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

INFRASTRUCTURE REPORT CARD OF SPAIN

ROADS REPORT 2023

August, 2023

INDEX

1. Purpose and scope 4
2. Description of the road infrastructure in Spain 6
3. Methodology used to evaluate the Roads 9
4. Quantitative Indicators of Roads 13
4.1. Capacity 16
4.1.1. Capacity Indicators 18
4.1.2. Capacity Indicator 26
4.2. Performance 28
4.2.1. Performance Indicators 31
4.2.2. Performance Indicator 42
4.3. Financing 44
4.3.1. Financing Indicators 45
4.3.2. Financing Indicator 54
4.4. Adaptation to the future and Sustainability 57
4.4.1. Adaptation to the future and sustainability Indicators 59
4.4.2. Adaptation to the future and sustainability Indicator 72
4.5. Operation and maintenance 74
4.5.1. Operation and Maintenance Indicators 76
4.5.2. Operation and maintenance Indicator 82
4.6. Safety 84
4.6.1. Safety Indicators 85
4.6.2. Safety Indicator 92
4.7. Resilience 94
4.7.1. Resilience Indicators 95
4.7.2. Resilience Indicator 100
4.8. Engineering and Innovation 101
4.8.1. Innovation Indicators 103
4.8.2. Engineering and Innovation Indicator 119
4.9. Assessment of the Road Sector through Objective Indicators 121
4.10. Objective Indicators Sensitivity Analysis 125
4.11. Conclusions of the assessment based on objective indicators. 127

4.11.1. Capacity Criterion 127
4.11.2. Performance Criterion 129
4.11.3. Financing Criterion 130
4.11.4. Adaptation to the future and sustainability Criterion 131
4.11.5. Operation and maintenance Criterion 132
4.11.6. Safety Criterion 133
4.11.7. Resilience Criterion 133
4.11.8. Innovation Criterion 134
5. Qualitative evaluation. Expert surveys. 136
5.1. Survey for expert evaluation 138
5.1.1. Capacity 138
5.1.2. Performance 140
5.1.3. Financing 142
5.1.4. Adaptation to the future and sustainability 144
5.1.5. Operation and Maintenance 146
5.1.6. Safety 147
5.1.7. Resilience 148
5.1.8. Engineering and Innovation 149
5.2. Supplementary Questionnaire 151
5.3. Overall evaluation of the roads by the experts 154
6. Overall assessment based on objective indicators and expert evaluations 155

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. **"Report Card for America's Infrastructure." American Society of Civil Engineers (ASCE)**
2. **"The Global Competitiveness Report (GCI)." World Economic Forum (WEF)**
3. **"The Global Adaptation Index (ND-Gain Indicators)." University of Notre Dame (USA)**
4. **"Transport in the European Union." European Commission.**

Annex 6: Roads Indicators from Major Spanish Organizations

Acknowledgments

Asociación Caminos would like to express its gratitude to all the individuals involved in the creation of this report for their professionalism and dedication. Without all of them, it would not have been possible to achieve the quality of content and conclusions presented in this report.

The professionals who have comprised the team are as follows:

- Project Director: José María Izard
- Project Director Support: Oumaima Naima and Estefanía Ramírez
- General Coordinator: Jesús Contreras
- Management Coordinator: Álvaro Díez
- Sector Coordinator: Pilar Crespo

We would also like to extend our gratitude to the experts who made possible the qualitative evaluation.

Special thanks to “Asociación Técnica de la Carretera”.

Furthermore, we have had the support and trust of various sponsors, whom we also thank for their contribution to the completion of this report. These companies include: Acciona, Adiante, ASCE, Cyopsa, Grusamar, and TYPSA.

1. Purpose and scope

The purpose of this report is to assess the infrastructure of Roads 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 Roads, 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 roads.
    - "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:
    - Ministry of Transport, Mobility, and Urban Agenda (Ministerio de Transportes, Movilidad y Agenda Urbana)
    - Ministry of Interior
    - Ministry for Ecological Transition and Demographic Challenge (Ministerio para la transición ecológica y el Reto Demográfico)

2. Description of the road infrastructure in Spain

In the year 2019, the national road network in Spain has a total length of 165,470[1] km, classified into three networks based on ownership:

- **State Road Network**: Roads owned by the State and managed by the Directorate General of Roads of the Ministry of Transport, Mobility, and Urban Agenda. This network includes routes of general interest that span multiple Autonomous Communities, with a total length of 26,466 km. It handles over 50% of total interurban traffic and over 60% of heavy traffic.
- **Autonomous Community Network**: Roads that function within a single Autonomous Community, with administrative management handled by the Autonomous Communities. This network comprises approximately 71,210 km.
- **Provincial Network**: Roads managed by Provincial Councils and Island Councils at the provincial level, with a total length of 67,793 km.

These networks are supplemented by **municipal roads**, with an approximate length of **489,698 km**, **including 361,517 km of interurban roads and 128,181 km of urban roads**. Additionally, there are roads owned by other organizations, such as the Hydrographic Confederations, which collectively have a length of 11,355 km.

Unidad: Kilómetros

AÑOS	Total	Red a cargo del Estado		Red a cargo de las Comunidades Autónomas		Red a cargo de Diputaciones y Cabildos	
		Vías de gran capacidad	Carreteras convencionales	Vías de gran capacidad	Carreteras convencionales	Vías de gran capacidad	Carreteras convencionales
2000	**163.557**	7.656	16.449	2.088	68.749	699	67.916
2001	**163.799**	8.082	16.376	2.362	68.492	708	67.779
2002	**164.139**	8.368	16.273	2.245	67.214	793	69.246
2003	**164.584**	8.794	16.063	2.361	67.909	854	68.603
2004	**165.152**	9.164	15.991	2.407	68.094	873	68.623
2005	**165.646**	9.465	15.950	2.746	68.009	945	68.531
2006	**166.339**	10.081	15.723	2.812	68.183	979	68.561
2007	**166.011**	10.526	15.320	3.166	67.918	997	68.084
2008 (1)	**165.008**	10.752	14.635	3.339	67.596	1.014	67.672
2009	**165.466**	11.096	14.537	3.484	67.592	1.041	67.716
2010 (2)	**165.787**	11.249	14.484	3.642	67.822	1.074	67.516
2011 (3)	**165.885**	11.365	14.470	3.739	68.114	1.078	67.119
2012	**165.595**	11.535	14.503	3.740	67.642	1.060	67.115
2013	**165.361**	11.604	14.468	3.915	67.230	1.063	67.080
2014	**165.639**	11.696	14.428	3.936	67.461	1.073	67.045
2015 (4)	**166.003**	11.942	14.387	3.968	67.356	1.111	67.238
2016 (5)	**165.483**	11.956	14.438	4.002	67.289	1.150	66.648
2017 (6)	**165.686**	11.974	14.419	4.015	67.310	1.174	66.794
2018 (7)	**165.624**	12.018	14.385	4.017	67.296	1.193	66.715
2019 (8)	**165.470**	12.035	14.432	4.076	67.134	1.276	66.516

Fuente: D. G. Carreteras (MITMA), consejerías de Comunidades Autónomas, Diputaciones y Cabildos.

Table 1: Spanish Road Network

[1] Capítulos del anuario estadístico 2019 | Ministerio de Transportes, Movilidad y Agenda Urbana (mitma.gob.es)

From the national road network, 2,997 km are toll highways, 12,725 km are expressways (autovías), and 1,665 km are multi-lane roads. For the purposes of this report, toll highways and expressways are considered high-capacity roads, totaling 15,722 km; out of these, 11,547 km belong to the State Road Network. The overall interurban road network in Spain (including the entire national road network and interurban municipal roads) has an approximate length of 524,000 km.

The communications established in the national territory develop across rugged topography, characterized by an average elevation exceeding 660 meters (18% of the territory is above 1,000 m). Therefore, Spain is the second European country with the highest average elevation after Switzerland (1,340 m). The territory is characterized by the presence of two large plateaus covering 55% of the territory, separated by mountain chains and the depressions of the Ebro and Guadalquivir valleys. Including the Balearic and Canary Islands, the national territory has 7,880 kilometers of coastline, with beaches accounting for 24%.

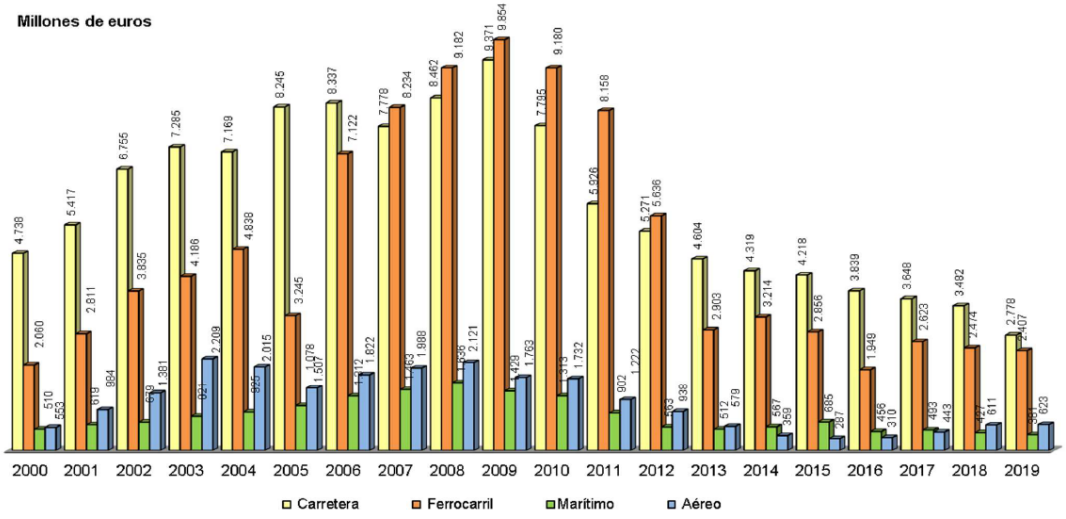
The Spanish population, which was 47.1 million inhabitants in 2019, is irregularly distributed across the territory, with concentrations in coastal areas and major metropolitan centers located inland.

These characteristics – the distribution of the population across the territory and the topography – significantly influence communication needs, explain the development of transportation networks throughout history, the use of transportation modes, and the importance of the road network in the overall transportation system. The following factors also need to be taken into consideration:

- The topographic complexity has influenced the layout of land-based networks and posed challenges for some functionally desirable connections.
- The concentration of population and economic activity in coastal areas and large metropolitan hubs, along with the existence of extensive areas with low population density, affects high-capacity transportation networks. Corridors connecting economic centers experience strong demand.
- Large metropolitan areas, with high population density, face congestion and capacity issues during peak demand hours.
- Tourist settlements along the coast generate transportation demand with pronounced seasonality.
- The territorial model is configured in corridors with varying degrees of consolidation.

In terms of road density per square kilometer, Spain's situation has always been lower than that of more industrialized European countries (such as Germany and Great Britain). Interurban transportation was dominated by railways until the 1950s. From 1956 to the present day, roads have clearly been the mode of transportation that carries the most people and goods: around 90% of domestic passenger transportation and 86% of freight transportation. These percentages have remained relatively constant over the years.

In recent years, as a consequence of the economic crisis that began in 2008, funds allocated to the creation and maintenance of roads have significantly decreased (similar to what has happened in other transportation infrastructure).



Fuente: Direcciones Generales y Organismos del Ministerio deTransportes, Movilidad y Agenda Urbana, RENFE Operadora, ADIF, FEVE, Diputaciones Provinciales, Cabildos Insulares y Comunidades Autónomas.

Figure 1: Investment made in infrastructure for different modes of transportation (Transportation and Infrastructure 2019. MITMA)

The land-based road transport system has a radial structure, which is complemented by four peripheral corridors: the Ebro Valley, the Mediterranean Corridor, the Cantabrian Corridor, and the Silver Route. The major radial and peripheral corridors channel the flows of long-distance passenger and freight transportation.

Figure 2: Major corridors of Spain's road network

3. Methodology used to evaluate the Roads

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 Spain's road sector, we have selected the major European countries: Germany, France, United Kingdom, Italy, Poland, Ireland, Portugal, and Turkey; two countries from the Americas: the United States and Mexico; and two countries from Asia: Japan and South Korea.

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 90th or 80th percentile and the 10th percentile. 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 2: 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 of Roads

For the comparative study, 75 quantitative indicators have been used, all referenced to the most representative data of the sector (both from Spain and other countries), obtained from publicly accessible databases available in important multilateral organizations (EUROSTAT, OECD, World Bank, UN, World Economic Forum, International Transport Forum, etc.). The selection of Indicators took into account the opinions of consulted experts and their experience. Having the appropriate database to compose each Indicator was also essential.

The period considered for this comparative study covers 5 years: from 2015 to 2019. It was not deemed appropriate to go beyond the year 2019 due to the distortion caused by the COVID-19 pandemic on traffic and transportation, which severely affects the comparison of indicators during the year 2020 and partially during the year 2021.

After analyzing the available databases, the following databases have been deemed suitable for use:

- The World Bank (WB)
  - Population
  - Area
  - GDP (in USD)
  - CO_2 emissions from fossil fuel consumption
- World Economic Forum (WEF)
  - Road infrastructure quality indicators
- OECD- International Transport Forum (OCDE)
  - Road networks (European countries)
  - Accident data
  - Domestic passenger and freight traffic
  - Road investment
  - Road infrastructure maintenance investment
  - Road infrastructure investment (in current €)
  - Passenger transport
- EUROSTAT and EU
  - National GDP (in current €)
  - Congestion hours
  - Statistical Annex: Transport in the EU 2018
  - Road networks for European countries
  - EU economic investment report 2017
  - Alternative Fuels Observatory
  - European Environment Agency
- INTERNATIONAL ROAD FEDERATION (IRF); European Road Federation (ERF)
  - Road networks: World Road Statistics 2015, 2016, 2017, 2018, and 2020
  - Accident data: World Road Statistics 2015, 2016, 2017, 2018, and 2020
  - Domestic passenger and freight traffic: World Road Statistics 2015, 2016, 2017, 2018, and 2020
- Ministry of Transport, Mobility, and Urban Agenda of Spain
  - Statistical Yearbook 2019
  - "Los transportes y las infraestructuras" 2019
  - Mobility and Transportation Observatory 2019
- Ministry of Interior of Spain

- Statistical Yearbook of Accidents 2019 (DGT)
- Ministry for Ecological Transition of Spain
  - Public Bank of Environmental Indicators

INDICATORS ROADS 2023	
1 CAPACITY	
CRR C.1	km of roads / 1,000 inhabitants
CRR C.2	km of interurban roads / 1,000 inhabitants
CRR C.3	km of high-capacity roads / 1,000 inhabitants
CRR C.4	km of roads / country's area (km2)
CRR C.5	km of interurban roads / country's area (km2)
CRR C.6	km of high-capacity roads / country's area (km2)
CRR C.7	km of equivalent high-capacity roads / country's area (km2)
CRR C.8	km of high-capacity roads / population density
2 PERFORMANCE	
CRR P.1	Total Vehicle Fleet / 1,000 inhabitants
CRR P.2	Total Vehicle Fleet / km of roads
CRR P.3	Total Vehicle Fleet / km of high-capacity roads
CRR P.4	Total Vehicle Fleet / km of interurban roads
CRR P.5	km of High-Capacity Roads / km of Interurban Roads
CRR P.6	Interior Passenger Traffic by Road (10^6 Passenger-km) / km of interurban roads
CRR P.7	Interior Freight Traffic by Road (10^6 ton-km) / km of interurban roads
CRR P.8	Route Factor (Road Distance / Direct Distance)
CRR P.9	Annual Hours of Congestion on Roads
CRR P.10	Road Connectivity. GCI Score (WEF)
CRR P.11	Quality of Road Infrastructure. GCI Score (WEF)
3 FUNDING	
CRR F.1	% Investment in Roads / National GDP
CRR F.2	Investment in Roads / Inhabitants (current €)
CRR F.3	Investment in Roads / km of roads (current €)
CRR F.4	Investment in Roads / Vehicle Fleet (current €)
CRR F.5	Investment in Roads / Country Area (km2) (current €)
CRR F.6	Investment in Roads / km of high-capacity roads
CRR F.7	Investment in Roads / Interior Passenger Traffic by Road (10^6 Passenger-km)
CRR F.8	Investment in Roads / Interior Freight Traffic by Road (10^6 ton-km)
CRR F.9	Investment in Roads / Total Investment in Land Transport Infrastructure
4 FUTURE ADAPTATION AND SUSTEINABILITY	
CRR A.1	Cumulative Year-on-Year Growth Index. Investment in Roads / Motorization Rate (Index 100 in 2015)
CRR A.2	Cumulative Year-on-Year Growth Index. Investment in Roads / GDP (Index 100 in 2015)
CRR A.3	Cumulative Year-on-Year Growth Index. Investment in Roads / Interior Passenger Traffic by Road
CRR A.4	Cumulative Year-on-Year Growth Index. Investment in Roads / Interior Freight Traffic by Road
CRR A.5	Cumulative Year-on-Year Growth Index. Investment in Roads / Population (Index 100 in 2015)
CRR A.6	Greenhouse Gas Emission Growth Index from Transportation (t equivalent of CO2)
CRR A.7	% Electric and Plug-in Hybrid Vehicles / Light Vehicles Registered
CRR A.8	% of CO2 Emission Generated by Road Transportation of Total Transportation
CRR A.9	CO2 Emissions from Registered Light Vehicles (g/km)
CRR A.10	Charging Points for Electric Vehicles / Million Inhabitants
CRR A.11	% of Urban Area Population Exposed to High Noise Levels
CRR A.12	% of Renewable Energy in Total Energy Consumed in Transportation
CRR A.13	Development of Climate Change Mitigation Technologies related to Transportation (OECD)
5 OPERATION AND MAINTENANCE	
CRR O.1	O&M Investment / National GDP
CRR O.2	O&M Investment / Inhabitants
CRR O.3	O&M Investment / Equivalent Kilometers of Roads
CRR O.4	O&M Investment / Total Road Investment
CRR O.5	O&M Investment / Interior Passenger Traffic by Road (€/million passenger-km)
CRR O.6	O&M Investment / Interior Freight Traffic by Road (€/million tonne-km)
6 SAFETY	
CRR S.1	Accidents with casualties / 100,000 inhabitants
CRR S.2	Accidents with casualties / km of roads
CRR S.3	Fatalities / km of road
CRR S.4	Fatalities / 100,000 inhabitants
CRR S.5	Fatality rate (Number of fatalities / Number of casualties)
CRR S.6	Number of casualties / Interior passenger traffic by road (Million passenger-km)
CRR S.7	Fatalities / Interior passenger traffic by road (Million passenger-km)
7 RESILIENCE	
CRR R.1	Railway density / Road density
CRR R.2	km of roads / Country area (km2)
CRR R.3	Secondary road length / Main road length
CRR R.4	km of high-capacity roads / Country area (km2)
CRR R.5	Transport infrastructure quality. GCI Score (WEF)
8 ENGINEERING AND INNOVATION	
CRR I.1	% of GDP spent on Research and Development (R&D) (OECD R&D)
CRR I.2	Gross domestic expenditure on R&D ($) / Population (OECD R&D)
CRR I.3	% of GDP allocated to basic research expenditure (OECD R&D)
CRR I.4	Total R&D personnel per 1,000 employees (OECD R&D)
CRR I.5	% of GDP for private funding of R&D (OECD R&D)
CRR I.6	% of GDP for public funding of R&D (OECD R&D)
CRR I.7	Digitalization. Participation in new technologies. GCI Score (WEF)
CRR I.8	Digitalization. Information and communication technology infrastructure index (ND Index)
CRR I.9	Digitalization. Number of internet users
CRR I.10	Resident patent applications (per million inhabitants)
CRR I.11	Engineering. Regulatory transparency. Index of trade in services restrictions (OECD)
CRR I.12	Engineering. Barriers to competition. Index of trade in services restrictions (OECD)
CRR I.13	Engineering. Movement restrictions. Index of trade in services restrictions (OECD)
CRR I.14	Engineering. Restrictions on the entry of foreign engineers
CRR I.15	Innovation Index. ND Gain Index
CRR I.16	Number of patents related to road transportation per million inhabitants (OECD)

4.1. Capacity

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

To address this, the following indicators have been selected:

1 CAPACITY	
CRR C.1	km of roads / 1,000 inhabitants
CRR C.2	km of interurban roads / 1,000 inhabitants
CRR C.3	km of high-capacity roads / 1,000 inhabitants
CRR C.4	km of roads / country's area (km2)
CRR C.5	km of interurban roads / country's area (km2)
CRR C.6	km of high-capacity roads / country's area (km2)
CRR C.7	km of equivalent high-capacity roads / country's area (km2)
CRR C.8	km of high-capacity roads / population density

Traditionally, it is considered that the provision and characteristics of roads determine their capacity to absorb demand. Therefore, the ratios considered refer to the density of roads per inhabitants and per country's area. After analyzing available databases, it has been deemed appropriate to group roads primarily based on two classifications: the International Road Federation (IRF) in its annual reports prior to 2019, known as World Road Statistics, and EUROSTAT data, which has been used for European countries.

- Total road network: Highways; main or national roads; secondary or regional roads; and local and urban roads (ERF; World Road Statistics. IRF).
- Interurban roads: High-capacity roads, main or national roads, and secondary and regional roads.
- High-capacity roads: Motorways and expressways. (ERF; IRF World Road Statistics. In European countries, EUROSTAT data is used).
- National or main roads: Excluding high-capacity roads (ERF; IRF World Road Statistics; for European countries, EUROSTAT data is used).
- Regional or secondary roads: Excluding high-capacity roads (ERF; IRF World Road Statistics; for European countries, EUROSTAT data is used).
- Other roads (local, communal, and other networks). (ERF; IRF World Road Statistics; for European countries, EUROSTAT data is used)

In these annual statistics, high-capacity roads are considered those designed according to the classic concepts of highways: separated carriageways, grade-separated interchanges, specially designed and reserved for motor vehicles, and with limited access.

It has been observed that in the case of Spain, the IRF road network statistics before the year 2019 only considered toll motorways as high-capacity roads, and therefore, expressways were not included in this category. In the 2020 edition, this criterion was modified, and expressways were considered high-capacity roads under the categories "Motorways" and "Highways". Therefore, the expert team has decided to make an adjustment to this classification for the analyzed period by adding Spanish expressways as high-capacity roads (and similar roads in other countries). For this purpose, EUROSTAT data has been used for European countries (including Turkey), where these roads are distinguished. In the case of Portugal, to maintain the consistency of indicators, the EUROSTAT classification has been retained, though modifying the "other roads" data,

estimating a figure of 78,122 km. For non-European countries, the classification criteria of World Road Statistics have been maintained.

It is also necessary to note that the data for equivalent lanes on high-capacity roads could not be obtained. This criterion is important for comparing investments per equivalent kilometer. It is evident that in countries with high population density and large metropolitan areas, the factor of equivalent kilometers on high-capacity roads is higher than in countries with low density, such as Spain. For the purposes of this report, equivalent kilometers have only been considered for high-capacity roads in the investment ratios for operation and maintenance of roads; and for this, an equivalent kilometer factor has been estimated for each country (details are included in the relevant annex).

4.1.1. Capacity Indicators

4.1.1.1 Indicator CRR C.1: Kilometers of roads per 1,000 inhabitants

CRR C.1	km carreteras/1.000 habitantes				
	2015	2016	2017	2018	2019
España	14,4	14,3	14,3	14,2	14,1
Alemania	7,9	7,8	7,8	7,8	7,7
Francia	16,6	16,5	16,5	16,4	16,4
Reino Unido	6,6	6,6	6,4	6,4	6,3
Italia	4,3	4,2	4,1	3,9	3,9
Polonia	11,1	11,1	11,2	11,2	11,2
Irlanda	21,0	20,8	20,6	20,3	20,0
Turquía	3,1	3,1	3,1	3,0	3,0
Portugal	9,0	9,0	9,0	9,0	9,0
EEUU	20,8	20,6	20,5	20,5	20,4
México	3,5	3,3	3,3	3,2	3,2
Japón	2,8	2,8	2,8	2,8	2,8
Corea del Sur	4,1	4,0	4,0	4,0	4,0
Maximo:	21,033	MAX ((Media+Factor max*Desv Est.):		19,029	10
Mínimo:	2,750	MIN ((Media-Factor min *Desv);0):		0,000	1
Media:	9,499	Percentil 90%:	20,450	19,029	9,000
Media+Factor max*Desv Estándar:	19,029	Percentil 10%:	3,024	Unidad:	0,473
Media-Factor min*Desv Estándar:	-0,030		Desv. Est.:	6,353	

Table 3: Indicator CRR C.1 values: Kilometers of roads per 1,000 inhabitants

CRR C.1	km carreteras/1.000 habitantes						
	2015	2016	2017	2018	Calificación 2019		
España	7,8	7,8	7,8	7,7	7,7	BIEN	C
Alemania	4,7	4,7	4,7	4,7	4,7	INSUFICIENTE	FX
Francia	8,8	8,8	8,8	8,8	8,8	MUY BIEN	B
Reino Unido	4,1	4,1	4,0	4,0	4,0	INSUFICIENTE	FX
Italia	3,0	3,0	2,9	2,8	2,9	MUY INSUFICIENTE	F
Polonia	6,2	6,3	6,3	6,3	6,3	SUFICIENTE ALTO	D
Irlanda	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Turquía	2,4	2,4	2,4	2,4	2,4	MUY INSUFICIENTE	F
Portugal	5,2	5,2	5,3	5,3	5,3	SUFICIENTE	E
EEUU	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
México	2,7	2,6	2,5	2,5	2,5	MUY INSUFICIENTE	F
Japón	2,3	2,3	2,3	2,3	2,3	MUY INSUFICIENTE	F
Corea del Sur	2,9	2,9	2,9	2,9	2,9	MUY INSUFICIENTE	F

Table 4: Indicator CRR C.1 rating: Kilometers of roads per 1,000 inhabitants

4.1.1.2 Indicator CRR C.2: Kilometers of interurban roads per 1,000 inhabitants

CRR C.2	km carreteras interurbanas/1.000 habitantes				
	2015	2016	2017	2018	2019
España	3,6	3,6	3,6	3,5	3,5
Alemania	2,8	2,8	2,8	2,8	2,8
Francia	6,0	6,0	6,0	6,0	5,9
Reino Unido	1,3	1,3	1,3	1,3	1,3
Italia	3,0	3,0	2,8	2,7	2,8
Polonia	4,6	4,6	4,6	4,6	4,6
Irlanda	3,9	3,9	3,8	3,8	3,7
Turquía	0,9	0,9	0,8	0,8	0,8
Portugal	1,4	1,4	1,4	1,4	1,4
EEUU	4,8	4,8	4,7	4,8	4,8
México	1,5	1,5	1,5	1,5	1,5
Japón	1,2	1,2	1,2	1,2	1,2
Corea del Sur	1,4	1,4	1,4	1,4	1,4
Maximo:	6,005	MAX ((Media+Factor max*Desv Est.):		5,187	10
Mínimo:	0,815	MIN ((Media-Factor min *Desv);0):		0,356	1
Media:	2,771	Percentil 90%:	4,802	4,831	9,000
Media+Factor max*Desv Estándar:	5,187	Percentil 10%:	1,210	Unidad:	1,863
Media-Factor min*Desv Estándar:	0,356		Desv. Est.:	1,610	

Table 5: Indicator CRR C.2 values: Kilometers of interurban roads per 1,000 inhabitants

CRR C.2	km carreteras interurbanas/1.000 habitantes						
	2015	2016	2017	2018	Calificación 2019		
España	7,0	7,0	7,0	6,9	6,9	SUFICIENTE ALTO	D
Alemania	5,6	5,5	5,5	5,5	5,5	SUFICIENTE	E
Francia	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Reino Unido	2,8	2,8	2,8	2,8	2,8	MUY INSUFICIENTE	F
Italia	6,0	6,0	5,6	5,5	5,6	SUFICIENTE	E
Polonia	8,9	8,9	8,9	8,9	8,9	MUY BIEN	B
Irlanda	7,6	7,6	7,5	7,4	7,3	BIEN	C
Turquía	2,0	1,9	1,9	1,9	1,9	MUY INSUFICIENTE	F
Portugal	2,9	2,9	2,9	2,9	2,9	MUY INSUFICIENTE	F
EEUU	9,3	9,2	9,2	9,3	9,3	EXCELENTE	A
México	3,2	3,1	3,1	3,1	3,0	INSUFICIENTE	FX
Japón	2,6	2,6	2,6	2,6	2,6	MUY INSUFICIENTE	F
Corea del Sur	2,9	2,9	2,9	2,9	2,9	MUY INSUFICIENTE	F

Table 6: Indicator CRR C.2 rating: Kilometers of interurban roads per 1,000 inhabitants

