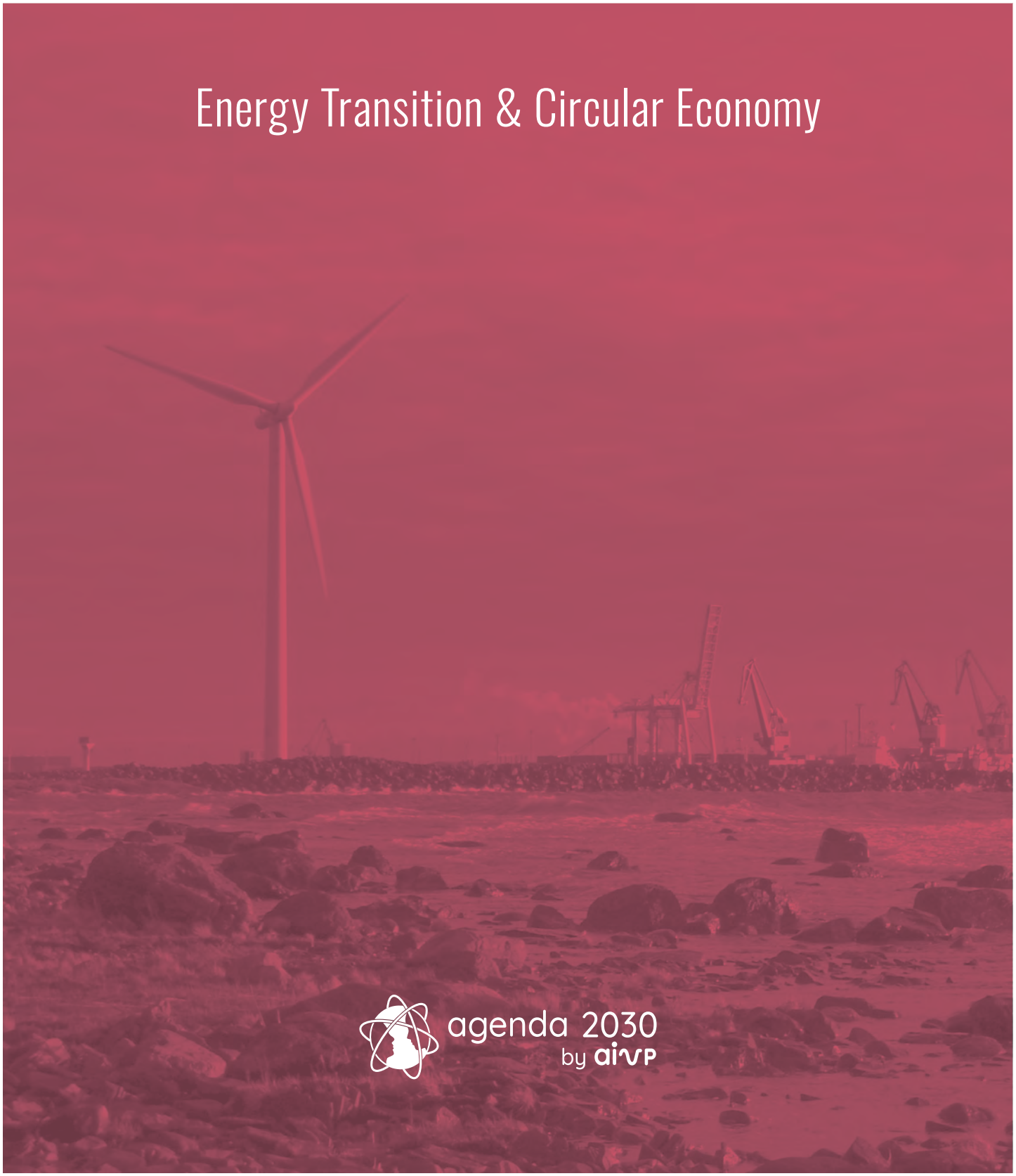
Thematic Dossier

Energy Transition & Circular Economy



agenda 2030
by aivp

For 30 years, AIVP has been accompanying port cities to guide them towards a more resilient, more concerted and more sustainable future.

In 2018, AIVP launched the AIVP 2030 Agenda, the 1st global initiative that adapts the 17 UN Sustainable Development Goals (SDGs) to the specific context of City-Port relations. This document, drawn up jointly with AIVP members at the Quebec Conference, sets 10 objectives for 2030.

In February 2020, AIVP signed an MoU with UN-Habitat to disseminate good practices related to this agenda.

Since September 2020, responding to the interest of our members, we focus in-depth on one Agenda goal per month.

In this seventh dossier we focus on "Energy Transition & Circular Economy". We wish you a fruitful reading!

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What is the AIVP 2030 Agenda?

The Agenda is designed to guide the actions and projects of port city stakeholders to ensure sustainable relations between the city and port. Port cities frequently find themselves in the front line when it comes to the most serious consequences of climate change (submersion, flooding, hurricanes, etc.), but they are also best placed to test innovative solutions in the following ten areas:

1. Adapting To Climate Change
2. Energy Transition And Circular Economy
3. Sustainable Mobility
4. Renewed Governance
5. Investing In The Human Capital Of Port Cities
6. Port Culture And Identity
7. Quality Food For All
8. City Port Interface
9. Health And Quality Of Life
10. Protecting Biodiversity

Discover the **AIVP Agenda 2030**

What is the “Energy Transition & Circular Economy” goal in the AIVP 2030 Agenda?

Making our city port territories central to the energy transiton and circular economy, in real symbiosis with the different local stakeholders:

1. Promoting dialogue and cooperation between socio-economic stakeholders to bring their activities closer together, identify potential synergies and encourage better management of natural resources.
2. Giving priority to circular economy projects as part of new partnerships between the city, port, businesses and civil society, and by supporting the development of port activities aimed at promoting exchanges and/or recycling of materials and energy.
3. Committing the City Port territory to achieving a low carbon, low resources society, through the transformation of industrial production, and the production and management of carbon-neutral, renewable energies.
4. Encouraging the port community to become partners in the generation of clean energy, notably when concessions come up for renewal.

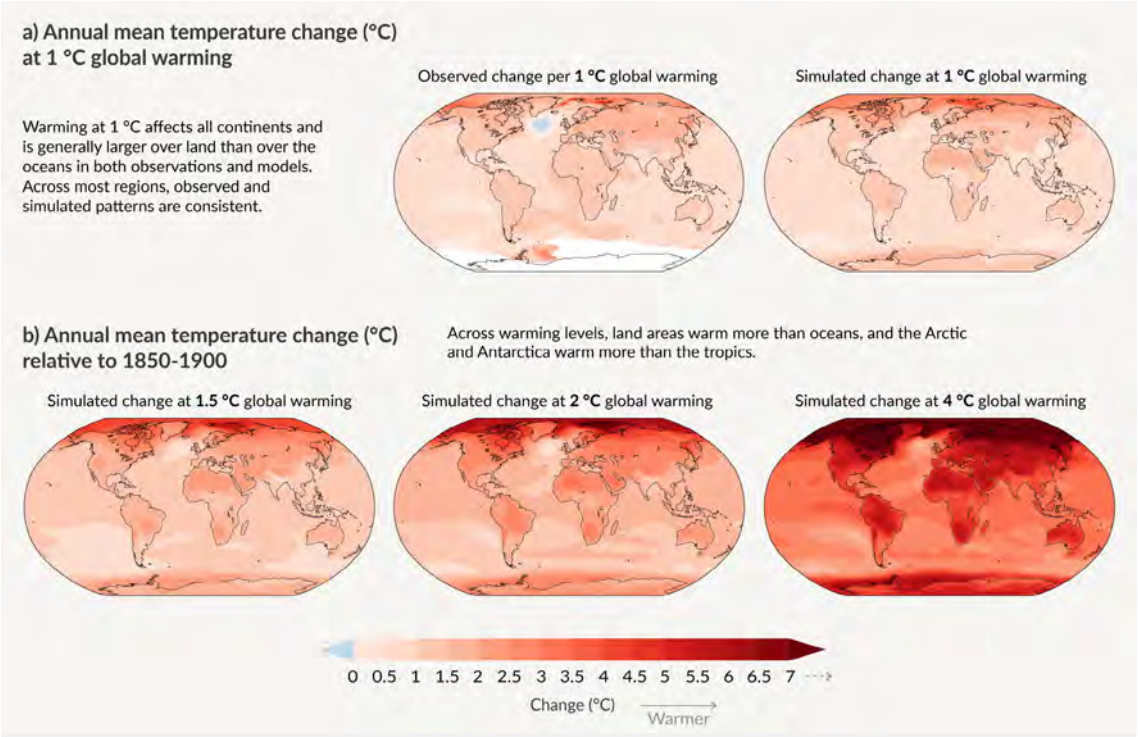
More details on **this goal**

What are the best practices to decarbonise port cities?

AIVP Team

IPCC report: our house is burning

There will be no turning back. This is the conclusion of the latest report published on 9 August 2021 by the IPCC (International Panel on Climate Change). Humanity will not be able to keep global warming below 1.5°C. Have we already failed? Is there nothing more to be done? Once the shock of this announcement has passed, we can try to assess the consequences. "Our house is burning" ... but this time it is not just an metaphor.



IPCC Report: Changes in annual mean surface temperature. With every increment of global warming, changes get larger.

Despite these facts, discouragement shall not prevail. Port cities are at the front line for several reasons. First and foremost because the rise of sea level will specially affect those who live on the seashore, as well as those in river port cities or estuaries. But also, because the vast industrial port areas have contributed to the polluting emissions that are leading us to disaster.

At the same time, we see that port citizens are acting responsibly to limit their carbon impact: port authorities, local stakeholders, civil society, companies, academics, the whole community is engaged. To accelerate the energy transition, inspiring initiatives have been launched everywhere in the world. A whole economic system is changing. Second-hand, recycling, waste valorisation, exchange of flows that were previously lost, capturing pollutants: the circular economy will become the norm tomorrow. Our energy mix is facing many pressures to accelerate the industrial electrification on the one hand, and to be more resource-efficient on the other. Energy saving is the only inexhaustible resource, except perhaps... the human imagination.

Wind energy in port.

