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#### 13. A patchwork of excellence, failure, and everything in between

– Two distinct takes on the development of the EU TEN-T

Ewa Kochańska

# The Port of Opportunities

The Port of HaminaKotka is a versatile Finnish seaport serving trade and industry. The location of HaminaKotka at the logistics hub makes the port truly unique – it opens up connections to all parts of the world.

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## EU reaches out to the Western Balkans

The **European Commission (COM)** has adopted the **Economic and Investment Plan for the Western Balkans** – comprising **Albania, Bosnia and Herzegovina, the Republic of North Macedonia, Kosovo, Montenegro, and Serbia** – set to mobilize €9.0b to support the long-term economic development of the region, i.e., through greater connectivity and facilitating a twin green-digital transition, as well as foster regional integration and convergence with the **European Union**. The Plan identifies ten investment flagships to support major road and railway connections in the region; renewable energy and the transition away from coal; renovation of public and private buildings to increase the energy efficiency and reduce greenhouse gas emissions; waste and waste-water management infrastructure; as well as the rollout of broadband infrastructure. Other flagship projects include increased investments in the private sector to boost competitiveness and innovation, in particular of small- and medium-sized companies, and the so-called Youth Guarantee (a commitment to ensure that all young people under the age of 25 receive a good quality offer of employment, continued education, apprenticeship, and traineeship). The COM has also presented guidelines for implementing the **Green Agenda** in the Western Balkans, which revolves around five themes: climate action (incl. decarbonisation, energy and mobility); circular economy (addressing in particular waste, recycling, sustainable production and efficient use of resources); biodiversity (aiming to protect and restore the natural wealth of the region); fighting air, water and soil pollution; and sustainable food systems and rural areas. In addition to grant funding, the EU can provide guarantees to help reduce the cost of financing for both public and private investments and to reduce the risk for investors. Support through the new **Western Balkans Guarantee** facility, under the **EU External Action Guarantee** and the **European**

**Fund for Sustainable Development Plus**, is expected to mobilise potential investments of up to €20b in the next decade. “The citizens of the Western Balkans are part of Europe, and we have a shared interest in helping these six partners move forward on their EU path. With the Economic and Investment Plan, we are backing our Enlargement Package assessment with action, providing deep and strong support for economic recovery and reform – for a modern, greener and more prosperous Western Balkans delivering better to their citizens on the road to the EU,” **Josep Borrell**, EU High Representative for Foreign Affairs and COM’s Security Policy/Vice-President, said. Better connecting the economies of the Western Balkans within the region and with the EU requires a strong commitment from the countries in question to implement fundamental reforms, deepen regional economic integration, and develop a common regional market on the basis of the EU acquis (the accumulated legislation, legal acts, and court decisions which constitute the body of EU law) in order to make the region a more attractive investment area. “The EU will strive to bring the region closer to the EU Single Market. Good governance is the foundation for sustainable economic growth. Boosting investment and economic growth will therefore only be possible if the Western Balkans firmly commit to and implement fundamental reforms in line with European values,” the COM underlined in a press release. To this **Olívér Várhelyi**, EU Commissioner for Neighbourhood and Enlargement, added, “The Plan also offers a path for a successful regional economic integration to help accelerate convergence with the EU and close the development gap between our regions, ultimately speeding up the process of EU integration. This plan should help to transform the Western Balkans into one of the most attractive regions for investments in the world. Implementation, of course, will need to go hand in hand with reforms.”

## Kapellskär-Naantali MoS secures EU money

Thanks to the grant, the Swedish and Finnish ports, between which an **EU Motorway of the Sea (MoS)** runs, will carry out a joint project tasked with reducing ship-caused emissions as well as streamlining ferry operations. Specifically, the two will invest in onshore power supply, automated mooring, and infrastructure to make it easier for foot passengers to embark and disembark a ferry. The project will have been completed by end-2023. “We are very happy that the agreement with the EU has now been signed. The development of Port of Kapellskär is strategically significant for sustainable shipping. More goods arriving by sea, using routes such as Naantali to

Kapellskär, ensures long-term sustainable development and growth of the entire Stockholm region,” **Bino Drummond**, Deputy Chairman, the **Port of Kapellskär**, highlighted. **Peter Lundman**, the port’s Technical Operations Manager, also said, “Increasing traffic volumes at the Port of Kapellskär, in combination with the environmental challenges faced by society, mean that the benefits of the joint EU project with the Port of Naantali will be both effective and sustainable. I believe that the capabilities to provide onshore power to the vessels, an automatic mooring system, and a new passenger tower are excellent competitive solutions for the future.”



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## HYDRA raises its head

The €9.4m-big and four-year-long **HYDRA** project, part of the **EU Horizon 2020** innovation programme, has been initiated with the aim of developing the next generation of sustainable, low-cost, energy-dense lithium-ion (Li-ion) batteries for electric vehicle (EV) applications. The initiative is led by **SINTEF**, an independent research organization headquartered in Trondheim, bringing together 12 partners from across the battery value chain. "Like the mythical beast, the HYDRA project will take a multi-headed approach to solve the challenges that have limited Li-ion batteries in EVs," the project partners wrote in a press release. They furthered, "The project will combine advances in hybridized battery materials with model-based design to develop optimized designs that balance the needs for energy and power while retaining capacity over many cycles. [...] From materials development, to cell manufacturing, and pack integration, HYDRA will pursue solutions that are feasible, sustainable, and relevant to the needs of the e-mobility industry today. [...] The project will target the development of environmentally friendly water-based processing of cobalt-free cathode materials. This has the potential to significantly improve the cost and safety of the manufacturing process and reduce dependence on critical raw materials (CRMs). The HYDRA concept uses abundant

electrode materials like iron, manganese, and silicon, with a net CRM reduction of >85%." **Dr. Simon Clark**, Research Scientist and Project Coordinator from SINTEF, also commented, "High-performance and affordable electric mobility is a cornerstone technology for reducing air pollution in cities and enabling the future of the Green Transition. The cost and lifetime of electric vehicles are largely determined by the battery pack, which can be heavy and expensive. HYDRA is developing advanced battery materials, cell designs, and manufacturing methods to address these challenges in a sustainable way." **Lars Ole Valøen**, Chief Technology Officer, **Corvus Energy**, one of HYDRA's project partners, also highlighted, "By collecting high-level expertise from across the value chain to collaborate on such a comprehensive scope, will create the momentum needed to accelerate the development towards the next generation batteries free of critical raw materials. For Corvus, this means we can shorten the time to market for more sustainable, higher-performing batteries at a lower cost for our customers. We will also be able to further develop advanced characterization methods and cell modelling framework, which will improve battery sizing algorithms and life cycle analysis for our systems in addition to improved services through our customer portal."

## CMP eyes storing & shipping CO<sub>2</sub>

The **Copenhagen Malmö Port (CMP)** and **Amager Resource Center (ARC)**, a municipal waste collector, have partnered to apply for **EU** funds to set up and operate a CO<sub>2</sub> capture facility. ARC and CMP will submit an application to the climate action EU Innovation Fund to receive funding in the range of DKK500m-1.0b (approx. €65-130m), a sum expected to cover up to 60% of the costs of establishing the facility, scheduled for completion in 2025, as well as running it for the first decade. The waste management site managed by ARC is located close to CMP's **Provstenen** dry & liquid bulk harbour to which the new facility will be connected by a pipeline. Captured CO<sub>2</sub> will be stored on-site for shipping to the North Sea where it'll be deposited in old oil fields. The facility will reduce ARC's CO<sub>2</sub> emissions by 500kt/year from today's 560kt. It'll form part of the **City of Copenhagen's** goal of becoming the world's first carbon-neutral capital as well as Denmark's aim of reducing its carbon footprint by 70% by 2030 (ARC's 500kt equals to about 1% of the country's annual emissions).

