ASOCIACIÓN DE INGENIEROS DE CAMINOS, CANALES Y PUERTOS Y DE LA INGENIERÍA CIVIL

# INFRASTRUCTURE REPORT CARD OF SPAIN

# PORTS REPORT 2023

August, 2023

# INDEX

# ANNEXES

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# 1. Purpose and scope

The purpose of this report is to assess the infrastructure of Ports in Spain, following the methodology established by the Spanish Association of Civil Engineers (Asociación de Ingenieros de Caminos, Canales y Puertos y de la Ingeniería Civil, also **Asociación Caminos**). For its elaboration, support has been provided by institutions and organizations linked to Ports, as well as the expertise of engineers, technicians, and experts who have collaborated with Asociación Caminos.

This document is part of a broader study that analyzes the state of six sectors of public works in Spain: Railways, Highways, Ports, Airports, the complete Water cycle, and Urban and Metropolitan Public Transportation. The methodology includes an objective evaluation, based on the analysis of quantitative indicators from both Spain and other selected countries in our economic environment, referenced to the most representative data of each sector in an international context. It also includes a qualitative evaluation of public works in Spain, based on the opinions of a selected group of experts for each sector.

The report is complemented with several ANNEXES:

- **Annex 1: List of tables.** Complete list of the report's tables.
- **Annex 2: List of figures.** Complete list of the report's figures.
- **Annex 3: Acronyms.**
- **Annex 4: Bibliography and references.** Details the bibliography used and the databases and publicly available documents considered and consulted in this report.
- **Annex 5: Indicators from major international organizations.** Includes detailed information about the evaluations, indices, and indicators from the main organizations that assess infrastructures.
    - *"OCDE--International Transport Forum*
    - *EUROSTAT*
    - *United Nations Conference on Trade and Development (UNCTAD)*
    - *"Report Card for America´s infrastructure." American Society of Civil Engineers (ASCE)*
    - *"The Global Competitiveness Report (GCI)". World Economic Forum (WEF)*
    - *"The Global Adaptation Index (ND-Gain Indicators)". University of Notre Dame (EE.UU.)*
    - *"Transport in the European Union". European Commission.*
- **Annex 6: Indicators from the main Spanish organizations,** which includes information about the indicators from the main Spanish organizations:

## 2. Description of the infrastructure of Spanish ports

Ports are an essential infrastructure of the transportation system for countries with access to seas and oceans. They promote and facilitate economic development and are essential for the movement of people and goods. Since the beginning of our civilization, they have been crucial strategic elements as military enclaves and for commercial exchange. Historically, any territory connected by maritime routes has had a natural advantage over others without access to seas and oceans. Countries with sea access start from a good starting position, but it's not sufficient on its own: a strong port connection and significant supporting infrastructure are necessary for loading and unloading, logistics operations, and connecting with other modes of transportation.

The fundamental feature of ports lies in their role as intermodal hubs, unlike roads or railways, where the infrastructure extends throughout the network. Therefore, the analysis must be based on both maritime and land connectivity, as well as the availability of logistic activity areas. The assessment of ports must consider two fundamental concepts: capacity and efficiency, on which potential indicators should be based.

Spain's strategic position, connecting the Atlantic Ocean with the Mediterranean Sea, and the privileged location of its coastlines, which surround its entire territory, are essential factors for the economic development of nearly all productive sectors.


*Figure 1: Ports of the State-Owned Port System*

According to the 'Statistical Yearbook of the State-Owned Port System,'[1] published by the public entity Ports of the State, the Spanish port system comprises 48 ports of general interest, managed by 28 port authorities. Additionally, there are a significant number of port facilities, primarily used for fishing and recreational purposes, managed both directly and indirectly by the regional administrations.

## 2.1. Port Traffic

In the year 2019, over 37.6 million passengers passed through Spanish ports, either in regular transportation (liner) or for cruise purposes, with nearly 11 million being cruise passengers. These figures surpass those of 2018, solidifying the tourist appeal of our country through maritime access.

Regarding goods, almost 564.5 million tons of cargo were transported. Out of the total goods imported or exported in Spain, 85% of exports and 60% of imports are carried out by maritime routes, accounting for 64% of Spain's foreign trade with the European Union and over 94% with non-EU countries. The direct, indirect, and induced activity of the Spanish Port System contributes to approximately 20% of the GDP of the transportation sector, representing 1.1% of the Spanish GDP.

The historical evolution of port traffic (in millions of tons) is depicted in the following graph:

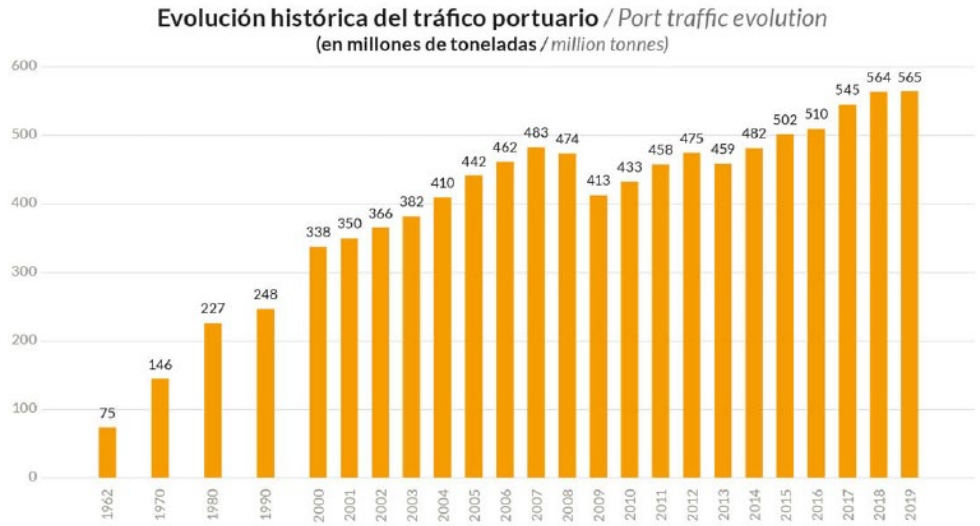



*Figure 2: Historical evolution of port traffic. Statistical Yearbook of the Port System. 2019*

[1] The Statistical Yearbook of the State-Owned Port System (**puertos.es**) primarily includes data on port traffic of goods, containers, vessels, and passengers from various Spanish ports, both those under the administration of the central government and those under regional authorities. The technical characteristics of the ports and the investments made are also reflected. The latest published Statistical Yearbook pertains to the data from 2020; however, for this report, the statistical yearbook from 2019 has been considered, as the data for the year 2020 is not representative of port activity due to the COVID-19 pandemic.

The cargo traffic by port authorities reflects, in absolute terms, that the Port Authority with the highest freight movement in 2019 has been, once again, the Bay of Algeciras Port Authority, surpassing the milestone of 100 million tons (109.4 million tons) again, followed by the Port Authority of Valencia with 81.1 million tons, and the Port Authority of Barcelona with 67.7 million tons. These three together account for 258.2 million tons, which represents 46% of the total traffic.

| Autoridades Portuarias *Port Authorities* | 2018 | 2019 | % Var. |
|---|---|---|---|
| A coruña | 15.703.803 | 13.696.828 | -12,8 |
| Alicante | 3.191.163 | 2.919.012 | -8,5 |
| Almería | 7.060.555 | 5.639.604 | -20.1 |
| Avilés | 5.024.863 | 5.146.026 | 2,4 |
| Bahía de Algericas | 107.361.029 | 109.415.052 | 1,9 |
| Bahía de Cádiz | 3.955.515 | 4.443.392 | 12,3 |
| Baleares | 16.453.613 | 16.812.167 | 2,2 |
| Barcelona | 67.756.258 | 67.693.385 | -0,1 |
| Bilbao | 35.695.401 | 35.561.022 | -0,4 |
| Cartagena | 33.941.690 | 34.282.141 | 1,0 |
| Castellón | 21.137.627 | 20.720.852 | -2,0 |
| Ceuta | 2.448.438 | 2.501.972 | 2,2 |
| Ferrol-San Cibrao | 13.707.823 | 11.183.384 | -18,4 |
| Gijón | 19.699.445 | 17.392.019 | -11,7 |
| Huelva | 32.966.864 | 33.813.726 | 2,6 |
| Las Palmas | 26.974.184 | 26.690.343 | -1,1 |
| Málaga | 3.320.198 | 3.589.995 | 8,1 |
| Marín y Ría de Pontevedra | 2.541.733 | 2.471.707 | -2,8 |
| Melilla | 873.528 | 863.501 | -1,1 |
| Motril | 2.852.896 | 2.775.518 | -2,7 |
| Pasaia | 3.138.321 | 3.244.922 | 3,4 |
| Santa Cruz de Tenerife | 13.051.755 | 13.094.034 | 0,3 |
| Santander | 5.984.392 | 6.586.233 | 10,1 |
| Sevilla | 4.436.320 | 4.393.664 | -1,0 |
| Tarragona | 32.084.325 | 32.802.075 | 2,2 |
| Valencia | 76.621.101 | 81.063.555 | 5,8 |
| Vigo | 4.362.465 | 4.387.209 | 0,6 |
| Vilagarcia | 1.211.306 | 1.320.702 | 9,0 |
| **TOTAL** | **563.556.611** | **565.504.040** | **0,2** |

*Figure 3: Cargo traffic in the main ports. Statistical Yearbook of the Port System. 2019*

The international perception of the Spanish port system is favorable, and the actual figures support this view. Analyzing the data provided by EUROSTAT, it can be concluded that, in absolute terms, Spain's total traffic is well above the European average and specifically surpasses Germany and France, while being comparable to the rest of the selected group. In terms of the ratio to GDP,

Spain doubles the others, which means that the Spanish economy is more 'port-dependent' than the other economies in its region. In container traffic, Spain and Germany are superior to the rest in absolute numbers, and in relation to GDP, Spain has the best indicator by a considerable margin, especially when considering the Netherlands and Germany as a unit to account for the 'Rotterdam effect.'

However, container traffic in the port system must consider the role of transit. In summary, within the European context, the Spanish port system as a whole is a 'port giant,' and undoubtedly, its infrastructure must have been optimal to achieve this status. The historical evolution of port exports and imports indicates a decrease in imports and a slight increase in exports:

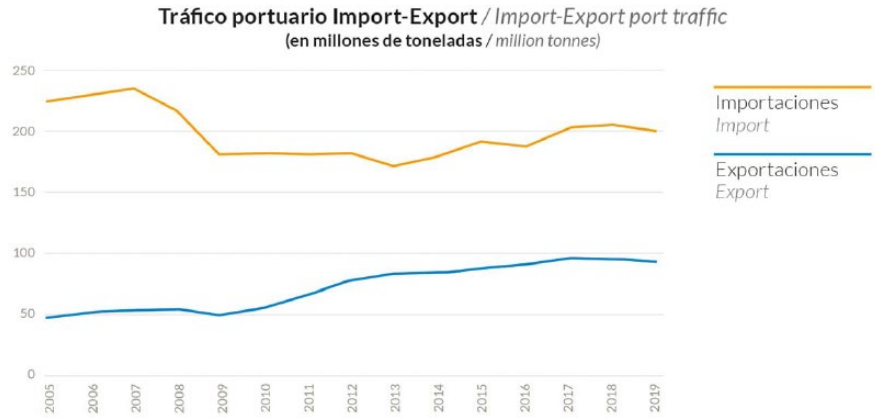



*Figure 4: Historical evolution of port exports and imports. Statistical Yearbook of the Port System. 2019*

The main bulk liquid and solid commodities, according to their nature, are reflected in the following charts:

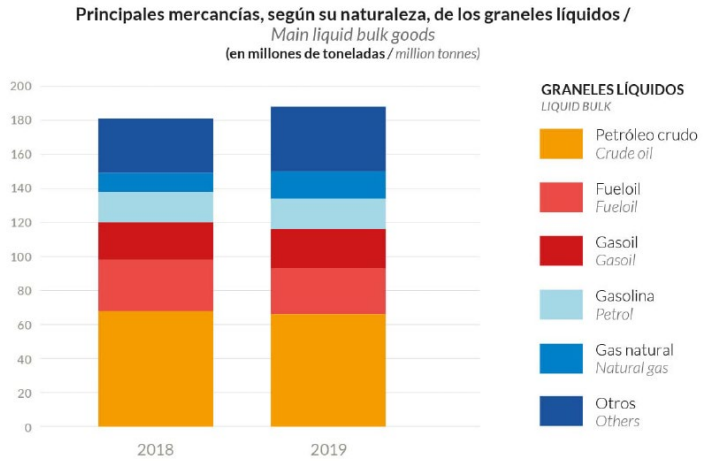



*Figure 5: Major commodities of liquid bulk. Statistical Yearbook of the Port System. 2019*

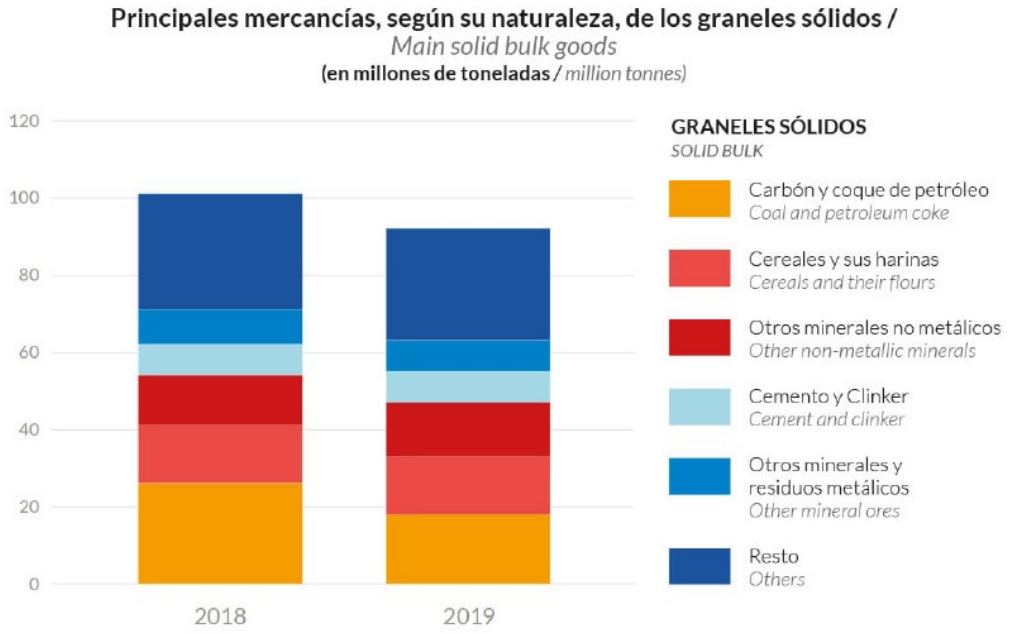



*Figure 6: Principal solid bulk commodities. Statistical Yearbook of the Port System. 2019*

These goods have entered and exited the ports by road and railway. The evolution of inbound and outbound traffic reflects annual overall growth and the strategic importance of intermodal infrastructure in the ports:

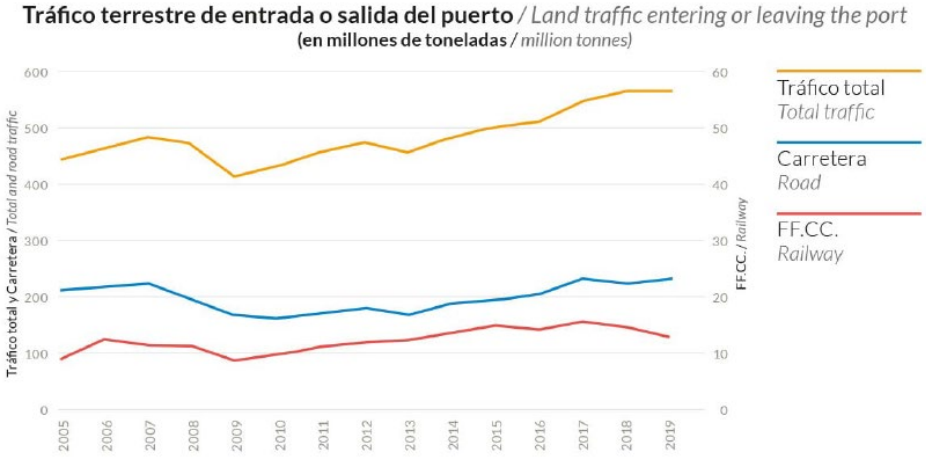



*Figure 7:"Land traffic for inbound and outbound flows from ports. Statistical Yearbook of the Port System. 2019*

## 2.2. Port Infrastructure and Geographical Determinants

Port infrastructure adapts to both the geographic location of the ports and the weather conditions, as well as to the supply and demand requirements of the traffic. These factors determine and shape the necessary infrastructure in the ports.

| Autoridades portuarias *Port authorities* | SITUACIÓN *SITUATION* | | VIENTOS *WINDS* | | Máxima altura de la ola (m) *Maximum wave height (m)* | Máxima carrera de marea (m) *Maximum Tide range (m)* | LIMITACIONES DE ENTRADA *ENTRANCE CONDITIONS* | | | | Corriente controlada (nudos) *Recorded current (knots)* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | CANAL *CHANNEL* | | BOCA *MOUTH* | | |
| | Longitud *Longitude* | Latitude *Latitude* | Reinante *Prevalent* | Dominante *Dominant* | | | Ancho (m) *Width(m)* | Calado (m) *Depth(m)* | Ancho (m) *Width(m)* | Calado (m) *Depth(m)* | |
| A Coruña | 8°23'O | 43°21'N | S | SSO | 10,47 | 4,50 | 600[1] | 23,5[1] | 800 | 21,0 | - |
| A Coruña (Puerto Exterior Langosteira) | 8°31'O | 43°21'N | NE | SO | 12,54 | 4,50 | 400,00 | 22,50 | 520 | 22,5 | 0,43 |
| Alicante | 0°29,26'O | 38°20,17'N | E7°S | E7°S | 6,82 | - | 500,00 | 15,00 | 330 | 14,5 | - |
| Almería | 2°28'O | 36°50'N | SO | SO | 4,75 | 0,63 | 200,00 | 13,00 | 300 | 13,0 | - |
| Carboneras Holcim (España) S.A. | 1°53'O | 36°58'N | SO | SO | 7,10 | 0,39 | - | - | 320 | 17,0 | - |
| Carboneras Endesa Generación S.A. | 1°54'O | 36°59'N | O/SO | EN | 7,10 | 0,39 | - | - | 490 | 19,0 | - |
| Avilés | 5°56'O | 43°35'N | NO | NO | 9,03 | 4,99 | 103,00 | 12,75 | 223-103 | 12,8 | 2,25 |
| Bahía de Algeciras | 5°26'O | 36°08'N | NO | SE | 5,80 | 1,23 | - | - | 665 | 16[9] | 3,00 |
| Tarifa | 5°36'O | 36°07'N | NO y E | NO y E | 4,00 | 1,60 | 185,00 | 10,00 | 100 | 7,0 | - |
| Cádiz | 6°17'O | 36°32'N | E/SE | E/SE | 5,50 | 3,67 | 250,00 | 13,00 | 300 | 11,5 | 2,00 |
| Zona Franca | 6°15'O | 36°30'N | E/SE | E/SE | 5,50 | 3,67 | 150,00 | 9,00 | 160 | 8,5 | 2,00 |
| Cabezuela - Puerto Real | 6°15'O | 36°31'N | E/SE | E/SE | 5,50 | 3,67 | 250,00 | 13,00 | - | - | - |
| El Puerto de Sta. María | 6°14'O | 36°35'N | OSO y ONO | E/SE | 5,00 | 3,67 | 80,00 | 3,00 | 100 | 3,0 | 2,00 |
| Palma de Mallorca | 2°38,4'E | 39°33,7'N | S y SO | S y SO | - | 0,80 | - | - | 790 | 16,0 | - |
| Alcudia | 3°08,2'E | 39°50'N | S | E | - | 0,80 | - | - | 220 | 7,0 | - |
| Mahón | 4°18,8'E | 39°52'N | SO | NE | - | 0,80 | 180,00 | 15,00 | 180 | 15,0 | - |
| Ibiza | 1°26,5'E | 38°54,6'N | O | SE | - | 0,80 | - | - | 220 | 8,5 | - |
| La Sabina | 1°25'E | 38°44'N | O | SE | - | 0,80 | - | - | 150 | 5,0 | - |
| Barcelona | 2°10'E | 41°21'N | SO | NE | 4,50 | 1,25 | 926[10] | 50[11] | 525[12] | 18,50[13] | - |
| Bilbao | 3°05'O | 43°23'N | NO | SO | 19,00 | 4,90 | 375-500 | 14-30 | 500 | 30,0 | - |
| Cartagena | 0°59'O | 37°35'N | SSO | SSE | 8,00 | 0,95 | - | - | 250[2] | 11,50[2] | - |
| Castellón | 0°01'E | 39°58'N | N/NE | N/NE | 4,04 | 0,70 | 735-376 | 17,00 | 346 | 17,0 | - |
| Ceuta | 5°18'O | 35°53'N | E | SO | 3,70 | 1,60 | - | - | 300 | 18,0 | - |
| Ferrol (Puerto interior) | 8°15'O | 43°28'N | NE | S/SO | 7,90 | 4,44 | 160,00 | 11,30 | 546 | 20,0 | - |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| San Cibrao | 7°27'O | 43°42'N | E | O/SO | 5,09 | 4,32 | 546,00 | 16,70 | 305 | 20,0 | - |
| Gijón (Musel) | 5°42'O | 43°33'N | SO/NE | NO | 9,75 | 4,96 | 490-1080 | >20,00 | 840 | 25,0 | - |
| Huelva | 6°49'O | 37°8'N | NO | SO | 4,36 | 3,65 | 200-300 | 13,00 | 300 | 13,0 | 5,00 |
| Las Palmas | 15°25'O | 28°09'N | NO | NE a NO | 14,90 | 3,00 | 1.100,00 | 30,00 | 500[6] | 23[6] | <1,00 |
| Arrecife | 13°31,8'O | 28°58'N | NO | NE a NO | 7,90 | 3,00 | - | - | 150[8] | 14[8] | <1,00 |
| Puerto Rosario | 13°33'O | 28°57'N | NO | NE a NO | 11,12 | 3,15 | - | - | 400[7] | 25[7] | <1,00 |
| Salinetas | 15°22'O | 27°59'N | NO | NE a NO | - | 3,00 | - | - | - | 15,0 | <1,00 |
| Arinaga | 25°24'O | 27°51'N | NO | NE a NO | - | 3,00 | - | - | - | 15,0 | <1,00 |
| Málaga | 4°25'O | 36°43'N | SE/SO | SE | 4,67 | 0,80 | - | - | 345 | 17,0 | - |
| Marín y Ría de Pontevedra | 8°42'O | 42°24'N | S/SSO | NNE | 8,95 | 3,75 | - | - | 5,500 | 60,0 | 2,00 |
| Melilla | 2°56'O | 35°17'N | NO | NE | 6,50 | 0,64 | - | - | 515 | 12,5 | - |
| Motril | 3°31'O | 36°43'N | O/E | E | 5,03 | 0,95 | 259 | 14,00 | 250 | 14,0 | - |
| Pasaia | 1°56'O | 43°20'N | O/NO | O/NO | 9,00 | 5,00 | 80-120 | 10,00 | 180 | 20,0 | 0,50 |
| Santa Cruz de Tenerife | 16°14'O | 28°29'N | NE | SO | 2,44 | - | 100-400[14] | 40-120[14] | 127-675[14] | 6-55[14] | 2,70 |
| Los Cristianos | 16°43'O | 28°03'N | NO | SE | - | - | 200 | 20,00 | 300 | 10,0 | 1,00 |
| San Sebastián de la Gomera | 17°06'O | 28°06'N | NE | SO | - | - | 400 | 30,00 | 240 | 18,0 | 2,50 |
| Santa Cruz de la Palma | 17°46'O | 28°40'N | NE | SE | 2,70 | 2,50 | 750 | 40,00 | 350 | 20,0 | 1,00 |
| La Estaca | 17°55'O | 27°47'N | NE | SO | - | - | 150 | 25,00 | 150 | 20,0 | 1,50 |
| Granadilla | 16°29'O | 28°04'N | NE | NE | - | - | 200 | 24,00 | 315 | 26,0 | - |
| Santander | 3°48'O | 43°27'N | O/NO | NO/S-SO | - | - | 150-400 | 11,5-12 | 1,700 | 18,0 | 0,29 |
| Sevilla | 6°00'O | 37°22'N | S/SO[3]SO[4] | S/SO[3]SO[4] | - | 3,70[3] | 100[3] | 7,20[3] | 39[5] | 11[5] | - |
| Tarragona | 1°14'E | 41°05'N | NO | NO | 2,82 | - | - | 20,00-25,00 | 570 | 20,00-25,00 | 2,00 |
| Valencia | 0°18,1'O | 39°26,9'N | SE | NE 1/4E | 4,63 | 0,76 | 500 | 18,50 | 260 | 18,5 | - |
| Sagunto | 0°13'O | 39°39'N | SE | NE 1/4E | 3,93 | 0,36 | 180 | 17,50 | 350 | 17,5 | - |
| Gandía | 0°09'O | 38°59'N | SE | NE 1/4E | 5,45 | 0,49 | 75 | 11,00 | 130 | 10,0 | - |
| Vigo | 8°46'O | 42°15'N | SO | O/SO | 1,75 | 4,00 | 740 | 38-23[15] | 2222-2037[15] | 38-23[15] | 3,00 |
| Vilagarcía | 8°46'O | 42°36'N | N y SO | N,ONO y SO | - | 4,21 | 110 | 9,00 | 200 | 9,0 | 1,00 |

*Table 1: Geographical determinants and general conditions of the ports. Statistical Yearbook of the Port System. 2019*