AIVP members share their experience

There is indeed so much to imagine. This is why AIVP has given the floor to its members, and experts, but also to external guests, to make an overview of this goal included in its Agenda 2030: "energy transition and circular economy", which is the second after adaptation to climate change.

Maritime transport is responsible for 3 to 4% of global carbon emissions. However, this could quadruple in the next few years. And if we take into account the whole industrial-port supply chain, the impact is huge. In his article, **Olivier Lemaire**, General Manager of **AIVP**, welcomes the new measures taken by the European Commission thanks to the "Fit For 55" green package. But this is also the occasion for him to call for a joint work between cities and ports on this topic, with transparency and inclusiveness.

The port city must be the dynamic centre of innovation: this is essentially what **Paul Tourret**, from **ISEMAR**, told us when we also asked him about the energy transition. Technological progress is not enough, but it can still help considerably. This is the case for alternative fuels, new digital systems, electrification, and batteries.

By meeting **Nuno Araújo**, President of the **Port of Leixoes (Portugal)**, we had a chance to discuss the roadmap he has set for the port: to achieve carbon neutrality by 2035, i.e. fifteen years before the deadline set by the European Commission! To achieve this, we will see that incentives are just as important as regulatory enforcement (if not more so).

As we said, the best energy is the one we don't spend. **Yann Usseglio**, from **Accenta**, demonstrated in his article the extent to which thermal efficiency and "intelligent" facility monitoring can reduce their environmental impact. Better management of our cities of course means better management of our buildings! This is all the more true in port cities, where poorly insulated warehouses fill the horizon.

Because the urban side is so important for decarbonisation, we met **Xavier Moiroux**, from the **Agence d'urbanisme de l'Agglomération Marseillaise (France)**. The Aix-Marseille territory is at the forefront on various subjects such as LNG, onshore power supply or even on flows exchange. A real port-city cooperation has been established for this purpose and the recent urban developments are greener than ever.

The whole chain must be taken into account when it comes to decarbonising. It is not only ships or factories which pollute, but also the vehicles servicing them. The contribution of **Vincenzo Giordano**, from **Engie Impact**, is very valuable as he explains the challenge represented by the electrification of the vehicles of the Port of Los Angeles - Long Beach (USA) and the change of model towards a fleet "as a service".

It is a real achievement to have highly industrialised areas coexisting with much more natural estuarine and coastal zones. But circular economy allows us to overcome this contradiction. Industrial symbioses, based on the exchange of flows, utilities or services, are a real advantage. This is what **Nicolas Mat**, from the **Piicto** association, was able to explain to us in a fine opinion piece.

AIVP is contributing to the collective effort by promoting worldwide exchange of ideas and good practices.

Enjoy your reading!

“Fit For 55”: AIVP calls on ports and cities to join forces for an efficient and transparent energy transition

Olivier Lemaire

Olivier Lemaire, General Manager of AIVP

AIVP welcomes the “Fit for 55” green package presented last week by the European Commission, in order to drastically reduce the EU’s greenhouse gas emissions (GHG) by 2030.

A new target of 40% of renewable energy has been set for Member States. For AIVP, the development of renewable marine, wind or solar energies on port territories is likely to support this effort. Energy-efficient renovation of buildings will also be fostered by a new European rule: each year, 3% of the public buildings should benefit from such a renovation. As some of its members have made significant progress in this direction, AIVP is calling for this dynamic to be amplified, with the support from mayors and local governments.

Port cities have the potential to become a driving force of the ecological transition in Europe. Cooperation between the stakeholders of port-city territories enables stronger synergies than elsewhere. The port-city is a laboratory in terms of industrial ecology, production of renewable energies or sustainable mobility of goods and people, supported by a high level of intermodality.

Port of Leixões in Portugal © APDL

Moreover, ports cities are part of much wider regional ecosystems and urban-port corridors, which call for wider cooperation at provincial, national and cross-border levels: this is a necessary the condition for a successful ecological transition for European port cities.

The European maritime sector is responsible for approximately 10% of EU emissions from the transport sector: it must therefore play a role in the climate effort. On the other hand, ports act daily to reduce the pollution and nuisances generated for neighbouring cities. The implementation of cold ironing is one of the examples of this collective effort, which must continue to be done in cooperation and sometimes co-funding between cities and port authorities, as it is already happening in some cases. In this respect, AIVP welcomes the new regulation that will soon impose the obligation to offer shore power to ships. Nevertheless, an in-depth coordination at European level is still missing, in order to standardize the connection technology that will be used.

The "Fuel EU maritime initiative" regulation, which concerns the development of alternative fuels in the main European port cities, is a step forward towards greater sustainability. Biofuels, synthetic fuels and electrification are some of the options for reducing the carbon impact of the maritime industry. It is estimated that by 2030, alternative fuels will account for nearly 10% of European marine fuel consumption, and that this figure will increase dramatically by 2050 to 80%, representing the vast majority of marine fuel supply.

None of these technological solutions will be possible without a dialogue with citizens and the active support of cities and local governments.

The investment required for shipping companies is estimated at around 85 billion euros, and the indirect costs for port authorities of this fuel change are estimated by the Commission at 5.7 billion euros.

Beyond the financial aspect, the societal acceptability of the new technologies must also be discussed. The energy transition in port cities requires a change in mentality, both in the vision of fuel consumption and in industrial safety: storing hydrogen or ammonia near urban areas represents a challenge in terms of community protection.

Transparency will be essential if alternative fuels are to be developed: there needs to be consultation with local residents who will be living near industrial facilities, whether for methanol, bio-GNL or other synthetic fuels.

In addition, it will require a large amount of electricity resources to produce hydrogen or biomass to produce bio-GNL: the European Commission considers that, in the future, nearly 5% of the electricity produced in the Union could be devoted to this. By 2030, no less than 18 GWh would be needed to exclusively supply the marine fuel industry, which is the equivalent of about 20 nuclear reactors or more than a thousand offshore wind turbines.

It is necessary to demonstrate to European citizens that the cost-benefit balance of switching to alternative fuels is positive and that it is worth the effort. If this is truly the case, it is in the best interest of shipping companies, ports and local governments to fully engage civil society.

This is what we are trying to achieve as participants in the EU project "MAGPIE" for green, smart and integrated ports. AIVP has taken on the coordination of dissemination and public dialogue for this important consortium from 6 different European countries. Even as an association primarily focused on sharing good practices and knowledge, our commitment must also take place in more concrete projects.

Green, smart and integrated ports – AIVP participates in the European Green Deal

Dialogue institutions like the Port Centers, already established in several European port cities, can play an important role. Other means, such as educational exhibitions or open workshops for associations and citizens, could also be used to encourage citizen participation in the energy transition.

AIVP is at the service of cities and ports who are looking for good practices, such as those included in its "Agenda 2030 for sustainable port cities".

We also extend the invitation to attend our future world conferences and other open events where it will possible to learn more and meet European and international stakeholders for the sustainable development of port cities.

Maritime and port innovation up and running

Paul Tourret

Paul Tourret, Doctor of Geography, Director of ISEMAR (Higher Institute of Maritime Economics), Nantes Saint-Nazaire

Goal 2 of the AIVP Agenda 2030 focuses on the Energy Transition and Circular Economy, this will also be the topic we will discuss for the coming weeks. In this article, expert Paul Tourret explains the role of port cities in the process of changing energy consumption and finding sustainable alternatives.

The combination of environmental pressure and the urgent need to save energy is both a constraint and a stimulus for maritime and port industries. A new cycle of innovation is taking shape. The ships and ports of the future are gradually emerging, although the path ahead remains tricky, with immature technologies and imperfect solutions. Nonetheless, the process of research, testing and operational deployment is moving quickly. In this context, city-ports with their economic and operational maritime transport roles, will be the nerve centres of a dynamic 21st century.

It is plain to see that this is a formidable time for the maritime industries. But not because of the sheer scale reached by sea-going transport with economic globalisation. The *Ever Given* incident in the Suez Canal was a high-profile sign of the importance of maritime trade. What makes this current period formidable is the great cycle of innovation sweeping through the entire maritime ecosystem. In recent years, the technological 21st century has got into gear to revolutionise ships. The trends established in the fifties and sixties, and which saw vessels continue to grow and grow in size over the following decades, now need to change.

The maritime industry is focused on the future, perhaps as never before. There are myriad stakeholders concerned, ranging from shipyards and owners, to classification societies, energy operators, engine constructors, and ports. Each one is working on this new cycle of innovation. Naturally, the change has not come by itself. Generally speaking, maritime transport evolves according to economic demand and regulatory conditions. In the past, ships have changed as a result of disasters and large-scale pollution. Today, that process of evolution is being guided by climate change.

With its emissions of fine particulate matter, certain greenhouse gases (SOx, NOx) due to the use of heavy fuel-oil, or simply CO2 from thermal combustion, maritime transport is the subject of intense environmental attention. It is responsible for 7% of all final consumption of oil and 3% of all CO2 emissions generated by human activity. That is perhaps a marginal proportion, but in one of the sectors with the potential to be transformed most easily. Maritime transport must and will change. Rules laid down by the International Maritime Organization and the European Union are there to guide it. The most ambitious concerns mass decarbonisation over the next half-century.

According to the IMO ship emissions have increased by 10% between 2012 and 2018.

There is one reason for change, however, that must not be ignored: energy savings. The maritime industry knows that oil can become highly expensive (again). It is not unrealistic to imagine that the oil price could return to $100/t in the medium term. An increasingly energy-hungry world has consequences, and so maritime transport must consider more economical means of propulsion. Efficiency is the order of the day, and concerns both air pollution and fuel use.

It is without doubt the biggest advantage of the change. Certain activities are trying to slow the imposition of environmental restrictions, which represent an operational burden. Maritime transport can absorb it, as controlling it has implications for the sector's future profitability. Greener transport can also be more profitable. There is also a more direct reason. Ultimately, it is consumers who will pay if maritime transport becomes more costly. You and me. And since it often represents just 1 to 2% of the price of goods sold, we are already accepting those higher costs right now.

