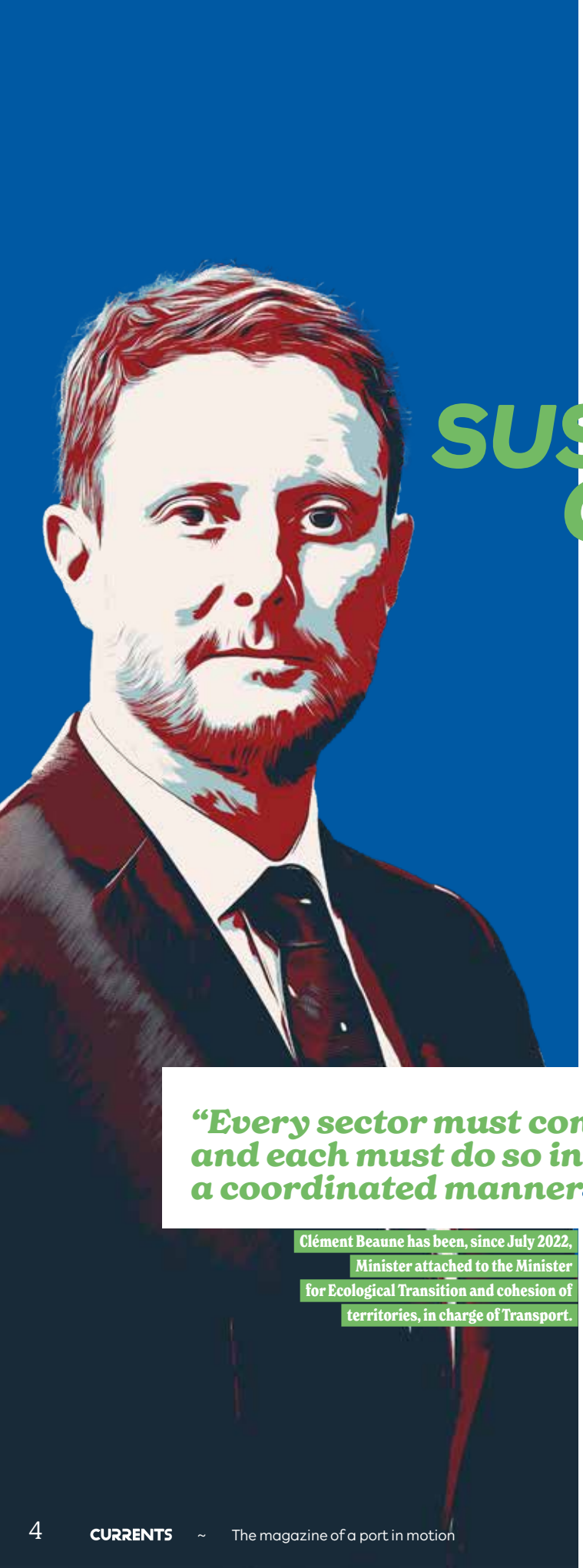
We therefore set out to make our magazine a locus for reflection on fundamental issues that are key to the future and relevant to all our partners. For that reason, we decided to prioritise both present-day and longer-range foresight analysis. To provide input for Courants, we will be using our own expertise while also counting on openness and collective intelligence: our publication will also be enriched by specialists and high-profile contributors.

For this first issue, we have chosen to take a look at new fuels. This is not only because of the historical role played by ports in the energy sector and the importance of such fuels for a successful energy transition. It is also justified by the commitment of our institution: HAROPA PORT is an active participant in projects in this area. And surely the presence at – or near – our ports of historical energy industry players willing to make adaptive changes to their production facilities, plus the arrival of investors, can make the Seine Axis the "New-Fuels Valley"?

What do these fuels amount to in the global, European or French energy market? How can they be produced and used? What forms of collaboration do they bring about? In the pages that follow you will find pointers to answers to these questions.

Pleasant reading!

Stéphane RAISON,
CEO of HAROPA PORT



Ports face a SUSTAINABLE CHALLENGE

THE ISSUES SURROUNDING THE ENERGY TRANSITION HAVE NEVER BEEN AS PRESSING AS THEY ARE TODAY, GIVEN THE NEED FOR A SHARP, RAPID CUT IN GREENHOUSE GAS EMISSIONS. WE MET WITH CLÉMENT BEAUNE, FRANCE'S DELEGATED MINISTER FOR TRANSPORT.

"Every sector must contribute to decarbonisation, and each must do so in its own way, but in a coordinated manner."

Clément Beaune has been, since July 2022, Minister attached to the Minister for Ecological Transition and cohesion of territories, in charge of Transport.

How has the government decided to respond to the fundamental issue of tomorrow's sources of energy?

The government has made a ground-breaking choice: to undertake an approach based on ecological planning. The founding assumption of that approach where transport is concerned is to consider that every sector must contribute to decarbonisation, and each must do so in its own way, but in a coordinated manner. Although the common heading is clearly defined, and the range of solutions identified (electrification, use of alternative sources of energy, restraint in energy consumption, modal transfer, intermodality and so on), the mix will in fact be different for each individual mode.

Tell us more about that common heading.

The European Union, and this is due in large part to France, has set itself a major goal, which is to be the first continent to achieve carbon net zero by 2050. This will be done in stages, specifically one in 2030 targeting a 55% reduction in our emissions by the end of the decade. The year just ended has brought a change of scale. In just a few months, the European Union has adopted a coherent and historical set of legislative measures, "Fit for 55", with the immediate effect of giving the EU unprecedented credibility internationally and a clear vision for our stakeholders, especially in industry and business. The crisis in Ukraine has confirmed the relevance of this general heading and is further accelerating our efforts on the energy transition. In this context, we must "leave no stone unturned" and move forward at a faster pace on the decarbonisation of all modes of transport.

France and the EU have clearly set ambitious goals for the transport sector...

Indeed they include the 90% cut maritime transport's greenhouse gas emissions by 2050, as well as the promotion of sustainable fuels for air transport. Where river transport is concerned, it is a response that offers very high value in terms of economics, ecology and energy, and we need to develop it further. These goals are both a challenge and an opportunity for ports, which have a key role to play in achieving them.

What is the position of ports in this context?

Sea and river ports are in fact faced with an issue of sustainability. They must help consolidate the competitive advantage of maritime transport and of river transport, which are structurally lower-carbon modes, while at the same time facilitating their decarbonisation: this will require the adoption of new, cleaner fuels, biofuels for example, and hydrogen or ammonia in the future, as well as investment in infrastructure compatible with these new technologies. And indeed, seaports have a major role to play in choices between modes: 80% of all goods pass through them and it is in the ports that the decisions are taken on whether to use rail, waterway or road transport. If the ports are at the cutting edge in terms of modal transfer, this will ensure demand for mass goods transport everywhere in France.

What support is government giving to ports?

It takes various forms, for example a doubling of the funds going to ports through the national port strategy, the planning agreements signed between central and regional governments or the work of the French Waterways Authority (Voies navigables de France – VNF). In this respect, the model provided by HAROPA PORT, which today includes not only the ports of Le Havre and Rouen but also Paris, France's most important river port, definitely constitutes a key advantage: connections across the entire Seine basin via river transport and access to 25 million consumers in the greater Paris area make the Seine a core vector for decarbonising our modes of consumption and HAROPA PORT a key player. Historically, ports are also places where innovations and industries are developed. It is there that all the major post-war industries were built up, and we can see today that it is also there that the new industrial areas of tomorrow are emerging, in particular around energy-related issues. It is in this way that in addition to providing shipowners with the fuels of tomorrow, we can see increasingly clearly that they will play a major part in producing those fuels. For the maritime sector, naturally, but also for aviation, given the obvious synergy. This pioneering role in industrial development is essential. That is why I was pleased to note that HAROPA PORT, which has already initiated some ambitious projects, had chosen this theme for the first issue of the magazine.

