



INTRODUCTION

In an international context where the vast majority of international trade is carried by sea, connectivity constitutes an essential element for companies involved in importing and exporting.

Thus, the fragmentation of global supply chains exerts pressure on ports to achieve greater integration of international transport networks with the aim of remaining competitive and creating value for companies.

Faced with this challenge, port connectivity has emerged as one of the principal factors of port competitiveness. The importance of this variable can be seen in how port managers have been making great efforts in the design and implementation of policies that improve connectivity aimed at, among other things, incentivising the establishment or regular maritime services and shipping companies. With this mission in mind, recent decades have seen ports embark on a process of transformation to adapt to the dynamic environment in which they operate and meet the needs of shipping companies. Measures like investment in port infrastructure and digitalisation have been implemented to allow larger vessels to stop over and to improve the efficiency of operations.

As a result of this process, ports offer companies a greater range of maritime services to facilitate their access to international markets. It is important to point out that the availability of maritime services at a port is a key element for companies in their decision to choose a port.

So, given the importance of this variable to port competitiveness, it is important to develop a tool that allows us to systemically measure and compare port connectivity. With this in mind, the Valenciaport Foundation and the Port Authority of Valencia have jointly developed the Port Connectivity Index (or ICP, as per the Spanish). This Index measures the connectivity of Short Sea Shipping (SSS) traffic for containerised goods from Spanish ports.

The index is particularly useful to port authorities in providing a tool that allows for self-assessment of current activity and comparison with competitors. It is also useful for companies by providing relevant information on how ports avail of greater connectivity for trade operations. Finally, shipping companies will have access to information on which ports are offering greater connectivity that can be useful in their decision in relation to stopovers.

LINEPORT DATABASE

The LinePort database, prepared by the Valenciaport Foundation, provides data on the maritime transport offering that are necessary for the development of the ICP.

This database provides standardised and detailed information on SSS service offered from Spanish ports. The wealth of data available allows us not only to enumerate the existing lines at each port under study, but it complements that information with data on the characteristics of regular lines (types of service, frequency, rotation, transit time, number of vessels employed on service, etc.) and the characteristics of the vessels (speed, GT, maximum transport capacity for TEUs/platforms, age, consumption, engine power, etc.)



Data are obtained in minute detail, consulting the information provided by different sources including the ports themselves, shipping agents, shipping companies, specialised press and the Automatic Identification System. After compiling the data, LinePort completes the task of validating and standardising the information from the different agents involved (shipping companies, shipping agents, ports and specialised press).

In terms of geographic coverage, adhering to the definition of the European Commission, the database encompasses any maritime transport service between Member States of the European Union and between Member States and coastal third countries on the Adriatic, Baltic, Aegean, Mediterranean, Black and the North Seas (passenger, bulk, container, roro, vehicles, etc.) and the type of service (regular line service, feeder, interoceanic).

LinePort is an important tool for the analysis of SSS in Spain, providing standardised information quickly on SSS Services offered from Spanish ports, which is considered an essential aspect of the transport of goods.

ICP METHODOLOGY

The ICP arose from an Index developed by the United Nations Conference on Trade and Development (UNCTAD), which publishes a connectivity index called the Liner Shipping Connectivity Index (LSCI). The purpose of that index is to measure the connectivity of countries, and is thus calculated on an aggregate basis for each country. The variables used for the calculation of the Index, which exclusively measure connectivity for container traffic, are the number of shipping companies operating at ports; the number of regular services offered at said ports; the number of vessels they use in services to and from the ports of each country; average capacity in TEUS offered by the ships operating at said ports; and the maximum size of the vessels that enter/leave the ports located in a Member State in TEUs.

Therefore, taking the methodology proposed by the UNCTAD for the connectivity index by country, the Valenciaport Foundation has calculated an index focussed on the connectivity of Spanish ports (ICP). The Index proposed by the Valenciaport Foundation measures the connectivity of Spanish ports considering exclusively their regular SSS services, using the definition of the European Shortsea Network.

That is regular services that connect Spanish ports with the ports in EU Member States or those located in non-European countries with a coastline on the seas surrounding Europe.

