

Convergence Among Transport and Energy Sectors in the West Mediterranean Countries

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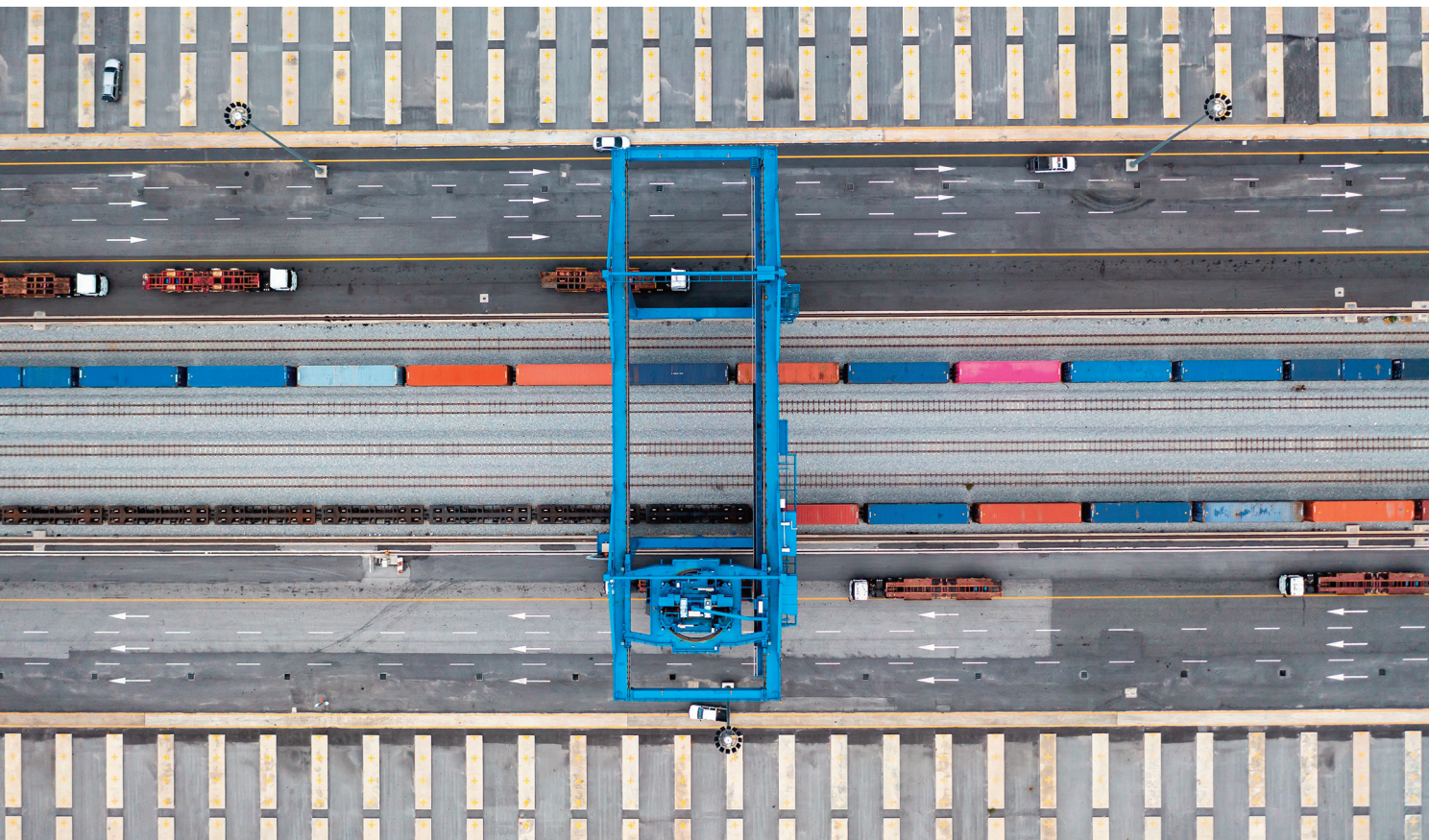
INFRASTRUCTURES, ENERGY AND DIGITALISATION: PILLARS FOR THE SUSTAINABLE DEVELOPMENT OF TRANSPORT IN THE WESTERN MEDITERRANEAN

Centre for Transportation Studies for the Western
Mediterranean (CETMO)

Coordinator

European Institute of the Mediterranean (IEMed)

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The **MedThink 5+5** is a network of think tanks that encourages dialogue and research to promote regional integration in the Western Mediterranean, as a part of a wider Euro-Mediterranean region.

The network emerged in 2016 on the initiative of the IEMed in coordination with think tanks and public diplomacy institutions, building on a mandate from the Summit of Heads of State and Government of the 5+5 Dialogue in 2012. This unique platform, composed of more than 30 institutions from Portugal, Spain, France, Italy, Malta, Morocco, Mauritania, Algeria, Libya, and Tunisia, contributes to dialogue, exchange, and joint research on crucial sub-regional areas of cooperation.

Working to strengthen the Western Mediterranean Dialogue, the MedThink 5+5 offers the unparalleled possibility of increasing ownership of policy-making processes. It allows research institutions to transfer their messages to decision- and policymakers, while improving understanding of key challenges, needs and trends that have an impact on sub-regional cooperation.

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IEMed.

The **European Institute of the Mediterranean (IEMed)**, founded in 1989, is a think and do tank specialised in Euro-Mediterranean relations. It provides policy-oriented and evidence-based research underpinned by a genuine Euromed multidimensional and inclusive approach.

The aim of the IEMed, in accordance with the principles of the Euro-Mediterranean Partnership (EMP), the European Neighbourhood Policy (ENP) and the Union for the Mediterranean (UfM), is to stimulate reflection and action that contribute to mutual understanding, exchange and cooperation between the different Mediterranean countries, societies and cultures, and to promote the progressive construction of a space of peace and stability, shared prosperity and dialogue between cultures and civilisations in the Mediterranean.

The IEMed is a consortium comprising the Catalan Government, the Spanish Ministry of Foreign Affairs and Cooperation, the European Union and Barcelona City Council. It also incorporates civil society through its Board of Trustees and its Advisory Council.



The **Centre for Transportation Studies for the Western Mediterranean (CETMO)** is an independent non-partisan think tank and non-profit international cooperation organisation, established in 1988 under the auspices of the United Nations, with the objective of supporting socio-economic development through progress in transport and logistics, especially in the Western Mediterranean.

The CETMO aims at developing regional cooperation at both institutional and technical levels in order to facilitate international transport conditions throughout the Mediterranean and the Western Mediterranean in particular, due to its belonging, participation, and collaborates with an extensive network of over 215 organisations facilitating Mediterranean cooperation. The CETMO also provides policy makers, transport infrastructure managers and logistics operators with practical and innovative analysis and knowledge.



The **Group of Transport Ministers for the Western Mediterranean (GTMO)** is an informal cooperation group composed by the Transport Ministers of the region to promote dialogue and cooperation for the development of transport and to contribute to the Euro-Mediterranean partnership. It was created in 1995 with the support of the ministries of transport of Algeria, Spain, France, Italy, Morocco and Tunisia and it joined the cooperation framework of the 5+5 Dialogue in 2007 with the full participation of all its member countries: Algeria, France, Italy, Libya, Malta, Mauritania, Morocco, Portugal, Spain, and Tunisia.

The group has a rotating presidency and holds a transport ministerial conference approximately every two years to define the strategic lines of the group's next presidency. In addition, the group organises two expert meetings per year, with the participation of senior officials from the respective ministries and observer institutions, to cooperate in the development of the work plan of the rotating presidency.

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Policy Study

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FOREWORD

Roger Albinyana

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Mediterranean (IEMed)

With the Russian aggression on Ukraine and the war in Gaza being prolonged over time the Mediterranean region at large is in total turmoil. The Policy Study entitled "Infrastructures, Energy, and Digitalisation, Pillars for the Sustainable Development of Transport in the Western Mediterranean" aims at contributing with shared reflections and formulation of policy proposals to the challenges and strategies that the region faces in the field of promoting sustainable development in the transport sector. To this end, the Policy Study delves into this topic from these three cross-cutting dimensions in the Western Mediterranean: infrastructures, energy and environment, and digitalisation.

The European Institute of the Mediterranean (IEMed) and the Centre for Transportation Studies for the Western Mediterranean (CETMO) have taken on this stimulating task by continuing for third year the preparation of a Policy Study that involves various authors who are experts in the field, while also unveiling some recommendations of public policy addressed to the Presidency of the Group of Transport Ministers for the Western Mediterranean (GTMO 5+5). Indeed, this publication released as a Policy Study comes within the framework of the MedThink 5+5 network of Western Mediterranean think tanks, a multidisciplinary platform of exchange associated with the 5+5 Dialogue, which brings together policymakers, practitioners and academics from the Western Mediterranean area.

Considering transport and logistics as one of the most relevant sectors to foster socio-economic development and regional integration in the Western Mediterranean, the MedThink 5+5 network has been committed to promoting debate and knowledge-sharing on the issue, building upon support and expertise of the CETMO as Technical Secretariat of the Group of

Transport Ministers for the Western Mediterranean (GTMO 5+5). As a matter of fact, the MedThink 5+5 convened seminars (2018, 2021) dedicated to the analysis of trends in the Western Mediterranean transport and logistics sectors, organised back-to-back with the GTMO 5+5. In this context, this Policy Study, which is part of the work programme of GTMO 5+5 under the Maltese presidency, aims at giving response to the challenges posed by climate change in the region and how the transport sector can counter it and adapt to it through digitalisation, the transformation and connection of transport with infrastructures and energy.

The Policy Study is structured along three main sections consisting of infrastructures, Energy and Environment, and Digitalisation, and it comprises seven articles, which have been commissioned by the MedThink 5+5 network and coordinated by the IEMed and CETMO. In particular, Mark Furness discusses the challenges faced by MENA countries (wars, geopolitics, climate change, etc) and how they adapt to them while promoting international partnerships. He examines the Belt and Road Initiative (BRI) and the Global Gateway strategy for enhancing connectivity in the Mediterranean Basin, with further insights on key projects in Egypt, Tunisia, Algeria, Morocco, and Jordan. He also explores the potential collaboration and competition between these two initiatives and how the EU could actively seek opportunities for cooperation with China on mutual projects while delivering a better deal than the BRI in terms of values and benefits for MENA countries.

In this vein, Jordi Selfa assesses the global and regional progress on both mitigation and adaptation strategies to respond to the effects of climate change on transport. Considering that there is insufficient progress and inadequate funding, particularly in

adaptation measures and that the transport sector faces severe impacts from climate-related extreme events. Against this backdrop, decarbonisation of transport has become the primary driver of political agendas, making the adaptation gap in the sector more pronounced. In the meanwhile, less visible and more challenging to execute policies and activities are being disregarded. Therefore, to avoid transport system disruption and according to this author, EU initiatives must generate knowledge on climate change and disseminate it, collaborate through financial support, and prevent the exacerbation of existing disparities between the two shores of the Mediterranean.

Moreover, Sassi Hammami delves into how railway connections in the region might spur trade integration. In this regard, the author recalls that intra-Maghreb trade is low because of regulatory, logistical, and protectionist measures, which makes it more costly to trade with the EU. However, Maghreb countries are willing to develop intra-Maghreb rail transport. He concludes that there is potential for trade integration and railway development, and development programmes should address the region's constraints paying attention to the slow progress. He finally recommends enhancing regional cooperation and reviving the UMA dialogue for a common strategy, addressing trade protectionism, simplifying procedures, and reducing barriers while adopting an action plan prioritising the railway corridor.

Other authors, Pier Paolo Raimondi and Michel Noussan, alert that the transport sector resists decarbonisation due to its dependence on oil products. Against this backdrop, electric vehicles (EVs) and electrification are crucial for decarbonising urban transport, but EU Western Mediterranean countries make lags in electrification rates. In this context, the availability of

charging infrastructure is crucial for the usage of EVs; therefore, there is a need for smart charging and vehicle-to-grid strategies for grid balance and optimising battery life. E-fuels may be able to assist in indirectly electrifying various modes of transportation such as long-distance or maritime applications, which seem difficult to run on batteries. Concerning the shortages in South West Mediterranean countries, there is a slow development in the power sector, a need for fuel standards, and fostering a reform in energy prices. Moreover, limited financial capabilities impact infrastructure deployment and EV demand. The authors conclude that increasing political commitment and expanding the role of clean energies can contribute to the decarbonisation of transport. They recommend cooperative measures between North and South West Med countries to foster investments and integration practices.

Furthermore, Alessandro Panaro and Anna Arianna Buonfanti highlight the imperative of reducing greenhouse gas (GHG) emissions, and with that, they emphasise the importance of the Green Port model or ports as Energy Hubs (E-hubs) to make the Mediterranean region more sustainable. They recall that ports handle 40% of energy traffic, and to increase the greening in shipping, the latter must integrate diversified energy sources such as sustainable energy generation and traditional fossil-fuel plants. The ports' proximity facilitates the adoption of green hydrogen. Other ways to reduce the ports' emissions are cold ironing and connecting the port to offshore wind parks. The authors conclude by expressing the importance of developing e-hubs to support a cleaner and cost-effective energy supply, increasing trade in renewable energy.

Marco Gorini and Valeria Burlando underscore that, despite digitalisation of the supply chain and customs being a complex

challenge, the International Fast & Secure Trade Lane (IFSTL) initiative can enhance global trade efficiency, security, and sustainability. In this respect, EU governments play a significant role in implementing IFSTL by promoting trade and security through policies and infrastructure investments. Moreover, cooperation between public and private operators is crucial for efficient global transportation. IFSTL is piloted on the corridor between La Spezia (Italy) and Casablanca (Morocco), focusing on the ports' digitalisation. They conclude by stating how pilot projects demonstrate that IFSTL is a crucial enabler for enhancing efficiency in the multimodal logistics chain. They recommend building a receptive ecosystem, communication campaigns, and establishing public/private working groups for successful IFSTL implementation.

Finally, Agustí Miró emphasizes the critical need for large-scale digital reskilling and upskilling, particularly in the transport and logistics sector, to overcome barriers hindering the adoption of digital tech-

nologies. The scarcity of digitally skilled human capital is identified as a major limiting factor. In this vein, digital transformation requires an unprecedented number of digitally skilled personnel, estimated to be around 13.5% of the overall labour force and 14.7% in the transport and logistics sector. Failure to address this need may lead to unemployment and an unbalanced labour market. Despite increasing corporate resources dedicated to digital skilling, surveys indicate that corporations, even large ones, may only be able to internally reskill and upskill 40% to 45% of the required employees. In this regard, there is a lack of preparation, limited resources, and a cultural resistance to skilling efforts. Against this backdrop, the article highlights guiding principles for successful digital reskilling and upskilling efforts, including multi-stakeholder collaborative approaches led by public administrations, strategic workforce planning and skills mapping, leveraging national professional education systems, and embracing platform-based learning solutions.

The EU's Global Gateway and China's Belt and Road: Two Strategies and Two Realities for the Southern Mediterranean

Mark Furness

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Introduction

The 2011 Arab uprisings promised political, economic, and social change throughout the Southern and Eastern Mediterranean. Since then, the Arab world has changed, but not as many had expected. The region's authoritarian political systems proved resilient. Political and economic turbulence driven by wars, geopolitics, a global pandemic, and climate change has led international partners to adjust their strategies for engagement with the many development and sustainability challenges facing Middle East and North African (MENA) countries.

This paper discusses the engagement strategies of two of the most important international partners for most Southern and Eastern Mediterranean countries: the European Union (EU) and China. China has supposedly been able to step into a geostrategic space left by the withdrawal of the United States and the relative weakness of European former colonial powers, mostly in terms of economic engagement but also as a security actor (Ghafar & Jacobs, 2020). Chinese economic cooperation with MENA countries has been conducted under the auspices of the Belt and Road Initiative (BRI), launched in 2013 to build a 'new Silk Road' connecting the world with China.

For the EU's Mediterranean policy, the years since the Arab uprisings have raised dilemmas created by an endlessly unfolding complex of real and perceived threats and opportunities. The EU has moved from supporting democracy to managing migration to promoting renewable energy to investing in infrastructure without fully convincing regional actors and outside observers that it had a comprehensive grip on its neighbouring region's challenges or even on its own interests. Its Global Gateway investment strategy represents a re-

newed effort to increase European influence in the Southern Mediterranean by working as 'Team Europe' to build 'connectivity' (EC/EEAS, 2021a).