Fuels: a metamorphosis

IT IS CERTAINLY TRUE THAT RESTRAINED AND EFFICIENT USE OF ENERGY, AS WELL AS MASSIVE PRODUCTION OF GREEN ELECTRICITY, ARE ESSENTIAL TOOLS FOR A SUCCESSFUL ENERGY TRANSITION. BUT IF WE WANT TO REACH THE GOAL OF ZERO CARBON EMISSIONS BY 2050, WE WILL NEED TO MAKE USE OF ANOTHER SOLUTION: NEW FUELS.

Thibault CANTAT

"They are essential because electricity cannot be used in every application. Without alternative fuels to replace fossil energy, it will for example be impossible to decarbonise the production of plastics or long-distance transport" explains Thibault Cantat, research director at CEA. But what exactly do we mean by "new fuels"? "We can make a distinction between two main families", adds Thibault Cantat. "The first is the e-fuel family – electrofuels – for example e-methanol and e-kerosene. They are also called synthetic fuels and are produced by combining hydrogen from water electrolysis and CO_2. In the second group are biofuels obtained using organic materials from biomass. This is the family that includes HVO , a type of diesel based on waste oils and fats, and advanced biofuels produced by recycling agricultural and forestry waste."

A STRONG DYNAMIC SINCE 2022

New fuels have been widely discussed since 2022. This is so because it was in that year that they were mentioned for the first time in the IPCC report as one of the solutions to the climate crisis. Additionally, because EU regulations changed in 2023 with the "Fit for 55" package. That set of proposals is aimed at aligning EU legislation with the goal of cutting emissions

Thibault CANTAT has a doctorate in chemistry and teaches at École Polytechnique. He is the director of the circular carbon economy research programme launched in 2019 by France's commission for atomic and alternative energies (Commissariat à l'Energie Atomique et aux énergies alternatives - CEA), involving around a hundred researchers.

by at least 55% by 2030 and reaching carbon net zero by 2050. *"This means that certain sectors will be obliged to make major, rapid reductions in the percentage of fossil fuels in their energy mix. Specifically, the air and sea transport sectors are primary targets"* comments Thibault Cantat.

DEDICATED MARKETS...

The change in EU regulations brings an advantage with it: it opens the door to markets dedicated to e-fuels and biofuels. For which there is a massive requirement globally. Including in France, where production of renewable energy sources is already at significant levels, but where one third of the energy mix of fossil origin cannot be decarbonised by direct electrification. Thibault Cantat sums up: *"We need now to succeed in producing these alternative fuels and obtain the highest possible energy yield and the smallest possible carbon footprint, with greenhouse gas emissions at least 70% lower than fuels from fossil sources, and do so at the lowest possible cost"*. The challenge is formidable, especially given that the cost of a litre of e-kerosene varies between two and four euros ... compared with 40 euro cents for kerosene!

... AND MARKETS UNDER CONSTRUCTION

At present, the technologies needed for a mass roll-out of alternative fuels have not reached maturity, but some critical components are almost ready to move on to industrial-scale production. This is true of hydrogen production based on water electrolysis and CO_2 capture. Thibault Cantat emphasises that *"when every component is ready, one further stage will remain: integrating them to form a new value chain. So there is still some way to go, and the need now is to speed up the pace"*. In this context, tomorrow's fuels have an important strength: they are compatible in part with existing facilities, which drastically reduces the scale of the funds to be invested in developing and using them. As Thibault Cantat confirms: *"investment capacity is a much less crucial issue than the production of low-carbon electricity, which will become a key resource"*, adding: *"Research is ongoing and will not stop in 2050. Because once the fuels have been decarbonised, we will need to make progress on cost, efficiency and social acceptability. The topic is therefore likely to be for a long time on the agenda of every actor in these markets, including ports, which have a decisive role to play."*

What ecological fuel can be USED BY SHIPS?

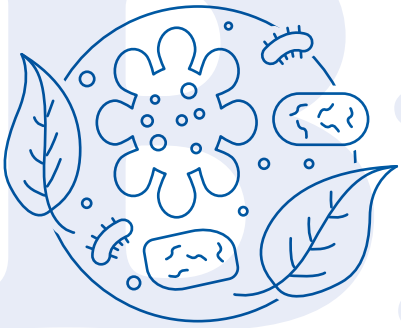
Three new fuels are especially promising for decarbonising the maritime industry: ammonia, e-methane and e-methanol. But in the opinion of Thibault Cantat they cannot coexist over the long term given the risk of increasing the number of different infrastructures. Given that the first is highly toxic and flammable and that the second is a more powerful greenhouse gas than CO_2, e-methanol might well have the edge.

1. Hydrotreated Vegetable Oil

NEW FUELS: WHAT

Biofuels

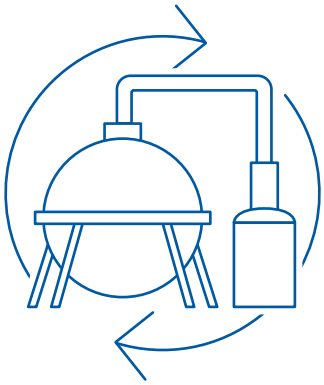
Produced from non-fossil organic materials: raw materials of plant origin, residual oils such as HVO (hydrotreated vegetable oil), animal fats, etc.



Advanced biofuels

2nd or 3rd generation biofuels, produced from biomass and micro-organisms. A particularly virtuous approach aimed at reducing environmental pressure.

EXACTLY ARE THEY?



E-fuels

Or synthetic fuels, produced from renewable or low-carbon (non-fossil) **electricity and carbon dioxide** (except for ammonia).
A common denominator: **hydrogen (H_2).**

e-methane

Industry, shipping and road transport

TO REPLACE
heavy fuel oil and methane

e-diesel

transport (land vehicles)

TO REPLACE
petroleum diesel

e-kerosene

transport (aviation)

TO REPLACE
petroleum-based kerosene

e-ammonia

fertilizers, shipping, power generation, H_2 transport

TO REPLACE
fossil ammonia, heavy fuel oil, natural gas

e-methanol

maritime and automotive transport, decarbonisation of chemical production

TO REPLACE
fossil methanol

A new geopolitics of HYDROGEN

Mikaa BLUGEON-MERED

MIKAA BLUGEON-MERED GIVES US HIS EXPERT VIEW ON THE EMERGING MARKET THAT IS CURRENTLY STARTING TO REVOLUTIONISE THE GLOBAL ENERGY LANDSCAPE: THE MARKET FOR LOW-CARBON AND RENEWABLE HYDROGEN. DISCUSSION.

"Mikaa BLUGEON-MERED is a teacher (notably at Sciences Po in Paris), a writer, lecturer and an expert analyst of hydrogen geopolitics, markets and diplomacy."

The hydrogen market is not new, and it is very substantial, with 95 million tonnes produced and consumed every year around the world. Why are people now talking about a new hydrogen market?

Historically, the hydrogen market relates to hydrogen produced from fossil sources, natural gas in the main. For that reason, it has a high carbon content, generating annual emissions assessed at 900 million tonnes of CO_2 equivalent. In a global context characterised by an intensification of the combat against global warming, it is logical to want to replace it with a more environmentally friendly form either by including CO_2 capture systems in the process or using water electrolysis plus a source of renewable energy.

What benefit does low-carbon and renewable hydrogen have for the energy transition?

Its benefit is twofold. Firstly, hydrogen is the flammable substance that offers the highest calorific value. In its ecological version, this means that it can replace natural gas for heating, be used as a clean fuel, or indeed become an e-fuel ingredient. Secondly, in its liquid form hydrogen is an energy vector that allows electricity to be stored and transported.

What is the current global market share of ecological hydrogen?