"CMP is extremely excited to be part of this project which has a colossal potential to contribute to reducing CO<sub>2</sub> emissions in Copenhagen. For CMP, this is an excellent example of how the port can play an active role in the green transition and be part of new pioneering climate technology, which can hopefully serve as inspiration for similar projects with CO<sub>2</sub> capture not only in Denmark but also abroad. Therefore, I hope that we get a positive response from the EU as a first step on the way to realising the project," **Barbara Scheel Agersnap**, CEO, CMP, commented. **Jacob H. Simonsen**, Managing Director, ARC, added, "It is absolutely vital that we have such a strong partner such as CMP on-board the project [...]. As an added benefit, we can create local, green workplaces and infrastructure for handling captured CO<sub>2</sub> that potentially can be used by a number of other large CO<sub>2</sub> emitters in the metropolitan area. Therefore, it is urgent to obtain the financing and have the framework conditions in place in a good and close dialogue with our joint owners and [...] the Danish Parliament."

## INFORM-3DEO MoU

The companies – **INFORM** specialising in Artificial Intelligence (AI), data analytics and optimization, while **3DEO** in data visualization tools – have signed a memorandum of understanding tasked with exploring how their respective solutions can be closely aligned. The parties will exchange knowledge as well as investigate new opportunities in order to best leverage port, terminal, and other maritime players user data to provide them with added value. The co-op is part of INFORM's data strategy, launched this year and aimed at delivering data management and analytics as well as other tools, such as machine learning, to established software vendors across the industry. "3DEO provides innovative visualization solutions to extract business intelligence, break down information silos and facilitate intuitive interaction and decision making. In doing so, we provide clarity and insight, which often highlights data gaps, data question, and opportunities for even greater insight and commercial advantage. Collaboration with INFORM and their data

capabilities has huge potential to unlock greater value for our mutual clients going forwards," **Andy MacPherson**, CEO, 3DEO, commented. To this **Dr. Eva Savelsberg**, SVP, INFORM's Logistics Division, added, "INFORM is a well-established specialist in AI and optimization providing solutions to some of the biggest names in our industry like HHLA, the Port of Rotterdam, GCT, and DP World. Data underpins all the work our add-on optimization modules do so it made sense for us to invest in building a strong data strategy component to our solution offering." **Matthew Wittemeier**, Senior Manager, International Marketing and Customer Relations, INFORM, also said, "3DEO are the specialists in our industry at aggregating and visualizing [...] typically siloed data. Their tool enables organizations across our industry to visualize and interrogate assets in ways not available before. Our aim is to take end customers to the next level of insight, whether that be predictive analytics, predictive maintenance, or deep machine enabled learning outcomes; really, the sky's the limit."

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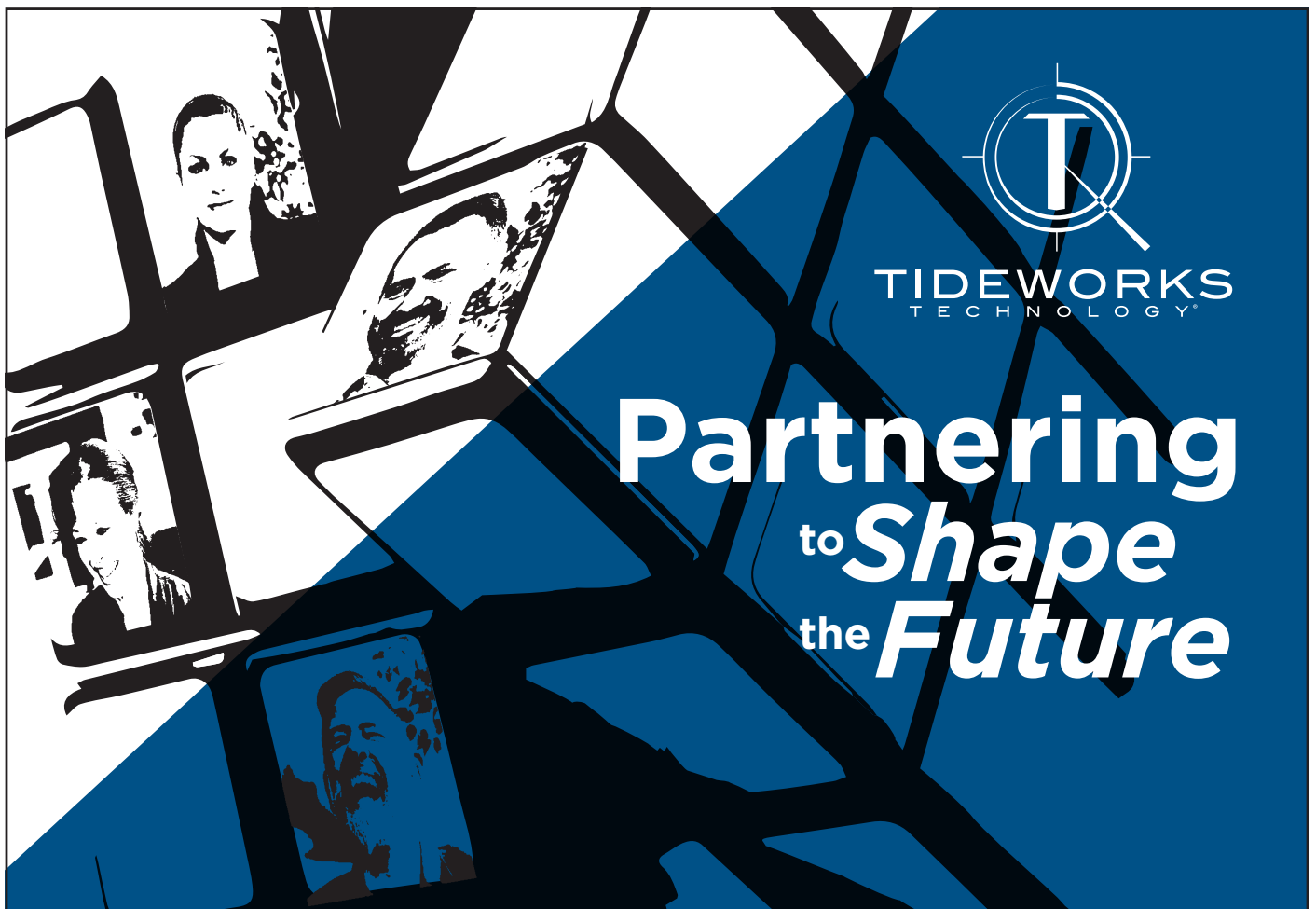
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## PD Ports attracts two waste-to-energy plants to the Tees Valley