The floating areas in the approach channels, docks, accesses, and anchorages of the main Spanish ports, as well as the length of quays and the land surface and storage areas, are as follows:

| Auto-ridades Portuarias *Port Authorities* | ZONA I *ZONE I* | | | | | ZONA II *ZONE II* | | | | TOTAL ZONA I + ZONA II *TOTAL ZONE I + ZONE II* |
|---|---|---|---|---|---|---|---|---|---|---|
| | Antepuerto *Entrance* | Dársenas comerciales *Basins* | Dársenas pesqueras *Fishing basins* | Resto Zona I *Others Zone I* | Total *Total* | Accesos *Entrance* | Fondeadero *Haven* | Resto Zona II *Others Zone II* | Total *Total* | |
| A Coruña | 105,09 | 380,34 | 38,98 | 20,49 | 544,90 | 1.738,48 | 1.488,75 | 4.741,91 | 7.969,14 | 8.514,04 |
| Alicante | - | 94,16 | 13,13 | 25,90 | 133,19 | - | 716,58 | 5.126,81 | 5.843,39 | 5.976,58 |
| Almería | 26,69 | 54,29 | 9,67 | 2,04 | 92,69 | 298,26 | 325,36 | 1.283,04 | 1.906,66 | 1.999,35 |
| Avilés | - | 51,80 | 2,83 | 116,69 | 171,32 | - | 224,00 | 4.495,85 | 4.719,85 | 4.891,17 |
| Bahía de Algeciras | 33,73 | 394,21 | 12,51 | 584,49 | 1.024,94 | - | 1.514,68 | 3.736,48 | 5.251,16 | 6.276,10 |
| Bahía de Cádiz | 1.095,46 | 230.79 | 13,40 | 68,70 | 1.408,35 | - | 11.743,93 | - | 11.743,93 | 13.152,28 |
| Baleares | 94,79 | 203,00 | 13,76 | 398,39 | 709,94 | 690,20 | 986,00 | 690,00 | 2.366,20 | 3.076,14 |
| Barcelona | - | 331,30 | 3,68 | 581,52 | 916,50 | 492,24 | 1.604,71 | 2.444,35 | 4.541,30 | 5.457,80 |
| Bilbao | 1.186,60 | 554,30 | 20,20 | 158,50 | 1.919,60 | 2.803,40 | 1.379,00 | 461,60 | 4.644,00 | 6.563,60 |
| Cartagena | - | 213,48 | 1,23 | 9,66 | 224,37 | 209,30 | 4.462,60 | 311,10 | 4.983,00 | 5.207,37 |
| Castellón | 73,21 | 135,59 | 14,11 | - | 222,91 | 4.950,00 | - | - | 4.950,00 | 5.172,91 |
| Ceuta | 52,10 | 46,30 | 1,40 | 4,05 | 103,85 | 62,00 | 334,10 | 293,15 | 689,25 | 793,10 |
| Ferrol-San Cibrao | - | 308,05 | - | 1.856,45 | 2.164,50 | 290,54 | 1.699,29 | 466,79 | 2.456,62 | 4.621,12 |
| Gijón | - | 292,35 | 5,40 | 305,51 | 603,26 | 698,73 | 1.406,00 | 1.351,45 | 3.456,18 | 4.059,44 |
| Huelva | 366,70 | 619,40 | 16,50 | 1.089,51 | 2.092,11 | - | 113,00 | 7.296,04 | 7.409,04 | 9.501,15 |
| Las Palmas | - | 809,24 | 25,91 | 67,55 | 902,70 | - | 5.126,37 | - | 5.126,37 | 6.029,07 |
| Málaga | - | 93,15 | 3,47 | 18,23 | 114,85 | 2.616,00 | 2.137,00 | 2.131,00 | 6.884,00 | 6.998,85 |
| Marín y Ría de Pontevedra | 251,00 | 40,53 | 8,47 | - | 300,00 | - | 700,00 | 8.873,00 | 9.573,00 | 9.873,00 |
| Melilla | 53,95 | 24,64 | - | 121,73 | 200,32 | - | - | 219,82 | 219,82 | 420,14 |
| Motril | - | 56,00 | 3,00 | 2,40 | 61,40 | - | - | 997,00 | 997,00 | 1.058,40 |
| Pasaia | 92,02 | 37,52 | 14,10 | 9,79 | 153,43 | - | 660,00 | 1.640,00 | 2.300,00 | 2.453,43 |
| Santa Cruz de Tenerife | - | 282,00 | 17,90 | 92,20 | 392,10 | - | 14.913,40 | - | 14.913,40 | 15.305,50 |
| Santander | - | 100,00 | 64,30 | 335,60 | 499,90 | 496,00 | 2.873,00 | - | 3.369,00 | 3.868,90 |
| Sevilla | - | 188,01 | - | 88,78 | 276,79 | 650,00 | 39,00 | 3.625,00 | 4.314,00 | 4.590,79 |
| Tarragona | - | 308,65 | 2,90 | 15,10 | 326,65 | 1.664,24 | 2.110,67 | 13.806,65 | 17.581,56 | 17.908,21 |
| Valencia | - | 723,44 | 2,31 | 121,68 | 847,43 | - | 2.229,00 | 20.789,45 | 23.018,45 | 23.865,88 |
| Vigo | 502,35 | 96,57 | 21,92 | 74,39 | 695,23 | 1.438,20 | 547,95 | 11.316,39 | 13.302,54 | 13.997,77 |
| Vilagarcía | 549,00 | 82,00 | - | - | 631,00 | 224,00 | 400,00 | 7.092,00 | 7.716,00 | 8.347,00 |
| **TOTAL** | **4.482,69** | **6.751,11** | **331,08** | **6.169,35** | **17.734,23** | **19.321,59** | **59.734,39** | **103.188,88** | **182.244,86** | **199.979,09** |

*Table 2: Floating areas (hectares). Statistical Yearbook of the Port System. 2019*

| Autoridades Portuarias *Port Authorities* | Mercancía general *General cargo* | Contenedores *Containers* | Ro-ro *Ro-ro* | Graneles sólidos sin instalación especial *Solid bulk handled without special facilities* | Graneles sólidos por instalación especial *Solid bulk handled by special facilities* | Graneles líquidos *Liquid bulk* | Multiusos (*) *Multi-purpose* | Pasajeros *Passengers* | Pesca *Fish captures* | Armamento, reparación y desguaces *Equipment* | Otros *Other* | Total *Total* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A Coruña | 220 | 316 | 29 | 385 | - | 860 | 3.284 | 484 | 2.912 | - | 4.052 | 12.542 |
| Alicante | 251 | 350 | 773 | 616 | 148 | - | 1.458 | 940 | 180 | 266 | 2.604 | 7.587 |
| Almería | - | - | 1.772 | 313 | - | - | 617 | 219 | 990 | 85 | 593 | 4.589 |
| Avilés | - | - | - | - | 133 | - | 3.639 | 260 | 810 | - | - | 4.842 |
| Bahía de Algeciras | 1.113 | 3.894 | 104 | 844 | - | 2.695 | 5.667 | 1.657 | 860 | 1.804 | 2.656 | 21.294 |
| Bahía de Cádiz | 1.572 | 591 | 1.130 | 915 | 150 | 520 | - | 324 | - | 2.240 | 2.270 | 9.712 |
| Baleares | 918 | 320 | 1.396 | 356 | 560 | 718 | - | 5.919 | 575 | 1.197 | 12.577 | 24.536 |
| Barcelona | 2.861 | 3.043 | 1.531 | 198 | 1.192 | 2.655 | - | 5.102 | 837 | 2.082 | 3.312 | 22.814 |
| Bilbao | 2.231 | 1.332 | 1.151 | 2.819 | 2.077 | 2.611 | 2.923 | 1.037 | - | 1.449 | 4.880 | 22.510 |
| Cartagena | 405 | 385 | 79 | 1.869 | 456 | 3.653 | - | 565 | 196 | 332 | 4.756 | 12.696 |
| Castellón | 1.061 | 417 | 181 | 947 | 154 | 1.475 | - | 350 | 1.213 | - | 2.952 | 8.750 |
| Ceuta | - | - | - | - | - | 791 | 1.403 | 1.079 | - | - | 180 | 3.453 |
| Ferrol-San Cibrao | - | 173 | 445 | 414 | - | 1.359 | 3.561 | - | 806 | 4.506 | 3.047 | 14.311 |
| Gijón | 4.198 | 260 | 462 | 3.256 | 1.130 | 1.316 | - | - | 850 | 480 | 2.260 | 14.212 |
| Huelva | - | - | - | - | 700 | 2.995 | 2.894 | 90 | 710 | 337 | 1.448 | 9.174 |
| Las Palmas | 401 | 3.316 | - | - | 1.036 | 1.382 | 6.719 | 3.655 | 1.841 | 3.045 | 2.337 | 23.732 |
| Málaga | - | - | 864 | - | - | - | 1.927 | 1.840 | 428 | 85 | 1.965 | 7.109 |
| Marín y Ría de Pontevedra | 1.039 | 524 | - | 272 | 275 | - | - | - | 879 | 826 | 446 | 4.261 |
| Melilla | - | 180 | 210 | 73 | - | 167 | 431 | 642 | - | - | 301 | 2.004 |
| Motril | - | - | - | - | - | 252 | 1.834 | 583 | 458 | - | - | 3.127 |
| Pasaia | 559 | - | 441 | - | - | - | 2.393 | - | 736 | 852 | 402 | 5.383 |
| Santa Cruz deTenerife | - | 1.265 | 2.142 | 315 | - | 1.124 | 1.961 | 2.778 | 1.866 | - | 5.985 | 17.436 |
| Santander | 1.747 | 200 | 1.140 | 2.140 | 935 | 454 | - | 480 | 644 | 1.455 | 3.924 | 13.119 |
| Sevilla | 898 | 728 | 86 | 1.466 | - | 200 | - | 679 | - | 706 | 520 | 5.283 |
| Tarragona | 2.050 | 1.056 | 252 | 1.316 | 2.421 | 4.595 | 995 | 707 | 543 | - | 1.647 | 15.582 |
| Valencia | - | 5.410 | 2.451 | 1.368 | - | 418 | 3.529 | 2.757 | 845 | 340 | 11.791 | 28.909 |
| Vigo | 1.232 | 762 | 1.014 | - | - | - | 531 | 1.062 | 5.250 | 1.882 | 457 | 12.190 |
| Vilagarcía | 1.319 | 271 | 150 | 392 | 303 | 230 | - | 319 | - | - | 1.320 | 4.304 |
| **TOTAL** | **24.075** | **24.793** | **17.803** | **20.275** | **11.670** | **30.471** | **45.766** | **33.528** | **24.429** | **23.969** | **78.683** | **335.461** |

*Table 3. Quay length (meters). Classification by usage. Ports of the State. Statistical Yearbook. 2019*

| Autorida-des Portuarias *Port Authorities* | ALMACENES *STORAGES* | | | | VIALES *ROADS* | RESTO *REST* | TOTAL GENERAL *TOTAL* |
|---|---|---|---|---|---|---|---|
| | Descubiertos *Open air* | Cubiertos y abiertos *Covered and open* | Cerrados *Closed* | Total *Total* | | | |
| A Coruña | 229.997 | - | 302.542 | 532.539 | 158.892 | 2.360.337 | 3.051.768 |
| Alicante | 93.382 | 11.032 | 94.901 | 199.315 | 332.336 | 1.093.103 | 1.624.754 |
| Almería | 311.919 | 14.437 | 61.559 | 387.915 | 277.900 | 528.471 | 1.194.286 |
| Avilés | 506.065 | - | 40.312 | 546.377 | 27.412 | 34.628 | 608.417 |
| Bahía de Algeciras | 2.532.794 | 40.031 | 33.015 | 2.605.840 | 435.938 | 1.624.015 | 4.665.793 |
| Bahía de Cádiz | 3.044.110 | - | 34.741 | 3.078.851 | 370.261 | 915.971 | 4.365.083 |
| Baleares | 495.373 | 11.842 | 18.282 | 525.497 | 430.370 | 1.037.907 | 1.993.774 |
| Barcelona | 5.116.555 | 164.354 | 28.916 | 5.309.825 | 2.421.689 | 3.409.840 | 11.141.354 |
| Bilbao | 2.596.567 | 15.920 | 526.989 | 3.139.476 | 637.775 | 251.184 | 4.028.435 |
| Cartagena | 438.110 | - | 115.189 | 553.299 | 262.534 | 1.590.608 | 2.406.441 |
| Castellón | 630.885 | 19.123 | 151.116 | 801.124 | 261.817 | 1.664.515 | 2.727.456 |
| Ceuta | 26.217 | - | 54.327 | 80.544 | 212.342 | 428.780 | 721.666 |
| Ferrol-San Cibrao | 827.572 | - | 46.058 | 873.630 | 143.769 | 2.408.227 | 3.425.626 |
| Gijón | 1.754.255 | 15.288 | 64.658 | 1.834.201 | 337.881 | 1.920.554 | 4.092.636 |
| Huelva | 517.777 | - | 194.930 | 712.707 | 2.516.875 | 13.926.634 | 17.156.216 |
| Las Palmas | 2.615.450 | - | 523.576 | 3.139.026 | 823.036 | 1.073.284 | 5.035.346 |
| Málaga | 480.611 | 1.247 | 12.473 | 494.331 | 313.430 | 382.962 | 1.190.723 |
| Marín y Ría de Pontevedra | 150.565 | 2.275 | 44.355 | 197.195 | 115.939 | 391.933 | 705.067 |
| Melilla | - | - | 11.354 | 11.354 | 37.551 | 225.741 | 274.646 |
| Motril | 741.679 | - | 18.106 | 759.785 | 36.921 | 108.103 | 904.809 |
| Pasaia | 423.230 | 1.458 | 56.429 | 481.117 | 92.004 | 72.997 | 646.118 |
| Santa Cruz deTenerife | 758.159 | 122.099 | 129.824 | 1.010.082 | 355.601 | 861.869 | 2.227.552 |
| Santander | 794.293 | - | 121.615 | 915.908 | 326.323 | 180.685 | 1.422.916 |
| Sevilla | 637.587 | 56.634 | 437.682 | 1.131.903 | 427.374 | 7.167.156 | 8.726.433 |
| Tarragona | 2.106.879 | - | 378.493 | 2.485.372 | 514.523 | 981.190 | 3.981.085 |
| Valencia | 4.541.672 | 17.632 | 320.794 | 4.880.098 | 1.116.175 | 1.625.661 | 7.621.934 |
| Vigo | 619.399 | 68.406 | 68.535 | 756.340 | 188.369 | 47.871 | 992.580 |
| Vilagarcía | 177.152 | - | 65.409 | 242.561 | 167.335 | 163.522 | 573.418 |
| **TOTAL** | **33.168.255** | **561.778** | **3.956.179** | **37.686.212** | **13.342.372** | **46.477.748** | **97.506.332** |

*Table 4. Land area and storage areas (square meters). Ports of the State. Statistical Yearbook. 2019.*

According to the data presented in the document 'Transport and Communications. 2020', published by the Ministry of Transport, Mobility, and Urban Agenda, the evolution of the main technical parameters of Spanish ports is as follows:

**Tabla 1.4.1. Evolución de los principales parámetros técnicos de los puertos**

| Concepto | 2016 | 2017 | 2018 | 2019 | 2020 (1) |
|---|---|---|---|---|---|
| Superficie de agua (millones $m^2$) | | | | | |
| (Dársenas, accesos, fondeaderos) | 2000,4 | 2024,0 | 2020,7 | 1999,8 | 1999,8 |
| **Total superficie de agua** | **2000,4** | **2024,0** | **2020,7** | **1999,8** | **1999,8** |
| Superficie de tierra (millones $m^2$) | | | | | |
| Almacenes | 39,0 | 39,3 | 39,5 | 37,7 | 37,7 |
| Viales y otros | 60,3 | 60,0 | 60,1 | 59,8 | 59,8 |
| **Total superficie de tierra** | **99,3** | **99,3** | **99,6** | **97,5** | **97,5** |
| Longitud de los muelles (miles de metros) | | | | | |
| Calado > 4 m. | 317,5 | 319,2 | 323,8 | 323,7 | 323,7 |
| Calado < 4 m. | 61,6 | 61,6 | 61,4 | 61,3 | 61,3 |
| **Total longitud de los muelles** | **379,1** | **380,8** | **385,2** | **385,0** | **385,0** |

(1) Cifras Provisionales
Fuente: Organismo Público Puertos del Estado. Ministerio de Transportes, Movilidad y Agenda Urbana.

*Table 5. Evolution of the main technical parameters of Spanish ports. 'Transport and Communications'. 2020. MITMA.*

## 2.3. Legislation, Regulation, and Management of Spanish Ports

Until 1880, Spanish ports did not have specific regulation. The promulgation of the General Public Works Law in 1770 marked the beginning of administrative organization for works and their operation. The Ports Law of 1880 remained in force until the promulgation of the Ports and Merchant Marine Law of 1992, a period of 112 years. It underwent minor corrections in 1929 and was complemented by other laws that regulated specific aspects of the ports, such as the Ports Board Law, the Financial Regime Law, or the Ports Boards and Sovereignty Statutes Law. The Financial Regime Law of Ports, enacted on January 28, 1966, clearly established the financial obligations to be covered by the Ports Boards, stating that subsidies from the State or other public bodies would be considered internal resources, and that works executed with these funds would be regarded as an increase in assets and would not accrue interest.

With the Spanish Constitution of 1978, the administration of ports underwent a change, establishing a dual system in which those designated as 'of general interest' are managed by port authorities (28 in total managing 46 ports of general interest), under the auspices of the Public Entity Ports of the State, while the rest were transferred for management by regional governments.

## 2.4. Financing of the Ports of the State

Spanish ports, as well as ports worldwide (except those in emerging countries), are governed by the principles of:

- Management Autonomy: There is no formal centralized planning.
- Financial Self-Sufficiency: There is no contribution from the general budget. Port expenses and investments are limited to the results of their economic balances.
- Competition: Concurrent investments for the same traffic are allowed.

As a result, there are no state objectives, and their growth is limited by their ability to finance it with their resources. Ports, therefore, operate in a manner close to the optimum level of satisfying the observed demand while considering their actual investment capabilities (providing the demanded service up to the profitability limit that ensures the ability to meet future total demand). This corresponds more to a business logic than public management.

The Ports and Merchant Marine Law of 1992 changed the economic and financial management, disconnecting ports from the state financing system, and establishing financial sufficiency as the only mode for the entire system and each individual port. The system has not been fully tested, as European funds have often substituted for state financing during much of this time. The need for self-funding has led to the establishment of high port fees, and surpluses are directed towards state services that should be funded with general resources, such as lighthouses, maritime rescue, railway and road access.

Regarding investments, the State-Owned Port System reached an investment volume of €352.1 million (in accrued expenses) in 2019, involving activities in logistics, equipment, and facilities, followed by modernization of infrastructure and increased port capacity.

The overall invested amount is classified by purpose as follows:

| | % |
|---|---|
| Infraestructuras y capacidad portuaria<br>*Infraestructure and port capacity* | 22,42 % |
| Actividades logísticas, equipamiento e instalaciones<br>*Logistics activities, equipment and facilities* | 32,98 % |
| Puerto ciudad y medio ambiente<br>*Port-City and environment* | 3,21 % |
| Instalaciones de pesca<br>*Fishery* | 1,24 % |
| Pasajeros<br>*Passengers* | 9,05 % |
| Otros<br>*Other assets* | 31,09 % |
| **TOTAL** | **100,0 %** |

*Table 6. Investments in the state-owned port system. Statistical Yearbook of the Port System. 2019.*

If we analyze the evolution of investments in current euros in the State-Owned Ports, we can see that the historical peak was reached in 2008 at 1.322 billion euros. Since then, there was a significant decline in investment to 498 million euros in 2012. From 2007 to 2019, according to data published in the statistical yearbook, investment has remained at similar figures, with a peak of 632.1 million euros in 2015 and a minimum of 352.1 million euros in 2019, the lowest figure in the entire historical series analyzed.

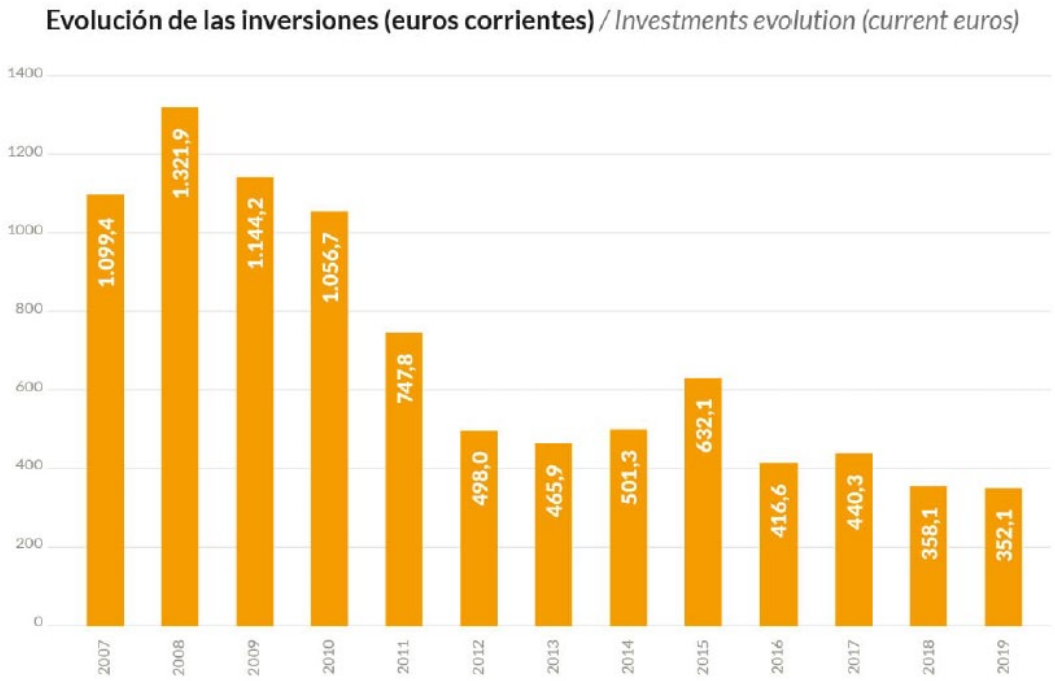



*Table 7. Evolution of investments in the state-owned port system. Statistical Yearbook of the Port System. 2019*

The total investments in maritime transport infrastructure (millions of euros) are shown in the following table:

| Concepto | 2015 | 2016 | 2017 | 2018 (1) | 2019 (1) | 19/18 |
|---|---|---|---|---|---|---|
| Autoridades Portuarias | 633,38 | 416,56 | 440,31 | 358,08 | 349,12 | -2,5% |
| Puertos Menores de CC.AA. | 42,84 | 30,28 | 38,71 | 60,52 | 24,02 | -60,3% |
| Otras Inversiones | | | | | | |
| D.G. Marina Mercante (Prog. 454M) | 2,52 | 2,47 | 2,50 | 3,03 | 1,64 | -45,9% |
| Sociedad Estatal Salvamento y Seguridad Marítima | 6,08 | 6,57 | 11,18 | 5,68 | 6,24 | 9,7% |
| **Total** | **684,82** | **455,87** | **492,71** | **427,32** | **381,02** | **-10,8%** |

(1) Cifras provisionales (Autoridades Portuarias datos diciembre 2020).Valencia y Murcia no han facilitado información.
Fuente: Organismo Público Puertos del Estado, Dirección General de la Marina Mercante. Ministerio de Transportes, Movilidad y Agenda Urbana.

*Table 8. Evolution of investments in maritime transport infrastructure. 'Transport and Communications'. 2019. MITMA.*

The 'Management Report of the State-Owned Port System. 2020' prepared by Ports of the State contains the necessary economic data to analyze the income statements of the aggregate of the State-Owned Port Authorities. As observed in the attached table, the net turnover reached the amount of 968.5 million euros in the year 2019, with a net profit of 108 million euros.

## Agregado Sistema Portuario

*(En millones de euros)*

| Concepto | Real 31-12-19 | Real 31-12-18 | Variación 2019/2018 | Presup. 2019 | % Ejecuc. Presup. 2019 |
|---|---|---|---|---|---|
| **1. Importe neto de la cifra de negocios** | **969,5** | **1.152,9** | **-15,9%** | **1.183,8** | **+81,9%** |
| A. Tasas portuarias | 861,5 | 1.033,4 | -16,6% | 1.050,6 | +82,0% |
| a) Tasa de ocupación | 264,9 | 286,6 | -7,6% | 298,6 | +88,7% |
| b) Tasas de utilización | 474,5 | 603,6 | -21,4% | 608,4 | +78,0% |
| *Tasa del buque* | *201,0* | *244,4* | *-17,7%* | *236,7* | *+84,9%* |
| *Tasa de las embarcaciones deportivas y de recreo* | *9,6* | *9,1* | *+6,1%* | *9,4* | *+102,4%* |
| *Tasa del pasaje* | *24,5* | *79,3* | *-69,1%* | *81,4* | *+30,1%* |
| *Tasa de la mercancía* | *231,7* | *261,9* | *-11,5%* | *272,6* | *+85,0%* |
| *Tasa de la pesca fresca* | *5,3* | *5,8* | *-9,8%* | *5,5* | *+95,7%* |
| *Tasa por utilización especial de la zona de tránsito* | *2,4* | *3,1* | *-21,6%* | *2,8* | *+87,0%* |
| c) Tasa de actividad | 111,2 | 130,5 | -14,8% | 131,3 | +84,7% |
| d) Tasa de ayudas a la navegación | 10,9 | 12,7 | -13,8% | 12,3 | +89,1% |
| B. Otros ingresos de negocio | 108,0 | 119,5 | -9,6% | 133,2 | +81,1% |
| **3. Trabajos realizados por la empresa para su activo** | **0,4** | **0,4** | **-0,4%** | **0,2** | **+177,4%** |
| **5. Otros ingresos de explotación** | **42,7** | **42,4** | **+0,8%** | **38,8** | **+110,1%** |
| a) Ingresos accesorios y otros de gestión corriente | 21,5 | 21,9 | -1,8% | 17,9 | +119,6% |
| b) Subvenciones de explotación incorporadas al rdo. del ejercicio | 1,5 | 1,1 | +30,6% | 1,1 | +129,1% |
| c) Ingresos traspasados al resultado por concesiones revertidas | 19,8 | 19,4 | +2,1% | 19,7 | +100,4% |
| **6. Gastos de personal** | **(272,2)** | **(266,1)** | **+2,3%** | **(308,6)** | **+88,2%** |
| a) Sueldos, salarios y asimilados | (193,9) | (190,7) | +1,7% | (216,1) | +89,7% |
| b) Indemnizaciones | (4,9) | (0,7) | +596,1% | (7,8) | +62,4% |
| c) Cargas sociales | (73,8) | (74,9) | -1,4% | (84,7) | +87,2% |
| d) Provisiones | 0,4 | 0,2 | +80,3% | - | -100,0% |
| **7. Otros gastos de explotación** | **(290,2)** | **(309,3)** | **-6,2%** | **(356,7)** | **+81,3%** |
| a) Servicios exteriores | (233,7) | (249,7) | -6,4% | (304,2) | +76,8% |
| *Reparaciones y conservación* | *(100,4)* | *(109,2)* | *-8,1%* | *(134,8)* | *+74,5%* |
| *Servicios de profesionales independientes* | *(28,8)* | *(30,8)* | *-6,3%* | *(43,9)* | *+65,7%* |
| *Suministros y consumos* | *(34,9)* | *(37,2)* | *-6,4%* | *(39,5)* | *+88,2%* |
| *Otros servicios exteriores* | *(69,6)* | *(72,5)* | *-4,0%* | *(86,0)* | *+80,9%* |
| b) Tributos | (26,8) | (26,9) | -0,2% | (29,3) | +91,5% |
| c) Pérdidas, deterioro y variación provisiones operac. comerc. | (3,0) | (8,4) | -64,1% | (5,8) | +51,8% |
| d) Otros gastos de gestión corriente | (26,6) | (24,4) | +9,3% | (17,4) | +153,2% |
| **8. Amortizaciones del inmovilizado** | **(436,5)** | **(437,4)** | **-0,2%** | **(460,2)** | **+94,8%** |
| **9. Imputación de subvenciones de inmov. no financiero y otras** | **90,5** | **87,5** | **+3,4%** | **87,1** | **+103,9%** |
| **10. Excesos de provisiones** | **49,4** | **25,4** | **+94,8%** | **0,1** | **+70.749,6%** |
| **11. Deterioro y resultado por enajenaciones del inmovilizado** | **(40,6)** | **(6,7)** | **+505,2%** | **70,0** | **-58,0%** |
| **Otros resultados** | **(5,0)** | **(1,5)** | **+236,8%** | **0,4** | **-1.378,9%** |
| **A.1. RESULTADO DE EXPLOTACIÓN (1+3+5+6+7+8+9+10)** | **108,1** | **287,5** | **-62,4%** | **254,9** | **+42,4%** |
| **12. Ingresos financieros** | **9,2** | **8,9** | **+3,4%** | **8,3** | **+110,2%** |
| **13. Gastos financieros** | **(12,6)** | **(20,2)** | **-37,4%** | **(18,5)** | **+68,1%** |
| **14. Variación de valor razonable en instrumentos financieros** | **(37,5)** | **(8,0)** | **+368,8%** | **(3,5)** | **+1.081,6%** |
| **16. Deterioro y resultado por enajenac. de instrumentos financ.** | **1,3** | **(7,7)** | **+117,2%** | **(0,2)** | **-556,8%** |
| **A.2. RESULTADO FINANCIERO (12+13+14+16)** | **(39,6)** | **(27,0)** | **+46,9%** | **(13,9)** | **+285,2%** |
| **A.3. RESULTADO ANTES DE IMPUESTOS (A.1+A.2)** | **68,4** | **260,5** | **-73,7%** | **241,0** | **+28,4%** |
| **17. Impuesto sobre beneficios** | **39,6** | **0,3** | **+13.078,8%** | **(0,5)** | **-7.614,2%** |
| **A.4. RESULTADO DEL EJERCICIO (A.3+17)** | **108,0** | **260,8** | **-58,6%** | **240,5** | **+44,9%** |

*Table 9. Income statement of the aggregate of the Spanish state-owned port system. 2019*

## 2.5. Strategic Framework of Ports of the State

The Strategic Framework of Ports of the State was definitively approved in October 2022 by the Ministry of Transport, Mobility, and Urban Agenda. As indicated by the president of Ports of the State in the introduction of the document:

> "This Strategic Framework outlines a shared course towards a renewed scenario for ports of general interest to be achieved by the horizon year 2030. A scenario in which, in addition to maintaining the best possible commercial positioning in transport and logistics networks, ports of general interest become references for the deployment of digital and energy transformation, aiming at the efficiency, connectivity, security, and sustainability of the sector itself and, therefore, the overall economy. In this desirable scenario, smart, hyperconnected, and synchromodal ports capable of optimizing the management of cargo, passengers, transportation elements, data, energy, and all types of resources in their economic and environmental contexts, no matter how changing they may be, are conceivable. This document also strongly emphasizes the widespread social recognition of ports as instruments in the service of people, both those residing in adjacent cities and those located in their areas of influence. For all of this, this Strategic Framework emphasizes the effective promotion of innovation in all its aspects, both incremental and disruptive, as the main lever for its urgent transformation."