What can we do? Using LNG as a fuel with better properties (low CO2, no fine particulate matter) and no controversy (emissions generated by the extraction process). The use of new fuels (hydrogen, biogas, methanol, ammonia) is possible, but the main issue is that they must be "green", i.e. the processes by which they are produced must not generate pollution. Electricity (batteries) is another option, but as elsewhere only as a hybrid solution. The major innovation, and the most surprising, is the return of sail power, although it is still too early to say whether it can be used on a mass scale.

In Savona, cruises have restarted with green ships running on LNG.
Photo Western Ligurian Sea Port Authority

It is difficult to say what the ships of the future will look like, but they are set to change, even though there are still many problems to be solved, from the availability of fuels and their environmental footprint, to their efficiency as a source of thrust. In addition, it is not just boats that are concerned by the change. Ports are also on the front line. By hosting ships, they are among the prime locations in terms of air pollution, and naturally the public, NGOs and local governments are pressing for change. The city-port needs to be able to breathe more easily.

The commercial port needs to answer a new demand. The first is cold ironing or shore power, to eliminate the pollution generated by ships themselves. The second is the production of the new energy sources that ships will use in the future. As industrial sites, ports will be natural locations for bio-energy production. Maritime cities, already active places with history and traditions, are now key hubs of innovation. Shipyards, ship owners, start-ups, and research centres form an ecosystems focused on the future. The ships and ports of the future are clearly on the agenda.

Port cities are not just tools for urban transformation or vehicles for the service-based economy. They must be the beating heart of innovation. Their public authorities therefore have an important role to play, by deploying solutions to support them (funding, land, governance, lobbying). Port cities are one of the cornerstones in the great changes sweeping through the maritime transport sector.

Port of Leixões (Portugal) : zero emissions by 2035

Interview by José M P Sánchez

President of the APDL, Nuno Araújo

The APDL – Administração dos Portos do Douro, Leixões e Viana do Castelo, SA – is also responsible for the Port of Leixões, Portugal's second largest port by cargo throughput, for the port of Viana do Castelo and the waterways of the Douro River. The port of Leixões is a key economic and logistical engine for the country's northern industrial region. The port territory is in both cases inserted in urban contexts, especially in municipality of Matosinhos and the metropolitan area of Porto. In this interview with President Nuno Araújo, we will learn about APDL's commitment to the energy transition and decarbonization of the port.

The APDL is member of AIVP since 2018

AIVP | *The decarbonization of port activities is one of your priorities and recently you announced an ambitious plan to be the first port with zero emissions by 2035. From what we could see in several communications, this plan will include a Road Map.*

Can you explain us how you are preparing for this challenge and the main motivation and vectors of this strategy?

President of the APDL, Nuno Araújo | The Port of Leixões is surrounded by the city of Matosinhos, under urban pressure. Therefore, it is necessary to find a coexistence model based on the decarbonization of port activities, ensuring that they can continue in the current location and are compatible with the urban context. If we were not able to give a good answer to this challenge it would be a risk to our main mission, which is to serve the north-western peninsular region and its relevant industry hubs. Therefore, it was necessary to advance in the decarbonization of our activity, embracing the energy transition.

Port of Leixões in Portugal © APDL

Port Authorities as leaders

If we use the word sustainability it must be in an honest way that really implies improvements. We must see how our investments contribute to the energy transition, helping us in the decarbonization. This is linked to remaining a competitive port and reducing our environmental footprint is connected to increasing our efficiency in logistical processes. And this has been our main strategy, to achieve positive environmental results, implementing planning, management, and technological solutions, that also contribute to the port and logistic efficiency. We believe port authorities must play a leading and active role, engaging with the port community and finding new partnerships.

Roadmap

The roadmap for the energy transition and decarbonization plan that we are currently developing with the assistance of external experts, has two main sections: diagnosis and action plan. The first one that we have already concluded, makes a global analysis of all our emissions and energy consumption, including the port infrastructure, our equipment, our operations and the road traffic and maritime activities. This diagnosis has been made as a joint effort, consulting with all stakeholders connected to the APDL.

The second part will be the action plan, including concrete measures, and the respective schedule. Here is where the APDL needs to be very active to achieve carbon neutrality by 2035. We are aware this is a very ambitious goal, since it implies anticipating carbon neutrality 15 years compared to other timelines. We know that we need to act on several fronts, leading the port community, changing the type of energy we consume to sustainable sources, developing multimodal logistic solutions in our hinterland, cooperating with the municipalities, efficiently managing the port territory, and reducing the impact of port mobility and operations.

AIVP | *Can you give us some examples of these measures?*

President of the APDL, Nuno Araújo | For example, we constantly look for ways to reduce the time it takes to manage the cargo. Reducing the time we take to handle a container, would also mean direct environmental gains, since the trucks would be less time in port. To do that, we need to simplify the bureaucratic procedures, coordinating with all the public authorities (phytosanitary control, customs, etc.) to find solutions that speed up the handling of cargo.

We are also working in new technology that will allow the digitalization of port activities, helping us to improve the traffic flow, better predict the arrival of cargo, prepare for potential disruptions, and avoid situations that could have repercussions for the city. This will be supported by the first public data centre of the country, that will also facilitate the implementation of other tools such as the digital map so that the truck driver can check the traffic in the port at that moment and the time it will take, allowing him to choose the time that suits him best.

Cooperation with the municipality

One example of the cooperation with the municipality of Matosinhos is the local voluntary carbon market. It is a pilot program from the municipality in collaboration with CEiiA (Centre of Engineering and Product Development) and the Ministry of Environment and Climate Action to encourage citizens and companies to implement behaviours to reduce the carbon footprint. Using the platform AYR, developed by CEiiA (with whom we also collaborate) will be possible to record and convert CO^2 savings into credits, that can be purchased by companies that aim to be carbon neutral, to offset emissions that they cannot eliminate in their activity. The revenue of these credits will contribute to green projects in the municipality, thus creating a circular economy around decarbonization. The APDL saw this as a great opportunity for a partnership and advance in our decarbonization plan.

AIVP | *You also mentioned the area of sustainable mobility, which has been particularly prominent in recent months, showing its importance for the decarbonization of ports and the Port-City relationship.*

Can you briefly explain to us how what kind of measures are you talking in this area and how was the dialogue with the different actors to reach a consensus?

President of the APDL, Nuno Araújo | In the port of Leixões about 1000 to 1500 trucks enter every day, that is about 450 thousand trucks every year, which release a total of 1.189 tons of CO^2 into the atmosphere. We are currently expanding the breakwater and will dredge the rotation basin, allowing a new terminal that will double the capacity of the port. Of course, this cannot mean doubling the number of polluting trucks. So, we decided to prepare several measures to avoid this impact.

View of the port and the city of Matosinhos © APDL

First, we decided in December 2020 to ban the entry of the most polluting trucks, those with designation EURO I, II, III and IV, which will represent a 50% decrease in pollution. This measure includes a 3-year transition period for the trucks registered in our database. This decision was taken in cooperation with the National Association of Public Road Carriers of Goods (ANTRAM), to guarantee a consensus. We had a positive dialogue since they intend to reduce their environmental impact. We signed a protocol to substantially reduce Greenhouse Gas emissions and increase cooperation between both organizations. Part of the agreement is a new working group, which will work during this first period to evaluate its implementation.

Ships docked in the port of Leixões © APDL

Additionally, since reducing the traffic is not enough, we also started to study different alternative solutions for road mobility. We decided to acquire the first electric truck for the port at the beginning of the year to see if it could be a solution and study its limitations. We want to set an example for the sector, as a state institution we are also responsible for promoting new solutions. This electric truck will be a test for our fleet (of 30 to 40 trucks) in charge of pendular movements between our terminals. We will assess its performance and discuss with the manufacturers if there are some limitations and in what way this truck could serve our purposes.

We have also introduced new measures for private vehicles from workers, banning them inside the terminals. In this case, we were addressing a triple problem: an environmental, security, and a port space issue. If there are 1000 vehicles entering the port territory every day and each occupies between 12 and 15 sqm., it means that they are using 15 000 sqm, that could be used for cargo. We started a dialogue with all involved parties, including the companies and unions, to find a solution to eliminate the additional 246 kg of CO^2 emissions they caused. We decided to allow only vehicles that are destined for maintenance operations and establish a shuttle for the port workers, offering a sustainable mobility solution. We also signed a cooperation agreement with all stakeholders to study the pedestrian access, parking areas and other mobility measures.

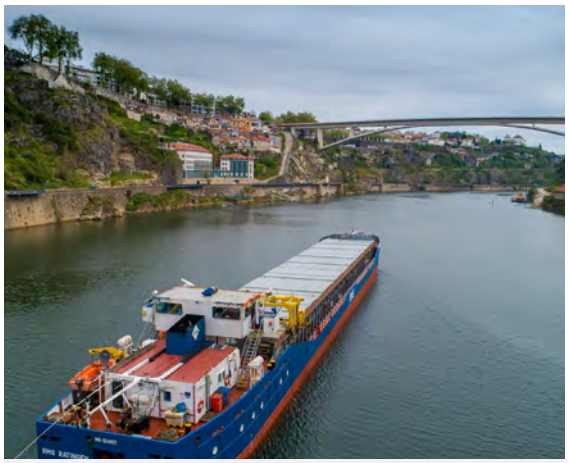
AIVP | *Still related to the issue of mobility and sustainable logistics, you commented that some solutions involve intermodality and better connections with the hinterland. Can you explain these solutions and their impact?*

President of the APDL, Nuno Araújo | The Port of Leixões relies mostly on road transport, that represented not long ago 95% of the goods movement, while the remaining 5% was on rail. To change this, we started several investments with the goal to increase the percentage of cargo and movement by rail, being able to double it in two or three years to 10%. Our goal in the coming years is to double it again.

Some of the actions to improve the rail logistic in our port includes an agreement with another public company to manage the IP road-rail terminal of Leixões that exists within the perimeter of the port, but it is not within the port itself. Currently, it separated by a physical barrier, forcing trucks to travel 18 km. when they are actually very close. This agreement will allow to double the capacity of the terminal, increase its efficiency by simplifying operations and reduce the environmental impact of this activity. Additionally, we are also connected to other key national investments, like the first dry port of Portugal, in Guarda, that will increase our hinterland, while reducing costs, making rail a commercially attractive alternative to trucks.