First at the beginning of November and then by the end of the month, the owner and operator of Teesport has announced the signing of two agreements with **Wentworth Clean Power (WCP)** for the construction of waste-to-energy plants, the former valued at £230m and the latter at £430m, both to be based by the **Teesport Commerce Park**. The first one, the **Teesport Renewable Energy Centre**, will sit on a nine-acre footprint and create between 250-300 full-time jobs during construction, with a further 40 permanent posts created when the plant becomes operational – which is expected to be in the second half of 2024. The plant will have an annual capacity of 300kt of feedstock and deliver an electrical output of 30 MW, enough to power up to 27k homes, with the potential to provide decentralised energy to existing and planned industrial users via combined heat and power. The second plant will deliver 250kt of specialist feedstocks and up to 18 MW, supplying over 16k households with electricity. The project will also generate usable heat and will offer the potential for direct heat supply to local and planned developments in the area, together with direct electrical supply. The second project will cover 30 acres and generate 250-300 full-time jobs during the construction phase and up to 50 further full-time occupations when operational. The site is expected to go fully online in the second half of 2025. “This is fantastic news for the whole of the Tees Valley. We have secured over £600 million of private investment to bring these state-of-the-art facilities to our region that will, in turn, create jobs, boost prosperity and place us at the forefront of the net-zero agenda,” **Frans Calje**, CEO, **PD Ports**, highlighted. He furthered, “At PD Ports, we are constantly working to support sustainable practices and reduce our impact on the environment. We are

committed to supporting the Government’s ‘levelling up’ agenda for the North, whilst also seeking to deliver more efficient and environmentally sustainable solutions to aid the target of net-zero carbon emissions by 2050 – these waste-to-energy projects fully support that commitment.” **Philip Spanos**, CEO, WCP, added to this, “We are delighted to be delivering not one but two highly advanced, sustainable energy and waste management projects to the Tees Valley and look forward to playing our role, alongside PD Ports and local stakeholders, in contributing to the realisation of the immense potential of this region.” **Andy Preston**, **Mayor of Middlesbrough**, also commented, “This is absolutely fantastic news for the Middlesbrough area and Tees region generally. PD Ports stands for everything I believe in – a high-quality local employer that’s ambitious, world-class and forward-thinking. At a hugely challenging time for business, it’s fantastic that PD Ports has won massive new private investment for our area, creating hundreds of new jobs. Our region was synonymous with the chemical and steel industries, but now, we can build a reputation as world leaders in a fast-growing sector as we focus increasingly on environmental issues.” Summing up, **James Ramsbotham**, Chief Executive of the **North East Chamber of Commerce**, remarked, “This announcement is such welcome news on many levels. Attracting such investment at this time of global crisis is a testament to the strength of the region, and these jobs are so important to our community. Our collective commitment towards Net Zero remains a top priority, and this project will bring us closer to delivering a more sustainable and greener economy for the future. We hugely congratulate PD Ports and everyone involved with this development – it will be a huge morale boost for our area.”



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## CO<sub>2</sub>-to-green & circular methanol in North Sea Port

A consortium of ten private & public partners has launched the **North-C-Methanol** project, part of the **North-CCU-Hub** programme that aims at reducing CO<sub>2</sub> emissions generated within the North Sea Port by 1.0mt/year. The new initiative, an investment of €140m, will see the construction of two large-scale demo plants as well as supporting infrastructure on the Rodenhuize peninsula. The first will be a 65 MW electrolyser, to be erected on the **ENGIE** site, converting water into green hydrogen and oxygen using wind power. “We already have a direct, high-voltage grid link with renewable energy generated by the North Sea winds. We can use this energy to produce hydrogen, which in turn can serve as a renewable raw material,” **Cedric Osterrieth**, Director of thermal activities in Europe of ENGIE, highlighted. The second, a **Proman** methanol plant, will use the produced hydrogen to convert the collected CO<sub>2</sub> emissions of major local industrial players (i.e., **ArcelorMittal**, **Alco Bio Fuel**, **Yara**) into green methanol which, in turn, can be further used by other local industries, e.g., as a chemical feedstock or fuel for ships or trains. **David Cassidy**, CEO, Proman, said in this regard, “We are excited to further develop methanol’s potential as a clean fuel for the future. Green methanol presents a significant opportunity to bridge the gap from fossil-based to renewable energy.” Overall,

the North-C-Methanol project is expected to capture 140kt/year of CO<sub>2</sub>, at the same time producing 44kt of methanol. It is expected that the electrolysis capacity will be six times greater than the largest system currently in use in the world; North-CCU-Hub expects a gradual increase of the North-C-Methanol capacity from 65 MW in 2024 to 600 MW in 2030. “The North-C-Methanol project is a landmark example of sustainable industrial symbiosis: raw materials are extracted locally, and finished products and secondary flows are used locally. A new, circular economy will be created in North Sea Port: waste from one enterprise will be used as a raw material by another one. All by-products of the methanol production process, such as oxygen, heat, and water, will also be recycled locally. This will ensure a unique and far-reaching industrial and circular integration,” North Sea Port said in a press release. **Hilde Crevits**, the **Flemish Deputy Prime Minister**, summed up by saying, “This project shows why Flanders can become a leader in sustainable innovation. With our ports and their industry, we are ideally positioned to invest in a circular and sustainable industry. It provides sustainable growth and new jobs, and with this type of project, we make a leap forward to a resilient Flanders. Moreover, it is also a step in the direction of becoming less dependent on fossil raw materials from abroad.”

## HySHIP to get €8.0m in EU funding

A consortium of 14 European partners will work on the design and construction of a ro-ro demonstration vessel that will run on liquid green hydrogen (LH2) as well as on the establishment of an LH2 supply chain and bunkering platform. The funds come from the **EU’s Research and Innovation programme Horizon 2020** under the **Fuel Cells and Hydrogen Joint Undertaking (FCH2 JU)**, but receiving the support is subject to the signing of a grant agreement by the **HySHIP** partners by end-year. **Topeka** will feature a 1,000 kWh battery pack and a 3.0 MW proton-exchange membrane hydrogen fuel cell. She’s slated to become operational from 2024, serving Norwegian coastal traffic, commercial as well as containerized LH2, in **Wilhelmsen’s** colours (at the same time the project’s leader). Hydrogen will be sourced from a new LH2 production plant, to be erected by **BKK**, **Equinor**, and **Air Liquide** at the **Mongstad** industrial site outside **Bergen**. In addition, HySHIP will conduct three replicator studies: a smaller, 1.0 MW inland waterways tanker barge, a 3.0 MW fast ferry, and a scaling-up study on a larger, 20 MW energy system for deep-sea vessels (using a capesize bulk carrier as the replicator). “Hydrogen as a fuel enables opportunities for low, or zero-emission shipping. **Topeka** will be our first step towards scalable LH2 fuelled maritime operations. We shall create a full LH2 infrastructure and commercial

ecosystem, while at the same time removing yearly some 25,000 trucks from the roads,” **Per Brinchmann**, VP Special Projects, Wilhelmsen, and the project’s coordinator, said. **Frida Eklöf Monstad**, VP Logistics and Emergency Response, Equinor (one of HySHIP’s partners), also commented, “A hydrogen driven coastliner that has a regular frequency is a very promising transportation alternative for Equinor’s bases on the west coast of Norway. This zero-emission vessel service will also be a valuable demonstrator of the technology development supporting Equinor’s ambitions to move cargo from road to sea and to halve emissions from our maritime activities in Norway by 2030.” **Bart Biebuyck**, Executive Director, FCH2 JU, summed up, “Maritime is a large contributor of global GHG emissions and thus a priority sector to decarbonize. Hydrogen and fuel cells have the potential to propel vessels in a zero-emission fashion, and various ship types are starting to integrate them. HySHIP will be a worldwide forerunner innovation project due to its use of liquid hydrogen, the size of the fuel cell and the concept for the LH2 distribution.” Apart from the aforementioned companies, the project consortium also comprises **Kongsberg Maritime**, **LMG Marin**, **Norled**, **PersEE**, **Diana Shipping**, **Stolt-Nielsen Inland Tanker Service**, **NCE Maritime CleanTech**, **DNV GL**, **ETH Zürich**, **Strathclyde University**, and **Demokritos**.

