



## Entrepreneurial Perspectives

### The Characteristics of the North Sea and its Importance for Maritime Transport

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**Abstract:** The North Sea is one of the largest seas in Europe in terms of maritime traffic. It is positioned between Norway, England, France, Germany and Denmark, a position that positively favours the maritime sector and the energy sector. Also, the North Sea area is a rich and important natural area for fishing. Due to the exchange of water with the Atlantic Ocean and the Baltic Sea, this sea is constantly changing and developing a complex ecosystem, which scientists are constantly studying to understand. The energetic potential places the North Sea on the first position in the European seas, and because of this in this area they are found in most wind turbines, in proportion of 70%. In this paper, a study was performed on the characteristics of the North Sea and maritime traffic in this area, as well as the exploitation potential both in terms of oil and wind turbines. The wind and wave conditions for the last twenty years, based on ERA5 data, from the Copernicus Climate Change Service (C3S) were also studied.

**Keywords:** North Sea; maritime traffic; wind turbines; climate changes

**JEL Classification:**

#### 1. Introduction

The maritime industry is constantly evolving and contributing to the economic improvement of Europe. Shipping in Europe has been a catalyst for economic development and prosperity throughout its history (Dedecca et al., 2009; Chiroasca & Rusu, 2020; Chiroasca & Rusu, 2020).

This form of transport is very efficient in terms of environmental impact, because maritime transport produces less carbon dioxide compared to other methods of transport, and it is less expensive.

Climate changes affecting sea temperatures, as well as their acidification, indicate

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that there are negative systemic changes in European marine regions that further reduce the resilience of marine ecosystems. Therefore, measures and solutions are needed to achieve clean, healthy and productive seas.

One of the main European seas, the North Sea, with an area of approximately 570 000 km<sup>2</sup>, has a special importance due to the border of seven regions (Norway, Germany, Denmark, Netherlands, Belgium, France and United Kingdom), as well as connectivity with the Atlantic Ocean and the Baltic Sea (Huthnance, 1991).

The North Sea also has a strong influence on European history, in terms of accessibility that has favoured trade due to the long coast and the rivers that flow into it. Thus, without the exchange of goods and services through the North Sea, the cultural development of this region Europe after the Middle Ages could have been very late.

In recent years, renewable marine energy is one of the most popular research topics, and the North Sea is the right marine environment with a great potential in terms of both wind energy and wave energy (Rusu & Rusu, 2021), due to its position and characteristics.

The aim of this paper is to carry out an analysis of the North Sea in terms of economic importance, maritime transport in this area, as well as a study on the characteristics of the North Sea and the evolution of wind and wave climate in the last twenty years.

## **2. Economic Impact**

The North Sea is of economic importance in several areas, such as renewable energy, oil, gas, mineral resources, transportation, but also fisheries.

In terms of renewable energy, wind farms have been established in the North Sea due to its huge energy potential since 2002, and other wind farms have continued to be installed since then.

Also due to the success of obtaining electricity through wind farms, but also due to the need to have as many green energy sources as possible, the means of obtaining energy from the energy of waves and tides have been studied.

With the exception of a number of disadvantages, such as the construction and maintenance costs of these energy sources and the impact on the environment, wind farms are constantly evolving and supplemented on a daily basis (Naveed Akhtar et al., 2021, Accelerating deployment of offshore wind energy alter wind climate and reduce future power generation potential).

The fishing activity is quite developed in the North Sea, which due to the constant mixing of the waters in the sea basin offers a development of a wide range of types

of fish, such as cod, herring, and many others. Unfortunately, overfishing could lead to a massive decline in fish stocks and even the expansion of some species, but expanding offshore wind farms can also be detrimental (Schupp et al., 2021).

One of the biggest economic impacts on Europe, and even globally, for the North Sea area, is the oil and gas fields. In addition, the North Sea is rich in mineral resources.

Being a region so rich in deposits and economically important, maritime traffic, both commercial and freight, is quite developed.