This paper discusses the implications of the BRI and Global Gateway strategies and realities for each other and for states and societies in the Southern and Eastern Mediterranean. The BRI has already had a significant impact in the region. The Global Gateway is still an unknown quantity but has the potential to make a big impact as well. The two investment strategies are essentially mechanisms for building influence and accessing resources in a competitive global geostrategic environment. There are nevertheless important overlaps and potential synergies that could be exploited for the benefit of MENA societies as well as the EU and China. There are also potential negative implications for people in MENA countries and dangers for foreign investors who help finance the prestige projects of autocrats. European policymakers need to decide how far they can go, and unlike Chinese leaders, their decisions will be publicly scrutinised by European researchers, civil society organisations, and the media.

The Belt and Road and the Global Gateway: Two Strategies for Building Connectivity in the Mediterranean Basin

The BRI and the Global Gateway are distinct investment strategies, but there are many similarities regarding their approaches and methodologies.

The Belt and Road Initiative

China's Arab policy paper notes that "Friendship between China and Arab

states dates back to ancient times... [when] land and maritime Silk Roads linked the Chinese and Arab nations" (PRC, 2016).

China's Arab policy paper stresses the BRI's centrality to its regional strategy:

"Joint efforts will be made by China and Arab countries to promote the "Belt and Road" initiative under the principle of wide consultation, joint contribution, and shared benefit. China and Arab countries will adopt the "1+2+3" cooperation pattern to upgrade pragmatic cooperation by taking energy cooperation as the core infrastructure construction and trade and investment facilitation as the two wings, and high and new technologies in the fields of nuclear energy, space satellite and new energy as the three breakthroughs (PRC, 2016)."

China is interested in deepening cooperation with Southern and Eastern Mediterranean countries as a means of connecting Asia and Europe, a key objective for the BRI. As Ghafar and Jacobs (2020) note: "North African countries are especially attractive prospects due to their proximity to European, African, and Asian markets, high number of industrial zones, and high levels of investment in infrastructure development." Devonshire-Ellis (2021) adds that North African countries' Free Trade Agreements with the EU and deepening ties to sub-Saharan Africa have increased their attractiveness as a destination for Chinese investment. As Savic (2021) foresees, "the next phase of the BRI will not, therefore, be solely as an international supply chain centre for goods and raw materials, but as a hub for Eurasian tourism and travel enabling global visitors to explore the fusion of the modern and original Silk Roads with the cradles of European civilisation".

China's authoritarian development model carries considerable legitimacy among Southern Mediterranean elites (Ghafar & Jacobs, 2020). China has stressed the difference between its "no strings attached" policy and European conditionality, which resonates in MENA countries even if it is not completely true. Many Arab political and business elites welcome Chinese finance, technology, consumer goods, expertise, and markets without accompanying lectures about human rights and democracy. Khurma (2023) goes further, arguing that China's "complete disregard for human rights and individual freedoms seems to attract many regional governments". Indeed, for some regional authoritarians, the relationship with China provides weapons and surveillance technology that can be used to suppress opposition movements in their countries. Khurma (2023) adds that "many Arabs see China as a friend" and that China has cultivated its soft power by investing around \$4 billion in CGTV Arabic, a UAE-based streaming platform providing Chinese news and other shows to millions of homes.

The Global Gateway

As its title suggests, the EU's Global Gateway is designed to reach far beyond the Mediterranean basin and builds European influence globally. When the connectivity strategy was officially launched in December 2021, the European Commission said that it would look to compete with the BRI and balance Chinese influence, especially in Africa and the Middle East (Liboreiro & Pitchers, 2021). The Commission has since played this aspect down, instead stressing the benefits of engagement on the basis of European standards and democratic values (Furness & Keijzer, 2022).

The EU's cooperation strategy towards its 'Southern Neighbourhood' has changed in emphasis since the Arab uprisings. The EU's initial reaction to the protest wave across the region was to offer "more for more": increased support in return for deeper governance reforms (EC/EEAS, 2021b). European development aid to European Neighbourhood Policy (ENP) South countries increased sharply in the wake of the Arab uprisings (Bodenstein & Furness, 2023). In recent years, EU engagement has become conditional on security and anti-migration cooperation (Del Sarto, 2021). This change in emphasis was seen in the EU-Africa migration trust fund after 2015 and in the comprehensive deals with Tunisia, Egypt and Morocco that have made aid and, to a lesser extent, investment conditional on migration management (Tocci, 2023).

Given the lack of success of nearly 30 years of 'positive conditionality' in the Southern Neighbourhood, there is a sense that the EU's change in strategy is partly the result of frustration. The EU has realised that incentivising change in non-EU countries is both difficult and questionable from a legitimacy perspective. The Global Gateway represents a step back from the traditional EU cooperation model based on supporting and rewarding reforms. The EU has been explicit about its more 'geopolitical' focus on European interests and mutually beneficial projects. Support for democracy and social justice in neighbouring countries has become a second-order priority.

Analysts have argued that the Global Gateway has the potential to have more success than earlier strategies. Rizzi and Varvelli (2023) consider that the EU should prioritise the Southern Neighbourhood for Global Gateway projects. They point out the potential for investments in green energy projects, better

infrastructure connections between MENA countries and Europe, and manufacturing sectors with shorter supply chains, which could make the region a nearshoring hub for the EU. While democracy is no longer on the agenda, the EU still has ambitions to export economic governance norms and standards via financial regulation rules underpinning investment projects (Prontera & Quitzow, 2023).

The Belt and Road and the Global Gateway: A New Reality for the Southern and Eastern Mediterranean?

The Belt and Road Initiative

Figures from the Chinese foreign ministry reveal that China-Arab states' economic and trade cooperation has increased dramatically since the Arab uprisings. In 2021, China's FDI stock in Arab states topped \$23 billion, an increase over 10 years of more than 260 per cent. Trade volumes reached \$330.3 billion, 1½ times more than in 2011, making China the largest trading partner for several ENP-South countries (PRC MFA, 2022).

As Chinese investment in the MENA has increased, the BRI has become a vital tool of Beijing's foreign policy. According to a Chinese report on BRI investment, the majority of BRI investment projects in 2021 were in the MENA region. In 2022, MENA countries expanded their cooperation with China and received about 23% of Chinese BRI engagement, up from 16.5% in the previous year. Projects included the TEDA area of the Suez Canal Authority and the operation of the new port terminal in Haifa Bay (Nedopil-Wang, 2022).

China's investments are creating opportunities for European companies. In January 2021, Egypt's National Authority for Tunnels signed a memorandum of understanding with Egyptian firms Orascom Construction and Arab Contractors and with Germany's Siemens Mobility to design and build high-speed rail linking the Red Sea and the Mediterranean. According to Devonshire-Ellis (2021), these companies will be paid \$23 billion for building and maintaining the network over 15 years.

Scepticism about Chinese motivations and, above all, about the effectiveness of Chinese investment may be growing. As Malik (2023) points out, mega projects in several MENA countries are demolishing homes and cultural heritage with little public consultation. The scandal in Jordan over the Attarat energy project, which promised to provide Jordan with a major electricity source and good relations with China, is providing a cautionary tale to other MENA countries. According to Debre (2023), since there are cleaner sources, the energy from the shale oil plant is no longer needed, meaning that Jordan has borrowed billions for out-of-date technology.

The Global Gateway

The Global Gateway's key implementation tools are "Team Europe Initiatives" (TEIs) and blended finance. TEIs arose during the Covid-19 pandemic to mobilise resources for supporting neighbouring countries. After many years of efforts to integrate development financing and coordinate external cooperation, TEI has become the preferred option for EU Member States (Hodson & Howarth, 2023). TEI is an intergovernmental approach where decisions are taken on a case-by-case basis, meaning Member States have considerable influence over strategic choices under the Global Gateway. Blended finance, on the other hand, is a mechanism for increas-

ing the European Commission's power via financial regulations (Prontera & Quitzow, 2023). The Neighbourhood has been the testing ground for the Global Gateway, in that blended finance has been an important instrument in the ENP 'toolbox' since the launch of the Neighbourhood Investment Facility in 2008.

To date, the Global Gateway has made a slow but steady start in the ENP-South region. The overarching policy goals for projects in ENP countries are set by the ENP Economic Investment Plans, which aim to boost economic development and connect partner countries with each other and with the EU, targeting connectivity gaps in digital, energy and transport infrastructure (EC/EEAS, 2021c). According to available information from the European Commission, projects have been launched or are being planned in five ENP-South countries.

The highest profile project is the 'Medusa Submarine Cable System,' which aims to connect universities and Small and Medium Enterprises (SMEs) in Egypt, Tunisia, Algeria, and Morocco with southern EU Member States. A second cross-regional project is the 'Global Maritime Green Corridor', which aims to produce six million tonnes of methanol annually for green shipping. A feasibility study for the first phase in Morocco and Egypt is close to completion, and the project will include private sector participants. Egypt is the location for the TEI 'Connected Economy and Society', which includes a project to modernise the Alexandria Area Control Centre, financed by France's Development Agency (AFD) and an EU grant. In Tunisia, the 'ELMED Interconnector Electricity Transmission Project' supports the construction of an undersea high-voltage electricity cable between Italy and Tunisia. The 'South2 Corridor' pipeline to transport hydrogen from Tunisia to

Southern Germany through Italy and Austria is planned to be operational by 2030. In Morocco, a TEI plans to blend loans from AFD and the European Investment Bank (EIB) with an EU grant to finance the extension of the Rabat tramway network. In Jordan, the Aqaba-Amman desalination project aims to end the country's water scarcity problem. The project is the largest infrastructure project in Jordan's history, envisaged to cost €3 billion and create 4,000 jobs in the construction phase planned to begin in June 2024.

Potential Synergies, Potential Pitfalls

When European Commission President von der Leyen announced the Global Gateway initiative during her State of the Union address to the European Parliament in September 2021, she argued that rather than “build[ing] a perfect road between a Chinese-owned copper mine and a Chinese-owned harbour”, Europe should “... get smarter when it comes to these kinds of investments”. Many infrastructure projects, particularly in the area of connectivity, aim at providing public goods which benefit everyone. The smarter option, therefore, is to explore the scope for Europe and China to work together in the Southern and Eastern Mediterranean, where it makes sense to do so. While scepticism about the others' motives is inevitable, the EU integration experience shows how intertwined investments and mutual dependency are instrumental for maintaining long-term peaceful cooperation.

The EU views its relations with China as a triptych: China is a partner for cooperation and negotiation, an economic competitor, and a systemic rival (EC/EEAS, 2021). This three-dimensional view of the relation-

ship highlights that Europe and China are global actors with complex interests that sometimes overlap and, at other times, are in conflict with each other. China's official narrative is one of synergy rather than competition. Whereas Western think tanks and media regularly depict the BRI as a Chinese plot to undermine European unity and create unsustainable debt burdens, Chinese state media envisage a bright future in which Europeans and Chinese are ancient civilisations coming together as strategic partners in a bright future (Savic, 2021).

The Global Gateway and the BRI have certain similarities. Both initiatives are brands that offer external economic cooperation and investment in return for access to resources and political influence. Both initiatives cover a wide and ever-expanding set of activities and include pre-existing projects. Neither initiative is “going away” in the near future.

There are key differences as well, but these appear to complement rather than contradict each other. One big difference is that Global Gateway projects are to be partly funded by grants as well as loans. Rizzi and Varvelli (2023) argue that this means that the EU can propose more attractive investment offers than China. A second difference is the EU's intention to engage the private sector in Global Gateway projects. According to the European Investment Bank (EIB), a new Global Gateway Fund of €400 million is planned for facilitating private sector investment, which is expected to catalyse more than €4 billion in funds (Shirley, 2023). According to Nedoil-Wang (2022), the Chinese government is also interested in exploring possibilities for co-financing initiatives with the Global Gateway.

The EU's main problem and vulnerability in relation to China remains its credibility and

its commitment to deliver on high-minded promises. On the financial side, the €300 billion Global Gateway investment target by 2027 is a big number. Nevertheless, this target pales in comparison to the estimated \$964 billion that China has invested in the BRI since 2013 (Scissors, 2023). Although pertinent questions about whether the EU can achieve its target have been raised, €300 billion globally, with a good proportion to be invested in North Africa and the Levant, should not be a problem for the EU as long as the political will to prioritise the Global Gateway is there. Indeed, if the Global Gateway is to make its envisaged impact in the ENP-South and globally, €300 billion will need to be just the start.

On the values side, assurances that investments will be made in line with European values and standards raise a dilemma that has plagued the ENP for many years. The EU has long faced the reality that addressing political, social, and economic challenges in the ENP-South requires cooperation with authoritarian governments. This has meant that the EU has been vulnerable to the charge of hypocrisy, and in addressing this, has had either to moderate its language or compromise on its values. The EU has mostly chosen the latter approach, leading to accusations of acting neo-colonially by talking about superior values while practicing double standards regarding human rights (Grimm & Roll, 2023).

Conclusions

The EU is right to view China through its three-faceted prism. China is not interested in a world order based on cooperation and exchange among liberal democracies. The Chinese government does not care about the rights of ordinary citizens in MENA countries. Nevertheless, there are opportunities for cooperating with China on projects of mutual interest. These opportunities should be actively sought out and taken when they arise.

At the same time, the EU would be well advised to take its own promise – to offer governments and societies in the Southern and Eastern Mediterranean a better deal than the BRI – seriously. It will not be enough for the EU to merely talk about its values, especially participative policymaking, accountability for decisions, and transparency of processes. These values are at the heart of European integration and make Europe an attractive model for people from all over the world.

The EU does not need to take a confrontational approach towards the Chinese engagement in the Southern Neighbourhood. Europe is most likely to reach its objectives when it leads by example, offering better deals that benefit all parties. If the EU is able to demonstrate that the benefits for MENA countries in cooperating with the 'European model' are greater than in cooperating with the 'Chinese model', it is likely that China will want to cooperate with Europe as well.

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The Resilience and Adaptation of Transport to Climate Change in the Mediterranean

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Introduction

Adaptation and mitigation are the two main responses to the challenges and threats posed by climate change. While mitigation actions can help reduce or eliminate anthropogenic drivers of global warming, the aim of adaptation actions is to increase resilience and reduce the vulnerability of people, activities and ecosystems to the effects of climate change. In the area of transport, some of the best examples of mitigation are the decarbonization of energy sources and measures to increase energy efficiency. The purpose of adapting transport to climate change is to protect infrastructure and operations from current and future effects of climate change.

Mitigation has featured prominently in recent years in transport policies, public debate and the agendas of financial institutions, whereas adaptation has played a less conspicuous role. This contrast between mitigation actions, identified adaptation needs, and actions actually implemented is known as the adaptation gap.

This article focuses on policies, strategies and tools aimed at climate change adaptation in the field of transport in the Mediterranean region. This geographic area is of particular relevance because it is expected to be one of the areas most affected by climate disruption (MEDECC, 2019). The challenge of adapting transport to the effects of climate change is yet another well-known inequality between the northern and southern shores of the Mediterranean, at a time of great economic and political instability and uncertainty. Indeed, the Mediterranean is once again a sea that separates two areas with highly different capacities and resources for action, as well as a sea that unites territories affected by similar climate challenges, in which cooperation and the

production and dissemination of knowledge are key in the move towards climate resilience and development.

Adaptation to Climate Change

When world leaders recognized the need to act on climate change, mitigation agreements were adopted to reduce greenhouse gas (GHG) emissions. It also became clear that human societies had to adapt. Specifically, the 1997 Kyoto Protocol acknowledged the need for action, especially in developing countries. The importance currently given to climate change adaptation is evident from its inclusion in Article 7 of the 2015 Paris Agreement, which states:

1. [...] Parties hereby establish the global goal on adaptation by enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change [...].
2. Adaptation is a key component of the long-term global response to climate change to protect people, livelihoods and ecosystems, [...].
6. Parties recognize the importance of support for and international cooperation on adaptation efforts and the importance of taking into account the needs of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change. (United Nations, 2015)

Adaptation aims to guarantee resilience and reduce the vulnerability of human and natural systems to new climate scenarios. The consequences of these new scenarios can be classified in two categories: the effects of extreme weather events and the effects of gradual transformations such as rising sea levels.

In the definition of the Paris Agreement's global goal on adaptation, the challenges posed by adapting to climate change are referred to as global, which is why international cooperation is so important, especially with regard to the most vulnerable countries. According to the Paris Agreement, special emphasis should be placed on generating and sharing knowledge and: "good practices, experiences and lessons learned, including, as appropriate, as these relate to science, planning, policies and implementation in relation to adaptation actions".

