Sustainability meets prosperity

Ports display the economic growth engines in the economy of countries. Increased activity requires larger ports, capable of handling a larger volume of traffic representing buoyant import-export balances. However, the epitome of ports also presents the consumables of natural resources, represented by the goods moving over the quay side. It could be argued that ports have an obligation to be the pacesetter for sustainable development, given that they are both instrumental and a longstanding economic driver.

Marsh to modern urbanity

On the West coast of Denmark lies Port Esbjerg, which was inaugurated in 1868 and therefore is a young generation port compared to other major European ports, which date back to the middle ages. Ports have evolved over centuries and must be considered in the context of the progression of the industries they support, whilst also recognizing that a port, its industry and society are intertwined.

Development has been progressive at Port Esbjerg. It has created a resource base and infrastructure, which support change when compared to other ports. The multifaceted types of cargo and operations conducted in here portray a myriad of markets allowing for resilience. Even so the question must be asked: are the vicinity's actors, stakeholders or implementors facilitating this phenomenon?

From the outset Port Esbjerg has followed a linear path from exporting cattle to fisheries and the present energy mix, supporting the oil, gas and renewable markets. A plausible explanation of the change may be found in the neighborhood, but this does not dictate the ability to transform, adapt and cater for the differentiation needed, for the evolutionary economics portrayed.

Hinterland hub to integral player

According to Observatory of Economic Complexity, Denmark is the 38th largest export economy in the world and the 19th most complex, measured by the economic complex index. The top exports are pig meat, refined petroleum and medicaments, whereas the top imports are cars and crude petroleum. This data draw parallels to Port Esbjerg and the variance of cargoes, but further analysis of the activities displays a coevolution, with integral players in the main areas of the energy mix, modular traffic and circular economy.

Port Esbjerg supports the renewable industry, where the largest components to offshore wind projects are pre-assembled and loaded. The maintenance and operations are also directed from here, for numerous windfarms in the area. In addition, a significant number of onshore wind turbine components are shipped around the

world from Port Esbjerg.

The Port handles around 500,000 tons of such major components every year. Special equipment is required to handle these nacelles, blades and tower sections, with big dimension and heavy loads. The number of self-propelled module transporters to move nacelles, with a weight of more than 400 tons, and a large fleet of reach stackers to move blades and tower sections, are similarly present in Port Esbjerg. This includes the world's strongest reach stacker, which is helped by Scandinavia's largest fleet of mobile harbor cranes. These are capable of lifting up to 448 tons. A true project port is often measured on its capability to handle high-and-heavy goods, and Port Esbjerg is renowned for the infrastructures, facilities and services of the multiple companies operating in this spatial cluster.

Furthermore, the Danish oil and gas fields are supplied from this unique location. Additionally, there are areas for all the supplementary businesses, such as drilling rig repairs, waste recycling, equipment supplies and stimulation fluid, used in the complex reservoirs in the North Sea.

Finally, the port is also the largest for coal import into Denmark, which is facing imminent change due to the green transition ongoing in Denmark, thus depicting the change towards renewable energy.

Renewable energy

The renewable industry, exemplified by the wind industry, is forecast to surge in the future to unpreceded levels of activity. The offshore wind industry is growing from the current 22 gigawatts installed to 100 gigawatts in 2030. In perspective, it can be said that the offshore wind industry has to install five times more capacity in the next decade compared to what has been achieved in the last two decades. Port Esbjerg is located in proximity to many of these projected new wind farms.

This aligns well with the track record of the port and the many companies in Esbjerg, which have supported more than half of the already installed offshore wind farms in the North Sea. Something to be contemplated is whether the future will resemble the past when offshore wind ports are discussed. The growth in size of the wind turbine generators is evident and clearly visible to everyone involved in the offshore wind industry, but the imminent future may depict nacelles weighing up to 1000 tons, blades more than 100 meters in length and tower sections 8 meters in diameter. This all requires different handling equipment from what is available today and the load-on/load-off practice used today may be replaced by the efficient roll-on/roll-off vessels already used by some original equipment manufacturers.

This shows that the offshore wind industry has tremendous potential for market growth and constant innovation, and has been able to create a variety of ways to lower the leverized cost of energy. This represents a coevolution that generates more and more demand and projects. This is in many cases the cheapest form of energy, but more important it helps lowering the carbon footprint, as laid out in climate agreements. To support this the ports supporting the construction of these offshore wind farms need to be developed in a vastly different way compared to conventional operations.

Offshore wind port

All offshore wind ports need: large areas available on flexible lease terms, heavy lift quays and seabed conditions, which can accommodate big enough jack-up turbine installation vessels. The speed at which the wind turbine generators are erected offshore, requires all the major components to be laid out at the port, whilst towers need to be pre-assembled simultaneously.

This requires hundreds of thousands of square meters for each wind farm project and

it is important that the original equipment manufacturer can redeliver to these areas, once the project is completed. In context to port operations, large areas on short term lease used for slow moving cargo is not necessarily the optimum, but this is the reality of offshore wind.

Consideration is needed on how the port infrastructure is developed. In Port Esbjerg, the circular economy plays a vital role in port development. More than a million square meters have been developed using the sand dredged from the channel. Port Esbjerg covers over 4.5 million square meters and an additional port expansion is planned to start next year.

This vast area is also the home to more than 200 companies many of which have transited into offshore wind. Some specialize in mobilizing and demobilizing the more than 100 turbine installation vessels which call the port each year, while others pre-assemble towers. In addition, several stevedoring companies and 162 competent dockers handle all the components. Likewise, operations and maintenance are conducted from the port and service operation vessels, plus crew transfer vessels call in at Port Esbjerg more than 2000 times each year.

Finally, there is also ongoing manufacturing and commissioning at Port Esbjerg, which equally illustrate the complexity of offshore wind ports. The development of the methodologies, capabilities and required competencies continues. Port Esbjerg is a spatial cluster, with many activities related to the complete supply chain of the offshore wind industry, which provides close to 5000 jobs to the surrounding city.

The green bid of port and city

The job creation of the renewable industry and the port activity is pivotal in understanding Port Esbjerg and the Energy Metropolis of Esbjerg. For more than 150 years the sea and the port have provided for the inhabitants of the city and it is a proud legacy that must be carried into the future.

This future will be green with the number of offshore wind projects forecast in the North Sea. The port is undergoing an electrification process that will allow vessels to operate on certified green shore power while in port.

The future will therefore see a port that delivers even larger, flexible areas for lease, which caters for greater vessels, whilst the companies operating within the port develop their capabilities and businesses to handle the future, heavier components in the ever-changing landscape of offshore wind.

The skyline of Port Esbjerg, which is visible from most of the city, will change, even though the noise and emissions from the ships may be a thing of the past. The City and the Port of Esbjerg will once again exemplify themselves with the resilience and ability to change in the bid for a greener future.

www.portesbjerg.dk