### 3. Maritime Traffic

Among the European seas, the North Sea has a special significance for maritime transport, and the waterways in this area are some of the most exploited, as can be seen in Figure 1. Also in the North Sea area we find the busiest ports in Europe, in the case of freight transport, namely Rotterdam and Antwerp, Hamburg.

The types of vessels found in the North Sea are diverse and we find vessels from sports and pleasure boats, to fishing vessels, merchant ships, to offshore industry vessels and offshore platforms.

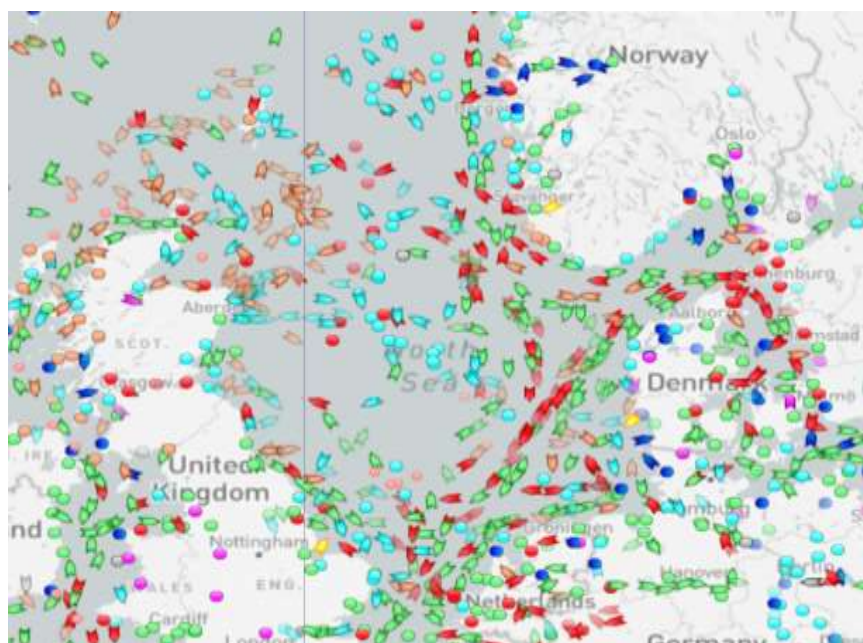


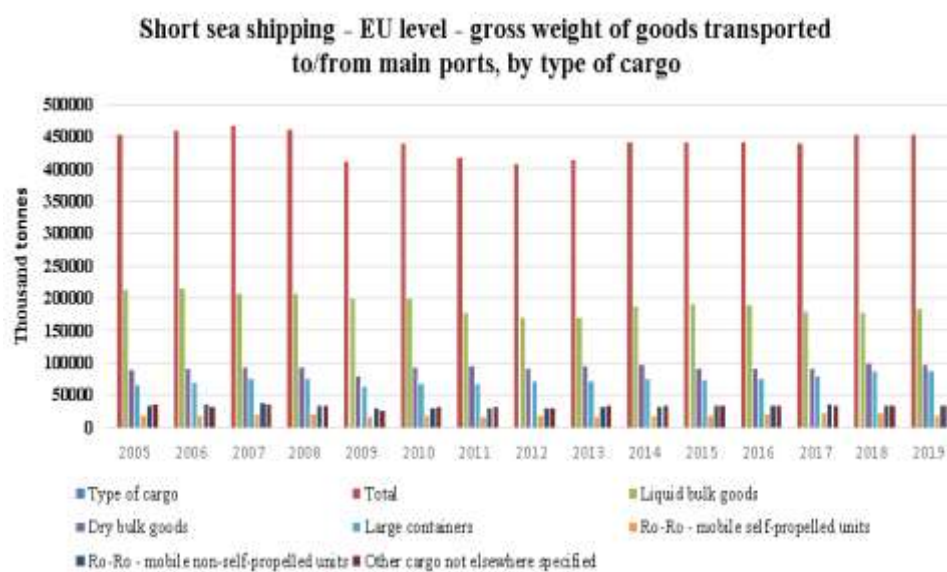
Figure 1. Maritime Traffic along the North Sea (Map data@2020 GeoBasis-DE/BKG (@2019), <https://www.marinetraffic.com>)

Based on the information generated by the Eurostat Transport Database (Eurostat transport database: <https://ec.europa.eu/eurostat/data/database>), the Statistical Office of the European Union, a diagram of the quantities of goods transported in the North Sea region during the period 2005-2019, total goods and types of goods is presented in Figure 2.