It is microscopically small, with annual production of approximately one million tonnes a year, or 0.7% of the market. But it is destined to expand very substantially judging by the ambitious targets announced by many countries. Today, globally, 59 have established a development strategy for ecological hydrogen, and they represent 82% of global GDP. Although at the present time we may note a certain wait-and-see attitude with investment trajectories very far below what is needed.

Which countries are most interested in developing low-carbon and renewable hydrogen?

I would make a distinction between three categories. Firstly, there are countries like Qatar that need this energy vector to decarbonise their hydrocarbon production. Secondly, there are hydrocarbon producing countries that also enjoy major potential for the production of renewable forms of energy, such as Saudi Arabia or Norway. Thirdly, there are those that have not hitherto

been producers of energy but who have the resources to produce and export renewable energy, such as Namibia, Morocco, Spain and Ireland.

What position is France adopting on this market?

France was among the first countries to implement a development plan for ecological hydrogen, the Hulot Plan in 2018. Since September 2020, it has had one of the most proactive national strategies given that it wants to bring 6.5GW of low-carbon hydrogen production on stream by 2030. This is a unique position in Europe: sovereignty-based energy security. France intends to develop its own hydrogen production in order to decarbonise its heavy industry on a completely independent basis. In addition, in tandem with nuclear energy, the production of which is more or less constant, hydrogen has many advantages. That is because the catalysts that convert it into electricity make it a supplementary energy vector — the only one possible — to guarantee reliable, constant power supply to cope with peaks in consumption. That is France's position. In comparison, Germany, which is also seeking energy security, has chosen a completely different path, preferring to import ecological hydrogen from a wide range of supplier countries. In Europe there is also a middle way between the French and German approaches, one that is counting on a pooling of potential across Europe. That is the position of certain southern and Nordic countries.

What is most advantageous for France's ports: dominance of the French approach or eventual adoption by France of another logic?

In both cases, the ports will come out ahead. Given the difficulties intrinsic to carrying and storing hydrogen, which is a low-density gas whose handling is highly demanding (as is the case for all fuels) and which requires specific grades of steel, the development of its production and consumption in France will have to involve short, low-cost distribution channels. At that point we will see the development of regional industrial ecosystems centred on hydrogen and its derivatives in which ports will be key participants. And if France abandons self-sufficiency, the ports will have just as essential a role as an interface in facilitating imports of large volumes of hydrogen at the lowest possible cost, thus encouraging the appearance of mass-transport value chains.

"59 countries have a development strategy for low-carbon or renewable hydrogen."

A deposit that changes everything IN LORRAINE?

Mikaa Blugeon-Mered has given us his opinion on the geological deposit of hydrogen recently discovered in France's Lorraine region: *"The talk is of production capacity that would make France self-sufficient in hydrogen for the next 45 years! If confirmed, France could decarbonise its industries and become an exporter, which would completely change its economic and geopolitical position on this market. The energy transition's Holy Grail, in a way. But we need to be careful here: we do not have exact information on the characteristics of the gas discovered, and specifically its purity and capacity for renewal. I also doubt that it will be possible to exploit the deposit at low cost for decades to come. Especially as deep drilling will be necessary, which will raise issues of social acceptability."*

PRO-DUCTION

Ports: melting pots for new forms of energy

AS POINTS OF ENTRY AND PRODUCTION SITES FOR ENERGY, PORTS HAVE A FUNDAMENTAL ROLE TO PLAY IN DECARBONISATION. THEY NEED TO ANTICIPATE MAJOR RADICAL CHANGES, ESPECIALLY THE DEVELOPMENT OF NEW FUELS, IN ORDER TO DESIGN A NEW PORT ECOSYSTEM, WORKING WITH INDUSTRIAL AND REGIONAL ACTORS.

Kris DANARADJOU

"The energy transportation network has been structured around ports, and the network for decarbonising energy will also be structured around ports." In the view of Kris Danaradjou, the future for energy is being created in port industrial zones. After the "fossil fuel" era that began in the 1950s with the arrival of oil tankers, the installation of refineries and fuel-burning power plants, plus distribution infrastructure and industrial sectors based around crude oil, the port is now undertaking a fundamental transformation where energy is concerned. As Kris Danaradjou explains: *"In port industrial zones we have available every form of utility network — electricity, oil pipelines, gas pipelines — plus maritime and river transport infrastructure. That is why it is here that the ecosystem must be transformed."* Put more simply, given that France must follow an ambitious roadmap for decarbonisation (see sidebar), industries operating in port industrial zones, the main sources of CO_2 emissions, have undertaken this approach in order to radically change their industrial processes.

PORTS ON THE ROAD TO DECARBONISATION

The actors in port industrial zones are using three tools to succeed in this: improvement of industrial plant energy efficiency, implementation of CO_2 capture solutions (*see sidebar*) and development of

Kris DANARADJOU has been deputy general manager of HAROPA PORT since 2021. Most notably, he is charged with leading development projects and liaising with local government.

decarbonised fuels. A wide-reaching programme! Where the deployment of new fuels is concerned, port complexes like HAROPA PORT play a central role. As developers of their port industrial zones, they need to understand what tomorrow's requirements will be, anticipate them and add to the port ecosystem by attracting the industries essential to developing the future fuels. They must also facilitate synergy between the various actors to ensure that they research and implement common solutions. And lastly, the aim must be to change port infrastructure to meet future needs, especially for the storage of new fuels and bunkering.

ADDING TO THE PORT ECOSYSTEM

The primary task: to target the industries necessary to the development and exploitation of new raw materials by making strategic locations available to them.

In Gennevilliers for example, HAROPA PORT is host to a methanisation plant to be run by Paprec between the local waste collection facility and the river port. When it comes on stream in 2025, this plant will be capable of recycling up to 50,000 tonnes of waste to produce 30,000 MWh of biomethane and 43,000 tonnes of digestate. The biomethane will fuel local buses and the digestate, after being taken to storage sites on the river, will go to agriculture for use as fertiliser.

Similarly, in Grand-Couronne, Saipol, a company specialising in processing oilseeds to make biofuel, recycles waste from grain carriers going through the port of Rouen.

If it is to underpin the production of decarbonised fuels, the port must also assist the development of green electricity. *"By freeing up and developing 36 hectares in Le Havre to accommodate the arrival of Siemens Gamesa's biggest manufacturing plant for wind turbine blades and nacelles, we are directly supporting regional offshore windfarm projects and the production of green electricity that can be used to*

"Tomorrow, the port must become an effective hub for decarbonised forms of energy."

Kris DANARADJOU

Port decarbonisation: THE LEGISLATIVE ROADMAP

Port industrial zones are obliged to limit their CO_2 emissions in order to comply with national and EU decarbonisation targets:

— The target for 100% decarbonisation of transport by 2050 under the Paris Agreement and the National Low-Carbon Strategy.

— A reduction of at least 55% in greenhouse gas emissions by 2030, including a decarbonisation obligation for ports, as part of the EU «Fit for 55 « package.

— A reduction of ships' greenhouse gas emissions: from 2% by 2025 to 80% by 2050, as laid down in the FuelEU Maritime regulation passed by the European Parliament in October 2022.

make new fuels", Kris Danaradjou explains, adding that *"tomorrow, the port must become an effective hub for decarbonised forms of energy."*

FACILITATING SYNERGY

A second core task for ports: their central role in the ecosystem formed by the port industrial zones allows them to orchestrate synergies between industrial firms, local authorities and central government for projects that further the production of new fuels.
For example, in connection with the call for Grand Canal projects issued by HAROPA PORT, ENGIE is partnering shipping line CMA CGM and the Air France KLM group to create in Le Havre the first industrial-scale facility for renewable, low-carbon fuels. This dual project – Salamandre and KerEAUzen – involves producing second-generation biomethane for maritime transport and e-kerosene for air transport (*see page 19*).
Looking beyond this, the formation of the "Socrate" association brings together HAROPA PORT and three associations of industrial firms around a wide-ranging decarbonisation studies project (*see page 32*).