We also intend to increase the use of the Douro River waterway. Until now the Douro was used mostly for tourism activities, but this will change in the coming years. The reactivation of the mines in Moncorvo, in the interior of the country, will create new logistic demands. Of course, trucks could be an option, but they would generate many externalities, going against our decarbonization goal, and are only a solution for exceptional situations. Rail is a good alternative, but it has some limitations. We want to develop river infrastructure to guarantee a reliable and safe rive logistic service in this case. For this purpose, we are working to receive EU funding of 60 mill. € for two key investments, the widening of the Tua Canal and improving the locks. This would allow that tourism and cargo could coexist in the Douro.

Cruises navigating the Douro River © APDL



Barges in the Douro River, in Porto © APDL

AIVP | *As you mentioned, one of the main challenges is connected to the energy consumption. Can you please explain us what the APDL is doing in this regard? And the innovative project being developed, for example in Viana do Castelo.*

President of the APDL, Nuno Araújo | Despite the benefits of the measures related to limiting the circulation of vehicles, we need to go further, because the main part of the carbon footprint of the port comes from the maritime sector. To really make a difference, the APDL must be able to produce its own energy, research and manage new fuels, and eventually even sell them to the maritime sector. The port authorities must take an active role, being able to change the business to be able to make this environmental change as well.

In this sense, we believe Hydrogen will be the main clean fuel for the future and we are currently discussing future projects. But additionally, we are also working with several innovative companies in Viana do Castelo to produce wind and wave energy. This has been a positive example of cooperation, and we want to replicate in Leixões. But there is a dilemma that we need to solve in the discussion with the citizens and the municipality. For example, if we want to include windmills in the pier will the municipalities be ok with this? Or if we want to install one wave energy production unit in the breakwater of Douro, will they agree? So here is the dilemma, we want to have a green port, but then we also need to be able to produce green energy ourselves. To do that, we need the cooperation of the municipalities. But this is sometimes not easy, since there are concerns from a landscape perspective, that these solutions would not be attractive. We need to define our priorities and be clear, if we want to have a carbon neutral infrastructure, we need to see which are the solutions that are really possible.

Transport of wind turbine blades © APDL

In Viana there are no conflicts of this kind. We, the port and the companies, have been very welcomed by the local actors. The innovation cluster has contributed to the development of the region and have found a good environment to test and develop new solutions. If it is not possible replicate this model in Leixões, we will reinforce our positioning in Viana and try to increase the installed capacity because it can greatly contribute to our decarbonization plan.

AIVP | *Finally, in 2021 the APDL joined the UN Global Compact network, reinforcing its commitment to sustainability and the Sustainable Development Goals. Can you explain us what this affiliation means to the APDL and how you will evaluate its progression in the next years?*

President of the APDL, Nuno Araújo | We are proud be the first Portuguese port to have joined the UN Global Compact Network, contributing with our role, on our own scale, applying the principles of the 2030 Agenda. Joining this initiative will gives us some guidance and help us assess our challenges and our development, following international standards and be more transparent. As I said if we are going to use the term "sustainable" we must be honest about it.

If we really want to be sustainable, we need to look at all our investments and measure them from an environmental perspective. That is why we have oriented all our strategy towards these two great aims, to be greener and more technological. The technology will help us make and accurate assessment, that will in itself also help us to motivate people, motivate teams, motivate our organization, demonstrating we are taking sustainability very seriously. In essence, the goal is being a green smart port, to be more environmentally friendly, more sustainable, and technologically more advanced. With technology as a driver, we will find ways to decrease our environmental footprint even more.

Port cities: catalysts for the global energy transition

Yann Usseglio

Yann Usseglio, Marketing Director in Accenta

The energy transition in port cites doesn't depend only on the ships, how we build and manages our buildings plays a major role, as Yann Usseglio, Marketing Director from Accenta, explains in this article.

Ports and port cities can play a central role in the global energy transition, if they focus their efforts on phasing out the use of fossil fuels for heating and air-conditioning in buildings.

What is meant by "energy transition"?

The energy transition can be a confusing subject, as different people with different interests see it in different ways, and because it has much to do with technologies. However, if we concentrate on the basics, everything becomes clearer.

According to the International Energy Agency, fossil energy sources, i.e. oil, gas, and coal, accounted for 81% of the world's primary energy consumption in 2017. But it is now accepted that the greenhouse gas emissions from burning these fuels are responsible for climate change. At the Paris Climate Summit in 2015, 195 States agreed on the need to limit global warming to an increase of 2°C compared with the pre-industrial age. And even to target an increase of no more than 1.5°C.

To achieve that goal, we need to drastically reduce our use of fossil energy. That is the energy transition. For example, France is aiming to achieve carbon neutrality by 2050, which will mean a sixfold reduction in greenhouse gas emissions between 2015 and 2050.

What uses should be reduced first?

Fossil energy is virtually omnipresent, and we are faced with a hugely important issue that requires us to act quickly and ambitiously. For those reasons, we need to focus our efforts on areas that will yield the biggest results rapidly.

Take the example of France, whose energy consumption profile is typical of many countries in the same latitudes. The transport and building industries account for 32% and 46% of the country's total energy use respectively, a total of 78%. Any ambitious and effective strategy will necessarily mean making significant energy savings in these two sectors.

Havneholmen, housing project in the waterfront of Copenhagen, Rob Deutscher

The strategic importance of adapting buildings

The building sector alone accounts for nearly half of France's national energy consumption, and is therefore the number one priority for the energy transition. In particular, renovating existing buildings. That's why France has introduced the "Tertiary Eco Energy Decree", a piece of legislation designed to put all owners and users of tertiary buildings over 1,000 m² on a trajectory to cutting energy use by 40% by 2030, 50% by 2040, and 60% by 2050, measured against a baseline year no earlier than 2010. And cities have a big part to play in terms of their own existing building stock and the renovation projects undertaken in their territory.

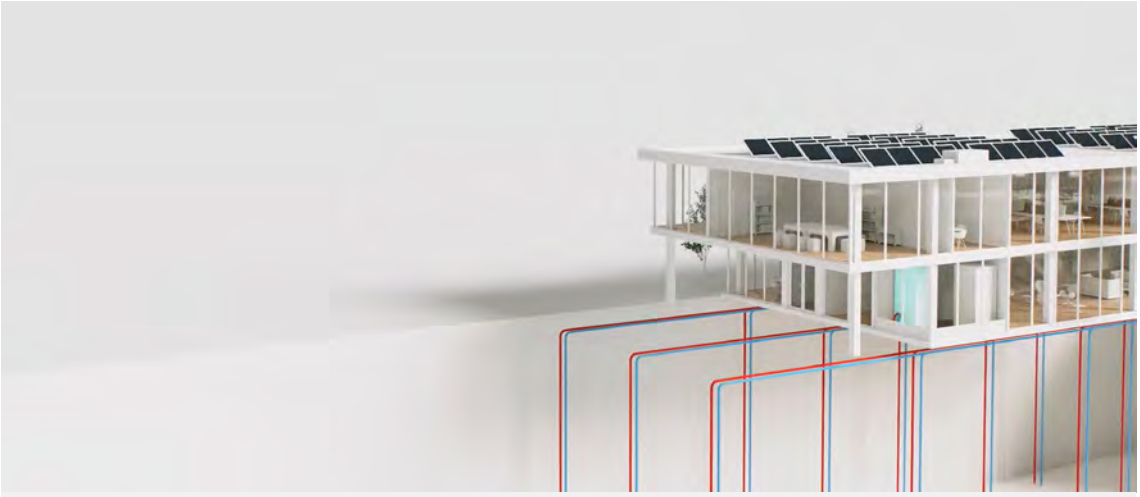
The building sector is unusual in that it has an ambivalent attitude that it has not yet been able to resolve. The energy issues with buildings are well known. Nearly 70% of the energy we use goes towards heating and cooling them. Reducing heat energy use and eliminating fossil energy are therefore priorities. But the mass move to thermally renovate buildings, for which everyone has been calling for many years, has still to materialise. The Higher Council for the Climate is clear on the problem. On page 52 of its 2020 annual report, it singles out the building sector as being responsible for French falling behind its climate targets, with an energy-efficient renovation rate of just 0.2% per annum.

However, there is some good news. Technologies that allow drastic reductions in energy use and greenhouse gas emissions are already there. There is no need to place all our hopes in some providential technological solution. The real challenge lies in the costs involved, and how to fund them. This is especially true given that the current preferred is building insulation, which is highly expensive.

Thermal storage and digitisation: the keys to paradigm change

The development of renewable energies is often associated with the idea that significant storage capacities are needed, to compensate for their intermittent nature. A common example is the day/night cycle for electricity. But isn't this ever more of an issue for thermal energy? Renewable energy, especially solar energy, tends to be present in spring and summer, whereas we need it to provide heat... in winter. Inversely, the winter cold would be very useful for cooling in summer. So it is easy to see that inter-seasonal storage would be the key to developing mass use of thermal renewables, and in doing so drastically decarbonising buildings.

But this solution already exists, and it is a very pragmatic one. It is called geothermal storage, and the idea behind it is to use the ground as a "thermal battery". There is a global consensus today that it is smart, environmentally-friendly, and profitable, to use solar and wind energy to generate electricity. A similar reasoning can be applied to the ground, which incidentally has served as giant battery, storing renewable thermal energy reliably for some 4.5 billion years.



Thermal Storage. ©Accenta

In practice, it is possible to recover the heat habitually lost by air-conditioning and solar energy during the spring and summer, to exchange that heat with a fluid that will carry it via vertical probes down to a depth of up to 200 metres, and to store it – with a yield close to 100% – in the ground, the temperature of which will rise by a few degrees locally. In winter, that heat can be used to heat buildings, allowing up to 70% reductions in the amount of energy used by their heating systems. The same approach, reversed, can be used for air-conditioning. Add in a healthy dose of Artificial Intelligence for design and predictive control systems, as Accenta does, and you get the most energy-efficient, environmentally friendly, economical solution compared with every other alternative in the market. In addition, you get up to twice the reductions in energy use and carbon emissions that you get with insulation, for a fifth of the cost. Mass deployment of geothermal storage is an opportunity to achieve the targets set out in the Tertiary Decree at the lowest possible cost, as the technology is reliable and competitive.