However, according to the United Nations Environment Programme's Adaptation Gap Report 2022: Too Little, Too Slow (United Nations Environment Programme, 2022), the amount and rate of progress on global adaptation goals are insufficient. The report highlights international efforts on adaptation and states that 80% of countries have designed some form of climate change adaptation planning. In addition, it mentions a significant increase in funding in recent years. However, it also makes clear that the financial resources earmarked for this purpose are insufficient. According to the report, for the least developed countries to meet adaptation targets by 2030, five times more spending on adaptation would be necessary.

But the dangers and risks of climate change are now upon us, and damage and losses are only expected to increase in the foreseeable future. Furthermore, current implementation of adaptation measures does not mean that the risks and hazards will disappear. In many cases, these measures are carried out in an incremental, ad hoc manner without addressing the cascading, long-term effects, and are also implemented by shifting the problems in time and space. This has been referred to as maladaptation. Moreover, adaptation has its own limits. Some climate impacts

are expected to be of such a magnitude that adaptation to produce only acceptable risks for society will be impossible. These hard limits of adaptation contrast with the soft limits, where risks can be kept at acceptable levels through adaptation measures. A port can take incremental measures against extreme sea level events, as long as such events remain within a certain recurrence or magnitude. In this case, port is facing soft limits. However, beyond certain levels of recurrence or magnitude of sea level rise events, there are no longer viable options for maintaining the operability under acceptable risks for society.

Today, the major challenges posed by climate change have prompted some experts to advocate the need to take urgent action to limit global warming and also implement adaptation measures. For example, the documents of the Intergovernmental Panel on Climate Change (IPCC) and, in particular, its sixth report, published in 2022 (IPCC, 2022), which exerts considerable influence by calling for urgent action to maximize synergies between mitigation and adaptation measures with the ultimate goal of achieving climate-resilient development.

Transport and Climate Change Adaptation

Transport infrastructure and operations that ensure flows of goods and people must deal with the effects and impacts of climate change in the form of extreme weather events such as floods and heat waves, and as the result of long-term incremental changes, the most graphic example of which is the rise in sea levels. Impacts on the transport system can cause damage to infrastructure and render it unusable while seriously affecting transport operations. These one-off impacts can have a cascading, multiplier effect on whole supply chains and passenger mobility systems

while distributing impacts on the transport sector to society as a whole. For example, recurrent extreme events, such as floods or long periods of drought, can cause land destabilisation and landslides. This could lead, even temporarily, to the disruption of communication routes, and thus the disruption of supply chains in larger areas than those affected directly by landslides. Finally, other impacts on the transport system cannot be ignored, such those resulting from changes in traffic flows due to climate change, as the distribution of tourist destinations and food production areas (UNECE, 2020).

Despite evidence of current and future impacts of climate change on transport, there is a lack of balance between the attention given to mitigation and adaptation policies. In transport, this adaptation gap is more evident due to the contrast between the work being done to decarbonize transport (which has become the top item on political agendas and in public debates) and adaptation policies and actions (which are less visible and more difficult to implement), among other factors, due to the lack of accurate knowledge of the specific effects and impacts of climate change on infrastructure and operations.

Based on the existence of this adaptation gap in transport policies and the general lack of knowledge on the effects and impacts of climate change on transport infrastructure, services and operations, two of the main recommendations for action have emerged from different areas. The first is to raise awareness of the need for action on climate change adaptation and the second focuses on generating specific, detailed

knowledge on the impact of climate change on transport infrastructure and operations in different time frames and specific locations. It is clear that these two recommendations are closely linked. The need for action to adapt transport to the impacts of climate change should emerge from an understanding of the potential impact of future climate states on transport system components. This knowledge also involves production and dissemination work, as well as proper translation to different working scales. Successfully adapting transport to climate change will therefore require modelling future climate states, impacts and risks generated at different scales, and defining specific spatial and temporal measures to address them, as well as mechanisms for the dissemination of this knowledge to all actors in the transport sector.

A whole set of methods and guidelines are now available for assessing adaptation needs and developing measures that are easier to implement. Assessing the impacts, risks and vulnerabilities of transport infrastructure is the basic tool for identifying and adopting measures aimed at increasing the resilience of infrastructure for handling climate change. Along these lines, several specific methods have been published on the impacts of climate change on different types of transport modes¹. In other cases, these methodological guides based on the assessment of infrastructure vulnerabilities are designed to be generic tools for funding programmes and specific policy development programmes.

Considering the interrelated effects on transport networks as a whole and, by ex-

¹ Some examples of transport modes include:

UIC (2017). *Rail Adapt*. Paris.

PIANC (2020). *Climate Change Adaptation Planning for Ports and Inland Waterways*. Brussels.

PIARC (2019). *Refinement of PIARC's International Climate Change Adaptation Framework for Road Infrastructure*. Paris.

tension, on society, there are calls for methods that go beyond the scale of specific projects and infrastructure and provide a more holistic view of the impacts of climate change. These methods include criticality analysis of infrastructure to assess the significance of the consequences of disruption for the system as a whole. Criticality analysis is not an alternative to vulnerability assessment, but it makes use of synergies as tools to move towards greater system resilience (UNECE, 2023a). The complex relationships between climate change and its consequences are not only unpredictable, but also introduce the difficulty of defining long-term strategies that take existing uncertainties into account. This leads to the need for new tools that help define the sequence of actions, as well as their adaptability and flexibility to new situations while considering the complexity of relationships between climate, human activities, and the natural environment (UNECE, 2023b).

Adaptation of Transport to Climate Change in the Mediterranean Region

In the context of adaptation to climate change, the Mediterranean region plays a critical role. The Mediterranean will be one of the areas where the effects of climate change are felt the most. This is reflected in IPCC6, which has a separate chapter on the Mediterranean region². Taking into account the biodiversity of the Mediterranean Sea, the high population density on its shores, its capacity to attract tourists and its role in global supply chains, the so-called region will clearly be one of the areas where these effects have the greatest impact on natural systems and human activities. The response to climate change

adaptation will undoubtedly be determined by the development and governance gap between societies on the northern and southern shores. Much of the northern shore is characterized by high levels of development and financial capacity. Furthermore, in terms of climate change adaptation, the existence of a governance system under the umbrella of the European Union should provide for the development of specific strategies, policies and measures aimed at adapting transport to the effects of climate change.

The countries on the southern shore must adapt transport to climate change with less capacity for action. This is due to lower levels of development, growing political and social instability, the lack of supranational structures that encourage the implementation of long-term regional strategies and measures, and climate change-related risks that directly affect priority systems such as food production and human settlements.

Back in 2013, the European Union established the first binding legislation for its Member States on the climate change adaptation strategy and, in 2014, the European Environment Agency published a guide on adapting transport to climate change (European Environment Agency, 2014). Moreover, the publication in 2019 of the European Green Deal (European Commission, 2019) marked the beginning of a whole set of initiatives on the challenge of climate change that currently provide the framework for the process of adapting transport to climate change in the European Union. The Green Deal addressed the need for a new climate change adaptation strategy in the communication *Forging a Climate-Resilient Europe - The New EU Strategy on Adaptation to Climate*

² On the effects of climate change in the Mediterranean, see also: MedECC (2019). *Risk Associated to Climate and Environmental Changes in the Mediterranean Region*.

Change (European Commission, 2021a). With their specific focus on transport, the new Connecting Europe Facility (European Commission, 2021b) in 2021 and the proposal for new Guidelines for the Development of the Trans-European Transport Network (European Commission, 2021d) also address the issue of adaptation and resilience of infrastructure to climate change. From a more technical perspective, the Technical Guidance on Climate Proofing of Infrastructure for the Period 2021-2027 (European Commission, 2021c) stands out. These guidelines, prepared by the European Commission and the European Investment Bank Group, provide a guide for assessing the resilience of infrastructure projects to be financed in this period. Finally, the Directive on the Resilience of Critical Entities (European Commission, 2022) again stresses the need to consider the impacts of climate change.

In the deployment of European Union actions on adaptation, two goals are of note, among many others, which will have a particular impact in the Mediterranean region. The first is the importance of generating and disseminating knowledge on climate change, including its effects, impacts, measures and adaptation strategies. The second is recognizing that the effects of climate change are a challenge that extends beyond the borders of the European Union, which implies the need for collaboration with third countries in the adaptation process, including the need for climate funding. These two goals are relevant in the Mediterranean because they address two of the problems jointly faced by countries in that region, especially those on its southern shore.

Firstly, generating, disseminating, and exchanging knowledge is fundamental for proper design of adaptation strategies and measures. Knowledge on climate change in the Mediterranean must therefore provide all countries with information on future climate conditions and their evolution on a scale and with a resolution that facilitate decision-making. In this exchange of information, it is also important to remember that the countries on the southern shore have historically faced climatic situations like those expected to be faced by European countries in the near future, an experience that makes the mutual exchange of knowledge possible³. Furthermore, the mobilization of financial resources by the European Union for adaptation to climate change in general and transport in particular in the countries on the southern shore is critical for societies with limited financial resources and immediate adaptation priorities to be addressed, in which adapting the transport system may be viewed more as a cost than a necessity.

Conclusion

Predicted impacts of climatic conditions in the Mediterranean basin threaten the ability of the transport system to continue performing its functions of ensuring the exchange of goods and mobility of people. Adaptation to new climatic conditions is a priority, as reflected in different national and supranational plans and strategies. However, the adaptation of transport in the Mediterranean is facing some challenges. First, the lack of precise knowledge about the effects of climate change and its evolution over time at required scales. Second, the lack of financial resources

³ It was therefore of interest to hold the conference for Mediterranean countries Raising Awareness on Adapting Transport Infrastructure to Climate Change and Setting up an Effective Intervention Programme, in Marseille on 15-16 May 2023, organized by UNECE, ESCWA, the French Ministry of Ecological Transition and Territorial Cohesion, Southern Region, Provence-Alpes-Côte d'Azur and CETMO

specifically devoted to transport adaptation, moreover when there exist other priorities in relation to climate change adaptation, such as food production. Third, the lack of a common governance structure that allows a common political and technical approach to common challenges in both side of the Mediterranean, as it exist in the European Union.

However, recognition of the fact that all countries in the Mediterranean region face the same climate challenges and that their transport systems are inter-

dependent should lead to actions and measures that favour specific adaptation strategies and measures, particularly in the countries on the southern shore and especially when the European Union's own adaptation goals include knowledge transfer and support for third countries. If these actions are not taken, there a risk that the transport system adaptation gap will be added to the list of the many existing inequalities between the two shores, and that more or less serious disruptions to the Mediterranean transport system as a whole will increase.

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The Potential of Railway Freight Transport in the Maghreb

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Context

Thanks to its advantages in mass transport, cost to the community, safety, and environmental protection, the railway sector remains undeniably a key sector and a growth lever, also serving as the backbone for economic integration and the development of exchanges at regional and international levels. The Maghreb countries, with the exception of Libya, have a railway network that includes the Casablanca-Algiers-Tunis corridor. However, this network has not evolved at the necessary pace in terms of maintenance and extension since the independence of these countries. Nevertheless, there has been a particular interest over the past two decades in the railway sector in these countries.

The railway connection could be a major asset for the development of intra-Maghreb traffic and has a real potential to facilitate commercial exchanges and, consequently, regional integration, which aligns with the objectives of the UMA's founding treaty.

Status of Intra-Maghreb Trade

The development of transport and logistics infrastructure is linked to international and regional trade in goods; nonetheless, despite the goodwill shown during the creation of the UMA, the level of intra-Maghreb trade remains at its lowest and marginal compared to the total trade of Maghreb countries. Several studies have concluded that this low level of trade is due to several considerations, but its real potential could be harnessed.

In this context, the “Economic Integration in the Maghreb” regional study on trade facilitation and infrastructure for Maghreb

countries (Rouis & Kounetsron, 2010) confirmed that the costs of intra-Maghreb trade are high compared to bilateral costs between the Maghreb and the European Union. The study on the cost of the non-Maghreb (Mahjoub et al., 2017) also notes the low level of intra-Maghreb trade, with almost no progression. The exchange of goods represents only 3.6% of the total, and the region's contribution to GDP is weak, with only 2.05% in 2015.

The “Report on Regional Integration in the Maghreb, 2019: Challenges and Opportunities for the Private Sector” (BAD & BMICE, 2020) highlights that intra-Maghreb trade performance is weak, accounting for only 2.7% of the total in 2017, compared to 3.1% in 2016 and an average of 3.2% for the period 2012-2017. According to this report, the delay in the integration process costs each country 1.5% to 2% of the growth rate and a loss of 200,000 to 300,000 additional jobs per year across the region.

The low level of trade integration is due to regulatory and logistical obstacles, and this is mainly related to high degrees of trade protection practiced in the region and restrictive trade rules with tariff and non-tariff barriers. Additionally, the multiple bilateral and regional trade agreements concluded by the Maghreb countries have not yielded the expected results due to a lack of willingness to implement these agreements. The complementarity of trade has not been harnessed under a common policy.

These constraints are compounded by customs clearance and border crossing procedures, low logistics performance, and the quality of border infrastructure and road and rail transport services, with missing sections. It is also noteworthy that direct maritime connectivity between

Maghreb countries is very low or non-existent, and maritime exchanges are carried out through European ports.

Rail Transport Networks in Maghreb Countries

Available data, including those from the “Pre-feasibility study for the project to modernise the Trans-Maghreb railway line: Project's Information Memorandum” study, show that the railway network has slightly evolved and is approximately 9,547 km long, of which only 8,523 km are operational. The Moroccan network consists of 2,109 km, of which 1,284 km are electrified. The Algerian network consists of 4,573 km, of which 3,854 km are operational. The Tunisian network consists of 2,165 km, of which 1,860 km are operational. Mauritania operates a single railway line of about 700 km, connecting the iron ore mine of Kédiet Ijill and the mineral port of Nouadhibou. Libya started construction on its first railway lines in 2001. The first line should connect the country to the borders with Tunisia to the west and the borders of Egypt to the east. However, work stopped in 2011, and there is no data on the completion of the work and the commissioning of the line.

The railway connection constitutes a fundamental component of the Maghreb network, the trans-Mediterranean transport network (RTM-T), and the Group of Transport Ministers for the Western Mediterranean (5+5 GTMO) network. The willingness of Maghreb countries to develop intra-Maghreb rail transport has been concretised through various cooperation frameworks. Firstly, at the UMA level, with the adoption of an ambitious program aligned with the realization of the UMA's founding treaty objectives, aiming for regional integration, and facilitating the movement of goods, services, and people.

The Maghreb high-speed rail line (LMGV) and the Maghreb highway are major projects agreed upon since the 1990s.

At the Mediterranean level, the identification of a trans-Mediterranean transport network, including a railway component, has always been a priority project for ministerial conferences of the Union for the Mediterranean (UfM), particularly in the various regional transport action plans (PARTs), including the current PART 2021-2027. The work on identifying a mutually accepted RTM-T by the countries includes the railway component. The same interest is granted in the framework of cooperation at the level of the Western Mediterranean, 5+5 GTMO. It is also noteworthy that the studies conducted by the Centre for Transportation Studies for the Western Mediterranean (CETMO) have confirmed the importance of focusing on the intra-Maghreb transport network, including railway transportation.

Railway Sector Development Programmes and Results of Conducted Studies

Maghreb countries have always sought to prioritise the railway sector, although the realisation of improvement and expansion programmes for railway networks falls short of objectives and stated intentions, owing to various considerations. This intention and special interest in the railway sector have been particularly evident in the last two decades.

In this context, data from available studies show that Morocco has made significant advances in railway transport and the Moroccan railway network is considered the most modern in Africa. Notable projects that have been completed, ongoing, or

planned include the construction of the Casablanca-Tangier high-speed line, station transformation projects, railway lines between Khouiribga and Beni Mallel, Rabat and Meknes, Marrakech and Agadir, the Fes-Oujda high-speed line, the Casablanca-Marrakech high-speed line, and fiber optic projects, among others (BAD et al., 2016).

Algeria places particular importance on railway transport through significant projects outlined in its railway sector master plan. The programme includes 2,890 km currently under construction, with 574 km dedicated to track renewal works. Of note is the North Ring project, connecting with the Moroccan borders on one side and the Tunisian borders on the other, spanning a length of 1,220 km. In this context, the Annaba El Tarf-El Kalla line and the high-speed line (LGV) were identified in 2013 (BAD et al., 2016).

Over the past 15 years, Tunisia has undertaken several actions related to track consolidation and renewal, strengthening of structures and axle load capacity, rectification of constraining sections, and protection of corridors, among others. Key projects completed or planned include upgrading the Tunis-Gabes line and track renewal on the Tunis-Alger line. The major projects and works undertaken or planned include the Gabes-Medenine link, the doubling of the Moknine-Mahdia track, the restoration of the Mateur-Tabarka line, electrification, the rehabilitation of the Tunis-Kasserine line, the restoration of the Sousse-Kairouan connection and its extension to Kasserine, via Sidi Bouzid, and more (BAD et al., 2016).