In total, during the fifteen years analyzed, 6,596,556 thousand tons of total cargos transported to/from main ports were registered, and the most frequent goods transported were liquid bulk goods by 43%, followed by dry bulk goods in 21% and large containers 17%.

As we can see, the distribution of goods transported over the years has the same pattern, from year to year, which means that this industry maintains its position in the economic market.

The most important ports in the North Sea, which are of both European and international importance, are Rotterdam, Antwerp, Brussels, Hamburg and Amsterdam.



**Figure 2. Short Sea Shipping – Gross Weight of Goods Transported to/ from Main Ports, Divided by Type of Cargo in the North Sea Area**

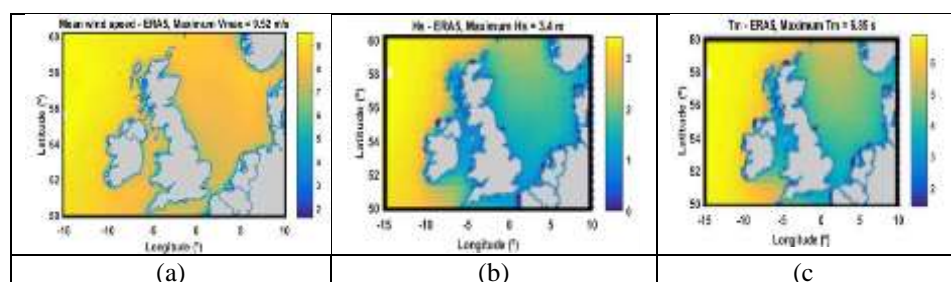
#### 4. Climate Analysis

The climate in the North Sea is warm and temperate, with significant rainfall throughout the year, and the average tidal ranges are between four and six meters along the southern coasts, while in the northern and eastern regions they are smaller.

The study of climate conditions in the North Sea for wind and waves for the period 2001-2020 was conducted using data extracted from the ERA5 database (ECMWF Reanalysis v5 (ERA5): <https://www.ecmwf.int/en/forecasts/dataset/ecmwf-reanalysis-v5>), a new generation of global ECMWF reanalysis for climate and weather in recent decades, provided by the Copernicus Climate Change Service (C3S).

As we can see in Figure 3, in the North Sea there are high values of wind, and the maximum average value over the entire period studied is 9.52 meters/seconds.

Throughout the studied period, the maximum average value for the height of the waves was 3.01 meters, and the period was 6.46 seconds. Depending on the season, the maximum mean regarding the wave heights in this area, for the period 2001-2020 was 4.16 meters during the winter season, and the lowest average value is 1.83 meters during the summer.



**Figure 3. North Sea: (a) Mean wind speed; (b) Mean wave heights and (c) mean wave periods for the 2001 -2020 period**

#### 5. Conclusion

Aspects of economic importance for the North Sea area are oil and gas reserves, fishing, maritime freight and passenger transport and renewable energy sources.

Short sea shipping accounts for 40% of intra-European maritime trade, and the North Sea is a major pillar of Europe but also of international importance due to its ports, including the top two largest ports in the world.

The current trend in European countries is to develop a renewable energy strategy, and the North Sea is ahead of all European countries in terms of offshore wind platforms.

But the climate of the North Sea is a good one both for wind platforms and for obtaining energy from waves.

Therefore, the North Sea is and will remain one of the busiest routes in Europe and not only in terms of maritime transport, renewable energy and oil and gas extraction.

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\*\*\* *Eurostat transport database*. <https://ec.europa.eu/eurostat/data/database>, accessed November 2021

\*\*\* *ECMWF Reanalysis v5 (ERA5)*. <https://www.ecmwf.int/en/forecasts/dataset/ecmwf-reanalysis-v5> (accessed on 12 July 2021).