MAKING CHANGES TO PORT INFRASTRUCTURE

And lastly, to help in the development of the new fuels, ports need to rethink their infrastructure. As Kris Danaradjou explains: *"The need is to put in place storage areas and bunkering processes that comply with regulations, especially for hydrogen and ammonia, fuels that require highly specific safety conditions".* He adds: *"As long ago as 2014 we took into account the risks associated with LNG bunkering in local port regulations and trained our staff to ensure safe bunkering." This is a major issue for ports. "In the future, the bunkering services for new fuels will tip the balance in shipping lines' decisions on routing their vessel rotations. This will also be true of industrial companies wishing to invest in carbon capture and open to the possibilities offered by ports in this domain: decarbonisation is a genuine challenge, but it is equally an opportunity for maintaining effective competition with the major global ports."*

Seine Axis
CARBON CAPTURE

Having been selected following the ZIBac (Zones industrielles bas carbone – low-carbon industrial zones) call for projects, the Seine Axis is the beneficiary of a high level of support from central government for the funding of carbon capture studies. That support underpins the efforts made since 2021 by an industrial consortium comprising Total, Exxon Mobil, Yara, Boréalis and Air Liquide, and focused on capturing CO_2 along the Seine Axis in Normandy. The logistics for the capture, liquefaction and transfer of carbon to underground disposal sites: the industrial firms, local government and HAROPA PORT are setting out here to create France's first CO_2 liquefaction hub. The goal to be achieved by 2030? A cut of three million tonnes in yearly carbon emissions.

The Seine Axis, low-carbon hydrogen valley

THIS IS A NEW AND MAJOR PROJECT FOR THE DECARBONISATION OF THE SEINE AXIS: VERSO ENERGY, A COMPANY SPECIALISING IN RENEWABLE ENERGY, IS INVESTING €500 MILLION TO SET UP AT THE PORT OF ROUEN A PRODUCTION FACILITY FOR LOW-CARBON HYDROGEN AND SYNTHETIC FUELS. THE SITE WILL COVER NEARLY NINE HECTARES AND IS EXPECTED TO COME ON STREAM IN 2029.

The future installation will be capable of producing hydrogen using water electrolysis and should achieve a capacity of 350MW, or an annual volume of over 50,000 tonnes of hydrogen. The site will also produce synthetic fuels by processing captured CO_2. It offers an opportunity for the local region given that it will generate a total of 400 jobs, including 150 direct posts.

NEW SYNERGIES BETWEEN INDUSTRIAL FIRMS

The new production plant based in Grand-Quevilly will be strategically important for HAROPA PORT and the entire port community. It is totally aligned with the dynamic driving the decarbonisation of industrial activities and will generate synergy between the companies that use the hydrogen for a range of applications: freight handling, maritime and waterway transport, road haulage and rail transport. *"Rouen is a particularly favourable location for a project of this kind, given the central position of*

Hervé Morin,
Chair of Normandy Regional Authority

"Normandy shows itself to be a pioneer"

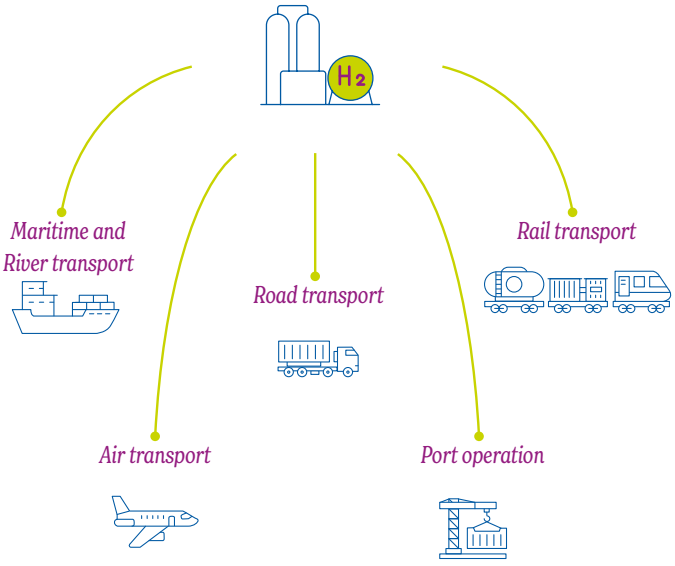
"In France, Normandy Regional Authority has shown itself to be a pioneer in the development of new uses for hydrogen. *As an industrial region in the first rank, comprising sectors of great importance such as logistics and ports, as well as an energy mix among the most diversified in France, Normandy enjoys exceptional advantages for the development of what is an energy source of the future. The VERSO ENERGY project is absolutely a contribution to achieving the Regional Authority's ambitions for the industrial development of Normandy and comes as one more in a long series of industrial investments on the Seine Axis, the favoured location of the leading national port complex"*

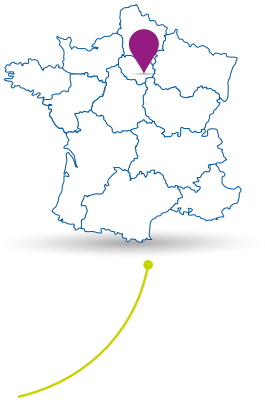
its port industrial zone along the Seine Axis and its connections to the Trapil network for fuel delivery to end-consumers," Antoine Huard, CEO of VERSO ENERGY points out, adding: *"We are pleased to be able to work with HAROPA PORT in driving this project, resolutely determined as we are to contribute to the reindustrialisation of the country and the decarbonisation of our economy."* As for the port, the selection of the Seine Axis is a source of satisfaction. Stéphane Raison, CEO of HAROPA PORT declares: *"We are proud to host the future production plant for decarbonised hydrogen proposed by VERSO ENERGY on Rouen port land."*

The agreement signed on 22 November last between VERSO ENERGY and HAROPA PORT sets a start date for the construction work in 2026, once the necessary official permits have been obtained, and entry into service is scheduled for 2029. Stéphane Raison adds: *"This major project comes as confirmation that the Seine Axis is the new-fuels, new-mobility valley."*

Ports, high-potential H_2 ecosystems

Production and distribution of H_2 and e-fuels from low-carbon electricity





Grandpuits: from petroleum ... to biofuel

TotalEnergies' Grandpuits plant in France's Seine-et-Marne area is currently transitioning to become a "zero petroleum" facility and is equipping itself with a plant to produce biofuels for aviation.

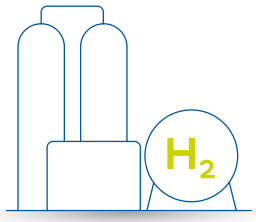
Under construction since late August 2023, this biorefinery will, beginning in 2024, process waste cooking oils and animal fats into Sustainable Aviation Fuel (SAF). Based on a partnership with Saria, a German specialist in SAF production, the facility will be capable of producing 210,000 tonnes of sustainable fuel for aircraft from 2025 on. The animal fats will be imported from EU countries and the waste cooking oils will be supplemented by plant oils such as rapeseed.

When mixed with kerosene, the resulting biofuel should make it possible to cut carbon emissions by 50% compared with the equivalent 100% fossil fuel: Bernard Pinatel, CEO of TotalEnergies' Refinery/Chemicals division, considers it to be "the most effective solution for an immediate reduction in air transport's CO_2 emissions." The biofuel will be stored at the Gargenville oil depot in the Yvelines area and will notably supply the airports in Paris.

"Greening" Normandy's hydrogen

Air Liquide has reached a new milestone in its development of hydrogen with the construction of a high-capacity electrolyser on its Port-Jérôme-sur-Seine site near Le Havre. This project, under the name "Air Liquide Normand'Hy", will be able from 2026 to supply renewable and low-carbon hydrogen to TotalEnergies' Gonfreville refinery, industrial firms in the area and the emerging low-carbon mobility sector.