The Strategic Framework unfolds through the following seven priority action criteria:

- Efficiency
- Connectivity
- Digitalization
- Innovation
- Sustainability
- Security
- Transparency

Based on these priority action criteria, a development is proposed in the form of 16 strategic lines, as shown in the following table:

| Modelo de desarrollo estratégico (dimensiones) | Criterios de actuación | Líneas estratégicas |
|---|---|---|
| ECONÓMICA (actividades) | Eficiencia | Autoridades Portuarias económicamente sostenibles |
| | | Ordenación y gestión ágil, transparente y avanzada del dominio público |
| | Conectividad | Infraestructuras orientadas a demanda, fiables, conectadas y sostenibles |
| | | Servicios competitivos y operaciones eficientes |
| | Digitalización | Seguimiento y facilitación de la actividad portuaria |
| | | Inspecciones y tramitaciones administrativas ágiles y eficaces |
| | | Administración portuaria digital. Puertos inteligentes y sincromodales |
| | Innovación | Puertos innovadores |
| | | Puertos con proyección internacional |
| AMBIENTAL (entorno) | Sostenibilidad | Puertos ambientalmente sostenibles |
| | | Puertos eco-proactivos |
| | | Puertos comprometidos con su ciudad |
| | Seguridad | Puertos seguros y protegidos |
| | | Ayudas a la navegación (AtoN) avanzadas y de calidad |
| SOCIAL (institucional) | | Cultura ética corporativa |
| | Transparencia | Ampliación y mejora continua del capital humano |

*Table 10. Dimensions, Action Criteria, and Strategic Lines*

Each strategic line is broken down into 56 general management objectives, the results of which are materialized through specific quantitative targets constructed on measurable indicators.

| Líneas estratégicas (16) | Objetivos generales de gestión (56) | | | | |
|---|---|---|---|---|---|
| Autoridades Portuarias económicamente sostenibles | Fórmulas revisadas de financiación | Presupuestación efectiva | Tasas ajustadas a la realidad portuaria | FCI tasado y alineado | |
| Ordenación y gestión ágil y avanzada del dominio público | Espacios portuarios con alto rendimiento | Espacios portuarios al servicio del interés general | Espacios portuarios geo-digitalizados | | |
| Infraestructuras orientadas a demanda, fiables, conectadas y sostenibles | Infraestructuras orientadas a demanda | Infraestructuras funcionales y rentables | Infraestructuras fiables y resilientes | Infraestructuras conectadas | Infraestructuras ambien-talmente respetuosas |
| Servicios competitivos y operaciones eficientes | Servicios competitivos al servicio del interés general | Operaciones eficientes al servicio del interés gral. | Ordenación de funciones y procedimientos | | |
| Seguimiento y facilitación de la actividad portuaria | Refuerzo del Observatorio | Estadísticas avanzadas | Oficina de estudios | Servicios océano-m. de alta precisión | |
| Inspecciones y tramitaciones administrativas ágiles y eficaces | Controles e inspecc. en frontera ágiles | Trámites eficaces y optimizados | Mayor interrelación institucional | | |
| Admon. portuaria digital. Puertos inteligentes y sincromodales | Administración portuaria digital | Puerto digital | Estandarización e interoperabilidad | Puerto inteligente | Puerto sincromodal |
| Puertos innovadores | Impulso sistémico de la innovación | Organismos portuarios co-creadores | Innovación al servicio del crecimiento azul | Premios a la innovación | |
| Puertos con proyección internacional | Refuerzo relaciones internacionales | Potenciación marca 'Puertos de España' | Foro de puertos iberoamericanos | | |
| Puertos ambientalmente sostenibles | Debida diligencia en la gestión ambiental | Elevar la calidad ambiental | Poner en valor la eco-eficiencia | | |
| Puertos eco-proactivos | Incentivar movilidad eco-sostenible | Contribuir a mitigar el cambio climático | Contribuir a adapt. al cambio climático | | |
| Puertos comprometidos con su ciudad | Puertos abiertos al ciudadano | Servicios portuario-munic. coordinados | Fomento de la RSC en el entorno | Dar a conocer el puerto | |
| Puertos seguros y protegidos | Mejora de la seguridad industrial y la circulac. | Mejora de la protección portuaria | Puertos ciberseguros | | |
| Ayudas a la navegación (AtoN) avanzadas y de calidad | Modernizar equipos y procesos | Reforzar la calidad y la transparencia | Acercar las AtoN al ciudadano | | |
| Cultura ética corporativa | Código ético portuario | Cumplimiento corporativo | | | |
| Ampliación y mejora continua del capital humano | Ampliación y reestructuración del capital humano | Ser inclusivos e impulsar la igualdad | Mejorar formación y promoción | Promover comunic. y participación | |

*Table 11. General Management Objectives*

It is not the purpose of this report to delve into management objectives. However, for illustrative purposes and to frame the evaluation conducted later, the following is a snapshot of some of the actions initiated by the port system in recent years, specifically relating to:

- The use of alternative fuels such as LNG (LNG Bunkering)
- The current state of railway connections
- Decarbonization through Onshore Power Supply (OPS)

### 2.5.1. *Bunkering* GNL

Bunkering is a refueling system that allows vessels to fill their fuel tanks at sea. In recent years, Liquefied Natural Gas (LNG) has emerged as a much cleaner, cost-effective, and efficient energy alternative for maritime transportation.

There are three types of LNG bunkering:

- Pipe-to-ship (PTS): This refers to supplying fuel through a terminal located on the dock. The terminal consists of a storage tank for LNG, a fuel loading dock, and a pipeline connecting the tanks to the dock.
- Ship-to-ship (STS): This system involves transferring fuel from one vessel to another. There are two types of supply vessels available in the market: the multi-fuel barge and specific LNG supply vessels, with capacities ranging from 5,000 to 10,000 m3.
- Truck-to-ship (TTS): This is the type of bunkering that uses tanker trucks located on the dock to transfer fuel to the ships.

In Spanish ports, the following LNG bunkering operations have been conducted in 2022, categorized by the type of supply:

| Ports where LNG bunkering operations have been conducted in 2022, by type of supply * | | |
|---|---|---|
| PTS | STS | TTS |
| Cartagena | Barcelona | Barcelona |
| | Tenerife | Valencia |
| | Huelva | Huelva |
| | Algeciras | Denia |
| | | Malaga |
| | | Motril |
| | | Cartagena |
| | | Almeria |
| | | Bilbao |
| | | Algeciras |
| | | Cadiz |
| | | Santander |
| | | Ferrol |
| | | Gijon |
| | | Vigo |
| 1 | 4 | 16 |

*Table 12. Ports where LNG bunkering operations have been conducted in 2022, by type of supply*

The ports where a supply vessel with a base in that port operates are shown in the following table:

| The ports where a supply vessel operates based in that port | |
|---|---|
| Port | Estado |
| Barcelona | existent |
| Algeciras | existent |
| Huelva | existent |
| Tenerife | expected |

*Table 13. Ports where a supply vessel operates based in that port*

The ports with berths adapted for LNG supply from tanks are as follows:

| Ports with berths adapted for LNG supply from tanks | |
|---|---|
| Puerto | Estado |
| Cartagena | existent |
| Sagunto | existent |
| Barcelona | existent |
| Ferrol | existent |
| Huelva | existent |
| Bilbao | existent |
| Santander | expected |
| Valencia | expected |
| Algeciras | expected |

*Table 14. Ports with berths adapted for LNG supply from tanks*

### 2.5.2. Current Status of Railway Connections in Spanish Ports

Improving railway connections to ports is a crucial factor in enhancing port competitiveness. In the port of Ferrol, there is railway access to the old port, and access to the new port is under construction. The ports of Almería and Motril (located on the peninsula), as well as the island ports, do not have railway access. Others, such as Algeciras, have existing railway access, but the line is inadequate, particularly the Bobadilla-Algeciras section. The following table presents the status of major Spanish ports and their railway connections:

| nº | AUTORIDAD PORTUARIA | PUERTO | Conexión en Ancho Ibérico | Conexión en Ancho UIC | Conexión en Ancho Métrico |
|---|---|---|---|---|---|
| 1 | BARCELONA | BARCELONA | En servicio | En servicio | En servicio |
| 2 | TARRAGONA | TARRAGONA | En servicio | En servicio | No |
| 3 | CASTELLÓN | CASTELLÓN | En construcción | En construcción | No |
| 4 | VALENCIA | SAGUNTO | En construcción | En construcción | No |
| | | VALENCIA | En servicio | En construcción | No |
| | | GANDIA | No | No | No |
| 5 | ALICANTE | ALICANTE | En servicio | En proyecto/planificación | No |
| 6 | CARTAGENA | ESCOMBRERAS | En servicio | No | No |
| 7 | MÁLAGA | MÁLAGA | En servicio | No | No |
| 8 | ALGECIRAS | BAHÍA DE ALGECIRAS | En servicio | No | No |
| 9 | BAHÍA DE CADIZ | BAHIA DE CADIZ (CABEZUELA) | En construcción | No | No |
| | | BAHIA DE CADIZ (CÁDIZ) | En planificación | No | No |
| 10 | SEVILLA | SEVILLA | En servicio | No | No |
| 11 | HUELVA | HUELVA | En servicio | No | No |
| 12 | VIGO | VIGO | En servicio | No | No |
| 13 | MARÍN Y RÍA DE PONTEVEDRA | MARÍN | En servicio | No | No |
| 14 | VILAGARCÍA DE AROUSA | VILAGARCÍA DE AROUSA | En servicio | No | No |
| 15 | A CORUÑA | A CORUÑA (PUERTO INTERIOR) | En servicio | No | No |
| | | A CORUÑA (PUERTO EXTERIOR) | En construcción | No | No |
| 16 | FERROL Y SAN CIBRAO | FERROL | En servicio | No | En proyecto |
| 17 | AVILÉS | AVILÉS | En servicio | No | En servicio |
| 18 | GIJÓN | GIJÓN | En servicio | No | En servicio |
| 19 | SANTANDER | SANTANDER | En servicio | No | En servicio |
| 20 | BILBAO | BILBAO | En servicio | No | No |
| 21 | PASAIA | PASAIA | En servicio | No | No |

*Table 15. The status of railway connections in Spanish ports by track gauge*

### 2.5.3. Decarbonization through Onshore Power Supply (OPS)

In 2021, the project 'OPS Master Plan for Spanish Ports' was completed, co-financed by the Connecting Europe Facility – CEF program for the construction of the EU's TEN-T network. Its objective was the drafting of a Master Plan for the supply of electrical power to ships at berth in Spanish ports.

'OPS Master Plan for Spanish Ports' is part of the National Action Framework for the development of infrastructure for the use of alternative fuels in the transport sector, in compliance with Article 13 of Directive 2014/94/EU.

At its conclusion, the following objectives were achieved:

- The benefits of connecting ships to the general electrical grid while berthed have been identified; the main barriers hindering the rapid development of this technological solution were identified, and various measures were proposed and implemented to overcome the aforementioned barriers.
- Three OPS installations were installed in the ports of Santa Cruz de Tenerife, Palma de Mallorca, and Las Palmas.
- A list of OPS installations that are part of the Master Plan, to be executed during 2022-24, was compiled, which includes 20 new OPS installations to be added to the existing ones.

| Promotor | Puerto | Terminal | Flota a suministrar | | | | Disponibilidad | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Ferris Ro-ro | Container | Cruceros | Otros | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
| AP | Algeciras | APM | | X | | | | | | X | | | | |
| AP | Algeciras | TTI | | X | | | | | | X | | | | |
| AP | Algeciras | La Galera: atraques 7 & 8 | X | | | | | | | X | | | | |
| AP | Tarifa | Tanger: atraques 2 & 3 | X | | | | | | X | | | | | |
| AP | Alicante | Terminales 11, 13, 15, 17 | X | X | | X | | | X | | | | | |
| AP | Almería | Muelle nº 6 | X | | | | X | | | | | | | |
| AP | Barcelona | BEST | | X | | | | | X | | | | | |
| AP | Barcelona | San Beltran | X | | | | | | X | | | | | |
| AP | Bilbao | Espigón Central | X | | | | | | | X | | | | |
| AP | Bilbao | Contenedores | | X | | | | | | X | | | | |
| AP | Bilbao | Cruceros | | | X | | | | | X | | | | |
| Privado | Cádiz | Alfonso XIII-Reina Sofía-Ciudad | | | X | | | | | | X | | | |
| Privado | Castellón | Terminal marítima El Grao | | X | | | | | | X | | | | |
| Privado | Castellón | Muelle Sur | | | | X | | | | X | | | | |
| AP | Huelva | Muelle Sur | X | X | | | | | | X | | | | |
| AP | Huelva | Muelle Levante | | | | X | | | | X | | | | |
| AP | Huelva | Pantalán Remolcadores | | | | X | | | | X | | | | |
| Privado | Pasaia | Capuchinos | X | | | | | | | X | | | | |
| AP | Sevilla | El Centenario | X | | | | | | | X | | | | |
| Privado | Valencia | MSC | | X | | | | | | X | | | | |
| Privado | Valencia | Pasajeros | X | | X | | | | | | X | | | |
| AP | Palma de M. | Peraires | X | | | | X | | | | | | | |
| Privado | Ibiza | | X | | | | | | | X | | | | |
| Privado | Formentera | | X | | | | | | | X | | | | |
| AP | Las Palmas | Antiguo Muelle de la Pesca | | | | X | X | | | | | | | |
| AP | Las Palmas | Muelle Grande | | | | X | | | | X | | | | |
| Privado | Las Palmas | Dique Reina Sofía | | | | X | | | | X | | | | |
| AP | Sta. Cruz La Palma | Adosado dique | X | | | | X | | | | | | | |
| AP | SS Gomera | Adosado dique | X | | | | X | | | | | | | |
| AP | Sta. Cruz Tenerife | Pasajeros | X | | | | X | | | | | | | |
| AP | Sta. Cruz Tenerife | Pantalán | X | | | | X | | | | | | | |
| AP | Melilla | Sur | X | | | | | | | X | | | | |
| AP | Melilla | Pasajeros | X | | | | X | | | | | | | |

*Table 16. The current status of the implementation of OPS (Onshore Power Supply) systems*

## 2.6. The Challenge of Obtaining Information on Port Systems Worldwide

It is important to reflect in this report the challenges faced in obtaining the essential data required for its preparation. Port systems in different countries have diverse organizational structures and analytical criteria, making international comparisons extraordinarily complex.

In numerous cases, port authorities overseeing ports are composed of numerous public and private entities, along with various government administrations. However, beyond the governance structure of ports, port operations are carried out by private operators under concession agreements. This links port operations closely to competitiveness. The primary issue in conducting a comparative study comes from the scarcity of integrated data about port facilities on a country-by-country basis. There are also no databases for port railway connections or databases that encompass port automation. In general, unified databases containing international port information are hard to find, and such information is often not uniform.

In ports, the reference hinterland and markets differ for each type of cargo based on its origin and land connections:

- Containers: Furthermore, there's the concept of transshipment containers, which is challenging to assess in terms of real demand.
- Bulk solids: Typically tied to nearby economic activities.
- Liquid bulk: Demand generation depends on connections like pipelines.
- General cargo: Associated with nearby economic activities.
- Ferries: The origin/destination of demand is variable, having both local and distant characteristics.
- Cruises: Almost global demand.

Regrettably, it has not been possible to obtain suitable information from the major ports worldwide to conduct a comparative evaluation of the situation of Spanish ports relative to the ports in countries within our socioeconomic context. Below is a list of potential indicators that, if reliable and verifiable data were available, could be useful for developing an international comparison among different port systems in various countries.

| INDICATORS PORTS 2023 | |
|---|---|
| **1** | **CAPACITY** |
| 1.1 | Sheltered water area / Population and GDP |
| 1.2 | Land area / Population and GDP |
| 1.3 | Total quay length / Population and GDP |
| 1.4 | Total quay length of m or more / Population and GDP |
| 1.5 | % of ports with railway connection |
| **2** | **PERFORMANCE** |
| 2.1 | Number of serviced vessels / Population |
| 2.2 | Number of serviced vessels / GDP |
| 2.3 | Total traffic / Population and GDP |
| 2.4 | Total TEU traffic / Population and GDP |
| 2.5 | Transit TEUs / Total TEU traffic |
| 2.6 | Passenger traffic / Population and GDP |
| 2.7 | Cruise passengers / Population and GDP |
| 2.8 | Liquid bulk traffic / Population and GDP |
| 2.9 | Solid bulk traffic / Population and GDP |
| 2.10 | General cargo traffic / Population and GDP |
| 2.11 | Ro-Ro cargo traffic / Population and GDP |
| 2.12 | Rail freight traffic |
| 2.13 | % of imports through ports |
| 2.14 | % of exports through ports |
| 2.15 | Economic impact / GDP |
| 2.16 | MWH/year supplied to vessels |
| 2.17 | t/year of LNG supplied to vessels |
| 2.18 | Connectivity: Number of countries connected by maritime routes |
| **3** | **FINANCING** |
| 3.1 | Public investment / Population |
| 3.2 | Private investment / Population |
| 3.3 | Total investment / Population |
| 3.4 | Public investment / GDP |
| 3.5 | Private investment / GDP |
| 3.6 | Total investment / GDP |
| 3.7 | % Private investment / Total investment |
| 3.8 | Investment in alternative energy supply infrastructure for vessels |
| **4** | **ADAPTATION TO THE FUTURE AND SUSTAINABILITY** |
| 4.1 | Emissions Evolution |
| 4.2 | % Green Energy / Total Consumed Energy |
| 4.3 | Operational and Alarm System Implementation |
| 4.4 | Decarbonization through Onshore Power Supply (OPS) |
| **5** | **OPERATION AND MAINTENANCE** |
| 5.1 | Operation expenses / Total traffic |
| 5.2 | Operation expenses / Population |
| 5.3 | Operation expenses / GDP |
| 5.4 | Operation expenses / Total investment |
| 5.5 | Conservation and maintenance expenses / Total traffic |
| 5.6 | Conservation and maintenance expenses / Population |
| 5.7 | Conservation and maintenance expenses / GDP |
| 5.8 | Conservation and maintenance expenses / Total investment |
| **6** | **SAFETY** |
| 6.1 | Number of emergencies / Population |
| 6.2 | Number of emergencies / GDP |
| 6.3 | Number of emergencies / Total traffic |
| 6.4 | Number of fatalities / Population |
| 6.5 | Number of fatalities / GDP |
| 6.6 | Number of workplace accidents per year |
| 6.7 | % of severe workplace accidents / Total workplace accidents |
| 6.8 | % of ports with emergency and self-protection plans |
| **7** | **RESILIENCE** |
| 7.1 | Investment in climate change adaptation / Total investment |
| 7.2 | Investment in climate change mitigation / Total investment |
| 7.3 | Investment in resilience enhancement / Total investment |
| 7.4 | Investment in climate change-related engineering / Total engineering investment |
| **8** | **ENGINEERING AND INNOVATION** |
| 8.1 | Investment in R&D / Population |
| 8.2 | Investment in R&D / GDP |
| 8.3 | Investment in engineering / Population |
| 8.4 | Investment in engineering / GDP |
| 8.5 | Investment in engineering / Total investment |
| 8.6 | Investment in R&D / Total investment |
| 8.7 | Number of patents related to the port sector |

Here's the translation of the provided text into English:

**Efficiency**

Efficiency involves measuring actual traffic in relation to capacity, which is very difficult to evaluate except on a terminal-to-terminal basis. The question is whether the ports are handling the growth in demand. Similar growth rates to GDP indicate that ports are accommodating new demand at the same pace as the economy grows. In Spain, there's a strong correlation between this indicator and GDP. In general terms, the volume of goods moved will be around 40% of GDP during periods of financial stability, although the analysis varies for different types of traffic such as bulk goods, passengers, etc.

**Capacity**

Capacity depends on demand, making it a function of the hinterland, which can be very different for each type of traffic. However, such an approach would allow for adopting "denominators" of indicators that would provide truly useful and meaningful information.

**Conservation**

This should be measured in comparison to the immobilized assets. In many environments, investment is much lower than necessary, yet there are no major issues due to the use of structures with very slow degradation. Values lower than nominal (2%) would indicate insufficient attention to comprehensive maintenance, although it's true that public infrastructure (breakwaters, dredging, quays, etc.) is quite "inert" regarding deterioration due to use and is only sensitive to extraordinary breaks. Infrastructure and equipment subject to wear and tear (pavements, cranes, etc.) are mostly private.

**Land Connectivity**

This aspect is vital for system efficiency. The aspect related to the road network can only be addressed with complex consultancy work (capacity, Average Daily Traffic -ADT- of the road influenced by the port, service levels, queues at access points, etc.), but some aspects related to railways can be evaluated, giving an idea of how much ports contribute to changes in the rail modal share.

**Resilience**

Establishing a single reference is not easy: resilience as critical infrastructure (terrorism, war, closure of Suez, etc.); resilience to climate change; resilience to market changes (oil prices, technological innovations in ship handling, etc.); resilience to extraordinary events (oil spills, incidents with dangerous goods, etc.), or resilience of the system considered globally (for example, passenger traffic is quickly reassignable, but the incident can be critical for oil supply).

**Sustainability**

Should refer to terms of $CO_2$ emissions reduction, decarbonization, assessment of generated pollution (different from emissions), energy intensity, environmental restoration, etc.

All of this makes it difficult to establish consistent quantitative indicators. To partially overcome these problems, it seems logical to focus primarily on European ports, as they have similar overseas references, making comparisons more homogeneous, and to use ports from other continents punctually. Spain's geographical configuration limits the available hinterland, and in this sense, the competitiveness of a Spanish port will always be inferior to a port in the flat zone of Northern Europe, for example. Land connectivity, besides being essential, is the weak point of nearly all Spanish ports. Land connectivity is what makes a port great. Another information difficulty also pertains to public security. There's no universal system for classifying ports in terms of security. The International Maritime Organization has safety standards that all ports comply with.

Given the difficulty of finding international data, we've considered conducting an assessment through some basic indicators, although the judgment of the sector's state should be based more on the experts' opinions as expressed through the survey. Nonetheless, in this report, an effort has been made to consider certain indicators that can provide relatively suitable information.

# 3. Methodology used to evaluate the Ports

The methodology designed by Asociación Caminos includes an objective evaluation that analyzes quantitative indicators referenced to the most representative data of each sector, as well as a qualitative evaluation based on the opinions of a selected group of experts.

The **quantitative evaluation** is conducted through a comparative study with other countries in our economic and social environment, considering the most representative indicators of the sector (both from Spain and other countries). These indicators are obtained from publicly accessible databases available in important multilateral organizations such as EUROSTAT, OECD, World Bank, UN, World Economic Forum, International Transport Forum, among others. The preference is to gather data that has been collected using comparable criteria among different countries, allowing the analysis of indicators' evolution over time.

The **qualitative evaluation** exclusively pertains to Spain and is based on the responses obtained from a questionnaire sent to a selected group of experts in the sector. The responses obtained are processed anonymously and confidentially, adhering to the current data protection legislation. Once the expert responses are processed, they are integrated (with a weight of 50%) into the quantitative assessment of the sector to obtain the final evaluation of the sector in an international context.

**To facilitate the evaluation, the analysis is grouped into eight sets of common characteristics for all sectors**, but with specificities for each sector, referred to as "Criteria": Capacity, Performance, Financing, Adaptation to the Future and Sustainable Development, Operation and Maintenance, Security, Resilience, and Engineering and Innovation.

The evaluation of each Criterion is obtained as a result of a weighted assessment of the selected Indicators for that Criterion. Once the eight Criteria indices for each sector are obtained, the Sector index is also calculated as a result of a new weighted assessment of these Criterion indicators.

To establish an international comparison of the Spanish Ports sector, the following large European countries have been selected: Spain, Germany, France, the United Kingdom, Italy, Portugal, the Netherlands, Belgium, and Turkey. Additionally, one country from America: the United States; one country from Africa: Morocco; and four countries from Asia: Japan, China, South Korea, and India. However, not all countries have been evaluated for all indicators due to a lack of basic data.

The objective indicators and expert surveys address the following questions (similar to the ASCE report) for each Criterion of each sector:

- **Capacity**: Does the provision and capacity of the public works sector meet current demands?
- **Performance**: Are the current performance and physical conditions of the public works sector adequate to meet current user expectations?
- **Financing**: What investment is allocated to financing the public works sector? How much is applied to infrastructure creation and to operation and maintenance?
- **Adaptation to the Future and Sustainable Development**: Is the capacity and performance of the public works sector prepared to meet future expectations and demands? Are the resources and investments considered adequate to cover future sector needs? How are

actions promoting environmental sustainability being implemented? Are active measures applied to achieve the established objectives for decarbonizing public works and transportation?

- **Operation and Maintenance**: Is the public works sector being operated and maintained according to its needs?
- **Security**: Is the public works sector safe for users? Are effective measures implemented to ensure safe performance and operation?
- **Resilience**: When faced with threats and adverse incidents, what is the capacity of the public works sector to prevent, protect, and minimize consequences for users, the environment, the economy, and national security? Is the public works prepared to recover its initial state within a reasonable time once the threat or adverse incident has ceased? Are there alternatives to meet the service it provides?
- **Engineering and Innovation**: Are the resources allocated to engineering in the design, construction, conservation, management, and operation of the public works sector considered adequate? Is the investment in innovation sufficient? What new techniques, materials, technologies, and operational methods are being implemented to improve public works? Is progress being made in digitalization, monitoring, and sensing throughout the complete cycle of public works? Is the information provided to users adequate?

The methodology used to assess each Indicator is the result of an adjustment and transformation process of the selected ratios. **To avoid excessive data dispersion (due to topographical, territorial, economic, population distribution peculiarities, etc.) and to minimize the effect of outlier data points, it is necessary to limit them both from above and below. After obtaining the ratios, the dispersion of the values achieved in the different countries and years considered is analyzed.**

For this purpose, two methods have been considered for each indicator to avoid dispersion. The first method considers the mean and standard deviation of the data from the historical series, assigning as limit values the mean minus 1.5 times the standard deviation and the mean plus 1.5 times the standard deviation. The second method uses percentiles of the data from the historical series, analyzing the percentile 90, 80 or 70 for maximum values and and percentile 10 for minimum values. The most suitable method to limit dispersion is adopted for each Indicator in each case. In some cases, there are exceptions to this general rule, such as the Safety indicators, for which the minimum value assigned is zero, considering it as the value that should obtain the highest score.

Once these values are obtained, they are transformed on a scale from 0 to 10, with 10 being the highest value and 0 being the lowest. Next, the following rating is assigned:

| Rating System of Asociación Caminos | | | | | | | |
|---|---|---|---|---|---|---|---|
| Asociación Caminos | 0 a 2,9 | 3,0 a 4,9 | 5,0 a 5,9 | 6,0 a 6,9 | 7,0 a 7,9 | 8,0 a 8,9 | 9,0 a 9,9 |
| | Very Insufficient | Insufficient | Sufficient | Highly Sufficient | Good | Very Good | Excellent |
| | F | FX | E | D | C | B | A |

*Table 17: Rating system for Indicators, Criteria, and Sectors*

When all the Indicators for each Criterion are calculated, they are then weighted to calculate the Criterion Indicator. This weighting is done based on the importance assigned to each Indicator in forming the Criterion Indicator.

Assigning weights to each Indicator represents one of the major challenges. To address this, the input of experts is essential. Based on their experience and knowledge, they assign these weights.

It's important to note that, to form the Criterion Indicator as a weighted assessment of the Indicators, the maximum value that the Criterion Indicator can reach is the result of summing the weight assigned to each Indicator by the maximum rating (10) that the Indicator can achieve, adjusted by a reduction coefficient (which has been considered as 0.9). The application of this reduction coefficient is considered essential to balance the integration of the indicators (for example: in the "Adaptation to the Future" Criterion, growth ratios of investment in relation to the growth of motorization rates, traffic, and population are analyzed. If the motorization rate decreases due to the increase in shared vehicle use, the sector's indicator would decrease even if the traffic increases).