In general, progress in developing and upgrading road networks and the railway connection is low due to certain considerations related to priorities, public finances, project planning and financing,

and the low level of trade that does not warrant heavy investments in transportation and logistics infrastructure.

The most recent study is focused on the "Feasibility of Rehabilitation and Modernization of the Trans-Maghreb Railway Line," financed by the African Development Bank (BAD) for the Maghreb Union (UMA) and conducted in 2018 by ITALFERR in association with COMETE International and MEDEVCO. The objective of this study is to re-establish a direct railway link between Casablanca, Algiers, and Tunis, and to reduce the total travel time in two stages: from 48 hours to 30 hours and then to 25 hours. The third stage involves the development of a Maghreb High-Speed Train (TGVM) and the extension of the high-speed railway axis to Mauritania and Libya as the final stage.

Six scenarios were studied, three without TGVM and three with TGVM. The evaluation of these scenarios took into account all technical, economic, financial, environmental, institutional, and social aspects. The study concluded that the only alternative to reduce the travel time to 30 hours by 2025 with reduced investment is to use the existing network, specifically the modernization of the existing Fez-Oujda-Akid Abbas line and the modernization of the existing Souk Ahras-Ghardimaou-Beja line.

For the second stage, aiming to reduce the travel time to 25 hours and employing new rolling stock, the most suitable route concluded by the study is Scenario 2 (which involves modernising the existing Fez-Oujda-Akid Abbas line, constructing a new railway line between Annaba Sud, El Tarf, and Jendouba, and modernising the existing Jendouba-Beja line). This same route is also recommended for the possible development of the Maghreb high-speed line between Casablanca, Algiers, and Tunis, i.e., Scenario 5 of the study.

Both for improving the existing network and for the high-speed line, the selected scenarios (Scenarios 2 and 5, respectively) require the construction of new sections. These sections concern the connection of the Algerian network to the Tunisian network with a new route, covering a length of 130 km from Annaba Sud to AlTarf-Jendouba.

In conclusion, the consulting firm considers that, given the schedule of interventions for the first two stages, achieving the objectives of these stages would entail unnecessary costs that could be avoided by prioritising the long term and establishing a progressive implementation plan, based on funding availability and focusing on the most profitable sections of Scenario 2.

Given the proposal by the consulting firm and considering that the period for the first stage of the study (2025) is nearly complete, and in view of the constraints and obstacles to commercial integration and the development of the railway corridor, it seems more appropriate to present the study results with the aim of retaining an option acceptable to all countries involved. The potential for freight traffic between Tunisia and Libya should be taken into consideration.

Conclusions

Conclusion 1 - Real Potential for Commercial Integration and Development of Freight Railway Transport: There is real potential for intra-Maghreb integration and opportunities to enhance trade. Land transportation, especially railway transport, also represents potential for facilitating exchanges. However, realising these potentials is primarily conditioned by a willingness to overcome observed constraints and obstacles through a well-defined action plan.

Conclusion 2 - Constraints on Commercial Exchanges and Regional Integration: The low level of commercial integration and marginal share of exchanges compared to total Maghreb trade is mainly due to regulatory and logistical constraints, high levels of commercial protection, restrictive rules, and tariff and non-tariff barriers. This weak integration is also attributed to customs clearance procedures, border crossing delays, poor logistical performance, inadequate infrastructure at borders, and missing segments in road and railway transportation.

Conclusion 3 - Low Progress in the implementation of Railway Transport Development Programs: The railway connection has not received the necessary investments for maintenance and extension, primarily due to considerations related to priorities, public finances, project planning, and financing. Additionally, the low level of trade and commercial integration does not justify the profitability and feasibility of investments in projects. However, there has been renewed interest in the sector in recent years, with significant projects for national railway transport.

Furthermore, the alternative proposed by the ITALFERR study, which involves maintaining and rehabilitating certain sections and constructing new 130 km sections on both the Tunisian and Algerian sides, would require significant funding and can only be realised through mutual validation and acceptance by both countries. The potential for traffic between Tunisia and Libya via Sousse, Sfax, and Gabes should also be considered.

Conclusion 4 - Financing: Despite various initiatives at the Union for the Mediterranean level, particularly the Civitavecchia conference in Italy in 2014 on financing the

trans-Mediterranean transport network, and efforts by the Arab Maghreb Union (UMA) and other bodies, financing for major projects, including the railway connection, has not yielded the expected results. As a result, railway projects in different countries are undertaken with uncoordinated efforts and mainly rely on state budget funds, which are subject to the priorities of public finances.

Conclusion 5 - Willingness and Coordination: It is evident that the obstacles to regional commercial integration and the development of transport and logistics services supporting this integration are largely due to a lack of willingness and coordination, despite efforts by the UMA secretariat, which has experienced a slowdown in the work of specialised commissions. The non-exploitation of certain borders for land transport in the region, delays in constructing railway line in Libya and the completion of the connection of the Tunisian network up to the Libyan borders, as well as the lack of a vision regarding the connection with Mauritania have significant medium-term impacts and hinder the development of exchanges.

Recommendations

- Revive dialogue through the UMA and its specialised commissions, with a shared commitment at the highest level and deeper consultation to adopt and implement a common strategy accepted and shared by all. Renewed commitment and coordination are more crucial than ever to reignite cooperation, drive regional trade, and progress in implementing the trans-Maghreb network, with a priority on the railway corridor within a comprehensive vision for the sector and complementarity among modes, giving priority to revitalising railways.
- Agree on necessary measures to reduce the still high level of commercial protection, simplify and harmonise procedures, progressively reduce or eliminate tariff and non-tariff barriers, strengthen customs cooperation, and enhance transit and border crossing infrastructure.
- Adopt, through UMA secretariat coordination, a mutually accepted action plan within the entire transportation system, prioritising the railway corridor. The results of the study on the “Feasibility of Rehabilitation and Modernisation of the Trans-Maghreb Railway Line” could serve as a starting point for agreeing on medium and long-term action plan priorities to effectively prioritise the railway sector for the rehabilitation and modernization of the railway network. This plan should include improving logistical performance with multimodal exchange stations. The Comité des Transports Ferroviaires Maghrébin or Maghreb Rail Transport Committee (CTFM) should play a significant technical role in any strategy and action plan related to the railway corridor. Ongoing projects at the country level that serve domestic transport should be strengthened to facilitate the full resumption of transport on the corridor when decided upon. Railway connection projects should also be synergistic and complementary with other initiatives and action plans at the GTMO 5+5 and UfM levels.
- Continue efforts at all levels of regional and global cooperation to secure financing for the Maghreb network, especially the railway connection. In this context, it is recommended to explore various financing avenues, including public-private partnerships (PPP).

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Convergence Among Transport and Energy Sectors in the West Mediterranean Countries

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Introduction

While many national strategies aim at decreasing carbon emissions, transport remains among the hardest sectors to decarbonize, due to its strong reliance on oil products and the need for high-density energy carriers in many applications. Moreover, mobility demand increase is correlated with economic growth, and this will represent an important trend in most countries in Northern Africa in the next years. An additional aspect is the continuous urbanization rate, with increasing shares of the total population moving from rural areas towards large city centres. This tendency requires coherent and effective urban planning strategies, to ensure all citizens an equitable access to workplaces, health-care, education and, in general, opportunities.

In addition to mobility demand, an important driver of energy consumption, and thus climate emissions, is the choice of specific transport modes by the users, and in particular the reliance on private vehicles instead of more sustainable alternative modes, including public transport, cycling and walking. While carbon emissions are the main goal of the current energy transition, it is important to remember that the use of private cars has also additional impacts on local pollution, congestion, safety, health, and noise (Essen et. al., 2020).

In this perspective, a general framework to evolve towards a sustainable transport system is the Avoid-Shift-Improve (ASI) approach (Bongardt et. al., 2019), which suggests starting by avoiding unnecessary trips, then shifting towards more sustainable modes and solutions and only focusing on improving the situation for the remaining trips.

However, after reducing unnecessary mobility demand and maximizing active mobil-

ity, an important part of everyday demand will continue to rely on motorized modes. Electrification is increasingly being seen as an effective solution to decarbonize urban transport, especially for light-duty vehicles such as private cars, and two- and three-wheelers (which are the most electrified transport segment worldwide (IEA & EVI, 2023)). EU West Med countries show electrification rates that are below Northern EU countries, as only 9% of total car sales are electric in Italy and Spain, and around 22% in France and Portugal (compared to 31% in Germany, 39% in Denmark and 56% in Sweden (ACEA, 2023)). Electrification rates remain near zero in South West Med countries. Nevertheless, the global trend in car manufacturing is clearly heading towards electric solutions. This in turn leads to an increased integration between the transport and electricity sectors, calling for the need to develop integrated strategies and policies by exploiting potential synergies.

Road Transport Electrification

Electric vehicles (EVs) can represent an effective solution compared to vehicles running on fossil fuels, both in terms of climate emissions and local pollutants. A key aspect for their successful contribution against climate change is the need to guarantee the use of electricity produced from low-carbon sources. Thus, in parallel to EV deployment, it is of utmost importance to guarantee a parallel development of electricity generation from low-carbon sources, charging infrastructure but also power distribution network (and to a lesser extent transmission network).

Electric Vehicles

Electric vehicle technology is gaining momentum worldwide, and automotive companies are adapting their business models

and production strategies to provide a range of electric models. The European Union (EU) is among the regions that are showing higher levels of electrification, especially due to ambitious climate policies aiming at an important reduction of emissions (especially since 2021 with the Fit for 55 package and the ban of new ICE vehicle sales by 2035). The technological development of li-ion batteries is improving the range of vehicles and reducing their cost, and also gradually allowing for shorter recharge times, addressing the three main issues that still undermine their wide adoption by the population.

While most interest is put on passenger cars, due to almost 2 billion cars on the streets worldwide (and figures in the West Med region as high as 675 cars per 1000 inhabitants in Italy (Eurostat, 2023)), it is interesting to remember that two- and three-wheelers also account for an important share of the total mobility demand, and they represent an interesting option for electrifying urban transport in an effective way.

Finally, while urban public transport has historically relied on electricity-based solutions, such as underground, trams and trolleybuses, in the last decade many cities are looking with interest to electric buses. Compared to light rail, they require fewer infrastructure investments and provide better flexibility, although the maximum range remains sometimes a barrier to their effective use in all the different transport routes on which urban buses are operated.

Finally, freight transport can be electrified via railways or potentially battery electric trucks, especially for short-haul operations. Long-haul trucks are especially hard to be operated on batteries, due to the high weight and the space that would be required onboard to accommodate the batteries, which would reduce the available

room for goods to be transported. Some countries are testing the possibility of implementing electric highways, by equipping motorways with catenary power lines to supply the trucks for at least a part of their total mileage and reduce the needed battery size.

Charging Infrastructure

An important critical point remains the availability of an effective and distributed charging infrastructure. While in many cases electric vehicles will be charged at home or at the workplace, public charging represents an important infrastructure, especially in urban environments where most of the cars are parked outside overnight. In addition to the issues of important investment costs and the need for space, an additional issue is the impact on electricity distribution grids, which are often already undersized in some dense districts. Thus, proper strategies should be in place for effective planning of charging infrastructure, taking into account charging speed and available electricity supply, but also encouraging the users to adopt charging behaviours that are in line with the availability of low-carbon electricity.

Vehicles as Additional Grid Storage Options?

From this perspective, vehicle charging could also represent an opportunity to balance the variability of electricity generation from renewables such as wind and solar. Smart charging and vehicle-to-grid are two strategies that may play a key role in supporting increasing renewable shares in the power grid. Smart charging is the possibility of choosing the best timing for electricity supply to EVs, while vehicle-to-grid also allows EVs to discharge a part of the stored electricity if the grid needs it. Their implementation requires additional charging infrastructure because each vehicle

needs to remain connected to the grid for a longer time slot, and also an effective optimization tool to coordinate charge and discharge operations. Moreover, the effect on the lifetime of batteries remains to be clarified, to avoid decreasing their lifetime.

Indirect Electrification: Is There a Role for Hydrogen and e-Fuels?

A final point to be addressed is the potential role of e-fuels to indirectly electrify some transport segments that appear to be hard to run on batteries, including maritime applications or long-haul road transport (the so-called 'hard-to-abate' sectors). E-fuels are synthetic fuels produced via low-carbon electricity, and they generally rely on hydrogen produced via electrolysis powered by renewables (or nuclear), which can also be combined with a source of carbon. These fuels can be used in traditional engines, and they can represent one of the few viable options, together with biofuels, for applications that cannot be directly electrified. However, it is worth noting that the production of e-fuels requires high amounts of electricity, due to the complex supply and the losses in the different processes that are involved (including – and especially – in their final use in internal combustion engines).

The highest share of electricity consumption for e-fuel production is due to electrolysis to produce green hydrogen. Thus, effective solutions to produce green hydrogen at low costs are fundamental to support the potential development of e-fuels. Countries with high solar and wind potential, such as the West Mediterranean countries⁴, could benefit from large-scale green hydrogen production, provided that effective ways to supply it to the final users

can be implemented, both from an economic and environmental perspective. Maritime and aviation sectors could be the most interesting applications, although e-fuels may also complement direct electrification in long-haul road transport (Prussi et al., 2022).

Policies and Strategies

Alongside the technological developments, national public policies and decarbonization strategies represent a key component in shaping the energy systems and the transport sector. Possible policies can either favour a reduction and/or a modal shift of transport demand or promote the spread of cleaner vehicles (Noussan, Hafner & Tagliapietra, 2020).

Although Western Mediterranean countries have joined the Paris Agreement and set climate objectives, there is a clear cleavage between Northern and Southern West Med countries regarding decarbonization strategies and policies – especially in the transport sector. North Med countries have increasingly undertaken measures to decarbonize their transport sector, which plays a significant role in their total emissions, mainly driven by the European Union (EU) climate strategy. Already in December 2020, the EU released its Sustainable and Smart Mobility Strategy, which proposed several policy measures that could deliver a 90% reduction in the transport sector's emissions by 2050 (EC, 2020). In 2023, the EU has undertaken additional measures to set higher fuel standards, which is a crucial factor in favouring a shift towards cleaner solutions. An example is its decision in 2023 to ban new ICE vehicles by 2035. As a result, Europe is currently the world's second-largest market for EVs after China. Both in terms of share of EV sales and volumes, the

⁴ France, Italy, Malta, Spain, Portugal, Algeria, Libya, Mauritania, Morocco, and Tunisia.

North West Med countries have experienced an upward trend, although with some differences, especially with other EU countries. In 2022, sales share of EVs was around 9% in Spain and Italy, while around 21% for France (21%) and Portugal (22%). Italy is the only market that experienced a reduction in terms of share of sales from 9.5% in 2021. In terms of volumes, considering the EU West Med countries France stands out with 330,000 EVs sold in 2022, while Spain exceeded 80,000 and Italy 115,000 (down from 140,000 in the previous year) in 2022 (Global EV Data Explorer, 2023). A key factor for the decline of EV sales in Italy, despite relevant subsidies, is the challenging economic context due to rising interest rates and the energy crisis, which erodes households' income.

Although Southern Med countries have set renewables targets and hold abundant renewable potential, the countries have largely experienced a slow development in the power sector (Hafner, Raimondi & Bonometti, 2023). This is obviously more aggravated in the transport sector, which depends entirely on oil, meaning further developments are needed. An initial step could be to encourage more efficiency and decarbonization in the sector through fuel standards. For example, most of these countries import a large number of used cars. By imposing stricter regulation on imports, they could reduce the total fuel consumption.

Besides fuel standards, policymakers can incentivize fuel switching and more efficient transport modes through pricing mechanisms. This is particularly relevant for South Med countries, where low energy prices are key barriers to the development of decarbonization measures in the transport sector. Reforming energy prices can be quite challenging for governments as they are a key element of the current social

contract. Nonetheless, energy price reforms yield several positive consequences in terms of energy consumption, fiscal and environmental benefits as well as encouraging investment in cleaner solutions. While North West Med already experience higher fuel prices compared to their Southern neighbours, they are expected to further increase transport prices as the EU decided to include the transport sector in its Emission Trading System, to further reduce emissions of the transport sector and to reach its 2030 and 2050 targets according to the EU ETS revision.