But decarbonising thermal energy production is not the only objective. As we can all see every day, energy is too often wasted. That means that without needing to make huge changes, we can already provide the same service while using much less energy. To do that, you have to supply the right amount of energy at the right time. That is exactly the idea behind the Building Automation and Control Systems Decree, which will require all buildings (subject to certain conditions) to have building management systems (BMS) by 1 January 2025, to control and regulate their heating and air-conditioning systems, among other things. These systems have been around for about thirty years, but new architectures like those developed by Accenta, based on digitisation and predictive analytics, make them the real energy nerve centre of a building. They also open up new possibilities in terms of energy performance.

Building Automation and Control Systems ©Accenta

The key role of port cities

"And seas but join the regions they divide". That quote by the English poet Alexander Poet wonderfully illustrates the special place occupied by the sea and those who make it. The essence of ports and port cities has always been to look towards the horizon, that symbol of discovery and audacity, but also, in the end, the otherness it leads to. What does that have to do with the energy transition, I hear you ask. Well, everything, as it happens!

By definition, port cities are open to the world and connected to one another, not least through AIVP. They are better placed than any to identify the best solutions from all over the world, and to take a proactive approach to applying regulations aimed at speeding up the energy transition we all need. It's interesting to think that in France, almost 10% of the population lives in port cities (even more if we consider metropolitan areas).. By addressing this issue, they can – by a capillary action – irrigate the world with ideas and innovations. As they have always done, over the centuries.

Innovating in the energy transition in Marseilles: Interview with AGAM

Interview by Denis Davoult

Xavier MOIROUX, Economics Research Officer at the AGAM

In Marseilles, there is the aim to create the sustainable Mediterranean city of the future. Efforts to combat air pollution from maritime shipping and heavy industry: there are a number of solutions already in use (LNG, shore power, scrubbers, etc.), while others, such as hydrogen, are at the experimental stage. The port – GPMM is particularly active in the Energy transition and circular economy, but there is a real risk of opposition vis-à-vis ports (especially for activities such as cruises). To address that, ports have strengthened their consultation mechanisms in collaboration with the AGAM (Agence d'Urbanisme de l'Agglomération Marseillaise, Planning Agency for the Marseilles Conurbation), with a city-port charter and city-port dialogue. In this interview, we discuss with them the issues related to this commitment on the territory of Marseilles.

The AGAM has been an active member of AIVP since 2004.

PIICTO, an industrial ecology platform

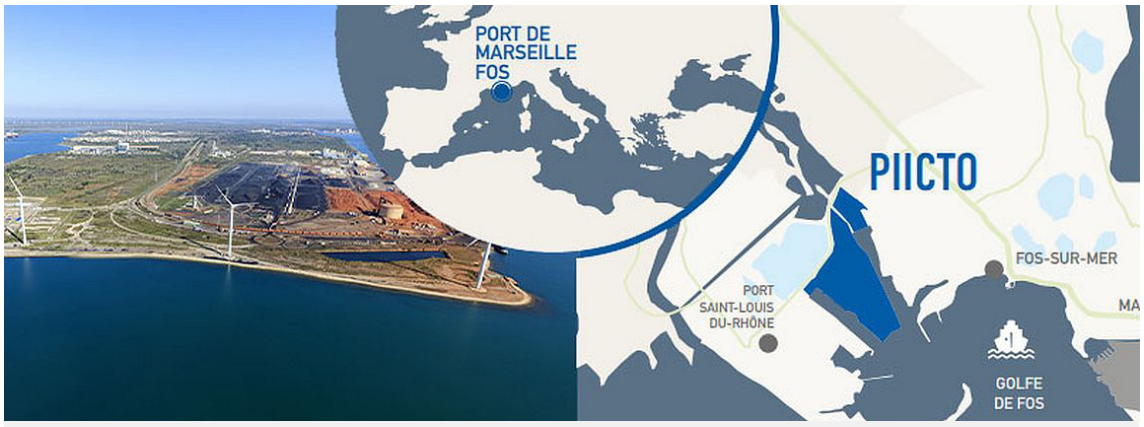
AIVP | *In 2017, you published a special booklet on the circular economy in the city and port of Marseilles. In it, you presented the PIICTO project, an industrial ecology scheme created in 2014 and coordinated by the Marseilles Chamber of Commerce & Industry.*

Can you tell us briefly what its main components are, and what challenges are involved?

Xavier MOIROUX, Economics Research Officer at the AGAM – Agence d'Urbanisme de l'Agglomération Marseillaise | On a 1,200 hectare site in the industrial port zone of Fos, the PIICTO platform houses 17 chemical, materials, and energy companies including Kem One, Lyondell, Bayer, Asco Industries, Elengy, Air Liquide, Solamat Merex, Everé, and GDF Suez. The platform represents 5 million tonnes of maritime traffic (6% of the total traffic passing through GPMM – Grand Port Maritime de Marseille) and employs 3,000 people.

PIICTO started out as a laboratory for the circular economy and territorial industrial ecology within the Industrial Port Zone of Fos, known as the "ZIP". It took inspiration from the circular economy movements begun at the major industrial ports of northern Europe, such as Kalundborg (Denmark) and Dunkirk. Those movements are based on the principle of pooling resources and exchanging flows of materials and energy between businesses and with the local area.

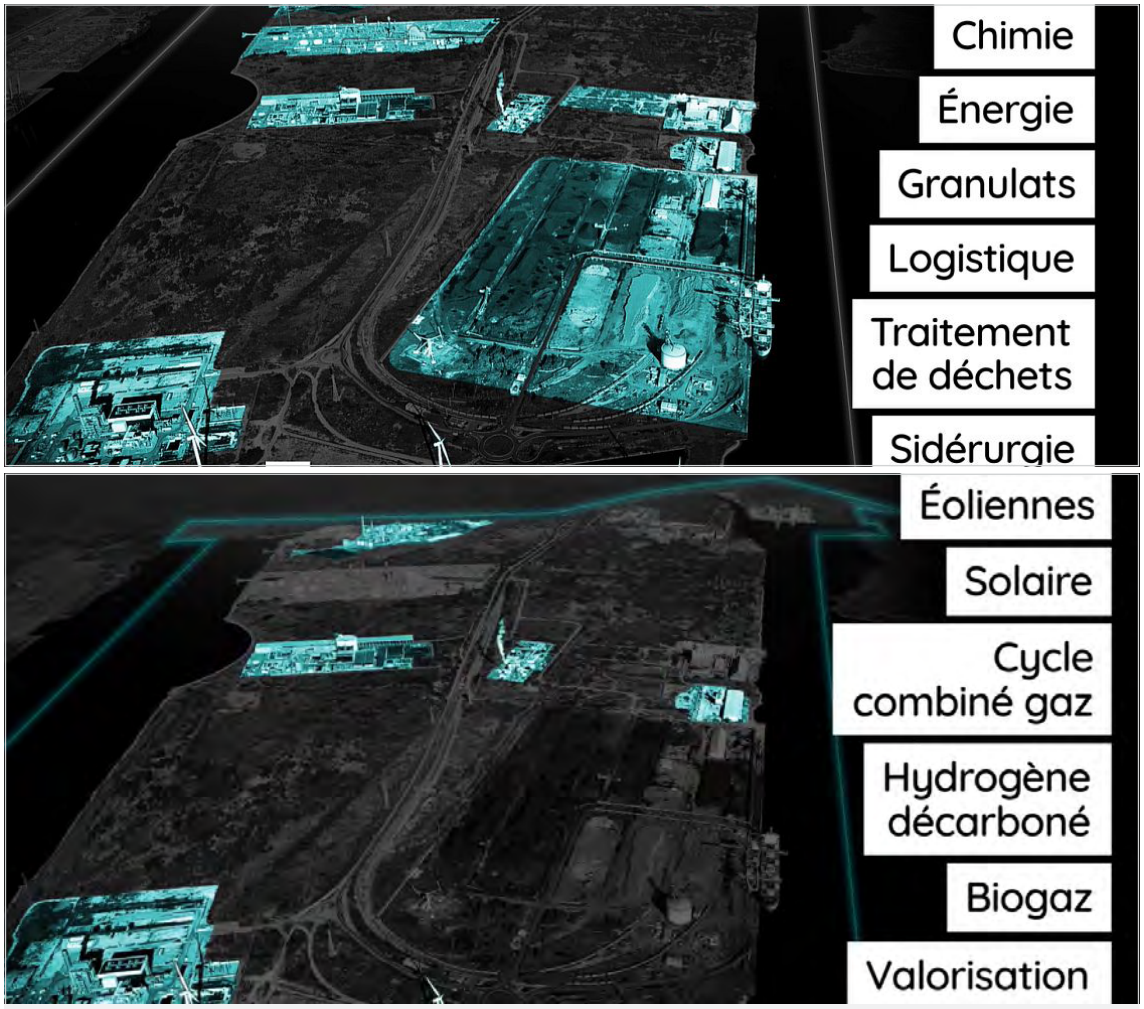
In more concrete terms, PIICTO has launched a steam network, which has generated substantial savings for those involved and helped to raise the international appeal of the sector in a "plug and play" equipped zone. Chinese firm Quechen has already opted to join the platform, and 400 million euros of investment is earmarked for it between 2020 and 2025.



Piicto @ Grand Port Maritime de Marseille

One of PIICTO's key features is the creation of an incubator for innovation in the energy transition field: Innovex. It occupies a 12 hectare site, and benefits from the presence of PIICTO's industrial operators, offering the opportunity to test pre-industrial pilot projects in the area of energy diversification (CO2, hydrogen, bioremediation, power to gas, renewable storage, smart grids, bio-refining, etc.).

Today, PIICTO, which is founded on a collective approach, has cemented its position as one of the leading industrial platforms in the Aix-Marseille-Provence agglomeration, housing activities in multiple different fields. Committed to the circular economy, the platform aims to play a central role in the energy transition and is a valuable testing ground for the region in these fields.



Platform Piicto © Piicto

What impact, what developments?