4.1.1.3 Indicator CRR C.3: Kilometers of high-capacity roads per 1,000 inhabitants

CRR C.3	km carreteras de gran capacidad/1.000 habitantes				
	2015	2016	2017	2018	2019
España	0,37	0,37	0,37	0,37	0,37
Alemania	0,16	0,16	0,16	0,16	0,16
Francia	0,17	0,17	0,17	0,17	0,17
Reino Unido	0,06	0,06	0,06	0,06	0,06
Italia	0,11	0,11	0,11	0,11	0,12
Polonia	0,04	0,04	0,04	0,04	0,04
Irlanda	0,19	0,19	0,19	0,19	0,19
Turquía	0,04	0,04	0,04	0,03	0,03
Portugal	0,30	0,30	0,30	0,30	0,30
EEUU	0,24	0,24	0,24	0,33	0,33
México	0,08	0,08	0,08	0,08	0,08
Japón	0,07	0,07	0,07	0,07	0,07
Corea del Sur	0,18	0,18	0,17	0,19	0,19
Maximo:	0,369	MAX ((Media+Factor max*Desv Est.):		0,311	10
Mínimo:	0,034	MIN ((Media-Factor min *Desv);0):		0,003	1
Media:	0,157	Percentil 90%:	0,315	0,308	9,000
Media+Factor max*Desv Estándar:	0,311	Percentil 10%:	0,043	Unidad:	29,257
Media-Factor min*Desv Estándar:	0,003		Desv. Est.:	0,103	

Table 7: Indicator CRR C.3 values: Kilometers of high-capacity roads per 1,000 inhabitants

CRR C.3	km carreteras de gran capacidad/1.000 habitantes						
	2015	2016	2017	2018	Calificación 2019		
España	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Alemania	5,6	5,5	5,5	5,5	5,5	SUFICIENTE	E
Francia	6,0	6,0	6,0	6,0	6,0	SUFICIENTE ALTO	D
Reino Unido	2,6	2,6	2,6	2,6	2,6	MUY INSUFICIENTE	F
Italia	4,2	4,3	4,3	4,3	4,3	INSUFICIENTE	FX
Polonia	2,1	2,2	2,2	2,2	2,2	MUY INSUFICIENTE	F
Irlanda	6,6	6,5	6,5	6,4	6,3	SUFICIENTE ALTO	D
Turquía	2,0	1,9	1,9	1,9	1,9	MUY INSUFICIENTE	F
Portugal	9,6	9,6	9,6	9,6	9,6	EXCELENTE	A
EEUU	7,9	7,9	7,8	10,0	10,0	EXCELENTE	A
México	3,3	3,2	3,2	3,4	3,3	INSUFICIENTE	FX
Japón	2,9	2,9	3,0	3,0	3,0	INSUFICIENTE	FX
Corea del Sur	6,1	6,0	6,0	6,4	6,3	SUFICIENTE ALTO	D

Table 8: Indicator CRR C.3 rating: Kilometers of high-capacity roads per 1,000 inhabitants

4.1.1.4 Indicator CRR C.4: Kilometers of roads per country's area (km²)

CRR C.4	km carreteras/superficie del país (km2)				
	2015	2016	2017	2018	2019
España	1,32	1,32	1,32	1,32	1,32
Alemania	1,80	1,80	1,80	1,80	1,80
Francia	2,01	2,01	2,01	2,01	2,01
Reino Unido	1,77	1,77	1,73	1,74	1,74
Italia	0,86	0,85	0,82	0,78	0,78
Polonia	1,35	1,35	1,36	1,36	1,36
Irlanda	1,41	1,41	1,41	1,41	1,41
Turquía	0,31	0,31	0,32	0,32	0,32
Portugal	1,01	1,01	1,01	1,00	1,00
EEUU	0,68	0,68	0,68	0,68	0,68
México	0,22	0,21	0,21	0,21	0,21
Japón	0,93	0,93	0,93	0,93	0,93
Corea del Sur	0,85	0,85	0,85	0,85	0,85
Maximo:	2,010	MAX ((Media+Factor max*Desv Est.):		1,918	10
Mínimo:	0,207	MIN ((Media-Factor min *Desv);0):		0,303	1
Media:	1,111	Percentil 90%:	1,798	1,616	9,000
Media+Factor max*Desv Estándar:	1,918	Percentil 10%:	0,312	Unidad:	5,570
Media-Factor min*Desv Estándar:	0,303		Desv. Est.:	0,539	

Table 9: Indicator CRR C.4 values: Kilometers of roads per country's area (km²)

CRR C.4	km carreteras/superficie del país (km2)						
	2015	2016	2017	2018	Calificación 2019		
España	6,7	6,7	6,7	6,7	6,7	SUFICIENTE ALTO	D
Alemania	9,3	9,3	9,3	9,3	9,3	EXCELENTE	A
Francia	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Reino Unido	9,2	9,2	9,0	9,0	9,0	EXCELENTE	A
Italia	4,1	4,1	3,9	3,6	3,7	INSUFICIENTE	FX
Polonia	6,8	6,8	6,9	6,9	6,9	SUFICIENTE ALTO	D
Irlanda	7,2	7,2	7,2	7,2	7,2	BIEN	C
Turquía	1,0	1,0	1,1	1,1	1,1	MUY INSUFICIENTE	F
Portugal	4,9	4,9	4,9	4,9	4,9	INSUFICIENTE	FX
EEUU	3,1	3,1	3,1	3,1	3,1	INSUFICIENTE	FX
México	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Japón	4,5	4,5	4,5	4,5	4,5	INSUFICIENTE	FX
Corea del Sur	4,0	4,0	4,0	4,0	4,0	INSUFICIENTE	FX

Table 10: Indicator CRR C.4 rating: Kilometers of roads per country's area (km²)

4.1.1.5 Indicator CRR C.5: Kilometers of interurban roads per country's area (km²)

CRR C.5	km carreteras interurbanas/superficie del país (km2)				
	2015	2016	2017	2018	2019
España	0,33	0,33	0,33	0,33	0,33
Alemania	0,64	0,64	0,64	0,64	0,64
Francia	0,73	0,73	0,73	0,73	0,73
Reino Unido	0,36	0,36	0,36	0,36	0,36
Italia	0,61	0,61	0,57	0,55	0,55
Polonia	0,56	0,56	0,56	0,56	0,56
Irlanda	0,26	0,26	0,26	0,26	0,26
Turquía	0,09	0,09	0,09	0,09	0,09
Portugal	0,16	0,16	0,16	0,16	0,16
EEUU	0,16	0,16	0,16	0,16	0,16
México	0,09	0,09	0,09	0,09	0,09
Japón	0,41	0,41	0,41	0,41	0,41
Corea del Sur	0,29	0,29	0,29	0,29	0,29
Maximo:	0,728	MAX ((Media+Factor max*Desv Est.):		0,668	10
Mínimo:	0,087	MIN ((Media-Factor min *Desv);0):		0,047	1
Media:	0,357	Percentil 90%:	0,643	0,621	9,000
Media+Factor max*Desv Estándar:	0,668	Percentil 10%:	0,094	Unidad:	14,491
Media-Factor min*Desv Estándar:	0,047		Desv. Est.:	0,207	

Table 11: Indicator CRR C.5 values: Kilometers of interurban roads per country's area (km²)

CRR C.5	km carreteras interurbanas/superficie del país (km2)						
	2015	2016	2017	2018	Calificación 2019		
España	5,1	5,1	5,1	5,1	5,1	SUFICIENTE	E
Alemania	9,6	9,6	9,6	9,6	9,6	EXCELENTE	A
Francia	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Reino Unido	5,5	5,5	5,5	5,5	5,5	SUFICIENTE	E
Italia	9,2	9,1	8,6	8,3	8,4	MUY BIEN	B
Polonia	8,4	8,4	8,4	8,4	8,4	MUY BIEN	B
Irlanda	4,1	4,1	4,1	4,1	4,1	INSUFICIENTE	FX
Turquía	1,6	1,6	1,6	1,6	1,6	MUY INSUFICIENTE	F
Portugal	2,6	2,6	2,6	2,6	2,6	MUY INSUFICIENTE	F
EEUU	2,6	2,6	2,6	2,6	2,6	MUY INSUFICIENTE	F
México	1,7	1,7	1,7	1,7	1,7	MUY INSUFICIENTE	F
Japón	6,2	6,2	6,2	6,2	6,2	SUFICIENTE ALTO	D
Corea del Sur	4,5	4,5	4,5	4,6	4,6	INSUFICIENTE	FX

Table 12: Indicator CRR C.5 rating: Kilometers of interurban roads per country's area (km²)

4.1.1.6 Indicator CRR C.6: Kilometers of high-capacity roads per country's area (km²)

CRR C.6	km carreteras de gran capacidad/superficie del país (km2)				
	2015	2016	2017	2018	2019
España	0,034	0,034	0,034	0,034	0,034
Alemania	0,036	0,036	0,036	0,037	0,037
Francia	0,021	0,021	0,021	0,021	0,021
Reino Unido	0,015	0,015	0,015	0,016	0,016
Italia	0,023	0,023	0,023	0,023	0,023
Polonia	0,005	0,005	0,005	0,005	0,005
Irlanda	0,013	0,013	0,013	0,013	0,013
Turquía	0,004	0,004	0,004	0,004	0,004
Portugal	0,033	0,033	0,033	0,033	0,033
EEUU	0,008	0,008	0,008	0,011	0,011
México	0,005	0,005	0,005	0,005	0,005
Japón	0,023	0,023	0,024	0,024	0,024
Corea del Sur	0,037	0,037	0,037	0,040	0,040
Maximo:	0,040	MAX ((Media+Factor max*Desv Est.):		0,038	10
Mínimo:	0,004	MIN ((Media-Factor min *Desv);0):		0,002	1
Media:	0,020	Percentil 90%:	0,037	0,036	9,000
Media+Factor max*Desv Estándar:	0,038	Percentil 10%:	0,005	Unidad:	247,200
Media-Factor min*Desv Estándar:	0,002		Desv. Est.:	0,012	

Table 13: Indicator CRR C.6 values: Kilometers of high-capacity roads per country's area (km²)

CRR C.6	km carreteras de gran capacidad/superficie del país (km2)						
	2015	2016	2017	2018	Calificación 2019		
España	8,9	8,9	8,9	9,0	9,0	EXCELENTE	A
Alemania	9,5	9,5	9,5	9,6	9,7	EXCELENTE	A
Francia	5,8	5,8	5,8	5,8	5,8	SUFICIENTE	E
Reino Unido	4,4	4,4	4,4	4,5	4,5	INSUFICIENTE	FX
Italia	6,2	6,2	6,2	6,2	6,2	SUFICIENTE ALTO	D
Polonia	1,8	1,8	1,8	1,8	1,9	MUY INSUFICIENTE	F
Irlanda	3,8	3,8	3,8	3,8	3,8	INSUFICIENTE	FX
Turquía	1,4	1,4	1,4	1,4	1,4	MUY INSUFICIENTE	F
Portugal	8,8	8,8	8,8	8,8	8,8	MUY BIEN	B
EEUU	2,5	2,5	2,5	3,2	3,2	INSUFICIENTE	FX
México	1,8	1,8	1,8	1,9	1,9	MUY INSUFICIENTE	F
Japón	6,2	6,3	6,4	6,4	6,4	SUFICIENTE ALTO	D
Corea del Sur	9,6	9,6	9,6	10,0	10,0	EXCELENTE	A

Table 14: Indicator CRR C.6 rating: Kilometers of high-capacity roads per country's area (km²)

4.1.1.7 Indicator CRR C.7: Equivalent kilometers of high-capacity roads per country's area (km²)

CRR C.7	km equivalentes de carreteras de gran capacidad /superficie del país (km2)				
	2015	2016	2017	2018	2019
España	0,074	0,074	0,075	0,075	0,076
Alemania	0,109	0,109	0,109	0,110	0,111
Francia	0,055	0,055	0,055	0,055	0,055
Reino Unido	0,046	0,046	0,046	0,047	0,047
Italia	0,060	0,060	0,060	0,060	0,060
Polonia	0,011	0,012	0,012	0,012	0,012
Irlanda	0,029	0,029	0,029	0,029	0,029
Turquía	0,008	0,008	0,008	0,008	0,008
Portugal	0,073	0,073	0,073	0,073	0,073
EEUU	0,023	0,023	0,023	0,033	0,033
México	0,011	0,011	0,011	0,012	0,012
Japón	0,080	0,081	0,083	0,083	0,083
Corea del Sur	0,129	0,129	0,129	0,138	0,138
Maximo:	0,138	MAX ((Media+Factor max*Desv Est.):		0,112	10
Mínimo:	0,008	MIN ((Media-Factor min *Desv);0):		0,000	1
Media:	0,055	Percentil 90%:	0,110	0,112	9,000
Media+Factor max*Desv Estándar:	0,112	Percentil 10%:	0,011	Unidad:	80,522
Media-Factor min*Desv Estándar:	-0,001		Desv. Est.:	0,038	

Table 15: Indicator CRR C1.7 values: Equivalent kilometers of high-capacity roads per country's area (km²)

CRR C.7	km equivalentes de carreteras de gran capacidad /superficie del país (km2)						
	2015	2016	2017	2018	Calificación 2019		
España	7,0	7,0	7,0	7,0	7,1	BIEN	C
Alemania	9,8	9,8	9,8	9,9	9,9	EXCELENTE	A
Francia	5,4	5,4	5,4	5,4	5,4	SUFICIENTE	E
Reino Unido	4,7	4,7	4,7	4,8	4,8	INSUFICIENTE	FX
Italia	5,8	5,8	5,8	5,8	5,8	SUFICIENTE	E
Polonia	1,9	1,9	1,9	1,9	1,9	MUY INSUFICIENTE	F
Irlanda	3,3	3,3	3,3	3,3	3,3	INSUFICIENTE	FX
Turquía	1,6	1,6	1,6	1,6	1,6	MUY INSUFICIENTE	F
Portugal	6,9	6,9	6,9	6,9	6,9	SUFICIENTE ALTO	D
EEUU	2,9	2,9	2,9	3,6	3,6	INSUFICIENTE	FX
México	1,9	1,9	1,9	2,0	2,0	MUY INSUFICIENTE	F
Japón	7,4	7,5	7,7	7,7	7,7	BIEN	C
Corea del Sur	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A

Table 16: Indicator CRR C1.7 Rating: Equivalent kilometers of high-capacity roads per country's area (km²)

4.1.1.8 Indicator CRR C.8: Kilometers of high-capacity roads per population density

CRR C.8	km carreteras de gran capacidad/densidad de población				
	2015	2016	2017	2018	2019
España	0,185	0,186	0,186	0,186	0,187
Alemania	0,057	0,056	0,056	0,057	0,057
Francia	0,096	0,096	0,095	0,096	0,095
Reino Unido	0,014	0,014	0,014	0,014	0,014
Italia	0,034	0,035	0,035	0,035	0,035
Polonia	0,013	0,013	0,013	0,013	0,014
Irlanda	0,014	0,014	0,013	0,013	0,013
Turquía	0,028	0,028	0,028	0,027	0,027
Portugal	0,027	0,027	0,027	0,027	0,027
EEUU	2,354	2,343	2,328	3,225	3,211
México	0,161	0,156	0,154	0,165	0,163
Japón	0,026	0,026	0,027	0,027	0,027
Corea del Sur	0,021	0,021	0,021	0,022	0,022
Maximo:	3,225		Percentil 90%:	0,186	10
Mínimo:	0,013	MIN ((Media-Factor min *Desv);0):		0,000	1
Media:	0,259	Percentil 90%:	0,186	0,186	9,000
Media+Factor max*Desv Estándar:	1,339	Percentil 10%:	0,014	Unidad:	48,303
Media-Factor min*Desv Estándar:	-0,821		Desv. Est.:	0,720	

Table 17: Indicator CRR C.8 values: Kilometers of high-capacity roads per population density

CRR C.8	km carreteras de gran capacidad/densidad de población						
	2015	2016	2017	2018	Calificación 2019		
España	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Alemania	3,7	3,7	3,7	3,7	3,7	INSUFICIENTE	FX
Francia	5,6	5,6	5,6	5,6	5,6	SUFICIENTE	E
Reino Unido	1,7	1,7	1,7	1,7	1,7	MUY INSUFICIENTE	F
Italia	2,7	2,7	2,7	2,7	2,7	MUY INSUFICIENTE	F
Polonia	1,6	1,7	1,7	1,7	1,7	MUY INSUFICIENTE	F
Irlanda	1,7	1,7	1,6	1,6	1,6	MUY INSUFICIENTE	F
Turquía	2,4	2,4	2,3	2,3	2,3	MUY INSUFICIENTE	F
Portugal	2,3	2,3	2,3	2,3	2,3	MUY INSUFICIENTE	F
EEUU	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
México	8,8	8,5	8,4	9,0	8,9	MUY BIEN	B
Japón	2,2	2,3	2,3	2,3	2,3	MUY INSUFICIENTE	F
Corea del Sur	2,0	2,0	2,0	2,1	2,1	MUY INSUFICIENTE	F

Table 18: Indicator CRR C.8 rating: Kilometers of high-capacity roads per population density

4.1.2. Capacity Indicator

	Índice de Capacidad					Max valor 2019
	2015	2016	2017	2018	2019	
España	62,3	62,3	62,4	62,4	62,4	72
Alemania	57,9	57,7	57,7	57,9	58,0	72
Francia	61,7	61,6	61,6	61,6	61,6	72
Reino Unido	35,0	34,9	34,6	34,8	34,8	72
Italia	41,3	41,1	40,0	39,2	39,6	72
Polonia	37,8	38,0	38,1	38,1	38,2	72
Irlanda	44,2	44,1	43,9	43,8	43,6	72
Turquía	14,4	14,4	14,3	14,2	14,2	72
Portugal	43,2	43,2	43,2	43,2	43,2	72
EEUU	48,2	48,2	48,1	51,9	51,9	72
México	24,3	23,8	23,6	24,5	24,3	72
Japón	34,3	34,6	34,8	35,0	35,0	72
Corea del Sur	42,1	42,1	42,0	42,9	42,8	72
Maximo:	62,397		Máximo Valor:	VER TABLA	10	
Mínimo:	14,206		MIN:	0	0	
Media:	42,090				10,000	

Table 19: Capacity Indicator Values

	Evaluación de Capacidad							Subindicadores considerados
	2015	2016	2017	2018	Calificación 2019			
España	8,7	8,7	8,7	8,7	8,7	MUY BIEN	B	8
Alemania	8,0	8,0	8,0	8,0	8,0	MUY BIEN	B	8
Francia	8,6	8,6	8,6	8,6	8,6	MUY BIEN	B	8
Reino Unido	4,9	4,8	4,8	4,8	4,8	INSUFICIENTE	FX	8
Italia	5,7	5,7	5,5	5,4	5,5	SUFICIENTE	E	8
Polonia	5,2	5,3	5,3	5,3	5,3	SUFICIENTE	E	8
Irlanda	6,1	6,1	6,1	6,1	6,0	SUFICIENTE ALTO	D	8
Turquía	2,0	2,0	2,0	2,0	2,0	MUY INSUFICIENTE	F	8
Portugal	6,0	6,0	6,0	6,0	6,0	SUFICIENTE ALTO	D	8
EEUU	6,7	6,7	6,7	7,2	7,2	BIEN	C	8
México	3,4	3,3	3,3	3,4	3,4	INSUFICIENTE	FX	8
Japón	4,8	4,8	4,8	4,9	4,9	INSUFICIENTE	FX	8
Corea del Sur	5,9	5,8	5,8	6,0	6,0	SUFICIENTE	E	8

Table 20: Capacity Criterion Rating

Subindicadores de Capacidad		Pesos	Punt. Max.	Total Max puntuación	Total Max puntuación reducida
CRR C.1	km carreteras/1.000 habitantes	1	10	10	9
CRR C.2	km carreteras interurbanas/1.000 habitantes	1	10	10	9
CRR C.3	km carreteras de gran capacidad/1.000 habitantes	1	10	10	9
CRR C.4	km carreteras/superficie del país (km2)	1	10	10	9
CRR C.5	km carreteras interurbanas/superficie del país (km2)	1	10	10	9
CRR C.6	km carreteras de gran capacidad/superficie del país (km2)	1	10	10	9
CRR C.7	km equivalentes de carreteras de gran capacidad /superficie del país (km2)	1	10	10	9
CRR C.8	km carreteras de gran capacidad/densidad de población	1	10	10	9
	Pesos considerados y máxima puntuación sin reducción:	8		80	72
		% Valorado de la Max. Puntuación del Criterio	90,0%	72	

Table 21: Weight and maximum reduced score of Capacity Indicators

Spain achieves the highest score with 8.7 out of 10, followed by France (8.6) and Germany (8.0). Mexico (3.4) and Turkey (2.0) receive notably low ratings. Overall, European countries perform well on the established indicators, with the United States closely following with a score of 7.2.

Regarding road capacity indicators, Spain stands out in road provision per inhabitant, particularly in kilometers of high-capacity roads (0.37 km of high-capacity roads / 1,000 inhabitants), closely followed by the United States (0.33) and Portugal (0.30). These ratios significantly impact the final assessment of the Capacity criterion.

For the indicator "km of high-capacity roads / population density," the United States achieves a ratio of 3.21, with Spain far behind (0.187). The other analyzed countries have much lower ratios (less than 0.1).

Taken together, the Capacity indicators suggest that Spanish roads are well-positioned in terms of capacity and provision, especially the high-capacity road network.

4.2. Performance

This criterion answers the question: Is the current provision and physical condition of the public works sector suitable to meet the current expectations of users?

The chosen indicators have been as follows:

2 PERFORMANCE	
CRR P.1	Total Vehicle Fleet / 1,000 inhabitants
CRR P.2	Total Vehicle Fleet / km of roads
CRR P.3	Total Vehicle Fleet / km of high-capacity roads
CRR P.4	Total Vehicle Fleet / km of interurban roads
CRR P.5	km of High-Capacity Roads / km of Interurban Roads
CRR P.6	Interior Passenger Traffic by Road (10^6 Passenger-km) / km of interurban roads
CRR P.7	Interior Freight Traffic by Road (10^6 ton-km) / km of interurban roads
CRR P.8	Route Factor (Road Distance / Direct Distance)
CRR P.9	Annual Hours of Congestion on Roads
CRR P.10	Road Connectivity. GCI Score (WEF)
CRR P.11	Quality of Road Infrastructure. GCI Score (WEF)

The density of the vehicle fleet in relation to different types of roads serves as an indication of performance. In principle, a lower vehicle fleet per kilometer of road implies better performance. However, the reality is more complex, considering factors such as the number of lanes on high-capacity roads and the calculation of road service levels. Unfortunately, data on service levels, Average Daily Traffic (ADT), or congestion hours distribution is unavailable.

The indicator CRR P.5 "km of High-Capacity Roads / km of Interurban Roads" provides valuable information about the quality provision of interurban road transportation.

Vehicle fleet data has been sourced from the "World Road Statistics" report by the International Road Federation (IRF), and traffic data from the OECD.

The World Economic Forum (WEF) has two indicators directly related to roads: "Road Connectivity" and "Quality of Road Infrastructure." These values are considered relevant for estimating the performance of the country's road network.

The use of new technologies, particularly tools like Google Maps, allows for easy calculation of distances between cities along the fastest road route, as well as calculating the direct geodesic distance between them. Following this process, the four most important cities in each country were chosen, and these two parameters were calculated between the most important city and the other three. These values were used to obtain the Route Factor, defined as the country's average (Road Distance / Direct Distance). This factor starts from a minimum of 1, which would be the optimal scenario (the road describes a straight line connecting the two cities), and it indicates the average additional distance (compared to the direct route) that needs to be traveled within the country.

CRR P.5	Cálculo del Factor de ruta (Distancia por carretera/distancia directa)						Índice
	1	2	3	4	5	6	
España	Madrid	Barcelona	Valencia	Sevilla	Zaragoza	Málaga	
Km por carreteras		621	357	526	314	529	
Km lineales		500	300	400	274	420	
Factor de Ruta		1,24	1,19	1,32	1,15	1,26	**1,25**
Alemania	Berlin	Hamburgo	Múnich	Colonia	Frankfurt	Stuttgart	
Km por carreteras		289	585	573			
Km lineales		254	500	480			
Factor de Ruta		1,14	1,17	1,19			**1,17**
Francia	Paris	Marsella	Lyon	Toulouse	Niza	Nantes	
Km por carreteras		775	466	678			
Km lineales		658	400	600			
Factor de Ruta		1,18	1,17	1,13			**1,16**
Reino Unido	Londres	Birmingham	Glasgow	Liverpool			
Km por carreteras		207	663	359			
Km lineales		162	560	287			
Factor de Ruta		1,28	1,18	1,25			**1,24**
Italia	Roma	Milán	Nápoles	Turín	Palermo	Génova	
Km por carreteras		651	225	690			
Km lineales		480	185	534			
Factor de Ruta		1,36	1,22	1,29			**1,29**
Polonia	Varsovia	Cracovia	lodz	Breslavia			
Km por carreteras		293	136	354			
Km lineales		250	120	300			
Factor de Ruta		1,17	1,13	1,18			**1,16**
Irlanda	Dublín	Cork	Limerick	Galway			
Km por carreteras		254	198	208			
Km lineales		220	175	186			
Factor de Ruta		1,15	1,13	1,12			**1,13**
Turquía	Estambul	Ankara	Esmirna	Bursa	Adana	Gaziantep	
Km por carreteras		452	487	154			
Km lineales		350	330	93			
Factor de Ruta		1,29	1,48	1,66			**1,47**
Portugal	Lisboa	Oporto	Vila Nova de	Amadora	Braga	Coímbra	
Km por carreteras		314	309	11	363	204	
Km lineales		270	270	9	320	175	
Factor de Ruta		1,16	1,14	1,22	1,13	1,17	**1,18**
EEUU	Nueva York	Los Ángeles	Chicago	Houston	Filadelfia	Phoenix	
Km por carreteras		4527	1270	2622			
Km lineales		4000	1150	2300			
Factor de Ruta		1,13	1,10	1,14			**1,13**
México	Ciudad de M	Ecatepec	Guadalajara	Puebla	Ciudad Juare	Tijuana	
Km por carreteras		25	540	129			
Km lineales		20	462	106			
Factor de Ruta		1,25	1,17	1,22			**1,21**
Japón	Tokio	Yokohama	Osaka	Nagoya	Sapporo	Kobe	
Km por carreteras		46	506	354			
Km lineales		28	400	270			
Factor de Ruta		1,64	1,27	1,31			**1,41**
Corea del Sur	Seúl	Busán	Incheon	Daegu	Jeonju		
Km por carreteras		390	34	277	202		
Km lineales		320	26	240	190		
Factor de Ruta		1,22	1,31	1,15	1,06		**1,23**
Australia	Sídney	Melbourne	Brisbane	Perth	Adelaide	Gold Coast	
Km por carreteras		878	909	3932	1374	837	
Km lineales		710	730	3290	1160	680	
Factor de Ruta		1,24	1,25	1,20	1,18	1,23	**1,23**
Nueva Zelanda	Auckland	Wellington	Hamilton	Tauranga			
Km por carreteras		643	122	200			
Km lineales		490	110	150			
Factor de Ruta		1,31	1,11	1,33			**1,25**

Fuente: Elaboración propia basada en el cáculo realizado con Google Maps

In the report "Transport in the European Union. Current Trends and Issues. March 2019" published by the EU, data on average congestion hours per capita in EU countries is provided. This data has been utilized to establish the indicator "Average Annual Congestion Hours per Capita."

	Average Annual Congestion Hours per Capita
Germany	29,90
Spain	26,30
France	30,10
Italy	37,70
Ireland	34,40
Poland	25,10
United Kingdom	45,20
Portugal	29,0

Source: Transport in the European Union. Current Trends and Issues. March 2019.