Alongside prices and targets, governments need to address other key issues regarding the decarbonization strategy, such as infrastructure. To support a wide use of EVs, governments need to deploy charging infrastructure through regulatory frameworks that enable public and private investments. In 2021, Europe had an estimated 375,000 charging stations (Conzade et al., 2022). In the expansion of the infrastructure, EU countries need to ensure a wide network including also rural areas (Falchetta & Noussan, 2021). By contrast, South Med countries may face more challenges as they traditionally have limited financial capabilities and often a lack of affordable financing, which could only delay the deployment of a solid network that incentivizes EV demand. Furthermore, power grids should be strengthened to accommodate increasing amounts of charging points, especially at the distribution level.

Regarding other transport modes, such as maritime, West Med countries' efforts can be further driven by international developments, such as the creation of an Emission Control Area (ECA) in the Mediterranean aimed at reducing air pollution by approving a 0.1% sulphur emission control area for ships in the Mediterranean. Moreover, the Marine Environment Protection Committee (MEPC) of the International

Maritime Organization (IMO) revised the GHG emission reduction strategy in 2023, which aims at reducing carbon intensity of international shipping by at least 40% by 2030. It includes a new level of ambition relating to the uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources which are to represent at least 5% striving for 10%, of the energy used by international shipping by 2030 (IMO, 2023). These developments can represent a positive breakthrough for the deployment of cleaner solutions in the maritime sector as well as a better and more coordinated strategy between countries in the area. This is particularly relevant for Med countries, as the Mediterranean Sea hosts major ports that have important economic and environmental consequences for each country and the entire region (Prussi & Chiaramonti (2023)). Indeed, the region is currently warming 20% faster than the rest of the globe. Regarding the decarbonization of shipping, the European Council adopted a new law to decarbonize the sector in July 2023. The Fuel EU Maritime initiative, which will come into force in January 2025, includes measures to ensure a gradual reduction of the greenhouse gas intensity of fuels by 2% in 2025 to as much as 80% by 2050 (Council of the EU, 2023). At the same time, the EU should promote a EuroMed approach to this issue to prevent a loss of competitiveness of its sector. Furthermore, it also envisages a special incentive regime to support the uptake of the so-called renewable fuels of non-biological origin (RFNBO) with a high decarbonization potential. In this sense, hydrogen can be relevant for the region to decarbonize hard-to-abate sectors. Many West Med

countries have launched and presented their own national hydrogen strategy and the two shores present a complementary nature with South West Med being especially on the supply side while EU West Med countries are on the demand side.

Conclusions and Recommendations

As political commitment increases, climate policies will broaden their scope. The role of clean energy sources will need to be expanded not only in the power and residential sectors but also in other key sectors, notably transport and industry. Technological developments and legislative pressure are set to increasingly shape the energy and transport sectors. The availability of credible and reliable technologies to reduce emissions in the transport sector requires adequate and clear political support in designing strategies, investment, and public support. While the current state of transport decarbonization highlights a clear cleavage among North and South West Med countries, cooperative measures could unleash investments and foster decarbonization. The EU can support South West Med regarding system integration practices, which will become essential as power systems accommodate higher shares of renewables. Furthermore, the EU Med countries could improve affordable financing to South West Med countries to harness their renewable potential. A key area of common cooperation is certainly the decarbonization of the maritime sector, given the recent international regulatory developments and the common interests in the shipping sector.

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The Role of Ports as Energy Hubs and their Impact on Mediterranean Maritime Relations

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Introduction

Reducing greenhouse gas (GHG) emissions has become an imperative responsibility for society. According to Clarksons Research (2023), shipping accounts for approximately 2.2% of global CO₂ emissions.

Decarbonisation of maritime transport requires all stakeholders to collaborate, including shippers, transport operators, freight forwarders, ports, vehicle makers, engine manufacturers, energy producers, policymakers, etc. The Green Port model is becoming increasingly pervasive in the national and international context as the relationship between ports and the energy system and investments in sustainability become affirmed.

This role of ports as E-hubs is contributing to the transformation of the Mediterranean, which is becoming more and more central for both reshoring processes and energy supplies, partly as a result of geopolitical tensions. This analysis will follow up with an examination of the impact of the role of ports as energy hubs in the Mediterranean maritime traffic and Italy's emerging role as an energy bridge between the two shores.

Ports Adapting for Green Transition Amid Climate Change

The scale and severity of climate change are becoming increasingly clear, requiring a complete transformation of the economy that impacts the maritime sector widely. The first to be affected is the shipping industry, but also the port industry, cargo types moved, and basic port infrastructure are involved.

Ports can facilitate decarbonisation, energy efficiency, and energy transition in multiple ways.

According to the concept of energy hubs, ports provide zero and low-emission energy for port operations and users.

While world shipping fleet emissions account for approximately 2.2% of global CO₂ emissions (Clarksons 2023), the International Maritime Organization (IMO) has set new targets to reduce the sector's GHG emissions. Following the 80th session of the IMO's Marine Environment Protection Committee (MEPC) in July 2023, the revised strategy to reduce GHG emissions from ships includes a commitment to reaching net zero "by or around" 2050.

The previous target was a 50% reduction in GHG emissions by 2050, compared to 2008 levels. The revised MEPC 80 strategy also includes a number of checkpoints: reducing shipping's GHG emissions by at least 20%, striving for 30%, by 2030; and by at least 70%, striving for 80%, by 2040. In both cases the baseline comparison is 2008 (United Nations Conference on Trade and Development [UNCTAD], 2023).

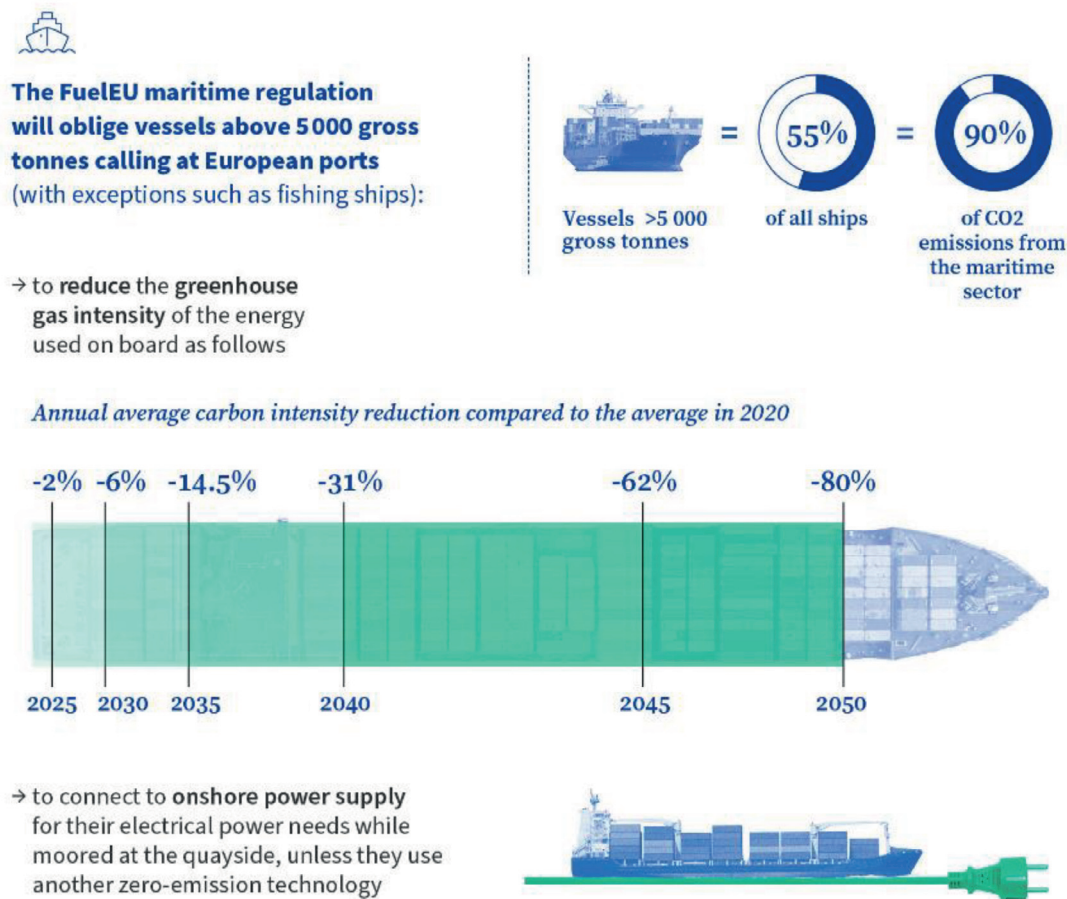
In addition, the IMO has a target of uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources, which are to represent at least 5%, striving for 10% of the energy used by international shipping by 2030 (UNCTAD, 2023).

The sector, as of October 2023, is still characterised by the vast majority (94.1% in capacity terms) of vessels that are running on bunker fuel derived from crude oil (Clarksons 2023). As en-

couraged by the European Union with its FuelEU Maritime initiative, fuel switch is one of the most important actions to reduce greenhouse gas emissions. The new rules will apply from 1 January 2025 to vessels above 5,000 gross tonnes calling at European ports: these

represent 55% of all ships but account for 90% of CO2 emissions from the maritime sector (Council of the EU, 2023). The proposals are part of the “Fit for 55” legislative package, which aims to reduce the EU’s greenhouse gas emissions by at least 55% by 2030.

Figure 1. FuelEU maritime regulation explained

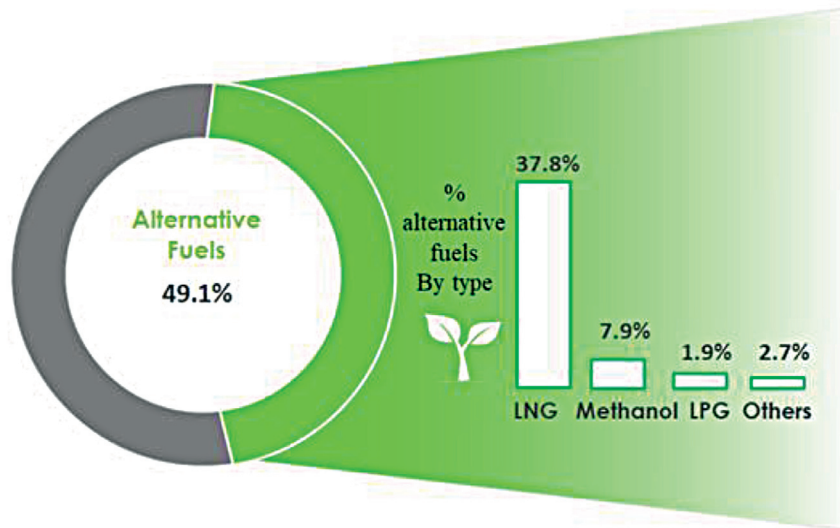


Source: Council of the European Union, 2023

Shipowners are moving in this direction of fuel switch: 49.1% (start 2022: 33.8%, 2017: 10.9%) of the order book in tonnage terms can use alternative fuels or propulsion. Of the total order-book, 37.8% of tonnage is set to use

liquefied natural gas (LNG) (893 units), 7.9% to use methanol (175 units), 1.9% to use liquefied petroleum gas (LPG), and c.2.7% due to use other alternative fuels including hydrogen, ethane, bio-fuels.

Figure 2. The choice of the alternative fuels in the order book as of October 2023



Source: SRM (Research Center for Economics Studies) on Clarksons Research, 2023

Ports can provide important infrastructures and services to support the use of cleaner fuels and technologies on board ships.

The impact of fuel switches on ports will be mainly in changes to fuelling stations and other facilities for alternative fuels (bunkering), such as liquefied natural gas (LNG) and, in the future, hydrogen, ammonia, and methanol. The industry is also focusing on biofuels, such as bio-methane, HVO (Hydrogen Vegetable Oil), or biodiesel. The main disadvantage is that the processes to produce biofuels may be more expensive than traditional ones. This will require additional investments in storage facilities and infrastructure and represents a challenge to ports as they must decide which fuel infrastructures to invest in. Furthermore, this is an important choice because bunkering alternative fuels is a competitive advantage for ports that will be able to attract more ships and, thus, more traffic.

The lower energy density of the alternative fuels may also require a much finer granu-

larity of bunkering facilities, as ships will have to bunker more often. To this end, the supply of LNG, Green Hydrogen or Renewable Low Carbon Fuels, either of biological or synthetic origin, should be promoted in consistency and in a way compatible with the feedstock and renewable energy availability around the Mediterranean basin. This is necessary to construct a resilient and diversified maritime fuel production network, which can support the uptake of demand from sustainable shipping.

Ports can also be key players in the energy transition by reducing emissions related to port operations. Energy commodities represent a substantial part (on average 40%) of the traffic volumes of ports. They play a key role in the greening of the shipping market, as they are the location where a lot of fossils- and other energy sources (crude oil, gas, LNG, coal, biomass) are either consumed, stored, bunkered, transported, or produced. European ports are among the largest chemical and production clusters in the world, and they host indus-

tries such as refineries, steel, iron, non-metallic minerals production and chemical industries that will need to cut greenhouse gas emissions by 45-55% and improve energy efficiency by at least 32.5% by 2030 (DNV, 2020).

Alongside traditional fossil-fuelled energy plants, ports are increasingly hosting sustainable energy generation with wind, solar, biomass, and waste-based energy production plants. Co-location of different energy sources and power plants in large ports is common because it has several advantages, such as the abundance of cooling water for power plants and large-scale bulk transportation infrastructure available for coal and biomass.

A first step to reduce port emissions could be cold ironing, also called shore-to-ship power (SSP). A ship docked at the port supplied with electricity - generated from renewable sources - from shore is known as "cold ironing". Therefore, it can avoid running its engines or diesel generators to power on-board activities. Cold ironing has the benefit of reducing local air pollution, noise, and carbon emissions. For this reason, the shore-side power supply should be developed, particularly in ports close to densely populated areas.

Another development that will have a significant impact on the port's energy system is the connection of offshore wind to the grid. According to a study of the International Renewable Energy Agency (IRENA, 2019), offshore wind will grow in Europe from 23 GW in 2018, to 228 GW in 2030, and nearly 1,000 GW in 2050. The uptake of offshore wind will increase the need for wind turbine installation and service activities. Ports situated in close proximity to large offshore wind parks are natural locations for such an emerging installation and service industry. When located near offshore wind farms,

ports can also act as natural conduits for the integration of offshore wind into the power system.

In addition, there are opportunities in green hydrogen. Produced by using renewably generated electricity to split water molecules into hydrogen and oxygen, green hydrogen is expected to play a key role in the global push to net zero, particularly in decarbonising hard-to-abate sectors. When locating an electrolyser close to large ports, the industry would have access to large quantities of green hydrogen directly produced from renewable power. Therefore, it is safe to assume that hydrogen can become economically competitive in ports sooner than in other locations.

Direct electrification can decarbonise several port-related activities. These include electric cranes and logistical vehicles for bunkering, logistics and freight handling, as well as powering offices and buildings, cold storage, and service vessels, such as pilot boats and tugboats, with renewable energy.

Ports are also greatly affected by the electrification of other sectors, such as nearby industry and electric intermodal transport (road, river, rail and short-distance sea). Hence, a vast capacity expansion of the local electrical distribution infrastructure is necessary, which requires large investments and enough space to set up the necessary infrastructure.

Ports can play an important role in the development of capturing carbon dioxide and sequentially storing it, called CCS. Its range of applications includes major industries like cement, steel, hydrogen, and ammonia; namely all processes that release CO₂ in the atmosphere as a result of a combustion or an industrial process.

Switching from fossil fuels to renewable electricity will, therefore, reduce carbon emissions on a global scale.

The levers on which ports can act to facilitate the green transition are:

- optimising spatial planning by ensuring the availability of land and infrastructure to facilitate energy projects and at the same time (co)invest in sustainable alternative energy solutions to meet their own energy needs and to support the energy needs of customers, neighbouring industry clusters and society at large; promoting intermodal connections between the port and inland through railways and inland waterways.
- developing green charging (providing green incentives) to promote greener fuels in their port area when it comes to fuel selection.
- promoting collaborations, partnerships, and business consortia with a wide range of players involved in the transportation and energy ecosystem to align climate goals, forecast energy demand, and develop energy-related projects along the low/zero carbon fuel value chain.
- setting specific rates and fees, onshore power supply, mobile power-to-ship services, and increased efficiency of port operations.

To address this challenge, ports should take the role of innovative energy communities by switching to modern energy hubs and providing users with a cleaner, more sustainable, and more efficient energy supply.