As a contribution in relation to the index proposed by UNCTAD, it was considered appropriate for the ICP to incorporate two key variables to define the competitiveness of a port; the frequency of maritime services and the number of connection destinations connecting Spanish ports. After incorporating these variables, the index shall take the following form:

$$ICP_{j,i} = \left(\frac{S_j}{Max(N_{j...n})} + \frac{L_j}{Max(L_{j...n})} + \frac{C_j}{Max(C_{j...n})} + \frac{V_j}{Max(B_{j...n})} + \frac{VS_j}{Max(TB_{j...n})} + \frac{F_j}{Max(F_{j...n})} + \frac{DP_j}{Max(PD_{j...n})} \right) / X$$

Where:

ICP= Port Connectivity Index.

j= port subject to study.



i= year ICP calculated for.

n= total number of ports include in the ICP.

S (Shipping companies): sum of the shipping lines offering services in each port.

L (LINES): sum of SSS line offered during year analysed.

C (Capacity): sum of DWT of vessels that offer services at each port.

V (Vessels): total number of vessels per line that are used in the rotation.

VS (Vessel size): maximum size of vessel operating at the port in question, expressed in DWT.

F (Frequency): number of departures per week offered by each port

DP (Destination ports): number of foreign destinations ports connected by Spanish port.

X: total number of ports included in the ICP.

As a final result the ICP generates a value of 100 for the port with the highest average index in the first half of 2016. For the upcoming semesters, the maximum value obtained for each variable in the first half of 2016. This way, in the following semesters the evolution of connectivity at each Spanish port can be analysed, assessing whether the policies implements to improve connectivity are effective.

RESULTS

The results obtained in the calculation of the Port Connectivity Index (ICP) for the second semester of 2019 show some significant changes with respect to the previous semesters.

PORT OF ORIGIN	ICP 1st Half 2016	ICP 2nd Half 2016	ICP 1st Half 2017	ICP 2nd Half 2017	ICP 1st Half 2018	ICP 2nd Half 2018	ICP 1st Half 2019	ICP 2nd Half 2019
VALENCIAPORT	100.00.	95.47	98.89	102.19	102.12	97.31	100.76	102.47
ALGECIRAS	75.26	78.44	87.64	88.75	85.86	83.85	92.14	93.20
BARCELONA	76.91.	73.2	84.03	84.94	89.42	83.57	84.88	83.99
CASTELLÓN	26.63	24.1	31.88	28.37	29.55	29.45	31.42	31.88
LAS PALMAS DE GRAN CANARIA	26.42	26.89	26.94	27.98	29.54	29.55	27.75	28.80
BILBAO	23.67	16.86	18.44	18.75	20.15	18.96	18.99	18.94
VIGO	18.74	16.7.	15.78	18.43	19.65	20.48	20.36	17.44
MALAGA	-	-	-	2.04	8.22	17.81	15.23	15.15
GIJÓN	12.82	6.15	9.15	9.24	11.91	12.87	10.89	11.31
TARRAGONA	12.38	13.4	15.71	14.95	11.33	11.58	14.54	11.19



The Tables shows how Valenicaport continues to lead the connectivity rankings for another semester, improving connectivity compared to the first semester of 2019. That improvement is primarily due to the increase in capacity offered and the increase in the number of connected SSS ports. In second position is Algeciras, which also improves its rating and, like Valenicaport, continues its growth trend from the second semester of 2018. Thus, the factors behind the increase of Algeciras are also the capacity offered and the number of destination ports. Barcelona remains in third position but saw a slight fall in connectivity as, despite maintaining a performance similar to that reached in the previous semester for most variables, the top two ports in the ranking improved to a greater extent and pulled away from Barcelona.

Among the principal ports it is also worth noting the increase in levels of connectivity at Castellón, Las Palmas, Gran Canaria and Bilbao. On the other hand, Vigo and Tarragona saw slight drop-offs in levels of connectivity, much like Málaga, which has now seen a fall in its score in two consecutive semesters.

Finally, one must highlight the entry of Gijón into the connectivity TOP 10 of Spanish ports, entering at ninth position. Its improvement on last semester put it ahead of Tarragona, to the detriment of Tenerife which slipped out of the ranking by a difference of just a few decimal points with tenth place.