4.2.1. Performance Indicators

4.2.1.1 Indicator CRR P.1: Vehicle Fleet per 1,000 Inhabitants

CRR P.1	Parque de Vehículos totales/1.000 habitantes				
	2015	2016	2017	2018	2019
España	719	733	749	762	771
Alemania	658	663	672	681	690
Francia	699	706	714	718	718
Reino Unido	577	585	589	592	606
Italia	855	869	884	898	921
Polonia	722	753	780	811	843
Irlanda	547	552	557	558	569
Turquía	233	242	251	255	254
Portugal	556	562	598	599	599
EEUU	877	892	893	909	911
México	328	344	367	379	397
Japón	718	719	721	723	724
Corea del Sur	464	480	495	507	519
Maximo:	921,265	MAX ((Media+Factor max*Desv Est.):		912,495	10
Mínimo:	233,025	MIN ((Media-Factor min *Desv);0):		356,371	1
Media:	634,433	Percentil 90%:	881,477	556,124	9,000
Media+Factor max*Desv Estándar:	912,495	Percentil 10%:	353,527	Unidad:	0,016
Media-Factor min*Desv Estándar:	356,371		Desv. Est.:	185,375	

Table 22: Indicator CRR P.1 values: Vehicle Fleet per 1,000 Inhabitants

CRR P.1	Parque de Vehículos totales/1.000 habitantes						
	2015	2016	2017	2018	Calificación 2019		
España	6,9	7,1	7,4	7,6	7,7	BIEN	C
Alemania	5,9	6,0	6,1	6,3	6,4	SUFICIENTE ALTO	D
Francia	6,5	6,7	6,8	6,8	6,9	SUFICIENTE ALTO	D
Reino Unido	4,6	4,7	4,8	4,8	5,0	SUFICIENTE	E
Italia	9,1	9,3	9,5	9,8	10,0	EXCELENTE	A
Polonia	6,9	7,4	7,9	8,4	8,9	MUY BIEN	B
Irlanda	4,1	4,2	4,2	4,3	4,4	INSUFICIENTE	FX
Turquía	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Portugal	4,2	4,3	4,9	4,9	4,9	INSUFICIENTE	FX
EEUU	9,4	9,7	9,7	9,9	10,0	EXCELENTE	A
México	1,0	1,0	1,2	1,4	1,7	MUY INSUFICIENTE	F
Japón	6,9	6,9	6,9	6,9	7,0	SUFICIENTE ALTO	D
Corea del Sur	2,7	3,0	3,2	3,4	3,6	INSUFICIENTE	FX

Table 23: Indicator CRR P.1 rating: Vehicle Fleet per 1,000 Inhabitants

4.2.1.2 Indicator CRR P.2: Vehicle Fleet per kilometer of roads

CRR P.2	Parque de Vehículos totales/km de carreteras				
	2015	2016	2017	2018	2019
España	50	51	52	53	55
Alemania	84	85	86	88	89
Francia	42	43	43	44	44
Reino Unido	87	89	92	93	96
Italia	200	205	217	231	234
Polonia	65	68	70	72	75
Irlanda	26	27	27	27	28
Turquía	76	79	82	85	85
Portugal	62	63	66	67	67
EEUU	42	43	44	44	45
México	93	104	113	117	124
Japón	261	261	262	260	260
Corea del Sur	114	119	123	126	130
Maximo:	261,559	MAX ((Media+Factor max*Desv Est.):		198,147	1
Mínimo:	25,989	MIN ((Media-Factor min *Desv);0):		0,000	10
Media:	97,786	Percentil 90%:	225,467	198,147	-9,000
Media+Factor max*Desv Estándar:	198,147	Percentil 10%:	42,393	Unidad:	-0,045
Media-Factor min*Desv Estándar:	-2,574		Desv. Est.:	66,907	

Table 24: Indicator CRR P.2 values: Vehicle Fleet per kilometer of roads

CRR P.2	Parque de Vehículos totales/km de carreteras						
	2015	2016	2017	2018	Calificación 2019		
España	7,7	7,7	7,6	7,6	7,5	BIEN	C
Alemania	6,2	6,1	6,1	6,0	6,0	SUFICIENTE	E
Francia	8,1	8,1	8,0	8,0	8,0	MUY BIEN	B
Reino Unido	6,0	6,0	5,8	5,8	5,6	SUFICIENTE	E
Italia	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Polonia	7,0	6,9	6,8	6,7	6,6	SUFICIENTE ALTO	D
Irlanda	8,8	8,8	8,8	8,8	8,7	MUY BIEN	B
Turquía	6,5	6,4	6,3	6,2	6,2	SUFICIENTE ALTO	D
Portugal	7,2	7,2	7,0	7,0	7,0	BIEN	C
EEUU	8,1	8,0	8,0	8,0	8,0	MUY BIEN	B
México	5,8	5,3	4,9	4,7	4,4	INSUFICIENTE	FX
Japón	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Corea del Sur	4,8	4,6	4,4	4,3	4,1	INSUFICIENTE	FX

Table 25: Indicator CRR P.2 Rating: Vehicle Fleet per kilometer of roads

4.2.1.3 Indicator CRR P.3: Vehicle Fleet per kilometer of high-capacity roads

CRR P.3	Parque de Vehículos totales/km de carreteras de gran capacidad				
	2015	2016	2017	2018	2019
España	1.963	1.993	2.033	2.070	2.090
Alemania	4.134	4.201	4.272	4.296	4.347
Francia	4.008	4.057	4.112	4.126	4.138
Reino Unido	9.971	10.199	10.333	10.206	10.500
Italia	7.477	7.584	7.711	7.815	7.887
Polonia	17.581	17.472	18.103	18.816	19.087
Irlanda	2.806	2.866	2.921	2.967	3.063
Turquía	6.439	6.800	7.171	7.382	7.460
Portugal	1.880	1.894	2.011	2.011	2.011
EEUU	3.662	3.741	3.770	2.770	2.791
México	4.012	4.334	4.681	4.505	4.767
Japón	10.560	10.413	10.261	10.276	10.282
Corea del Sur	2.632	2.736	2.835	2.717	2.795
Maximo:	19.086,516	MAX ((Media+Factor max*Desv Est.):		12.854,073	1
Mínimo:	1.880,261	MIN ((Media-Factor min *Desv);0):		0,000	10
Media:	6.104,683	Percentil 90%:	10.465,441	12854,073	-9,000
Media+Factor max*Desv Estándar:	12.854,073	Percentil 10%:	2.019,950	Unidad:	-0,001
Media-Factor min*Desv Estándar:	-644,706		Desv. Est.:	4.499,593	

Table 26: Indicator CRR P.3 values: Vehicle Fleet per kilometer of high-capacity roads

CRR P.3	Parque de Vehículos totales/km de carreteras de gran capacidad						
	2015	2016	2017	2018	Calificación 2019		
España	8,6	8,6	8,6	8,6	8,5	MUY BIEN	B
Alemania	7,1	7,1	7,0	7,0	7,0	BIEN	C
Francia	7,2	7,2	7,1	7,1	7,1	BIEN	C
Reino Unido	3,0	2,9	2,8	2,9	2,6	MUY INSUFICIENTE	F
Italia	4,8	4,7	4,6	4,5	4,5	INSUFICIENTE	FX
Polonia	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Irlanda	8,0	8,0	8,0	7,9	7,9	BIEN	C
Turquía	5,5	5,2	5,0	4,8	4,8	INSUFICIENTE	FX
Portugal	8,7	8,7	8,6	8,6	8,6	MUY BIEN	B
EEUU	7,4	7,4	7,4	8,1	8,0	MUY BIEN	B
México	7,2	7,0	6,7	6,8	6,7	SUFICIENTE ALTO	D
Japón	2,6	2,7	2,8	2,8	2,8	MUY INSUFICIENTE	F
Corea del Sur	8,2	8,1	8,0	8,1	8,0	MUY BIEN	B

Table 27: Indicator CRR P.3 Rating: Vehicle Fleet per kilometer of high-capacity roads

4.2.1.4 Indicator CRR P.4: Vehicle Fleet per kilometer of interurban roads

CRR P.4	Parque de Vehículos totales/km de carreteras interurbanas				
	2015	2016	2017	2018	2019
España	201	206	211	215	220
Alemania	234	238	242	246	249
Francia	116	118	120	120	121
Reino Unido	433	443	449	454	467
Italia	282	288	312	327	328
Polonia	157	164	170	176	183
Irlanda	139	142	145	147	153
Turquía	268	284	299	308	312
Portugal	403	406	431	431	431
EEUU	182	187	188	189	190
México	217	231	249	258	273
Japón	595	595	595	593	594
Corea del Sur	333	346	358	365	376
Maximo:	595,346	MAX ((Media+Factor max*Desv Est.):		487,451	1
Mínimo:	116,340	MIN ((Media-Factor min *Desv);0):		88,014	10
Media:	287,732	Percentil 90%:	451,677	399,438	-9,000
Media+Factor max*Desv Estándar:	487,451	Percentil 10%:	143,565	Unidad:	-0,023
Media-Factor min*Desv Estándar:	88,014		Desv. Est.:	133,146	

Table 28: Indicator CRR P.4 values: Vehicle Fleet per kilometer of interurban roads

CRR P.4	Parque de Vehículos totales/km de carreteras interurbanas						
	2015	2016	2017	2018	Calificación 2019		
España	7,4	7,3	7,2	7,1	7,0	BIEN	C
Alemania	6,7	6,6	6,5	6,4	6,4	SUFICIENTE ALTO	D
Francia	9,4	9,3	9,3	9,3	9,3	EXCELENTE	A
Reino Unido	2,2	2,0	1,9	1,8	1,5	MUY INSUFICIENTE	F
Italia	5,6	5,5	4,9	4,6	4,6	INSUFICIENTE	FX
Polonia	8,5	8,3	8,2	8,0	7,9	BIEN	C
Irlanda	8,8	8,8	8,7	8,7	8,5	MUY BIEN	B
Turquía	5,9	5,6	5,2	5,0	5,0	SUFICIENTE	E
Portugal	2,9	2,8	2,3	2,3	2,3	MUY INSUFICIENTE	F
EEUU	7,9	7,8	7,7	7,7	7,7	BIEN	C
México	7,1	6,8	6,4	6,2	5,8	SUFICIENTE	E
Japón	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Corea del Sur	4,5	4,2	3,9	3,8	3,5	INSUFICIENTE	FX

Table 29: Indicator CRR P.4 Rating: Vehicle Fleet per kilometer of interurban roads

4.2.1.5 Indicator CRR P.5: Kilometers of high-capacity roads per kilometer of interurban roads

CRR P.5	km de Carreteras de gran capacidad/km de carreteras interurbanas				
	2015	2016	2017	2018	2019
España	0,103	0,103	0,104	0,104	0,105
Alemania	0,057	0,057	0,057	0,057	0,057
Francia	0,029	0,029	0,029	0,029	0,029
Reino Unido	0,043	0,043	0,043	0,044	0,044
Italia	0,038	0,038	0,040	0,042	0,042
Polonia	0,009	0,009	0,009	0,009	0,010
Irlanda	0,050	0,050	0,050	0,050	0,050
Turquía	0,042	0,042	0,042	0,042	0,042
Portugal	0,214	0,214	0,214	0,214	0,214
EEUU	0,050	0,050	0,050	0,068	0,068
México	0,054	0,053	0,053	0,057	0,057
Japón	0,056	0,057	0,058	0,058	0,058
Corea del Sur	0,126	0,126	0,126	0,134	0,134
Maximo:	0,214	MAX ((Media+Factor max*Desv Est.):		0,146	10
Mínimo:	0,009	MIN ((Media-Factor min *Desv);0):		0,000	1
Media:	0,068	Percentil 90%:	0,131	0,146	9,000
Media+Factor max*Desv Estándar:	0,146	Percentil 10%:	0,029	Unidad:	61,622
Media-Factor min*Desv Estándar:	-0,009		Desv. Est.:	0,052	

Table 30: Indicator CRR P.5 Values: Kilometers of high-capacity roads per kilometer of interurban roads

CRR P.5	km de Carreteras de gran capacidad/km de carreteras interurbanas						
	2015	2016	2017	2018	Calificación 2019		
España	7,3	7,4	7,4	7,4	7,5	BIEN	C
Alemania	4,5	4,5	4,5	4,5	4,5	INSUFICIENTE	FX
Francia	2,8	2,8	2,8	2,8	2,8	MUY INSUFICIENTE	F
Reino Unido	3,7	3,7	3,7	3,7	3,7	INSUFICIENTE	FX
Italia	3,3	3,3	3,5	3,6	3,6	INSUFICIENTE	FX
Polonia	1,5	1,6	1,6	1,6	1,6	MUY INSUFICIENTE	F
Irlanda	4,1	4,1	4,1	4,1	4,1	INSUFICIENTE	FX
Turquía	3,6	3,6	3,6	3,6	3,6	INSUFICIENTE	FX
Portugal	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
EEUU	4,1	4,1	4,1	5,2	5,2	SUFICIENTE	E
México	4,3	4,3	4,3	4,5	4,5	INSUFICIENTE	FX
Japón	4,5	4,5	4,6	4,6	4,6	INSUFICIENTE	FX
Corea del Sur	8,8	8,8	8,8	9,3	9,3	EXCELENTE	A

Table 31: Indicator CRR P.5 Rating: Kilometers of high-capacity roads per kilometer of interurban roads

4.2.1.6 *Indicator CRR P.6: Domestic passenger road traffic (10^6 passenger-km) per kilometer of interurban roads*

CRR P.6	Tráfico interior de viajeros por carretera (10^6 Viajeros-km)/km carreteras interurbanas				
	2015	2016	2017	2018	2019
España	2,192	2,282	2,193	2,251	2,268
Alemania	4,392	4,473	4,254	4,258	4,270
Francia	2,108	2,137	2,157	2,149	2,130
Reino Unido	8,322	8,439	8,599	8,721	8,876
Italia	4,226	4,410	4,943	4,974	4,985
Polonia	1,360	1,430	1,474	1,538	1,606
Irlanda					
Turquía	4,262	4,418	4,624	4,842	4,993
Portugal					
EEUU	4,144	4,221	4,251	4,169	4,169
México					
Japón	5,733	5,803	5,886	5,940	5,887
Corea del Sur	10,772	10,654	10,880	10,921	10,940
Maximo:	10,940	MAX ((Media+Factor max*Desv Est.):		9,112	1
Mínimo:	1,360	MIN ((Media-Factor min *Desv);0):		0,685	10
Media:	4,899	Percentil 90%:	9,054	8,428	-9,000
Media+Factor max*Desv Estándar:	9,112	Percentil 10%:	2,057	Unidad:	-1,068
Media-Factor min*Desv Estándar:	0,685		Desv. Est.:	2,809	

Table 32: Indicator CRR P.6 Values: Domestic passenger road traffic (10^6 passenger-km) per kilometer of interurban roads

CRR P.6	Tráfico interior de viajeros por carretera (10^6 Viajeros-km)/km carreteras interurbanas						
	2015	2016	2017	2018	Calificación 2019		
España	8,4	8,3	8,4	8,3	8,3	MUY BIEN	B
Alemania	6,0	6,0	6,2	6,2	6,2	SUFICIENTE ALTO	D
Francia	8,5	8,4	8,4	8,4	8,5	MUY BIEN	B
Reino Unido	1,8	1,7	1,5	1,4	1,3	MUY INSUFICIENTE	F
Italia	6,2	6,0	5,5	5,4	5,4	SUFICIENTE	E
Polonia	9,3	9,2	9,2	9,1	9,0	EXCELENTE	A
Irlanda							
Turquía	6,2	6,0	5,8	5,6	5,4	SUFICIENTE	E
Portugal							
EEUU	6,3	6,2	6,2	6,3	6,3	SUFICIENTE ALTO	D
México							
Japón	4,6	4,5	4,4	4,4	4,4	INSUFICIENTE	FX
Corea del Sur	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F

Table 33: Indicator CRR P.6 Rating: Domestic passenger road traffic (10^6 passenger-km) per kilometer of interurban roads

4.2.1.7 *Indicator CRR P.7: Domestic freight road traffic (10^6 ton-km) per kilometer of interurban roads*

CRR P.7	Tráfico interior de mercancías por carretera (10^6 tn-km)/km carreteras Interurbanas				
	2015	2016	2017	2018	2019
España	1,261	1,311	1,395	1,443	1,508
Alemania	1,371	1,374	1,363	1,378	1,357
Francia	0,377	0,382	0,413	0,416	0,423
Reino Unido	1,751	1,819	1,800	1,856	1,887
Italia	0,634	0,616	0,698	0,753	0,823
Polonia	1,560	1,736	1,994	2,164	2,261
Irlanda	0,534	0,628	0,638	0,626	0,676
Turquía	3,582	3,717	3,860	3,918	3,934
Portugal	2,272	2,423	2,381	2,283	2,172
EEUU	1,879	1,950	1,914	1,922	1,922
México	1,330	1,363	1,391	1,409	1,398
Japón	1,331	1,369	1,371	1,362	1,384
Corea del Sur	3,772	3,854	4,000	4,047	3,944
Maximo:	4,047	MAX ((Media+Factor max*Desv Est.):		3,344	1
Mínimo:	0,377	MIN ((Media-Factor min *Desv);0):		0,185	10
Media:	1,764	Percentil 90%:	3,821	3,159	-9,000
Media+Factor max*Desv Estándar:	3,344	Percentil 10%:	0,620	Unidad:	-2,849
Media-Factor min*Desv Estándar:	0,185		Desv. Est.:	1,053	

Table 34: Indicator CRR P.7 Values: Domestic freight road traffic (10^6 ton-km) per kilometer of interurban roads

CRR P.7	Tráfico interior de mercancías por carretera (10^6 tn-km)/km carreteras Interurbanas						
	2015	2016	2017	2018	Calificación 2019		
España	6,9	6,8	6,6	6,4	6,2	SUFICIENTE ALTO	D
Alemania	6,6	6,6	6,6	6,6	6,7	SUFICIENTE ALTO	D
Francia	9,5	9,4	9,3	9,3	9,3	EXCELENTE	A
Reino Unido	5,5	5,3	5,4	5,2	5,2	SUFICIENTE	E
Italia	8,7	8,8	8,5	8,4	8,2	MUY BIEN	B
Polonia	6,1	5,6	4,8	4,4	4,1	INSUFICIENTE	FX
Irlanda	9,0	8,7	8,7	8,7	8,6	MUY BIEN	B
Turquía	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Portugal	4,1	3,6	3,7	4,0	4,3	INSUFICIENTE	FX
EEUU	5,2	5,0	5,1	5,1	5,1	SUFICIENTE	E
México	6,7	6,6	6,6	6,5	6,5	SUFICIENTE ALTO	D
Japón	6,7	6,6	6,6	6,6	6,6	SUFICIENTE ALTO	D
Corea del Sur	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F

Table 35: Indicator CRR P.7 Rating: Domestic freight road traffic (10^6 ton-km) per kilometer of interurban roads

4.2.1.8 Indicator: CRR P.8: Route Factor (Road Distance / Direct Distance)

CRR P.8	Factor de Ruta (Distancia por carretera/ distancia directa)				
	2015	2016	2017	2018	2019
España	1,249	1,249	1,249	1,249	1,249
Alemania	1,167	1,167	1,167	1,167	1,167
Francia	1,158	1,158	1,158	1,158	1,158
Reino Unido	1,238	1,238	1,238	1,238	1,238
Italia	1,288	1,288	1,288	1,288	1,288
Polonia	1,162	1,162	1,162	1,162	1,162
Irlanda	1,135	1,135	1,135	1,135	1,135
Turquía	1,474	1,474	1,474	1,474	1,474
Portugal	1,177	1,177	1,177	1,177	1,177
EEUU	1,125	1,125	1,125	1,125	1,125
México	1,212	1,212	1,212	1,212	1,212
Japón	1,406	1,406	1,406	1,406	1,406
Corea del Sur	1,227	1,227	1,227	1,227	1,227
Maximo:	1,474	MAX ((Media+Factor max*Desv Est.):		1,384	1
Mínimo:	1,125	MIN ((Media-Factor min *Desv);0):		1,080	10
Media:	1,232	Percentil 90%:	1,406	0,304	-9,000
Media+Factor max*Desv Estándar:	1,384	Percentil 10%:	1,135	Unidad:	-29,586
Media-Factor min*Desv Estándar:	1,080		Desv. Est.:	0,101	

Table 36: Indicator CRR P.8 Values: Route Factor (Road Distance / Direct Distance)

CRR P.8	Factor de Ruta (Distancia por carretera/ distancia directa)						
	2015	2016	2017	2018	Calificación 2019		
España	5,0	5,0	5,0	5,0	5,0	SUFICIENTE	E
Alemania	7,4	7,4	7,4	7,4	7,4	BIEN	C
Francia	7,7	7,7	7,7	7,7	7,7	BIEN	C
Reino Unido	5,3	5,3	5,3	5,3	5,3	SUFICIENTE	E
Italia	3,8	3,8	3,8	3,8	3,8	INSUFICIENTE	FX
Polonia	7,6	7,6	7,6	7,6	7,6	BIEN	C
Irlanda	8,4	8,4	8,4	8,4	8,4	MUY BIEN	B
Turquía	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Portugal	7,1	7,1	7,1	7,1	7,1	BIEN	C
EEUU	8,7	8,7	8,7	8,7	8,7	MUY BIEN	B
México	6,1	6,1	6,1	6,1	6,1	SUFICIENTE ALTO	D
Japón	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Corea del Sur	5,7	5,7	5,7	5,7	5,7	SUFICIENTE	E

Table 37: Indicator CRR P.8 Rating: Route Factor (Road Distance / Direct Distance)

4.2.1.9 Indicator CRR P.9: Annual hours of congestion on roads per inhabitants

CRR P.9	Horas anuales de congestión en carreteras / Habitantes				
	2015	2016	2017	2018	2019
España	26	26	26	26	26
Alemania	30	30	30	30	30
Francia	30	30	30	30	30
Reino Unido	45	45	45	45	45
Italia	38	38	38	38	38
Polonia	25	25	25	25	25
Irlanda	34	34	34	34	34
Turquía					
Portugal	29	29	29	29	29
EEUU					
México					
Japón					
Corea del Sur					
Maximo:	45,000	MAX ((Media+Factor max*Desv Est.):		41,595	1
Mínimo:	25,000	MIN ((Media-Factor min *Desv);0):		22,655	10
Media:	32,125	Percentil 90%:	45,000	18,939	-9,000
Media+Factor max*Desv Estándar:	41,595	Percentil 10%:	25,000	Unidad:	-0,475
Media-Factor min*Desv Estándar:	22,655		Desv. Est.:	6,313	

Table 38: Indicator CRR P.9 values: Annual hours of congestion on roads per inhabitants

CRR P.9	Horas anuales de congestión en carreteras / Habitantes						
	2015	2016	2017	2018	Calificación 2019		
España	8,4	8,4	8,4	8,4	8,4	MUY BIEN	B
Alemania	6,5	6,5	6,5	6,5	6,5	SUFICIENTE ALTO	D
Francia	6,5	6,5	6,5	6,5	6,5	SUFICIENTE ALTO	D
Reino Unido	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Italia	2,7	2,7	2,7	2,7	2,7	MUY INSUFICIENTE	F
Polonia	8,9	8,9	8,9	8,9	8,9	MUY BIEN	B
Irlanda	4,6	4,6	4,6	4,6	4,6	INSUFICIENTE	FX
Turquía							
Portugal	7,0	7,0	7,0	7,0	7,0	BIEN	C
EEUU							
México							
Japón							
Corea del Sur							

Table 39: Indicator CRR P.9 Rating: Annual hours of congestion on roads per inhabitants

4.2.1.10 Indicator CRR P.10: Road Connectivity. GCI Score (WEF)

CRR P.10	Conectividad de las carreteras. GCI Score (WEF)				
	2015	2016	2017	2018	2019
España	99,0	99,0	99,0	99,0	100,0
Alemania	93,5	93,5	93,5	93,5	95,1
Francia	93,4	93,4	93,4	93,4	96,6
Reino Unido	80,5	80,5	80,5	80,5	91,3
Italia	84,0	84,0	84,0	84,0	85,9
Polonia	78,7	78,7	78,7	78,7	88,0
Irlanda	76,4	76,4	76,4	76,4	88,4
Turquía	80,9	80,9	80,9	80,9	87,1
Portugal	90,1	90,1	90,1	90,1	94,2
EEUU	100,0	100,0	100,0	100,0	100,0
México	93,5	93,5	93,5	93,5	90,3
Japón	70,0	70,0	70,0	70,0	77,8
Corea del Sur	89,5	89,5	89,5	89,5	89,5
Maximo:	100,000	MAX:		100,000	10
Mínimo:	70,000	MIN ((Media-Factor min *Desv);0):		74,886	1
Media:	87,726	Percentil 90%:	99,000	25,114	9,000
Media+Factor max*Desv Estándar:	100,567	Percentil 10%:	76,400	Unidad:	0,358
Media-Factor min*Desv Estándar:	74,886		Desv. Est.:	8,560	

Table 40: Indicator CRR P.10 Values: Road Connectivity. GCI Score (WEF)

CRR P.10	Conectividad de las carreteras. GCI Score (WEF)						
	2015	2016	2017	2018	Calificación 2019		
España	9,6	9,6	9,6	9,6	10,0	EXCELENTE	A
Alemania	7,7	7,7	7,7	7,7	8,2	MUY BIEN	B
Francia	7,6	7,6	7,6	7,6	8,8	MUY BIEN	B
Reino Unido	3,0	3,0	3,0	3,0	6,9	SUFICIENTE ALTO	D
Italia	4,3	4,3	4,3	4,3	4,9	INSUFICIENTE	FX
Polonia	2,4	2,4	2,4	2,4	5,7	SUFICIENTE	E
Irlanda	1,5	1,5	1,5	1,5	5,8	SUFICIENTE	E
Turquía	3,2	3,2	3,2	3,2	5,4	SUFICIENTE	E
Portugal	6,5	6,5	6,5	6,5	7,9	BIEN	C
EEUU	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
México	7,7	7,7	7,7	7,7	6,5	SUFICIENTE ALTO	D
Japón	1,0	1,0	1,0	1,0	2,0	MUY INSUFICIENTE	F
Corea del Sur	6,2	6,2	6,2	6,2	6,2	SUFICIENTE ALTO	D

Table 41: Indicator CRR P.10 Rating: Road Connectivity. GCI Score (WEF)

4.2.1.11 Indicator CRR P.11: Quality of Road Infrastructure. GCI Score (WEF)

CRR P.11	Calidad de las infraestructuras de carreteras. GCI Score (WEF)				
	2015	2016	2017	2018	2019
España	77,1	77,1	77,1	77,1	78,4
Alemania	74,3	74,3	74,3	74,3	71,7
Francia	82,7	82,7	82,7	82,7	73,9
Reino Unido	69,5	69,5	69,5	69,5	64,4
Italia	56,4	56,4	56,4	56,4	56,8
Polonia	52,3	52,3	52,3	52,3	55,2
Irlanda	57,9	57,9	57,9	57,9	56,7
Turquía	65,4	65,4	65,4	65,4	67,0
Portugal	84,2	84,2	84,2	84,2	83,2
EEUU	81,1	81,1	81,1	81,1	74,5
México	58,3	58,3	58,3	58,3	58,4
Japón	83,7	83,7	83,7	83,7	84,8
Corea del Sur	78,8	78,8	78,8	78,8	81,6
Maximo:	84,800	MAX:		100,000	10
Mínimo:	52,300	MIN ((Media-Factor min *Desv);0):		54,060	0
Media:	70,668	Percentil 90%:	83,700	45,940	10,000
Media+Factor max*Desv Estándar:	87,275	Percentil 10%:	56,400	Unidad:	0,218
Media-Factor min*Desv Estándar:	54,060		Desv. Est.:	11,072	

Table 42: Indicator CRR P.11 Values: Quality of Road Infrastructure. GCI Score (WEF)

CRR P.11	Calidad de las infraestructuras de carreteras. GCI Score (WEF)						
	2015	2016	2017	2018	Calificación 2019		
España	5,0	5,0	5,0	5,0	5,3	SUFICIENTE	E
Alemania	4,4	4,4	4,4	4,4	3,8	INSUFICIENTE	FX
Francia	6,2	6,2	6,2	6,2	4,3	INSUFICIENTE	FX
Reino Unido	3,4	3,4	3,4	3,4	2,3	MUY INSUFICIENTE	F
Italia	0,5	0,5	0,5	0,5	0,6	MUY INSUFICIENTE	F
Polonia	0,0	0,0	0,0	0,0	0,2	MUY INSUFICIENTE	F
Irlanda	0,8	0,8	0,8	0,8	0,6	MUY INSUFICIENTE	F
Turquía	2,5	2,5	2,5	2,5	2,8	MUY INSUFICIENTE	F
Portugal	6,6	6,6	6,6	6,6	6,3	SUFICIENTE ALTO	D
EEUU	5,9	5,9	5,9	5,9	4,4	INSUFICIENTE	FX
México	0,9	0,9	0,9	0,9	0,9	MUY INSUFICIENTE	F
Japón	6,5	6,5	6,5	6,5	6,7	SUFICIENTE ALTO	D
Corea del Sur	5,4	5,4	5,4	5,4	6,0	SUFICIENTE ALTO	D

Table 43: Indicator CRR P.11 Rating: Quality of Road Infrastructure. GCI Score (WEF)

4.2.2. Performance Indicator

	Índice de Prestaciones					Max valor 2019
	2015	2016	2017	2018	2019	
España	81,4	81,2	81,2	81,0	81,5	99
Alemania	69,1	68,9	69,1	69,0	69,0	99
Francia	80,0	80,0	79,9	79,9	79,1	99
Reino Unido	39,6	39,0	38,6	38,3	40,4	99
Italia	50,1	49,9	48,9	48,6	49,3	99
Polonia	59,2	58,8	58,3	57,9	61,4	99
Irlanda	58,2	57,9	57,8	57,8	61,6	90
Turquía	36,3	35,4	34,5	33,8	36,1	90
Portugal	64,2	63,8	63,7	63,9	65,5	90
EEUU	72,9	72,7	72,7	74,8	73,3	90
México	46,8	45,6	44,7	44,8	43,1	81
Japón	35,7	35,7	35,8	35,8	37,1	90
Corea del Sur	48,3	47,9	47,6	48,1	48,5	90
Maximo:	81,529		Máximo Valor:	VER TABLA	10	
Mínimo:	33,773		MIN:	0	0	
Media:	56,786				10,000	
Media+Factor max*Desv Estándar	80,123					

Table 44: Performance Indicator Values

	Evaluación de Prestaciones							Subindicadores considerados	Max valor 2019
	2015	2016	2017	2018	Calificación 2019				
España	8,2	8,2	8,2	8,2	8,2	MUY BIEN	B	11	99
Alemania	7,0	7,0	7,0	7,0	7,0	BIEN	C	11	99
Francia	8,1	8,1	8,1	8,1	8,0	MUY BIEN	B	11	99
Reino Unido	4,0	3,9	3,9	3,9	4,1	INSUFICIENTE	FX	11	99
Italia	5,1	5,0	4,9	4,9	5,0	SUFICIENTE	E	11	99
Polonia	6,0	5,9	5,9	5,9	6,2	SUFICIENTE ALTO	D	11	99
Irlanda	6,5	6,4	6,4	6,4	6,8	SUFICIENTE ALTO	D	10	90
Turquía	4,0	3,9	3,8	3,8	4,0	INSUFICIENTE	FX	10	90
Portugal	7,1	7,1	7,1	7,1	7,3	BIEN	C	10	90
EEUU	8,1	8,1	8,1	8,3	8,1	MUY BIEN	B	10	90
México	5,8	5,6	5,5	5,5	5,3	SUFICIENTE	E	9	81
Japón	4,0	4,0	4,0	4,0	4,1	INSUFICIENTE	FX	10	90
Corea del Sur	5,4	5,3	5,3	5,3	5,4	SUFICIENTE	E	10	90

Table 45: Performance Criterion Rating

Subindicadores de Prestaciones		Pesos	Total Max puntuación	Total Max puntuación reducida
CRR P.1	Parque de Vehículos totales/1.000 habitantes	1	10	9
CRR P.2	Parque de Vehículos totales/km de carreteras	1	10	9
CRR P.3	Parque de Vehículos totales/km de carreteras de gran capacidad	1	10	9
CRR P.4	Parque de Vehículos totales/km de carreteras interurbanas	1	10	9
CRR P.5	km de Carreteras de gran capacidad/km de carreteras interurbanas	1	10	9
CRR P.6	Tráfico interior de viajeros por carretera (10^6 Viajeros-km)/km carreteras interurbanas	1	10	9
CRR P.7	Tráfico interior de mercancías por carretera (10^6 tn-km)/km carreteras Interurbanas	1	10	9
CRR P.8	Factor de Ruta (Distancia por carretera/ distancia directa)	1	10	9
CRR P.9	Horas anuales de congestión en carreteras / Habitantes	1	10	9
CRR P.10	Conectividad de las carreteras. GCI Score (WEF)	1	10	9
CRR P.11	Calidad de las infraestructuras de carreteras. GCI Score (WEF)	1	10	9
		11	110	99
		% Valorado de la Max. Puntuación del Criterio	99	

Table 46: Weights and maximum reduced score of Performance Indicators

In the Performance Criterion, the highest ratings are achieved by Spain, the United States, and France. Japan's low evaluation in the "vehicle fleet/kilometer of high-capacity roads" ratio is noteworthy, likely due to not considering high-capacity roads in urban and peri-urban areas.