Decarbonising shipping by 2050 will require large investments, with some esti-

mates suggesting an additional \$8 billion to \$28 billion annually, to enable ships to decarbonise by this date. Fuel infrastructure investments are expected to surpass onboard investments. Scaling up fuel production, distribution, and bunkering infrastructure to supply 100% carbon-neutral fuels by 2050 will require annual investments of around \$28 billion to \$90 billion. Estimates suggest that full decarbonisation could raise annual fuel costs by 70 to 100% compared to current levels (UNCTAD, 2023).

In the coming years, there will be a series of market impacts associated with emission reduction strategies, from lower speeds, increased scrapping, and “multi-level” fleet renewal, i.e., covering mechanical, hydrodynamic, wind and operational parts as well as fuel. In the long term, the energy transition is expected to have implications for trade because commodity flows and, thus, trade patterns will change.

The Decarbonisation of Shipping: Potential Impact on Mediterranean Trade

There are several dimensions of maritime traffic in the Mediterranean, which can be considered on three levels:

- As a ‘shipping east-west route’ directly connecting the Atlantic and Indian oceans, allowing shorter trade routes for Europe and Asia.
- As a ‘shipping south-north route’ through which coastal countries develop their trade by short sea traffic, the busiest in UE.
- As a ‘crossroads’ of continents –European, Asian, and African– whose trade is growing with globalisation.

The vocation of the Mediterranean serving as a crossroads of continents has grown stronger over the past few years, for recent economic and geopolitical trends – such as the decoupling between USA and China, and conflicts - that are boosting protectionist drives and nearshoring processes.

The Mediterranean is increasing its relevance. Despite covering only 1% of the world's seas, it accounts for 20% of global shipping traffic, 27% of container shipping line traffic, and 30% of oil and gas flows (including pipelines). In the period of January- September 2023, 19,285 ships utilised the Suez Canal, a 13% jump in 2022 with record-breaking revenues of 8 billion US dollars in 2022 (Clarksons, 2023). The Canal's location makes it a key hub for shipping oil and other hydrocarbons: it is the 4^o global energy chokepoint. It enables the transfer of an estimated 7–10% of the world's oil and 8% of liquefied natural gas (IEA, 2021). Approximately 2.8 million barrels of crude oil and oil products passed via the Canal daily. Since the Gulf states are the most prominent users of the Suez Canal for oil transport, the recent Israeli-Palestinian conflict could have a major impact on the Canal traffic.

The European Union is considerably dependent on energy imports. The decline in the status of Norwegian oil, alongside the fear of depending on Russian oil, has brought EU countries to aspire to an energy balance. In 2022, the European Union has overtaken both China and Japan as the top importer of LNG. Combined with its environmental awareness, this energy balance aim has led the EU to set ambitious targets for the use of renewable and less polluting energy sources, which could decrease future oil imports through the Suez Canal. In this respect, one must note that a stronger market for gas at the expense of oil may lead to increased ex-

ports of liquid gas from the Arabian Gulf to EU countries, thereby balancing out the possible loss of Suez Canal transits from oil tankers.

Moreover, emergent energy sources countries are located on the Southern shore connected with the Black Sea and Africa. They have a potential for development and strong links with European economies through Mediterranean seaports. Pipelines and renewable energies on the Southern shore are a new generation of link, infrastructural, and economic between North Africa and Europe in the Mediterranean. It will surely change the map of transport and economy in the basin. A shift to more sustainable forms of energy will be essential on both sides of the Mediterranean to ensure a green mobility market and achieve the ambitious decarbonisation targets set by the European Commission and most countries in the area.

On this whole, there is maritime trade between the Mediterranean countries and the rest of the world. However, the pivotal aspect is that this trade takes place between the entire EU and the countries of Asia and the Middle East through the Suez Canal.

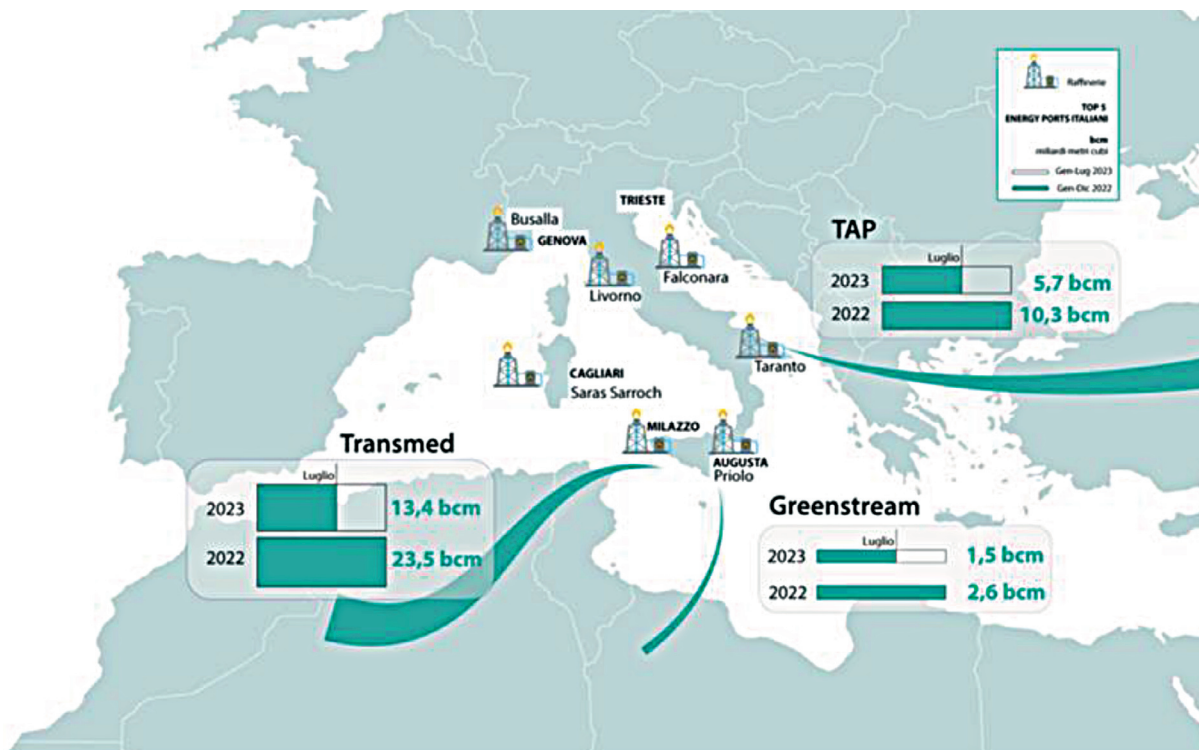
In conclusion, the complexity and changes in energy trade have taken place at a very fast velocity on a global scale. The energy flow from one part of the world to another has grown, and at the same time, commercial patterns have considerably changed and extended; they remain complex and dynamic. Furthermore, this will have a major impact on ports that handle mostly energy-related cargo and are the entry point for pipelines.

This topic concerns Italy closely because much of the critical infrastructure for our country in the wider Mediterranean is linked to energy supply. The geographical position of the peninsula places it at the

centre of a complex network of submarine gas pipelines, which are essential for Italian and European energy diversification, especially to decrease dependence on Russian exports. Italy is a gateway for new energy flows from North Africa and the Caspian area to Europe, accounting for 74% of gas imports in January-July 2023 via pipeline (Italian Ministry of the Environment, 2023). Italy receives on its

coasts the Transmed and the Green Stream from North Africa and the Trans-Adriatic Pipeline (TAP), which carries Azeri gas passing through Turkey. Added to these is the Eastmed project, which will connect Italy with the gas fields discovered by ENI in the Eastern Mediterranean (Zhor and Nour in Egypt, Leviathan in Israel, and Calypso in Cyprus).

Figure 3. Gas pipelines to Italy



Source: SRM on Italian Ministry of the Environment, 2023

The Mediterranean Sea transport trade has its own peculiarities, where many asymmetries are still making differences between territories and where many considerable changes in the near future will draw new maps of relations between growing economies. Long-term strategies cannot avoid these realities and have to play with the political uncertainties that remain in the region.

Conclusions

The strict targets set by national and international bodies to limit carbon emissions in the maritime sector have encouraged the development of cleaner production systems in port areas, resulting in the emergence of modern energy hubs that supply the port facilities and ships with multiple energy carriers. However, optimising the

design and operational strategies of these energy hubs and identifying the most effective pathways for decarbonisation in specific cases can be challenging. A combination of environmental, economic, regulatory, and technological factors drives the development of energy hubs systems in port areas. By embracing these energy systems, ports can contribute to global sustainability goals and benefit from cleaner, more reliable, and cost-effective energy supply.

Recommendations

What developments can we expect for the green transition of shipping in the Mediterranean Sea?

- fewer ships carrying fossil fuels.
- on a transitional basis, growth of sea-

borne gas trade.

- an increase in trade in renewable energy equipment and parts, thus increasing project cargo traffic.
- escalating energy flows via pipeline from North Africa.

In this way, ports as E-hubs can play a “pivotal role” in supporting the decarbonisation goals of countries and regions, international logistics and strategic import-export value chains, such as those for green hydrogen and its derivatives.

Italy, thanks to its geographical positioning, could become the European gateway for imports of renewable energy from South Mediterranean countries, supporting in this way the strengthening of the cooperation between the basin’s shores.

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Digitalisation of Freight Transport in the Mediterranean: Reflections on Use Cases' Findings

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Introduction

Abstract

The digitalisation of the supply chain and customs is a complex challenge, but it offers the potential to significantly improve the efficiency, security, and sustainability of global trade. The International Fast & Secure Trade Lane (IFSTL) is a trade facilitation initiative that aims to address these challenges using interoperable digital technologies.

IFSTL offers several benefits to all users in the supply chain, including enhanced multimodal coordination and efficiency, improved visibility and traceability of goods, reduced costs and dwell times, and increased security. The implementation of this approach requires supportive policies and regulations at the national and international levels, as well as mature and reliable enabling technology.

This article offers a perspective on the above-mentioned considerations, along with a concrete application in the pilot project connecting the ports of La Spezia (Italy) and Casablanca (Morocco), illustrating the perspective in facing challenges and seizing business opportunities with the players' direct contributions.

Background: The Challenge of Digitalisation for Supply Chain and Customs

The International Fast & Secure Trade Lane (IFSTL) is a trade facilitation initiative aimed at optimising strategic and operational effectiveness in the port system by utilising harmonised tools (software solutions, operational guidelines, and governance models) to address modern supply chain complexities. Continuous evaluation of

management processes is indeed crucial for optimising strategic and operational effectiveness. The IFSTL concept confers some key benefits on all users in the supply chain:

- Coordinated multimodal operations in the international logistics chain, possibly supporting the decision-making processes in real-time (Al-Fuqaha et al., 2015; Li et al., 2023).
- Increased efficiency of different transport modes (road, rail, sea) by channeling their processes through technological platforms.
- Advanced data sharing by implementing new tools for efficient freight management.
- Increased visibility of multimodal transportation and tracking of goods through a single interface with significant reduction of decision-making time, real-time incident resolution, and goods dwell time.
- Streamlined Customs procedures, through the widespread adoption of IoT (Internet of Things) technologies.

The above-mentioned objectives can be achieved by integrating advanced technological solutions throughout the entire supply chain, specifically identifying five distinct IFSTL components:

- Platform: the back-office component of IFSTL, implementing the business logics for collecting, aggregating, and persisting data, and for exchanging them with external systems.
- Dashboard: offers a user-friendly, real-time, and easy-to-read visual representation of goods' status, enabling immediate and informed decision-making
- Field component (Gate Automation): the collection of equipment, hardware, and software to automatically read and manage information

coming from electronic seals (eSeals) installed on trailers and cars, like passive RFID (Radio-Frequency Identification) tags and labels (Gu et al., 2020).

- Mobile component: a software application installed on handheld devices (e.g., rugged smartphones) enabling operators to “baptize” eSeals and verify their integrity at each checkpoint.
- Logistic Optimiser: an optional DSS (Decision-Support System) for modelling and optimising the synchromodal planning in port/rail terminals.

National/European Union (EU) governments significantly contribute to the implementation of the IFSTL concept by promoting trade and security through policies, infrastructure investments, digital trade systems, and security measures.

Policy Framework: Key Policy Considerations for International Fast and Secure Trade Lanes

Customs administrations and government organisations have a pivotal role in the advancement of technologies aimed at enhancing the management of trade activities. This is achieved through the implementation of international conventions, national and European legislation, as well as cross-border agreements. In order to maximise efficiency and productivity, infrastructural projects should prioritise efficiency, sustainability, digital solutions, climate resilience, and emerging technologies to enhance economic system productivity, business placement preferences, and institutional effectiveness (Nazari, 2023; Zúñiga-Terán et al., 2019).

At the European level, these are the most notable regulations related to the IFSTL concept:

- Regulation (EU) No 2016/679, General Data Protection Regulation (GDPR), which governs personal data collection, use, and sharing.
- Regulation (EU) No 2020/1056, Electronic Freight Transport Information (eFTI), establishing a legal framework for the electronic communication of regulatory information relating to the transport of goods on the territory of the Union.
- Regulation (EU) No 2019/1239, establishing a European Maritime Single Window environment (EMSWe).
- Regulation (EU) No 952/2013, laying down the Union Customs Code.

The last three regulations (and associated Implementing Acts) establish regulatory and technological frameworks for exchanging data in the relevant domain of application, but do not extensively cover cross-domain interoperability issues and are usually focused on B2A (Business-to-Authority) and A2A (Authority-to-Authority) transactions, leaving the B2B (Business-to-Business) domain out of scope. To fill this gap, the direct cooperation between public and private operators (covering all the types of transactions: B2A, A2A and B2B) is then crucial for efficient global transportation systems, and flexibility and adaptability of regulation are key factors in policy evolution (Regulation 2016/679; Taeihagh et al., 2021).

Main Sections

Pilot Case: IFSTL from La Spezia (Italy) to Casablanca (Morocco)

EU Logistics projects focus on digitalisation in ports, as a strategic node within the end-to-end logistics chain, to optimise trades, promote modal integration, and enhance interoperability; aligning with the European

Green Deal and CEF (Connecting Europe Facility) Funding instrument guidelines.

Building upon previous studies and small-scale pilot projects on national corridors, the International Fast & Secure Trade Lane (IFSTL) concept has been further developed within the CEF project FENIX European Federated Network of Information eXchange in LogistiX (Action Number: 2018-EU-TM-0077-S) (FENIX, 2019). This project has been piloted on three full-scale international corridors between Italy and Morocco, Egypt and Turkey, and, subsequently, replicated on another CEF project taking its full name (INTERNATIONAL FAST AND SECURE TRADE LANE Improving the Dublin – Cherbourg MoS route, Action Number 2019-EU-TM-0193-S) (IFSTL, 2023; Ashmore, 2022).

More specifically, the pilot project between Italy and Morocco aimed to explore the benefits and effects of interoperable digital platforms and IoT in terms of (Circle S.p.A., 2019):

- Enhanced multimodal coordination in the ports of La Spezia and Casablanca (and related logistics corridor).
- Removal or mitigation of bottlenecks (e.g., documental interchanges) according to the needs of logistics operators.
- Enhanced coordination between different transport modes.
- Increased efficiency, service quality, and ease of use through centralised information flows.
- Provision of advanced information services to transport and logistics operators, for a more efficient management of goods transport.
- Visibility and traceability of goods shipped through a single interface, including cross-border and non-EU connections, thereby reducing the permanence of goods in ports.

These objectives have been pursued throughout the digitalisation/automation of the following information flows:

- Cargo manifest and Customs data: declaration of the goods aboard the ship, for Customs clearance purposes.
- Vessel ETA (Expected Time of Arrival), updated in real time.
- Port Gate-In/Gate-Out: the transit of the container at the port terminal gate.
- Container boarding/disembarkation.
- eSeal status: integrity status of the electronic seal affixed to the container.

The following diagram shows how the information above is handled in a sample export cycle from La Spezia to Casablanca; please note that all Italian logistics operators (P2P, Carbox, etc.) are part of the Tarros Group.