AIVP | *How do you see the project today? What are its impacts, and what could be done to optimise it?*

Xavier MOIROUX, AGAM | It's a precious project for the future, that will see Marseille Fos follow the circular economy trail blazed by northern Europe's big industrial ports, but it is also important for the energy transition in the region. There are a number of projects in the pipeline in this area, including Jupiter 1000, carbon4pur, and others. Many of them are to do with hydrogen (kem one, based on the platform, already produces 10,000 tonnes of hydrogen annually), particularly with the need to switch from grey to green hydrogen.

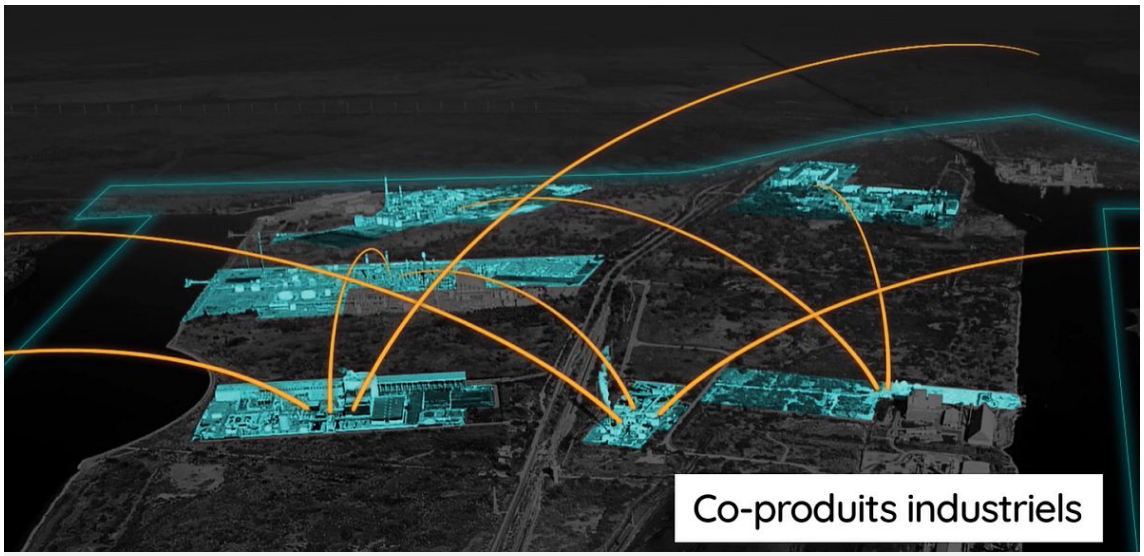
Kem One Fos © Piicto

PIICTO is also a powerful tool for promoting economic growth and innovation in the Industrial Port Zone, which now stands alongside the other innovation hubs in the conurbation, especially in the field of the energy transition. It is breathing new industrial life into the ZIP.

The zone can be thought of as a space for preserving hydrocarbons and heavy industry, which are closely associated with pollution and will have to disappear eventually. Whilst we will certainly need to reduce our dependence on hydrocarbons, the issue of reindustrialisation (which is increasingly at the forefront of public debate, particularly since the onset of the health crisis) is putting this territory back in the spotlight. Committing to the energy and ecological transition does not mean abandoning industry, but paving the way for it to change radically. That change must encompass decarbonisation, the energy transition, and the industry of the future. It will not just ensure that industry is able to navigate the ecological transition successfully, but will also restore local, national, and European technological sovereignty, a goal that features heavily in the French economic recovery plan. In that respect, PIICTO is a unique offer of land, in a geographical area historically dedicated to activities of this kind.

PIICTO involves a large number of projects, so in order to optimise it we need to regularly assess their progress, so as to make its potential clearer. The challenge is to transition the platform from being a testing ground to a pilot territory for the energy transition and for Industrial and Territorial Ecology.

That process of optimisation may also mean opening up PIICTO more to the outside, with the ZIP at Fos and, more widely, with other industrial zones in the conurbation with which it exchanges flows of goods and materials. From that perspective, it is worth noting that PIICTO's intra-metropolitan cooperation efforts are being scaled up, not just with the "Cap énergies" competitiveness cluster, but with a variety of organisations and institutions. To develop that, the AGAM has enlisted PIICTO as a partner for its efforts to develop an industrial-port network. As part of this partnership, we are taking part in PIICTO's decarbonised logistics initiative.



Synergies © Piicto

Advantages of City Port territories...

AIVP | *... To conclude, what do you see as the advantages and specific features of City Port territories in terms of the energy transition and renewable energies ?...*

Xavier MOIROUX, AGAM | Major industrial ports are engines for the energy transition and renewable energies in their regions. They are on the front line, and their decarbonisation (a key plank of the recovery plan) – combined with efforts to counter air pollution – is clearly vital.

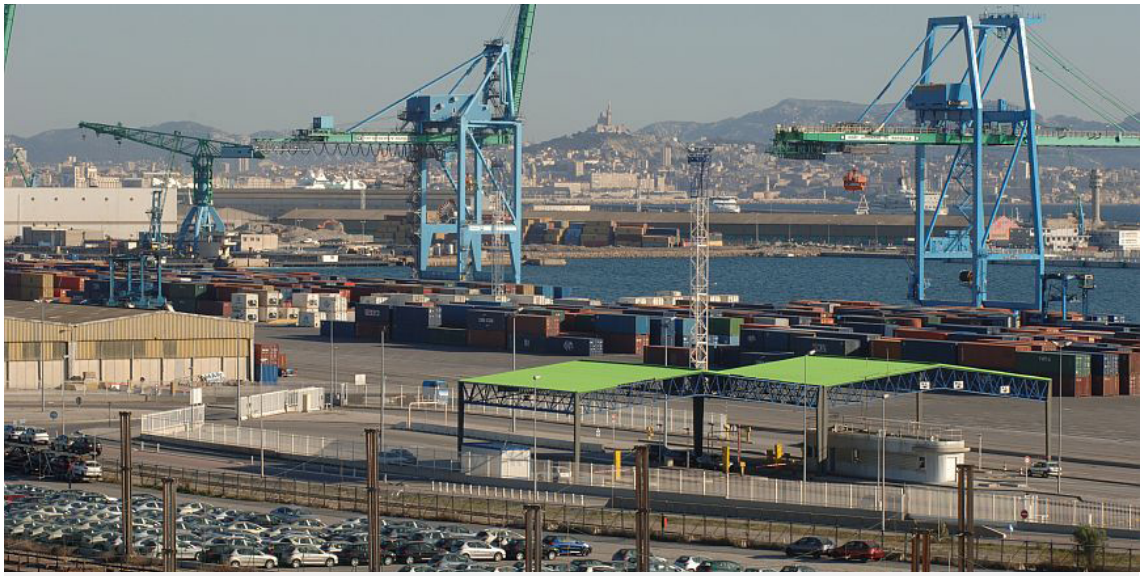
These big industrial ports are a big part of the solution to launching the energy transition: producing clean fuels (LNG) and hydrogen in large quantities, generating electricity from renewables, shore power, etc.

Today, the main green hydrogen production projects are emerging primarily around the big heavy industrial sites, especially in the Aix-Marseille-Provence Conurbation (PIICTO, Fos ZIP, La Mède, Gardanne, Berre l'étang, etc.), which incidentally also have very close ties to Grand Port Maritime de Marseille. The Fos ZIP being the main one.

Industrial port zones are also ideal locations for marine renewables, especially in the industrial phase. For example, Fos is the only location able to host the new plants where floating wind turbines will be manufactured. It has plenty of land (including land already artificialised and re-allocated for this new purpose), unlike the rest of the conurbation. But the Eastern docks at the port of Marseilles are not to be outdone in this area, with marine geothermal energy providing heating, cooling, and hot water for 500,000 m2 of buildings that form part of the extended Euroméditérranée development.

One of the challenges now is to integrate these big sites into the high-technology cluster, in synergy with the urban territories.

By creating a smart port, GPMM (Grand Port Maritime de Marseille) has become part of the growing high-tech, innovation-focused approach in the local area. It is crucial to expand that approach to include the challenges facing the Fos ZIP and connected sites.



GPMM © AGAM

Generally speaking, the maritime-port industries, on which AGAM recently conducted a study, are contributing more and more to this high-technology movement.

… and solutions to be explored

AIVP | *… and what ideas and solutions are worth exploring and adopting further?*

Xavier MOIROUX, AGAM | The energy transition, industrial decarbonisation, and tackling air and marine pollution are the priorities for dealing with climate change. Places that fail to make the transition could find themselves left behind, including economically. This is particularly true of metropolitan and port territories.

There are a multitude of priorities for projects:

- Green hydrogen production and industrial decarbonisation: the need for city-wide coordination between the various projects, all of which are closely connected to traffic passing through GPMM (PIICTO, Fos ZIP, Arecelor, La Mède, Gardanne, Berre l'étang, Arkéma, etc.). Tools such as the industrial-port network being tested by the AGAM can also help us to anticipate the economic implications of the energy transition, better manage the knock-on effects due to the vulnerability of a particular company, and create new industrial synergies in these fields.
- Renewable energies: offshore wind is a big opportunity for electricity generation (25% of electricity generation in France by 2050), and floating wind farms could be a more convincing solution than fixed facilities, particularly as, being sited further offshore, they are more acceptable and have higher generating capacities. In our local area, there is the "Provence grand large" project off Port Saint Louis.

Project Provence Grand Large

There are also challenges with building energy self-sufficiency for ports, which could see warehouse roofs covered with solar panels, for example.

- Efforts to combat air pollution from maritime shipping and heavy industry: there are a number of solutions already in use (LNG, shore power, scrubbers, etc.), while others, such as hydrogen, are at the experimental stage. GPMM is particularly active in this area, but there is a real risk of opposition vis-à-vis ports (especially for activities such as cruises). To address that, ports have strengthened their consultation mechanisms in collaboration with the AGAM, with a city-port charter and city-port dialogue.

Electrical connection of the ships

ENGIE : Decarbonizing Ports, The Promise of As-a-Service Models for Zero-Emissions Trucks

Vincenzo Giordano

Vincenzo Giordano, Director – Sustainability Solutions for cities and communities, (picture : © ENGIE Impact)

Port Trucking and Climate Change

Short-haul trucking at ports is a major contributor to global carbon and nitrogen oxide emissions. Port activities alone account for 3% of global carbon emissions and heavy-duty trucks emit around 40% of a port's total greenhouse gases (GHGs).