This will definitely be a high-profile facility! In 2026, the Seine Axis will be welcoming one of the world's biggest proton exchange membrane (PEM) electrolysers with a capacity of 200MW. Its construction, calling for investment of over €400m, is a notable outcome of an agreement signed between Air Liquide and TotalEnergies in the summer of 2023, in addition to other agreements still being negotiated. It means that Air Liquide will be delivering half of the renewable, low-carbon hydrogen it produces to the TotalEnergies refinery in Gonfreville. As for the petroleum group, it is committed to supplying Air Liquide with electricity from renewable sources, solar and wind, up to 100MW, a level corresponding to the hydrogen delivered to its refinery. For the rest, Air Liquide intends to call upon other suppliers of renewable energy, plus supplemental low-carbon energy from France's electricity grid.



28,000 tonnes of green hydrogen

On a wider front, the Air Liquide Normand'Hy project will help in decarbonising the Port-Jérôme-sur-Seine port industrial zone. This is so because the other half of the hydrogen produced will go to industry and the mobility sector.

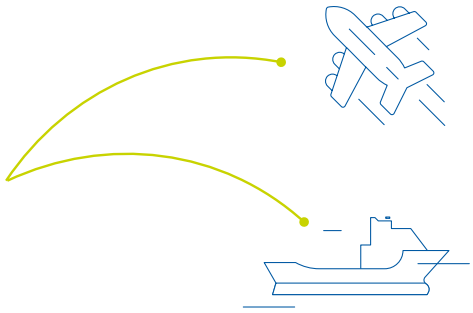
By supplying around 28,000 tonnes of renewable, low-carbon hydrogen a year to replace "grey" hydrogen from hydrocarbons, this facility will make it possible to avoid up to 250,000 tonnes of CO_2 emissions every year. With support of €190m from central government, this project will be an addition to Air Liquide's local system of hydrogen supply.

Stéphane VIALET,
Energy Transition projects director for Air Liquide - Southwest Europe

"Collective action"

"The memorandum of agreement signed last summer with TotalEnergies is an illustration of our ability to propose concrete solutions *for decarbonisation to our customers while at the same maintaining the decarbonisation trajectory for our own installations. Collective action across the same geographical area is a major advantage for meeting the challenge of carbon net zero that many industrial companies such as ourselves are seeking to meet."*

ENGIE invests in supply to sea and air transport



Following its selection in the call for "Grand Canal" projects issued by HAROPA PORT, ENGIE will be using a 24-hectare plot in Le Havre to develop a plant to produce low-carbon fuels. Two projects are to become reality: Salamandre, for supply to sea transport, and France KerEAUzen, for air transport.

"Salamandre" and "France KerEAUzen": interest in these two ENGIE projects is unlikely to fade any time soon! And for good reason: on a 24-hectare plot on Le Havre's Grand Canal, formerly occupied by Lafarge, what is being created is an entire industrial sector centred on new fuels.

The first of these projects is Salamandre, which brings together ENGIE and shipping line CMA CGM to build a production plant for renewable gas to supply maritime transport. It is aimed at annual production of 11,000 tonnes of renewable, low-carbon gas using dry biomass from local waste wood supply chains and refuse-derived fuel (RFD). As Liquefied Natural Gas (LNG), this green fuel will power CMA CGM container ships. The Salamandre project should reach completion by the end of 2024 with the construction of the plant, which is scheduled to come on stream in 2027. The goal? To avoid the emission of 60,000 tonnes of CO_2 every year by replacing natural gas from fossil sources with a green fuel.

70,000 tonnes of e-kerosene annually

Based on a partnership between ENGIE and the Air France-KLM group, the "France KerEAUzen" project is directed at establishing an e-kerosene production plant by 2030.

The fuel will be obtained from CO_2 — from the Salamandre facility and other industrial sites — and green hydrogen produced by an electrolyser with around 250MW capacity. The declared goal: an annual 70,000 tonnes of e-kerosene! The site will then be recycling 270,000 tonnes of CO_2 from industrial sources. In addition to SAF (Sustainable Aviation Fuel) delivered by pipeline to Roissy-Charles de Gaulle and Orly airports in Paris, this facility is also intended to supply renewable hydrogen for industrial operations in the port industrial zone. Use of captured CO_2, supplies of decarbonised hydrogen: France KerEAUzen will provide solutions to underpin the decarbonisation of industry at the port of Le Havre.

200,000

TONNES OF RENEWABLE GAS BY 2028: this is the annual global production target of ENGIE and the CMA CGM group under their partnership signed at the end of 2021.

UTILI-SATION

Decarbonisation of sea and river transport - WHAT ARE THE SOLUTIONS?

Antonis MICHAIL is the technical director for IAPH (International Association of Ports and Harbors) and its World Ports Sustainability Program (WPSP). He coordinates work on the climate, energy and data cooperation.

MARITIME TRANSPORT ACCOUNTS FOR BETWEEN 3% AND 4% OF GLOBAL GREENHOUSE GAS EMISSIONS. DESPITE BEING A VIRTUOUS REPLACEMENT FOR ROAD HAULAGE, RIVER TRANSPORT NEVERTHELESS GENERATES AN ENVIRONMENTAL FOOTPRINT. HOW CAN BOTH BE DECARBONISED? THE LATEST UPDATE FROM ANTONIS MICHAIL.

Why is it important to decarbonise maritime and river transport?

Today, the reality of climate change is no longer challenged and the emissions from maritime transport must bear their share of responsibility for it. For the planet and for us, we need to decarbonise, but each sector needs to play its part. According to the strategy of the International Maritime Organisation (IMO), we must decarbonise completely by 2050 at the latest if we are to keep global warming to no more than 1.5°C between now and the end of the century. This is all the more imperative because all forecasts point to a rapid expansion of maritime traffic in coming years. There is an urgent need for action because everything takes time to implement, and we are only at the beginning of the process.

Other than fuel, what measures can be useful?

In addition to reducing navigation speeds and efforts by engineers to adapt vessel configurations, incentive programmes are being conducted, such as the implementation of ESI, the Environmental Ship Index. This measures the footprint of merchant vessels to allow ports to reward those that improve. Additionally, under COP26, 24 countries have undertaken to speed up the development of green maritime corridors. Still in their trial phase, these routes link ports with

cargo ships running on forms of zero-emissions energy and which can be developed on a large scale hand in hand with appropriate landside facilities. The IAPH supports this concept. It is an effective way of bringing together the stakeholders along a given route and trying out new approaches. At a later stage, a framework will be necessary to define "successful" green corridors in order to ensure progress and transferability at the global level. If the decarbonisation of maritime transport is to be accelerated, cooperation will be required across the entire value chain between ports, shipping lines, energy producers, shippers and regulators.

"River craft are likely to be the fastest to decarbonise using solutions that are easier to implement in terms of technical requirements, as well as local regulations."

What about wind-driven transport?

Wind propulsion is welcome, of course. After all, sailing has been tried and tested for centuries for carrying goods and generates no emissions. There are actors in the sector who are turning to solutions of this type using new, highly efficient technologies.

Are new fuels ready in this sector? Under what conditions can they be rolled out?

We at the IAPH want to be able to offer shipowners a wide range of alternative fuels. To do so, we are working with standards agencies, industry associations, classification societies, petroleum groups, terminals and bunkering firms. The role of hydrogen and its derivatives will be important but there are issues to be addressed: volume, toxicity, operating range, among others. It is probably better suited to river rather than sea transport. Methanol can be seen as a potential alternative fuel for the maritime sector. When produced using sustainable hydrogen and biogenic CO_2, either biogenic or captured directly from the air, it is a carbon-neutral fuel.