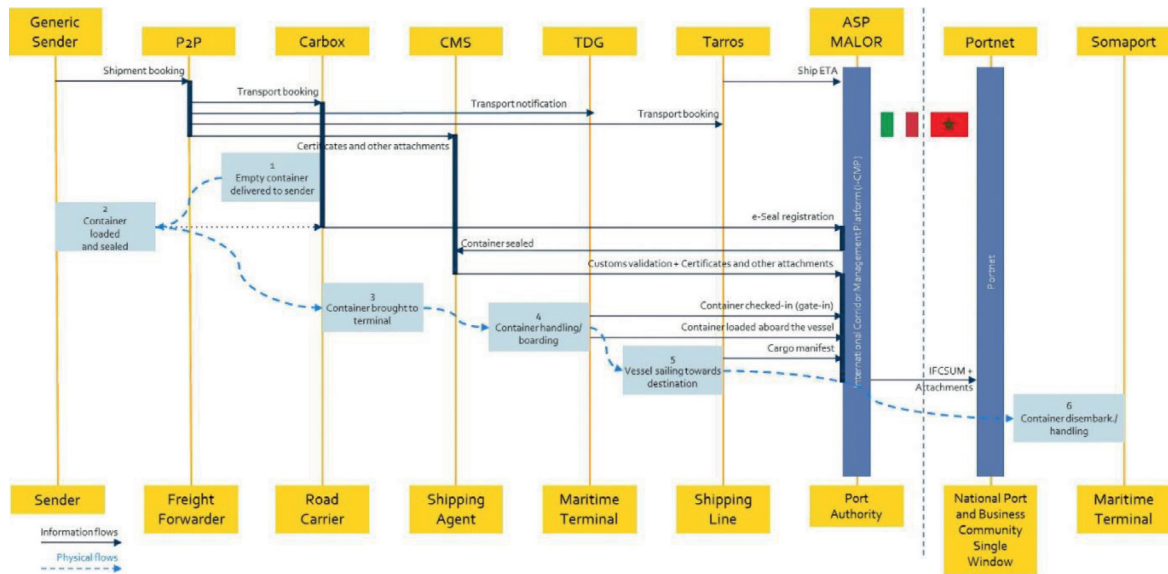
Digitalisation of information flows offers benefits like document simplification and reliability, speed of exchange, and cost savings. These benefits are even more important when applied to the Customs processes, where the anticipation of documents and certificates, the pre-clearing of goods, and the automation of port security checks bring a substantial reduction in the overall clearance time. Digitalised documents are uploaded and associated with each container by the shipper, and then made available to logistics parties for security and customs purposes through the simple consultation of the dashboard (according to the granted access level).

IoT technology stands at the very core of IFSTL, by providing devices on containers that share information about their status, enhancing security and customs processes, and warrants further study. IFSTL utilises electronic seals (eSeals) to track the movements of containers and report about their status each time they are read

by dedicated devices (RFID antennas at terminal gates or handheld devices for terminal operators), sharing status information like open, closed, or broken. Furthermore, eSeals are associated (“baptized”) with

transport documents through the mobile component, making it possible to have a continuous tracking of integrity status and to automate Customs clearance procedures.

Figure 4. Digitalised information flow in a sample export cycle from Italy to Morocco



Source: Circle Group; FENIX project, 2019

All the benefits above have been measured and assessed through a pervasive validation campaign, based on the following KPIs (Key Performance Indicators):

- Reduction in the overall number of paper documents and manual data entry per shipment.
- Reduction in the processing time for Customs documents.
- Reduction of stationary time of trucks for gate-in/gate-out operations at port terminal gates.
- Reduction in the duration of Customs clearance procedures.

The Perspective of the Private Players: Tarros Group

Tarros Group is a primary Italian logistics operator connecting 16 countries and 31 ports across the Mediterranean Sea. In particular, the traffic between Italy and Morocco, estimated at over €1.5 million/year, represents a strategic business for Tarros; thus, making the IFSTL pilot project on the corridor La Spezia-Casablanca particularly relevant.

All the logistics companies in Tarros Group took part in the pilot project, hence putting into practice the advan-

tages of the IFSTL concept at every step of the logistics chain.

From the forwarding agent's point of view, greater control and accurate electronic traceability of cargo led to greater data transmission efficiency, reduction (or elimination) of data entry errors, better monitoring of goods, immediate detection of any tampering, and, even more important, the certainty of receiving the intact cargo at the final destination stowed by the exporter.

From the Customs' point of view, the system does not change the type of documents; what differs significantly is how the aforementioned documents are transmitted to the destiny. Traditionally, they "physically" follow the cargo using the ship itself or some express courier as carriers; with IFSTL, the documents are digitalised and transmitted to the destination with paperless procedures.

The combination of digitalisation and electronic seals enabled a valuable reduction in both customs' clearance times at destination (virtually zeroed) and physical checks on the goods. Within the pilot project, it has been estimated that the average sailing time from La Spezia to Casablanca takes about 5.5 days, while the corresponding driving time for carrying a single container through France and Spain is about 4 days. The Customs clearance times in the two cases are about 2.5 days and 0.5 days, respectively, taking the "gate-to-gate" time to 8 and 4.5 days. Even considering the much lower price of maritime transport, the nearly doubled time constitutes a severe loss of competitiveness in comparison to the road transport.

A substantial reduction of customs clearance time for maritime transport (as enabled by IFSTL) would make the "gate-to-gate" time (5.5 days) almost com-

parable with road transport. Consequently, a large-scale application of the IFSTL concept would enable a remarkable recovery of competitiveness, which in turn is expected to contribute to the modal shift, thus bringing direct benefits to Tarros Group (in terms of efficiency and revenues) together with valuable indirect benefits, such as a reduction in truck traffic flows and significant CO₂ savings.

During the preparation and execution of the pilot project, the only remarkable issues were some initial difficulties in establishing a communications link between the two customs agencies and the lack of harmonisation between the two legislation systems.

To conclude, Tarros Group believes that in the long term the IFSTL concept can guarantee the creation of effective customs corridors enabling an all-around control over the goods and an agile transit through borders.

The Perspective of the Public Players: Eastern Ligurian Sea Port System Authority

The IFSTL pilot project helped the Eastern Ligurian Sea Port System Authority to assess innovative tools for the digitisation of the logistics corridors to and from the Port of La Spezia. As a strategic goal, the Port Authority has the aim of supporting the operators of the port system community by encouraging the application of innovative technologies that incentivise trade for the ultimate benefit of the local economic community.

From a technological perspective, this goal has been achieved through the enhanced interoperability between the PCS (Port Community System) of La Spezia (APnet) and its Moroccan counterpart (Portnet) and

a dedicated module (International Corridor Management Platform).

However, without the Memorandum of Understanding signed by the Eastern Ligurian Sea Port System Authority and Moroccan Agence Nationale des Ports (ANP) the challenge of integrating the information systems, which was implemented in the ports of La Spezia and Casablanca through a global logistics corridor, would not have been realized. Furthermore, the harmonisation of different standards and protocols was realised thanks to the collaboration with the Italian Customs Agency.

In conclusion, commercial exchanges between the ports of La Spezia and Casablanca are increasingly efficient thanks to the positive results of the IFTSL pilot project, aimed at creating an international seamless logistic corridor between the two ports.

This kind of innovative project, in which the Port System Authority of the Eastern Ligurian Sea expects to invest increasingly, can contribute to increasing relations between its ports and the countries around the Mediterranean basin, which are strategic partners from a commercial point of view.

Conclusions and Recommendations

The pilot projects carried out within FENIX proved that the IFSTL concept is a key enabler for enhancing the overall efficiency of the multimodal logistics chain; more specifically, the solution validated on the corridor La Spezia-Casablanca saw the satisfaction of involved public and private operators. These tangible results achieved especially in terms of

document management simplification and customs clearance time have, in turn, resulted in increased efficiency of the administrative and operational processes, with reasonable infrastructural investments (e.g., automated gates at port terminals) and operational costs (e.g., non-recyclable eSeals). The substantial reduction of customs clearance time would make the “gate-to-gate” time of maritime transport more attractive and, where feasible, comparable to road transport; thus, improving the competitiveness of this transport mode and likely shifting some cargo traffic from road to sea.

However, these results are only possible through a pervasive series of initiatives that go beyond the mere deployment of technologies. To this purpose, the major recommendations for future implementations of the IFSTL concept are the following:

- To ensure the proper operation of the concept, it is crucial to build a receptive ecosystem at port level; in this perspective, port authorities play a key role in involving all public/private operators.
- For such purpose, it is highly recommended to plan a pervasive communication campaign (webinars, meetings, focus groups) for creating a common understanding and a unity of purpose for all the parties from the very early stages of the project.
- The engagement of public authorities might require time; hence, as a part of such launch activities, it is crucial to establish a public/private working group including all involved authorities at both sides of the corridor. Moreover, port authorities must operate as facilitators for reaching all needed administrative bodies.

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Digital Reskilling and Upskilling: Unprecedented Scale, Impact, and Guiding Principles

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Introduction

Well justified high expectations regarding digital technologies' adoption and impact, have proven to be difficult to fulfil, in particular in the Transports and Logistics sector, as a set of not-so-obvious limiting factors have been cancelling-out the main and well-established incentives. Chief among them, is the scarcity of digitally skilled human capital.

Indeed, large scale digital skilling emerges as the core requirement for digital advancement, and as the necessary condition for the creation of new jobs in a similar magnitude than the ones being rendered obsolete.

This paper establishes the need for digital skilling at an unprecedented scale and defines its two varieties: reskilling and upskilling. Furthermore, this paper assesses the level of readiness of Western Mediterranean economic agents, and presents the main required changes in corporate priorities, and roles and capabilities of public administrations along with the need to establish a cooperative approach. Finally, it presents some of the guiding principles that arise from the best practices of digitally advanced countries and leading corporations.

Incentives and Barriers to Digital Transformation in Transport and Logistics

Expectations regarding digital technologies adoption since their large-scale emergence in 2018, have been persistently optimistic, as analysts and researchers identified three sets of adoption facilitators: first, the fast-advancing technological maturity, and range of applications provided

by these technologies. Second, the low technology acquisition costs and minimal fixed capital investments required, thanks to cloud-based platform computing. Finally, the gamut of advanced capabilities provided, and the benefits generated, which have been tested, refined and proved with large scale successful implementations in the advanced manufacturing sector.

These optimistic expectations have proven stubbornly difficult to fulfil in all other sectors and particularly in Transport and Logistics, due to a set of underrated disincentives. First of all, the fact that the bulk of benefits and new capabilities provided by digital technologies are generated when processes are modified to leverage them, which results in a delayed positive business case. Secondly, the advantages of cloud-based platform computing are offset by the lack of trust regarding digital platforms' governance and data ownership, and also by the extended uncertainty regarding standards, regulations and their enforceability. This disincentive is particularly strong in Transport and Logistics due to the long history of attempts of vertical integration.

Thirdly, without changes in the organization's culture regarding risk-taking and professional rewards, there is a generalized lack of career incentives for managers and technicians in all Western Mediterranean countries to undertake risky new technology adoption initiatives (Bris et al., 2022) (Chakravorti et al., 2020).

Finally, and most importantly, the advancement towards digital transformation relies on initially affordable but complex technologies that require human capital with updated technological and managerial digital skills. For many corporations and organizations, the incentive of low digital technology acquisition costs is being offset by the scarcity and high cost of the skilled personnel required to take digital tech-

nologies' adoption decisions, to efficiently deploy them, and to undertake the changes in operational processes necessary to generate benefits.

Digital Skilling, Scale and Impact

The main reason why personnel with up-to-date digital skills is scarce and expensive, and the main limiting factor for the digital transformation advancement at corporate, national and sector level, is the sheer quantity of required digitally skilled personnel. Estimations for the 26 countries that generate 80% of the worldwide GDP, indicate that this required amount make up for 13,5% of the overall labour force, and 14,7% of the Transport and Logistics sector (Zahidi et al., 2020).

These large numbers arise from the fact that both, technological and managerial digital skills are required, to facilitate the transformation of processes for a broad range of corporate activities, including planning, operations, logistics, inventory management, manufacturing, sales and customer management. Additionally, new digital capabilities also enable new product and service development, as well as new go-to-market and business models which, in turn, require new managerial skills.

The development of new digital skills at this scale, is not only a necessary requirement to advance towards digital transformation, it is also a social issue, as digital technologies accelerate job displacement through the automation and replacement of human tasks and are already leading to the obsolescence of entire job categories while also generating new professions (Zahidi et al., 2020) (LinkedIn Economic Graph, 2023). Therefore, without a vast in-

crease of digitally skilled individuals, unemployment will grow, and an unbalanced and outdated labour marketplace will appear.

Studies tend to agree that job destruction, will be large and generalized across all sectors, amounting to 14% of the world's jobs over 15 years (OECD, 2019). Additionally, only 2% of the labour displaced will be able to transition to another job by their own means (World Economic Forum & Boston Consulting Group, 2019).

Forecasts also concur that the creation of new jobs will be of similar magnitude, resulting in a near neutral net effect across all countries and sectors, only if efforts are undertaken to provide the rapid acquisition of new digital skills (reskilling) and the actualization to brand new roles (upskilling) for a large number of employees (Zahidi et al., 2020) (World Economic Forum & Boston Consulting Group, 2019).

Reskilling and Upskilling Definition

Digital professional skill building can be divided into reskilling and upskilling, depending on the objective, the scope of the updated skills and the length of training required to achieve them.

Reskilling is the professional training for personnel, management, and technologists to improve and expand their skills, in order to adjust to the changes generated by digital technologies in their current role and position. The objective is to bolster employees' performance and facilitate job maintenance and employability. Reskilling applies to roles still in demand, that have been significantly modified by digital technologies. It applies to a minimum of 65% and a maximum of 81% of the labour population impacted by the digital advancement (Zahidi et al., 2020). The time

required to undertake it ranges from less than three months up to a year.

Upskilling is the professional training addressed to allow employees to switch from present roles and responsibilities that are becoming obsolete, to new roles in high demand. Upskilling results in learning fresh skills and to adequately perform in brand new positions generated by the adoption of digital technologies. It applies to a minimum of 19% and a maximum of 35% of the labour population impacted by the digital advancement (Zahidi et al., 2020). The time required for a successful upskilling transition ranges from one to two years.

Corporate, Labour and Public Administration Readiness

Western Mediterranean countries' public administrations are not sufficiently prepared to the economic, social and competitive needs to provide reskilling and upskilling at an unprecedented scale, find corporations, transport associations, and employees.

Traditional corporate approaches to address skill gaps, like the influx of new young recently educated personnel, hiring from other corporations, or as it is habitual in the Western Mediterranean countries, self-directed individual skilling and limited training of their existing workforce, are all insufficient to provide the required number of digitally skilled personnel. Presently, all leading consulting firms consistently advise corporations to re-evaluate their cost-benefit calculations for corporate funded employee skilling, and also advocate for corporations to finance long term upskilling instead of firing personnel with outdated skills. It is revealing, that leading consulting firms with a long history of profit oriented advice and that spearheaded the corporate

re-engineering wave of the 1990s are now consistently advocating for long term training for employees and advising against layoffs.

Despite significantly increasing the corporate resources dedicated to digital skilling, all surveys and projections indicate that corporations, big or small, will not be able to completely address the new skilling challenges just by themselves. Even, large corporations will manage to internally reskill and upskill only an estimated range of 40% to 45% of the employees required.

Regarding employees, even though reskilling and upskilling provide them with the skills needed to maintain, succeed, and even advance in their own careers, they face this new challenge with reservations, after decades of increasing efficiency demands and job insecurity. Based on recent history, large part of employees perceives reskilling and upskilling as an additional effort, to at best maintain present labour conditions.

Lack of preparation, limited resources, and little internal skilling culture drives corporations and transport operators and associations to turn to public administrations for digital skilling solutions. Administrations in the Western Mediterranean countries are facing these demands, equipped with professional education systems historically oriented to young students training, and limited interest and capabilities for adult professional education of already employed personnel. Additionally, most public administrations have experienced decades of pressure to limit their field of action.

On the other hand, digital reskilling and upskilling initiatives of the most digitally advanced countries except the USA and the Republic of Korea, (Denmark, Singapore, Sweden, The Netherlands, Switzerland and Finland,) (Bris et al., 2022) (Chakra-

vorti et al., 2020), build on a very strong role of the public administration, working in close cooperation with corporations and associations, and providing multiple incentives to corporations and employees, to achieve significant digital skilling objectives. This strong role is also advocated by analysts and researchers regardless of their political orientation. Additionally, detailed positive business cases for public investment in digital skilling have been developed, which consider the opportunity costs of welfare, missed opportunities for taxation as well as a range of costs harder to quantify, such as the effect of job displacement on families and on health, and overall social instability (World Economic Forum & Boston Consulting Group, 2019).

Digital Reskilling and Upskilling, Guiding Principles

Direct research on corporate and public reskilling and upskilling and digital transformation best practices reveals a set of successful guiding principles. The following is a brief description of some of them.

Multi-Stakeholder Collaborative Skilling Efforts Lead by the Administration

The changes, planning and resources that large scale reskilling and upskilling entails, exceeds the capabilities of corporations, associations, unions, employees, and academia. Best practices from the most digitally advanced countries, indicate that successful large reskilling and upskilling, is often the result of a multi-stakeholder cooperative approach, lead and financed in good part by public administrations. This active role of

public administrations is well suited to Transport and Logistics, as the sector is characterized by a chronic lack of collaboration.