## Green hydrogen – from Iceland to Rotterdam

**Landsvirkjun**, Iceland’s largest electricity generator, and the **Port of Rotterdam** have signed a memorandum of understanding to carry out a pre-feasibility study on exporting emission-free Icelandic hydrogen to Rotterdam. The former eyes setting up a hydrogen production facility at the **Ljósifoss Hydropower Station**, about 70 km outside of Reykjavík, through carbon-free renewable power electrolysis of water. At the same time, the latter has elaborated a hydrogen master plan, according to which the Port of Rotterdam is to become one of Europe’s major hydrogen import hubs. “Hydrogen is, without a doubt, one of the energy carriers of the future, and a very exciting option as a means to combat climate change. Using hydrogen as a carrier, we can export our Icelandic green renewable energy to the European

mainland, thereby increasing our contribution to the joint efforts necessary to facilitate a worldwide energy transition. The European market for green hydrogen will no doubt grow considerably in the coming years, and this MOU will enable us to monitor and take part in that development right from the get-go,” **Hordur Arnarson**, CEO, Landsvirkjun, commented. **Allard Castelein**, CEO, the Port of Rotterdam, added, “Northwest Europe will need to import large volumes of green hydrogen to become CO<sub>2</sub>-neutral. Rotterdam is currently Europe’s main energy hub. We expect hydrogen to take on the position oil has today, as an energy carrier as well as feedstock for the industry. We are therefore exploring the possibilities to import hydrogen from countries that have the potential to produce large volumes of hydrogen at a competitive price, like Iceland.”

## 5G Maritime

The **Port of Barcelona** – together with **IBM, Vodafone, Huawei, Mobile World Capital Barcelona, Fundació i2CAT**, and the **Catalan Regional Ministry of Digital Policies** – is trialling a geolocation project which combines the use of Artificial Intelligence (AI), cloud & edge computing, and 5G. The aim of the project is to gain real-time ship location with greater precision than today (sourced through the automatic identification and radar geo-positioning systems), plus obtain complementary image data. This, in turn, will help the Catalan seaport optimize its maritime traffic management and to improve safety and sustainability using complete information on ships, their location, and the actions of the various port services. “Around 9,000 ships dock at the Port of Barcelona each year. The vessels have many different characteristics and sizes, some as big as 400 metres long [...]. Having very precise and real-time information on their movements and geolocation is essential not only to optimise docking space in the port, but also to offer the highest level of safety to ships and port services when performing manoeuvres,” the port wrote in a press release. The solution comprises the **IBM Maximo Visual Insights AI**, created by the tech-company and trained on its **IBM Cloud** to recognise ships, their bow and stern. Huawei has supplied two sets of high-performance cameras and 5G terminals, which have been located in the port to capture ship entry in real-time. Images are sent to a server via Vodafone’s 5G network for running them through an AI model, which recognises and interprets the input. The AI model is distributed to a server located in the port control tower using the **IBM Edge Application** computing technology. Subsequently, a geolocation algorithm translates the pixels of the images into geographic latitude and longitude coordinates. Finally, these geolocation data are integrated with the rest of the port’s systems. “The technological solution makes it possible to obtain fore and aft geo-positioning and a high-precision ship movement indicator that facilitates remote assistance to navigation. The port

pilot will be able to accurately estimate valuable information for the entry and berthing operations of vessels in the port, such as the location of several ships sailing within the Port of Barcelona docks, the course or even the speed of the ship itself, all based on an analysis of video from 5G cameras installed around the port area,” the port underlined in the brief. “The importance of this project linked to one of the country’s key infrastructures and to a sector like logistics that is also key to the entire Catalan economy, inserted into the Catalan Government’s 5G strategy and the alliance that we maintain with the Port of Barcelona to accelerate its digitalisation and turn it into a benchmark SmartPort,” **Jordi Puigneró**, Regional Minister of Digital Policies, commented. He furthered, “Projects like this allow us to get ready for the impact of 5G and other advanced technologies in different areas of our society and as drivers of reactivation and dynamization of the Catalan economy with the promotion of a new technological industry and above all, new jobs.” To this **Laura Molist**, Territorial Director of Vodafone in Catalonia and Aragon, added, “Public-private collaboration is essential for accelerating the development of 5G use cases such as the one presented today, since it allows us to make the best use of the know-how and efficiency of the private sector, with the interests of the public sector in developing a powerful digital ecosystem adapted to the new technologies.” **Mercè Conesa**, President of the Port of Barcelona, summed up by saying, “Having a network of cameras connected by 5G technology would represent an important advance in terms of safety for maritime traffic in the Port of Barcelona. But not only would it help us improve safety and security in the port area, which are of the utmost importance, but it would also help to optimise our dockside management. And it would facilitate the daily work of all port services – pilots, tug-operators and moorers.” The 5G Maritime project is part of **5G Barcelona**, a public-private scheme to create an experimental infrastructure for testing, piloting, and implementing new digital solutions.



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## Multi fuel cell

**Odfjell, Prototech, Wärtsilä, and Lundin Energy Norway** have partnered to develop a fuel cell that can use different types of fuel, including green ammonia and liquefied natural gas (LNG). The project partners are constructing a 1.2 MW prototype at the **Sustainable Energy** catapult centre in Norway, to be installed later on-board one of Odfjell's chemical tankers. "Our tests show a CO<sub>2</sub> reduction of as much as 40-45% when using LNG, compared to current solutions. Increased efficiency and reduced fuel consumption also provide significant cost savings, and the ship will be able to sail significantly longer on the same amount of energy. The system will also be ready to operate completely emission-free from the locations where, for instance, ammonia is available for bunkering. The technology also enables direct capture of CO<sub>2</sub>, which will be yet another alternative for emission-free operation when logistics for CO<sub>2</sub> management become available," **Bernt Skeie**, CEO, Prototech, highlighted. **Erik Hjortland**, Technology Director, Odfjell SE, added, "Ships are to be operated for 20-30 years, and we need flexible solutions that can meet future emission requirements. We do not have time to wait; we have to think about zero emissions already now. The fuel cell project is one of the paths we are pursuing. We focus on machinery

rather than focusing on one single type of fuel. Fuel cell technology gives us a flexibility that ensures environmentally efficient operation regardless of fuel changes that may occur in the years ahead." **Ingve Sørfonn**, Technical Director, Wärtsilä, also commented, "The new energy solution has the potential to take us a big step closer to the goal of climate neutrality. And it does not stop with ships; this solution can also be used in offshore oil and gas operations." **Harald Solberg**, CEO, the **Norwegian Shipowners' Association**, summed up, "The development of this fuel cell is an example of how forward-looking shipping companies and our unique maritime expertise have the prerequisites to drive new solutions through a broad collaboration within the maritime cluster. In the long run, scaling up such solutions will be of great importance in achieving our climate goals, they will have business value, and they can create new jobs in Norway. Norwegian shipping has set ambitious climate goals [becoming climate-neutral by 2050]. This type of projects is very important for us to be able to develop solutions that quickly reduce emissions." The project is funded by the involved partners as well as by **Gassnova**, a Norwegian state enterprise for carbon capture and storage, and the **Research Council of Norway**.

## ABS-DSME SOFC JDP

The **American Bureau of Shipping (ABS)** and **Daewoo Shipbuilding & Marine Engineering (DSME)** have partnered to further investigate the use of solid oxide fuel cell (SOFC) technology, this time in a joint development project (JDP) that will see the replacement of at least one diesel generator on-board a very large crude carrier (VLCC). DSME will select the particular type of VLCC for the study, considering the analysis of load requirements, emission control zone, stack characterization and system footprint prediction as well as simulation of process flow and arrangement of the system on the vessel and risk analysis. ABS will review the findings and evaluate safety issues arising from the arrangement of the system with respect to existing structures and equipment of the vessel in accordance with ABS Rules and Guides. Ultimately, DSME intends to seek ABS approval for the design. "SOFC systems have significant

potential for applications in maritime transport, and we are excited to be able to support this project, which will advance the industry's understanding of their possibilities. The work builds on our experience from the first collaboration. Together ABS and DSME are shaping the vessels of tomorrow," **Darren Leskoski**, Regional Vice President North Pacific of Business Development, ABS, said. **Il Guk Woo**, Vice President of Naval and Energy System Research and Development Institute, DSME, added, "This JDP will contribute to gain knowledge on safe use and accommodation of a fuel cell system with constraints of space on the ocean-going vessels, benefiting maritime sectors seeking green technology for electricity and propulsion." It's the second SOFC-focused JDP between ABS and DSME, with the first collaboration in 2019 revealing the high efficiency of a SOFC and gas turbine hybrid system due to the re-use of hot exhaust off-gas.