In Turkey and Japan, the Route Factor is very high (above 1.4). In Spain, due to its rugged terrain and an average elevation exceeding 660 meters (18% of the territory is above 1,000 m), the route factor reaches a value of 1.249, higher than all analyzed European countries (except Turkey).

Regarding congestion hours, among the analyzed countries (all European), the congestion in the United Kingdom is striking (45.2 annual congestion hours per inhabitant), followed by Ireland, Italy, and France. In the case of Germany, it is noteworthy that despite its high population density, it is similar to Spain (29.9 hours), indicating that Germany's capacity is very high.

Among the two World Economic Forum (WEF) indicators related to roads: "Road Connectivity" awards the highest score to Spain and the United States (100 out of 100), followed by Germany, France, Portugal, and the United Kingdom. The second indicator, "Quality of Road Infrastructure," gives high ratings to Japan, Portugal, and South Korea, followed by Spain, Germany, and France. As detailed in the corresponding annex, the set of WEF indicators that make up "The Global Competitiveness Index" (GCI) covers 141 countries worldwide. Spain ranks seventh in the "2nd Pillar: Infrastructure" (with a rating of 90 out of a maximum of 100).

4.3. Financing

The question this criterion aims to answer is: What investment is allocated to the financing of the public works sector? What amount is dedicated to infrastructure creation? And what is allocated to operation and maintenance?

The financing of infrastructure is an essential criterion for evaluating the quality of the infrastructure, incorporating two distinct elements: investment for infrastructure creation and investment for conservation, operation, and maintenance. In countries with mature road infrastructure, overall investment is lower than in countries where it is still being developed, and a significant percentage is allocated to conservation compared to creation. Conversely, in countries where infrastructure is yet to be established, investment in infrastructure creation is predominant compared to investment in conservation. Unfortunately, separating investment for creation from investment in conservation is not straightforward. For the purposes of this report, the following indicators have been considered:

3 FINANCING	
CRR F.1	% Investment in Roads / National GDP
CRR F.2	Investment in Roads / Inhabitants (current €)
CRR F.3	Investment in Roads / km of roads (current €)
CRR F.4	Investment in Roads / Vehicle Fleet (current €)
CRR F.5	Investment in Roads / Country Area (km2) (current €)
CRR F.6	Investment in Roads / km of high-capacity roads
CRR F.7	Investment in Roads / Interior Passenger Traffic by Road (10^6 Passenger-km)
CRR F.8	Investment in Roads / Interior Freight Traffic by Road (10^6 ton-km)
CRR F.9	Investment in Roads / Total Investment in Land Transport Infrastructure

One of the most representative indicators is the investment in roads as a percentage of the national GDP. The evolution of this indicator over the years provides valuable information about the level of infrastructure development in the country and its conservation status. A high percentage of GDP (above 0.8%) indicates that the road network is in the process of being created (as in the cases of Poland, Japan, and South Korea; or in Spain before 2006), or that the network is being renewed (as in Japan from 2006 to 2014). In general, if this percentage drops below 0.4% (as is the case in Spain from 2016 onwards: 0.35% in 2016 and 0.28 in 2019), it indicates that new infrastructure is not being created. If, furthermore, this percentage falls below 0.3%, it suggests that investment also inadequately covers the needs for conservation, maintenance, and management of the infrastructure.

Analyzing the accumulated investment (4 years) in roads as a percentage of the accumulated national GDP (4 years) eliminates a possible seasonal factor in road investment, providing a clearer view of investment trends. For example, in Spain, the ratio between investment and accumulated GDP reached or exceeded 0.8% of GDP between 2006 and 2010, then dramatically dropped from that point to 0.4% of GDP (representing a 50% reduction in investment relative to GDP).

The rest of the investment-related indicators behave similarly to the investment/GDP ratio, making them complementary and providing detailed information. Investment data have been extracted from the OECD: Road infrastructure investment (current €).

4.3.1. Financing Indicators

4.3.1.1 Indicator CRR F.1: Investment in roads / National GDP (current €)

CRR F.1	% Inversión en carreteras / PIB nacional (€ corrientes)				
	2015	2016	2017	2018	2019
España	0,40%	0,35%	0,32%	0,29%	0,28%
Alemania	0,29%	0,27%	0,33%	0,37%	0,36%
Francia	0,46%	0,41%	0,40%	0,41%	0,40%
Reino Unido	0,34%	0,35%	0,38%	0,36%	0,38%
Italia	0,31%	0,21%	0,20%	0,37%	0,24%
Polonia	0,50%	0,72%	0,69%	0,54%	0,45%
Irlanda	0,23%	0,23%	0,18%	0,21%	0,23%
Turquía	1,17%	0,93%	0,81%	0,93%	0,90%
Portugal					
EEUU	0,49%	0,49%	0,49%	0,49%	0,49%
México	0,41%	0,35%	0,21%	0,22%	0,20%
Japón	0,70%	0,72%	0,72%	0,70%	0,72%
Corea del Sur	1,00%	0,93%	0,93%	0,83%	0,90%
Maximo:	1,17%	MAX ((Media+Factor max*Desv Est.):		0,86%	10
Mínimo:	0,18%	MIN ((Media-Factor min *Desv);0):		0,11%	1
Media:	0,49%	Percentil 90%:	0,91%	0,75%	9,000
Media+Factor max*Desv Estándar:	0,86%	Percentil 10%:	0,22%	Unidad:	1199,152
Media-Factor min*Desv Estándar:	0,11%		Desv. Est.:	0,25%	

Table 47: Indicator CRR F.1 Values: Investment in roads / National GDP (current €)

CRR F.1	% Inversión en carreteras / PIB nacional (€ corrientes)						
	2015	2016	2017	2018	Calificación 2019		
España	4,4	3,8	3,5	3,2	3,0	INSUFICIENTE	FX
Alemania	3,2	2,9	3,6	4,1	4,0	INSUFICIENTE	FX
Francia	5,1	4,6	4,4	4,6	4,5	INSUFICIENTE	FX
Reino Unido	3,8	3,9	4,3	4,0	4,2	INSUFICIENTE	FX
Italia	3,4	2,1	2,0	4,1	2,5	MUY INSUFICIENTE	F
Polonia	5,7	8,3	7,9	6,1	5,1	SUFICIENTE	E
Irlanda	2,5	2,4	1,9	2,2	2,5	MUY INSUFICIENTE	F
Turquía	10,0	10,0	9,3	10,0	10,0	EXCELENTE	A
Portugal							
EEUU	5,5	5,6	5,5	5,5	5,6	SUFICIENTE	E
México	4,6	3,8	2,2	2,3	2,1	MUY INSUFICIENTE	F
Japón	8,1	8,3	8,3	8,1	8,3	MUY BIEN	B
Corea del Sur	10,0	10,0	10,0	9,6	10,0	EXCELENTE	A

Table 48: Indicator CRR F.1 Rating: Investment in roads / National GDP (current €)

4.3.1.2 Indicator CRR F.2: Investment in roads / inhabitants (current €)

CRR F.2	Inversión en carreteras / habitantes (€ corrientes)				
	2015	2016	2017	2018	2019
España	92	83	79	75	73
Alemania	143	150	172	189	200
Francia	150	138	136	144	146
Reino Unido	139	130	138	131	144
Italia	85	58	56	108	72
Polonia	57	81	85	70	64
Irlanda	130	131	114	142	170
Turquía	115	92	76	75	74
Portugal					
EEUU	250	259	260	260	286
México	35	27	17	18	18
Japón	221	256	249	237	259
Corea del Sur	523	497	512	475	515
Maximo:	523		Percentil 90%:	263	10
Mínimo:	17	MIN ((Media-Factor min *Desv);0):		0	1
Media:	161	Percentil 90%:	263	263	9
Media+Factor max*Desv Estándar:	349	Percentil 10%:	57	Unidad:	0,03
Media-Factor min*Desv Estándar:	-27		Desv. Est.:	125	

Table 49: Indicator CRR F.2 Values: Investment in roads / inhabitants (current €)

CRR F.2	Inversión en carreteras / habitantes (€ corrientes)						
	2015	2016	2017	2018	Calificación 2019		
España	4,1	3,9	3,7	3,6	3,5	INSUFICIENTE	FX
Alemania	5,9	6,2	6,9	7,5	7,9	BIEN	C
Francia	6,2	5,7	5,7	5,9	6,0	SUFICIENTE ALTO	D
Reino Unido	5,8	5,5	5,7	5,5	5,9	SUFICIENTE	E
Italia	3,9	3,0	2,9	4,7	3,5	INSUFICIENTE	FX
Polonia	3,0	3,8	3,9	3,4	3,2	INSUFICIENTE	FX
Irlanda	5,5	5,5	4,9	5,9	6,8	SUFICIENTE ALTO	D
Turquía	5,0	4,1	3,6	3,6	3,5	INSUFICIENTE	FX
Portugal							
EEUU	9,6	9,9	9,9	9,9	10,0	EXCELENTE	A
México	2,2	1,9	1,6	1,6	1,6	MUY INSUFICIENTE	F
Japón	8,6	9,8	9,5	9,1	9,9	EXCELENTE	A
Corea del Sur	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A

Table 50: Indicator CRR F.2 Rating: Investment in roads / inhabitants (current €)

4.3.1.3 Indicator CRR F.3: Investment in roads / kilometers of roads (current €)

CRR F.3	Inversión en carreteras / km de carreteras (€ corrientes)				
	2015	2016	2017	2018	2019
España	6.385	5.821	5.534	5.277	5.169
Alemania	18.190	19.276	22.154	24.315	25.902
Francia	9.070	8.349	8.230	8.725	8.908
Reino Unido	21.055	19.879	21.490	20.516	22.809
Italia	19.887	13.685	13.846	27.886	18.302
Polonia	5.154	7.290	7.571	6.261	5.662
Irlanda	6.188	6.289	5.531	7.007	8.463
Turquía	37.651	30.097	24.757	24.797	24.504
Portugal					
EEUU	12.047	12.540	12.660	12.690	14.032
México	9.957	8.308	5.308	5.648	5.580
Japón	80.479	93.120	90.230	85.079	93.020
Corea del Sur	129.057	123.128	127.550	118.322	128.878
Maximo:	129.057	MAX ((Media+Factor max*Desv Est.):		84.251	10
Mínimo:	5.154	MIN ((Media-Factor min *Desv);0):		0	1
Media:	29.259	Percentil 90%:	93.030	84.251	9
Media+Factor max*Desv Estándar:	84.251	Percentil 10%:	5.576	Unidad:	0,00
Media-Factor min*Desv Estándar:	-25.734		Desv. Est.:	36.661	

Table 51: Indicator CRR F.3 Values: Investment in roads / kilometers of roads (current €)

CRR F.3	Inversión en carreteras / km de carreteras (€ corrientes)						
	2015	2016	2017	2018	Calificación 2019		
España	1,7	1,6	1,6	1,6	1,6	MUY INSUFICIENTE	F
Alemania	2,9	3,1	3,4	3,6	3,8	INSUFICIENTE	FX
Francia	2,0	1,9	1,9	1,9	2,0	MUY INSUFICIENTE	F
Reino Unido	3,2	3,1	3,3	3,2	3,4	INSUFICIENTE	FX
Italia	3,1	2,5	2,5	4,0	3,0	INSUFICIENTE	FX
Polonia	1,6	1,8	1,8	1,7	1,6	MUY INSUFICIENTE	F
Irlanda	1,7	1,7	1,6	1,7	1,9	MUY INSUFICIENTE	F
Turquía	5,0	4,2	3,6	3,6	3,6	INSUFICIENTE	FX
Portugal							
EEUU	2,3	2,3	2,4	2,4	2,5	MUY INSUFICIENTE	F
México	2,1	1,9	1,6	1,6	1,6	MUY INSUFICIENTE	F
Japón	9,6	10,0	10,0	10,0	10,0	EXCELENTE	A
Corea del Sur	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A

Table 52: Indicator CRR F.3 Rating: Investment in roads / kilometers of roads (current €)

4.3.1.4 Indicator CRR F.4: Investment in roads / vehicle fleet (current €)

CRR F.4	Inversión de carreteras / parque de vehículos (€ corrientes)				
	2015	2016	2017	2018	2019
España	127	114	106	99	95
Alemania	218	227	256	277	291
Francia	215	196	190	200	204
Reino Unido	241	223	234	220	238
Italia	99	67	64	121	78
Polonia	79	108	108	87	76
Irlanda	238	237	204	255	298
Turquía	495	379	301	293	290
Portugal					
EEUU	285	290	291	286	314
México	107	80	47	48	45
Japón	308	356	345	328	358
Corea del Sur	1128	1035	1035	936	991
Maximo:	1.128		Percentil 90%:	391	10
Mínimo:	45	MIN ((Media-Factor min *Desv);0):		0	1
Media:	274	Percentil 90%:	391	391	9
Media+Factor max*Desv Estándar:	649	Percentil 10%:	78	Unidad:	0,02
Media-Factor min*Desv Estándar:	-101		Desv. Est.:	250	

Table 53: Indicator CRR F.4 Values: Investment in roads / vehicle fleet (current €)

CRR F.4	Inversión de carreteras / parque de vehículos (€ corrientes)						
	2015	2016	2017	2018	Calificación 2019		
España	3,9	3,6	3,4	3,3	3,2	INSUFICIENTE	FX
Alemania	6,0	6,2	6,9	7,4	7,7	BIEN	C
Francia	6,0	5,5	5,4	5,6	5,7	SUFICIENTE	E
Reino Unido	6,6	6,1	6,4	6,1	6,5	SUFICIENTE ALTO	D
Italia	3,3	2,5	2,5	3,8	2,8	MUY INSUFICIENTE	F
Polonia	2,8	3,5	3,5	3,0	2,7	MUY INSUFICIENTE	F
Irlanda	6,5	6,5	5,7	6,9	7,9	BIEN	C
Turquía	10,0	9,7	7,9	7,7	7,7	BIEN	C
Portugal							
EEUU	7,6	7,7	7,7	7,6	8,2	MUY BIEN	B
México	3,5	2,8	2,1	2,1	2,0	MUY INSUFICIENTE	F
Japón	8,1	9,2	8,9	8,5	9,2	EXCELENTE	A
Corea del Sur	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A

Table 54: Indicator CRR F.4 Rating: Investment in roads / vehicle fleet (current €)

4.3.1.5 Indicator CRR F.5: Investment in roads / Country's Area (km²) (current €)

CRR F.5	Inversión de carreteras / Superficie del País (km2) (€ corrientes)				
	2015	2016	2017	2018	2019
España	8.418	7.669	7.293	6.953	6.809
Alemania	32.708	34.650	39.823	43.710	46.563
Francia	18.232	16.784	16.537	17.539	17.908
Reino Unido	37.223	35.144	37.286	35.603	39.582
Italia	17.094	11.651	11.313	21.700	14.268
Polonia	6.943	9.836	10.265	8.534	7.724
Irlanda	8.708	8.850	7.783	9.861	11.910
Turquía	11.532	9.333	7.817	7.817	7.817
Portugal					
EEUU	8.168	8.502	8.583	8.643	9.557
México	2.187	1.722	1.100	1.173	1.159
Japón	74.459	86.187	83.546	79.443	86.858
Corea del Sur	109.313	104.291	108.036	100.580	109.552
Maximo:	109.552	MAX ((Media+Factor max*Desv Est.):		76.779	10
Mínimo:	1.100	MIN ((Media-Factor min *Desv);0):		0	1
Media:	28.504	Percentil 90%:	86.254	76.779	9
Media+Factor max*Desv Estándar:	76.779	Percentil 10%:	6.929	Unidad:	0,00
Media-Factor min*Desv Estándar:	-19.770		Desv. Est.:	32.183	

Table 55: Indicator CRR F.5 Values: Investment in roads / Country's Area (km²) (current €)

CRR F.5	Inversión de carreteras / Superficie del País (km2) (€ corrientes)						
	2015	2016	2017	2018	Calificación 2019		
España	2,0	1,9	1,9	1,8	1,8	MUY INSUFICIENTE	F
Alemania	4,8	5,1	5,7	6,1	6,5	SUFICIENTE ALTO	D
Francia	3,1	3,0	2,9	3,1	3,1	INSUFICIENTE	FX
Reino Unido	5,4	5,1	5,4	5,2	5,6	SUFICIENTE	E
Italia	3,0	2,4	2,3	3,5	2,7	MUY INSUFICIENTE	F
Polonia	1,8	2,2	2,2	2,0	1,9	MUY INSUFICIENTE	F
Irlanda	2,0	2,0	1,9	2,2	2,4	MUY INSUFICIENTE	F
Turquía	2,4	2,1	1,9	1,9	1,9	MUY INSUFICIENTE	F
Portugal							
EEUU	2,0	2,0	2,0	2,0	2,1	MUY INSUFICIENTE	F
México	1,3	1,2	1,1	1,1	1,1	MUY INSUFICIENTE	F
Japón	9,7	10,0	10,0	10,0	10,0	EXCELENTE	A
Corea del Sur	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A

Table 56: Indicator CRR F.5 Rating: Investment in roads / Country's Area (km²) (current €)

4.3.1.6 Indicator CRR F.6: Investment in roads / kilometers of high-capacity roads

CRR F.6	Inversión en carreteras / km carreteras de gran capacidad				
	2015	2016	2017	2018	2019
España	0,296	0,269	0,256	0,245	0,239
Alemania	0,309	0,327	0,376	0,413	0,440
Francia	1,039	0,962	1,004	1,008	1,033
Reino Unido	0,182	0,172	0,183	0,175	0,194
Italia	0,238	0,169	0,152	0,281	0,185
Polonia	0,113	0,159	0,165	0,138	0,124
Irlanda	0,139	0,142	0,125	0,158	0,194
Turquía	0,290	0,236	0,198	0,198	0,198
Portugal					
EEUU	0,319	0,332	0,336	0,338	0,374
México	0,106	0,083	0,053	0,057	0,056
Japón	0,543	0,629	0,610	0,577	0,631
Corea del Sur	0,954	0,910	0,943	0,875	0,953
Maximo:	1,04	MAX ((Media+Factor max*Desv Est.):		0,82	10
Mínimo:	0,05	MIN ((Media-Factor min *Desv);0):		0,00	1
Media:	0,37	Percentil 90%:	0,95	0,82	9
Media+Factor max*Desv Estándar:	0,82	Percentil 10%:	0,12	Unidad:	10,91
Media-Factor min*Desv Estándar:	-0,08		Desv. Est.:	0,30	

Table 57: Indicator CRR F.6 Values: Investment in roads / kilometers of high-capacity roads

CRR F.6	Inversión en carreteras / km carreteras de gran capacidad						
	2015	2016	2017	2018	Calificación 2019		
España	4,2	3,9	3,8	3,7	3,6	INSUFICIENTE	FX
Alemania	4,4	4,6	5,1	5,5	5,8	SUFICIENTE	E
Francia	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Reino Unido	3,0	2,9	3,0	2,9	3,1	INSUFICIENTE	FX
Italia	3,6	2,8	2,7	4,1	3,0	INSUFICIENTE	FX
Polonia	2,2	2,7	2,8	2,5	2,4	MUY INSUFICIENTE	F
Irlanda	2,5	2,5	2,4	2,7	3,1	INSUFICIENTE	FX
Turquía	4,2	3,6	3,2	3,2	3,2	INSUFICIENTE	FX
Portugal							
EEUU	4,5	4,6	4,7	4,7	5,1	SUFICIENTE	E
México	2,2	1,9	1,6	1,6	1,6	MUY INSUFICIENTE	F
Japón	6,9	7,9	7,7	7,3	7,9	BIEN	C
Corea del Sur	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A

Table 58: Indicator CRR F.6 Rating: Investment in roads / kilometers of high-capacity roads

4.3.1.7 *Indicator CRR F.7: Investment in roads / Domestic passenger road traffic (10^6 Passenger-km)*

CRR F.7	Inversión de carreteras / Tráfico interior de viajeros por carretera (10^6 Viajeros-km)				
	2015	2016	2017	2018	2019
España	11.702	10.274	10.155	9.438	9.180
Alemania	11.588	12.055	14.569	15.970	16.969
Francia	11.886	10.792	10.548	11.213	11.552
Reino Unido	12.570	11.705	12.186	11.462	12.520
Italia	6.614	4.351	4.022	7.941	5.159
Polonia	9.115	12.297	12.459	9.943	8.604
Irlanda					
Turquía	31.152	24.363	19.504	18.638	18.076
Portugal					
EEUU	12.560	12.836	12.867	12.957	14.327
México					
Japón	31.984	36.541	34.894	32.712	36.093
Corea del Sur	34.855	33.620	34.104	31.306	34.038
Maximo:	36.541	MAX ((Media+Factor max*Desv Est.):		31.468	10
Mínimo:	4.022	MIN ((Media-Factor min *Desv);0):		1.983	1
Media:	16.725	Percentil 90%:	34.045	29.484	9
Media+Factor max*Desv Estándar:	31.468	Percentil 10%:	8.538	Unidad:	0,00
Media-Factor min*Desv Estándar:	1.983		Desv. Est.:	9.828	

Table 59: Indicator CRR F.7 Values: Investment in roads / Domestic passenger road traffic (10^6 Passenger-km)

CRR F.7	Inversión de carreteras / Tráfico interior de viajeros por carretera (10^6 Viajeros-km)						
	2015	2016	2017	2018	Calificación 2019		
España	4,0	3,5	3,5	3,3	3,2	INSUFICIENTE	FX
Alemania	3,9	4,1	4,8	5,3	5,6	SUFICIENTE	E
Francia	4,0	3,7	3,6	3,8	3,9	INSUFICIENTE	FX
Reino Unido	4,2	4,0	4,1	3,9	4,2	INSUFICIENTE	FX
Italia	2,4	1,7	1,6	2,8	2,0	MUY INSUFICIENTE	F
Polonia	3,2	4,1	4,2	3,4	3,0	INSUFICIENTE	FX
Irlanda							
Turquía	9,9	7,8	6,3	6,1	5,9	SUFICIENTE	E
Portugal							
EEUU	4,2	4,3	4,3	4,3	4,8	INSUFICIENTE	FX
México							
Japón	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Corea del Sur	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A

Table 60: Indicator CRR F.7 Rating: Investment in roads / Domestic passenger road traffic (10^6 Passenger-km)

4.3.1.8 Indicator CRR F.8: Investment in roads / Domestic freight road traffic (10^6 ton-km)

CRR F.8	Inversión de carreteras / Tráfico interior de mercancías por carretera (10^6 tn-km)				
	2015	2016	2017	2018	2019
España	20.340	17.881	15.967	14.720	13.805
Alemania	37.133	39.238	45.474	49.342	53.388
Francia	66.387	60.314	55.064	57.911	58.218
Reino Unido	59.734	54.304	58.201	53.852	58.905
Italia	44.093	31.170	28.483	52.476	31.235
Polonia	7.949	10.131	9.208	7.064	6.110
Irlanda	62.170	53.788	46.522	60.062	67.484
Turquía	37.068	28.955	23.364	23.034	22.942
Portugal					
EEUU	27.697	27.783	28.578	28.112	31.084
México	17.526	13.473	8.439	8.843	8.803
Japón	137.745	154.892	149.780	142.670	153.528
Corea del Sur	99.535	92.942	92.772	84.469	94.418
Maximo:	154.892		Percentil 90%:	94.929	10
Mínimo:	6.110	MIN ((Media-Factor min *Desv);0):		0	1
Media:	49.110	Percentil 90%:	94.929	94.929	9
Media+Factor max*Desv Estándar:	106.744	Percentil 10%:	9.172	Unidad:	0,00
Media-Factor min*Desv Estándar:	-8.525		Desv. Est.:	38.423	

Table 61: Indicator CRR F.8 Values: Investment in roads / Domestic freight road traffic (10^6 ton-km)

CRR F.8	Inversión de carreteras / Tráfico interior de mercancías por carretera (10^6 tn-km)						
	2015	2016	2017	2018	Calificación 2019		
España	2,9	2,7	2,5	2,4	2,3	MUY INSUFICIENTE	F
Alemania	4,5	4,7	5,3	5,7	6,1	SUFICIENTE ALTO	D
Francia	7,3	6,7	6,2	6,5	6,5	SUFICIENTE ALTO	D
Reino Unido	6,7	6,1	6,5	6,1	6,6	SUFICIENTE ALTO	D
Italia	5,2	4,0	3,7	6,0	4,0	INSUFICIENTE	FX
Polonia	1,8	2,0	1,9	1,7	1,6	MUY INSUFICIENTE	F
Irlanda	6,9	6,1	5,4	6,7	7,4	BIEN	C
Turquía	4,5	3,7	3,2	3,2	3,2	INSUFICIENTE	FX
Portugal							
EEUU	3,6	3,6	3,7	3,7	3,9	INSUFICIENTE	FX
México	2,7	2,3	1,8	1,8	1,8	MUY INSUFICIENTE	F
Japón	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Corea del Sur	10,0	9,8	9,8	9,0	10,0	EXCELENTE	A

Table 62: Indicator CRR F.8 Rating: Investment in roads / Domestic freight road traffic (10^6 ton-km)

4.3.1.9 Indicator CRR F.9: Investment in roads / Total investment in land transport infrastructure

CRR F.9	Inversión en carreteras / Inversión total en infraestructura de transporte terrestre				
	2015	2016	2017	2018	2019
España	0,620	0,701	0,625	0,619	0,608
Alemania	0,639	0,667	0,669	0,673	0,661
Francia	0,543	0,522	0,494	0,499	0,469
Reino Unido	0,382	0,388	0,408	0,390	0,420
Italia	0,664	0,520	0,525	0,704	0,508
Polonia					
Irlanda					
Turquía					
Portugal					
EEUU	0,837	0,870	0,880	0,890	0,891
México	0,789	0,714	0,567	0,613	0,740
Japón	0,760	0,780	0,699	0,665	0,652
Corea del Sur					
Maximo:	0,89	MAX ((Media+Factor max*Desv Est.):		0,85	10
Mínimo:	0,38	MIN ((Media-Factor min *Desv);0):		0,42	1
Media:	0,63	Percentil 90%:	0,84	0,43	9
Media+Factor max*Desv Estándar:	0,85	Percentil 10%:	0,42	Unidad:	20,94
Media-Factor min*Desv Estándar:	0,42		Desv. Est.:	0,14	