As an example, for the "Operation and Maintenance" Criterion, the minimum value would be 0 (zero), and the theoretical maximum value of the Safety Indicator would be 120, reduced by 10% to 108.

| Indicators | Weight | Max Score | Total Max score | |
|---|---|---|---|---|
| I 5,1 | 4 | 10 | 40 | Investment and maintenance as a % of national GDP |
| I 5,2 | 1 | 10 | 10 | Investment in operation and maintenance per capita |
| I 5,3 | 2 | 10 | 20 | Investment in operation and maintenance per equivalent km of roads |
| I 5,4 | 1 | 10 | 10 | Investment in operation and maintenance per domestic road passenger traffic (€) |
| I 5,5 | 4 | 10 | 40 | Investment in operation and maintenance per domestic road freight traffic (€) |
| **Total:** | **12** | **30** | **120** | |
| **% Max score over Max Value** | | **90,0%** | **108,00** | |

When forming the Criterion Indicator, the mean and standard deviation are not taken into account, as this would distort the Criterion Indicator by overvaluing the assessments of the integration of the Indicators. However, a reduction percentage is indeed taken into consideration.

Furthermore, since data for certain countries and certain years might not always be available, this document has chosen to calculate the ratios without considering or estimating data that is not available. Thus, unverifiable or erroneous data is not considered in the assessment of the Criterion Indicator or the Sector Indicator. In this way, the Criterion Index and Sector Index only evaluate data for which there is confirmed information, following a method to prevent it from distorting the assessment achieved by a particular country.

In the earlier example, if reliable data for Indicator I 5.5 is not available for a specific country, the assessment of the Operation and Maintenance Criterion for that country would be calculated based on the maximum value of 68 (which results from subtracting 40, the maximum score of Indicator I 6.5, from 108, which is the total maximum score of all indicators, after applying the 10% reduction coefficient). For the assessment of other countries with data in all indicators, the value of 108 would be considered as the maximum score.

In other words, each country is evaluated based on the data that is truly reliable and comparable, even if fewer indicators are used for comparison with other countries. In any case, when this effect occurs, it is noted in the assessment of Criteria and the sector.

# 4. Quantitative Indicators for Ports

For the comparative study, 10 quantitative indicators have been used, all of them referenced to the most representative data in the sector (both from Spain and other countries), obtained from publicly accessible databases available in important multilateral organizations, institutions, and universities (EUROSTAT, OECD, World Bank, UN, World Economic Forum, International Transport Forum, etc.). The selection of these indicators considered the opinions of consulted experts and previous experience. Having the appropriate database to compose the indicator was also essential.

It's important to note that data collection has not extended beyond the year 2019 due to the significant disruption caused by the COVID-19 pandemic, which seriously affects the comparison of indicators during 2020 and, to some extent, during 2021.

After analyzing available databases, the following sources have been considered suitable for this evaluation:

- The World Bank (WB)
  - Population
  - Area
  - GDP (current US$)
- United Nations Conference on Trade and Development (UNCTAD)
  - Merchandise trade (millions $)
  - Transport services trade (millions $)
  - Total coastline length (m) / Country area (km2)
  - National flag fleet (thousands DWT)
  - Container port throughput (TEU)
  - Shipbuilding (GT)
  - National flag fleet (number of vessels)
  - Number of seafarers
  - Ship recycling (GT)
  - Owned fleet (thousands DWT)
  - Number of port calls
  - Merchandise exports (millions $)
  - Merchandise imports (millions $)

- Merchandise trade balance (millions $)
- Export of servicesTransport (as % of total services)
- Export of servicesTravel (as % of total services)
- Export of servicesOther services (as % of total services)
- Export of transport services (millions $)
- Import of transport services (millions $)
- Trade balance of transport services (millions $)
- Cargo carrying capacity by ship type: Total fleet (thousand DWT)
- Cargo carrying capacity by ship type: Tankers (thousand DWT)
- Cargo carrying capacity by ship type: Bulk carriers (thousand DWT)
- Cargo carrying capacity by ship type: General cargo (thousand DWT)
- Cargo carrying capacity by ship type: Container ships (thousand DWT)
- Cargo carrying capacity by ship type: Other types of vessels (thousand DWT)
- Year-on-year growth index of maritime transport line connectivity (UNCTAD)
- % growth of maritime transport line connectivity (2019/2015) (UNCTAD)
- Average port stay time (days)
- Average port stay time for all cargoes (days)
- Average port stay time for wet cargo (days)
- Average port stay time for merchant vessels (days)
- Average port stay time for dry bulk cargo (days)
- Average port stay time for dry bulk cargo (days)
- Average port stay time for Liquefied Petroleum Gas carriers (days)
- Average port stay time for Liquefied Natural Gas carriers (days)

- OECD- International Transport Forum (OCDE)
  - Merchant fleet (GT million)
  - Container shipping (thousands t)
  - Inland waterway transport of goods (t-km/1,000 units GDP -$-)
  - Inland waterway transport of goods

  - Investment in inland waterway transport infrastructure ($/Inhabitant)
  - Share of international maritime bunker emissions in total CO2 emissions
  - Share of maritime transport CO2 emissions in total transport CO2 emissions
  - Share of inland waterway transport of goods in total inland goods transport
  - Share of investment in inland waterway transport infrastructure in total investment in inland transport infrastructure
  - Total cargo capacity (1,000 t)
  - Total pusher and tugboat fleet (number of units)
  - Total inland waterway length (km)
  - Total self-propelled vessels (number of units)
  - Cabotage maritime transport (national transport) (OECD)
- EUROSTAT and EU
  - National GDP (current €)
  - EU economic investment report
  - EU Alternative Fuels Observatory
- Ministry of Transport, Mobility, and Urban Agenda of Spain
  - Statistical Yearbook 2019
  - Transport and Infrastructure 2019
  - Transport and Mobility Observatory 2019
- Puertos del Estado (Spanish Port Authorities)
  - Statistical Yearbook of the Port System. 2015, 2016, 2017, 2018, 2019, and 2020

It's important to mention that for the quantitative indicators, indicators related to international trade or purely commercial aspects have not been considered for the international comparative analysis. The focus of the overall report on the analyzed infrastructure sectors is solely on the infrastructure aspects, in this case, the port sector. Additionally, not all criteria of analysis have been evaluated, as reliable and objective databases for certain criteria were not available. The historical evolution of indicators has not been analyzed, focusing exclusively on the values of the year 2019.

However, after a rigorous analysis, it has been concluded that, with the available data, a quantitative evaluation can be performed for three out of the eight criteria considered in the study: Performance, Financing, and Adaptation to the future and sustainable development. The selected quantitative indicators for evaluation are as follows:

| INDICATORS PORTS 2023 | |
|---|---|
| 1 | CAPACITY |
| 2 | PERFORMANCE |
| P.1 | Passengers embarked and disembarked in ports / Population |
| P.2 | Passengers embarked and disembarked in ports / GDP (thousands of $) |
| P.3 | Container traffic (tons) / Population |
| P.4 | Container traffic (tons) / GDP (thousands of $) |
| P.5 | Container traffic (TEUs) / Population |
| P.6 | Container traffic (TEUs) / GDP (thousands of $) |
| P.7 | Maritime transport line connectivity index (Index 100 in China in Q1 2006) (UNCTAD) |
| 3 | FINANCING |
| F.1 | Investment in port infrastructure / Population |
| F.2 | % Investment in port infrastructure / GDP ($) |
| 4 | ADAPTATION TO THE FUTURE AND SUSTAINABILITY |
| A.4 | Cumulative year-on-year growth index of investment in port infrastructure (index 100 in 2015) |
| A.5 | % Growth of maritime transport lines connectivity (2019/2015) (UNCTAD) |
| 5 | OPERATION AND MAINTENANCE |
| 6 | SAFETY |
| 7 | RESILIENCE |
| 8 | ENGINEERING AND INNOVATION |

## 4.1. Capacity

The indicators for this criterion aim to answer the question: Does the public works sector meet current demands in terms of resources and capacity?

Reliable and comparable data for a comparative evaluation of the selected countries have not been found.

This criterion will be assessed solely based on the opinions provided by the experts selected in the qualitative evaluation.

## 4.2. Performance

This criterion answers the question: Are the current service delivery and physical conditions of the public works sector adequate to meet current user expectations?

The selected indicators for this criterion are as follows:

| 2 | PERFORMANCE |
|---|---|
| P.1 | Passengers embarked and disembarked in ports / Population |
| P.2 | Passengers embarked and disembarked in ports / GDP (thousands of $) |
| P.3 | Container traffic (tons) / Population |
| P.4 | Container traffic (tons) / GDP (thousands of $) |
| P.5 | Container traffic (TEUs) / Population |
| P.6 | Container traffic (TEUs) / GDP (thousands of $) |
| P.7 | Maritime transport line connectivity index (Index 100 in China in Q1 2006) (UNCTAD) |

For the analysis of this Criterion, 7 indicators have been used, including those related to the traffic of passengers and goods per population and GDP.

An indicator that is particularly interesting has been included: the UNCTAD Maritime Transport Connectivity Index (with a base index of 100 in China for maritime connectivity in the first quarter of 2006).

## 4.2.1. Performance Indicators

### *4.2.1.1 Indicator PUERT P.1: Passengers embarked and disembarked in ports / Population*

| PUERT P.1 | Pasajeros embarcados y desembarcados en los puertos / Población | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 |
| España | | | | | | 0,73 |
| Alemania | | | | | | 0,38 |
| Francia | | | | | | 0,37 |
| Reino Unido | | | | | | 0,38 |
| Italia | | | | | | 1,45 |
| Turquía | | | | | | 0,02 |
| Portugal | | | | | | 0,08 |
| Países Bajos | | | | | | 0,12 |
| Bélgica | | | | | | 0,10 |
| EEUU | | | | | | |
| Marruecos | | | | | | |
| Japón | | | | | | |
| China | | | | | | |
| India | | | | | | |
| Corea del Sur | | | | | | |
| Maximo: | | 1,45 | | Percentil 90%: | 0,872 | 10,00 |
| Mínimo: | | 0,019 | MIN ((Media-Factor min *Desv );0): | | 0 | 1 |
| **Media:** | | 0,401 | Percentil 90%: | 0,872 | 0,872 | 9,000 |
| Media+Factor max*Desv Estándar: | | 1,079 | Percentil 10%: | 0,068 | Unidad: | 10,317 |
| Media-Factor min*Desv Estándar: | | -0,276 | | Desv. Est.: | 0,451 | |

*Table 18: Indicator PUERT P.1 Values: Passengers embarked and disembarked in ports / Population*

| PUERT P.1 | Pasajeros embarcados y desembarcados en los puertos / Población | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | |
| España | | | | | | 8,5 | MUY BIEN | B |
| Alemania | | | | | | 4,9 | INSUFICIENTE | FX |
| Francia | | | | | | 4,8 | INSUFICIENTE | FX |
| Reino Unido | | | | | | 4,9 | INSUFICIENTE | FX |
| Italia | | | | | | 10,0 | EXCELENTE | A |
| Turquía | | | | | | 1,2 | MUY INSUFICIENTE | F |
| Portugal | | | | | | 1,8 | MUY INSUFICIENTE | F |
| Países Bajos | | | | | | 2,2 | MUY INSUFICIENTE | F |
| Bélgica | | | | | | 2,0 | MUY INSUFICIENTE | F |
| EEUU | | | | | | | | |
| Marruecos | | | | | | | | |
| Japón | | | | | | | | |
| China | | | | | | | | |
| India | | | | | | | | |
| Corea del Sur | | | | | | | | |

*Table 19: Indicator PUERT P.1 Rating: Passengers embarked and disembarked in ports / Population*

#### 4.2.1.2 Indicator PUERT P.2: Passengers embarked and disembarked in ports / GDP (thousands of $)

| PUERT P.2 | Pasajeros embarcados y desembarcados en los puertos / PIB (miles de $) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 |
| España | | | | | | 0,025 |
| Alemania | | | | | | 0,008 |
| Francia | | | | | | 0,009 |
| Reino Unido | | | | | | 0,009 |
| Italia | | | | | | 0,043 |
| Turquía | | | | | | 0,002 |
| Portugal | | | | | | 0,003 |
| Países Bajos | | | | | | 0,002 |
| Bélgica | | | | | | 0,002 |
| EEUU | | | | | | |
| Marruecos | | | | | | |
| Japón | | | | | | |
| China | | | | | | |
| India | | | | | | |
| Corea del Sur | | | | | | |
| | | | | | | |
| Maximo: | | 0,04 | | Percentil 90%: | 0,028 | 10,00 |
| Mínimo: | | 0,002 | MIN ((Media-Factor min *Desv );0): | | 0 | 1 |
| **Media:** | | 0,011 | Percentil 90%: | 0,028 | 0,028 | 9,000 |
| Media+Factor max*Desv Estándar: | | 0,032 | Percentil 10%: | 0,002 | Unidad: | 317,841 |
| Media-Factor min*Desv Estándar: | | -0,009 | | Desv. Est.: | 0,014 | |

*Table 20: Indicator PUERT P.2 Values: Passengers embarked and disembarked in ports / GDP (thousands of $)*

| PUERT P.2 | Pasajeros embarcados y desembarcados en los puertos / PIB (miles de $) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | |
| España | | | | | | 8,8 | MUY BIEN | B |
| Alemania | | | | | | 3,6 | INSUFICIENTE | FX |
| Francia | | | | | | 3,9 | INSUFICIENTE | FX |
| Reino Unido | | | | | | 3,8 | INSUFICIENTE | FX |
| Italia | | | | | | 10,0 | EXCELENTE | A |
| Turquía | | | | | | 1,7 | MUY INSUFICIENTE | F |
| Portugal | | | | | | 2,1 | MUY INSUFICIENTE | F |
| Países Bajos | | | | | | 1,7 | MUY INSUFICIENTE | F |
| Bélgica | | | | | | 1,6 | MUY INSUFICIENTE | F |
| EEUU | | | | | | | | |
| Marruecos | | | | | | | | |
| Japón | | | | | | | | |
| China | | | | | | | | |
| India | | | | | | | | |
| Corea del Sur | | | | | | | | |
| | | | | | | | | |

*Table 21: Indicator PUERT P.2 Rating: Passengers embarked and disembarked in ports / GDP (thousands of $)*

### 4.2.1.3 Indicator PUERT P.3: Container traffic (tons) / Population

| PUERT P.3 | Tráfico de contenedores (t) / Población | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 |
| España | | | | | | 4,14 |
| Alemania | | | | | | 1,51 |
| Francia | | | | | | 0,82 |
| Reino Unido | | | | | | 1,00 |
| Italia | | | | | | 1,71 |
| Turquía | | | | | | 1,42 |
| Portugal | | | | | | 2,58 |
| Países Bajos | | | | | | 7,70 |
| Bélgica | | | | | | 10,25 |
| EEUU | | | | | | |
| Marruecos | | | | | | |
| Japón | | | | | | 2,37 |
| China | | | | | | |
| India | | | | | | |
| Corea del Sur | | | | | | |
| Maximo: | | 10,25 | | Percentil 90%: | 7,955 | 10,00 |
| Mínimo: | | 0,821 | MIN ((Media-Factor min *Desv );0): | | 0 | 1 |
| Media: | | 3,351 | Percentil 90%: | 7,955 | 7,955 | 9,000 |
| Media+Factor max*Desv Estándar: | | 8,104 | Percentil 10%: | 0,983 | Unidad: | 1,131 |
| Media-Factor min*Desv Estándar: | | -1,403 | | Desv. Est.: | 3,169 | |

*Table 22: Indicator PUERT P.3 Values: Container traffic (tons) / Population*

| PUERT P.3 | Tráfico de contenedores (t) / Población | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | |
| España | | | | | | 5,7 | SUFICIENTE | E |
| Alemania | | | | | | 2,7 | MUY INSUFICIENTE | F |
| Francia | | | | | | 1,9 | MUY INSUFICIENTE | F |
| Reino Unido | | | | | | 2,1 | MUY INSUFICIENTE | F |
| Italia | | | | | | 2,9 | MUY INSUFICIENTE | F |
| Turquía | | | | | | 2,6 | MUY INSUFICIENTE | F |
| Portugal | | | | | | 3,9 | INSUFICIENTE | FX |
| Países Bajos | | | | | | 9,7 | EXCELENTE | A |
| Bélgica | | | | | | 10,0 | EXCELENTE | A |
| EEUU | | | | | | | | |
| Marruecos | | | | | | | | |
| Japón | | | | | | 3,7 | INSUFICIENTE | FX |
| China | | | | | | | | |
| India | | | | | | | | |
| Corea del Sur | | | | | | | | |

*Table 23: Indicator PUERT P. Rating3: Container traffic (tons) / Population*

#### 4.2.1.4 Indicator PUERT P.4: Container traffic (tons) / GDP (thousands of $)

| PUERT P.4 | Tráfico de contenedores (t) / PIB (miles de $) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 |
| España | | | | | | 0,14 |
| Alemania | | | | | | 0,03 |
| Francia | | | | | | 0,02 |
| Reino Unido | | | | | | 0,02 |
| Italia | | | | | | 0,05 |
| Turquía | | | | | | 0,16 |
| Portugal | | | | | | 0,11 |
| Países Bajos | | | | | | 0,15 |
| Bélgica | | | | | | 0,22 |
| EEUU | | | | | | |
| Marruecos | | | | | | |
| Japón | | | | | | 0,06 |
| China | | | | | | |
| India | | | | | | |
| Corea del Sur | | | | | | |
| | | | | | | |
| Maximo: | | 0,22 | | Percentil 90%: | 0,162 | 10,00 |
| Mínimo: | | 0,020 | MIN ((Media-Factor min *Desv );0): | | 0 | 1 |
| **Media:** | | 0,096 | Percentil 90%: | 0,162 | 0,162 | 9,000 |
| Media+Factor max*Desv Estándar: | | 0,199 | Percentil 10%: | 0,023 | Unidad: | 55,402 |
| Media-Factor min*Desv Estándar: | | -0,007 | | Desv. Est.: | 0,069 | |

*Table 24: Indicator PUERT P.4 Values: Container traffic (tons) / GDP (thousands of $)*

| PUERT P.4 | Tráfico de contenedores (t) / PIB (miles de $) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | |
| España | | | | | | 8,8 | MUY BIEN | B |
| Alemania | | | | | | 2,8 | MUY INSUFICIENTE | F |
| Francia | | | | | | 2,1 | MUY INSUFICIENTE | F |
| Reino Unido | | | | | | 2,3 | MUY INSUFICIENTE | F |
| Italia | | | | | | 3,8 | INSUFICIENTE | FX |
| Turquía | | | | | | 9,6 | EXCELENTE | A |
| Portugal | | | | | | 7,1 | BIEN | C |
| Países Bajos | | | | | | 9,1 | EXCELENTE | A |
| Bélgica | | | | | | 10,0 | EXCELENTE | A |
| EEUU | | | | | | | | |
| Marruecos | | | | | | | | |
| Japón | | | | | | 4,2 | INSUFICIENTE | FX |
| China | | | | | | | | |
| India | | | | | | | | |
| Corea del Sur | | | | | | | | |
| | | | | | | | | |

*Table 25: Indicator PUERT P.4 Rating: Container traffic (tons) / GDP (thousands of $)*

### 4.2.1.5 Indicator PUERT P.5: Container traffic (TEUs) / Population

| PUERT P.7 | Tráfico de contenedores (TEU) / Población | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 |
| España | | | | | | 0,37 |
| Alemania | | | | | | 0,22 |
| Francia | | | | | | 0,08 |
| Reino Unido | | | | | | 0,13 |
| Italia | | | | | | 0,16 |
| Turquía | | | | | | 0,14 |
| Portugal | | | | | | 0,27 |
| Países Bajos | | | | | | 0,84 |
| Bélgica | | | | | | 1,22 |
| EEUU | | | | | | 0,17 |
| Marruecos | | | | | | 0,19 |
| Japón | | | | | | 0,17 |
| China | | | | | | 0,17 |
| India | | | | | | 0,01 |
| Corea del Sur | | | | | | 1,11 |
| Maximo: | | 1,22 | | Percentil 80%: | 0,462 | 10,00 |
| Mínimo: | | 0,012 | MIN ((Media-Factor min *Desv );0): | | 0 | 1 |
| **Media:** | | 0,350 | Percentil 80%: | 0,462 | 0,462 | 9,000 |
| Media+Factor max*Desv Estándar: | | 0,922 | Percentil 10%: | 0,098 | Unidad: | 19,468 |
| Media-Factor min*Desv Estándar: | | -0,222 | | Desv. Est.: | 0,382 | |

*Table 26: Indicator PUERT P.5 Values: Container traffic (TEUs) / Population*

| PUERT P.7 | Tráfico de contenedores (TEU) / Población | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | |
| España | | | | | | 8,2 | MUY BIEN | B |
| Alemania | | | | | | 5,2 | SUFICIENTE | E |
| Francia | | | | | | 2,5 | MUY INSUFICIENTE | F |
| Reino Unido | | | | | | 3,5 | INSUFICIENTE | FX |
| Italia | | | | | | 4,2 | INSUFICIENTE | FX |
| Turquía | | | | | | 3,7 | INSUFICIENTE | FX |
| Portugal | | | | | | 6,3 | SUFICIENTE ALTO | D |
| Países Bajos | | | | | | 10,0 | EXCELENTE | A |
| Bélgica | | | | | | 10,0 | EXCELENTE | A |
| EEUU | | | | | | 4,3 | INSUFICIENTE | FX |
| Marruecos | | | | | | 4,7 | INSUFICIENTE | FX |
| Japón | | | | | | 4,3 | INSUFICIENTE | FX |
| China | | | | | | 4,4 | INSUFICIENTE | FX |
| India | | | | | | 1,2 | MUY INSUFICIENTE | F |
| Corea del Sur | | | | | | 10,0 | EXCELENTE | A |

*Table 27: Indicator PUERT P.5 Rating: Container traffic (TEUs) / Population*

### 4.2.1.6 Indicator PUERT P.6: Container traffic (TEUs) / GDP (thousands of $)

| PUERT P.8 | Tráfico de contenedores (TEU) / PIB (miles $) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 |
| España | | | | | | 0,012 |
| Alemania | | | | | | 0,005 |
| Francia | | | | | | 0,002 |
| Reino Unido | | | | | | 0,003 |
| Italia | | | | | | 0,005 |
| Turquía | | | | | | 0,015 |
| Portugal | | | | | | 0,012 |
| Países Bajos | | | | | | 0,016 |
| Bélgica | | | | | | 0,026 |
| EEUU | | | | | | 0,003 |
| Marruecos | | | | | | 0,058 |
| Japón | | | | | | 0,004 |
| China | | | | | | 0,017 |
| India | | | | | | 0,006 |
| Corea del Sur | | | | | | 0,017 |
| Maximo: | | 0,06 | | Percentil 80%: | 0,017 | 10,00 |
| Mínimo: | | 0,002 | MIN ((Media-Factor min *Desv );0): | | 0 | 1 |
| **Media:** | | 0,013 | Percentil 80%: | 0,017 | 0,017 | 9,000 |
| Media+Factor max*Desv Estándar: | | 0,035 | Percentil 10%: | 0,003 | Unidad: | 524,052 |
| Media-Factor min*Desv Estándar: | | -0,008 | | Desv. Est.: | 0,014 | |

*Table 28: Inidicator PUERT P.6 Values: Container traffic (TEUs) / GDP (thousands of $)*

| PUERT P.8 | Tráfico de contenedores (TEU) / PIB (miles $) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | |
| España | | | | | | 7,5 | BIEN | C |
| Alemania | | | | | | 3,4 | INSUFICIENTE | FX |
| Francia | | | | | | 2,0 | MUY INSUFICIENTE | F |
| Reino Unido | | | | | | 2,6 | MUY INSUFICIENTE | F |
| Italia | | | | | | 3,6 | INSUFICIENTE | FX |
| Turquía | | | | | | 9,0 | EXCELENTE | A |
| Portugal | | | | | | 7,1 | BIEN | C |
| Países Bajos | | | | | | 9,4 | EXCELENTE | A |
| Bélgica | | | | | | 10,0 | EXCELENTE | A |
| EEUU | | | | | | 2,3 | MUY INSUFICIENTE | F |
| Marruecos | | | | | | 10,0 | EXCELENTE | A |
| Japón | | | | | | 3,2 | INSUFICIENTE | FX |
| China | | | | | | 10,0 | EXCELENTE | A |
| India | | | | | | 4,0 | INSUFICIENTE | FX |
| Corea del Sur | | | | | | 10,0 | EXCELENTE | A |

*Table 29: Indicator PUERT P.6 Rating: Container traffic (TEUs) / GDP (thousands of $)*

#### 4.2.1.7 *Indicador PUERT P.7: Maritime transport line connectivity index (Index 100 in China in Q1 2006) (UNCTAD)*

| PUERT P.9 | Índice de conectividad de líneas de transporte marítimo (Índice 100 en China en Q1 2006) (UNCTAD) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 |
| España | | | | | | 83,913 |
| Alemania | | | | | | 82,462 |
| Francia | | | | | | 74,655 |
| Reino Unido | | | | | | 87,530 |
| Italia | | | | | | 65,898 |
| Turquía | | | | | | 55,184 |
| Portugal | | | | | | 59,231 |
| Países Bajos | | | | | | 88,405 |
| Bélgica | | | | | | 84,587 |
| EEUU | | | | | | 92,907 |
| Marruecos | | | | | | 61,829 |
| Japón | | | | | | 78,196 |
| China | | | | | | 152,877 |
| India | | | | | | 53,967 |
| Corea del Sur | | | | | | 103,410 |
| | | | | | | |
| Maximo: | | 152,88 | MAX ((Media+Factor max*Desv Est.): | | 118,50 | 10,00 |
| Mínimo: | | 53,967 | MIN ((Media-Factor min *Desv );0): | | 44,84176948 | 1 |
| **Media:** | | 81,670 | Percentil 90%: | 99,209 | 73,657 | 9,000 |
| Media+Factor max*Desv Estándar: | | 118,499 | Percentil 10%: | 56,803 | Unidad: | 0,122 |
| Media-Factor min*Desv Estándar: | | 44,842 | | Desv. Est.: | 24,552 | |

*Table 30: Indicator PUERT P.7 Values: Maritime transport line connectivity index (Index 100 in China in Q1 2006) (UNCTAD)*

| PUERT P.9 | Índice de conectividad de líneas de transporte marítimo (Índice 100 en China en Q1 2006) (UNCTAD) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | |
| España | | | | | | 5,8 | SUFICIENTE | E |
| Alemania | | | | | | 5,6 | SUFICIENTE | E |
| Francia | | | | | | 4,6 | INSUFICIENTE | FX |
| Reino Unido | | | | | | 6,2 | SUFICIENTE ALTO | D |
| Italia | | | | | | 3,6 | INSUFICIENTE | FX |
| Turquía | | | | | | 2,3 | MUY INSUFICIENTE | F |
| Portugal | | | | | | 2,8 | MUY INSUFICIENTE | F |
| Países Bajos | | | | | | 6,3 | SUFICIENTE ALTO | D |
| Bélgica | | | | | | 5,9 | SUFICIENTE | E |
| EEUU | | | | | | 6,9 | SUFICIENTE ALTO | D |
| Marruecos | | | | | | 3,1 | INSUFICIENTE | FX |
| Japón | | | | | | 5,1 | SUFICIENTE | E |
| China | | | | | | 10,0 | EXCELENTE | A |
| India | | | | | | 2,1 | MUY INSUFICIENTE | F |
| Corea del Sur | | | | | | 8,2 | MUY BIEN | B |
| | | | | | | | | |

*Table 31: Indicator PUERT P.7 Rating: Maritime transport line connectivity index (Index 100 in China in Q1 2006) (UNCTAD)*

## 4.2.2. Performance Indicator

| | Índice de Prestaciones | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 |
| España | | | | | | 125,2 |
| Alemania | | | | | | 67,7 |
| Francia | | | | | | 48,1 |
| Reino Unido | | | | | | 59,0 |
| Italia | | | | | | 74,2 |
| Turquía | | | | | | 84,6 |
| Portugal | | | | | | 85,6 |
| Países Bajos | | | | | | 137,5 |
| Bélgica | | | | | | 141,2 |
| EEUU | | | | | | 40,4 |
| Marruecos | | | | | | 53,4 |
| Japón | | | | | | 61,4 |
| China | | | | | | 73,1 |
| India | | | | | | 22,1 |
| Corea del Sur | | | | | | 84,5 |
| Maximo: | | 141,198 | | Máxima puntuación: | 153 | 10 |
| Mínimo: | | 22,082 | | Mínima puntuación: | 0 | 0 |
| Media: | | 77,202 | | Dif: | 153,000 | 10,000 |

*Table 32: Performance Indicator Values*

| | Evaluación de Prestaciones | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | |
| España | | | | | | 8,2 | MUY BIEN | B |
| Alemania | | | | | | 4,4 | INSUFICIENTE | FX |
| Francia | | | | | | 3,1 | INSUFICIENTE | FX |
| Reino Unido | | | | | | 3,9 | INSUFICIENTE | FX |
| Italia | | | | | | 4,8 | INSUFICIENTE | FX |
| Turquía | | | | | | 5,5 | SUFICIENTE | E |
| Portugal | | | | | | 5,6 | SUFICIENTE | E |
| Países Bajos | | | | | | 9,0 | EXCELENTE | A |
| Bélgica | | | | | | 9,2 | EXCELENTE | A |
| EEUU | | | | | | 5,0 | SUFICIENTE | E |
| Marruecos | | | | | | 6,6 | SUFICIENTE ALTO | D |
| Japón | | | | | | 4,6 | INSUFICIENTE | FX |
| China | | | | | | 9,0 | EXCELENTE | A |
| India | | | | | | 2,7 | MUY INSUFICIENTE | F |
| Corea del Sur | | | | | | 10,0 | EXCELENTE | A |

*Table 33: Performance Criterion Values*

| Subindicadores de Prestaciones | | Pesos | Punt. Max. | Total Max puntuación |
|---|---|---|---|---|
| PUERT P.1 | Pasajeros embarcados y desembarcados en los puertos / Población | 1 | 10 | 10 |
| PUERT P.2 | Pasajeros embarcados y desembarcados en los puertos / PIB (miles de $) | 1 | 10 | 10 |
| PUERT P.3 | Tráfico de contenedores (t) / Población | 3 | 10 | 30 |
| PUERT P.4 | Tráfico de contenedores (t) / PIB (miles de $) | 3 | 10 | 30 |
| PUERT P.7 | Tráfico de contenedores (TEU) / Población | 3 | 10 | 30 |
| PUERT P.8 | Tráfico de contenedores (TEU) / PIB (miles $) | 3 | 10 | 30 |
| PUERT P.9 | Índice de conectividad de líneas de transporte marítimo (Índice 100 en China en Q1 2006) (UNCTAD) | 3 | 10 | 30 |
| | | 17 | | 170 |
| | | % Valorado de la Max. Puntuación del Criterio | 90,0% | 153 |

*Table 34: Weights and maximum reduced scores of the Performance Indicators*

The indicators related to passengers embarked in the ports per population and GDP, which are exclusively applied to European countries, show the importance of cruise tourism in Italy and, to a lesser extent, in Spain (values of 1.45 and 0.73 passengers embarked per inhabitant, respectively, and 0.043 and 0.025 passengers embarked per thousand $ of GDP, respectively).