## BT-Belfast Harbour 5G co-op

Following what's said to be the UK's first trial of the 5G technology by both parties last year, the two have again partnered to build a 5G ecosystem that will go live across large parts of the port's 2,000-acre-big site early next year. The network will be designed to deliver ultrafast mobile connectivity, coverage, reliability, and security. For instance, **BT** and **Belfast Harbour** will work on enabling 5G remote-controlled inspection technology to reduce the need for staff to work at height. Meanwhile, the roll-out of 5G-enabled sensors to monitor air quality and other environmental factors will support Belfast Harbour and the wider city in achieving its green recovery and sustainability ambitions. "Our UK and Ireland-first 5G trial with Belfast Harbour last year was a powerful illustration of how 5G-led technology can transform the port's operations, propel the success of local businesses and drive economic growth. Today's deal with Belfast Harbour will make these benefits a reality, with the creation of a sophisticated digital ecosystem comprising of 5G as well as other emerging technologies such as Artificial Intelligence, the Internet of Things and Connected Vehicles. This will act as a springboard for Belfast Harbour to achieve its ambition to be the world's best regional smart port and an innovation hub for the region," **Paul Murnaghan**, Regional Director for BT's Enterprise division in

Northern Ireland, said. He furthered, "Ports are fundamental to the UK economy, and Belfast Harbour handles approximately two-thirds of Northern Ireland's seaborne trade. With the rising demands on transport and logistics, and the growing need for operations to be safe, secure and sustainable, we're excited to work with Belfast Harbour as its technology partner, building 5G-led innovations to unlock the productivity benefits for the port and contribute to the region's green recovery ambitions." To this **Joe O'Neill**, Chief Executive, Belfast Harbour, added, "One of Belfast Harbour's key strategic ambitions is to become a smart port that engages creatively and effectively with customers, visitors and employees. Following a successful test programme last year, we are pleased to have engaged BT to bring 5G technology into Belfast Harbour and delighted that this private network is a first for the UK and Ireland." O'Neill also underlined, "The smooth and efficient running of our port logistics network relies on the accurate tracking and integration of data gathered from multiple sources. We believe the increased capabilities of 5G technology can have a beneficial effect on our operations, helping us, for example, to capture, process and interpret data in real-time and giving insights that will speed decision-making, better manage vehicle traffic through our Harbour Estate and improve productivity across our operations and services."



## Atomic technology for greening shipping

A consortium made up of **CORE POWER, Southern Company, TerraPower** and **Orano USA** has submitted an application to the **US Department of Energy** to take part in cost-share risk reduction awards under the **Advanced Reactor Demonstration Programme** to build a prototype molten salt reactor (MSR), as a proof-of-concept for a medium-scale commercial-grade unit. According to the parties, the MSR could be used to power

the production of green sustainable fuels for smaller ships as well as to provide onboard electric power for large vessels. "The implications of the MSR for transport and industry could be transformational, as we seek to build scale-appropriate technology and broad acceptance of modern and durable liquid-fuelled atomic power to shape the future of how we deal with climate change," **Mikal Bøe**, CEO, CORE POWER, commented.

## Göteborg the first to trial the Emission-Free Construction Sites project

The initiative has been launched by the **City of Göteborg** and the trade and industry development company **Business Region Göteborg**, with the **Göteborg Port Authority (GPA)** as the first to introduce a procurement system that includes the new stipulations "[...] each of which could be suitable for different projects and which could be made stricter as the market matures. This would mean, for example, that we could demand that a certain proportion of the equipment, work process, or energy consumption should be emission-free," GPA wrote in a press release. According to Business Region Göteborg, as much as 20% of Sweden's carbon emissions from the transport sector currently derive from construction equipment & machinery. This figure is expected to rise to 50% as the development of emission-free road transport gathers momentum. The organization noted, "A project is therefore presently underway in which the City of Göteborg's construction administrations and companies have come together to develop common procurement requirements in order to accelerate the construction sector's transition to electrified and quiet machinery. The goal is for the City of Göteborg's construction sites to be completely emission-free by 2030." **Dirk Wallem**, Procurement Manager at GPA's purchasing department, commented, "Being a forerunner in this project is entirely in line with our ambition to be

the most competitive port in the world. In our endeavour to achieve this position, we strongly support the groundbreaking initiatives that are being implemented in many areas. We are proud to act as the driving force in this process even if it demands more resources from us as the client." The GPA also highlighted that the valuation model could be designed "[...] in a way that the prospective contractor is required to set out the measures they intend to take to reduce emissions for a specific contract, which could then give them quality points. The higher the assured carbon reduction, the more quality points they are awarded. The points would then be weighted to bring down their price, making it more competitive." Moreover, the port authority noted, "There is also the possibility of receiving alternative tenders from the same contractor in which they calculate construction costs in a conventional way and in an emission-free way. The emission-free alternative would be awarded quality points to calculate a price deduction, and it would allow a comparison to be made with conventional construction. Different tenders from the same contractor would give a clear indication of the true cost of emission-free construction." Wallem concluded by saying, "We are currently working with our infrastructure department to examine upcoming projects in an effort to identify one that would be suitable for inclusion in our pilot project."

## DFDS eyes constructing a green hydrogen ferry

The Danish shipping line and its partners – **ABB, Ballard Power Systems Europe, Hexagon Purus, Lloyd's Register, KNUD E. HANSEN, Ørsted**, and **Danish Ship Finance** – have applied for money from the **EU Innovation Fund** to build a ro-pax equipped with proton-exchange membrane fuel cells. The 44t-big tank fuel cell system, hydrogen for which is to be sourced from an offshore wind energy-powered electrolyser plant planned to be erected in the Greater Copenhagen, will be able to produce up to 23 MW to propel the ship. "There are no ferries of this kind in the world today, and a high level of uncertainty is therefore involved in the undertaking. However, if the project develops as projected, the ferry could be in full operation on the route, or elsewhere, as early as 2027," **DFDS** said in a press release. The ferry, bearing the working name *Europa Seaways*, will be able to

take up to 1,800 passengers on-board and offer 2,300 lane metres of cargo capacity. She'll be initially deployed across the **Oslo-Frederikshavn-Copenhagen** route. According to the parties, by running on green hydrogen *Europa Seaways* will avoid emitting 64kt CO<sub>2</sub>/year. "The largest fuel cell systems today produce only 1-5 MW, and the development of such large-scale fuel cell installations for an electric ferry is a monumental task. We can only succeed in partnership with companies that bring together some of the globe's finest expertise in the design, approval, building, financing and operation of innovative vessels," **Torben Carlsen**, CEO, DFDS, highlighted. He also said, "Together, we expect to be able to make these fuel types and technologies commercially viable, which is key to a transition of the industry to climate neutrality. This is also the ultimate goal of DFDS' climate action plan."