These so-called drayage trucks complete routes within a 150-mile radius, transporting goods between two ports, between ports and distribution centers or warehouses and between nodal points within the same port. Although they travel relatively short distances, the frequent stops and starts—as well as spending idle time in queues with their diesel engines running—make them one of the most energy inefficient forms of transport.

Additionally, ports are often located near disadvantaged communities, meaning the immediate impact of their pollution falls disproportionately upon the marginalized. These environmental and social factors are driving a strategic need for deep decarbonization of ports and of truck fleets.

In this article, ENGIE Impact looks at the potential to transform the San Pedro Bay Ports' 15,000 diesel drayage fleet to zero-emission trucks (ZE) by 2035. Drawing from our experience in large-scale energy infrastructure and eMobility transitions, we explore the opportunities that adopting as-a-Service models can provide to not only San Pedro Bay Ports (California), but ports around the world facing similar decarbonization challenges.

Ports: Air Quality and Sustainability in Focus

The Port of Los Angeles (PoLA) and the Port of Long Beach (PoLB), collectively the San Pedro Bay Ports (SPB Ports), is the busiest port system in the Western Hemisphere. As a leader in port sustainability, they have consistently reduced GHG emissions between 5% and 7% on a year-over-year basis and when compared to 2005, have reduced GHG emissions by 32%. They are also targeting local air pollutants such as sulfur oxide (SOx), nitrogen oxide (NOx) and ozone, which contribute to $44 million per year in health care costs in Los Angeles related to respiratory hospitalizations.

However, to fully address their local air quality and global climate impacts, the SPB Ports have pledged to achieve 100% zero-emission (ZE) Class 8 truck operations by 2035. Their Clean Truck Zero Emission Funding Program will be instrumental to achieving their ambitions.

The SPB Ports currently use a diverse network of over 15,000 drayage trucks, populated by both large corporate-owned fleets and small owner-operators. All operators are essential community members, some of whom may need extra support to meet emission reduction targets.

Encouragingly, these initiatives enjoy strong political support from federal, state and city bodies.

In 2020, California introduced the Advanced Clean Trucks (ACT) rule, which mandates that an increasing percentage of state-wide freight truck sales be zero emission trucks, beginning in 2024. Similar measures have followed nationwide. Fifteen Northeast states and the District of Columbia, for instance, recently signed the Multi-State Medium- and Heavy-Duty Zero Emission Vehicle Memorandum of Understanding, with similar goals to decarbonize truck fleets. Meanwhile, large port cities across the globe are proactively introducing their own measures.

Obstacles to Truck Fleet Electrification

While these policy actions are steps in the right direction, the path to implementation on a meaningful scale faces financial, infrastructure and operational barriers. In order to understand these challenges on a deeper level, ENGIE Impact undertook an analysis specific to the drayage fleets—both large and small—operating at the SPB Ports. Here's what we found:

- ***High total cost of ownership (TCO)***
  In 2021, the estimated TCO for heavy-duty electric trucks is 30-35% higher when compared to diesel trucks. For small scale drayage operators, that number is 40-45%. This cost includes not just the initial purchase price of the vehicle, but routine maintenance, insurance, fuel costs, equipment replacements and eventual resale value.

- ***High upfront capital investment***
  Upfront capital and financing costs for heavy-duty electric trucks and supporting charging infrastructure, range from $450,000 for large drayage operators to $550,000 for small operators. While we estimate significant electric truck price reductions to be achieved within the next decade, at 2021 prices an electric truck costs roughly double that of its diesel counterpart.

- ***Unproven technology***
  The availability of electric truck fleets on a commercial scale is a still-emerging innovation. While suppliers like Tesla are promising 500 miles with a single battery charge and per-mile operating costs $0.25 less than traditional diesel, electric trucks lack a track record to prove how those promises play out over their lifespan.

- ***Operational change***
  Southern California—like most of the world—does not have the necessary charging infrastructure in place to enable wide-scale electric vehicle (EV) uptake. Large and small trucking operators that transition to electric truck fleets will have to jointly invest in charging infrastructure, or enter contract arrangements with charging suppliers, adding further complexity and cost to an already significant transition.

- ***Complex stakeholder ecosystem***
  Short-haul truckers operate within a public and private stakeholder ecosystem that includes federal, state, regional and local governments, port agencies, community groups, logistics hubs, cargo owners, truck drivers and local utilities. While each group stands to benefit from the zero-emission transition, uncoordinated actions can leave red tape, misallocated costs and unaddressed risks that slow adoption.

Traditionally, governments and policymakers have overcome clean technology cost barriers with subsidies and fees designed to encourage adoption. However, direct incentives alone are likely inadequate to address the cost differential between electric trucks and diesel, the inequality between large and small operators, insufficient infrastructure and the complex technological risks.

Interconnected ports and cities. Picture : © ENGIE Impact

As-a-Service Models can Accelerate Drayage Vehicle Decarbonization at Ports

Novel as-a-Service models provide a compelling solution to shift the zero-emission truck transition from small pilots to scaled deployments. As-as-Service models leverage public and private actors to lower costs, share risks and expand the capital available for zero-emission fleets. They allow drayage operators to maintain their core logistics businesses while introducing new partners to finance and manage emerging EV technologies and infrastructure.

Perhaps most importantly, these models offer disproportional benefits to small operators when compared to large operators. The former face higher TCOs in the transition to electric, due to the inability to capitalize on economies of scale and secure low-cost financing. When making the transition from diesel to electric, a smaller operator would require direct incentives 30%-40% higher than required by large operators. As-a-Service models, however, pass on the benefits of scaling to smaller operators, shaving 30%-40% more off their TCOs when compared to their larger counterparts.

Incorporating the financial, technical and political challenges that ports around the world face in their drive for carbon neutrality, we see two primary as-a-Service models for port ecosystems to transition drayage fleets. Both alternatives, if implemented, achieve drayage fleet decarbonization at a lower total cost and risk when compared to models where drayage operators are solely responsible for transitioning their fleets.

Two as-a-Service Models that Can Accelerate Zero Emission Truck Adoption

Model 1: Charging Infrastructure as-a-Service (ClaaS)

In the ClaaS model, a central infrastructure provider designs, builds, operates, maintains and finances vehicle charging infrastructure for drayage operators—via public or private truck depots—and charges a fee per kilowatt-hour (kWh). Drayage operators enter an as-a-Service contract with the infrastructure provider to pay for the electricity used to power their daily operations, while maintaining ownership of the zero emission trucks as well as cargo logistics and transport.

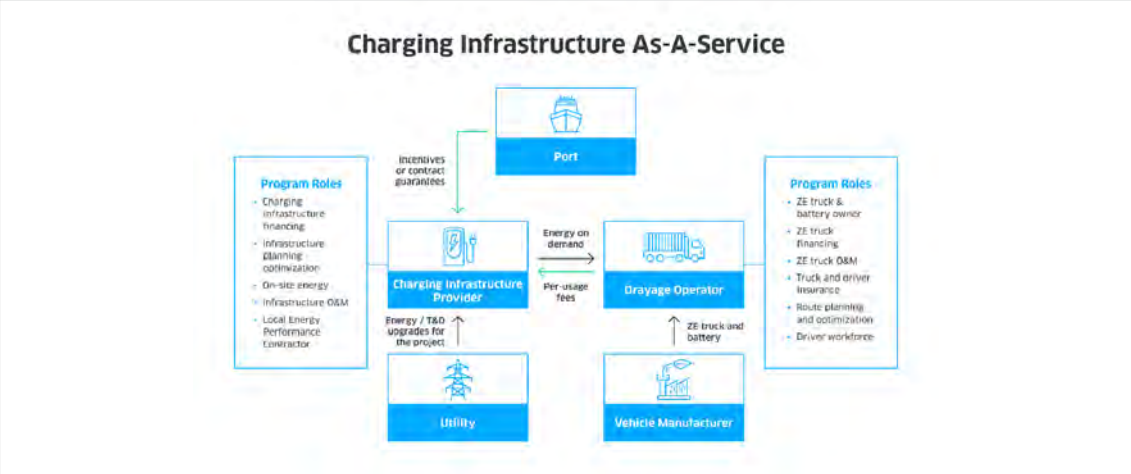
A dedicated entity assumes the risks associated with maintaining charging infrastructure, thus, easing the operational burden on drayage operators large and small. The central entity manages permitting, installation, purchasing process and all ongoing operational and maintenance issues over the infrastructure's lifespan.

Benefit: Experienced infrastructure providers reduce risk and cost of capital

Having an experienced, scaled charging provider that can access reduced financing rates and cheaper equipment also reduces costs. Our estimates for the SPB Ports found this arrangement could reduce zero-emission truck TCO costs by 4%-8% for small operators and 1%-4% for large operators. Further, drayage fleets could reduce upfront capital and financing costs by $65,000-$90,000 in the case of small operators and $40,000-$50,000 in the case of large operators between 2020 and 2035.

Benefit: Lower costs reduce time to cost parity

These lower costs also move up the time when zero emission trucks will become less expensive than diesel trucks. Estimated cost parity could be achieved one to two years sooner for overnight charging solutions and up to five years sooner for fast charging solutions. There is a disproportionate benefit for accelerating cost parity for fast charging, which will enable two-shift drayage operators to convert to zero emission drayage vehicles on an accelerated timeline.