The indicators related to container traffic per population and GDP show the same trend as the previous ones: high values for Spain and, to a lesser extent, for Italy; although much lower values than those achieved by Belgium and the Netherlands. In European countries, Turkey stands out for the high value of container traffic per capita GDP (13.02).

The "UNCTAD Maritime Transport Connectivity Index" (with an index of 100 in China in the first quarter of 2006) rates Spain, Germany, the United Kingdom, the Netherlands, Belgium, the United States, China (with the maximum value: 152), and South Korea above 80.

## 4.3. Financing

The question this criterion seeks to answer is: What investment is allocated to the financing of the public works sector? How much is dedicated to infrastructure development? And how much to operation and maintenance?

For the purposes of this report, the following two indicators have been considered:

| 3 FINANCING | |
|---|---|
| F.1 | Investment in port infrastructure / Population |
| F.2 | % Investment in port infrastructure / GDP ($) |

To assess the financing in the Ports sector, one must study the investment in management, operation, conservation, maintenance, and improvement, both in the creation of new infrastructure and its preservation. One of the peculiarities of this sector is the notable variation in service management: each port authority establishes its financing based on its revenues and applies different criteria, which are not always comparable between countries.

Due to the diverse ways of operating and financing ports, conducting a rigorous international comparative study is complex. In this report, we have chosen to analyze the Financing criterion while considering indicators such as investment in port infrastructure per population and per GDP, extracted from the "Maritime port infrastructure investment (OECD) (€)" dataset.

It has been observed that the data on infrastructure investment in Spain for the year 2019 (€929 million) from the OECD's records closely matches the aggregated revenue figure from the state-owned port system (€969.5 million). Naturally, this revenue figure does not correspond to the amount of investment in port infrastructure provided by Puertos del Estado for the year 2019 (€352 million). To facilitate international comparison among countries, we have respected the OECD figures under the label "Investment in road infrastructure," although, it represents the revenue of the main ports in the countries.

| PUERT F DB.5 | Maritime port infrastructure investment (OCDE) (€ corrientes) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 |
| España | | 904.000.000 | 847.000.000 | 920.000.000 | 927.000.000 | 929.000.000 |
| Alemania | | 460.000.000 | 430.000.000 | 410.000.000 | 435.000.000 | 510.000.000 |
| Francia | | 307.520.739 | 310.000.000 | 273.000.000 | 301.000.000 | 241.000.000 |
| Reino Unido | | | | | | |
| Italia | | 1.059.000.000 | 1.032.000.000 | 772.000.000 | 658.000.000 | 1.113.000.000 |
| | | | | | | |
| | | | | | | |
| Turquía | | 83.776.968 | 53.569.872 | 91.231.135 | 91.231.135 | 91.231.135 |
| Portugal | | | | | | |
| Países Bajos | | | | | | |
| Bélgica | | 108.000.000 | 269.000.000 | 180.000.000 | 169.000.000 | 198.000.000 |
| | | | | | | |
| | | | | | | |
| EEUU | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| Marruecos | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| Japón | | 2.109.821.096 | 2.617.434.364 | 2.257.981.800 | 2.247.547.541 | 2.774.051.566 |
| China | | | | | | |
| India | | 66.324.592 | 79.668.460 | 79.668.460 | 79.668.460 | 79.668.460 |
| Corea del Sur | | 1.326.568.444 | 1.338.620.416 | 944.736.313 | 873.884.693 | 860.068.924 |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| Fuente: https://stats.oecd.org/OECDStat_Metadata/ShowMetadata.ashx?Dataset=ITF_INV-MTN_DATA&Coords=%5bVARIABLE%5d | | | | | | |

*Table 35: Maritime port infrastructure investment* (OCDE) (€)

## 4.3.1. Financing indicators

### *4.3.1.1 Indicator PUERT F.1: Investment in port infrastructure / Population*

| PUERT F.1 | Inversión en infraestructuras portuarias / Población | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 |
| España | | | | | | 19,709 |
| Alemania | | | | | | 6,138 |
| Francia | | | | | | 3,584 |
| Reino Unido | | | | | | |
| Italia | | | | | | 18,634 |
| Turquía | | | | | | 1,094 |
| Portugal | | | | | | |
| Países Bajos | | | | | | |
| Bélgica | | | | | | 17,234 |
| EEUU | | | | | | |
| Marruecos | | | | | | |
| Japón | | | | | | 21,906 |
| China | | | | | | |
| India | | | | | | 0,058 |
| Corea del Sur | | | | | | 33,510 |
| Maximo: | | 33,51 | MAX ((Media+Factor max*Desv Est.): | | 30,62 | 10,00 |
| Mínimo: | | 0,058 | MIN ((Media-Factor min *Desv );0): | | 0 | 1 |
| **Media:** | | 13,541 | Percentil 90%: | 24,227 | 30,619 | 9,000 |
| Media+Factor max*Desv Estándar: | | 30,619 | Percentil 10%: | 0,886 | Unidad: | 0,294 |
| Media-Factor min*Desv Estándar: | | -3,538 | | Desv. Est.: | 11,386 | |

*Table 36: Indicator PUERT F.1 Values: Investment in port infrastructure / Population*

| PUERT F.1 | Inversión en infraestructuras portuarias / Población | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | |
| España | | | | | | 6,8 | SUFICIENTE ALTO | D |
| Alemania | | | | | | 2,8 | MUY INSUFICIENTE | F |
| Francia | | | | | | 2,1 | MUY INSUFICIENTE | F |
| Reino Unido | | | | | | | | |
| Italia | | | | | | 6,5 | SUFICIENTE ALTO | D |
| Turquía | | | | | | 1,3 | MUY INSUFICIENTE | F |
| Portugal | | | | | | | | |
| Países Bajos | | | | | | | | |
| Bélgica | | | | | | 6,1 | SUFICIENTE ALTO | D |
| EEUU | | | | | | | | |
| Marruecos | | | | | | | | |
| Japón | | | | | | 7,4 | BIEN | C |
| China | | | | | | | | |
| India | | | | | | 1,0 | MUY INSUFICIENTE | F |
| Corea del Sur | | | | | | 10,0 | EXCELENTE | A |

*Table 37: Indicator PUERT F.1 Rating: Investment in port infrastructure / Population*

#### 4.3.1.2 Indicator PUERT F.2: % Investment in port infrastructure / GDP ($)

| PUERT F.2 | % Inversión en infraestructuras portuarias / PIB ($) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 |
| España | | | | | | 0,0667% |
| Alemania | | | | | | 0,0131% |
| Francia | | | | | | 0,0088% |
| Reino Unido | | | | | | |
| Italia | | | | | | 0,0553% |
| Turquía | | | | | | 0,0120% |
| Portugal | | | | | | |
| Países Bajos | | | | | | |
| Bélgica | | | | | | 0,0370% |
| EEUU | | | | | | |
| Marruecos | | | | | | |
| Japón | | | | | | 0,0541% |
| China | | | | | | |
| India | | | | | | 0,0028% |
| Corea del Sur | | | | | | 0,0521% |
| | | | | | | |
| Maximo: | | 0,0667% | MAX ((Media+Factor max*Desv Est.): | | 0,0007 | 10,00 |
| Mínimo: | | 0,0028% | MIN ((Media-Factor min *Desv );0): | | 0,0000% | 1 |
| **Media:** | | 0,0336% | Percentil 90%: | 0,0576% | 0,0703% | 9,000 |
| Media+Factor max*Desv Estándar: | | 0,0703% | Percentil 10%: | 0,0076% | Unidad: | 12809,670 |
| Media-Factor min*Desv Estándar: | | -0,0032% | | Desv. Est.: | 0,0245% | |

*Table 38: Indicator PUERT F.2 Values: % Investment in port infrastructure / GDP ($)*

| PUERT F.2 | % Inversión en infraestructuras portuarias / PIB ($) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | |
| España | | | | | | 9,5 | EXCELENTE | A |
| Alemania | | | | | | 2,7 | MUY INSUFICIENTE | F |
| Francia | | | | | | 2,1 | MUY INSUFICIENTE | F |
| Reino Unido | | | | | | | | |
| Italia | | | | | | 8,1 | MUY BIEN | B |
| Turquía | | | | | | 2,5 | MUY INSUFICIENTE | F |
| Portugal | | | | | | | | |
| Países Bajos | | | | | | | | |
| Bélgica | | | | | | 5,7 | SUFICIENTE | E |
| EEUU | | | | | | | | |
| Marruecos | | | | | | | | |
| Japón | | | | | | 7,9 | BIEN | C |
| China | | | | | | | | |
| India | | | | | | 1,4 | MUY INSUFICIENTE | F |
| Corea del Sur | | | | | | 7,7 | BIEN | C |
| | | | | | | | | |

*Table 39: Indicator PUERT F.2 rating: % Investment in port infrastructure / GDP ($)*

## 4.3.2. Financing Indicator

| | Índice de Financiación | | | | | | Max valor 2019 |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 | |
| España | | | | | | 16,3 | 18 |
| Alemania | | | | | | 5,5 | 18 |
| Francia | | | | | | 4,2 | 18 |
| Reino Unido | | | | | | | 0 |
| Italia | | | | | | 14,6 | 18 |
| Turquía | | | | | | 3,9 | 18 |
| Portugal | | | | | | | 0 |
| Países Bajos | | | | | | | 0 |
| Bélgica | | | | | | 11,8 | 18 |
| EEUU | | | | | | | 0 |
| Marruecos | | | | | | | 0 |
| Japón | | | | | | 15,4 | 18 |
| China | | | | | | | 0 |
| India | | | | | | 2,4 | 18 |
| Corea del Sur | | | | | | 17,7 | 18 |
| Maximo: | | 17,671 | | Máxima puntuación: | 18 | 10 | |
| Mínimo: | | 2,378 | | Mínima puntuación: | 0 | 0 | |
| Media: | | 10,184 | | Dif: | 18,000 | 10,000 | |
| | | | | | Unidad: | 0,556 | |

*Table 40: Financing Indicator Values*

| Subindicadores de Financiación | | Pesos | Punt. Max. |
|---|---|---|---|
| PUERT F.1 | Inversión en infraestructuras portuarias / Población | 1 | 10 |
| PUERT F.2 | % Inversión en infraestructuras portuarias / PIB ($) | 1 | 10 |
| | | 2 | |
| | | % Valorado de la Max. Puntuación del Criterio | 90,0% |

*Table 41: Financing Indicator Weights*

| | Evaluación de Financiación | | | | | | | | Subindicadores considerados |
|---|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | | |
| España | | | | | | 9,1 | EXCELENTE | A | 2 |
| Alemania | | | | | | 3,0 | INSUFICIENTE | FX | 2 |
| Francia | | | | | | 2,3 | MUY INSUFICIENTE | F | 2 |
| Reino Unido | | | | | | | | | 0 |
| Italia | | | | | | 8,1 | MUY BIEN | B | 2 |
| Turquía | | | | | | 2,1 | MUY INSUFICIENTE | F | 2 |
| Portugal | | | | | | | | | 0 |
| Países Bajos | | | | | | | | | 0 |
| Bélgica | | | | | | 6,6 | SUFICIENTE ALTO | D | 2 |
| EEUU | | | | | | | | | 0 |
| Marruecos | | | | | | | | | 0 |
| Japón | | | | | | 8,5 | MUY BIEN | B | 2 |
| China | | | | | | | | | 0 |
| India | | | | | | 1,3 | MUY INSUFICIENTE | F | 2 |
| Corea del Sur | | | | | | 9,8 | EXCELENTE | A | 2 |

*Table 42: Financing Criterion Rating*

As seen in the breakdown of the financing indicators, Spain achieves an excellent rating in the comparative study among the analyzed countries for which OECD data is available. Unfortunately, due to a lack of data, it has not been possible to evaluate the Netherlands, Belgium, the United States, the United Kingdom, Portugal, and China, making the assessment less than fully rigorous for these countries.

## 4.4. Adaptation to the future and sustainability

The questions addressed in this criterion are: Is the capacity and performance of the public works sector ready to meet future expectations and demands? Are the resources and investment considered adequate to cover the future needs of the sector? How are actions being implemented to ensure environmental sustainability? Are active measures being taken to achieve the established objectives for decarbonizing public works and transportation?

The chosen indicators are as follows:

| 4 ADAPTATION TO THE FUTURE AND SUSTAINABILITY | |
|---|---|
| A.1 | Cumulative year-on-year growth index of investment in port infrastructure (index 100 in 2015) |
| A.2 | % Growth of maritime transport lines connectivity (2019/2015) (UNCTAD) |

The selected indicators: the cumulative year-on-year growth index of investment and the percentage increase in connectivity, provide information on the adaptation to the future of investments and the growth of connectivity of the national ports.

## 4.4.1. Adaptation to the future and Sustainability Indicators

### *4.4.1.1 Indicator PUERT A.1: Cumulative year-on-year growth index of investment in port infrastructure (index 100 in 2015)*

| PUERT A.4 | Índice del crecimiento interanual acumulado de la inversión en infraestructura portuaria (Índice 100 en 2015) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 |
| España | | | | | | 102,8 |
| Alemania | | | | | | 110,9 |
| Francia | | | | | | 78,4 |
| Reino Unido | | | | | | |
| Italia | | | | | | 105,1 |
| Turquía | | | | | | 108,9 |
| Portugal | | | | | | |
| Países Bajos | | | | | | |
| Bélgica | | | | | | 183,3 |
| EEUU | | | | | | |
| Marruecos | | | | | | |
| Japón | | | | | | 131,5 |
| China | | | | | | |
| India | | | | | | 120,1 |
| Corea del Sur | | | | | | 64,8 |
| | | | | | | |
| Maximo: | | 183,33 | | Percentil 90%: | 141,853 | 10,00 |
| Mínimo: | | 64,834 | MIN ((Media-Factor min *Desv );0): | | 61,348866 | 1 |
| **Media:** | | 111,752 | Percentil 90%: | 141,853 | 80,504 | 9,000 |
| Media+Factor max*Desv Estándar: | | 162,156 | Percentil 10%: | 75,662 | Unidad: | 0,112 |
| Media-Factor min*Desv Estándar: | | 61,349 | | Desv. Est.: | 33,602 | |

*Table 43: Indicator PUERT A.1 Values: Cumulative year-on-year growth index of investment in port infrastructure (index 100 in 2015)*

| PUERT A.4 | Índice del crecimiento interanual acumulado de la inversión en infraestructura portuaria (Índice 100 en 2015) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | |
| España | | | | | | 5,6 | SUFICIENTE | E |
| Alemania | | | | | | 6,5 | SUFICIENTE ALTO | D |
| Francia | | | | | | 2,9 | MUY INSUFICIENTE | F |
| Reino Unido | | | | | | | | |
| Italia | | | | | | 5,9 | SUFICIENTE | E |
| Turquía | | | | | | 6,3 | SUFICIENTE ALTO | D |
| Portugal | | | | | | | | |
| Países Bajos | | | | | | | | |
| Bélgica | | | | | | 10,0 | EXCELENTE | A |
| EEUU | | | | | | | | |
| Marruecos | | | | | | | | |
| Japón | | | | | | 8,8 | MUY BIEN | B |
| China | | | | | | | | |
| India | | | | | | 7,6 | BIEN | C |
| Corea del Sur | | | | | | 1,4 | MUY INSUFICIENTE | F |
| | | | | | | | | |

*Table 44: Indicator PUERT A.1 Rating: Cumulative year-on-year growth index of investment in port infrastructure (index 100 in 2015)*

#### 4.4.1.2 Indicator PUERT A.2: % Growth of maritime transport lines connectivity (2019/2015) (UNCTAD)

| PUERT A.5 | %de crecimiento de la conectividad de líneas de transporte marítimo (2019/2015) (UNCTAD) | | | | | |
|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 |
| España | | | | | | 5,34% |
| Alemania | | | | | | -0,64% |
| Francia | | | | | | 8,85% |
| Reino Unido | | | | | | 2,80% |
| Italia | | | | | | 3,88% |
| Turquía | | | | | | 5,55% |
| Portugal | | | | | | 32,89% |
| Países Bajos | | | | | | 8,89% |
| Bélgica | | | | | | 1,19% |
| EEUU | | | | | | 7,82% |
| Marruecos | | | | | | 7,36% |
| Japón | | | | | | 6,06% |
| China | | | | | | 10,37% |
| India | | | | | | 14,02% |
| Corea del Sur | | | | | | 9,82% |
| | | | | | | |
| Maximo: | | 32,89% | | Percentil 70%: | 8,88% | 10,00 |
| Mínimo: | | -0,64% | MIN ((Media-Factor min *Desv );0): | | 0,00% | 1 |
| Media: | | 8,28% | Percentil 70%: | 8,88% | 8,88% | 9,000 |
| Media+Factor max*Desv Estándar: | | 19,95% | Percentil 10%: | 1,84% | Unidad: | 101,371 |
| Media-Factor min*Desv Estándar: | | -3,39% | | Desv. Est.: | 7,78% | |

*Table 45: Indicator PUERT A.2 Values: % Growth of maritime transport lines connectivity (2019/2015) (UNCTAD)*

| PUERT A.5 | %de crecimiento de la conectividad de líneas de transporte marítimo (2019/2015) (UNCTAD) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | |
| España | | | | | | 6,4 | SUFICIENTE ALTO | D |
| Alemania | | | | | | 1,0 | MUY INSUFICIENTE | F |
| Francia | | | | | | 10,0 | EXCELENTE | A |
| Reino Unido | | | | | | 3,8 | INSUFICIENTE | FX |
| Italia | | | | | | 4,9 | INSUFICIENTE | FX |
| Turquía | | | | | | 6,6 | SUFICIENTE ALTO | D |
| Portugal | | | | | | 10,0 | EXCELENTE | A |
| Países Bajos | | | | | | 10,0 | EXCELENTE | A |
| Bélgica | | | | | | 2,2 | MUY INSUFICIENTE | F |
| EEUU | | | | | | 8,9 | MUY BIEN | B |
| Marruecos | | | | | | 8,5 | MUY BIEN | B |
| Japón | | | | | | 7,1 | BIEN | C |
| China | | | | | | 10,0 | EXCELENTE | A |
| India | | | | | | 10,0 | EXCELENTE | A |
| Corea del Sur | | | | | | 10,0 | EXCELENTE | A |
| | | | | | | | | |

*Table 46: Indicator PUERT A.2 Rating: % Growth of maritime transport lines connectivity (2019/2015) (UNCTAD)*

## 4.4.2. Adaptation to the future and Sustainability Indicator

| | Índice de Adaptación al futuro y Desarrollo Sost. | | | | | | Max valor 2019 |
|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | 2019 | |
| España | | | | | | 12,0 | 18 |
| Alemania | | | | | | 7,5 | 18 |
| Francia | | | | | | 12,9 | 18 |
| Reino Unido | | | | | | 3,8 | 9 |
| Italia | | | | | | 10,8 | 18 |
| Turquía | | | | | | 12,9 | 18 |
| Portugal | | | | | | 10,0 | 9 |
| Países Bajos | | | | | | 10,0 | 9 |
| Bélgica | | | | | | 12,2 | 18 |
| EEUU | | | | | | 8,9 | 9 |
| Marruecos | | | | | | 8,5 | 9 |
| Japón | | | | | | 16,0 | 18 |
| China | | | | | | 10,0 | 9 |
| India | | | | | | 17,6 | 18 |
| Corea del Sur | | | | | | 11,4 | 18 |
| Maximo: | | 17,570 | | Máxima puntuación: | 18 | 10 | |
| Mínimo: | | 3,842 | | Mínima puntuación: | 0 | 0 | |
| Media: | | 10,973 | | Dif: | 18,000 | 10,000 | |

*Table 47: Adaptation to the future and Sustainability Indicator Values*

| | Evaluación de Adaptación al futuro y Desarrollo Sost. | | | | | | | | Subindicadores considerados |
|---|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | | |
| España | | | | | | 6,7 | SUFICIENTE ALTO | D | 2 |
| Alemania | | | | | | 4,2 | INSUFICIENTE | FX | 2 |
| Francia | | | | | | 7,2 | BIEN | C | 2 |
| Reino Unido | | | | | | 4,3 | INSUFICIENTE | FX | 1 |
| Italia | | | | | | 6,0 | SUFICIENTE ALTO | D | 2 |
| Turquía | | | | | | 7,2 | BIEN | C | 2 |
| Portugal | | | | | | 10,0 | EXCELENTE | A | 1 |
| Países Bajos | | | | | | 10,0 | EXCELENTE | A | 1 |
| Bélgica | | | | | | 6,8 | SUFICIENTE ALTO | D | 2 |
| EEUU | | | | | | 9,9 | EXCELENTE | A | 1 |
| Marruecos | | | | | | 9,4 | EXCELENTE | A | 1 |
| Japón | | | | | | 8,9 | MUY BIEN | B | 2 |
| China | | | | | | 10,0 | EXCELENTE | A | 1 |
| India | | | | | | 9,8 | EXCELENTE | A | 2 |
| Corea del Sur | | | | | | 6,3 | SUFICIENTE ALTO | D | 2 |

*Table 48: Adaptation to the future and Sustainability Indicator Rating*

| | Subindicadores de Adaptación al futuro y Desarrollo Sost. | Pesos | Punt. Max. |
|---|---|---|---|
| PUERT A.4 | Índice del crecimiento interanual acumulado de la inversión en infraestructura portuaria (Índice 100 en 2015) | 1 | 10 |
| PUERT A.5 | % de crecimiento de la conectividad de líneas de transporte marítimo (2019/2015) (UNCTAD) | 1 | 10 |
| | | 2 | |
| | | % Valorado de la Max. Puntuación del Criterio | 90,0% |

*Table 49: Weights and reduced maximum score for the Indicators of Adaptation to the Future and Sustainability*

The highest-rated countries are the United States (9.9), India (9.8), and China (10.0). Spain receives a relatively high rating (6.7).

## 4.5. Operation and maintenance

The questions posed in this criterion are: Is public infrastructure being operated and maintained according to its needs? Is sufficient investment being made to ensure proper conservation and maintenance?

Reliable and comparable data for a comparative evaluation of the selected countries has not been found.

This criterion will be evaluated solely based on the opinions provided by the selected experts in the qualitative assessment.

## 4.6. Safety

Within this criterion, the safety of the service provided by the ports is evaluated. The questions this criterion aims to answer are: Is the public infrastructure sector safe for users? Are effective measures implemented to ensure safe performance and operation?

Reliable and comparable data for a comparative evaluation of the selected countries has not been found.

This criterion will be evaluated solely based on the opinions provided by the selected experts in the qualitative assessment.

## 4.7. Resilience

Resilience is the ability of a system to return to its initial state once the disturbances that have disrupted the system have ceased. The question posed is as follows: When adverse threats and incidents occur, what is the ability of public infrastructure to prevent, protect, and minimize the consequences for users, the environment, the economy, and national security? Is the public infrastructure prepared to recover its initial state within a reasonable time once the threat or adverse incident has ceased? Are there alternatives available to maintain the service it provides?

Reliable and comparable data for a comparative evaluation of the selected countries has not been found.

This criterion will be evaluated solely based on the opinions provided by the selected experts in the qualitative assessment.

## 4.8. Engineering and Innovation

The evaluation of innovation through indicators aims to address the following questions: Are the resources allocated to engineering in the design, construction, conservation, management, and operation of the public infrastructure sector considered adequate? Is the investment in innovation appropriate? What new techniques, materials, technologies, and operational methods are being implemented to improve public infrastructure? Is there progress in digitalization, monitoring, and sensorization throughout the entire lifecycle of public works? Is the information provided to users adequate?

Reliable and comparable data for a comparative evaluation of the selected countries has not been found.

This criterion will be evaluated solely based on the opinions provided by the selected experts in the qualitative assessment.

# 5. Global Port Assessment through Objective Indicators

As mentioned, it has not been possible to assess the following Criteria: Capacity; Operation and Maintenance; Security; Resilience; and Engineering and Innovation due to a lack of data.