Table 63: Indicator CRR F.9 Values: Investment in roads / Total investment in land transport infrastructure

CRR F.9	Inversión en carreteras / Inversión total en infraestructura de transporte terrestre						
	2015	2016	2017	2018	Calificación 2019		
España	5,3	6,9	5,4	5,2	5,0	SUFICIENTE	E
Alemania	5,7	6,2	6,3	6,4	6,1	SUFICIENTE ALTO	D
Francia	3,6	3,2	2,6	2,7	2,1	MUY INSUFICIENTE	F
Reino Unido	1,0	1,0	1,0	1,0	1,1	MUY INSUFICIENTE	F
Italia	6,2	3,2	3,3	7,0	2,9	MUY INSUFICIENTE	F
Polonia							
Irlanda							
Turquía							
Portugal							
EEUU	9,8	10,0	10,0	10,0	10,0	EXCELENTE	A
México	8,8	7,2	4,1	5,1	7,8	BIEN	C
Japón	8,2	8,6	6,9	6,2	5,9	SUFICIENTE	E
Corea del Sur							

Table 64: Indicator CRR F.9 Rating: Investment in roads / Total investment in land transport infrastructure

4.3.2. Financing Indicator

	Índice de Financiación					Max valor 2019
	2015	2016	2017	2018	2019	
España	32,5	31,9	29,2	27,9	27,1	81
Alemania	41,3	43,1	48,0	51,4	53,4	81
Francia	47,3	44,3	42,7	44,1	43,8	81
Reino Unido	39,6	37,7	39,7	37,8	40,7	81
Italia	34,1	24,2	23,5	40,0	26,3	81
Polonia	22,0	28,3	28,2	23,8	21,5	72
Irlanda	27,5	26,7	23,7	28,3	32,0	63
Turquía	50,9	45,3	39,2	39,3	39,0	72
Portugal	0,0	0,0	0,0	0,0	0,0	0
EEUU	49,1	50,1	50,2	50,1	52,2	81
México	27,2	23,1	16,1	17,4	19,7	72
Japón	79,2	83,8	81,4	79,3	81,2	81
Corea del Sur	80,0	79,8	79,8	78,6	80,0	72
Maximo:	83,753		Máximo Valor:	VER TABLA	10	
Mínimo:	16,087		MIN:	0	0	

Table 65: Financing Indicator

Subindicadores de Financiación		Pesos	Punt. Max.	Total Max puntuación	Total Max puntuación reducida
CRR F.1	% Inversión en carreteras / PIB nacional (€ corrientes)	1	10	10	9
CRR F.2	Inversión en carreteras / habitantes (€ corrientes)	1	10	10	9
CRR F.3	Inversión en carreteras / km de carreteras (€ corrientes)	1	10	10	9
CRR F.4	Inversión de carreteras / parque de vehículos (€ corrientes)	1	10	10	9
CRR F.5	Inversión de carreteras / Superficie del País (km2) (€ corrientes)	1	10	10	9
CRR F.6	Inversión en carreteras / km carreteras de gran capacidad	1	10	10	9
CRR F.7	Inversión de carreteras / Tráfico interior de viajeros por carretera (10^6 Viajeros-km)	1	10	10	9
CRR F.8	Inversión de carreteras / Tráfico interior de mercancías por carretera (10^6 tn-km)	1	10	10	9
CRR F.9	Inversión en carreteras / Inversión total en infraestructura de transporte terrestre	1	10	10	9
		9		90	
		% Valorado de la Max. Puntuación del Criterio	90,0%	81	81

Table 66: Financing Indicators Weights

	Evaluación de Financiación							Subindicadores considerados
	2015	2016	2017	2018	Calificación 2019			
España	4,0	3,9	3,6	3,5	3,4	INSUFICIENTE	FX	9
Alemania	5,1	5,3	5,9	6,3	6,6	SUFICIENTE ALTO	D	9
Francia	5,8	5,5	5,3	5,4	5,4	SUFICIENTE	E	9
Reino Unido	4,9	4,7	4,9	4,7	5,0	SUFICIENTE	E	9
Italia	4,2	3,0	2,9	4,9	3,2	INSUFICIENTE	FX	9
Polonia	3,1	3,9	3,9	3,3	3,0	INSUFICIENTE	FX	8
Irlanda	4,4	4,2	3,8	4,5	5,1	SUFICIENTE	E	7
Turquía	7,1	6,3	5,4	5,5	5,4	SUFICIENTE	E	8
Portugal								0
EEUU	6,1	6,2	6,2	6,2	6,4	SUFICIENTE ALTO	D	9
México	3,8	3,2	2,2	2,4	2,7	MUY INSUFICIENTE	F	8
Japón	9,8	10,0	10,0	9,8	10,0	EXCELENTE	A	9
Corea del Sur	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A	8

Table 67: Financing Criterion Rating

As mentioned, the most relevant indicator is the investment in roads as a percentage of GDP. The average value for the analyzed countries and years is 0.49%, with a maximum of 1.17% reached in 2015 by Turkey. Spain has one of the lowest values among the analyzed countries (0.28% of GDP in 2019); in the years before the 2008 crisis, it remained above 0.8% (the reduction in public works investment began to materialize in 2010).

The percentage of investment relative to GDP is highly significant for analyzing the state of the road network and its investment needs. In countries with a well-developed road network (like Germany), this percentage remains relatively stable around 0.4%. In cases of significant road network renovation, the percentage of GDP allocated to roads increases to around 0.8% (as seen in Japan, South Korea, and Turkey). In countries where the road network is still being created, the percentage of investment relative to GDP can exceed 1%.

Some interesting data inferred from the used indicators are reflected in the following table:

Indicator	Average	Min Value	Max Value
Road investment as a % of GDP	**0,49%**	**0,18%**	**1,17%**
Road investment per capita	**161€**	**17€**	**523€**
Road investment per kilometer of roads	**29.249€**	**4.894€**	**129.057€**
Road investment per vehicle fleet	**274€**	**1.128€**	**45€**
Road investment per unit of area (Km^2)	**28.504**	**1.100€**	**109.552€**

The significant variation in the results presented in the previous table reflects a reality: countries that, in the analyzed years of this report (2015-2019), are creating new infrastructure or undergoing significant transformations in their networks, exhibit much higher values than countries that have already modified their networks in the past. This situation leads to higher ratings for countries undergoing transformation compared to those with well-established networks from previous years.

It may be instructive to develop indicators that reflect the investment effort in roads that countries have undertaken in recent decades. This is because a significant transformation of infrastructure requires substantial investment sustained over many years, and the lifespan of these investments (with proper maintenance) can extend for several decades. To achieve this, the indicators proposed in this study could be applied over the last 40 or 50 years, calculating indicators that consider cumulative investment. However, this calculation requires appropriate data from all analyzed countries, and it goes beyond the scope of this study.

In the case of Spain, the creation of the network of motorways (autovías) began with the launch of the 1984-1992 General Road Plan and continued in subsequent plans. During those years, significant investment was maintained, extending into subsequent years to improve the road network. This investment effort was consistently sustained, with some fluctuations, until 2010. That year, due to the severe financial crisis triggered by the 2008 global financial crisis, investments were paused due to resource constraints and the belief that the road network was already essentially created. Since then, investments have primarily been directed towards the conservation and maintenance of the network, along with the completion of a few residual segments of the high-capacity road network. Currently, the road network, especially the high-capacity network, is well-established and adequately equipped, no longer requiring the substantial investment seen in the past. The network now primarily needs appropriate investment

for conservation, operations, and the creation of new road infrastructure were deemed necessary.

To roughly consider the level of development of the road network in each country in relation to current investment, new indicators can be derived based on the ones calculated (investment relative to GDP, to population, to road network length, to the vehicle fleet, to the country's area, and to traffic), corrected by the Capacity Index and Performance Index assessed in this study. These indicators have been termed "Investment Need Indices."

For instance, the "Investment Need Index" related to GDP produces the following result:

CRR F.10	Índice de necesidad de inversión (PIB): (IC*IP)*(% Inversión en carreteras / PIB nacional)				
	2015	2016	2017	2018	2019
España	313	273	247	228	216
Alemania	177	164	200	227	226
Francia	354	319	304	314	308
Reino Unido	73	74	80	74	84
Italia	98	62	55	110	70
Polonia	179	260	246	189	168
Irlanda	98	96	73	86	103
Turquía	81	78	71	74	79
Portugal					
EEUU	300	302	298	331	327
México	89	71	40	44	37
Japón	153	158	161	156	165
Corea del Sur	314	311	309	306	320
Maximo:	354,47	MAX ((Media+Factor max*Desv Est.):		330,72	10
Mínimo:	37,24	MIN ((Media-Factor min *Desv);0):		26,69	1
Media:	178,70	Percentil 90%:	313,79	304,03	9
Media+Factor max*Desv Estándar:	330,72	Percentil 10%:	71,00	Unidad:	0,03
Media-Factor min*Desv Estándar:	26,69		Desv. Est.:	101,34	

With this data, the evaluation of the investment in roads / national GDP, adjusted with the Capacity Index and the Performance Index, would be:

CRR F.10	Índice de necesidad de inversión (PIB): (IC*IP)*(% Inversión en carreteras / PIB nacional)						
	2015	2016	2017	2018	Calificación 2019		
España	9,5	8,3	7,5	7,0	6,6	SUFICIENTE ALTO	D
Alemania	5,5	5,1	6,1	6,9	6,9	SUFICIENTE ALTO	D
Francia	10,0	9,6	9,2	9,5	9,3	EXCELENTE	A
Reino Unido	2,4	2,4	2,6	2,4	2,7	MUY INSUFICIENTE	F
Italia	3,1	2,0	1,8	3,5	2,3	MUY INSUFICIENTE	F
Polonia	5,5	7,9	7,5	5,8	5,2	SUFICIENTE	E
Irlanda	3,1	3,0	2,4	2,8	3,2	INSUFICIENTE	FX
Turquía	2,6	2,5	2,3	2,4	2,5	MUY INSUFICIENTE	F
Portugal							
EEUU	9,1	9,2	9,0	10,0	9,9	EXCELENTE	A
México	2,8	2,3	1,4	1,5	1,3	MUY INSUFICIENTE	F
Japón	4,7	4,9	5,0	4,8	5,1	SUFICIENTE	E
Corea del Sur	9,5	9,4	9,4	9,3	9,7	EXCELENTE	A

As observed, this evaluation significantly differs from the one obtained with the CRR F.1 Indicator.

4.4. Adaptation to the future and Sustainability

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

The chosen indicators for evaluation are as follows:

4 FUTURE ADAPTATION AND SUSTEINABILITY	
CRR A.1	Cumulative Year-on-Year Growth Index. Investment in Roads / Motorization Rate (Index 100 in 2015)
CRR A.2	Cumulative Year-on-Year Growth Index. Investment in Roads / GDP (Index 100 in 2015)
CRR A.3	Cumulative Year-on-Year Growth Index. Investment in Roads / Interior Passenger Traffic by Road
CRR A.4	Cumulative Year-on-Year Growth Index. Investment in Roads / Interior Freight Traffic by Road
CRR A.5	Cumulative Year-on-Year Growth Index. Investment in Roads / Population (Index 100 in 2015)
CRR A.6	Greenhouse Gas Emission Growth Index from Transportation (t equivalent of CO2)
CRR A.7	% Electric and Plug-in Hybrid Vehicles / Light Vehicles Registered
CRR A.8	% of CO2 Emission Generated by Road Transportation of Total Transportation
CRR A.9	CO2 Emissions from Registered Light Vehicles (g/km)
CRR A.10	Charging Points for Electric Vehicles / Million Inhabitants
CRR A.11	% of Urban Area Population Exposed to High Noise Levels
CRR A.12	% of Renewable Energy in Total Energy Consumed in Transportation
CRR A.13	Development of Climate Change Mitigation Technologies related to Transportation (OECD)

In the report, it has been considered that the readiness of infrastructure for future demands is linked to the trends in motorization rates, GDP growth, growth in domestic passenger and freight traffic, and population growth. Therefore, the indicators should reflect whether the growth in investment is related to these variables. The reference year for calculating these indicators has been set at 2015 to capture the assessment over the last five years.

The environmental sustainability of the road network is related to the growth of greenhouse gas emissions from vehicles. For this purpose, data from European countries were used from the report by the EU titled "Transport in the European Union. Current Trends and Issues. March 2019," which analyzes the adoption of alternative vehicles to internal combustion engine vehicles.

The chosen indicators include the percentage of alternative vehicles (electric, hybrid) in relation to the total number of registered vehicles, the percentage of renewable energy used in transportation, CO_2 emissions from registered light vehicles, and the number of electric vehicles charging points per inhabitant in suburban areas.

No information could be found for countries outside the European Union: the US, Mexico, Japan, and Turkey, thus this criterion has not been evaluated for these countries.

Data on greenhouse gas emissions from the entire road transport sector have also been considered as sufficiently indicative of the trend in environmental sustainability. This data comes from the OECD: "Greenhouse gas emissions for transport."

Indicators reflecting the progress in vehicle decarbonization have been included as well. These indicators consider the percentage of electric and plug-in hybrid vehicles in relation to total registered vehicles, the assessment of CO_2 emissions from vehicles, and the deployment of

charging points for electric vehicles. Additionally, the percentage of renewable energy in total energy consumption for transportation is analyzed.

To assess noise levels experienced by inhabitants in urban areas, a chosen indicator evaluates the percentage of the population exposed to high noise levels.

Finally, an indicator is considered that reflects the development of climate change mitigation technologies related to transportation.

4.4.1. Adaptation to the future and sustainability Indicators

4.4.1.1 Indicator CRR A.1: Year-on-year cumulative growth index. Road investment / motorization rate (Index 100 in 2015)

CRR A.1	Índice del crecimiento interanual acumulado. Inversión en carreteras / tasa de motorización (Índice 100 en 2015)				
	2015	2016	2017	2018	2019
España	100,00	89,28	82,97	77,39	74,36
Alemania	100,00	104,27	117,75	127,21	133,51
Francia	100,00	90,86	88,28	92,89	94,55
Reino Unido	100,00	92,40	96,76	91,29	98,65
Italia	100,00	67,19	64,17	121,75	78,94
Polonia	100,00	135,77	136,75	109,40	95,34
Irlanda	100,00	99,52	85,85	107,09	125,28
Turquía	100,00	76,64	60,86	59,12	58,51
Portugal	100,00				
EEUU	100,00	101,67	101,83	100,22	109,99
México	100,00	74,15	43,86	44,85	41,88
Japón	100,00	115,66	111,93	106,28	116,13
Corea del Sur	100,00	91,78	91,76	82,96	87,85
Maximo:	136,748	MAX ((Media+Factor max*Desv Est.):		125,774	10
Mínimo:	41,879	MIN ((Media-Factor min *Desv);0):		62,992	1
Media:	94,383	Percentil 90%:	117,753	62,782	9,000
Media+Factor max*Desv Estándar:	125,774	Percentil 10%:	64,168	Unidad:	0,143
Media-Factor min*Desv Estándar:	62,992		Desv. Est.:	20,927	

Table 68: Indicator CRR A.1 Values: Year-on-year cumulative growth index. Road investment / motorization rate (Index 100 in 2015)

CRR A.1	Índice del crecimiento interanual acumulado. Inversión en carreteras / tasa de motorización (Índice 100 en 2015)						
	2015	2016	2017	2018	Calificación 2019		
España	6,3	4,8	3,9	3,1	2,6	MUY INSUFICIENTE	F
Alemania	6,3	6,9	8,9	10,0	10,0	EXCELENTE	A
Francia	6,3	5,0	4,6	5,3	5,5	SUFICIENTE	E
Reino Unido	6,3	5,2	5,8	5,1	6,1	SUFICIENTE ALTO	D
Italia	6,3	1,6	1,2	9,4	3,3	INSUFICIENTE	FX
Polonia	6,3	10,0	10,0	7,7	5,6	SUFICIENTE	E
Irlanda	6,3	6,2	4,3	7,3	9,9	EXCELENTE	A
Turquía	6,3	3,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Portugal	6,3						
EEUU	6,3	6,5	6,6	6,3	7,7	BIEN	C
México	6,3	2,6	1,0	1,0	1,0	MUY INSUFICIENTE	F
Japón	6,3	8,6	8,0	7,2	8,6	MUY BIEN	B
Corea del Sur	6,3	5,1	5,1	3,9	4,6	INSUFICIENTE	FX

Table 69: Indicator CRR A.1 Rating: Year-on-year cumulative growth index. Road investment / motorization rate (Index 100 in 2015)

4.4.1.2 *Indicator CRR A.2: Índice del crecimiento interanual acumulado. Inversión en carreteras / PIB (Índice 100 en 2015)*

CRR A.2	Índice del crecimiento interanual acumulado. Inversión en carreteras / PIB (Índice 100 en 2015)				
	2015	2016	2017	2018	2019
España	100,00	88,14	80,36	73,97	70,05
Alemania	100,00	93,75	111,80	125,55	124,65
Francia	100,00	90,59	86,80	89,49	88,58
Reino Unido	100,00	102,58	112,26	104,49	111,31
Italia	100,00	66,54	63,09	118,92	77,09
Polonia	100,00	142,79	136,16	106,30	89,76
Irlanda	100,00	98,91	78,94	91,17	100,83
Turquía	100,00	80,05	69,25	79,98	77,55
Portugal					
EEUU	100,00	101,14	100,01	99,91	100,58
México	100,00	85,25	51,58	54,59	49,26
Japón	100,00	102,38	102,98	100,19	102,09
Corea del Sur	100,00	92,87	93,15	83,09	89,69
Maximo:	142,793	MAX ((Media+Factor max*Desv Est.):		121,153	10
Mínimo:	49,260	MIN ((Media-Factor min *Desv);0):		66,861	1
Media:	94,007	Percentil 90%:	111,842	54,293	9,000
Media+Factor max*Desv Estándar:	121,153	Percentil 10%:	69,967	Unidad:	0,166
Media-Factor min*Desv Estándar:	66,861		Desv. Est.:	18,098	

Table 70: Indicator CRR A.2 Values: Cumulative year-on-year growth index. Road investment / GDP (Index 100 in 2015)

CRR A.2	Índice del crecimiento interanual acumulado. Inversión en carreteras / PIB (Índice 100 en 2015)						
	2015	2016	2017	2018	Calificación 2019		
España	6,5	4,5	3,2	2,2	1,5	MUY INSUFICIENTE	F
Alemania	6,5	5,5	8,4	10,0	10,0	EXCELENTE	A
Francia	6,5	4,9	4,3	4,8	4,6	INSUFICIENTE	FX
Reino Unido	6,5	6,9	8,5	7,2	8,4	MUY BIEN	B
Italia	6,5	1,0	1,0	9,6	2,7	MUY INSUFICIENTE	F
Polonia	6,5	10,0	10,0	7,5	4,8	INSUFICIENTE	FX
Irlanda	6,5	6,3	3,0	5,0	6,6	SUFICIENTE ALTO	D
Turquía	6,5	3,2	1,4	3,2	2,8	MUY INSUFICIENTE	F
Portugal							
EEUU	6,5	6,7	6,5	6,5	6,6	SUFICIENTE ALTO	D
México	6,5	4,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Japón	6,5	6,9	7,0	6,5	6,8	SUFICIENTE ALTO	D
Corea del Sur	6,5	5,3	5,4	3,7	4,8	INSUFICIENTE	FX

Table 71: Indicator CRR A.2 Rating: Cumulative year-on-year growth index. Road investment / GDP (Index 100 in 2015)

4.4.1.3 Indicator CRR A.3: Cumulative year-on-year growth index. Road investment / Domestic road passenger traffic (Index 100 in 2015)

CRR A.3	Índice del crecimiento interanual acumulado. Inversión en carreteras / Tráfico interior de pasajeros por carretera (Índice 100 en 2015)				
	2015	2016	2017	2018	2019
España	100,00	100,39	92,60	91,72	89,29
Alemania	100,00	90,12	88,92	91,10	85,12
Francia	100,00	99,77	97,81	94,86	91,15
Reino Unido	100,00	110,17	115,80	114,59	111,76
Italia	100,00	101,12	103,73	99,04	98,82
Polonia	100,00	105,84	99,62	97,44	95,09
Irlanda					
Turquía	100,00	102,35	110,61	133,67	133,65
Portugal					
EEUU	100,00	98,96	97,62	96,85	88,17
México					
Japón	100,00	89,61	94,39	97,96	90,46
Corea del Sur	100,00	96,28	95,20	92,51	91,84
Maximo:	133,671	MAX ((Media+Factor max*Desv Est.):		114,020	10
Mínimo:	85,124	MIN ((Media-Factor min *Desv);0):		85,021	1
Media:	99,521	Percentil 90%:	110,725	28,998	9,000
Media+Factor max*Desv Estándar:	114,020	Percentil 10%:	90,068	Unidad:	0,310
Media-Factor min*Desv Estándar:	85,021		Desv. Est.:	9,666	

Table 72: Indicator CRR A.3 Values: Cumulative year-on-year growth index. Road investment / Domestic road passenger traffic (Index 100 in 2015)

CRR A.3	Indice del crecimiento interanual acumulado. Inversión en carreteras / Tráfico interior de pasajeros por carretera (Índice 100 en 2015)						
	2015	2016	2017	2018	Calificación 2019		
España	5,6	5,8	3,4	3,1	2,3	MUY INSUFICIENTE	F
Alemania	5,6	2,6	2,2	2,9	1,0	MUY INSUFICIENTE	F
Francia	5,6	5,6	5,0	4,1	2,9	MUY INSUFICIENTE	F
Reino Unido	5,6	8,8	10,0	10,0	9,3	EXCELENTE	A
Italia	5,6	6,0	6,8	5,4	5,3	SUFICIENTE	E
Polonia	5,6	7,5	5,5	4,9	4,1	INSUFICIENTE	FX
Irlanda							
Turquía	5,6	6,4	8,9	10,0	10,0	EXCELENTE	A
Portugal							
EEUU	5,6	5,3	4,9	4,7	2,0	MUY INSUFICIENTE	F
México							
Japón	5,6	2,4	3,9	5,0	2,7	MUY INSUFICIENTE	F
Corea del Sur	5,6	4,5	4,2	3,3	3,1	INSUFICIENTE	FX

Table 73: Indicator CRR A.3 Rating: Cumulative year-on-year growth index. Road investment / Domestic road passenger traffic (Index 100 in 2015)

4.4.1.4 *Indicator CRR A.4: Cumulative year-on-year growth index. Road investment / Domestic road freight traffic (Index 100 in 2015)*

CRR A.4	Índice del crecimiento interanual acumulado. Inversión carreteras / Tráfico interior de mercancías por carretera (Índice 100 en 2015)				
	2015	2016	2017	2018	2019
España	100,00	87,91	78,50	72,37	67,87
Alemania	100,00	105,67	122,46	132,88	143,77
Francia	100,00	90,85	82,94	87,23	87,69
Reino Unido	100,00	90,91	97,43	90,15	98,61
Italia	100,00	70,69	64,60	119,01	70,84
Polonia	100,00	127,46	115,85	88,87	76,87
Irlanda	100,00	86,52	74,83	96,61	108,55
Turquía	100,00	78,11	63,03	62,14	61,89
Portugal					
EEUU	100,00	100,31	103,18	101,50	112,23
México	100,00	76,87	48,15	50,46	50,23
Japón	100,00	112,45	108,74	103,58	111,46
Corea del Sur	100,00	93,38	93,21	84,86	94,86
Maximo:	143,775	MAX ((Media+Factor max*Desv Est.):		122,143	10
Mínimo:	48,149	MIN ((Media-Factor min *Desv);0):		62,810	1
Media:	92,476	Percentil 90%:	112,789	59,332	9,000
Media+Factor max*Desv Estándar:	122,143	Percentil 10%:	64,439	Unidad:	0,152
Media-Factor min*Desv Estándar:	62,810		Desv. Est.:	19,777	

Table 74: Indicator CRR A.4 Values: Cumulative year-on-year growth index. Road investment / Domestic road freight traffic (Index 100 in 2015)

CRR A.4	Índice del crecimiento interanual acumulado. Inversión carreteras / Tráfico interior de mercancías por carretera (Índice 100 en 2015)						
	2015	2016	2017	2018	Calificación 2019		
España	6,6	4,8	3,4	2,5	1,8	MUY INSUFICIENTE	F
Alemania	6,6	7,5	10,0	10,0	10,0	EXCELENTE	A
Francia	6,6	5,3	4,1	4,7	4,8	INSUFICIENTE	FX
Reino Unido	6,6	5,3	6,3	5,1	6,4	SUFICIENTE ALTO	D
Italia	6,6	2,2	1,3	9,5	2,2	MUY INSUFICIENTE	F
Polonia	6,6	10,0	9,0	5,0	3,1	INSUFICIENTE	FX
Irlanda	6,6	4,6	2,8	6,1	7,9	BIEN	C
Turquía	6,6	3,3	1,0	1,0	1,0	MUY INSUFICIENTE	F
Portugal							
EEUU	6,6	6,7	7,1	6,9	8,5	MUY BIEN	B
México	6,6	3,1	1,0	1,0	1,0	MUY INSUFICIENTE	F
Japón	6,6	8,5	8,0	7,2	8,4	MUY BIEN	B
Corea del Sur	6,6	5,6	5,6	4,3	5,9	SUFICIENTE	E

Table 75: Indicator CRR A.4 Rating: Cumulative year-on-year growth index. Road investment / Domestic road freight traffic (Index 100 in 2015)

4.4.1.5 *Indicator CRR A.5: Cumulative year-on-year growth index. Road investment / Population (Index 100 in 2015)*

CRR A.5	Índice del crecimiento interanual acumulado. Inversión en carreteras / Población (Índice 100 en 2015)				
	2015	2016	2017	2018	2019
España	100,00	91,02	86,36	81,98	79,70
Alemania	100,00	105,14	120,38	131,74	140,02
Francia	100,00	91,81	90,20	95,40	97,20
Reino Unido	100,00	93,70	98,74	93,71	103,60
Italia	100,00	68,28	66,39	127,91	85,08
Polonia	100,00	141,73	147,90	122,97	111,33
Irlanda	100,00	100,49	87,42	109,39	130,32
Turquía	100,00	79,61	65,62	64,64	63,80
Portugal					
EEUU	100,00	103,35	103,68	103,85	114,31
México	100,00	77,81	49,13	51,80	50,63
Japón	1,00	1,16	1,12	1,07	1,17
Corea del Sur	1,00	0,95	0,98	0,91	0,98
Maximo:	147,899	MAX ((Media+Factor max*Desv Est.):		142,715	10
Mínimo:	0,907	MIN ((Media-Factor min *Desv);0):		18,568	1
Media:	80,641	Percentil 90%:	123,465	124,146	9,000
Media+Factor max*Desv Estándar:	142,715	Percentil 10%:	1,063	Unidad:	0,072
Media-Factor min*Desv Estándar:	18,568		Desv. Est.:	41,382	

Table 76: Indicator CRR A.5 Values: Cumulative year-on-year growth index. Road investment / Population (Index 100 in 2015)

CRR A.5	Índice del crecimiento interanual acumulado. Inversión en carreteras / Población (Índice 100 en 2015)						
	2015	2016	2017	2018	Calificación 2019		
España	6,9	6,3	5,9	5,6	5,4	SUFICIENTE	E
Alemania	6,9	7,3	8,4	9,2	9,8	EXCELENTE	A
Francia	6,9	6,3	6,2	6,6	6,7	SUFICIENTE ALTO	D
Reino Unido	6,9	6,4	6,8	6,4	7,2	BIEN	C
Italia	6,9	4,6	4,5	8,9	5,8	SUFICIENTE	E
Polonia	6,9	9,9	10,0	8,6	7,7	BIEN	C
Irlanda	6,9	6,9	6,0	7,6	9,1	EXCELENTE	A
Turquía	6,9	5,4	4,4	4,3	4,3	INSUFICIENTE	FX
Portugal							
EEUU	6,9	7,1	7,2	7,2	7,9	BIEN	C
México	6,9	5,3	3,2	3,4	3,3	INSUFICIENTE	FX
Japón	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Corea del Sur	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F

Table 77: Indicator CRR A.5 Rating: Cumulative year-on-year growth index. Road investment / Population (Index 100 in 2015)

4.4.1.6 *Indicator CRR A.6: Greenhouse gas emission growth index from transportation (t CO2 equivalent) (Index 100 in 2015)*

CRR A.6	índice del Crecimiento de la emisión de gases efecto invernadero por el trasporte (t equivalentes de CO2) (Índice 100 en 2015)				
	2015	2016	2017	2018	2019
España	100,00	103,40	106,55	107,91	109,31
Alemania	100,00	101,85	103,80	100,41	101,42
Francia	100,00	100,18	100,42	98,48	98,51
Reino Unido	100,00	102,05	102,25	100,83	99,11
Italia	100,00	98,88	95,00	98,31	99,30
Polonia	100,00	113,96	131,70	135,59	137,68
Irlanda	100,00	104,09	101,73	103,22	103,28
Turquía	100,00	107,97	111,84	111,63	108,75
Portugal	100,00	102,83	104,92	105,31	108,30
EEUU	100,00	102,31	103,56	105,44	105,55
México	100,00	104,12	99,26	102,98	86,77
Japón	100,00	99,13	98,26	97,19	95,06
Corea del Sur	100,00	104,87	104,39	104,15	107,22
Maximo:	137,677	MAX ((Media+Factor max*Desv Est.):		115,967	1
Mínimo:	86,771	MIN ((Media-Factor min *Desv);0):		91,449	10
Media:	103,708	Percentil 90%:	109,086	24,518	-9,000
Media+Factor max*Desv Estándar:	115,967	Percentil 10%:	98,494	Unidad:	-0,367
Media-Factor min*Desv Estándar:	91,449		Desv. Est.:	8,173	

Table 78: Indicator CRR A.6 Values: Greenhouse gas emission growth index from transportation (t CO2 equivalent) (Index 100 in 2015)

CRR A.6	índice del Crecimiento de la emisión de gases efecto invernadero por el trasporte (t equivalentes de CO2) (Índice 100 en 2015)						
	2015	2016	2017	2018	Calificación 2019		
España	6,9	5,6	4,5	4,0	3,4	INSUFICIENTE	FX
Alemania	6,9	6,2	5,5	6,7	6,3	SUFICIENTE ALTO	D
Francia	6,9	6,8	6,7	7,4	7,4	BIEN	C
Reino Unido	6,9	6,1	6,0	6,6	7,2	BIEN	C
Italia	6,9	7,3	8,7	7,5	7,1	BIEN	C
Polonia	6,9	1,7	1,0	1,0	1,0	MUY INSUFICIENTE	F
Irlanda	6,9	5,4	6,2	5,7	5,7	SUFICIENTE	E
Turquía	6,9	3,9	2,5	2,6	3,7	INSUFICIENTE	FX
Portugal	6,9	5,8	5,1	4,9	3,8	INSUFICIENTE	FX
EEUU	6,9	6,0	5,6	4,9	4,8	INSUFICIENTE	FX
México	6,9	5,3	7,1	5,8	10,0	EXCELENTE	A
Japón	6,9	7,2	7,5	7,9	8,7	MUY BIEN	B
Corea del Sur	6,9	5,1	5,2	5,3	4,2	INSUFICIENTE	FX

Table 79: Indicator CRR A.6 Rating: Greenhouse gas emission growth index from transportation (t CO2 equivalent) (Index 100 in 2015)

4.4.1.7 *Indicator CRR A.7: Percentage of electric and plug-in hybrid vehicles / Registered light vehicles*

CRR A.7	% vehículos eléctricos e híbridos enchufables / Vehículos ligeros matriculados				
	2015	2016	2017	2018	2019
España					5%
Alemania					14%
Francia					12%
Reino Unido					12%
Italia					4%
Polonia					3%
Irlanda					8%
Turquía					
Portugal					13%
EEUU					
México					
Japón					
Corea del Sur					
Maximo:	0,140	MAX ((Media+Factor max*Desv Est.):		0,155	10
Mínimo:	0,030	MIN ((Media-Factor min *Desv);0):		0,022	1
Media:	0,089	Percentil 90%:	0,133	0,133	9,000
Media+Factor max*Desv Estándar:	0,155	Percentil 10%:	0,037	Unidad:	67,843
Media-Factor min*Desv Estándar:	0,022		Desv. Est.:	0,044	

Table 80: Indicator CRR A.7 Values: Percentage of electric and plug-in hybrid vehicles / Registered light vehicles.