## Japan: commercial hydrogen supply chain by 2030

The country's **Ministry of Economy, Trade and Industry** will support the establishment of a transportation system for wholesale hydrogen imports by ship till this decade's end. To that end, **Minister Hiroshi Kajiyama** has requested a hydrogen budget of \$800m for the next fiscal year, up by one-fifth on the previous one. "Given growing momentum in actions taken by many countries toward wider use of hydrogen, we have come to share a common understanding that hydrogen is an essential energy for decarbonisation," he said. **Kawasaki Heavy Industries**, which launched the world's first liquefied

hydrogen tanker in December 2019, plans to make a shipment from Australia to Japan in early 2021, the first of such kind in history. In March 2020, the world's biggest (10 MW) renewables-powered hydrogen plant was built in the Fukushima prefecture. Most recently, a group of nine Japanese companies (**ENEOS, Iwatani, Kawasaki Heavy Industries, Kobe Steel, MITSUI & CO., Sumitomo Mitsui Financial Group, Kansai Electric Power Company, Toshiba**, and **Toyota Motor**) have partnered to set up the **Japan Hydrogen Association**, the aim of which is also to promote the development of hydrogen supply chains.

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# A patchwork of excellence, failure, and everything in between

by Ewa Kochańska

The timely construction of the European Union's Trans-European Transport Network (TEN-T) is crucial to realising its priorities of strengthening and invigorating economic growth and addressing climate change-related challenges. To measure TEN-T's progress, the European Court of Auditors (ECA) analysed eight Transport Flagship Infrastructures (TFIs) which, together with their access lines, are critical links in the Core Network Corridors. The ECA's findings show that six of the analysed TFIs will not operate at full capacity by the 2030 deadline. Consequently, the EU's transport network will not be able to deliver the expected socio-economic benefits on time. The reasons, according to ECA, are rooted in the Member States' varying degree of commitment to the projects, due to political and social changes, and financial mismanagement issues, as well as the European Commission's (COM) limited powers regarding the enforcement of the TEN-T construction. On the other hand, COM's own assessment sports a more optimistic view of TEN-T development.

**T**he 2020 special report, *EU transport infrastructures: more speed needed in megaproject implementation to deliver network effects on time* was to assess whether the oversight by the COM (or rather its Directorate-General for Mobility and Transport – DG Move) is adequate and that the EU co-funded cross-border TFIs are progressing according to the plan. More specifically, the auditors' main objectives for the report were to review if the COM ensured that Member States' processes for developing TFIs will result in operational Core TEN-T Corridors by 2030; if the management of TFIs is robust and transparent; if the implementation methods are efficient; and if the COM's oversight of EU co-funded

investments in TFIs is satisfactory. The implementation of the TEN-T projects is governed by the 2013 TEN-T Regulation, and all the Core Network projects require previous approval and commitment by each affected Member State.

## In the cross hairs

For the audit, the ECA selected eight TFIs, which include 17 underlying actions, concerning 13 Member States, road and rail infrastructure, inland waterways, combination of rail and road, and maritime and rail infrastructure. The total cost of the TFIs within the sample is 54b, with the EU co-funding at 7.5 billion to date and 3.4 billion already allocated. The audited TFIs



**Tab. 1. ECA's assessment of the state of progress of the selected TFIs**

Transport Flagship Infrastructure	Countries involved	TFI itself operational by 2030	TFI, incl. Connecting infrastructure, operating at full capacity by 2030?	TEN-T requirements fulfilled by 2030 by the TFI and connecting infrastructure?
Rail Baltica	EE, LV, LT			
Lyon-Turin	FR			
	IT			
Brenner Base Tunnel	AT			
	DE	Access line only		
	IT			
Fehmarn Belt Fixed Link	DE			
	DK			
Basque Y/GPSO	ES			
	FR			
Canal Seine Nord Europe	FR			Non-rail TFI
A1 motorway	RO			
E59 railway line	PL			

<sup>1</sup> Green – low risk; orange – medium; red – high

include Rail Baltica, the Lyon-Turin rail link, the Brenner Base Tunnel, the Fehmarn Belt Fixed Link, Basque Y and its connection with France, the Seine-Scheldt link, the A1 motorway, and the E59 railway line.

According to the review, the TFIs that are unlikely to be ready by 2030, with some sections not yet planned, are the 297km Basque Y connection with the French rail network, the Romanian A1 motorway, and the Polish E59 railway. Additionally, the Lyon-Turin link completion by 2030 is in question. On the flip side, the other four TFIs may be completed even ahead of the 2030 deadline, and here, the Basque Y high-speed rail within the Spanish territory is also set to be completed before 2030. These assessments apply to the main infrastructure, while there are also significant delays in the secondary/connecting links, “Taking into account the time needed to complete transport infrastructures, we consider it unlikely that six of the eight TFIs will be operating at full capacity by the 2030 deadline set out in the TEN-T Regulation,” report the auditors. Consequently, since the eight TFI are key links in the TEN-T network, their delay puts at risk five out of nine TEN-T Corridors.

### Too lax

The auditors recognise that different Member States have their own procedures, priorities and implementation speeds, and the cross-border TFIs are not always equally supported by all the Member States involved. The EU's transport policy is governed by Regulations, which are legally binding for the members, but the COM has no legal power at the

Member State level to enforce completion. However, the report states that the COM hasn't fully utilised the few tools that it does have at its disposal, with the exception of a handful implementing acts they have started to use to reinforce its oversight of the projects. “According to Article 56 of the TEN-T Regulation, the Commission may ask for reasons if there are significant delays in starting or completing work on the Core Network, and it must consult the Member States concerned to solve the problem causing the delay. It can also launch infringement procedures, and it may adopt implementing acts.” Those implementing acts have been used in the cases of Rail Baltica and the Seine-Scheldt link (as well as the Évora-Mérida rail between Spain and Portugal, a TFI that was not included in this study). The Article 56 procedure has not yet been used, and the auditors believe it should be. “The Commission has not yet taken any such formal action to induce the Member States to plan and implement these infrastructures more quickly. This is because it claims that it is premature to do so. It considers that the 2030 deadline is still a long way away. We do not share this optimistic view, given the time it takes to plan, build and operate such infrastructures,” report the auditors.

### Data quality (or the lack thereof)

The auditors found that the overall planning for the TFIs is lacking, and specifically, traffic estimates are overly optimistic. The forecasts are not coordinated between the Member States in four out of the eight TFIs, and the COM hasn't done its own traffic analysis, which the auditors believe heightens the likelihood of ineffectual spending. Also, “There was no cost-benefit analysis covering all of the proposed work for an overall TFI before providing EU co-funding,” said the report.

The environmental factors have also been misreported, according to the auditors. Some estimates of the negative environmental impacts of the TFIs construction phase being offset by the later improvements in traffic and shifts to less polluting transport modes have been incorrect. For example, the Lyon-Turin cross-border link, together with its access lines, was estimated by the French infrastructure management in 2012 to emit about 10mt of CO<sub>2</sub> which was supposed to be offset in 25 years after the beginning of the TFI construction. However, the auditors' experts, who used the same traffic forecasts, found that the benefits would actually not be reached until 25 years after the TFI construction enters into service. Even that prediction depends on traffic levels.