The assessment based on the established Criteria is as follows:

| PUERTOS | Prestaciones | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | |
| España | | | | | | 8,2 | MUY BIEN | B |
| Alemania | | | | | | 4,4 | INSUFICIENTE | FX |
| Francia | | | | | | 3,1 | INSUFICIENTE | FX |
| Reino Unido | | | | | | 3,9 | INSUFICIENTE | FX |
| Italia | | | | | | 4,8 | INSUFICIENTE | FX |
| Turquía | | | | | | 5,5 | SUFICIENTE | E |
| Portugal | | | | | | 5,6 | SUFICIENTE | E |
| Países Bajos | | | | | | 9,0 | EXCELENTE | A |
| Bélgica | | | | | | 9,2 | EXCELENTE | A |
| EEUU | | | | | | 5,0 | SUFICIENTE | E |
| Marruecos | | | | | | 6,6 | SUFICIENTE ALTO | D |
| Japón | | | | | | 4,6 | INSUFICIENTE | FX |
| China | | | | | | 9,0 | EXCELENTE | A |
| India | | | | | | 2,7 | MUY INSUFICIENTE | F |
| Corea del Sur | | | | | | 10,0 | EXCELENTE | A |
| | | | | | | | | |

*Table 50: Performance Criterion Rating*

| PUERTOS | Financiación | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | |
| España | | | | | | 9,1 | EXCELENTE | A |
| Alemania | | | | | | 3,0 | INSUFICIENTE | FX |
| Francia | | | | | | 2,3 | MUY INSUFICIENTE | F |
| Reino Unido | | | | | | | | |
| Italia | | | | | | 8,1 | MUY BIEN | B |
| Turquía | | | | | | 2,1 | MUY INSUFICIENTE | F |
| Portugal | | | | | | | | |
| Países Bajos | | | | | | | | |
| Bélgica | | | | | | 6,6 | SUFICIENTE ALTO | D |
| EEUU | | | | | | | | |
| Marruecos | | | | | | | | |
| Japón | | | | | | 8,5 | MUY BIEN | B |
| China | | | | | | | | |
| India | | | | | | 1,3 | MUY INSUFICIENTE | F |
| Corea del Sur | | | | | | 9,8 | EXCELENTE | A |

*Table 51: Financing Criterion Rating*

| PUERTIA | Adaptación al futuro y desarrollo sostenible | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | |
| España | | | | | | 6,7 | SUFICIENTE ALTO | D |
| Alemania | | | | | | 4,2 | INSUFICIENTE | FX |
| Francia | | | | | | 7,2 | BIEN | C |
| Reino Unido | | | | | | 4,3 | INSUFICIENTE | FX |
| Italia | | | | | | 6,0 | SUFICIENTE ALTO | D |
| Turquía | | | | | | 7,2 | BIEN | C |
| Portugal | | | | | | 10,0 | EXCELENTE | A |
| Países Bajos | | | | | | 10,0 | EXCELENTE | A |
| Bélgica | | | | | | 6,8 | SUFICIENTE ALTO | D |
| EEUU | | | | | | 9,9 | EXCELENTE | A |
| Marruecos | | | | | | 9,4 | EXCELENTE | A |
| Japón | | | | | | 8,9 | MUY BIEN | B |
| China | | | | | | 10,0 | EXCELENTE | A |
| India | | | | | | 9,8 | EXCELENTE | A |
| Corea del Sur | | | | | | 6,3 | SUFICIENTE ALTO | D |
| | | | | | | | | |

*Table 52: Adaptation to the future and Sustainability Criterion Rating*

With the evaluations of the different Criteria, the overall assessment of the Ports sector is determined by applying weights to each criterion. The assigned weights are as follows:

| Criterios de Puertos | | Pesos | Punt. Max. | Total Max puntuación |
|---|---|---|---|---|
| PUERTIC | Capacidad | | | |
| PUERTIP | Prestaciones | 1 | 10 | 10 |
| PUERTIF | Financiación | 1 | 10 | 10 |
| PUERTIA | Adaptación al futuro y desarrollo sostenible | 1 | 10 | 10 |
| PUERTIO | Operación y mantenimiento | | | |
| PUERTIS | Seguridad | | | |
| PUERTIR | Resiliencia | | | |
| PUERTII | Ingeniería e Innovación | | | |
| | | 3 | | 30 |
| | | % Valorado de la Max. Puntuación de los Criterios | 100% | 30 |

*Table 53: Weights assigned to the Criteria for the formation of the Ports Sector Evaluation*

| | Evaluación de la Puertos | | | | | | | | Subindicadores considerados |
|---|---|---|---|---|---|---|---|---|---|
| | 2010 | 2015 | 2016 | 2017 | 2018 | Calificación 2019 | | | |
| España | | | | | | 8,0 | MUY BIEN | B | 11 |
| Alemania | | | | | | 3,9 | INSUFICIENTE | FX | 11 |
| Francia | | | | | | 4,2 | INSUFICIENTE | FX | 11 |
| Reino Unido | | | | | | 4,1 | INSUFICIENTE | FX | 8 |
| Italia | | | | | | 6,3 | SUFICIENTE ALTO | D | 11 |
| Turquía | | | | | | 5,0 | SUFICIENTE | E | 11 |
| Portugal | | | | | | 7,8 | BIEN | C | 8 |
| Países Bajos | | | | | | 9,5 | EXCELENTE | A | 8 |
| Bélgica | | | | | | 7,5 | BIEN | C | 11 |
| EEUU | | | | | | 7,5 | BIEN | C | 4 |
| Marruecos | | | | | | 8,0 | MUY BIEN | B | 4 |
| Japón | | | | | | 7,3 | BIEN | C | 9 |
| China | | | | | | 9,5 | EXCELENTE | A | 4 |
| India | | | | | | 4,6 | INSUFICIENTE | FX | 7 |
| Corea del Sur | | | | | | 8,7 | MUY BIEN | B | 7 |

*Table 54: Ports Sector Evaluation based on objective indicators*

The evaluation of each country in each year in the overall assessment has been conducted using the maximum rating of the country and the corresponding year as a reference (without making any adjustments or limiting the maximum and minimum), in order not to distort the assessment in case data for a particular criterion is not available. It's important to consider this aspect, as the overall evaluation only takes into account the criteria for which reliable data is available.

In countries where data for a specific criterion is missing, the overall sector rating could either increase or decrease based on the outcome of the criterion or criteria that are not being evaluated.

**The countries that are rated highest overall, considering the established indicators, are South Korea (8.7 out of 10), USA (7.5), Japan (7.3), China (9.5), the Netherlands (9.5), and Spain (8.0).**

# 6. Qualitative Evaluation: Surveys to Experts

As described in the methodology employed by Asociación Caminos, once the objective indicators (which have served as the basis for the objective evaluation of the sector in comparison to selected countries) were obtained, a series of questions (grouped into the eight analyzed criteria) were drafted for assessment on the same scale as the assessment of the objective indicators. The questions posed include the possibility of providing comments and suggestions in each group of criteria, to capture those criteria that experts might consider relevant and are not included in the objective indicators or the questionnaire presented.

The questions were directed at a group of experts selected by Asociación Caminos. The survey was transformed into a Google form to facilitate analysis and integration of results.

Two complementary questions are included in the questionnaire sent to the experts:

- What infrastructure and equipment actions do you consider necessary for airports in the next 10 years?
- Approximately, what is the estimated investment required to meet the infrastructure and equipment needs of the sector in the next 10 years?

Since the questions in the questionnaire are very general (evaluating the public works sector of Spain as a whole), it is difficult to provide a precise qualitative and numerical rating. Therefore, a qualitative non-numerical rating has been requested; although to integrate the result obtained with the objective numerical indicators, a numerical assignment is subsequently given to each qualitative rating.

| Rating system of Asociación Caminos | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Asociación Caminos** | | | | | | | |
| | **VERY INSUFFICIENT** | **INFUFFICIENT** | **SUFFICIENT** | **HIGHLY SUFFICIENT** | **GOOD** | **VERTY GOOD** | **EXCELLENT** |
| | **F** | **FX** | **E** | **D** | **C** | **B** | **A** |

*Table 55: Qualitative evaluation rating system by the experts*

| Rating | **Numerical Assignment** |
|---|---|
| Excellent | 9,5 |
| Very good | 8,5 |
| Good | 7,5 |
| Highly sufficient | 6,5 |
| Sufficient | 5,5 |
| Insufficient | 4,0 |
| Very insufficient | 2,0 |
| Insufficient criterion or no response | - |

*Table 56: Numerical assignment of qualitative evaluation by experts*

In a schematic way, the evaluation process for each sector is as follows:

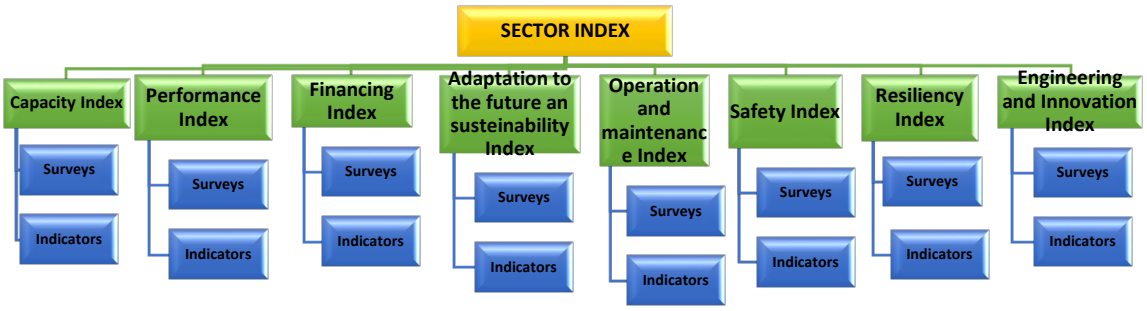



*Figure 8: Scheme of the evaluation system for public works sectors*

Once the responses have been obtained, the results achieved have been analyzed, combining them with the results obtained through the objective indicators.

In general[2], a weighting is established for each Criterion between the quantitative indicators (expressed by objective indicators) and the qualitative evaluation from experts to obtain the Criterion Index, in the following proportions:

**A. Quantitative evaluation of each Criterion: ..... 50%**

**B. Qualitative evaluation of each Criterion by experts through surveys, questionnaires, and opinions ..... 50%**

[2] In some sectors, such as Ports, there is the possibility of modifying this weighting due to the difficulty of quantitative indicators accurately reflecting the reality of the sector.

## 6.1. Survey for expert evaluation

A total of 33 responses have been obtained with the following results.

### 6.1.1. Capacity

| Peso | EVALUACIÓN DE CAPACIDAD (Encuestas a expertos) (Max 10) | | | |
|---|---|---|---|---|
| 1 | 1.1. ¿Cómo valora la infraestructura portuaria en cuanto al acceso y áreas de maniobra de buques? | 7,1 | BIEN | C |
| 1 | 1.2. ¿Cómo valora la infraestructura portuaria en cuanto a la longitud y calado de muelles y atraques? | 6,9 | SUFICIENTE ALTO | D |
| 1 | 1.3. ¿Cómo valora la infraestructura portuaria en cuanto a la superficie de explanada y zonas de almacenamiento disponibles? | 5,7 | SUFICIENTE | E |
| 1 | 1.4. ¿Cómo valora la infraestructura portuaria en cuanto a los medios mecánicos disponibles entierra (grúas, etc.)? | 7,4 | BIEN | C |
| 1 | 1.5. ¿Cómo valora la infraestructura portuaria en cuanto a las conexiones terrestres? | 5,5 | SUFICIENTE | E |
| 1 | 1.7. ¿Cómo valora la especialización en terminales de los puertos españoles? | 7,1 | BIEN | C |
| 6 | TOTAL EVALUACIÓN CAPACIDAD POR LOS EXPERTOS: | 6,6 | SUFICIENTE ALTO | D |

Table 57: Expert assessment of capacity

# Comments, suggestions, and recommendations from the experts

- Spanish ports generally lack clear connectivity (only three/four have capacity in this regard).
- Common management is necessary for multiple ports in the same port area to improve operations.
- Adjacent areas are generally insufficient, and their costs are high.
- Insufficient railway connections.
- Old infrastructure.
- Better road connections are needed, as well as greater efficiency in the entry and exit of containers at terminals.
- Access to the terminal is generally a key infrastructure for terminal development. Additionally, the contribution to the development and implementation of new technologies/energies contributes to the growth of traffic in port facilities. All of this should be supported by a coherent and strategic legislative framework.
- In the Ports of the Balearic Islands, terminals should be offered as concessions to regular users who demand them.
- Improve railway connections at all ports.
- Unify the management of ports in the same port area.
- Improve land infrastructure and reduce costs.

- Speed up connections with access highways.
- Better communication between container terminals, Customs, and Port Community Systems.
- Insufficient berth space in the ports of Ibiza and Palma, especially during the summer season.

## 6.1.2. Performance

| Peso | EVALUACIÓN DE SEGURIDAD (Encuestas a expertos) (Max 10) | | | |
|---|---|---|---|---|
| 1 | 2.1. ¿Cómo valora el servicio de practicaje ofertado en los puertos españoles? | 7,0 | BIEN | C |
| 1 | 2.2. ¿Cómo valora el servicio de remolque ofertado en los puertos españoles? | 6,9 | SUFICIENTE ALTO | D |
| 1 | 2.3. ¿Cómo valora el servicio de amarre ofertado en los puertos españoles? | 7,5 | BIEN | C |
| 1 | 2.4. ¿Cómo valora los servicios para el pasaje ofertados en los puertos españoles? | 6,8 | SUFICIENTE ALTO | D |
| 1 | 2.5. ¿Cómo valora los servicios ofertados para la gestión de mercancías en contenedor en los puertos españoles? | 7,1 | BIEN | C |
| 1 | 2.6. ¿Cómo valora los servicios ofertados para la gestión de graneles líquidos en los puertos españoles? | 7,5 | BIEN | C |
| 1 | 2.7. ¿Cómo valora los servicios ofertados para la gestión de graneles sólidos en los puertos españoles? | 7,3 | BIEN | C |
| 1 | 2.8. ¿Cómo valora los servicios ofertados para la gestión de buques RoRo en los puertos españoles? | 7,2 | BIEN | C |
| 1 | 2.9. ¿Cómo valora los servicios ofertados para la gestión de carga general en los puertos españoles? | 6,8 | SUFICIENTE ALTO | D |
| 1 | 2.10. ¿Cómo valora los servicios MARPOL en los puertos españoles? | 6,9 | SUFICIENTE ALTO | D |
| 1 | 2.11. ¿Cómo valora en líneas generales la conexión intermodal puerto-ferrocarril en el Sistema Portuario Español? | 4,6 | INSUFICIENTE | FX |
| 1 | 2.12. ¿Cómo valora la gestión del tráfico portuario en el Sistema Portuario Español? | 6,6 | SUFICIENTE ALTO | D |
| 1 | 2.13. ¿Cómo valora la señalización marítima? | 7,1 | BIEN | C |
| 1 | 2.14. ¿Cómo valora los suministros de agua y electricidad en el atraque? | 5,7 | SUFICIENTE | E |
| 1 | 2.15. ¿Cómo valora la prestación de servicios de bunker en los puertos españoles? | 6,6 | SUFICIENTE ALTO | D |
| 1 | 2.16. ¿Cómo valora la conectividad tecnológica entre los prestadores de servicios, las Autoridades Portuarias, armadores y cargadores? | 6,6 | SUFICIENTE ALTO | D |
| 1 | 2.17. ¿Qué grado de competencia real tienen los diversos tipos de prestadores en el sistema portuario español? ¿Lo considera suficiente? ¿Cómo se podría incrementar la apertura del mercado a nuevos competidores en cada uno de los servicios? | 6,6 | SUFICIENTE ALTO | D |
| 17 | TOTAL EVALUACIÓN SEGURIDAD POR LOS EXPERTOS: | 6,7 | SUFICIENTE ALTO | D |

*Table 58:Expert Assessment of Performances*

## Comments, suggestions, and recommendations from the experts

- In general, there is a monopoly in the tugboat and pilotage sector. Large terminals owned by shipping companies should have their own pilots and tugboats, without depending on others. The Stevedoring service is completely monopolized by the CPEs, due to the extortion by the Stevedoring unions.
- The cold ironing system is in an embryonic phase.
- As mentioned before, ports should be developed like any business, based on their strengths and their competitors' weaknesses, rather than all aiming for the same thing, which happens to be convenient, clean goods that don't cause complaints or headaches for the officials managing the ports, and who, in the end, seek to work just enough without problems, completely neglecting the real needs and possibilities of the port, in this case, the port of Motril.
- Improvement in port tariffs, optimization of port structures (Port Authorities, Harbormasters, National Police, Civil Guard, Rescue, Customs, etc.).
- Increase the availability of authorities, it cannot be that their operational availability ends at 14:00, and emergency procedures start.
- Captive traffic, such as interisland traffic, the main customers of Port Authorities, are being used to finance a significant portion of the port services provided by Port Authorities. Services like mooring or pilotage, essential for other non-captive traffic, such as cruises, are charged to the shipping companies that operate these connections, obliging us to pay for availability when such services are not needed for these traffics.
- Passenger fees are being used to finance services that should be covered by the traffics in need of these services, instead of using this financing tool and charging higher fees to Canary Island residents.
- No more unnecessary competition in some services, such as stevedoring, and fewer practices of guaranteed profitability in port authorities. Uniform regime services accepted for some cases but not for others, causing discouragement for those of us with concessions.
- Port Authorities should liberalize the Stevedoring market, so that terminals can be more flexible and efficient.
- Harmonization of regulations among ports regarding the use of scrubbers. Legal certainty to avoid regulatory changes.
- Implementation of the corresponding exemptions established in the Law, actions aimed at facilitating maritime traffic between islands and, especially, improving the service provided to users in ports, in direct competition with airports.
- Introduce into port culture, especially among the personnel of Port Authorities, a culture of excellent service to passengers, who are also users and likely the most important ones due to the social service provided by the ports, but also because of the revenue generation for the Port Authorities.
- Licenses subject to appropriate investments for the service to be offered. Capacity increase for maintenance departments of Port Authorities.

### 6.1.3. Financing

| Peso | EVALUACIÓN DE FINANCIACIÓN (Encuestas a expertos) (Max 10) | | | |
|---|---|---|---|---|
| 1 | 3.1. Teniendo en cuenta que los puertos tienen etapas expansivas y etapas de consolidación, ¿considera suficiente la inversión pública actual en infraestructuras portuarias para mantener los niveles de servicio existentes? | 5,3 | SUFICIENTE | E |
| 1 | 3.2. ¿Cómo valora en líneas generales la inversión en conservación y mantenimiento de los puertos españoles? | 5,5 | SUFICIENTE | E |
| 1 | 3.3. ¿Cómo valora el nivel de inversión privada en los puertos españoles? ¿Le parece adecuado el actual sistema de concesiones y la aplicación de tasas por ocupación y actividad? | 5,8 | SUFICIENTE | E |
| 1 | 3.4. ¿Considera adecuada la actual inversión en infraestructuras portuarias en España frente a los países de nuestro entorno? | 5,2 | SUFICIENTE | E |
| 1 | 3.5. ¿Cómo valora la actual inversión de los puertos en sus accesos y conexiones con las redes de transporte terrestre? | 4,6 | INSUFICIENTE | FX |
| 5 | TOTAL EVALUACIÓN FINANCIACIÓN POR LOS EXPERTOS: | 5,3 | SUFICIENTE | E |

*Table 59: Expert Assessment of Financing*

## Comments, suggestions, and recommendations from the experts

- Port Authorities should invest more in connections between Ports and the Hinterland, as poor connections between ports and highways, railways, etc., create a negative perception among the population. OPPE (State Ports and Merchant Marine) should better prepare ports for Climate Change, invest massively in electric connections for container ships, etc. OPPE should create an environment for private energy companies focused on renewable energy to invest in major ports, creating a new industry utilizing renewable energy sources.
- Private investment seems appropriate, but it's not understood why some Public Administrations do not utilize this system when there are interested companies willing to invest.
- There are still general interest ports without railway access.
- Competition should be promoted to attract traffic from the Strait and Finisterre. The bunker service is not well managed and should allow more flexibility for the stakeholders involved.
- Ports like Valencia, Barcelona, Bilbao, Algeciras, Las Palmas, etc., should become generators of renewable energy by installing energy islands in the coastal zone, connected to these ports, and supplying clean energy to households.
- Land connections need to be improved. Furthermore, new concessions should not worsen access to existing ones.

### 6.1.4. Adaptation to the future and Sustainability

| Peso | EVALUACIÓN DE ADAPTACIÓN AL FUTURO Y DESARROLLO SOSTENIBLE (Encuestas a expertos) (Max 10) | | | |
|---|---|---|---|---|
| 1 | 4.1. Teniendo en cuenta que los puertos tienen etapas expansivas y etapas de consolidación, ¿considera suficiente la inversión pública actual en infraestructuras portuarias para mantener los niveles de servicio existentes? | 5,2 | SUFICIENTE | E |
| 1 | 4.2. ¿Cómo valora los actuales sistemas de gestión de tráfico marítimo en los puertos? | 5,9 | SUFICIENTE | E |
| 1 | 4.3. ¿Cómo valora las acciones que se están tomando para reducir las emisiones de CO2 en las instalaciones portuarias? | 6,2 | SUFICIENTE ALTO | D |
| 1 | 4.4. ¿Cómo valora las acciones que se están tomando para gestionar GNL en las instalaciones portuarias? | 5,8 | SUFICIENTE | E |
| 1 | 4.5. ¿Cómo valora las acciones que se están tomando en el ámbito de lucha contra el cambio climático? | 5,4 | SUFICIENTE | E |
| 1 | 4.6. ¿Cómo valora la relación puerto-ciudad? | 5,8 | SUFICIENTE | E |
| 1 | 4.7. ¿Cómo valora los programas de adaptación de la infraestructura portuaria, su gestión y operación a las nuevas tecnologías? | 5,9 | SUFICIENTE | E |
| 1 | 4.8. ¿Cómo considera las medidas que se adoptan para reducir el impacto ambiental y el tratamiento de los residuos en los puertos? | 5,7 | SUFICIENTE | E |
| 8 | TOTAL EVALUACIÓN ADAPTACIÓN AL FUTURO Y DESARROLLO SOSTENIBLE POR LOS EXPERTOS: | 5,7 | SUFICIENTE | E |

*Table 60: Expert Assessment of Adaptation to the Future and Sustainability*

## Comments, suggestions, and recommendations from the experts

- OPPE (State Ports and Merchant Marine) and the Ministry of Transportation, along with local Port Authorities, should create an environment to enhance the readiness of ports against climate change. The industry generating renewable energy should be encouraged, using or expanding areas of major ports to generate clean energy for businesses and cities adjacent to the ports.
- Ports must comply with existing regulations and facilitate waste management, but without inventing local application rules for a global business. Regarding 4.3, there should be decisive economic incentives for shipowners who invest in emissions reduction.
- Ports of the State (Puertos del Estado) assumes an excessive role with the SIMPLE program. Greater participation from stakeholders and a more defined strategy are needed.
- Arid zones are not adequately protected, leading to air and port facility pollution, and even reaching the roadways.
- Transit areas cleaning needs significant improvement; residues and waste on the ground pose health risks for both individuals and vehicles.

- Authorities should enforce collaboration with large companies to prepare ports for the use/generation of clean energy, mass installation of Onshore Power Supply (OPS) in ports, etc.
- The port-city relationship should maintain port operations, which serve as a job generator, economic catalyst, and entry/exit point for commerce. Yielding more of the port to cruise ships, nautical activities, or leisure areas while reducing port operations is a medium to long-term mistake.
- Weekly cleaning of surfaces.
- Modification of the location for the dumping of aggregates.

### 6.1.5. Operation and Maintenance

| Peso | EVALUACIÓN DE OPERACIÓN Y MANTENIMIENTO (Encuestas a expertos) (Max 10) | | | |
|---|---|---|---|---|
| 1 | 5.1. ¿Considera que los medios técnicos y de gestión y organización aplicados a la operación de las instalaciones portuarias son los adecuados para atender las demandas de los usuarios? | 6,1 | SUFICIENTE ALTO | D |
| 1 | 5.2. ¿Considera que los medios técnicos y de gestión y organización aplicados a la conservación y mantenimiento de las instalaciones portuarias son los adecuados para atender las demandas de los usuarios? | 5,8 | SUFICIENTE | E |
| 1 | 5.3. ¿Cómo valora en líneas generales el estado de conservación y mantenimiento de las obras de abrigo en los puertos españoles? | 6,7 | SUFICIENTE ALTO | D |
| 1 | 5.4. ¿Cómo valora en líneas generales el estado de conservación y mantenimiento de las obras de atraque y amarre? | 6,1 | SUFICIENTE ALTO | D |
| 1 | 5.5. ¿Cómo valora en líneas generales el estado de conservación y mantenimiento de las infraestructuras de servicios del puerto (electricidad, abastecimiento, saneamiento, etc.? | 5,9 | SUFICIENTE | E |
| 5 | TOTAL EVALUACIÓN OPERACIÓN Y MANTENIMIENTO POR LOS EXPERTOS: | 6,1 | SUFICIENTE ALTO | D |

*Table 61: Expert Assessment of Operation and Maintenance*

## Comments, suggestions, and recommendations from the experts

- There should be more interaction between the Port Authorities (AP's) and the terminals to understand the needs of port operators.
- Road speed bumps accumulate rainwater and do not properly connect to the sewer system.
- The parking area gets flooded when it rains.
- Port Authorities (AP's) should regularly and proactively engage with Terminals to understand areas for improvement, anticipate significant changes ahead, etc.
- Maintenance operations for critical infrastructure need to be expedited.

### 6.1.6. Safety

| Peso | EVALUACIÓN DE SEGURIDAD (Encuestas a expertos) (Max 10) | | | |
|---|---|---|---|---|
| 1 | 6.1. ¿Cómo valora en líneas generales el nivel de seguridad en los puertos españoles? | 6,3 | SUFICIENTE ALTO | D |
| 1 | 6.2. ¿Cómo valora en líneas generales las medidas adoptadas en la actualidad para prevenir la siniestralidad frente a vertidos en los puertos españoles y su capacidad de reacción? | 6,5 | SUFICIENTE ALTO | D |
| 1 | 6.3. ¿Cómo valora el equipamiento de las instalaciones portuarias para prevenir o reducir los efectos de los accidentes en buques de gran capacidad? | 6,3 | SUFICIENTE ALTO | D |
| 1 | 6.4. ¿Cómo valora el equipamiento de las instalaciones portuarias para prevenir o reducir los efectos de los accidentes derivados de la gestión de mercancías tóxicas y peligrosas? | 6,3 | SUFICIENTE ALTO | D |
| 1 | 6.5. ¿Considera que se están tomando las medidas adecuadas para aumentar en el futuro la seguridad en las instalaciones portuarias? | 6,0 | SUFICIENTE ALTO | D |
| 5 | TOTAL EVALUACIÓN SEGURIDAD POR LOS EXPERTOS: | 6,3 | | D |

*Table 62: Expert Assessment of Safety*

## Comments, suggestions, and recommendations from the experts

- In general, Port Authorities (AP's) do not provide sufficient information to users about the resources available to prevent/solve accidents, spills, etc.
- The disparity in security measures among different ports is significant. An audit is worthwhile to standardize security systems and procedures across state ports.
- Security is an area where PPEE and its network are deficient.
- Port Authorities (AP's), as managers of the ports, should thoroughly study the activities of the terminals to determine where investments in materials/equipment/facilities, etc., are necessary to reduce/avoid the impact of accidents involving hazardous goods, etc.

### 6.1.7. Resilience

| Peso | EVALUACIÓN DE RESILIENCIA (Encuestas a expertos) (Max 10) | | | |
|---|---|---|---|---|
| 1 | 7.1. ¿Cómo valora la capacidad de las instalaciones portuarias para recuperar, en un tiempo razonable, el estado de servicio inicial cuando se producen situaciones adversas temporales? | 6,3 | SUFICIENTE ALTO | D |
| 1 | 7.2. ¿Cómo valora la capacidad de las instalaciones portuarias para recuperar, en un tiempo razonable, el estado de servicio inicial cuando se producen vertidos? | 6,4 | SUFICIENTE ALTO | D |
| 1 | 7.3. ¿Cómo valora la capacidad de las instalaciones portuarias para recuperar, en un tiempo razonable, el estado de servicio inicial cuando se produce el impacto de una embarcación? | 6,5 | SUFICIENTE ALTO | D |
| 1 | 7.4. ¿Cómo valora las medidas que se están llevando a cabo en las infraestructuras portuarias españolas para hacer frente a los efectos del cambio climático? | 5,4 | SUFICIENTE | E |
| 1 | 7.5. ¿Cómo valora el conocimiento real sobre el nivel de resiliencia de las infraestructuras portuarias? | 5,9 | SUFICIENTE | E |
| 1 | 7.6. ¿Cómo valora los planes de contingencia que se aplican en los puertos para prevenir la infraestructura ante incidentes naturales o provocados? | 6,0 | SUFICIENTE ALTO | D |
| 6 | TOTAL EVALUACIÓN RESILIENCIA POR LOS EXPERTOS: | 6,1 | SUFICIENTE ALTO | D |

Table 63: Expert Assessment of resilience

## Comments, suggestions, and recommendations from the experts

- In general, Port Authorities (AP's) should provide better information to port users about measures to recover from disastrous impacts of storms, major accidents, etc., which may disrupt operations at terminals or ports.
- Resilience is a new and unfamiliar concept for users, and generally, for port authorities as well.
- I assume that Port Authorities must have recovery and continuity plans in place, but I'm not familiar with them. .

