

Expansion of Port Infrastructures

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1. INTRODUCTION

Ports on the Danish North Sea coast were built over the last 150 years to serve as basis for fishery and transport of goods to and from UK and Norway. These ports were all constructed on sandy shores in a dynamic morphological setting. During the recent past the ports have been challenged by new demands for increased activity in other areas than the traditional fishery and related industries. The exploitation of oil and gas resources in the North Sea and development of offshore wind require good and safe port infrastructures. Also the increase in handling other commodities and international trade has added to the demand for expansion of the port infrastructures.

The present paper presents the challenges related to expansion of these ports which were originally planned and constructed for less demanding purposes.

2. THE PORTS AND THEIR SETTINGS

Port of Esbjerg

The port is located in the shallow northern part of the Wadden Sea, an area dominated by tidal flats and off-lying sandy barrier along the the coasts of Denmark, Germany and The Netherlands. The approach from the North Sea is through a 10 Nm long dredged channel, presently dredged to a depth of 10.3 m.

The port area developed in the shallow coastal zone taking advantage of the proximity of the deep tidal channels. Strong environmental restrictions have to be observed as the region is a NATURA 2000 area and since 2014 a UNESCO World Heritage site.



Fig 1a: Location of Port of Esbjerg with access channel



Fig 1b: Port of Esbjerg in 2010

The port was originally conceived as a gateway for transport of agricultural products to UK and during the 20th century it developed to become the major Danish fishery port. After construction of other fishing ports on the coast and particularly after exploitation of oil and gas resources started in the 80ies, the fishery activities gradually reduced and the port became the prime Danish offshore supply base. In recent years this transition has continued with services to the growing offshore wind industry.

Port of Hirtshals

The port is protected by breakwaters at a point on the open coast. The strong littoral drift from south is a major factor in securing navigational access to the port. The space for port facilities is restricted by the bluff created during the last glacial period. The available space between the bluff and the coastline is shared between the fishing related activities and the facilities for the ferry links to other countries. The ferry traffic is of increasing importance with larger ferries requiring deeper and wider access to the port.

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Fig 2a: Port of Hirtshals on northwestern corner of Denmark



Fig 2b: Hirtshals port entrance

Port of Thyborøn

The port is located behind the southern spit at Thyborøn inlet. The spit is low, sandy and has been the object of intense coastal protection. The inlet needs frequent dredging to provide safe access for fishing vessels. The port is a center for fisheries for human consumption and a number of fishing industries and supporting services.



Fig 3a: Thyborøn inlet on the Danish North Sea coast



Fig 3b: Port of Thyborøn viewed from north

3. CHALLENGES FOR FUTURE PORT INFRASTRUCTURES

The ports described above face a number of development challenges due to societal changes and changes in the sectors they are to serve in the future.

- Fishing is concentrated on fewer and larger vessels which need efficient handling in the ports.
- Increased offshore energy related activities (oil and gas, renewables).
- International trade increases with demand for larger ferries and container operations.
- Expanding cruise industry.
- Separation of different port activities.
- Improvements of transport corridors to the hinterland.

The key issue for the ports is to create more space for the operations. This includes i.a.. dredging and reclamation, new and deeper quays and improved navigational access. All of these developments shall respect actual environmental legislation.



Fig 4: Expansion of Port of Esbjerg