CRR A.7	% vehículos eléctricos e híbridos enchufables / Vehículos ligeros matriculados						
	2015	2016	2017	2018	Calificación 2019		
España					2,9	MUY INSUFICIENTE	F
Alemania					9,0	EXCELENTE	A
Francia					7,6	BIEN	C
Reino Unido					7,6	BIEN	C
Italia					2,2	MUY INSUFICIENTE	F
Polonia					1,5	MUY INSUFICIENTE	F
Irlanda					4,9	INSUFICIENTE	FX
Turquía							
Portugal					8,3	MUY BIEN	B
EEUU							
México							
Japón							
Corea del Sur							

Table 81: Indicator CRR A.7 Rating: Percentage of electric and plug-in hybrid vehicles / Registered light vehicles

4.4.1.8 *Indicator CRR A.8: Percentage of CO2 emissions generated by road transport out of total transportation emissions*

CRR A.8	% de la emisión de CO2 generado por el transporte por carretera del total del transporte				
	2015	2016	2017	2018	2019
España	91,4%	90,5%	89,1%	88,9%	88,4%
Alemania	96,7%	96,8%	97,1%	96,8%	96,4%
Francia	94,9%	94,9%	94,8%	94,5%	94,4%
Reino Unido	94,1%	94,1%	94,0%	94,0%	93,7%
Italia	94,6%	94,4%	94,2%	94,7%	94,8%
Polonia	97,6%	97,7%	98,0%	97,8%	98,1%
Irlanda	96,8%	96,4%	96,5%	96,3%	96,2%
Turquía	92,3%	92,2%	92,9%	92,4%	93,1%
Portugal	95,5%	95,2%	95,0%	94,7%	95,3%
EEUU	84,9%	84,6%	84,1%	83,3%	82,9%
México	97,0%	96,9%	97,2%	97,3%	97,2%
Japón	90,2%	90,0%	89,9%	89,7%	89,5%
Corea del Sur	95,2%	94,6%	94,6%	94,8%	95,5%
Maximo:	0,981	MAX ((Media+(F.max*Desv Est.)):		0,993	1
Mínimo:	0,829	MIN ((Media-F min*Desv);>0):		0,880	10
Media:	0,937	Percentil 90%:	0,972	0,113	-9,000
Media+Factor max*Desv Estándar:	0,993	Percentil 10%:	0,890	Unidad:	-79,839
Media-Factor min*Desv Estándar:	0,880		Desv. Est.:	0,038	

Table 82: Indicator CRR A.8 Values: Percentage of CO2 emissions generated by road transport out of total transportation emissions.

CRR A.8	% de la emisión de CO2 generado por el transporte por carretera del total del transporte						
	2015	2016	2017	2018	Calificación 2019		
España	7,3	8,0	9,1	9,3	9,7	EXCELENTE	A
Alemania	3,1	3,0	2,7	3,0	3,3	INSUFICIENTE	FX
Francia	4,5	4,5	4,6	4,8	4,9	INSUFICIENTE	FX
Reino Unido	5,1	5,1	5,2	5,2	5,5	SUFICIENTE	E
Italia	4,7	4,9	5,1	4,7	4,6	INSUFICIENTE	FX
Polonia	2,4	2,3	2,0	2,2	2,0	MUY INSUFICIENTE	F
Irlanda	3,0	3,3	3,2	3,4	3,5	INSUFICIENTE	FX
Turquía	6,6	6,7	6,1	6,5	5,9	SUFICIENTE	E
Portugal	4,0	4,3	4,4	4,7	4,2	INSUFICIENTE	FX
EEUU	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
México	2,8	2,9	2,7	2,6	2,7	MUY INSUFICIENTE	F
Japón	8,3	8,4	8,5	8,7	8,8	MUY BIEN	B
Corea del Sur	4,3	4,7	4,7	4,6	4,0	INSUFICIENTE	FX

Table 83: Indicator CRR A.8 Rating: Percentage of CO2 emissions generated by road transport out of total transportation emissions

4.4.1.9 Indicator CRR A.9: CO2 emissions from registered light vehicles (g/km)

CRR A.9	Emisiones de CO2 procedente de los vehículos ligeros matriculados (g/km)				
	2015	2016	2017	2018	2019
España					121
Alemania					131
Francia					114
Reino Unido					
Italia					119
Polonia					132
Irlanda					114
Turquía					
Portugal					109
EEUU					
México					
Japón					
Corea del Sur					
Maximo:	132,000	MAX ((Media+Factor max*Desv Est.):		133,134	10
Mínimo:	109,000	MIN ((Media-Factor min *Desv);0):		106,866	1
Media:	120,000	Percentil 90%:	131,400	26,268	9,000
Media+Factor max*Desv Estándar:	133,134	Percentil 10%:	112,000	Unidad:	0,343
Media-Factor min*Desv Estándar:	106,866		Desv. Est.:	8,756	

Table 84: Indicator CRR A.9 Values: CO2 emissions from registered light vehicles (g/km)

CRR A.9	Emisiones de CO2 procedente de los vehículos ligeros matriculados (g/km)						
	2015	2016	2017	2018	Calificación 2019		
España					5,8	SUFICIENTE	E
Alemania					9,3	EXCELENTE	A
Francia					3,4	INSUFICIENTE	FX
Reino Unido							
Italia					5,2	SUFICIENTE	E
Polonia					9,6	EXCELENTE	A
Irlanda					3,4	INSUFICIENTE	FX
Turquía							
Portugal					1,7	MUY INSUFICIENTE	F
EEUU							
México							
Japón							
Corea del Sur							

Table 85: Indicator CRR A.9 Rating: CO2 emissions from registered light vehicles (g/km)

4.4.1.10 Indicator CRR A.10: Electric vehicle charging points per million inhabitants

CRR A.10	Puntos de carga de vehículos eléctricos / millon de Habitantes				
	2015	2016	2017	2018	2019
España	54	101	133	137	148
Alemania	165	287	404	427	584
Francia	187	250	354	395	436
Reino Unido	173	205	270	305	445
Italia	109	118	133	148	262
Polonia	151	151	181	218	224
Irlanda	192	220	227	226	228
Turquía	136	132	128	127	126
Portugal	152	162	190	193	215
EEUU					
México					
Japón					
Corea del Sur					
Maximo:	584,249	MAX ((Media+Factor max*Desv Est.):		383,885	10
Mínimo:	54,409	MIN ((Media-Factor min *Desv);0):		52,242	1
Media:	218,063	Percentil 90%:	400,358	331,644	9,000
Media+Factor max*Desv Estándar:	383,885	Percentil 10%:	126,498	Unidad:	0,027
Media-Factor min*Desv Estándar:	52,242		Desv. Est.:	110,548	

Table 86: Indicator CRR A.10 Values: Electric vehicle charging points per million inhabitants

CRR A.10	Puntos de carga de vehículos eléctricos / millon de Habitantes						
	2015	2016	2017	2018	Calificación 2019		
España	1,1	2,3	3,2	3,3	3,6	INSUFICIENTE	FX
Alemania	4,1	7,4	10,0	10,0	10,0	EXCELENTE	A
Francia	4,7	6,4	9,2	10,0	10,0	EXCELENTE	A
Reino Unido	4,3	5,2	6,9	7,9	10,0	EXCELENTE	A
Italia	2,5	2,8	3,2	3,6	6,7	SUFICIENTE ALTO	D
Polonia	3,7	3,7	4,5	5,5	5,7	SUFICIENTE	E
Irlanda	4,8	5,5	5,7	5,7	5,8	SUFICIENTE	E
Turquía	3,3	3,2	3,1	3,0	3,0	INSUFICIENTE	FX
Portugal	3,7	4,0	4,7	4,8	5,4	SUFICIENTE	E
EEUU							
México							
Japón							
Corea del Sur							

Table 87: Indicator CRR A.10 Rating: Electric vehicle charging points per million inhabitants

4.4.1.11 Indicator CRR A.11: Percentage of urban area population exposed to high noise levels

CRR A.11	% de la población de áreas urbanas expuesto a niveles altos de ruido				
	2015	2016	2017	2018	2019
España					60
Alemania					23
Francia					52
Reino Unido					27
Italia					61
Polonia					43
Irlanda					47
Turquía					
Portugal					38
EEUU					
México					
Japón					
Corea del Sur					
Maximo:	61,000	MAX ((Media+Factor max*Desv Est.):		64,973	10
Mínimo:	23,000	MIN ((Media-Factor min *Desv);0):		22,777	1
Media:	43,875	Percentil 90%:	60,300	42,197	9,000
Media+Factor max*Desv Estándar:	64,973	Percentil 10%:	25,800	Unidad:	0,213
Media-Factor min*Desv Estándar:	22,777		Desv. Est.:	14,066	

Table 88: Indicator CRR A.11 Values: Percentage of urban area population exposed to high noise levels

CRR A.11	% de la población de áreas urbanas expuesto a niveles altos de ruido						
	2015	2016	2017	2018	Calificación 2019		
España					8,9	MUY BIEN	B
Alemania					1,0	MUY INSUFICIENTE	F
Francia					7,2	BIEN	C
Reino Unido					1,9	MUY INSUFICIENTE	F
Italia					9,2	EXCELENTE	A
Polonia					5,3	SUFICIENTE	E
Irlanda					6,2	SUFICIENTE ALTO	D
Turquía							
Portugal					4,2	INSUFICIENTE	FX
EEUU							
México							
Japón							
Corea del Sur							

Table 89: Indicator CRR A.11 Rating: Percentage of urban area population exposed to high noise levels

4.4.1.12 Indicator CRR A.12: Percentage of renewable energy in total energy consumed in transportation

CRR A.12	% de energía renovable sobre el total de la enegía consumida en transporte				
	2015	2016	2017	2018	2019
España	5,1%	5,2%	5,8%	6,9%	7,6%
Alemania	6,6%	7,0%	7,0%	7,9%	7,6%
Francia	8,4%	8,4%	8,8%	9,0%	9,2%
Reino Unido	4,5%	5,0%	4,8%	6,5%	8,9%
Italia	6,5%	7,4%	6,5%	7,7%	9,0%
Polonia	5,7%	4,0%	4,2%	5,7%	6,2%
Irlanda	5,9%	5,2%	7,4%	7,2%	8,9%
Turquía					
Portugal	7,4%	7,6%	7,9%	9,0%	9,1%
EEUU					
México					
Japón					
Corea del Sur					
Maximo:	0,092	MAX ((Media+Factor max*Desv Est.):		0,092	10
Mínimo:	0,040	MIN ((Media-Factor min *Desv);0):		0,047	1
Media:	0,070	Percentil 90%:	0,090	0,045	9,000
Media+Factor max*Desv Estándar:	0,092	Percentil 10%:	0,050	Unidad:	198,694
Media-Factor min*Desv Estándar:	0,047		Desv. Est.:	0,015	

Table 90: Indicator CRR A.12 Values: Percentage of renewable energy in total energy consumed in transportation

CRR A.12	% de energía renovable sobre el total de la enegía consumida en transporte						
	2015	2016	2017	2018	Calificación 2019		
España	1,8	2,0	3,2	5,4	6,8	SUFICIENTE ALTO	D
Alemania	4,8	5,6	5,6	7,4	6,8	SUFICIENTE ALTO	D
Francia	8,3	8,3	9,1	9,5	9,9	EXCELENTE	A
Reino Unido	1,0	1,6	1,2	4,6	9,3	EXCELENTE	A
Italia	4,6	6,4	4,6	7,0	9,5	EXCELENTE	A
Polonia	3,0	1,0	1,0	3,0	4,0	INSUFICIENTE	FX
Irlanda	3,4	2,0	6,4	6,0	9,3	EXCELENTE	A
Turquía							
Portugal	6,4	6,8	7,4	9,5	9,7	EXCELENTE	A
EEUU							
México							
Japón							
Corea del Sur							

Table 91: Indicator CRR A.12 Rating: Percentage of renewable energy in total energy consumed in transportation

4.4.1.13 Indicator CRR A.13: Development of climate change mitigation technologies related to transportation (OECD)

CRR A.13	Desarrollo de Tecnologías de mitigación del cambio climático relacionado con el transporte (OCDE)				
	2015	2016	2017	2018	2019
España	1,850	0,890	0,580	0,910	0,840
Alemania	4,250	4,480	5,120	7,270	4,770
Francia	4,160	3,940	4,460	5,120	4,930
Reino Unido	3,010	3,200	3,160	4,770	3,880
Italia	2,200	1,650	2,590	3,790	2,120
Polonia	2,140	1,140	1,080	0,440	1,100
Irlanda	0,320	0,600	0,830	0,670	0,930
Turquía	1,260	0,670	0,730	0,650	0,480
Portugal	1,310	0,480	1,770	0,880	0,270
EEUU	2,800	3,170	2,920	3,280	2,070
México	1,870	1,300	2,020	3,750	1,680
Japón	3,100	3,080	2,940	4,310	2,400
Corea del Sur	2,450	2,880	2,330	2,920	2,000
Maximo:	7,270	MAX ((Media+Factor max*Desv Est.):		4,696	10
Mínimo:	0,270	MIN ((Media-Factor min *Desv);0):		0,072	1
Media:	2,384	Percentil 90%:	4,472	4,624	9,000
Media+Factor max*Desv Estándar:	4,696	Percentil 10%:	0,620	Unidad:	1,946

Table 92: Indicator CRR A.13 Values: Development of climate change mitigation technologies related to transportation (OECD)

CRR A.13	Desarrollo de Tecnologías de mitigación del cambio climático relacionado con el transporte (OCDE)						
	2015	2016	2017	2018	Calificación 2019		
España	4,5	2,6	2,0	2,6	2,5	MUY INSUFICIENTE	F
Alemania	9,1	9,6	10,0	10,0	10,0	EXCELENTE	A
Francia	9,0	8,5	9,5	10,0	10,0	EXCELENTE	A
Reino Unido	6,7	7,1	7,0	10,0	8,4	MUY BIEN	B
Italia	5,1	4,1	5,9	8,2	5,0	SUFICIENTE	E
Polonia	5,0	3,1	3,0	1,7	3,0	INSUFICIENTE	FX
Irlanda	1,5	2,0	2,5	2,2	2,7	MUY INSUFICIENTE	F
Turquía	3,3	2,2	2,3	2,1	1,8	MUY INSUFICIENTE	F
Portugal	3,4	1,8	4,3	2,6	1,4	MUY INSUFICIENTE	F
EEUU	6,3	7,0	6,5	7,2	4,9	INSUFICIENTE	FX
México	4,5	3,4	4,8	8,2	4,1	INSUFICIENTE	FX
Japón	6,9	6,9	6,6	9,2	5,5	SUFICIENTE	E
Corea del Sur	5,6	6,5	5,4	6,5	4,8	INSUFICIENTE	FX

Table 93: Indicator CRR A.13 Rating: Development of climate change mitigation technologies related to transportation (OECD)

4.4.2. Adaptation to the future and sustainability Indicator

	Índice de Adaptación al futuro y desarrollo sostenible					Max valor 2019
	2015	2016	2017	2018	2019	
España	52,4	45,0	39,7	38,6	54,8	117
Alemania	58,8	60,7	72,0	79,9	96,7	117
Francia	64,2	60,0	61,5	65,7	83,8	117
Reino Unido	54,9	56,2	62,6	66,6	86,5	108
Italia	54,8	37,5	38,7	74,7	66,6	117
Polonia	51,8	59,2	56,1	47,5	57,2	117
Irlanda	44,8	41,3	38,2	48,6	75,9	108
Turquía	50,9	34,7	27,3	30,4	30,2	81
Portugal	30,7	22,6	25,9	26,5	38,8	72
EEUU	54,1	54,6	53,5	52,8	52,4	72
México	39,5	24,1	18,6	20,5	20,8	63
Japón	52,9	56,9	57,0	58,5	57,8	72
Corea del Sur	47,7	42,0	41,2	36,2	36,9	72
Maximo:	96,730		Máximo Valor:	VER TABLA	10	
Mínimo:	18,595		MIN:	0	0	
Media:	49,994				10,000	

Table 94: Adaptation to the future and sustainability indicator Values

	Evaluación de Adaptación al futuro y desarrollo sostenible							Subindicadores considerados
	2010	2015	2016	2017	2018	Calificación 2019		
España		5,8	5,0	4,4	4,3	4,7	INSUFICIENTE	FX	13
Alemania		6,5	6,7	8,0	8,9	8,3	MUY BIEN	B	13
Francia		7,1	6,7	6,8	7,3	7,2	BIEN	C	13
Reino Unido		6,1	6,2	7,0	7,4	8,0	MUY BIEN	B	12
Italia		6,1	4,2	4,3	8,3	5,7	SUFICIENTE	E	13
Polonia		5,8	6,6	6,2	5,3	4,9	INSUFICIENTE	FX	13
Irlanda		5,5	5,1	4,7	6,0	7,0	BIEN	C	12
Turquía		6,3	4,3	3,4	3,8	3,7	INSUFICIENTE	FX	9
Portugal		5,7	5,0	5,8	5,9	5,4	SUFICIENTE	E	8
EEUU		7,5	7,6	7,4	7,3	7,3	BIEN	C	8
México		6,3	3,8	3,0	3,3	3,3	INSUFICIENTE	FX	7
Japón		7,4	7,9	7,9	8,1	8,0	MUY BIEN	B	8
Corea del Sur		6,6	5,8	5,7	5,0	5,1	SUFICIENTE	E	8

Table 95: Adaptation to the future and sustainability indicator Rating

Subindicadores de Adaptación al futuro y desarrollo sostenible		Pesos	Punt. Max.	Total Max puntuación	Total Max puntuación reducida
CRR A.1	Índice del crecimiento interanual acumulado. Inversión en carreteras / tasa de motorización (Índice 100 en 2015)	1	10	10	9
CRR A.2	Índice del crecimiento interanual acumulado. Inversión en carreteras / PIB (Índice 100 en 2015)	1	10	10	9
CRR A.3	Índice del crecimiento interanual acumulado. Inversión en carreteras / Tráfico interior de pasajeros por carretera (Índice 100 en 2015)	1	10	10	9
CRR A.4	Índice del crecimiento interanual acumulado. Inversión carreteras / Tráfico interior de mercancías por carretera (Índice 100 en 2015)	1	10	10	9
CRR A.5	Índice del crecimiento interanual acumulado. Inversión en carreteras / Población (Índice 100 en 2015)	1	10	10	9
CRR A.6	índice del Crecimiento de la emisión de gases efecto invernadero por el trasporte (t equivalentes de CO2) (Índice 100 en 2015)	1	10	10	9
CRR A.7	% vehículos eléctricos e híbridos enchufables / Vehículos ligeros matriculados	1	10	10	9
CRR A.8	% de la emisión de CO2 generado por el transporte por carretera del total del transporte	1	10	10	9
CRR A.9	Emisiones de CO2 procedente de los vehículos ligeros matriculados (g/km)	1	10	10	9
CRR A.10	Puntos de carga de vehículos eléctricos / millon de Habitantes	1	10	10	9
CRR A.11	% de la población de áreas urbanas expuesto a niveles altos de ruido	1	10	10	9
CRR A.12	% de energía renovable sobre el total de la enegía consumida en transporte	1	10	10	9
CRR A.13	Desarrollo de Tecnologías de mitigación del cambio climático relacionado con el transporte (OCDE)	1	10	10	9
		13		130	117
		% Valorado de la Max. Puntuación del Criterio	90,0%	117	

Table 96: Weights and maximum reduced scores for the Indicators of Adaptation to the Future and Sustainability

From the annual growth rates of certain indicators in relation to investment (expressed as indices, assigning a value of 100 to the reached value in 2015), it can be deduced whether the investment in roads is adjusted to the growth of demand, motorization, population, and economic growth. As observed in the table below, the average of the indices is close to 100. That is to say, investment tends to align with the growth of the most relevant factors, with the exception of population growth.

As seen, Spain has very low indices (in all cases significantly below the average), indicating a deficit in investment in recent years and a deterioration in the condition of the road network.

Indicator	Average	Min Value	Max Value	Spain (2019)
Annual cumulative growth index. Investment in roads / Motorization rate (Index 100 in 2015)	**94,4**	**41.8**	**136,7**	**74,4**
Annual cumulative growth index. Investment in roads / GDP (Index 100 in 2015)	**94.0**	**49,3**	**142.8**	**70,1**
Annual cumulative growth index. Investment in roads / Interior passenger road traffic (Index 100 in 2015)	**99,5**	**85,1**	**133,7**	**89,3**
Annual cumulative growth index. Investment in roads / Interior goods road traffic (Index 100 in 2015)	**92,5**	**48,8**	**143,8**	**67,9**
Annual cumulative growth index. Investment in roads / Population (Index 100 in 2015)	**80,6**	**49,1**	**147,9**	**79,7**

In relation to environmental sustainability, the index of greenhouse gas emissions growth from transport activity has been analyzed, using a reference value of 100 in the year 2015 (disaggregated data for vehicles was not available). The result indicates that in the year 2010, Spain had the highest index (109.3): from 2015 to 2019, Spain has grown by 9.3%, surpassing all the analyzed countries. Although not explicitly shown in the tables, the Nordic countries are the ones most effectively reducing greenhouse gas emissions, as expected, while developing countries with significant growth are seeing the largest annual increases in emissions.

Other indicators related to vehicle decarbonization:

- The average CO2 emissions from newly registered light vehicles is 120 g/km.
- The average number of electric vehicles charging points per million inhabitants is 218. Spain has one of the lower values at 148. Notable figures are achieved by Germany (584), France (436), and the United Kingdom (445).
- The average percentage of renewable energy in the total energy consumed in transportation is 7%. Spain's value is 7.6%.

In the final index of adaptation to the future and sustainable development, the top-performing countries are Japan, Germany, and the United Kingdom due to their high investments in roads and moderation in greenhouse gas emissions growth (in the case of Japan, it's steadily reducing at a rate of 0.99% in recent years). Spain has the lowest index among the analyzed European countries.

4.5. Operation and maintenance

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

The selected indicators are as follows:

5 OPERATION AND MAINTENANCE	
CRR O.1	O&M Investment / National GDP
CRR O.2	O&M Investment / Inhabitants
CRR O.3	O&M Investment / Equivalent Kilometers of Roads
CRR O.4	O&M Investment / Total Road Investment
CRR O.5	O&M Investment / Interior Passenger Traffic by Road (€/million passenger-km)
CRR O.6	O&M Investment / Interior Freight Traffic by Road (€/million tonne-km)

It should be noted that distinguishing between investment in operation and maintenance and investment in infrastructure creation is challenging. Budget items are not always clearly defined, and national accounting practices in certain countries may not differentiate this separation, leading to unreliable data.

The investment needs for operation, conservation, and maintenance are related to the condition of the infrastructure and the requirements for adapting to new technical, functional, and technological standards. There has been considerable debate among experts, international road associations, and multilateral organizations about the investment necessary for adequate conservation. Although there is no widespread consensus on the exact percentage, it is considered that the necessary investment for conservation should be between 2% and 4% of the asset value, depending on the infrastructure's condition. Calculating the asset value requires establishing agreed-upon criteria that can approximate reality. Some attempts have been made to determine the asset value of roads, but the criteria to be used are not standardized, and verifiable and verifiable data are not available.

Similarly to what was mentioned regarding the Financing criterion, the percentage of GDP allocated to conservation serves as an indicator that can provide guidance on the adequacy of investment for conservation needs. To further specify and support this indicator, investment per capita, investment per equivalent kilometer of roads (see comment in the methodology chapter), and the percentage of investment allocated to conservation in relation to total road investment have also been considered.

The conservation data have been obtained from the OECD: Road infrastructure maintenance investment (€ Current). Although it may not accurately reflect the reality of conservation investment, as the line between creation and conservation investment is blurred.

Data for Germany, Portugal, and Italy were not available, so these countries are not evaluated in this criterion.

When analyzing the investment in operation and maintenance of roads, the ratio of investment per equivalent kilometer of road is essential to standardize data between conventional roads and roads with more than two lanes. Since reliable data is lacking, the following ratios have been considered for the analyzed countries:

	Equivalent Lane Factor (related to population density)				
	2006	2010	2014	2015	2016
Germany	3,00	3,00	3,00	3,00	3,00
Spain	2,20	2,20	2,20	2,20	2,20
USA (United States)	3,00	3,00	3,00	3,00	3,00
France	2,60	2,60	2,60	2,60	2,60
Italy	2,60	2,60	2,60	2,60	2,60
Ireland	2,20	2,20	2,20	2,20	2,20
Japan	3,50	3,50	3,50	3,50	3,50
Mexico	2,20	2,20	2,20	2,20	2,20
Poland	2,20	2,20	2,20	2,20	2,20
United Kingdom	3,00	3,00	3,00	3,00	3,00
Turkey	2,20	2,20	2,20	2,20	2,20
Portugal	2,20	2,20	2,20	2,20	2,20
South Korea	3,50	3,50	3,50	3,50	3,50

In Spain, a factor of 2.2 has been estimated, which is applied to high-capacity roads. This factor increases based on population density, reaching a maximum of 3.5 in Japan.