### 6.1.8. Engineering and innovation

| Peso | EVALUACIÓN DE INGENIERÍA E INNOVACIÓN (Encuestas a expertos) (Max 10) | | | |
|---|---|---|---|---|
| 1 | 8.1. ¿Se consideran adecuados los recursos destinados a la ingeniería en el diseño, construcción, conservación, gestión y operación del sector de puertos? | 6,1 | SUFICIENTE ALTO | D |
| 1 | 8.2. ¿Cómo valora los conocimientos y la actitud técnica de los ingenieros portuarios actuales? | 6,7 | SUFICIENTE ALTO | D |
| 1 | 8.3. ¿Considera adecuados y ajustados a las nuevas tecnologías los conocimientos impartidos en las universidades a los ingenieros portuarios? | 6,1 | SUFICIENTE ALTO | D |
| 1 | 8.4. ¿Cómo valora en líneas generales el Programa Puertos 4.0, si lo conoce? | 6,0 | SUFICIENTE ALTO | D |
| 1 | 8.5. ¿Cómo valora las medidas adoptadas en la licitación pública para favorecer la innovación en las obras portuarias de nueva construcción? | 5,8 | SUFICIENTE | E |
| 1 | 8.6. ¿Cómo considera el nivel de digitalización de los puertos en el momento actual? | 5,9 | SUFICIENTE | E |
| 1 | 8.7. ¿Cómo valora las innovaciones en digitalización de la gestión y operaciones portuarias? | 6,0 | SUFICIENTE | E |
| 1 | 8.8. ¿Cómo valora la integración de las medidas de digitalización en una estrategia general de digitalización a nivel puerto? | 6,0 | SUFICIENTE ALTO | D |
| 1 | 8.9. ¿Cómo valora el nivel de integración digital de las cadenas logísticas en las que se integra el puerto? | 5,7 | SUFICIENTE | E |
| 1 | 8.10. ¿Considera que las inversiones en innovación están trasladándose a la mejora de la eficiencia de los puertos españoles? | 5,6 | SUFICIENTE | E |
| 1 | 8.11. ¿Cómo valora la investigación, desarrollo e innovación que se está desarrollando en España con relación a los puertos? | 5,4 | SUFICIENTE | E |
| 1 | 8.12. ¿Cómo valora la tecnología actual que se está aplicando en los puertos? | 5,8 | SUFICIENTE | E |
| 12 | TOTAL EVALUACIÓN INGENIERÍA E INNOVACIÓN POR LOS EXPERTOS: | 5,9 | SUFICIENTE | E |

Table 64: Expert Assessment of Engineering and Innovation

## Comments, suggestions, and recommendations from the experts

Port Authorities (AP's) should publicly showcase their knowledge of new technologies and recommend their applications.

## 6.2. Supplementary Questionnaire

Among the questions posed to the experts, a supplementary questionnaire has been included with the following questions:

| | |
|---|---|
| **CP.1** | **What type of port infrastructure and equipment needs do you consider will be necessary in the next 10 years?** |
| **CP.2** | **How much investment do you estimate will be required to develop the port infrastructure and equipment needs in the next 10 years?** |

### CP.1 What type of port infrastructure and equipment needs do you consider will be necessary in the next 10 years?

- In my opinion, ports should help reduce the negative impact of Climate Change, and this involves creating areas in the ports focused on purifying/recycling rainwater, generating fresh water, then producing clean energy for the port itself and the city, and also promoting biodiversity activities in the coastal area near the ports.
- Logistics activity zones near the terminals, investment in alternative energies compatible with port uses.
- In general, those related to decarbonization and automation: electrical connection, new fuel supply systems, installation of renewable energy sources (solar panels, wind turbines), beacon systems for maneuvering assistance, automatic mooring systems. In some ports, capacity expansions will be necessary.
- Connectivity, resilience, digitalization, and intercommunication, grouping of ports in the management of common port fronts, etc.
- In the Melilla port, an adaptation to the new times.
- A good railway access is necessary.
- Promote rail/intermodal ports further.
- Improvements in land and rail connections, as well as a greater number of non-intrusive inspection equipment.
- Expansion of berthing lines in congested ports.
- Nearby electric vehicle charging point.
- Create second-line space and make port fees more competitive.
- According to the port and the business needs in that port, connections, storage, machinery, pollution protection measures, etc.

- More modern terminals, ready for automation and OPS. More substations.
- Railway access wherever necessary. More storage area for goods.
- Adaptation to new fuels and cabotage services. Use of LNG as fuel and shipping goods by train from North to South of Spain.
- Each port is unique. Some ports require technology, while others need infrastructure.

Digitalization, use of alternative energies, development of new technologies, and utilization of existing ones, reduction of bureaucracy through digital systems, the need for effective and real digitalization of administration, etc.

## CP.2.- How much investment do you estimate will be required to develop the port infrastructure and equipment needs in the next 10 years?

- 1st invest in energy infrastructure to generate clean energy and supply the ports, docked ships, and the city;
- 2nd create infrastructure for wastewater recycling, generating fresh water;
- 3rd improve connections with the hinterland through more investment in the railway network and upgrading highways that lead to/from the ports.
- Billions of Euros in the Spanish port territory.
- Considering only electrical connections to the ports, the investment amount should be over 100 million Euros in each medium-sized port.
- The more investments are truly directed towards improvement, the better. Our ports should be at the forefront in Europe.
- In large ports, around 300 million Euros.

## 6.3. Overall evaluation of the airports by the experts

Integrating the evaluation provided by the experts across different criteria, the overall result of the evaluation of the ports is as follows:

| Evaluación del sector Puertos por los expertos (Max: 10) | | 33 | | |
|---|---|---|---|---|
| Pesos del criterio | CRITERIOS | CALIFICACIÓN AICCP | | |
| 1 | CAPACIDAD | 6,6 | SUFICIENTE ALTO | D |
| 1 | PRESTACIONES | 6,7 | SUFICIENTE ALTO | D |
| 1 | FINANCIACIÓN | 5,3 | SUFICIENTE | E |
| 1 | ADAPTACIÓN AL FUTURO Y DESARROLLO SOSTENIBLE | 5,7 | SUFICIENTE | E |
| 1 | OPERACIÓN Y MANTENIMIENTO | 6,1 | SUFICIENTE ALTO | D |
| 1 | SEGURIDAD | 6,3 | SUFICIENTE ALTO | D |
| 1 | RESILIENCIA | 6,1 | SUFICIENTE ALTO | D |
| 1 | INGENIERÍA E INNOVACIÓN | 5,9 | SUFICIENTE | E |
| Sector Puertos. Evaluación ponderada por los expertos | | 6,1 | SUFICIENTE ALTO | D |
| Respuestas recibidas: 33 | | | | |

Table 65: Overall evaluation of the ports by the experts

# 7. Overall assessment based on objective indicators and expert evaluations

| Evaluación del sector Puertos por los expertos (Max: 10) | | 33 | | |
|---|---|---|---|---|
| Pesos del criterio | CRITERIOS | CALIFICACIÓN AICCP | | |
| 1 | CAPACIDAD | 6,6 | SUFICIENTE ALTO | D |
| 1 | PRESTACIONES | 6,7 | SUFICIENTE ALTO | D |
| 1 | FINANCIACIÓN | 5,3 | SUFICIENTE | E |
| 1 | ADAPTACIÓN AL FUTURO Y DESARROLLO SOSTENIBLE | 5,7 | SUFICIENTE | E |
| 1 | OPERACIÓN Y MANTENIMIENTO | 6,1 | SUFICIENTE ALTO | D |
| 1 | SEGURIDAD | 6,3 | SUFICIENTE ALTO | D |
| 1 | RESILIENCIA | 6,1 | SUFICIENTE ALTO | D |
| 1 | INGENIERÍA E INNOVACIÓN | 5,9 | SUFICIENTE | E |
| Sector Puertos. Evaluación ponderada por los expertos | | 6,1 | SUFICIENTE ALTO | D |
| Respuestas recibidas: 33 | | | | |

Table 66: Overall assessment by the experts

| Evaluación del sector Puertos por indicadores objetivos (Max: 10) | | | | |
|---|---|---|---|---|
| Pesos del criterio | CRITERIOS | CALIFICACIÓN AICCP | | |
| | CAPACIDAD | | | |
| 1 | PRESTACIONES | 8,2 | MUY BIEN | B |
| 1 | FINANCIACIÓN | 9,1 | EXCELENTE | A |
| 1 | ADAPTACIÓN AL FUTURO Y DESARROLLO SOSTENIBLE | 6,7 | SUFICIENTE ALTO | D |
| | OPERACIÓN Y MANTENIMIENTO | | | |
| | SEGURIDAD | | | |
| | RESILIENCIA | | | |
| | INGENIERÍA E INNOVACIÓN | | | |
| Sector Puertos. Evaluación ponderada por indicadores objetivos | | 8,0 | MUY BIEN | B |
| Indicadores considerados: 11 | | | | |

Table 67: Overall assessment based on objective indicators

| Evaluación final del sector Puertos (Max: 10) | | | | |
|---|---|---|---|---|
| Pesos del criterio | CRITERIOS | CALIFICACIÓN FINAL AICCP (50% evaluación por indicadores; 50% evaluación por expertos) | | |
| 1 | CAPACIDAD | 6,6 | SUFICIENTE ALTO | D |
| 1 | PRESTACIONES | 7,5 | BIEN | C |
| 1 | FINANCIACIÓN | 7,2 | BIEN | C |
| 1 | ADAPTACIÓN AL FUTURO Y DESARROLLO SOSTENIBLE | 6,2 | SUFICIENTE ALTO | D |
| 1 | OPERACIÓN Y MANTENIMIENTO | 6,1 | SUFICIENTE ALTO | D |
| 1 | SEGURIDAD | 6,3 | SUFICIENTE ALTO | D |
| 1 | RESILIENCIA | 6,1 | SUFICIENTE ALTO | D |
| 1 | INGENIERÍA E INNOVACIÓN | 5,9 | SUFICIENTE | E |
| Sector Puertos. Evaluación ponderada final | | 6,5 | SUFICIENTE ALTO | D |

Table 68: Final evaluation based on objective indicators and by the experts

# ANNEXES

**Annex 1: List of Tables**

**Annex 2: List of Figures**

**Annex 3: Acronyms**

**Annex 4: Bibliography and References**

**Annex 5: Infrastructure Indicators from Key International Organizations**

1. **OCDE--International Transport Forum**
2. **EUROSTAT**
3. **United Nations Conference on Trade and Development (UNCTAD)**
4. **"Report Card for America´s infrastructure." American Society of Civil Engineers (ASCE)**
5. **"The Global Competitiveness Report (GCI)". World Economic Forum (WEF)**
6. **"The Global Adaptation Index (ND-Gain Indicators)". University of Notre Dame (EE.UU.)**
7. **"Transport in the European Union". European Commission.**

**Annex 6: Port Indicators from Major Spanish Organizations**

# ANNEX 1

## List of Tables

# ANNEX 2

## List of figures

# ANNEX 3

## Acronyms

| | |
|---|---|
| ASCE | AMERICAN SOCIETY OF CIVIL ENGINEERS |
| BTS | BUREAU OF TRANSPORTATION STATISTICS (USA) |
| OECD | ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT |
| EE.UU. | THE UNITED STATES OF AMERICA |
| USDT | U.S. DEPARTMENT OF TRANSPORTATION |
| WB | THE WORLD BANK |
| WEF | WORLD ECONOMIC FORUM |
| GCI | GLOBAL COMPETITIVENESS INDEX (WEF) |
| LPI | LOGISTIC PERFORMANCE INDEX (WB) |
| ITF | Internacional Transport Forum |

# ANNEX 4

## Bibliography and references


- World Bank “Connecting to Compete. Trade Logistics in the Global Economy” Years 2010-2019”
- World Economic Forum “The Global Competitiveness Report” Years 2010-2022”. **http://documents.worldbank.org/curated/en/576061531492034646/Connecting-to-compete-2018-trade-logistics-in-the-global-economy-the-logistics-performance-index-and-its-indicators.**
- United Nations Conference on Trade and Development (UNCTAD)
- Puertos del Estado. España
    - Anuario Estadístico del Sistema Portuario. 2015, 2016, 2017, 2018, 2019 and 2020
- OECD-International Transport Forum-Report "Transport Infrastructure InvestmentOptions for Efficiency" (Ed 2022)
- OECD-International Transport Forum-Report "Key Transport Statistics 2019 Data"
- European Commission “Statistical pocketbook”. Years 2010-2022
- Ministerio de Transportes, Movilidad y Agenda Urbana de España- Los transportes y las infraestructurasinforme anual 2019 y 2020
- Ministerio de Transportes, Movilidad y Agenda Urbana de EspañaAnuario Estadístico 2019 y 2020
- Eurostat- Report "Energy, transport and environment indicators" 2022 Edition
- Eurostat- Report "Energy balance sheets 2015 DATA"2019 edition
- International Energy AgencyReport "Energy efficiency indicators, Highlights" 2019
- Comisión Europea. Transport in the European Union. Current Trends and Issues. March 2019.
- Comisión Europea. *Putting European transport on track for the future.* ***https://transport.ec.europa.eu/system/files/2021-04/2021-mobility-strategy-and-action-plan.pdf***
- Ministerio de Transportes, Movilidad y Agenda Urbana de España. Observatorio del transporte y la movilidad 2019.
- American Society Of Civil Engineers (ASCE). *Report Card for America’s Infraestructure.* **https://www.infrastructurereportcard.org/**
- World Bank. Logistic Performance Index (LPI)
- World Económic Forum. *Global Competitiveness Index* (GCI)
- **https://ec.europa.eu/transport/**
- **http://www.worldbank.org/**
- **https://www.weforum.org/**
- **https://www.itf-oecd.org/**
- **http://ec.europa.eu/eurostat/**
- **http://observatoriotransporte.fomento.es**

- http://www.worldportsource.com/countries.php
- https://www.searates.com/maritime/netherlands.html
- https://www.aapa-ports.org
- https://www.marad.dot.gov/resources/data-statistics/
- https://www.iaphworldports.org/
- https://maritimeintelligence.informa.com/content/top-100-ports
- https://www.iaphworldports.org/statistics
- https://www.aapa-ports.org/unifying/c
- https://www.cruiseindustrynews.com/
- http://www.imo.org/
- https://gisis.imo.org/
- https://www.marinetraffic.com/
- https://www.searates.com/
- http://www.worldshipping.org/

# ANNEX 5

## Infrastructure Indicators from Key International Organizations

1. **OCDE--International Transport Forum**
2. **EUROSTAT**
3. **United Nations Conference on Trade and Development (UNCTAD)**
4. **"Report Card for America´s infrastructure." American Society of Civil Engineers (ASCE)**
5. **"The Global Competitiveness Report (GCI)". World Economic Forum (WEF)**
6. **"The Global Adaptation Index (ND-Gain Indicators)". University of Notre Dame (EE.UU.)**
7. **"Transport in the European Union". European Commission.**
8. **"World Bank – Urban Transport Data Analysis Tool"**

## 1.- OECD-International Transport Forum. https://www.itf-oecd.org/

The International Transport Forum (ITF) is an intergovernmental organization within the framework of the Organization for Economic Cooperation and Development (OECD). It serves as an expert group for global transportation policy issues and organizes an annual summit of transport ministers. Their website is: **https://www.itf-oecd.org/**

The OECD maintains a database covering 157 countries, providing general statistical data and information on various topics (agriculture and fisheries, education and training, development, environment, etc.). Among all the topics, the Transport section specifically addresses different modes of transportation. Their website is: **http://stats.oecd.org/**

Additionally, the OECD provides a set of indicators related to transportation (roads, railways, airports, and inland water transport), which can be accessed on the following webpage: **http://stats.oecd.org/Index.aspx?DataSetCode=ITF_INDICATORS**

The general and port sector indicators include:

- Transport Infrastructure
  - Total investment in land transport infrastructure as a percentage of GDP
  - Total investment in land transport infrastructure in current USD per capita
  - Investment in inland waterway infrastructure as a percentage of GDP
  - Investment in inland waterway infrastructure in current USD per capita
  - Percentage of investment in inland waterway infrastructure in total inland transport infrastructure investment
- Transport Figures
  - Ton-kilometers of freight transport per thousand units of real GDP in USD
  - Passenger-kilometers of inland transport per thousand units of real GDP in USD
  - Ton-kilometers of freight transport by inland waterways per thousand units of real GDP in USD
  - Percentage of inland waterway freight transport in total inland freight transport
- Energy and Environment
  - CO2 emissions from transport in tons per capita
  - CO2 emissions from transport in tons per million units of real GDP in USD
  - Percentage of CO2 emissions from transport in total CO2 emissions
  - Percentage of CO2 emissions from international maritime bunkers in total CO2 emissions
- Short-Term Indicators
  - Freight transport by inland waterways (Ton-kilometers, millions)
  - National inland waterway freight transport (Ton-kilometers, millions)
  - International inland waterway freight transport (Ton-kilometers, millions)

## 2.- EUROSTAT.https://ec.europa.eu/info/departments/eurostat-european-statistics_es

Eurostat is the statistical office of the European Commission, producing data about the European Union and its 27 member countries, and promoting the harmonization of statistical methods among EU member states and other European countries. Based on these principles, the report "Energy, Transport and Environment Indicators" is published, which gathers indicators of interest related to these three areas, and their figures can also be found in Eurostat's database.

The indicators featured in this report that specifically relate to maritime transportation include:

- Self-propelled ships, tugboats, and pusher craft, by year of construction.

**http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=iww_eq_age&lang=en**

- Self-propelled ships, silent ships, and pusher craft, by cargo capacity.

**http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=iww_eq_loadcap&lang=en**

- Goods transport by inland waterways (thousand tonnes TKM).

**http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=iww_go_atygo&lang=en**

- Gross weight of goods handled in all ports, by flow direction Inwards/Outwards (thousand tonnes).

**http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=mar_mg_aa_cwhd&lang=en**

- Top 20 ports: the gross weight of goods handled in each port, by flow direction Inwards/Outwards (thousand tonnes).

**http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=mar_mg_aa_pwhd&lang=en**

- Gross weight of goods handled in all ports by flow direction, Inwards/Outwards (thousand tonnes).

**http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=mar_go_aa&lang=en**

- Number of passengers in maritime transport embarked and disembarked in all ports (million passengers).

**http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=mar_mp_aa_cph&lang=en**

## 3.- United Nations Conference on Trade and Development (UNCTAD)

The United Nations Conference on Trade and Development (UNCTAD) is a permanent intergovernmental body established by the United Nations General Assembly in 1964. The organization's objectives are to "maximize the trade, investment, and development opportunities of developing countries, as well as to assist them in their efforts to integrate into the world economy." UNCTAD offers analysis, consensus-building, and technical assistance to achieve these goals.

UNCTAD provides a series of indicators that can be accessed on the website: http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx

These indicators include:

- World Merchant Fleet
  - Merchant fleet by flag of registration and by type of ship, annual, 1980-2018 (Dead weight tons in thousands, Percentage of total world, Percentage of total fleet, Number of ships, Gross Tonnage in thousands).
  - Merchant fleet by country of beneficial ownership, annual, 2014 - 2017 (Dead weight tons in thousands, Percentage of total fleet, Number of ships).
  - Ship scrapping by country of demolition, annual, 2014-2017 (Gross Tonnage, Percentage of total all economies).
  - Ships built by country of building, annual, 2014-2017 (Gross Tonnage, Percentage of total all economies).
- Maritime Transport Indicators
  - Liner shipping connectivity index, annual, 2004-2017 (Index - Maximum 2004=100-).
  - Liner shipping bilateral connectivity index, annual, 2006-2016 (Index).
  - Container port throughput, annual, 2010-2016 (TEU -Twenty-foot Equivalent Unit-).
- World Seaborne Trade
  - World seaborne trade by types of cargo and by group of economies, annual, 1970-2016 (Metric tons in millions).
  - World Bank: https://worldroadstatistics.org/
  - World Economic Forum: https://www.weforum.org/
  - European Commission: https://ec.europa.eu/commission/index_en
  - International Energy Agency: https://www.iea.org/
  - American Society of Civil Engineers: https://www.fhwa.dot.gov/
  - Sustainable Development Goals (SDGs) indicators for the 2030 Agenda for Sustainable Development (UNSDG).

## 4.- "Report Card for America´s infrastructure." American Society of Civil Engineers (ASCE)

The "Report Card for America's Infrastructure" by ASCE (American Society of Civil Engineers) is the reference used by the Asociación Caminos for the preparation of this report. The report exclusively focuses on the scope of the United States, without conducting comparative studies with other countries or describing the specific methodology employed. The established indicators are not known, but the report provides generalized results with a rating that allows us to conclude whether the analyzed sectors of public works and services in the U.S. have improved or deteriorated compared to the previous period.

The latest edition of the "Infrastructure Report Card"[3] from 2021, analyzes eight criteria: capacity, physical condition, financing, future needs, operation and maintenance, public safety, resilience, and innovation.


*Figure 9: Criteria analyzed in the IRC Report, ASCE 2021*

As can be seen in the table below, the assessment system used by Asociación Caminos is similar to the ASCE[4] system.

| ESPAÑA | 0,0 a 2,9 | 3,0 a 4,9 | 5,0 a 5,9 | 6,0 a 6,9 | 7,0 a 7,9 | 8,0 a 8,9 | 9,0 a 10 |
|---|---|---|---|---|---|---|---|
| | SUSPENSO | | APROBADO | | NOTABLE | | SOBRESALIENTE |
| ECTS | FAIL | FAIL | SUFFICIENT | SATISFACTORY | GOOD | VERY GOOD | EXCELLENT |
| | F | FX | E | D | C | B | A |
| ASOCIACIÓN CAMINOS | MUY INSUFICIENTE | INSUFICIENTE | SUFICIENTE | SUFIENTE ALTO | BIEN | MUY BIEN | EXCELENTE |
| | F | FX | E | D | C | B | A |
| INFORME ASCE | CRITICAL | FAILING | POOR | | MEDIOCRE | GOOD | EXCEPTIONAL |
| | 1 (F) | 2 (F) | 3 (D) | | 4 (C) | 4 (B) | 5 (A) |
| GPA EEUU 1 | F | | C B- | B | B+ | | A |
| GPA EEUU 2 | F | | D- D | D+ C- | C C+ | B- B | B+ A- A |

*Table 69: Rating system of the sector index used by Asociación Caminos and its equivalence with the system used in this report*

The full global report can be found at: [https://infrastructurereportcard.org/wp-content/uploads/2020/12/National_IRC_2021-report.pdf](https://infrastructurereportcard.org/wp-content/uploads/2020/12/National_IRC_2021-report.pdf)

[3] National_IRC_2021-report-2.pdf (infrastructurereportcard.org)

[4] The ASCE system uses letters accompanied by "+" and "-" signs to indicate if it is slightly above or below the assigned letter level. To create an equivalent system, the Report of Asociación Caminos, which quantifies the state of the sector numerically on a scale of 0 to 10, allows for a correspondence with the previously published Infrastructure Report Card (IRC) reports.

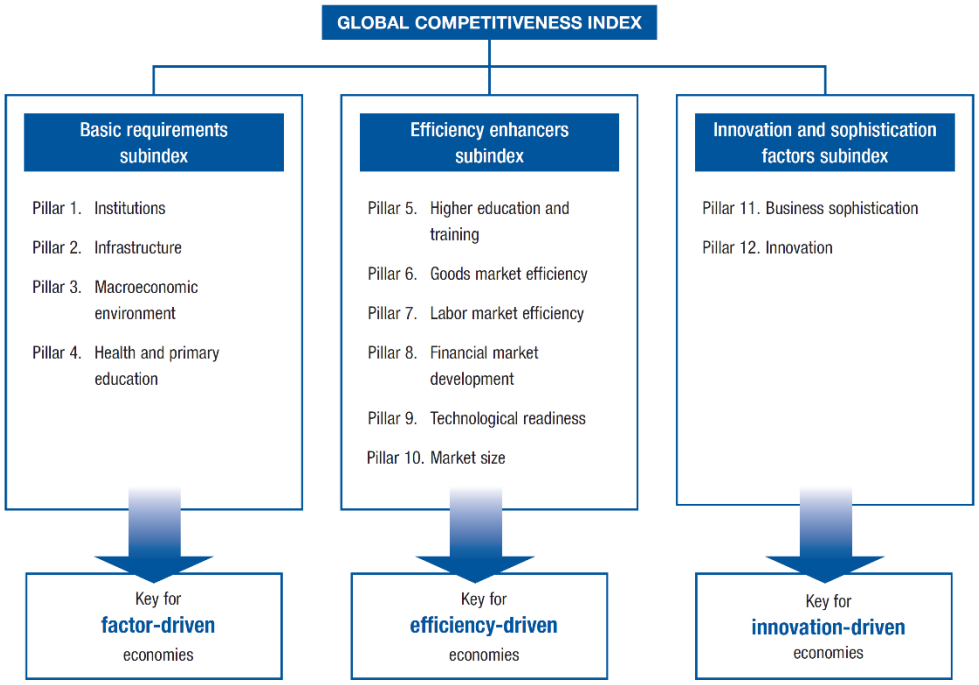
## *5.- "The Global Competitiveness Report". World Economic Forum*

The World Economic Forum (WEF) produces a series of annual economic reports. Among them, the "Global Competitiveness Report (2019)" [5] provides an analysis of countries with data from the year 2019, creating a list of indicators and a main index called the Global Competitiveness Index (GCI).

This global competitiveness index combines 114 components grouped into twelve policy domains or "pillars" that measure, through an indicator, three main categories or "sub-indices." Each category assesses the development of each "pillar" for the 141 participating countries.

The main categories are:

- S1: Basic Requirements
- S2: Enhancers of Efficiency
- S3: Innovation and Complexity Factors




Fuente: World Economic Forum

*Figure 10: Outline of the Composition of the GCI Indicator by the WEF*

Infrastructure is considered a fundamental requirement for a country's development, and it has sufficient significance to be part of one of the four pillars comprising Subindex 1 - Basic Requirements. The assessment of its indicator is carried out through nine main components based on survey ratings and objective data.

[5] WEF_TheGlobalCompetitivenessReport2019.pdf (weforum.org)

The calculation of the Global Competitiveness Index (GCI) is based on successive aggregations of ratings of the disaggregated indicator levels until the overall GCI is obtained. The weighting of the three main categories (subindices) depends on the development level of each country. To determine the weight of each pillar, a percentage weight is assigned to each indicator in advance, and the value of each component of the pillar is obtained from a series of surveys, adjusted with objective data to which a weight is assigned. The maximum rating is 100 and the minimum is 0.

Pillar 2: Infrastructure represents 8.3% of weight in the overall index, with the following weighting:

**Pillar 2: Infrastructure ..... 8.3%**

**A. Transport infrastructure ..... 50%[2]**

I. Road ..... 25%
- 2.01 Quality of road network
- 2.02 Quality of road infrastructure

II. Rail ..... 25%
- 2.03 Railroad density
- 2.04 Efficiency of train services

III. Air ..... 25%
- 2.05 Airport connectivity
- 2.06 Efficiency of air transport services

IV. Sea ..... 25%
- 2.07 Liner shipping connectivity[3]
- 2.08 Efficiency of seaport services

**B. Utility infrastructure ..... 50%**

I. Electricity ..... 50%
- 2.09 Electricity access
- 2.10 Electricity quality

II. Water ..... 50%
- 2.11 Exposure to unsafe drinking water
- 2.12 Reliability of water supply

*Figura 11: Weighting of the Infrastructure Indicator in the 2019 GCI (Global Competitiveness Index) by the WEF (World Economic Forum)*

Ports account for 50% of the total rating for public utility infrastructure, while electricity accounts for the remaining 50%.

Spain's score in the infrastructure pillar is 90.3 out of 100, ranking seventh out of 141 countries worldwide.

| | | | |
|---|---|---|---|
| **2nd pillar: Infrastructure** 0–100 | - | **90.3** ↑ | **7** |
| **Transport infrastructure** 0–100 | - | **83.6** ↑ | **9** |
| 2.01 Road connectivity 0–100 (best) | 100.0 | 100.0 ↑ | 1 |
| 2.02 Quality of road infrastructure 1–7 (best) | 5.7 | 78.4 ↑ | 11 |
| 2.03 Railroad density km/1,000 km[[2 | 31.1 | 77.9 ↑ | 28 |
| 2.04 Efficiency of train services 1–7 (best) | 5.4 | 72.9 ↓ | 9 |
| 2.05 Airport connectivity score | 813,743.1 | 100.0 = | 8 |
| 2.06 Efficiency of air transport services 1–7 (best) | 5.6 | 76.9 ↑ | 18 |
| 2.07 Liner shipping connectivity 0–100 (best) | 90.1 | 90.1 ↑ | 11 |
| 2.08 Efficiency of seaport services 1–7 (best) | 5.4 | 73.0 ↑ | 16 |
| **Utility infrastructure** 0–100 | - | **97.0** ↑ | **19** |
| 2.09 Electricity access % of population | 100.0 | 100.0 = | 2 |
| 2.10 Electricity supply quality % of output | 9.5 | 94.3 ↓ | 56 |
| 2.11 Exposure to unsafe drinking water % of population | 0.4 | 100.0 = | 19 |
| 2.12 Reliability of water supply 1–7 (best) | 6.6 | 93.6 ↑ | 16 |

*Figure 12: Infrastructure indicators of the GCI (Global Competitiveness Index) from the WEF (World Economic Forum) in 2019*

Spain's overall rating in the GCI indicator is 75%, placing it 23rd out of 141 countries.