The Seine Axis steps UP TO THE MARK

The Sogestran group has announced that its hydrogen-powered self-propelled barge, ZULU06, will be ready for navigation in the spring of 2024. There are five other ZULU barges now operating on the Seine, on the Rhône and in Belgium between Brussels and Antwerp. They are equipped with a crane that makes them "self-unloading" barges and they need no quayside facilities to operate, which ensures that operations are seamless.
Another initiative has come from SOGEPP (Société de gestion de produits pétroliers / petroleum products management company), which is investing in the river transportation of biofuels. Based at Gennevilliers port, the facility, which supplies service stations across the Paris and neighbouring regions, is planning for throughput of 20,000 tonnes over the next few years.

Shipowners AT THE FOREFRONT

CMA CGM, a global player in maritime, land, air and logistics solutions, is counting on new decarbonised forms of energy (biogas, biomethanol and e-fuels) to fulfil its promise of carbon neutrality by 2059 across all Group activities. As Christine Cabau-Woehrel, executive vice-president for corporate assets and operations, clarifies: *"by 2027, we will have 95 vessels capable of running on biomethane and e-methane, and 24 ships able to use biomethanol and e-methanol in our fleet." Alongside this, R&D is looking at solutions for the future, and she adds: "I would put ammonia, onboard carbon capture and indeed hydrogen into that category. I am convinced that the decarbonisation of shipping can only be based on a number of energy solutions."* In addition, the signing of the partnership between CMA CGM and Maersk positions the two sector leaders as pioneers in the energy transition of maritime transport, convinced as they are of the benefits of common action for faster progress. She does add however that *"the form of energy is only part of the solution and so-called "energy sobriety" measures, the ergonomics of our ships and AI-assisted routing solutions, which relate to operational efficiency, are major sources of savings in consumption and therefore of reductions in carbon emissions."*

Ammonia is also a possible solution: early in 2024, the first engines will be ready for installation on new vessels. The fuel of the future will generate zero emissions from production to consumption, but I doubt that there will be just one – it will be a mix. In order to take advantage of green fuels, the infrastructure must be rethought. The IMO's port resolution specifically encourages the optimisation of port calls with services to provide landside electrical power and totally safe bunkering for these fuels. Additionally, it calls for cooperation between all concerned to address the fuel supply issue from every angle: law, regulations and infrastructure. Lastly, we must establish global standards for digital information to promote reliable ship-land data exchange. Data from sensors can help us optimise fuel consumption in real time and improve schedule management. We must make every possible effort to assist ports in accommodating vessels that run on these fuels.

What progress has actually been made where use is concerned?

The major shippers are looking more closely at their procurement and transportation chains in order to cut their emissions. Some have practical demands – and even time-driven improvement targets – that they impose on their carriers. Fuel manufacturers are also doing preparatory work, but the problem is how to move up in scale and ensure that these fuels are genuinely carbon-free from a life cycle analysis standpoint, like green methanol, for example. There are more and more pilot projects: hydrogen trials are ongoing in Rotterdam in the Netherlands, Antwerp in Belgium, Falkland in New Zealand, and Amsterdam with Neo Orbis, where the world's first ship powered by solid hydrogen is due to enter service in 2024. We will see which will be the new standard. River craft are likely to be the fastest to decarbonise using solutions that are easier to implement in terms of technical requirements, as well as local regulations. Conversely, there are specific safety issues where access to city centres is concerned, for example. In order to ensure that low-emissions products have a chance of success, a carbon price must be set in order to refocus investor interest. Today, we have stabilised the increase in carbon growth, but we need to reduce it to the point of decarbonisation, especially given that traffic is expanding. All actors are more or less aligned on the principle, but the challenge is the speed at which we will reach the goal.

"E-molecules" for industry decarbonisation

RECOURSE TO E-MOLECULES BY INDUSTRIAL FIRMS ALLOWS TWO ISSUES TO BE ADDRESSED. THEY CAN BE USED AS INPUT MATERIALS TO DECARBONISE THEIR PROCESSES AND/OR PRODUCTS, OR AS ENERGY INPUTS. BUT THERE REMAINS ONE UNKNOWN FACTOR: HOW MUCH OF THE "GREEN", OR LOW-CARBON ELECTRICITY NEEDED FOR THEIR PRODUCTION WILL BE AVAILABLE IN THE YEARS TO COME.

Faced with French and EU regulations that set a goal for the decarbonisation of production, industry is looking closely at the possible use of decarbonised molecules for processes whose direct electrification is impossible and which will therefore call for indirect electrification.

"The Yara group is looking to decarbonise 30% of its ammonia production by 2030."

Nicolas BROUTIN

The first of these is low-carbon electrolytic hydrogen, "e-H_2", initially used to replace hydrogen from fossil sources, in particular for industrial and mobility applications (*cf. Air Liquide Normand'Hy p. 18*). Industrial firms are also looking at new uses of hydrogen for the indirect electrification of their processes. A typical instance: the production of "green" steel by replacing the blast furnace (which burns coal) with direct reduction of the iron ore using "e-H2". Other examples: the replacement of natural gas in industries that use high-temperature processes: chemicals, glass, cement, among others.

Two other e-molecules are also of interest to industry: e-methanol and e-ammonia. HAROPA PORT's industrial environment manager Aymeric Vincent explains: *"E-methanol is mature because we have mastered methanolation, which uses hydrogen and CO_2. This replaces methanol of fossil origin as an input material for manufacturing solvents, varnishes, paints, and for producing the ethylene and propylene used to make plastics."* He goes on to add: *"as for e-ammonia, this can also be used as both an energy input and a material input, most notably in the production of fertiliser."*

Where Yara France is concerned, ammonia is a

base material for the manufacture of nitrogen fertilisers, specifically ammonium nitrate and urea. The use of e-ammonia is an important resource for decarbonising plant nutrition and therefore agricultural production. E-ammonia is also suitable for use as a vector for energy storage and transport. This means that it could be used directly in maritime fuel applications and electrical production or possibly cracked for the local production and distribution of hydrogen. "Production of decarbonised ammonia will lead to substantial reductions of 80% to 90% in the carbon footprint of mineral nitrogen fertilisers", explains Nicolas Broutin, president of Yara France. "In practice, this means that a farmer using this fertiliser will be able to shrink the carbon footprint of the harvest by 10-30% with no loss of yield. Globally, the Yara group is looking to decarbonise 30% of its ammonia production by 2030, and to achieve climate neutrality by 2050."

Christophe LE SAUSSE,
manager of process projects at Chevron Oronite

"There are numerous local requirements for base materials"

"In order to minimise the need to store CO_2, its use as a base material must be considered. One of the first components of industrial chemical production is methanol synthesised from CO_2 and hydrogen. The issue for the chemicals sector is an assessment of whether CO_2 chemistry would allow local synthesis of more complex molecules and thereby a reconfiguration of the industrial chemicals sector. This is so because there are numerous and diverse local requirements for base materials. Whether more complex molecules can be made is not only an important question for technology, ***but it can also provide a response to a range of needs of industrial firms along the Seine Axis.*** *In addition, we should not forget that the use of CO_2 is possible in the inorganic chemicals sector, most notably to meet the requirements of cement producers, as well as for biochemicals,"*

"The development of such sectors is dependent on three parameters: resources, needs and infrastructure."

Aymeric VINCENT

A SECTOR DEPENDENT ON ELECTRICITY PRODUCTION

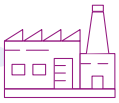
It still remains necessary to ensure large-scale production of these molecules... On consideration, it can be seen that sector building will depend on scenarios that include a number of unknown factors. *"The development of such sectors is dependent on three parameters: resources, needs and infrastructure"* explains Aymeric Vincent: *"the infrastructure is available in port industrial zones: the lines to carry the water, hydrogen, CO_2 and electricity. Needs are looked at using scenarios, assuming for example increases or decreases in requirements for plastics, solvents, lubricants that impact demand for e-molecules. As for the resources, we are dependent on public policies on the development of renewable energy and nuclear power: production of the low-carbon hydrogen providing these molecules requires enormous quantities of electricity."* Imports of hydrogen and its derivatives can also be envisaged (*cf. Mikaa Blugeon-Mered article, p. 10*).