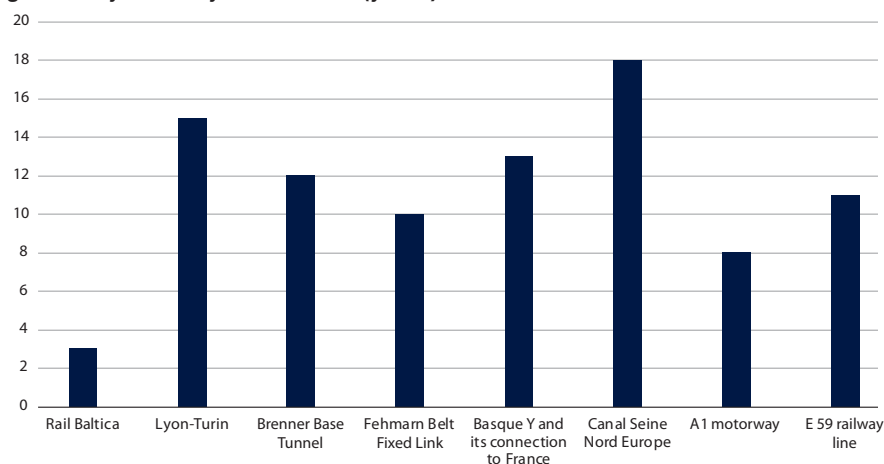
**Tab. 2. Cost increase per TFI (million euros; 2019 values)**

Transport Flagship Infrastructure	Original estimate	Latest estimate	Increase
<b>Rail Baltica</b>	4,648	7,000 <sup>1</sup>	+2,352 (+51%)
<b>Lyon-Turin</b>	5,203	9,630	+4,427 (+85%)
<b>Brenner Base Tunnel</b>	5,972	8,492	+2,520 (+42%)
<b>Fehmarn Belt Fixed Link</b>	5,016	7,711	+2,695 (+54%)
<b>Basque Y and its connections with France</b>	4,675	6,500	+1,825 (+39%)
<b>Seine-Scheldt link<sup>2</sup></b>	1,662	4,969	+3,307 (+199%)
<b>A1 motorway</b>	7,244	7,324	+80 (+1%)
<b>E59 railway line</b>	2,113	2,160	+48 (+2%)
<b>Total</b>			<b>17,253 (+47%)</b>

<sup>1</sup> Costs include the provisions for risk of future cost increase as identified by the auditors. The official costs are stated to be €5.8b so far

<sup>2</sup> Figures refer to the main component of the Seine-Scheldt link (the Canal Seine Nord Europe) only

**Fig. 1. Delay for entry into service (years)**



### All aboard?

Another problem poses limited inclusion of stakeholders in a decision-making process. However, the auditors have noted a few instances where input from interested parties was welcomed and led to positive outcomes – such as in the Seine-Scheldt link, the Fehmarn Belt Fixed Link, and the Italian part of the Brenner Base Tunnel. Effective communication and promotion methods translate into local support for the TFIs; in the absence of that, problems along with delays are likely to arise. For example, the Lyon-Turin cross border rail link has been plagued by over 30 court cases from citizens and associations concerned about the environmental consequences of the construction. The COM has not been visible enough in these types of situations, and the local entities maintain that the COM's presence at stakeholder meetings would be helpful in promoting the value of the TFIs. The auditors noted an example of such involvement with Rail Baltica “where the Commission and the European Coordinator participated in public events related to the project (such as the Rail Baltica Global Forum), engaging with local and international stakeholders, being active in

the media and being present at meetings of the Rail Baltica Rail Supervisory Board.” Such involvement helps cut through some of the false assumptions locals may have about the side-effects of the European transport network.

### Costs go up, deadlines down (the drain)

The inefficiency in implementation of the TFIs is another issue, with an average time of the construction being 15 years. The auditors suggest that ‘competence centres’ within the COM are needed for an improved overview of the projects which would help steer project promoters throughout the years of construction to achieve maximum efficiency in terms of EU co-funding. The competence centres could advise in the matters of, for example, the number of stations (for passengers); the number and location of terminals; interoperability requirements; loading factors (for freight); and rules for tolling. Also, unmonitored fluctuations in design and scope of the TFIs have caused a 47% cost increase – that's 17.3b, and all eight TFIs had seen cost increases since the initial estimates were provided. The largest increase in costs out of the eight was on the Canal Seine Nord Europe, the Seine-Scheldt link, which increased by 199% or 3.3b.

This is in addition to high levels of bureaucracy which pose another problem for the timely completion of the TFIs. For example, in Romania, for a motorway of 582 km, each 7.0 km needs a new building permit and every 26 km – an environmental authorisation. Conversely, the auditors cited a good example of cutting through the bureaucracy in Italy, where its Inter-ministerial Committee for Economic Planning (CIPE) became a ‘one-stop-shop’ for the TFI promoters, also providing support if financing for infrastructure comes from multiple sources.

The main repercussions of the above problems are of course delays, which are on average 11 years in the studied TFI sample. The longest delays are in the Canal Seine Nord Europe, part of the Seine-Scheldt TFI – 18 years, the Lyon-Turin connection (15), the Basque Y (13), and the Brenner Base Tunnel (12). If the completion dates for the connecting infrastructure to rail TFIs were to be taken into account, the delays would be even longer.

### Party politics, oversight limits, and faulty analytics

The local management of the TFIs blames the delays mostly on political processes afflicted with the always evolving party politics, elections, and national priorities. The bureaucratic procedures

**Tab. 3. TEN-T expenditure in 2016-17 (million euros)**

	Core Network	Comprehensive Network	Total
<b>Railways (incl. ERTMS)</b>	28,632	7,546	<b>36,178</b>
<b>Roads (incl. Intelligent transport systems)</b>	16,644	14,410	<b>31,054</b>
<b>Inland waterways (incl. RIS)</b>	2,374	n/a	<b>2,374</b>
<b>Seaports (incl. VTMS<sup>1</sup>)</b>	3,876	870	<b>4,746</b>
<b>Airports (incl. ATM<sup>2</sup>)</b>	5,041	790	<b>5,831</b>
<b>Total</b>	<b>56,657</b>	<b>23,616</b>	<b>80,183</b>

<sup>1</sup> Vessel Traffic Monitoring & Information Systems <sup>2</sup> Air Traffic Management

related to stakeholder involvement and permit issuing are also at fault. The auditors are concerned with the human costs of these delays, which can be significant. For example, in Romania, the A1 motorway construction delays force motorists to keep using two-lane roads around it. That causes traffic jams and bottlenecks resulting in poor road safety and accidents. “We noted that the number of accidents and casualties on these stretches is much higher than Romania’s average, and 92 of them involved a frontal collision,” says the report. The delays often lead to underlying actions and loss of EU funds. For example, under the Connecting Europe Facility (CEF), if action is not completed in the allotted time set out in the grant agreement, the funds can be withdrawn. This has already happened pertaining to 17 actions in the studied sample, a loss of 1.4b.

The COM’s oversight is “distant” at best, relying on the European Coordinators, who don’t have the official power to enforce the building of the network. There have been instances where the relevant Managing Authorities “suboptimally” used the EU funds, and more effective oversight would have saved millions of euros. The COM is now seeking to expand the role of the Coordinators, proposing that “future applications for EU co-funding be consistent with the corridor work plan and implementing acts and take into account the opinion of the European Coordinator; the Coordinators be allowed to closely follow the permit granting procedure for cross-border projects of common interest and be able to ask the competent authority to report regularly on progress achieved.”

Additionally, there is no mechanism to measure results and degree of success of the completed works in the TFIs, even though some very positive outcomes have already materialised. For example, on the Seine-Scheldt link, the Lys river has already been widened and deepened producing some positive results in Flanders such as a boom in construction and real estate as well as urban regeneration in Kortrijk and Harelbeke. “There is no systematic ex post evaluation of individual TFIs as a whole, even though they are multi-billion-euro investments. This makes it difficult to

learn from past problems,” says the report.

Further, the Commission doesn’t conduct an adequate investment analysis to independently assess potential passenger and cargo transport needs before co-funding projects. The Rail Baltic and the Fehmarn Belt Fixed Link TFIs may serve as examples. According to ECA’s report, the mixed high-speed rail even up to Warsaw may not be economically sustainable since the population living within the 60-minute catchment area will only go up to about 8.3m, short of the 9.0m passengers per year benchmark that makes the Rail Baltica investment economically sustainable. In the Fehmarn Belt project, the part of the rail passing through there will only carry about 1.0m passengers annually in each direction which, again, makes it economically unfeasible. The COM also didn’t take under consideration the high cost of the German access line between Copenhagen and Hamburg estimated to be up to 46m per km.