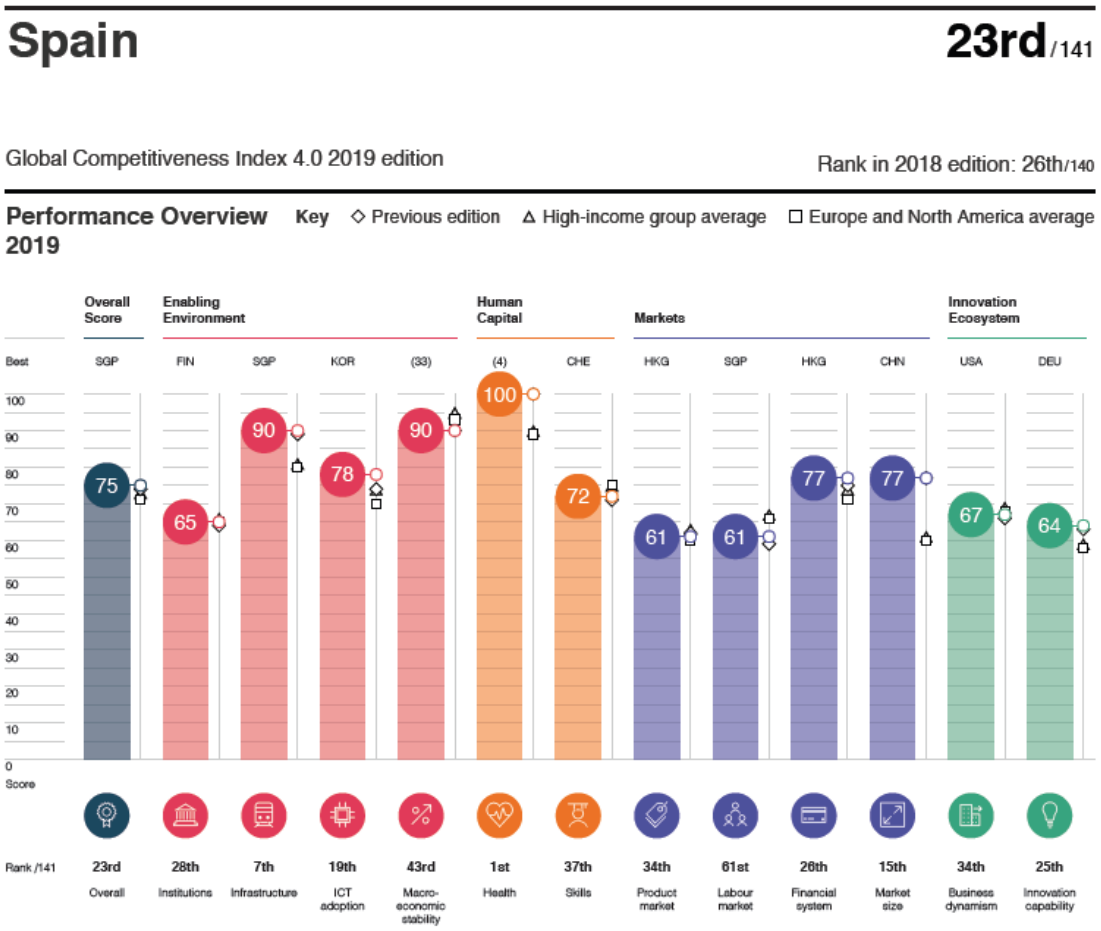



*Figure 13: Spain's overall assessment in the GCI indicator of the World Economic Forum (2019)*

## *6.- "The Global Adaptation Index (ND-Gain Indicators)". University of Notre Dame (EE.UU.)*

The Global Adaptation Index (ND-GAIN) [6] by the University of Notre Dame is an open-source index that assesses a country's **vulnerability**[7] to climate change and its **readiness**[8] to utilize public and private sector investment for implementing adaptation actions to address climate change. The ND-GAIN index comprises over 74 variables, forming 45 basic indicators to measure the vulnerability and readiness of 192 UN member countries from 1995 to the present (due to data availability, ND-GAIN measures vulnerability for 182 countries and readiness for 184 countries).

Government agencies, multilateral organizations, NGOs, and many other entities that study the climate change adaptation measures implemented by countries use this classification and the associated indicators to evaluate countries' efforts in relation to climate change. All countries, to varying degrees, face the challenges of climate change adaptation. Some countries are more vulnerable to climate change impacts due to their geographic location or socioeconomic conditions. Additionally, certain countries are better prepared to take adaptation actions by leveraging public and private sector investments through national government policies, societal awareness, and the capacity of the private sector to engage. ND-GAIN measures both dimensions: vulnerability and readiness.

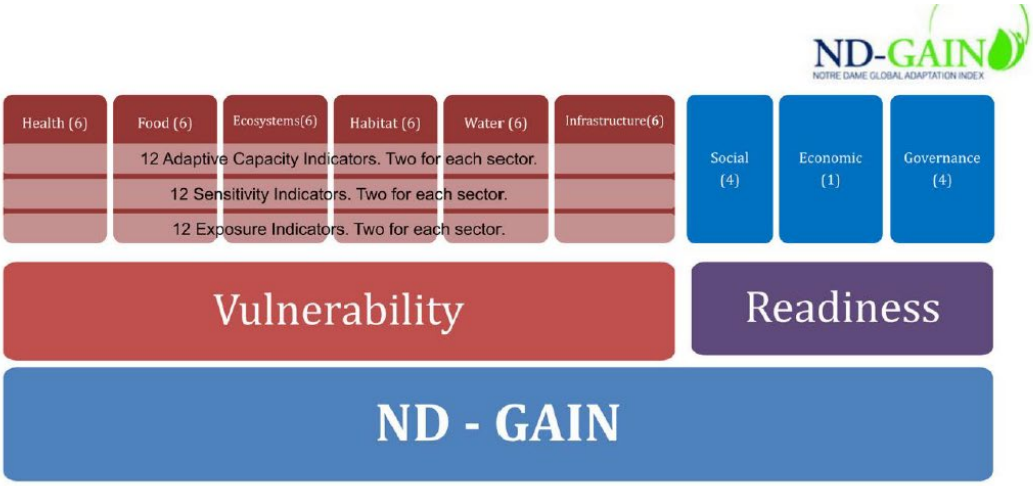



*Figure 14: Summary of the vulnerability and readiness indicators from ND-GAIN*

[6] Rankings // Notre Dame Global Adaptation Initiative // University of Notre Dame (nd.edu)
[7] ND-GAIN defines the concept of Vulnerability as: The propensity or predisposition of human societies to be negatively affected by climate threats.
[8] ND-GAIN defines the concept of Readiness as: The willingness to make effective use of investments for adaptation actions due to a secure and efficient business and governmental environment.

The vulnerability is composed of 36 indicators grouped into three components (each component has 12 indicators) and six sectors (each sector has 6 indicators). The readiness consists of 9 indicators, grouped into three sectors.

The ND-GAIN index can be represented as a scatter plot matrix of readiness versus vulnerability.


*Figure 15: Scatter plot: Vulnerability vs. Readiness by ND Gain*

For assessment purposes: a higher vulnerability score indicates higher vulnerability ("worse"), a higher readiness score indicates greater readiness ("better"). Thus, vulnerability indicators are measured between 1 (lowest score) and 0 (highest score). Readiness indicators are measured between 1 (highest score) and 0 (lowest score).

The latest published ranking is from the year 2020 and shows the following results:

Rank countries by ND-GAIN Country Index, Vulnerability and Readiness.

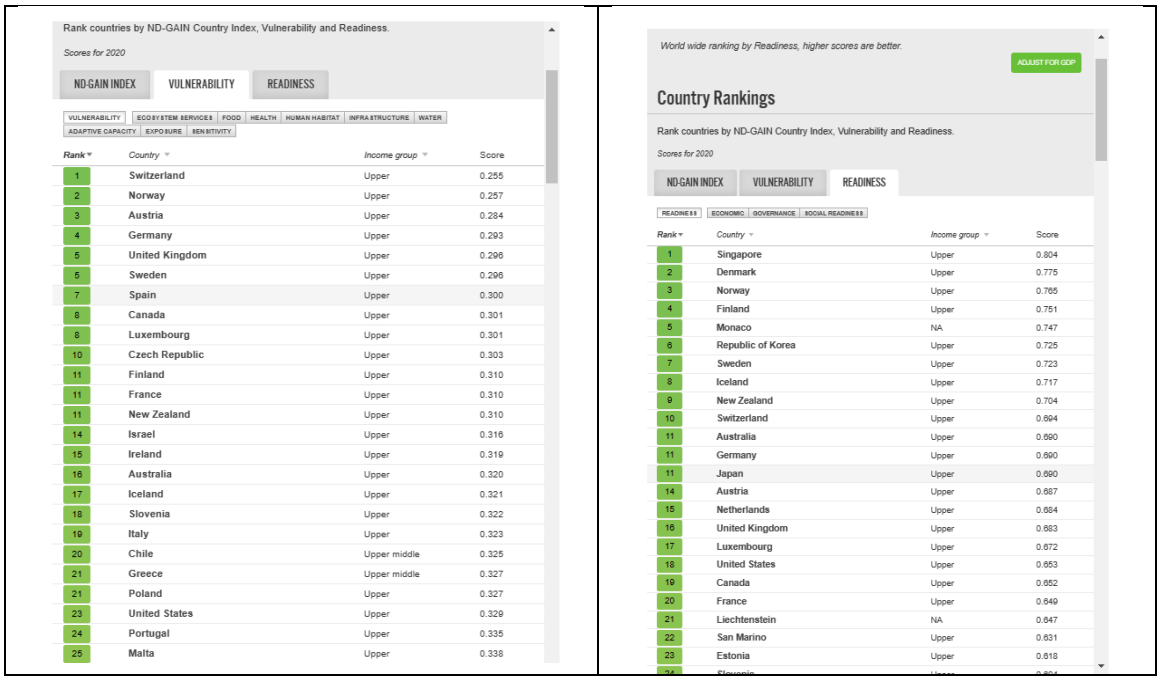
*Scores for 2020*

ND-GAIN INDEX | VULNERABILITY | READINESS

| Rank | Country | Income group | Score |
|---|---|---|---|
| 1 | Norway | Upper | 75.4 |
| 2 | Finland | Upper | 72.0 |
| 3 | Switzerland | Upper | 71.9 |
| 4 | Sweden | Upper | 71.3 |
| 5 | Denmark | Upper | 71.1 |
| 6 | Singapore | Upper | 70.6 |
| 7 | Austria | Upper | 70.1 |
| 8 | Germany | Upper | 69.8 |
| 8 | Iceland | Upper | 69.8 |
| 10 | New Zealand | Upper | 69.7 |
| 11 | United Kingdom | Upper | 69.4 |
| 12 | Luxembourg | Upper | 68.6 |
| 13 | Australia | Upper | 68.5 |
| 14 | Canada | Upper | 67.5 |
| 15 | Republic of Korea | Upper | 67.2 |
| 16 | France | Upper | 66.9 |
| 17 | Netherlands | Upper | 66.6 |
| 18 | United States | Upper | 66.2 |
| 19 | Japan | Upper | 65.5 |
| 20 | Slovenia | Upper | 64.1 |
| 21 | Ireland | Upper | 64.0 |
| 22 | Estonia | Upper | 62.8 |
| 23 | Belgium | Upper | 62.7 |
| 24 | Czech Republic | Upper | 62.6 |
| 25 | Portugal | Upper | 62.2 |
| 26 | Spain | Upper | 61.8 |

*Figure 16: Global ranking of the ND Gain Index for 2020*

In the global ND Gain index, Spain ranks 28th with a score of 61.8 (the top country, Norway, has a score of 75.4).



Rank countries by ND-GAIN Country Index, Vulnerability and Readiness.

Scores for 2020

ND-GAIN INDEX | VULNERABILITY | READINESS

| Rank | Country | Income group | Score |
|---|---|---|---|
| 1 | Switzerland | Upper | 0.255 |
| 2 | Norway | Upper | 0.257 |
| 3 | Austria | Upper | 0.284 |
| 4 | Germany | Upper | 0.293 |
| 5 | United Kingdom | Upper | 0.296 |
| 5 | Sweden | Upper | 0.296 |
| 7 | Spain | Upper | 0.300 |
| 8 | Canada | Upper | 0.301 |
| 8 | Luxembourg | Upper | 0.301 |
| 10 | Czech Republic | Upper | 0.303 |
| 11 | Finland | Upper | 0.310 |
| 11 | France | Upper | 0.310 |
| 11 | New Zealand | Upper | 0.310 |
| 14 | Israel | Upper | 0.316 |
| 15 | Ireland | Upper | 0.319 |
| 16 | Australia | Upper | 0.320 |
| 17 | Iceland | Upper | 0.321 |
| 18 | Slovenia | Upper | 0.322 |
| 19 | Italy | Upper | 0.323 |
| 20 | Chile | Upper middle | 0.325 |
| 21 | Greece | Upper middle | 0.327 |
| 21 | Poland | Upper | 0.327 |
| 23 | United States | Upper | 0.329 |
| 24 | Portugal | Upper | 0.335 |
| 25 | Malta | Upper | 0.338 |

World wide ranking by Readiness, higher scores are better.

Country Rankings

Rank countries by ND-GAIN Country Index, Vulnerability and Readiness.

Scores for 2020

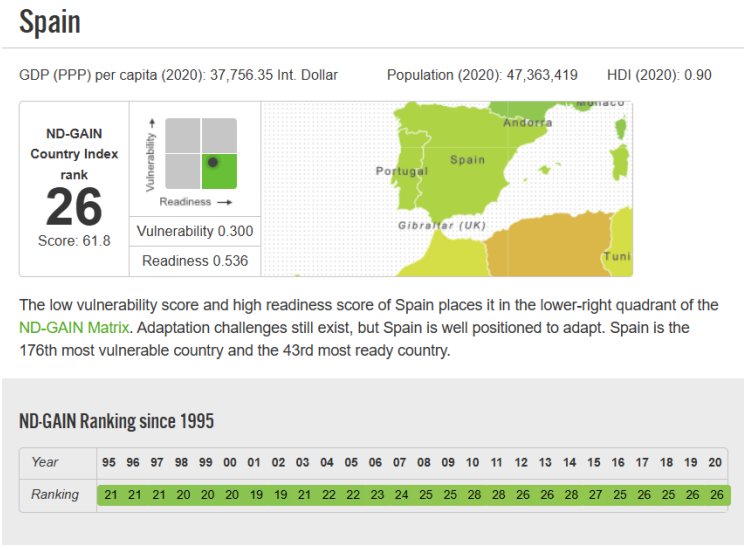
ND-GAIN INDEX | VULNERABILITY | READINESS

| Rank | Country | Income group | Score |
|---|---|---|---|
| 1 | Singapore | Upper | 0.804 |
| 2 | Denmark | Upper | 0.775 |
| 3 | Norway | Upper | 0.765 |
| 4 | Finland | Upper | 0.751 |
| 5 | Monaco | NA | 0.747 |
| 6 | Republic of Korea | Upper | 0.725 |
| 7 | Sweden | Upper | 0.723 |
| 8 | Iceland | Upper | 0.717 |
| 9 | New Zealand | Upper | 0.704 |
| 10 | Switzerland | Upper | 0.694 |
| 11 | Australia | Upper | 0.690 |
| 11 | Germany | Upper | 0.690 |
| 11 | Japan | Upper | 0.690 |
| 14 | Austria | Upper | 0.687 |
| 15 | Netherlands | Upper | 0.684 |
| 16 | United Kingdom | Upper | 0.683 |
| 17 | Luxembourg | Upper | 0.672 |
| 18 | United States | Upper | 0.653 |
| 19 | Canada | Upper | 0.652 |
| 20 | France | Upper | 0.649 |
| 21 | Liechtenstein | NA | 0.647 |
| 22 | San Marino | Upper | 0.631 |
| 23 | Estonia | Upper | 0.618 |

*Figure 17: Ranking of Vulnerability and Preparedness in the 2020 ND Gain Index*

In vulnerability, Spain ranks 7th with a score of 0.300 (the top country, Switzerland, has a score of 0.255). In preparedness, Spain scores 0.536 (the highest-scoring country is Singapore with 0.804).

The profile of Spain[9] breaks down the results of all the indicators.



Spain

GDP (PPP) per capita (2020): 37,756.35 Int. Dollar  Population (2020): 47,363,419  HDI (2020): 0.90

ND-GAIN Country Index rank 26

Score: 61.8

Vulnerability

Readiness →

Vulnerability 0.300

Readiness 0.536



The low vulnerability score and high readiness score of Spain places it in the lower-right quadrant of the ND-GAIN Matrix. Adaptation challenges still exist, but Spain is well positioned to adapt. Spain is the 176th most vulnerable country and the 43rd most ready country.

ND-GAIN Ranking since 1995

| Year | 95 | 96 | 97 | 98 | 99 | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ranking | 21 | 21 | 21 | 20 | 20 | 20 | 19 | 19 | 21 | 22 | 22 | 23 | 24 | 25 | 25 | 28 | 28 | 26 | 26 | 28 | 27 | 25 | 26 | 25 | 26 | 26 |

*Figure 18: Position of Spain in the scatterplot and annual assessment of ND Gain*

The related indicators for Spain are as follows::

[9] Matrix // Notre Dame Global Adaptation Initiative // University of Notre Dame (nd.edu)

VULNERABILITY | READINESS

SECTOR | COMPONENT

● Denotes worst scores

| Indicator | 2001 to 2020 | Score |
|---|---|---|
| **Vulnerability** |  | **0.300** |
| **Food** |  | **0.313** |
| Projected change of cereal yields |  | 0.801 ● |
| Projected population change |  | 0.086 |
| Food import dependency |  | 0.185 |
| Rural population |  | 0.207 |
| Agriculture capacity |  | 0.601 |
| Child malnutrition |  | 0 |
| **Water** |  | **0.266** |
| Projected change of annual runoff |  | 0.453 |
| Projected change of annual groundwater recharge |  | 0.186 |
| Fresh water withdrawal rate |  | 0.237 |
| Water dependency ratio |  | 0.003 |
| Dam capacity |  | 0.715 |
| Access to reliable drinking water |  | 0.004 |

| | | |
|---|---|---|
| **Health** | | **0.228** |
| Projected change of deaths from climate change induced diseases | | 0.030 |
| Projected change in vector-borne diseases | | 0.658 |
| Dependency on external resource for health services | | 0 |
| Slum population | | 0 |
| Medical staff | | 0.635 |
| Access to improved sanitation facilities | | 0.044 |
| **Ecosystem Services** | | **0.281** |
| Projected change of biome distribution | | 0.647 |
| Projected change of marine biodiversity | | 0.340 |
| Natural capital dependency | | 0.038 |
| Ecological footprint | | 0.343 |
| Protected biome | | 0.149 |
| Engagement in international environmental conventions | | 0.170 |
| **Human Habitat** | | **0.373** |
| Projected change of warm periods | | 0.084 |
| Projected change of flood hazard | | 0.533 |

VULNERABILITY READINESS

● *Denotes worst scores*

| *Indicator* | *2001 to 2020* | *Score* |
|---|---|---|
| **Readiness** | | **0.536** |
| **Economic** | | **0.499** |
| Doing business | | 0.499 |
| **Governance** | | **0.646** |
| Political stability and non-violence | | 0.638 |
| Control of corruption | | 0.597 |
| Regulatory quality | | 0.663 |
| Rule of law | | 0.687 |
| **Social readiness** | | **0.463** |
| Social inequality | | 0.403 |
| ICT infrastructure | | 0.682 |
| Education | | 0.625 |
| Innovation | | 0.141 ● |

*Figure 19: Indicators for Spain. ND Gain*

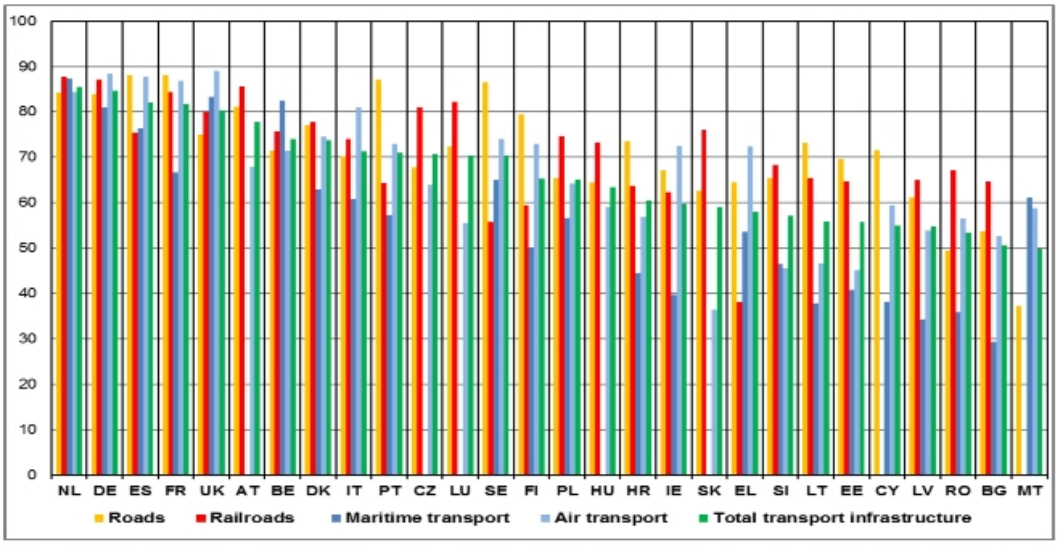
## *7.- "Transport in the European Union. Current Trends and Issues". European Commission*[10]

In this report, published by the European Commission in March 2019 and led by the Directorate-General for Mobility and Transport, issues of mobility in the EU and the implications of transportation on climate change are addressed.

It contains information from all European Union countries on various transportation-related matters.

Of particular relevance is the classification of EU countries in relation to the satisfaction of their citizens regarding the quality of major infrastructures: Roads, Complete Water Cycle, Maritime Transport, and Air Transport. It also provides an overall assessment of the infrastructure across EU countries.

Figure 5: Satisfaction with infrastructure quality (2018)




Source: World Economic Forum, The Global Competitiveness Report database 2018. Scale from 1 to 100 [best]. The countries were ranked on their overall performance on transport infrastructure. Note that after a change in methodology, the 2018 edition of the Global Competitiveness Report is of limited comparability to previous editions.

*Figure 20: Satisfaction with the quality of infrastructure, European Commission, 2019*

[10] https://ec.europa.eu/transport/sites/transport/files/2018-transport-in-the-eu-current-trends-and-issues.pdf

# ANNEX 6

## Indicators from the main Spanish organizations for Ports

In Spain, we can find three fundamental organizations to provide data on the port sector:

- Ministry of Transport, Mobility, and Urban Agenda: Observatory of Transport and Logistics of Spain
- Ministry of Transport, Mobility, and Urban Agenda: Puertos del Estado (Ports Authority). Statistical Yearbooks
- Ministry of Transport, Mobility, and Urban Agenda: Puertos del Estado (Ports Authority). Annual Reports for each Port Area

The Observatory of Transport and Logistics of Spain contains data and indicators in the following sources:

- Indicators
- Database
- Statistical Yearbook 2016

The indicators are classified by types, and for each one, a fact sheet is prepared.


*Figure 21: Classification of Indicators by the Ministry of Transport*

El observatorio del transporte y logística de España nos proporciona los siguientes indicadores del sector portuario:

Here's the translation of the provided information:

- Mobility
    - Maritime transport of passengers and vehicles (number of passengers and vehicles) by type of traffic
    - Regular maritime passenger transport on subsidized lines (passengers and passenger-km) by sector of maritime traffic
    - Passenger and vehicle transport in general ports (number of passengers and number of vehicles) by type of traffic, type of operation, and Port Authority
    - Passenger and vehicle transport in regional ports (number of passengers and number of vehicles) by type of traffic, type of operation, and autonomous community
    - Maritime passenger transport on subsidized regular lines (number of passengers and passenger-kilometers). Relationships between the port or set of origin ports and the port or set of destination ports
    - Maritime transport of goods (tons) by type of traffic

  - Goods transport in ports of general interest (tons) by type of traffic, type of operation, and Port Authority
  - Goods transport in regional ports (tons) by type of traffic, type of operation, and autonomous community
  - Goods transport in ports of general interest (tons) by type of operation, mode of transportation for entry and exit from the port, and Port Authority
  - Goods transport in ports of general interest (tons) by form of presentation, type of goods, and Port Authority
  - Goods transport in ports of general interest (tons) by type of operation. Relationships between Port Authority and geographical area of the world
  - International goods transport in ports of general interest (tons). Goods loaded and unloaded in Spain by countries of origin and destination
  - Traffic of goods and passengers in ports of general interest (number of ships and GT) by Port Authority, type of ship, and nationality
- Transport Infrastructure and Capital
  - Length (linear meters) of docks by owner, draft, and Port Authority
  - Floating surfaces (hectares) by zones and type of surfaces and Port Authority
  - Land area and storage areas (square meters) by type of surface and storage and Port Authority
  - Capacity of specific facilities (cold storage and other facilities) by type of installation and Port Authority
  - Ship repair and construction facilities by type of installation and Port Authority
  - Port cranes by type, lifting capacity, owner, and Port Authority
  - Tugs by power, ownership, and Port Authority
  - Maritime fuel supply posts by autonomous community, province, and type of fuel
  - Fleet of registered ships in Spain (number of ships and thousands of GT) by ship class and type of registration
  - Fleet of registered ships in Spain (number of ships and thousands of GT) by age and ship class
  - Fleet of registered ships in Spain (number of ships) by GT size and ship class
  - Navigational aids by type of aid, area, and Port Authority

- Security
  - Number of emergencies, ships involved, and people involved in maritime accidents

- Environment
  - Energy consumption in transportation (TJ)
  - Energy consumption intensity in transportation (TJ/million constant 2010 USD of GDP)
  - Emissions of polluting gases in transportation by mode and type of traffic (national and international)

  - Emissions of polluting substances in transportation by mode and type of traffic (national and international)
  - Energy consumption in transportation by mode, type of fuel, and type of traffic (national and international)

- Logistics
  - Containerized maritime freight in ports of general interest (tons and TEUs equivalent)
  - Containerized freight in ports of general interest (TEUs twenty-foot equivalent units) by type of traffic, type of operation, container status, and Port Authority
  - Freight transport in ports of general interest (tons) by type of operation, mode of transportation for entry and exit from the port, and Port Authority
  - RO-RO (roll-on/roll-off) freight transport in ports of general interest by type of operation, mode of transportation (containers and other means), and Port Authority

- Additionally, the 2019 Annual Report on Transport and Infrastructure covers the following:
  - Evolution of the main technical parameters of ports
  - Investments in maritime transport infrastructure (millions of euros)
  - Structure of income and operating expenses of Spanish ports (millions of euros)
  - Evolution of the fleet of registered ships in Spain
  - Spanish transport fleet. Special registration of the Canary Islands
  - Number of ships in the fleet of registered ships in Spain distributed by GT size
  - Disposal of the registered fleet in Spain
  - Age distribution of the fleet of registered ships in Spain
  - Distribution of the fleet by the number of ships per shipping company
  - Evolution of Spanish shipbuilding
  - Port traffic by products
  - Traffic of ships, passengers, and goods in ports
  - RO-RO traffic, cruise ship traffic, and passenger cars in passenger traffic
  - Exterior traffic by presentation of the goods (tons)
  - Cabotage traffic by presentation of the goods (tons)
  - Number of moved 20-foot and larger containers and tons transported in Spanish ports
  - 20-foot and larger container traffic (cabotage and exterior)
  - General cargo transported in 20-foot and larger containers. Year 2016 (Cabotage and exterior)