4.5.1. Operation and Maintenance Indicators

4.5.1.1 Indicator CRR O.1: % Investment in operation and maintenance / National GDP

CRR O.1	Inversión en O&M / PIB nacional				
	2015	2016	2017	2018	2019
España	0,17%	0,16%	0,18%	0,16%	0,15%
Alemania					
Francia	0,12%	0,11%	0,10%	0,10%	0,10%
Reino Unido	0,12%	0,10%	0,09%	0,10%	0,09%
Italia					
Polonia	0,10%	0,10%	0,11%	0,09%	0,09%
Irlanda	0,03%	0,03%	0,03%	0,03%	0,02%
Turquía	0,03%	0,03%	0,03%	0,03%	0,03%
Portugal					
EEUU	0,24%	0,29%	0,28%	0,28%	0,25%
México	0,10%	0,11%	0,07%	0,08%	0,11%
Japón	0,36%	0,37%	0,39%	0,39%	0,47%
Corea del Sur	0,17%	0,14%	0,16%	0,15%	0,17%
Maximo:	0,47%	MAX ((Media+Factor max*Desv Est.):		0,31%	10
Mínimo:	0,02%	MIN ((Media-Factor min *Desv);0):		0,00%	1
Media:	0,14%	Percentil 90%:	0,29%	0,31%	9,000
Media+Factor max*Desv Estándar:	0,31%	Percentil 10%:	0,03%	Unidad:	2920,384
Media-Factor min*Desv Estándar:	-0,02%		Desv. Est.:	0,11%	

Table 97: Indicator CRR O.1 Values: % Investment in operation and maintenance / National GDP

CRR O.1	Inversión en O&M / PIB nacional						
	2015	2016	2017	2018	Calificación 2019		
España	5,9	5,6	6,3	5,7	5,4	SUFICIENTE	E
Alemania							
Francia	4,5	4,2	4,0	3,9	3,8	INSUFICIENTE	FX
Reino Unido	4,5	4,0	3,5	3,8	3,7	INSUFICIENTE	FX
Italia							
Polonia	3,8	3,9	4,2	3,7	3,6	INSUFICIENTE	FX
Irlanda	1,9	1,9	1,8	1,8	1,6	MUY INSUFICIENTE	F
Turquía	1,9	1,9	1,9	2,0	2,0	MUY INSUFICIENTE	F
Portugal							
EEUU	8,1	9,3	9,2	9,1	8,4	MUY BIEN	B
México	4,0	4,3	3,1	3,3	4,3	INSUFICIENTE	FX
Japón	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Corea del Sur	5,9	5,2	5,6	5,4	5,9	SUFICIENTE	E

Table 98: Indicator CRR O.1 Rating: % Investment in operation and maintenance / National GDP

4.5.1.2 Indicator CRR O.2: Investment in O&M / inhabitants

CRR O.2	Inversión en O&M / habitantes				
	2015	2016	2017	2018	2019
España	39	38	45	42	40
Alemania					
Francia	39	36	35	35	35
Reino Unido	49	38	31	35	35
Italia					
Polonia	11	11	14	12	13
Irlanda	17	17	17	18	15
Turquía	3	3	3	3	3
Portugal					
EEUU	124	149	148	148	147
México	9	9	6	6	10
Japón	114	133	136	130	171
Corea del Sur	88	76	87	86	96
Maximo:	171,091	MAX ((Media+Factor max*Desv Est.):		127,832	10
Mínimo:	2,748	MIN ((Media-Factor min *Desv);0):		0,000	1
Media:	52,074	Percentil 90%:	136,771	127,832	9,000
Media+Factor max*Desv Estándar:	127,832	Percentil 10%:	5,614	Unidad:	0,070
Media-Factor min*Desv Estándar:	-23,683		Desv. Est.:	50,505	

Table 99: Indicator CRR O.2 Values: Investment in O&M / inhabitants

CRR O.2	Inversión en O&M / habitantes						
	2015	2016	2017	2018	Calificación 2019		
España	3,7	3,7	4,2	3,9	3,8	INSUFICIENTE	FX
Alemania							
Francia	3,7	3,6	3,5	3,5	3,4	INSUFICIENTE	FX
Reino Unido	4,4	3,7	3,2	3,5	3,4	INSUFICIENTE	FX
Italia							
Polonia	1,8	1,8	2,0	1,9	1,9	MUY INSUFICIENTE	F
Irlanda	2,2	2,2	2,2	2,3	2,1	MUY INSUFICIENTE	F
Turquía	1,2	1,2	1,2	1,2	1,2	MUY INSUFICIENTE	F
Portugal							
EEUU	9,7	10,0	10,0	10,0	10,0	EXCELENTE	A
México	1,6	1,6	1,4	1,4	1,7	MUY INSUFICIENTE	F
Japón	9,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Corea del Sur	7,2	6,4	7,1	7,0	7,8	BIEN	C

Table 100: Indicator CRR O.2 Rating: Investment in O&M / inhabitants

4.5.1.3 Indicator CRR O.3: Investment in O&M / equivalent road kilometers

CRR O.3	Inversión en O&M / km equivalente de carreteras				
	2015	2016	2017	2018	2019
España	2.633	2.554	3.050	2.687	2.587
Alemania					
Francia	2.315	2.166	2.112	2.112	2.073
Reino Unido	7.221	5.719	4.691	5.415	5.370
Italia					
Polonia	982	988	1.213	1.085	1.122
Irlanda	820	830	810	880	750
Turquía	981	932	912	914	903
Portugal					
EEUU	5.813	7.077	7.077	6.984	6.984
México	2.460	2.611	1.757	1.905	3.040
Japón	38.882	45.525	46.261	43.914	57.739
Corea del Sur	19.498	17.075	19.594	19.179	21.616
Maximo:	57.738,838		Percentil 90%:	23.342,692	10
Mínimo:	750,021	MIN ((Media-Factor min *Desv);0):		0,000	1
Media:	8.836,319	Percentil 90%:	23.342,692	23342,692	9,000
Media+Factor max*Desv Estándar:	29.691,581	Percentil 10%:	900,696	Unidad:	0,000
Media-Factor min*Desv Estándar:	-12.018,943		Desv. Est.:	13.903,508	

Table 101: Indicator CRR O.3 Values: Investment in O&M / equivalent road kilometers

CRR O.3	Inversión en O&M / km equivalente de carreteras						
	2015	2016	2017	2018	Calificación 2019		
España	2,0	2,0	2,2	2,0	2,0	MUY INSUFICIENTE	F
Alemania							
Francia	1,9	1,8	1,8	1,8	1,8	MUY INSUFICIENTE	F
Reino Unido	3,8	3,2	2,8	3,1	3,1	INSUFICIENTE	FX
Italia							
Polonia	1,4	1,4	1,5	1,4	1,4	MUY INSUFICIENTE	F
Irlanda	1,3	1,3	1,3	1,3	1,3	MUY INSUFICIENTE	F
Turquía	1,4	1,4	1,4	1,4	1,3	MUY INSUFICIENTE	F
Portugal							
EEUU	3,2	3,7	3,7	3,7	3,7	INSUFICIENTE	FX
México	1,9	2,0	1,7	1,7	2,2	MUY INSUFICIENTE	F
Japón	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Corea del Sur	8,5	7,6	8,6	8,4	9,3	EXCELENTE	A

Table 102: Indicator CRR O.3 Rating: Investment in O&M / equivalent road kilometers

4.5.1.4 Indicator CRR O.4: Investment in O&M / Total investment in roads

CRR O.4	Inversión en O&M / Inversión total en carreteras				
	2015	2016	2017	2018	2019
España	0,42	0,45	0,57	0,55	0,54
Alemania					
Francia	0,26	0,26	0,26	0,25	0,24
Reino Unido	0,35	0,29	0,22	0,27	0,24
Italia					
Polonia	0,19	0,14	0,16	0,17	0,20
Irlanda	0,13	0,13	0,15	0,13	0,09
Turquía	0,03	0,03	0,04	0,04	0,04
Portugal					
EEUU	0,49	0,58	0,57	0,57	0,51
México	0,25	0,32	0,34	0,35	0,56
Japón	0,51	0,52	0,55	0,55	0,66
Corea del Sur	0,17	0,15	0,17	0,18	0,19
Maximo:	0,660	MAX ((Media+Factor max*Desv Est.):		0,577	10
Mínimo:	0,026	MIN ((Media-Factor min *Desv);0):		0,025	1
Media:	0,301	Percentil 90%:	0,562	0,552	9,000
Media+Factor max*Desv Estándar:	0,577	Percentil 10%:	0,084	Unidad:	16,307
Media-Factor min*Desv Estándar:	0,025		Desv. Est.:	0,184	

Table 103: Indicator CRR O.4 Values: Investment in O&M / Total investment in roads

CRR O.4	Inversión en O&M / Inversión total en carreteras						
	2015	2016	2017	2018	Calificación 2019		
España	7,5	8,0	9,9	9,6	9,5	EXCELENTE	A
Alemania							
Francia	4,8	4,9	4,8	4,6	4,5	INSUFICIENTE	FX
Reino Unido	6,3	5,4	4,2	5,0	4,5	INSUFICIENTE	FX
Italia							
Polonia	3,7	2,8	3,2	3,4	3,8	INSUFICIENTE	FX
Irlanda	2,8	2,8	3,0	2,7	2,1	MUY INSUFICIENTE	F
Turquía	1,0	1,1	1,2	1,2	1,2	MUY INSUFICIENTE	F
Portugal							
EEUU	8,6	10,0	9,9	9,9	9,0	EXCELENTE	A
México	4,7	5,9	6,1	6,3	9,8	EXCELENTE	A
Japón	9,0	9,1	9,5	9,5	10,0	EXCELENTE	A
Corea del Sur	3,3	3,1	3,4	3,5	3,6	INSUFICIENTE	FX

Table 104: Indicator CRR O.4 Rating: Investment in O&M / Total investment in roads

4.5.1.5 *Indicator CRR O.5: Investment in O&M / Domestic road passenger traffic (€/million passenger-km)*

CRR O.5	Inversión en O&M / Tráfico interior de viajeros por carretera (€/millón viajeros-km)				
	2015	2016	2017	2018	2019
España	4.973,32	4.647,25	5.769,57	5.224,26	4.996,23
Alemania					
Francia	3.084,92	2.846,62	2.752,37	2.760,19	2.733,75
Reino Unido	4.386,41	3.425,92	2.707,52	3.080,58	3.001,61
Italia					
Polonia	1.744,75	1.674,15	2.005,54	1.731,55	1.713,39
Irlanda					
Turquía	822,96	764,67	728,52	696,17	675,18
Portugal					
EEUU	6.200,41	7.411,35	7.359,09	7.359,09	7.359,09
México					
Japón	16.407,35	18.985,05	19.030,32	17.951,50	23.819,07
Corea del Sur	5.837,98	5.168,99	5.808,35	5.664,54	6.373,15
Maximo:	23.819,069		Percentil 90%:	16.561,766	10
Mínimo:	675,178	MIN ((Media-Factor min *Desv);0):		0,000	1
Media:	5.742,069	Percentil 90%:	16.561,766	16561,766	9,000
Media+Factor max*Desv Estándar:	14.176,634	Percentil 10%:	817,128	Unidad:	0,001
Media-Factor min*Desv Estándar:	-2.692,496		Desv. Est.:	5.623,043	

Table 105: Indicator CRR O.5 Values: Investment in O&M / Domestic road passenger traffic (€/million passenger-km)

CRR O.5	Inversión en O&M / Tráfico interior de viajeros por carretera (€/millón viajeros-km)						
	2015	2016	2017	2018	Calificación 2019		
España	3,7	3,5	4,1	3,8	3,7	INSUFICIENTE	FX
Alemania							
Francia	2,7	2,5	2,5	2,5	2,5	MUY INSUFICIENTE	F
Reino Unido	3,4	2,9	2,5	2,7	2,6	MUY INSUFICIENTE	F
Italia							
Polonia	1,9	1,9	2,1	1,9	1,9	MUY INSUFICIENTE	F
Irlanda							
Turquía	1,4	1,4	1,4	1,4	1,4	MUY INSUFICIENTE	F
Portugal							
EEUU	4,4	5,0	5,0	5,0	5,0	SUFICIENTE	E
México							
Japón	9,9	10,0	10,0	10,0	10,0	EXCELENTE	A
Corea del Sur	4,2	3,8	4,2	4,1	4,5	INSUFICIENTE	FX

Table 106: Indicator CRR O.5 Rating: Investment in O&M / Domestic road passenger traffic (€/million passenger-km)

4.5.1.6 Indicator CRR O.6: Investment in O&M / Domestic road freight traffic (€/million tonne-km)

CRR O.6	Inversión en O&M / Tráfico interior de mercancías por carretera (€/millón tn-km)				
	2015	2016	2017	2018	2019
España	8.644,28	8.087,82	9.071,54	8.148,06	7.512,82
Alemania					
Francia	17.229,64	15.908,70	14.367,68	14.255,26	13.777,44
Reino Unido	20.844,45	15.894,45	12.931,01	14.473,72	14.122,46
Italia					
Polonia	1.521,42	1.379,27	1.482,23	1.230,15	1.216,71
Irlanda	8.329,95	7.177,45	6.888,93	7.626,97	6.046,92
Turquía	979,26	908,80	872,70	860,37	856,91
Portugal					
EEUU	13.672,32	16.041,30	16.344,45	15.966,37	15.966,37
México	4.450,48	4.356,12	2.873,65	3.076,07	4.945,40
Japón	70.662,12	80.473,84	81.686,17	78.292,85	101.319,60
Corea del Sur	16.671,57	14.289,49	15.800,23	15.283,88	17.678,20
Maximo:	101.319,596		Percentil 90%:	25.826,219	10
Mínimo:	856,910	MIN ((Media-Factor min *Desv);0):		0,000	1
Media:	16.649,957	Percentil 90%:	25.826,219	25826,219	9,000
Media+Factor max*Desv Estándar:	51.395,146	Percentil 10%:	1.192,961	Unidad:	0,000
Media-Factor min*Desv Estándar:	-18.095,232		Desv. Est.:	23.163,459	

Table 107: Indicator CRR O.6 Values: Investment in O&M / Domestic road freight traffic (€/million tonne-km)

CRR O.6	Inversión en O&M / Tráfico interior de mercancías por carretera (€/millón tn-km)						
	2015	2016	2017	2018	Calificación 2019		
España	4,0	3,8	4,2	3,8	3,6	INSUFICIENTE	FX
Alemania							
Francia	7,0	6,5	6,0	6,0	5,8	SUFICIENTE	E
Reino Unido	8,3	6,5	5,5	6,0	5,9	SUFICIENTE	E
Italia							
Polonia	1,5	1,5	1,5	1,4	1,4	MUY INSUFICIENTE	F
Irlanda	3,9	3,5	3,4	3,7	3,1	INSUFICIENTE	FX
Turquía	1,3	1,3	1,3	1,3	1,3	MUY INSUFICIENTE	F
Portugal							
EEUU	5,8	6,6	6,7	6,6	6,6	SUFICIENTE ALTO	D
México	2,6	2,5	2,0	2,1	2,7	MUY INSUFICIENTE	F
Japón	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Corea del Sur	6,8	6,0	6,5	6,3	7,2	BIEN	C

Table 108: Indicator CRR O.6 Rating: Investment in O&M / Domestic road freight traffic (€/million tonne-km)

4.5.2. Operation and maintenance Indicator

	Índice de operación y mantenimiento					Max valor 2019
	2015	2016	2017	2018	2019	
España	26,9	26,6	30,8	29,0	28,1	54
Alemania	0,0	0,0	0,0	0,0	0,0	
Francia	24,6	23,6	22,7	22,3	21,8	54
Reino Unido	30,6	25,7	21,7	24,1	23,2	54
Italia	0,0	0,0	0,0	0,0	0,0	
Polonia	14,2	13,2	14,5	13,8	14,2	54
Irlanda	12,1	11,7	11,7	11,7	10,1	45
Turquía	8,3	8,3	8,3	8,4	8,4	54
Portugal	0,0	0,0	0,0	0,0	0,0	
EEUU	39,8	44,7	44,5	44,2	42,6	54
México	14,9	16,3	14,3	14,8	20,6	45
Japón	57,9	59,1	59,5	59,5	60,0	54
Corea del Sur	35,9	32,0	35,4	34,8	38,3	54
Maximo:	60,000		Máximo Valor:	VER TABLA	10	

Table 109: Operation and maintenance Indicator Values

Subindicadores de operación y mantenimiento		Pesos	Punt. Max.	Total Max puntuación	Total Max puntuación reducida
CRR O.1	Inversión en O&M / PIB nacional	1	10	10	9
CRR O.2	Inversión en O&M / habitantes	1	10	10	9
CRR O.3	Inversión en O&M / km equivalente de carreteras	1	10	10	9
CRR O.4	Inversión en O&M / Inversión total en carreteras	1	10	10	9
CRR O.5	Inversión en O&M / Tráfico interior de viajeros por carretera (€/millón viajeros-km)	1	10	10	9
CRR O.6	Inversión en O&M / Tráfico interior de mercancías por carretera (€/millón tn-km)	1	10	10	9
		6		60	
		% Valorado de la Max. Puntuación del Criterio	90,0%	54	54

Table 110: Operation and maintenance Indicator Weights

	Evaluación de operación y mantenimiento							Subindicadores considerados
	2010	2015	2016	2017	2018	Calificación 2019		
España		5,0	4,9	5,7	5,4	5,2	SUFICIENTE	E	6
Alemania									0
Francia		4,6	4,4	4,2	4,1	4,0	INSUFICIENTE	FX	6
Reino Unido		5,7	4,8	4,0	4,5	4,3	INSUFICIENTE	FX	6
Italia									0
Polonia		2,6	2,4	2,7	2,6	2,6	MUY INSUFICIENTE	F	6
Irlanda		2,7	2,6	2,6	2,6	2,3	MUY INSUFICIENTE	F	5
Turquía		1,5	1,5	1,5	1,6	1,6	MUY INSUFICIENTE	F	6
Portugal									0
EEUU		7,4	8,3	8,2	8,2	7,9	BIEN	C	6
México		3,3	3,6	3,2	3,3	4,6	INSUFICIENTE	FX	5
Japón		10,0	10,0	10,0	10,0	10,0	EXCELENTE	A	6
Corea del Sur		6,6	5,9	6,5	6,4	7,1	BIEN	C	6

Table 111: Operation and Maintenance Criterion Rating

It should be noted that separating investment in operation and maintenance from infrastructure creation is often challenging: budget allocations are not always well-defined, and the national accounting practices in certain countries do not distinguish this separation, leading to potentially unreliable data.

As mentioned earlier, the most significant ratio for evaluating the Operation and Maintenance criterion is the percentage of investment in operation and maintenance relative to the asset value, but this value is not obtainable for road infrastructure. Therefore, the investment in operation and maintenance relative to GDP has been used, although data for all countries was not available (Germany, Portugal, and Italy). This ratio averages 0.14%, with a maximum of 0.47% in Japan and a minimum of 0.02% in Ireland and Turkey. Spain has a percentage of 0.15% of GDP.

Another indicative ratio is the percentage of investment in operation and maintenance relative to the total investment. The resulting average value is 30.1% (which is nearly one-third of the total investment in roads), with the maximum at 66% and the minimum at 2.6%. Spain has stabilized this percentage in recent years (around 54%).

The Investment in O&M / equivalent km of roads yields an average value of €8,836/km. This value is likely elevated due to the figures from Japan and South Korea (€57,739 and €21,616, respectively). The investment data for these countries (collected from the OECD) might be inaccurate.

Once again, the countries with the highest scores are the USA and Japan (66%). Germany likely ranks among the better-performing countries, although investment data was not available.

Regarding the percentage of GDP allocated to investment in Operation and Maintenance, Spain invests 0.15%, the lowest value in recent years. The investment per equivalent km of road is one of the lowest among the analyzed countries (€2,587 per km equivalent in 2019), which has translated into a deficient state of road maintenance.

Overall, in the Operation and Maintenance criterion, Spain receives a rating of "sufficient."

4.6. Safety

Within this criterion, the safety of road infrastructure is assessed. The questions that need to be answered are: Is the public works sector safe for users? Are effective measures implemented to ensure safe performance and operation?

The chosen indicators are:

6 SAFETY	
CRR S.1	Accidents with casualties / 100,000 inhabitants
CRR S.2	Accidents with casualties / km of roads
CRR S.3	Fatalities / km of road
CRR S.4	Fatalities / 100,000 inhabitants
CRR S.5	Fatality rate (Number of fatalities / Number of casualties)
CRR S.6	Number of casualties / Interior passenger traffic by road (Million passenger-km)
CRR S.7	Fatalities / Interior passenger traffic by road (Million passenger-km)

The selection of the indicators corresponds to those commonly used: accidents with casualties and fatalities per 100,000 inhabitants; accidents with casualties and fatalities per kilometer of road; fatality index (number of fatalities/number of casualties); and casualties from internal road traffic.

The data source for these indicators is the IRF (International Road Federation) as contained in their World Road Statistics reports for various years. In the case of Spain, these data have been cross-referenced with the Statistical Yearbook of the Ministry of the Interior.

As mentioned in the methodological notes, for the indicators in this criterion, the minimum value for evaluation has not followed the general rule (Mean - 1.5 * Standard Deviation) but has been set at zero, as society as a whole considers achieving the elimination of road accidents an essential and non-negotiable goal.

4.6.1. Safety Indicators

4.6.1.1 Indicator CRR S.1: Accidents with casualties/ 100,000 inhabitants

CRR S.1	Accidentes con víctimas/ 100.000 habitantes				
	2015	2016	2017	2018	2019
España	210	220	219	219	221
Alemania	374	374	366	372	361
Francia	85	86	88	83	83
Reino Unido	225	218	206	193	184
Italia	287	290	289	285	288
Polonia	87	89	86	83	80
Irlanda	124	124	125	126	119
Turquía	233	232	225	227	210
Portugal	308	313	334	333	347
EEUU	545	666	591	588	586
México					
Japón	422	393	372	340	301
Corea del Sur	921	873	851	850	895
Maximo:	921,365	MAX ((Media+Factor max*Desv Est.):		645,854	0
Mínimo:	79,778		MIN=0:	0,000	10
Media:	313,765	Percentil 90%:	598,903	645,854	-10,000
Media+Factor max*Desv Estándar:	645,854	Percentil 10%:	86,262	Unidad:	-0,015
Media-Factor min*Desv Estándar:	-18,324		Desv. Est.:	221,393	

Table 112: Indicator CRR S.1 Values: Accidents with casualties/ 100,000 inhabitants

CRR S.1	Accidentes con víctimas/ 100.000 habitantes						
	2015	2016	2017	2018	Calificación 2019		
España	6,7	6,6	6,6	6,6	6,6	SUFICIENTE ALTO	D
Alemania	4,2	4,2	4,3	4,2	4,4	INSUFICIENTE	FX
Francia	8,7	8,7	8,6	8,7	8,7	MUY BIEN	B
Reino Unido	6,5	6,6	6,8	7,0	7,1	BIEN	C
Italia	5,6	5,5	5,5	5,6	5,5	SUFICIENTE	E
Polonia	8,7	8,6	8,7	8,7	8,8	MUY BIEN	B
Irlanda	8,1	8,1	8,1	8,1	8,2	MUY BIEN	B
Turquía	6,4	6,4	6,5	6,5	6,8	SUFICIENTE ALTO	D
Portugal	5,2	5,2	4,8	4,8	4,6	INSUFICIENTE	FX
EEUU	1,6	0,0	0,8	0,9	0,9	MUY INSUFICIENTE	F
México							
Japón	3,5	3,9	4,2	4,7	5,3	SUFICIENTE	E
Corea del Sur	0,0	0,0	0,0	0,0	0,0	MUY INSUFICIENTE	F

Table 113: Indicator CRR S.1 Rating: Accidents with casualties/ 100,000 inhabitants

4.6.1.2 Indicator CRR S.2: Accidents with casualties/ km of roads

CRR S.2	Accidentes con víctimas/ km carreteras				
	2015	2016	2017	2018	2019
España	0,147	0,154	0,153	0,153	0,156
Alemania	0,476	0,479	0,471	0,480	0,467
Francia	0,051	0,052	0,053	0,051	0,051
Reino Unido	0,339	0,332	0,322	0,304	0,291
Italia	0,674	0,685	0,710	0,733	0,731
Polonia	0,078	0,080	0,077	0,074	0,071
Irlanda	0,059	0,059	0,061	0,062	0,059
Turquía	0,761	0,760	0,737	0,755	0,698
Portugal	0,344	0,348	0,371	0,370	0,386
EEUU	0,262	0,323	0,288	0,287	0,287
México					
Japón	1,535	1,427	1,349	1,220	1,080
Corea del Sur	2,273	2,164	2,119	2,119	2,241
Maximo:	2,273	MAX ((Media+Factor max*Desv Est.):		1,476	0
Mínimo:	0,051		MIN=0:	0,000	10
Media:	0,562	Percentil 90%:	1,438	1,476	-10,000
Media+Factor max*Desv Estándar:	1,476	Percentil 10%:	0,059	Unidad:	-6,773

Table 114: Indicator CRR S.2 Values: Accidents with casualties/ km of roads

CRR S.2	Accidentes con víctimas/ km carreteras						
	2015	2016	2017	2018	Calificación 2019		
España	9,0	9,0	9,0	9,0	8,9	MUY BIEN	B
Alemania	6,8	6,8	6,8	6,7	6,8	SUFICIENTE ALTO	D
Francia	9,7	9,6	9,6	9,7	9,7	EXCELENTE	A
Reino Unido	7,7	7,8	7,8	7,9	8,0	MUY BIEN	B
Italia	5,4	5,4	5,2	5,0	5,0	SUFICIENTE	E
Polonia	9,5	9,5	9,5	9,5	9,5	EXCELENTE	A
Irlanda	9,6	9,6	9,6	9,6	9,6	EXCELENTE	A
Turquía	4,8	4,9	5,0	4,9	5,3	SUFICIENTE	E
Portugal	7,7	7,6	7,5	7,5	7,4	BIEN	C
EEUU	8,2	7,8	8,0	8,1	8,1	MUY BIEN	B
México							
Japón	0,0	0,3	0,9	1,7	2,7	MUY INSUFICIENTE	F
Corea del Sur	0,0	0,0	0,0	0,0	0,0	MUY INSUFICIENTE	F

Table 115: Indicator CRR S.2 Rating: Accidents with casualties/ km of roads

4.6.1.3 Indicator CRR S.3: Fatalities/ km of roads

CRR S.3	Víctimas mortales / km de carretera				
	2015	2016	2017	2018	2019
España	0,003	0,003	0,003	0,003	0,003
Alemania	0,005	0,005	0,005	0,005	0,005
Francia	0,003	0,003	0,003	0,003	0,003
Reino Unido	0,004	0,004	0,004	0,004	0,004
Italia	0,013	0,013	0,014	0,014	0,013
Polonia	0,007	0,007	0,007	0,007	0,007
Irlanda	0,002	0,002	0,002	0,001	0,001
Turquía	0,031	0,030	0,030	0,027	0,022
Portugal	0,006	0,006	0,006	0,007	0,007
EEUU	0,005	0,006	0,006	0,005	0,005
México					
Japón	0,014	0,013	0,013	0,012	0,011
Corea del Sur	0,045	0,042	0,041	0,037	0,033
Maximo:	0,045	MAX ((Media+Factor max*Desv Est.):		0,028	0
Mínimo:	0,001		MIN=0:	0,000	10
Media:	0,011	Percentil 90%:	0,030	0,028	-10,000
Media+Factor max*Desv Estándar:	0,028	Percentil 10%:	0,003	Unidad:	-360,174
Media-Factor min*Desv Estándar:	-0,006		Desv. Est.:	0,011	

Table 116: Indicator CRR S.3 Values: Fatalities/ km of roads

CRR S.3	Víctimas mortales / km de carretera						
	2015	2016	2017	2018	Calificación 2019		
España	9,1	9,0	9,0	9,0	9,1	EXCELENTE	A
Alemania	8,1	8,2	8,2	8,2	8,3	MUY BIEN	B
Francia	8,9	8,9	8,9	8,9	8,9	MUY BIEN	B
Reino Unido	8,5	8,4	8,4	8,4	8,5	MUY BIEN	B
Italia	5,2	5,4	5,1	4,9	5,1	SUFICIENTE	E
Polonia	7,5	7,4	7,6	7,6	7,5	BIEN	C
Irlanda	9,4	9,3	9,4	9,5	9,5	EXCELENTE	A
Turquía	0,0	0,0	0,0	0,3	2,1	MUY INSUFICIENTE	F
Portugal	7,7	7,8	7,7	7,4	7,6	BIEN	C
EEUU	8,1	8,0	8,0	8,0	8,1	MUY BIEN	B
México							
Japón	5,0	5,2	5,4	5,7	6,0	SUFICIENTE ALTO	D
Corea del Sur	0,0	0,0	0,0	0,0	0,0	MUY INSUFICIENTE	F

Table 117: Indicator CRR S.3 Rating: Fatalities/ km of roads

4.6.1.4 Indicator CRR S.4: Fatalities/100,000 inhabitants

CRR S.4	Víctimas mortales/100.000 habitantes				
	2015	2016	2017	2018	2019
España	3,6	3,9	3,9	3,9	3,7
Alemania	4,2	3,9	3,8	4,0	3,7
Francia	5,2	5,2	5,2	4,8	4,8
Reino Unido	2,8	2,8	2,8	2,8	2,7
Italia	5,6	5,4	5,6	5,5	5,3
Polonia	7,7	8,0	7,5	7,5	7,7
Irlanda	3,4	3,8	3,2	2,9	2,8
Turquía	9,6	9,1	9,2	8,1	6,6
Portugal	5,7	5,5	5,8	6,6	6,1
EEUU	11,1	11,6	11,5	11,2	11,0
México					
Japón	3,8	3,7	3,5	3,3	3,1
Corea del Sur	18,3	17,0	16,5	14,8	13,0
Maximo:	18,349	MAX ((Media+Factor max*Desv Est.):		12,166	0
Mínimo:	2,705		MIN=0:	0,000	10
Media:	6,423	Percentil 90%:	11,533	12,166	-10,000
Media+Factor max*Desv Estándar:	12,166	Percentil 10%:	2,854	Unidad:	-0,822
Media-Factor min*Desv Estándar:	0,680		Desv. Est.:	3,829	