SYNERGIES AROUND AMBITIOUS PROJECTS

In order to design such scenarios, industrial firms are joining major projects and working in synergy with others, notably energy sector actors. The objective? To come up with effective ecosystems centred on the production and consumption of these products. This is the case for the SOCRATE non-profit association on the Seine Axis (*cf p 32*). Other projects led by energy producers are looking to make available decarbonised forms of energy in the medium term: green hydrogen in the case of Air Liquide in Le Havre (*Normand'Hy cf. p18*). Aymeric Vincent concludes: *"central government is providing massive support for these initiatives because, in addition to the environmental questions, these are issues that impact our energy and industrial sovereignty."*

CO_2 capture: a molecule's itinerary

1 Capture



In industry
The CO_2 is captured from plant fumes or during combustion using various technologies

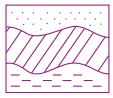
By air suction
Large fans with filters or chemicals draw in ambient air

2 Transport

After liquification to take up less space, the CO_2 is transferred to a nearby storage or valorization facility.

3 Valorization or Storage

The molecule is then used as a base material. Once processed into fuels, plastics, fertilisers or medical drugs, it can continue its existence on the earth instead of in the air.



Back to square one for the fossil CO_2, now completely isolated from the atmosphere. It is injected and stored permanently underground.

more info

Source: IFP Énergies nouvelles

Decarbonisation, as seen from the sky

LIKE THE SHIPPING INDUSTRY, AVIATION IS ALSO RESOLUTELY ENGAGED IN THE ECOLOGICAL TRANSITION. AND ONCE AGAIN, DECARBONISATION WILL INEVITABLY INVOLVE NEW FUELS.

Matthieu PIRON

At the present time only 3% of global CO_2 emissions are attributable to the aviation sector. However, air traffic worldwide is likely to continue to increase over the next few decades. Matthieu Piron, speaking for the ADP Group's sustainable development and public affairs department, emphasises that *"given the climate emergency and in order to ensure our industry continues to prosper over the long term, it is imperative to decarbonise. This is the priority for our sector if its ability to grow, or even to operate, is to be maintained."*

AN AMBITIOUS APPROACH

The industry has therefore engaged in a highly proactive approach to reducing its carbon footprint. It is involving all of its stakeholders, both nationally and internationally (*see pages 32-33*). As for its goal, it is particularly ambitious: the achievement of net zero CO_2 emissions by 2050 for the world's air traffic. As Matthieu Piron points out: *"We set out on our sustainable trajectory several years ago, but the vision of the sector is currently changing. Decarbonisation is now seen less as a constraint and more as an opportunity, specifically one that allows airports to convert to operating as energy hubs."*

NEW METHODS AND TECHNOLOGICAL PROGRESS

Nevertheless, airports are not the key to sector decarbonisation because they account for no more than 3%

"Matthieu PIRON is a qualified engineer trained at France's École nationale supérieure d'Arts et Métiers and he holds a specialist master's degree in the management of international projects. He joined the ADP Group in 2014 and became general manager of Hydrogen Airport in 2023."

Matthieu PIRON,
speaking for ADP Group's sustainable development and public affairs department and general manager of Hydrogen Airport

"Hydrogen Airport assists airports in making their transition"

"The first commercial aircraft driven by liquid hydrogen are expected to arrive by 2035, but it is today that airports need to adapt their infrastructure. We – the ADP Group in partnership with Airbus and Air Liquide – have been working on this over the last two years, looking at what adaptive changes are necessary for our Paris airports. These factual considerations and our experience have resulted in "Hydrogen Airport". Created by Air Liquide and the ADP Group, our joint venture proposes a service and engineering offering to assist airports in their transition to hydrogen. ***We have the benefit of Air Liquide's more than 60 years of expertise with hydrogen, especially in its renewable form****, as well as the ADP Group's competence where airport design and operation are concerned. This partnership reflects our shared goal: to prepare for the worldwide deployment of decarbonised aviation."*

of air transport's CO_2 emissions. The primary need is for action with regard to the aircraft, and specifically the emissions due to their fuel consumption.
To limit the latter a new method has emerged: eco-piloting. Matthieu Piron explains that *"under current air traffic rules it is possible only at high altitudes at cruising speed and during shallow, continuous descents, which restricts its impact. On medium-haul flights, it cuts CO_2 by no more than 100kg. Nevertheless, when multiplied by the number of flights, it is not insignificant."* Steps are also being taken on the ground, such as limiting the time aircraft spend taxiing. Another tool for improvement is technological, with the emergence of increasingly less energy-intensive propulsion systems. Matthieu Piron clarifies: *"For the same level of traffic, each fleet renewal equates to a 30% drop in consumption."*

SAF AND LIQUID HYDROGEN

The most promising way forward to decarbonisation is to replace fossil-sourced aviation fuel with decarbonised fuels. Those manufactured from sustainable base materials (Sustainable Aviation Fuels or SAF) can be rolled out most rapidly. They may be biofuels, derived for instance from recycled cooking oils, or synthetic fuels (*for example, the e-kerosene developed by ENGIE and the Air France-KLM group in the France KerEAUzen project – see page 19*), and they can in fact be used without modifications either to an aircraft's engines or to existing logistics chains. But as Matthieu Piron points out: *"they are not produced in sufficient quantities and, more especially, they do not completely eliminate the carbon emissions. If we are to achieve Net Zero by 2050, it is decarbonised liquid hydrogen, the only fuel that discharges no CO_2 when consumed, that is likely to be the most efficient over the medium to long term."* Given that for liquid hydrogen, modifications are in fact necessary to aircraft engines and logistics infrastructure, the sector has already set out to bring about its transition to this new fuel (*see sidebar*). He concludes: *"Alongside this, the French market needs to reach maturity to allow mass production and competitive pricing."*

COO-PERATION

“It’s not easy being a PIONEER!”

Reyer WILL

“Reyer WILL is MAGPIE project manager, international port of Rotterdam”

MAGPIE MEMBERSHIP IS 45 STRONG[1]. FORTY-FIVE EUROPEAN PARTNERS, RESEARCH BODIES, UNIVERSITIES, PORTS, PRIVATE FIRMS AND LOCAL AUTHORITIES, ALL PART OF A COLLABORATIVE EFFORT UNIQUE IN EUROPE. THE GOAL: TO DEVELOP INNOVATIVE TECHNOLOGIES FOR GREENER TRANSPORT TO, FROM AND WITHIN PORTS. AMONG THE AVENUES BEING EXPLORED: NEW FUELS. REYER WILL, THE PROJECT’S LEADER, WHO IS BASED IN ROTTERDAM PORT, EXPLAINS.

If you had to sum up MAGPIE …

It is a crucial project for identifying good practice as well as the obstacles needing to be overcome in order to implement the objectives of the European Green Deal in ports. At a time when the issues surrounding the energy transition are more than ever on the agenda, ports need to adapt rapidly, notably by putting in place supply infrastructure for renewable fuels. MAGPIE is in fact a living laboratory for conducting pilot projects in three areas: the digital transition, connections to the hinterland, and alternative sources of energy. The green port of the future is central to MAGPIE…

Where are we two years on from the creation of MAGPIE?

It is not easy being a pioneer on such topics, of whose issues we are all aware! For that reason, we took the time to develop our own approach and draw up a roadmap. We spread our projects across ten working groups. For example, one is dedicated to maritime and river transport, another to energy needs and supply chains; a third is looking at building a masterplan for green ports. We have now arrived at a mature stage and submitted proposals to the European Union. Now is therefore the time for action and to try out the tools. It was with this in mind that the MAGPIE partners gathered in Le Havre on 27 September 2023 with the aim of discussing the programmes of the working groups and a series of demonstration projects. The aim was also to compare and contrast the trials with the reality of the Seine Axis port ecosystem.