#### Re-examination and redirection

The COM has started to use implementing decisions to strengthen their oversight of the progress and completion of the TEN-T Core Corridors. These decisions are reached in agreement with the Member States and have so far been utilised with Rail Baltica, the Seine-Scheldt link, and the Évora-Mérida rail connection. This is a positive development, according to the auditors, and should be used as a tool for future investments. “However, these decisions do not yet include clear rules on the responsibility of all parties, including the Commission; they also have weaknesses in terms of tackling all critical issues, do not consider the anticipated results, and do not require an ex post evaluation in order to learn from past experiences,” warn the auditors. To improve the financial oversight of EU co-funding of TFIs, the ECA recommends for the COM to: amend and utilise existing instruments to implement better long-term planning; demand higher quality analysis before issuing EU co-funding for mega projects; enact procedures to ensure stakeholder involvement in decision-making; improve the COM’s management methods related to EU co-funding of

mega projects; improve the implementing decision tool by applying it to each cross-border TFI and bolster the role of European Coordinators.

The auditors emphasised that the magnitude and cross-border nature of European transport projects, the technical and financial planning, as well as the implementation of the TFIs makes the overall execution exceptionally challenging. With that in mind, however, the COM ought to consider taking more of a hands-on approach in order to reach the objectives of the TEN-T network in a reasonable time frame.

#### Satisfied, but...

In the newest available evaluation of developing the TEN-T, *Progress report on the implementation of the TEN-T Network in 2016 and 2017*, the COM officials found significant progress and seemed to be satisfied with the technical compliance and financial investment mechanisms. They did note, however, some flaws in the TEN-T Regulation compliance specifications.

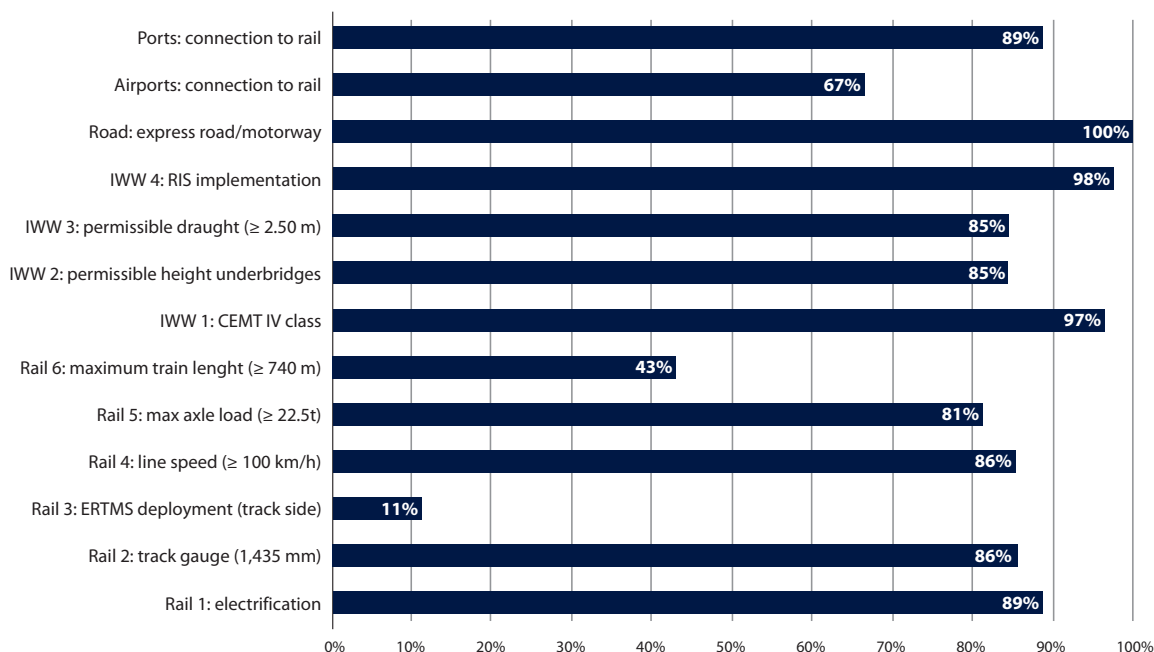
This report is certainly much more optimistic than ECA’s, finding that the implementation of TEN-T at the level of the Core Network Corridors is 81%-100% for ten out of 13 available indicators, and for the other three, compliance extends from 11%-67%. The report does recognize that the improved compliance rates found in 2017 compared to previous years may not always demonstrate the reality of the actual capability and functionality of the transport network. This is because the present definition of the compliance parameters is not established and specified enough to measure all the indicators sufficiently. Therefore, the report states that the next TEN-T Regulation revision should include an update to these standards.

#### Compliance rates

Starting with railways, the COM found rail electrification compliance at a high 89%, rail track gauge at a high 86%, except the Iberian and Irish gauge as well as the broad gauge in the Baltic States and Finland. The (track-side) deployment of the European Railway Traffic Management System (ERTMS) was at a low 11% compliance, which was much lower than



**Fig. 2. Compliance in % for the TEN-T Core Network**



expected, posing the biggest challenge regarding TEN-T parameters' compliance. Freight line speed compliance was at a high 86%, with outages mainly present in the Baltic States, Poland, and Bulgaria. Freight axle load compliance versus the parameter of 22.5 or more tonnes per axle was at a high 81%, with shortcomings primarily found in Romania, Hungary, Poland, and Ireland. For freight train length, the compliance versus the parameter of 740 m or longer sidings for trains was at 43% on average.

Roads, for which the main indicator is the total kilometres compliant with motorways/expressways road types, were 100% compliant according to the report.

The compliance of maritime ports' connection to rail was at 89%, although there still might have been limitations since the TEN-T standard only concerns itself with the rail connection without scrutinising the quality of that connection.

Regarding inland waterways compliance, the implementation of River Information Services (RIS) was at a very high 98%. Compliance versus the parameter of Classification of European Inland Waterways class IV or higher was also at a very high 97%. Compliance of a minimum of 5.25 m of permissible height under bridges was at a high 85%. Compliance of a minimum of 2.5 m of permissible draught was also at a high 85%.

Airports, which according to the TEN-T Regulation must be connected to railways and roads within the network by 2050 and be integrated into the high-speed rail network if possible, were at a 67% compliance rate.

## Financial investments

In 2016-17, the total investment in the TEN-T network was above 91b. The contributions to that figure included 11.5b from European Investment Bank loans, 9.8b co-funded by the European Structural and Investment Funds, and 3.1b by CEF. When the EU is involved, the rate ranges between 20% and 85%. Out of the overall investments by the Member States in the amount of 80b, including the EU backing part wherever relevant, about 71% had been invested in the Core Network, with most funds directed to TEN-T railways.

## Just keep pedallin'

The COM concluded that although "significant progress" has been made in the 2016-17 period when it comes to technical compliance and financial investments, at least some of the positive developments might be unrealistic due to the shortcomings of the TEN-T Regulation compliance parameters. However, in stark difference to the ECA's report, the COM touts the work of the European Coordinators who "do their utmost efforts in ensuring a sound, mature and visible TEN-T project pipeline." The COM is also expecting "further progress" in the development of the transport network ahead of the 2030 and 2050 deadlines, with bolstered efficiency, better modal integration and digitalisation, clean transport, and improved quality and resilience of infrastructure.

So, the TEN-T is akin to the EU itself. "Europe is like a bicycle: it must keep moving forward or it will fall over," one can often hear across Brussels corridors. Faster or slower, taking turns, wiggling, you name it – but never backwards..



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