Strategic Workforce Planning and Skills Mapping

A core challenge that corporations and public administration face when developing reskilling and upskilling programs is to have a clear understanding of what skills and jobs, and in which quantity, will be needed in the future. Countries with a strong professional educational system like Germany, Sweden and Finland have been analysing labour market demands and forecasting labour supply needs for a near exhaustive number of jobs since 1950s. Their analysis is organized around sectors and also involves the mapping of decreasing and increasing skills, and its learning transition path. Furthermore, since early 2010s, digitally advanced countries like Denmark, Finland or the Netherlands have applied that experience to specific digital strategic workforce planning and digital skills mapping.

Corporations, transport sector organizations, and administrations in countries with little or no experience in strategic workforce planning can obtain national, sector and sub-sector analysis from a handful of specialized companies, and from leading platform-based learning providers specialized in large-scale reskilling and upskilling.

Evolve, Expand and Leverage National Professional Education and Tertiary Education Systems

Existing national professional education systems, even if only oriented towards young students, can be expanded and

their capabilities and infrastructure leveraged to provide reskilling and upskilling for adults already employed even for highly qualified jobs. Additionally, adult professional education can be intertwined with the tertiary educational system, in order to provide professionally and technically oriented education and short-term degrees. This expansion is at the core of the cutting-edge digital reskilling and upskilling capabilities of most digitally advanced countries. Specific examples include Denmark's adult vocational training system, (AMU), which offers 3,000 programs organized around 130 work areas, and Finland's tertiary educational system that counts with 23 technical universities, and just 12 research-oriented ones.

Mostly Platform-Based Learning

Large corporate digital skilling efforts without public administration significant involvement, started in 2018 with AT&T's pioneering program, that successfully reskilled and upskilled 100.000 employees. The program achieved 81% of the company digital technology jobs being filled internally, increased the newly skilled employees' career promotions likelihood by 70%, and reduced labour turnover by 60%. This successful experience paved the way and incentivized other leading corporations, to undertake similar efforts.

Near all of these programs followed a well-defined set of principles, and implementation methodology that have been improved over time. Principles include revised concept of leadership and hierarchy, rewarding trial, error, and risk taking, transparency, consensus and labour involvement, plus centralized program management and high importance of strategic workforce planning and skills mapping.

The implementation methodology main characteristic is the reliance on customized platform-based learning solutions that provide not only content and learning, but also sophisticated program and career management capabilities at low cost. Currently, the costs of setting a fully operational solution, with customized content, for over 500 individuals is just a small fraction of the main cost, which is the salaries of employees being paid while training. Low costs and relatively small-scale threshold, allows not only their use by a single large corporation, but also by a coalition of corporations of any size, by sectorial organizations and by consortia of corporations, associations and public agencies. They can do it either as the main skilling delivery mechanism or as complement to academic and adult professional education.

Conclusions

Digital reskilling and upskilling of management and labour, to provide the new skills and roles required for the advancement of the digital transformation is also a necessary mechanism to avoid massive unemployment and to secure that the whole population enjoys the benefits of new digital technologies. The scale and complexity of providing the adaptive skills to confront the structural changes that digital transformation generates is unprecedented and should not be downplayed.

Failing to provide these skills in a specific country or sector will slow-down its digital transformation, resulting in massive unemployment, as local corporations and the overall economy will lose competitiveness. This loss of competitiveness will reduce exports as local products and services will become outdated and more expensive, while imports from digitally advanced countries will rise. In the long term, there will be an increasing risk that local companies are

progressively substituted by those from more advanced and competitive countries. The gap between digitally advanced countries with society-wide reskilling and upskilling capabilities, and countries from both sides of the Western Mediterranean, has widened in the last 4 years.

Policy makers, corporations, associations, public administration, and academics should be aware of these risks, and assess, the numerous and well established experiences and best practices, to potentially adjust and apply them to their sector and countries.

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CONCLUSIONS

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Introduction

The latest report of the United Nations Framework Convention on Climate Change (UNFCCC), 14 November 2023, concludes that more effort is needed in national climate action plans to meet the Paris Agreement targets aiming to limit global temperature rise to 1.5 degrees Celsius (UNFCCC, 2023). More specifically, greenhouse gas (GHG) emissions must be reduced by 43% by 2030 compared to 2019 levels, according to data from the Intergovernmental Panel on Climate Change (IPCC, 2023).

Data from the IPCC's 6th Assessment Report show that, in 2019, approximately 15% of global GHG emissions originated from the transport sector (ibid.). At the European Union (EU) level, this represented 25% of CO₂ emissions according to the European Environment Agency (EEA) (EEA, 2023). The EEA also shows that GHG emissions from the transport sector grew steadily between 2013 and 2019 in the EU. In 2019, there was a decrease due to the Covid-19 pandemic. Subsequently, in 2021, the record of GHG emissions rose again, as is expected to be the case also in 2022 and 2023. To meet the Paris Agreement targets, transport emissions would need to be reduced by 25% by 2030, even if demand continues to grow.

With these figures, environmental sustainability has become the current and future challenge for the transport sector. And decarbonisation is the main strategy to achieve climate targets, based on the use of low-carbon or zero-emission fuels and energy sources.

In addition to decarbonisation, there are two other strategies that can contribute significantly to the sustainability of transport. On the one hand, the integration of

digital technologies, which should contribute to a more efficient and energy-efficient transport system by facilitating trade and simplifying transport administrative processes. On the other hand, the development of more resilient transport infrastructures and services, prepared to better withstand potential new and more demanding climate scenarios, while enabling more sustainable mobility choices.

Synergies Between the Energy and Transport Sectors

Transport is currently a sector with a high dependence on fossil fuels. This applies to road, maritime and air transport. For this reason, in order to achieve decarbonisation of the sector, it is necessary to eliminate this dependence by offering fuels or energy alternatives that involve lower or zero GHG emissions.

Electrification is the most widely used solution to reduce GHG emissions from urban mobility. This means increasing the presence of electric vehicles in cities, as well as the promotion of traditional public transport, such as metros and trams. In addition to the latter, bus services are also increasingly relying on electricity or renewable fuels.

Electrification can also be applied to freight transport, via railways or in electric trucks used for short distance operations. Yet, for long-distance road freight transport, there is currently no competitive technology in terms of range, cost and sustainability that allows for electrification.

Electrification is also a solution for reducing emissions at infrastructure nodes such as ports and airports. Some ports are developing initiatives to supply shore-side electricity to ships at berth in the port and thus

avoid running their engines or generators. Electrification in ports can also be used for the operation of cranes, inland vehicles, buildings and service vessels. The potential for electrification at airports refers to the supply of electricity to aircraft parked at gates and remote parking points.

However, to meet the decarbonisation target, it must be ensured that the electricity used is obtained from low-carbon sources and that the sizing of the recharging infrastructure and the energy distribution network is in line with the potential electricity needs (Raimondi & Noussan, 2024).

With regard to the use of alternative low-carbon fuels, most shipowners opt for liquefied natural gas (LNG), followed by methanol, liquefied petroleum gas (LPG) and other alternative fuels such as hydrogen, ethanol and biofuels. The choice of fuel must be made in a coherent and compatible way with the availability of raw materials and renewable energies in the Mediterranean Sea. In this way, a diversified and resilient response to maritime transport fuel demand can be provided (Panaro & Buonfanti, 2024).

In air transport, sustainable aviation fuels (SAFs) are being developed, but are not yet a competitive reality.

The contribution of transport to the decarbonisation of other sectors is an issue that is also currently being raised. More specifically, some ports are developing their own plans and strategies for sustainable energy generation within their premises, to become energy hubs. In addition to contributing to the electrification of port operations, energy generation could also be used for the electrification of nearby industries or simply for supply to the grid. An example would be green hydrogen generation

schemes in port facilities (Panaro & Buonfanti, 2024).

At the Mediterranean level, there are two different paces of transport decarbonisation. EU Mediterranean countries have a common strategy, the Sustainable and Intelligent Mobility Strategy, including ambitious emission reduction targets reflected by a 90% reduction from the transport sector by 2050, and concrete measures that contribute to the achievement of its objectives, namely the "Fit for 55" package. Here, the main challenge is to obtain sufficient renewable energy or energy from low-carbon energy sources to meet the needs of decarbonisation.

In contrast, on the southern shore of the Mediterranean, most countries are experiencing slower progress in decarbonising transport. They have set renewable energy targets and have abundant renewable potential, however, they have generally experienced slow development in the electricity sector (Raimondi & Noussan, 2024). This also affects their pace of decarbonisation. Lack of political decisions and economic resources may be some of the factors holding back this step towards decarbonisation and the possibility of becoming the region's renewable energy leaders, both in terms of generation and distribution.

Integration of Digital Technologies

The integration of digital technologies should contribute to the sustainability of the transport system in the Mediterranean by improving its efficiency, eliminating barriers to fluid traffic, improving coordination between the actors involved and eliminating the paper format for the exchange of information.

Some of the main barriers to fluid traffic are the different relations between EU customs

and between EU customs and southern Mediterranean customs, as well as the different administrative and cargo information procedures between the different actors in the transport chain (CETMO, 2022) (Ticó, 2022).

The integration of digital technologies in the transport chain and customs allows for better coordination between chain actors, increased multimodal efficiency of the transport system, improved visibility and traceability of goods, reduced costs and waiting times, and increased security. But it requires complementary policies and regulations at national and international level, as well as mature and reliable technology.

The International Fast & Secure Trade Lane (IFSTL) initiative is an example of this, based on three pilot projects on transport chains between Italy and Morocco, Egypt and Turkey. The main result of the pilot project between Italy and Morocco is the simplification of document management and the reduction of customs clearance time, i.e. increased efficiency of administrative and operational processes. As a result, maritime transport has improved its attractiveness compared to the traditional road transport option, favouring greater sustainability of the transport chain. The implementation of technology has required investments in infrastructure (e.g. automated gates at port terminals) and the joint and coordinated work of the authorities involved in the operation of the corridor, with a prominent role for port authorities (Gorini & Burlando, 2024).

Another example of the integration of digital technologies in transport is the use of maritime single windows. These platforms for the exchange of information on the arrival and departure of ships are already in use in some Mediterranean ports. From 1 January 2024, their use will be compulsory for all ports. This decision was adopted on

13 May 2022, within the framework of the International Maritime Organisation (IMO) by resolution FAL.14(46). Its aim is to simplify port formalities and reduce the administrative burden, based on a single presentation of harmonised data. This avoids the traditional submission of information to multiple entities once the ship has docked. In addition, the digitalisation of information allows for faster approval of port declarations and greater coordination between the port actors that must provide services to the ship. All this leads to the possibility of reducing port call times and consequently GHG emissions in the port.

A last example of integration of digital technologies is electronic freight transport information in the EU framework. It is based on Regulation (EU) 2020/1056 and aims to establish a legal framework for economic operators to share with authorities' information in an electronic format relating to the transport of goods by road, rail, inland waterways and air in the EU. Maritime transport is not included, as it is covered by maritime single window regulations. The regulation aims to speed up the digitalisation of freight transport documentation in the administration, as private companies are usually ahead in this area. Thus, from December 2025, when the Regulation is due to be implemented, authorities will be obliged to accept electronically submitted information. More specifically, the Regulation promotes the reduction of inefficiencies in freight transport by reducing administrative costs for operators; by uniform application in the acceptance of electronic information and by promoting interoperability of the systems and solutions used.

Yet, when talking about the integration of digital technologies, the impact on current professional profiles and the need for upskilling and reskilling must also be taken into account, whether in the transport sector or in any other sector. Without con-

sidering the recent rise of artificial intelligence, it is estimated that 15% of current professions will require digital skilling to cope with the possibility of becoming outdated or disappearing. This percentage is also valid for the transport sector. Even if in the short term there is no destruction of workplaces, the lack of digital skills leads to a loss of competitiveness at national level, which in the mid-long term will mean a loss of jobs due to the demand for digital professions at international level (Miró, 2024).

Given the lack of skilled professionals in the new digital environments, the most efficient and cost-effective solution for companies is to train the workers themselves. In this sense, reskilling and upskilling programmes in leading countries in digital technologies combine public and private participation. Companies assume part of the adaptation costs with hours dedicated to specific reskilling and upskilling programmes during working hours. But it is very important that the administration leads this adaptation process (Miró, 2024).

Development of a Resilient Transport System

The COVID-19 pandemic, the shortage of microchips, the bottleneck in the Suez Canal, the war in Ukraine and Russia... All these disruptions have shown the importance of building more resilient transport chains, capable of improving their response to the occurrence of unforeseen events with hardly predictable impacts. Climate change represents one of the potential disruptions to be taken into account in this future planning. Its impact will be particularly relevant in the Mediterranean region, given the occurrence of increasingly extreme weather events with more severe consequences on transport infrastructures and services.

In this regard, it is expected that the impacts of future climate conditions in the Mediterranean basin may put the functioning of the regional transport system at risk, and therefore concrete adaptation strategies, actions and measures should be promoted to help increase the resilience and operational capacity of transport infrastructures. At EU level, some strategic approaches and communications have already been developed to address infrastructure adaptation to climate change. But there is a need to raise awareness of the importance of defining and adopting such approaches at Mediterranean level to ensure the future resilience of the whole transport network. Moreover, one of the main handicaps in the field of adaptation in the Mediterranean is the lack of precise shared knowledge on the effects and impacts of climate change on transport infrastructures and services (Selfa, 2024).

Another element that can contribute to increasing the resilience of the transport system is the existence of routing alternatives that allow the choice of one or the other based on sustainability, cost or time criteria. In the EU, these alternatives are defined by the components of the Trans-European Transport Network (TEN-T). Although there is still a long way to go for their full development, with different target scenarios for 2030, 2040 or 2050, their degree of development is higher than that of the transport network on the southern shore of the Mediterranean. In the latter, the future potential of the trans-Maghreb rail network, which should contribute to trade integration and transport sustainability, should be highlighted. Currently, the development of the trans-Maghreb rail network requires agreements at the highest level to adopt an action plan to overcome the existing constraints and obstacles, especially with regard to the harmonisation of regulations and the definition and development of pending sections (Hammami, 2024).

Another major challenge for the southern Mediterranean transport network in general, and the completion of the trans-Maghreb rail network in particular, is obtaining international support for financing beyond public finance. However, the development of the Global Gateway initiative and its interest in investing in connectivity projects in the transport, energy and communications sectors could represent a new opportunity. The Global Gateway initiative is expected to mobilise up to EUR 300 billion in investments for high quality and sustainable projects between 2021 and 2027.

The Global Gateway initiative represents a renewed effort to increase European influence in the southern Mediterranean. In this sense, the nearshoring or regionalisation processes that have been developing in recent years and the possibility of strengthening these processes in order to have more resilient transport chains, together with the possibility of exporting European norms and standards that contribute to facilitating trade relations in the Mediterranean, are all incentives for EU investment on the southern shore of the Mediterranean through the Global Gateway initiative (Furness, 2024).

Conclusions and Recommendations

Collaboration with the energy sector, integration of digital technologies and adoption of more resilient transport approaches are three strategies to keep in mind to achieve transport sustainability in the Mediterranean. A sector with a significant impact on global climate health.

Firstly, the search for fuels or energy alternatives with lower emissions entails close collaboration between the energy sector and the different modes of transport. This

situation exposes the potential of ports as sustainable e-hubs, energy hubs capable of providing zero or low-emission energy for port operations and other users.

Secondly, the integration of digital technologies offers tools to improve trade relations and the efficiency of transport chains in the region. Administrations are a responsible part of this integration, with their regulatory support and their leadership in developing reskilling and upskilling programmes for the professionals concerned in coordination with the private sector.

Thirdly, the development of a resilient transport system requires specific knowledge at regional level on the effects and evolution of climate change in the Mediterranean. This knowledge should contribute to a harmonised vision on how to ensure the future functioning of the regional transport system in the face of climate change impacts. It should also allow better targeting and exploitation of funding possibilities for transport infrastructure and its operation.

Finally, it is worth highlighting the wide room for collaboration that exists in the Mediterranean to advance in the complementarity between the energy and transport sectors, in the coordinated implementation of digital technologies, reducing the digital maturity gap, and in the development of collective intelligence on the relationship between climate change and transport.

For this reason, it is recommended that the current cooperation frameworks, forums, initiatives and working groups on transport be used to identify the complementarities between the countries of the region on the above-mentioned issues. This should allow them to strengthen their relations on the basis of concrete collaborations and, in this way, build a more sustainable and integrated regional transport system.

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