What topics are you working on?

Examples are – in no particular order – issues linked to the production of biofuels, smart energy systems, the port digital twin, the green energy container with autonomous inland navigation, the hybrid shunting locomotive and, of course, all and any innovations directed at increasing the use of green energy.

What about your work on new fuels for the maritime sector?

The fuels of tomorrow must be aligned with the energy transition and must demonstrate their efficiency. On those terms, ammonia, electricity and hydrogen all constitute satisfactory responses. MAGPIE's approach therefore involves imagining and implementing demonstrator projects in the port of Rotterdam capable of providing solutions that take account of the EU's constraints, and are able to be adopted by our partners and the partner Ports. I would add that the volume of international trade continues to increase and we need therefore to undertake radical changes in every domain: green, sustainable fuels, along with digital tools, and much else. The decarbonisation of maritime transport will take more than just a word, it will take a whole range of mutually complementary solutions.

How can ports be decarbonised?

Among the strengths of MAGPIE is that it has ports among its partners: in addition to Rotterdam and HAROPA PORT, I can point to Sines port (Portugal) and Delta Port (Germany). We are working together for example on ammonia bunkering, most notably with regard to safety, in order to make its use feasible in ports. This is a topic that masks major logistics issues. We are at the cutting edge and it is by sharing our knowledge that we can support innovations of these kinds to ensure that other ports can gain inspiration from them. Our strength is that we are working with numerous, qualified experts and partners. It is this collective force that will allow us to publish in the near future a study on the use of ammonia in ports.

Are you satisfied with the progress made in MAGPIE's work?

The innovations are being developed in Rotterdam. If the results are positive, HAROPA PORT, the port of Sines and Delta Port will duplicate the project or projects of their choosing in accordance with their requirements and their home regions. That means that I will be satisfied ... when all the partners engaged with us have found, over the next three years, a constancy of motivation that will allow them to pick up, or even to improve, the MAGPIE project.

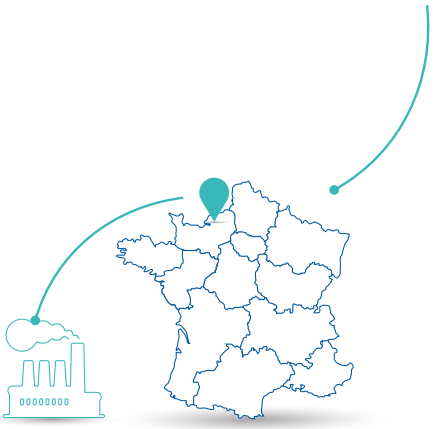
1. sMArt Green Ports as Integrated Efficient multimodal hubs. The project, initiated in 2021, has received funding from the European Union of €25m over five years.
www.magpie-ports.eu

"I believe in this collaboration because, faced with an urgent need, we will always be smarter together", asserts Stéphane Raison, CEO of HAROPA PORT, a founding member of MAGPIE.

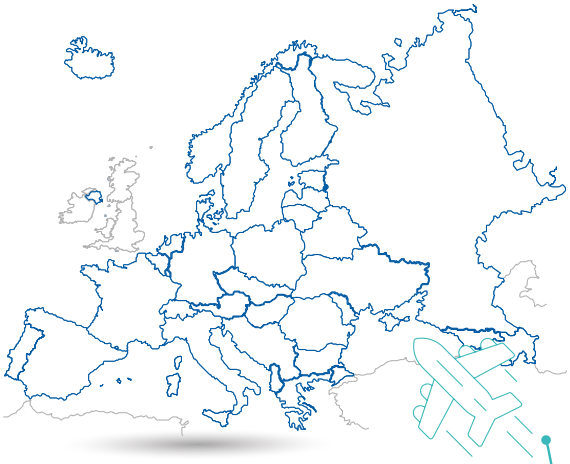
Port and industry united by SOCRATE ...

Set up in May 2023, SOCRATE , a non-profit association, comprises HAROPA PORT and three industry associations: Synerzip-Le Havre, Incase (Industrie Caux Seine) and Upside Boucles de Rouen. Its goal? To define common pathways to carbon neutrality on the Seine Axis by 2050.

The programme of studies is supported by SOCRATE, selected following the call for projects for low-carbon industrial zones (ZiBac). With total funding of €15m, it has a €7.4m grant from central government. Cooperative effort within the non-profit has already led to the definition of a number of pathways, firstly the development of shared distribution networks for power and materials (heat, CO_2, H_2, waste, water, oxygen, etc.) to promote energy efficiency and industrial and regional ecology. Also under consideration are the conditions needed for the emergence of novel sectors such as renewable energy, hydrogen and synthetic fuels, most notably green ammonia, e-SAF and e-methanol.



1. SOCRATE / Synergy for collective, rational organisation of the energy transition on the Seine Axis.



Europe: aviation in action

Fifty-eight European aviation community organisations take up the challenge of decarbonising aviation.

How can airport operations and aviation be rendered carbon neutral? How can intermodality be developed for passengers and freight? What circular economy solutions are possible for aircraft end-of-life? Such challenges for the aviation world have been unanimously addressed by the members of OLGA[2] since October 2021: Virginie Pasquier, OLGA project coordinator and Environment Projects manager for the Paris Airports Group explains: *"representatives from ten countries, we combine our respective skills in order to study and test solutions directed at accelerating the environmental transition in the aviation industry"*. Initial trials are under way: ways of ensuring SAF traceability, conversion of apron vehicles to biodiesel, the circular economy, means of access to airports, hydrogen, and so on. *"We have the same concerns as ports in many cases: our objective is therefore to work more closely with them to maximise benefit from our innovations."* OLGA is subsidised by the European Commission and gives itself five years ... and the means to achieve its goals by bringing together the expertise of 58 partners: airports, airlines, the aircraft construction industry, actors in the world of research and innovative start-ups.

The OLGA project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 101036871.

2. OLGA : hOListic & Green Airports

Ammonia: Japan takes the lead

Safe use of ammonia as a fuel for shipping? Japan leads international practical efforts ...

Imagining container ships powered by ammonia means thinking about safety first and foremost. Use of this chemical compound as a fuel for shipping does indeed raise issues, notably due to its toxicity and its energy density, which is lower than that of conventional fuels. Japanese company Itochu (Tokyo) and seven other enterprises and organisations have begun to address the topic with the autumn 2023 signing of an international memorandum of understanding: the aim is to examine all critical aspects of safe ammonia bunkering of container ships with a view to making this carbon-free fuel one that is both viable and sustainable.

A core focus for this study is the simultaneous execution at container terminals of two categories of operation: firstly, container freight handling and, secondly, ammonia bunkering, which will generally be required if container carriers are to make efficiency gains.

Itochu is breaking new ground in the development of ammonia-powered container ships: in 2022 this Japanese firm obtained approval in principle for the design of the first 200,000-tonne bulk carrier running on ammonia. Based on the studies conducted under the MoU signed this autumn, Itochu is expecting it to come into service in the late 2020s.

This MoU therefore marks a new direction. Firstly, because the aim is genuinely to consider the global use of ammonia, as is demonstrated by the nationalities of the partners, observers and facilitators (see sidebar) involved. This agreement also marks a crucial stage in the development of ships fuelled by ammonia and the construction of an effective global ammonia supply chain.

3. Present in more than 60 countries, Itochu specialises in the import/export of a wide range of goods (textiles, minerals, energy, chemicals, foodstuffs, etc.)

SEINE-ET-MARNE

LOW-CARBON FUELS

AS EARLY AS 2027

As part of its ongoing transition to being a “zero oil” platform, **TotalEnergies’ Grandpuits** site (in the Seine-et-Marne) is in the process of setting up a plant to produce biofuels for aircraft (photomontage).