Charging Infrastructure As-A-Service. Picture : © ENGIE Impact

Model 2: Zero Emission Truck as-a-Service (ZETaaS)

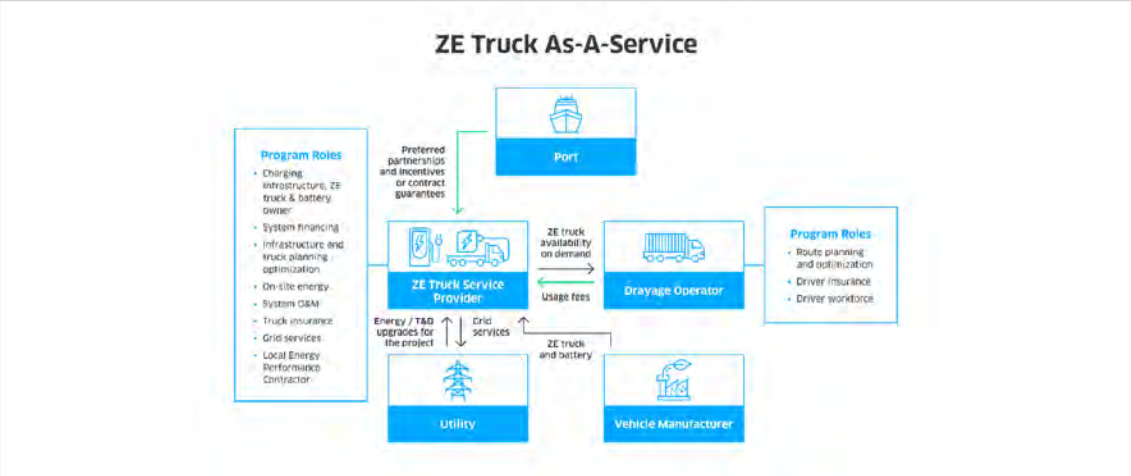
In the ZETaaS model, a central zero emission truck service provider finances, owns and maintains both the charging infrastructure and the zero emission drayage vehicles in a centralized fleet. Drayage operators then pay the zero-emission truck service provider for truck availability as they require it, much like a car rental service. In this way, the responsibility for truck and infrastructure capital assets are consolidated under one provider. That includes maintenance, upgrades and end-of-life turnover. The truck service provider ensures truck availability on a per mile, hour, or TEU basis, while drayage operators retain ownership and management of cargo and logistics transport.

With a central entity, the operational burden of both charging infrastructure and zero emission drayage vehicles is eased since the entity can implement widespread fleet management policies in a coordinated manner. This might include route management to maximize range of zero emission drayage vehicles and fuelling coordination to minimize demand charges and leverage maximum incentives.

Benefit: Transferring both infrastructure and truck asset ownership unlocks greater cost savings and accelerates time to cost parity

Transferring infrastructure and vehicle ownership to a central entity reduces both the upfront cost of zero emission drayage vehicles and the operational costs. Our estimates found that this arrangement could reduce zero emission truck total cost of ownership (TCO) by 15%-20% for small operators and by 5%-8% for large operators. Upfront capital and financing costs for drayage operators could be reduced by $235,000-$550,000 for small

operators and by $200,000-$450,000 for larger operators, between 2020 and 2035. The resulting reduction in cost can accelerate estimated cost parity with diesel by three to seven years for small operators and two to three years for larger operators.



ZE Truck As-A-Service. Picture : © ENGIE Impact

How port agencies can accelerate adoption of as-a-Service models

To adopt zero emission heavy-duty trucks quickly and economically, port agencies and drayage fleet operators need innovative models that address the technological, financial and complex implementation challenges. As-a-Service models offer an attractive solution. As outlined, these models can significantly lower the total cost of ownership and accelerate timelines to cost parity, with an equitable transition made accessible to small and large drayage operators alike.

Port agencies will play a critical role in this transition. While they are not the direct owners of some of the biggest port emitters—heavy-duty truck fleets and cargo ships—as-a-Service models provide an avenue for port agencies to innovate and create incentives for such models to grow. They can do so in the following ways:

- Administratively, port agencies would be important program advocates, encouraging operators to join the programs and vetting preferred as-a-Service providers.
- Operationally, port agencies support the permitting and planning required to build-out charging infrastructure at scale.
- Financially, they can structure innovative incentives to encourage early adoption, mitigating the initial cost gap and program risks as ZETs achieve scale.

As the players within the port ecosystem unify behind the shared goal of decarbonization, collaboration will be critical to unlock progress. Together, stakeholders can deploy proven solutions at a scale that reduces overall cost and risk, a necessary step to meet ambitious climate goals.

ENGIE Impact delivers sustainability and decarbonization solutions for port districts around the world. ENGIE Impact brings together a wide range of strategic and technical capabilities, to provide a comprehensive offer to support clients in tackling their complex sustainability challenges from strategy to execution. With 21 offices worldwide and headquarters in New York City, ENGIE Impact today has a portfolio of 1,000 clients, including 25% of the Fortune 500 Companies, across more than 1,000,000 sites.

The circular economy applied in industrial port territories – a reality and a part of tomorrow's world

Nicolas Mat

Nicolas Mat. Secretary General of the PIICTO Association – Industrial and Innovation Platform of Caban-Tonkin (Marseilles-Fos)

The global health crisis caused by the Covid-19 pandemic has illustrated the extent to which our hyper-industrial societies are interdependent, complex, yet vulnerable. This extraordinary situation that has affected every continent has at least served to highlight two important aspects of industrial and port territories. The first is that, in a globalised economy, these port communities are key to ensuring that the stream of goods and energy needed for our societies to function continues to flow (90% of international goods traffic is shipped by sea). Secondly, though the health crisis has forced them to reduce their operations and navigate periods of difficulty, the industries based in those port communities have successfully adapted, for example producing the oxygen desperately needed by healthcare services or continuing to manage and recycle our waste (household water, hazardous waste, etc.).

The City-Port territory: a strategic space for realising the circular economy

In a world constantly described as changing, it is vitally important for industrial-port communities to tackle the challenge of renewing and adapting themselves. Renewing practices, perceptions, ambitions, forms of global and local cooperation, etc. Numerous projects and studies, particularly those undertaken by AIVP over the last ten years or more, have shown that most of the world's major industrial port communities are now well aware and committed to addressing the issues raised by the energy and ecological transition, and are taking an active interest in the circular economy.

View of Kalundborg Eco-Industrial Park, Denmark.

The basic equation is not simple, however. These territories need to find a way for human-centric, urbanised, industrialised, port and in some cases agricultural spaces to co-exist alongside natural environments with rich biodiversity, many of them situated in estuaries or coastal areas. The challenge then is to plan ahead and balance the long-term development policies for these industrial and port activities, which generate jobs and wealth, while at the same time limiting the impacts on the environment, whether in terms of the use of space and natural resources, or in terms of emissions (atmospheric, effluents, solid waste). Today's industries understand the problem, and must strive – and continue to strive – to be ever more efficient and environmentally-friendly. Otherwise, they risk being "left behind", seen with apathy by younger generations and faced with increasing issues around the local acceptability of their activities. Having long been symbols and cornerstones of an "all oil" economy, these strategic territories are now innovating, experimenting with the low-carbon, resource-efficient society of the future, relying on new forms of cooperation between

economic operators. Home to a wide variety of transformation and processing industries (steel, metallurgy, petrochemical, chemical, granulates, etc.) and dense, complementary logistics infrastructures (rail, road, river, maritime, pipeline), they are testing grounds for industrial symbioses, in the form of a complex, dense and varied network of flows of goods, utilities, and services. Some of these territories are now banking on industrial ecology and the circular economy as real differentiation strategies, enabling them to gain comparative advantages, nationally and internationally. But whether in Rotterdam, Marseilles, or Ulsan, these strategies must fit around the very nature of these spaces, where there is a permanent tension between the localised "territory system" and the globalised "world system". Current projects involving CO2 and decarbonisation in general serve to illustrate these two concepts, between a "globalising" approach that aims to structure solutions internationally (large offshore storage zones fed by CO2 hubs in port territories), and a more "territorialised" approach that looks for solutions to re-use and recycle flows of CO2 within the local industrial and agricultural sector. These two approaches complement one another, and contribute to ambitious decarbonisation goals. They are repositioning the industrial port space as a strategic node in the interface between globalised traffic and optimised resource management (industrial and agricultural "co-products", energy recovery) on a local scale.

Dublin Port. Photo : José M P Sánchez

Opportunities for the taking

On an international scale, there are plenty of lessons to be learned from the many circular economy and industrial ecology initiatives developed in these port spaces. Though they take different forms, all are based on the need to foster synergies between economic operators, and the creation of closed circuits for recycling and re-using materials and energy.

Today, these initiatives are also addressing issues to do with attractiveness, innovation, and interfaces with local stakeholders, particularly when it comes to acceptability. They cover various spatial scales, ranging from the heavily localised "platform" approach to the "network" approach with different territories interacting. These circular economy and industrial and territorial ecology strategies represent an opportunity, and a potential means of securing the resilience and future of industrial port territories. In addition to generating new forms of technical and organisational cooperation between socio-economic actors, they also promote the diversity of skills and expertise within territories. Though strategic in scope, these approaches are first and foremost based on real, concrete projects (steam networks, energy transition demonstrators, industrial closed loop recycling of industrial co-products, etc.). In some cases, they are raising new questions about our relationship with resources, the role of economic operators, or the need to develop port infrastructures. These initiatives also accompany and herald major changes in the industrial fabric of these territories, which for years was based on a model where factories were sited "at the water's edge", with mass-scale international flows of materials and energy. As a consequence, these initiatives are also helping to redefine port authorities' balance and business models, which in many cases are still based on land rental and port fees and are therefore dependent on the quantities of bulk liquids and solids passing through them.

Industrial co-products revalorized. Nicolas Mat

Explaining these current transitions and building the way forward together

Commitment number 2 on the AIVP 2030 Agenda stipulates that applying this circular economy to the industrial port environment must be an opportunity to promote meetings and new partnerships between the City, the Port, Businesses, and Citizens. It is one thing to identify and deploy concrete synergies between socio-economic actors that contribute to more efficient resource management. It is quite another to explain exactly how they work in layman's terms, whether to employees of the companies concerned, environmental protection organisations, or local residents. Explaining these initiatives and creations in terms that can be understood by all is a considerable challenge, one that is perhaps too often overlooked. Yet it would doubtless help to promote them and to breathe new life into the industrial culture, which is gradually being eroded in these territories. It would restore familiarity and mutual trust between stakeholders, which is vital for supporting and ensuring the acceptability of the changes that these industrial port communities are experiencing now, and those to come in the future. Finally, a more inclusive approach should pave the way for developing shared visions, perhaps even a shared story, about the future of these territories, which have always been and will remain strategic hubs for nations with access to the sea.

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