Table 118: Indicator CRR S.4 Values: Fatalities/100,000 inhabitants

CRR S.4	Víctimas mortales/100.000 habitantes						
	2015	2016	2017	2018	Calificación 2019		
España	7,0	6,8	6,8	6,8	6,9	SUFICIENTE ALTO	D
Alemania	6,5	6,8	6,8	6,8	7,0	BIEN	C
Francia	5,7	5,7	5,8	6,0	6,0	SUFICIENTE ALTO	D
Reino Unido	7,7	7,7	7,7	7,7	7,8	BIEN	C
Italia	5,4	5,5	5,4	5,5	5,6	SUFICIENTE	E
Polonia	3,6	3,4	3,9	3,8	3,7	INSUFICIENTE	FX
Irlanda	7,2	6,9	7,3	7,7	7,7	BIEN	C
Turquía	2,1	2,5	2,5	3,3	4,6	INSUFICIENTE	FX
Portugal	5,3	5,5	5,2	4,6	5,0	SUFICIENTE	E
EEUU	0,9	0,5	0,5	0,8	1,0	MUY INSUFICIENTE	F
México							
Japón	6,8	7,0	7,1	7,3	7,5	BIEN	C
Corea del Sur	0,0	0,0	0,0	0,0	0,0	MUY INSUFICIENTE	F

Table 119: Indicator CRR S.4 Rating: Fatalities/100,000 inhabitants

4.6.1.5 Indicator CRR S.5: Lethality index (Number of fatalities/Number of casualties)

CRR S.5	Índice de letalidad (Número de víctimas mortales/Número de víctimas)				
	2015	2016	2017	2018	2019
España	0,013	0,013	0,013	0,013	0,013
Alemania	0,009	0,008	0,008	0,008	0,008
Francia	0,049	0,048	0,047	0,046	0,046
Reino Unido	0,009	0,010	0,010	0,011	0,011
Italia	0,014	0,013	0,014	0,014	0,013
Polonia	0,074	0,074	0,072	0,077	0,082
Irlanda	0,021	0,023	0,020	0,017	0,017
Turquía	0,025	0,024	0,025	0,022	0,019
Portugal	0,014	0,014	0,014	0,016	0,014
EEUU	0,015	0,012	0,014	0,013	0,013
México					
Japón	0,007	0,008	0,008	0,008	0,009
Corea del Sur	0,013	0,013	0,013	0,012	0,010
Maximo:	0,082	MAX ((Media+Factor max*Desv Est.):		0,051	0
Mínimo:	0,007		MIN=0:	0,000	10
Media:	0,022	Percentil 90%:	0,048	0,051	-10,000
Media+Factor max*Desv Estándar:	0,051	Percentil 10%:	0,008	Unidad:	-197,301
Media-Factor min*Desv Estándar:	-0,008		Desv. Est.:	0,019	

Table 120: Indicator CRR S.5 Values: Lethality index (Number of fatalities/Number of casualties)

CRR S.5	Índice de letalidad (Número de víctimas mortales/Número de víctimas)						
	2015	2016	2017	2018	Calificación 2019		
España	7,5	7,5	7,4	7,4	7,5	BIEN	C
Alemania	8,3	8,4	8,4	8,4	8,4	MUY BIEN	B
Francia	0,4	0,6	0,7	0,8	0,9	MUY INSUFICIENTE	F
Reino Unido	8,2	8,1	7,9	7,8	7,8	BIEN	C
Italia	7,3	7,4	7,3	7,3	7,4	BIEN	C
Polonia	0,0	0,0	0,0	0,0	0,0	MUY INSUFICIENTE	F
Irlanda	5,9	5,4	6,1	6,6	6,6	SUFICIENTE ALTO	D
Turquía	5,1	5,3	5,1	5,7	6,2	SUFICIENTE ALTO	D
Portugal	7,1	7,3	7,3	6,9	7,3	BIEN	C
EEUU	7,1	7,6	7,3	7,3	7,4	BIEN	C
México							
Japón	8,6	8,5	8,5	8,4	8,3	MUY BIEN	B
Corea del Sur	7,4	7,4	7,4	7,7	8,1	MUY BIEN	B

Table 121: Indicator CRR S.5 Rating: Lethality index (Number of fatalities/Number of casualties)

4.6.1.6 Indicator CRR S.6: Number of casualties/Interior road traffic (Million passenger-kilometers)

CRR S.6	Número de víctimas/ Tráfico interior de viajeros por carretera (Mill pasajeros-km)				
	2015	2016	2017	2018	2019
España	0,269	0,271	0,281	0,274	0,277
Alemania	0,303	0,300	0,310	0,315	0,306
Francia	0,067	0,067	0,068	0,065	0,066
Reino Unido	0,203	0,195	0,183	0,170	0,160
Italia	0,224	0,218	0,206	0,209	0,206
Polonia	0,138	0,135	0,127	0,118	0,108
Irlanda					
Turquía	0,629	0,615	0,580	0,567	0,515
Portugal					
EEUU	0,273	0,330	0,293	0,293	0,293
México					
Japón	0,610	0,560	0,522	0,469	0,419
Corea del Sur	0,614	0,591	0,567	0,561	0,592
Maximo:	0,629	MAX ((Media+Factor max*Desv Est.):		0,585	0
Mínimo:	0,065		MIN=0:	0,000	10
Media:	0,315	Percentil 90%:	0,591	0,585	-10,000
Media+Factor max*Desv Estándar:	0,585	Percentil 10%:	0,104	Unidad:	-17,081
Media-Factor min*Desv Estándar:	0,044		Desv. Est.:	0,181	

Table 122: Indicator CRR S.6 Values: Number of casualties/Interior road traffic (Million passenger-kilometers)

CRR S.6	Número de víctimas/ Tráfico interior de viajeros por carretera (Mill pasajeros-km)						
	2015	2016	2017	2018	Calificación 2019		
España	5,4	5,4	5,2	5,3	5,3	SUFICIENTE	E
Alemania	4,8	4,9	4,7	4,6	4,8	INSUFICIENTE	FX
Francia	8,9	8,8	8,8	8,9	8,9	MUY BIEN	B
Reino Unido	6,5	6,7	6,9	7,1	7,3	BIEN	C
Italia	6,2	6,3	6,5	6,4	6,5	SUFICIENTE ALTO	D
Polonia	7,6	7,7	7,8	8,0	8,2	MUY BIEN	B
Irlanda							
Turquía	0,0	0,0	0,1	0,3	1,2	MUY INSUFICIENTE	F
Portugal							
EEUU	5,3	4,4	5,0	5,0	5,0	SUFICIENTE	E
México							
Japón	0,0	0,4	1,1	2,0	2,8	MUY INSUFICIENTE	F
Corea del Sur	0,0	0,0	0,3	0,4	0,0	MUY INSUFICIENTE	F

Table 123: Indicator CRR S.6 Rating: Number of casualties/Interior road traffic (Million passenger-kilometers)

4.6.1.7 Indicator CRR S.7: Fatalities/Interior road traffic (Million passenger-kilometers)

CRR S.7	Víctimas mortales/ Tráfico interior de viajeros por carretera (Mill pasajeros-km)				
	2015	2016	2017	2018	2019
España	0,005	0,005	0,005	0,005	0,005
Alemania	0,003	0,003	0,003	0,003	0,003
Francia	0,004	0,004	0,004	0,004	0,004
Reino Unido	0,003	0,003	0,002	0,002	0,002
Italia	0,004	0,004	0,004	0,004	0,004
Polonia	0,012	0,012	0,011	0,011	0,010
Irlanda					
Turquía	0,026	0,024	0,024	0,020	0,016
Portugal					
EEUU	0,006	0,006	0,006	0,006	0,006
México					
Japón	0,006	0,005	0,005	0,005	0,004
Corea del Sur	0,012	0,011	0,011	0,010	0,009
Maximo:	0,026	MAX ((Media+Factor max*Desv Est.):		0,016	0
Mínimo:	0,002		MIN=0:	0,000	10
Media:	0,007	Percentil 90%:	0,013	0,016	-10,000
Media+Factor max*Desv Estándar:	0,016	Percentil 10%:	0,003	Unidad:	-622,444
Media-Factor min*Desv Estándar:	-0,001		Desv. Est.:	0,006	

Table 124: Indicator CRR S.7 Values: Fatalities/Interior road traffic (Million passenger-kilometers)

CRR S.7	Víctimas mortales/ Tráfico interior de viajeros por carretera (Mill pasajeros-km)						
	2015	2016	2017	2018	Calificación 2019		
España	7,1	7,0	6,9	7,0	7,1	BIEN	C
Alemania	7,9	8,1	8,0	7,9	8,1	MUY BIEN	B
Francia	7,4	7,5	7,5	7,6	7,6	BIEN	C
Reino Unido	8,4	8,4	8,5	8,5	8,5	MUY BIEN	B
Italia	7,3	7,5	7,5	7,5	7,6	BIEN	C
Polonia	2,3	2,5	3,2	3,4	3,5	INSUFICIENTE	FX
Irlanda							
Turquía	0,0	0,0	0,0	0,0	0,0	MUY INSUFICIENTE	F
Portugal							
EEUU	6,5	6,4	6,4	6,5	6,6	SUFICIENTE ALTO	D
México							
Japón	6,5	6,7	7,0	7,2	7,3	BIEN	C
Corea del Sur	2,4	2,9	3,2	3,9	4,6	INSUFICIENTE	FX

Table 125: Indicator CRR S.7 Rating: Fatalities/Interior road traffic (Million passenger-kilometers)

4.6.2. Safety Indicator

	Índice de seguridad					Max valor 2019
	2015	2016	2017	2018	2019	
España	51,9	51,2	50,8	51,2	51,4	63
Alemania	46,5	47,3	47,3	46,8	47,8	63
Francia	49,6	49,8	50,0	50,7	50,8	63
Reino Unido	53,6	53,6	54,0	54,5	55,0	63
Italia	42,3	43,0	42,5	42,2	42,9	63
Polonia	39,2	39,1	40,6	40,9	41,2	63
Irlanda	40,2	39,3	40,5	41,4	41,5	45
Turquía	18,5	19,0	19,2	21,0	26,2	63
Portugal	33,0	33,4	32,5	31,2	31,8	45
EEUU	37,8	34,6	36,1	36,6	36,9	63
México						0
Japón	30,4	32,0	34,2	37,1	40,0	63
Corea del Sur	9,8	10,3	10,9	12,0	12,7	63
Maximo:	54,988		Máximo Valor:	VER TABLA	10	
Mínimo:	9,790		MIN:	0	0	

Table 126: Safety Indicator Values

Subindicadores de seguridad		Pesos	Punt. Max.	Total Max puntuación	Total Max puntuación reducida
CRR S.1	Accidentes con víctimas/ 100.000 habitantes	1	10	10	9
CRR S.2	Accidentes con víctimas/ km carreteras	1	10	10	9
CRR S.3	Víctimas mortales / km de carretera	1	10	10	9
CRR S.4	Víctimas mortales/100.000 habitantes	1	10	10	9
CRR S.5	Índice de letalidad (Número de víctimas mortales/Número de víctimas)	1	10	10	9
CRR S.6	Número de víctimas/ Tráfico interior de viajeros por carretera (Mill pasajeros-km)	1	10	10	9
CRR S.7	Víctimas mortales/ Tráfico interior de viajeros por carretera (Mill pasajeros-km)	1	10	10	9
		7		70	63
		% Valorado de la Max. Puntuación del Criterio	90,0%	63	

Table 127: Safety Indicator Weights

	Evaluación de seguridad							Subindicadores considerados
	2015	2016	2017	2018	Calificación 2019			
España	8,2	8,1	8,1	8,1	8,2	MUY BIEN	B	7
Alemania	7,4	7,5	7,5	7,4	7,6	BIEN	C	7
Francia	7,9	7,9	7,9	8,0	8,1	MUY BIEN	B	7
Reino Unido	8,5	8,5	8,6	8,7	8,7	MUY BIEN	B	7
Italia	6,7	6,8	6,7	6,7	6,8	SUFICIENTE ALTO	D	7
Polonia	6,2	6,2	6,4	6,5	6,5	SUFICIENTE ALTO	D	7
Irlanda	8,9	8,7	9,0	9,2	9,2	EXCELENTE	A	5
Turquía	2,9	3,0	3,0	3,3	4,2	INSUFICIENTE	FX	7
Portugal	7,3	7,4	7,2	6,9	7,1	BIEN	C	5
EEUU	6,0	5,5	5,7	5,8	5,9	SUFICIENTE	E	7
México								0
Japón	4,8	5,1	5,4	5,9	6,3	SUFICIENTE ALTO	D	7
Corea del Sur	1,6	1,6	1,7	1,9	2,0	MUY INSUFICIENTE	F	7

Table 128: Safety Criterion Rating

The indicators for this criterion are the usual ones used in most countries. The average number of accidents with victims is 313 per 100,000 inhabitants, with France and Poland having the lowest values around 80. Germany, Japan, Portugal, the US, and South Korea have very high values, exceeding 300, and in the case of the US, it surpasses 500. The number of fatalities per 100,000 inhabitants is very high in the US (11) and South Korea (13), and moderate in the rest of the European countries (around 4 in most of them). In Ireland and Turkey, it exceeds 6.

The best-rated countries are Ireland, the United Kingdom, Spain, and France. Turkey and South Korea are the least well-rated (4.2 and 2, respectively).

4.7. Resilience

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

The chosen indicators are:

7 RESILIENCE	
CRR R.1	Railway density / Road density
CRR R.2	km of roads / Country area (km2)
CRR R.3	Secondary road length / Main road length
CRR R.4	km of high-capacity roads / Country area (km2)
CRR R.5	Transport infrastructure quality. GCI Score (WEF)

To adequately address the posed question, data related to the technical characteristics of road design should be available: terrain conditions and vulnerability to adverse phenomena, drainage capacity of the infrastructure (to check if the return period of floods is appropriate for preventing inundations), stability of embankments and cuttings of the roads, organization and equipment of maintenance teams to efficiently and quickly respond to any eventuality, comprehensive winter road maintenance system, etc.

As obtaining all these data for all roads would be very labor-intensive, an alternative approach has been taken by considering alternative transportation systems to roads, both the railway system and the presence of alternative roads. Therefore, the chosen indicators refer to the density of the railway system in relation to the density of roads and to the kilometers of roads in relation to the country's area.

Since secondary roads are the alternative to main roads (which bear the majority of long-distance passenger and freight traffic), a ratio of kilometers of high-capacity roads to kilometers of main roads has been considered.

Another indicator refers to the kilometers of high-capacity roads in relation to the country's area (as high-capacity roads usually have wide platforms typically consisting of dual carriageways with bypasses, and in the event of a disturbance on one carriageway, traffic can be diverted to the other).

Lastly, an indicator developed by the World Economic Forum that assesses the transportation infrastructure of countries worldwide has been considered. It is believed that a country with a well-developed transportation network is better prepared and more resilient in the face of disruptions to the overall transportation system.

4.7.1. Resilience Indicators

4.7.1.1 Indicator CRR R.1: Railway density / Road density

CRR R.1	Densidad de ferrocarril / Densidad de carreteras (km líneas FC/ km carreteras)				
	2015	2016	2017	2018	2019
España	0,024	0,024	0,024	0,024	0,024
Alemania	0,060	0,060	0,060	0,060	0,060
Francia	0,025	0,024	0,025	0,024	0,024
Reino Unido	0,038	0,038	0,039	0,039	0,039
Italia	0,064	0,065	0,068	0,071	0,071
Polonia	0,045	0,044	0,044	0,045	0,045
Irlanda	0,023	0,023	0,019	0,019	0,019
Turquía	0,042	0,042	0,041	0,041	0,041
Portugal	0,028	0,028	0,028	0,028	0,028
EEUU	0,023	0,023	0,022	0,022	0,022
México	0,027	0,029	0,034	0,034	0,034
Japón	0,057	0,055	0,055	0,055	0,055
Corea del Sur	0,050	0,050	0,050	0,049	0,049
Maximo:	0,071	MAX ((Media+Factor max*Desv Est.):		0,062	10
Mínimo:	0,019	MIN ((Media-Factor min *Desv);0):		0,016	1
Media:	0,039	Percentil 90%:	0,060	0,045	9,000
Media+Factor max*Desv Estándar:	0,062	Percentil 10%:	0,023	Unidad:	198,071
Media-Factor min*Desv Estándar:	0,016		Desv. Est.:	0,015	

Table 129: Indicator CRR R.1 Values: Railway density / Road density

CRR R.1	Densidad de ferrocarril / Densidad de carreteras (km líneas FC/ km carreteras)							
	2010	2015	2016	2017	2018	Calificación 2019		
España		2,6	2,6	2,6	2,6	2,6	MUY INSUFICIENTE	F
Alemania		9,6	9,7	9,6	9,6	9,6	EXCELENTE	A
Francia		2,7	2,6	2,7	2,6	2,6	MUY INSUFICIENTE	F
Reino Unido		5,2	5,2	5,4	5,4	5,4	SUFICIENTE	E
Italia		10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Polonia		6,6	6,6	6,5	6,6	6,6	SUFICIENTE ALTO	D
Irlanda		2,3	2,3	1,6	1,6	1,6	MUY INSUFICIENTE	F
Turquía		6,2	6,1	5,9	5,9	5,8	SUFICIENTE	E
Portugal		3,3	3,3	3,3	3,3	3,3	INSUFICIENTE	FX
EEUU		2,2	2,2	2,2	2,2	2,2	MUY INSUFICIENTE	F
México		3,2	3,5	4,4	4,4	4,4	INSUFICIENTE	FX
Japón		9,1	8,7	8,6	8,6	8,6	MUY BIEN	B
Corea del Sur		7,6	7,6	7,6	7,5	7,5	BIEN	C

Table 130: Indicator CRR R.1 Rating: Railway density / Road density

4.7.1.2 Indicator CRR R.2: km of roads / Country area (100 km2)

CRR R.2	km de carreteras / Superficie país (100 km2)				
	2015	2016	2017	2018	2019
España	132	132	132	132	132
Alemania	180	180	180	180	180
Francia	201	201	201	201	201
Reino Unido	177	177	173	174	174
Italia	86	85	82	78	78
Polonia	135	135	136	136	136
Irlanda	141	141	141	141	141
Turquía	31	31	32	32	32
Portugal	101	101	101	100	100
EEUU	68	68	68	68	68
México	22	21	21	21	21
Japón	93	93	93	93	93
Corea del Sur	85	85	85	85	85
Maximo:	201,031	MAX ((Media+Factor max*Desv Est.):		191,847	10
Mínimo:	20,731	MIN ((Media-Factor min *Desv);0):		30,278	1
Media:	111,062	Percentil 90%:	179,770	161,569	9,000
Media+Factor max*Desv Estándar:	191,847	Percentil 10%:	31,214	Unidad:	0,056
Media-Factor min*Desv Estándar:	30,278		Desv. Est.:	53,856	

Table 131: Indicator CRR R.2 Values: km of roads / Country area (100 km2)

CRR R.2	km de carreteras / Superficie país (100 km2)							
	2010	2015	2016	2017	2018	Calificación 2019		
España		6,7	6,7	6,7	6,7	6,7	SUFICIENTE ALTO	D
Alemania		9,3	9,3	9,3	9,3	9,3	EXCELENTE	A
Francia		10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Reino Unido		9,2	9,2	9,0	9,0	9,0	EXCELENTE	A
Italia		4,1	4,1	3,9	3,6	3,7	INSUFICIENTE	FX
Polonia		6,8	6,8	6,9	6,9	6,9	SUFICIENTE ALTO	D
Irlanda		7,2	7,2	7,2	7,2	7,2	BIEN	C
Turquía		1,0	1,0	1,1	1,1	1,1	MUY INSUFICIENTE	F
Portugal		4,9	4,9	4,9	4,9	4,9	INSUFICIENTE	FX
EEUU		3,1	3,1	3,1	3,1	3,1	INSUFICIENTE	FX
México		1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Japón		4,5	4,5	4,5	4,5	4,5	INSUFICIENTE	FX
Corea del Sur		4,0	4,0	4,0	4,0	4,0	INSUFICIENTE	FX

Table 132: Indicator CRR R.2 Rating: km of roads / Country area (100 km2)

4.7.1.3 Indicator CRR R.3: km of secondary roads / km of main roads

CRR R.3	km carreteras secundarias / km Carreteras principales				
	2015	2016	2017	2018	2019
España	9,4	9,3	9,3	9,3	9,3
Alemania	4,7	4,7	4,7	4,7	4,7
Francia	39,3	39,5	41,8	39,6	39,7
Reino Unido	0,7	0,7	0,7	0,7	0,7
Italia	7,2	7,5	6,3	5,8	5,9
Polonia	8,0	7,9	7,9	7,9	7,9
Irlanda	3,0	3,0	3,0	3,0	3,0
Turquía	1,1	1,1	1,1	1,1	1,1
Portugal	0,7	0,7	0,7	0,7	0,7
EEUU	4,8	4,8	4,8	4,8	4,8
México	3,3	3,3	3,3	3,3	3,3
Japón	1,8	1,8	1,8	1,8	1,8
Corea del Sur	1,2	1,2	1,2	1,2	1,2
Maximo:	41,840		Percentil 90%:	9,310	10
Mínimo:	0,668	MIN ((Media-Factor min *Desv);0):		0,000	1
Media:	6,548	Percentil 90%:	9,310	9,310	9,000
Media+Factor max*Desv Estándar:	21,710	Percentil 10%:	0,742	Unidad:	0,967
Media-Factor min*Desv Estándar:	-8,614		Desv. Est.:	10,108	

Table 133: Indicator CRR R.3 Values: km of secondary roads / km of main roads

CRR R.3	km carreteras secundarias / km Carreteras principales						
	2015	2016	2017	2018	Calificación 2019		
España	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Alemania	5,6	5,6	5,6	5,6	5,6	SUFICIENTE	E
Francia	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Reino Unido	1,6	1,6	1,6	1,6	1,6	MUY INSUFICIENTE	F
Italia	7,9	8,2	7,1	6,6	6,7	SUFICIENTE ALTO	D
Polonia	8,7	8,7	8,7	8,6	8,6	MUY BIEN	B
Irlanda	3,9	3,9	3,9	3,9	3,9	INSUFICIENTE	FX
Turquía	2,1	2,1	2,1	2,1	2,1	MUY INSUFICIENTE	F
Portugal	1,7	1,7	1,7	1,7	1,7	MUY INSUFICIENTE	F
EEUU	5,7	5,7	5,7	5,7	5,7	SUFICIENTE	E
México	4,2	4,2	4,2	4,2	4,2	INSUFICIENTE	FX
Japón	2,7	2,7	2,7	2,7	2,7	MUY INSUFICIENTE	F
Corea del Sur	2,2	2,2	2,2	2,2	2,2	MUY INSUFICIENTE	F

Table 134: Indicator CRR R.3 Rating: km of secondary roads / km of main roads

4.7.1.4 Indicator CRR R.4: km of high-capacity roads / Country area (100 km²)

CRR R.4	km de carreteras de gran capacidad/ Superficie país (100 km2)				
	2015	2016	2017	2018	2019
España	3,364	3,381	3,392	3,405	3,436
Alemania	3,635	3,634	3,638	3,675	3,687
Francia	2,112	2,115	2,116	2,126	2,126
Reino Unido	1,547	1,545	1,545	1,583	1,583
Italia	2,304	2,304	2,304	2,298	2,310
Polonia	0,499	0,524	0,524	0,524	0,536
Irlanda	1,303	1,303	1,303	1,303	1,303
Turquía	0,362	0,362	0,362	0,362	0,362
Portugal	3,323	3,323	3,323	3,323	3,323
EEUU	0,781	0,783	0,783	1,091	1,091
México	0,507	0,499	0,499	0,540	0,540
Japón	2,288	2,322	2,360	2,360	2,360
Corea del Sur	3,682	3,682	3,682	3,955	3,955
Maximo:	3,955	MAX ((Media+Factor max*Desv Est.):		3,828	10
Mínimo:	0,362	MIN ((Media-Factor min *Desv);0):		0,187	1
Media:	2,007	Percentil 90%:	3,660	3,641	9,000
Media+Factor max*Desv Estándar:	3,828	Percentil 10%:	0,499	Unidad:	2,472
Media-Factor min*Desv Estándar:	0,187		Desv. Est.:	1,214	

Table 135: Indicator CRR R.4 Values: km of high-capacity roads / Country area (100 km²)

CRR R.4	km de carreteras de gran capacidad/ Superficie país (100 km2)						
	2015	2016	2017	2018	Calificación 2019		
España	8,9	8,9	8,9	9,0	9,0	EXCELENTE	A
Alemania	9,5	9,5	9,5	9,6	9,7	EXCELENTE	A
Francia	5,8	5,8	5,8	5,8	5,8	SUFICIENTE	E
Reino Unido	4,4	4,4	4,4	4,5	4,5	INSUFICIENTE	FX
Italia	6,2	6,2	6,2	6,2	6,2	SUFICIENTE ALTO	D
Polonia	1,8	1,8	1,8	1,8	1,9	MUY INSUFICIENTE	F
Irlanda	3,8	3,8	3,8	3,8	3,8	INSUFICIENTE	FX
Turquía	1,4	1,4	1,4	1,4	1,4	MUY INSUFICIENTE	F
Portugal	8,8	8,8	8,8	8,8	8,8	MUY BIEN	B
EEUU	2,5	2,5	2,5	3,2	3,2	INSUFICIENTE	FX
México	1,8	1,8	1,8	1,9	1,9	MUY INSUFICIENTE	F
Japón	6,2	6,3	6,4	6,4	6,4	SUFICIENTE ALTO	D
Corea del Sur	9,6	9,6	9,6	10,0	10,0	EXCELENTE	A

Table 136: Indicator CRR R.4 Rating: km of high-capacity roads / Country area (100 km²)

4.7.1.5 Indicator CRR R.5: Transport infrastructure score (WEF)

CRR R.5	Infraestructura de transporte. Score GCI (WEF)				
	2015	2016	2017	2018	2019
España	90,300	90,300	90,300	90,300	90,300
Alemania	90,200	90,200	90,200	90,200	90,200
Francia	82,600	82,600	82,600	82,600	82,600
Reino Unido	81,000	81,000	81,000	81,000	81,000
Italia	73,200	73,200	73,200	73,200	73,200
Polonia	67,800	67,800	67,800	67,800	67,800
Irlanda	60,400	60,400	60,400	60,400	60,400
Turquía	64,900	64,900	64,900	64,900	64,900
Portugal	71,200	71,200	71,200	71,200	71,200
EEUU	79,600	79,600	79,600	79,600	79,600
México	57,400	57,400	57,400	57,400	57,400
Japón	87,800	87,800	87,800	87,800	87,800
Corea del Sur	87,600	87,600	87,600	87,600	87,600
Maximo:	90,300	MAX ((Media+Factor max*Desv Est.):		100,000	10
Mínimo:	57,400	MIN ((Media-Factor min *Desv);0):		59,853	1
Media:	76,462	Percentil 90%:	90,200	40,147	9,000
Media+Factor max*Desv Estándar:	93,071	Percentil 10%:	60,400	Unidad:	0,224
Media-Factor min*Desv Estándar:	59,853		Desv. Est.:	11,073	

Table 137: Indicator CRR R.5 Values: Transport infrastructure score (WEF)

CRR R.5	Infraestructura de transporte. Score GCI (WEF)						
	2015	2016	2017	2018	Calificación 2019		
España	7,8	7,8	7,8	7,8	7,8	BIEN	C
Alemania	7,8	7,8	7,8	7,8	7,8	BIEN	C
Francia	6,1	6,1	6,1	6,1	6,1	SUFICIENTE ALTO	D
Reino Unido	5,7	5,7	5,7	5,7	5,7	SUFICIENTE	E
Italia	4,0	4,0	4,0	4,0	4,0	INSUFICIENTE	FX
Polonia	2,8	2,8	2,8	2,8	2,8	MUY INSUFICIENTE	F
Irlanda	1,1	1,1	1,1	1,1	1,1	MUY INSUFICIENTE	F
Turquía	2,1	2,1	2,1	2,1	2,1	MUY INSUFICIENTE	F
Portugal	3,5	3,5	3,5	3,5	3,5	INSUFICIENTE	FX
EEUU	5,4	5,4	5,4	5,4	5,4	SUFICIENTE	E
México	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Japón	7,3	7,3	7,3	7,3	7,3	BIEN	C
Corea del Sur	7,2	7,2	7,2	7,2	7,2	BIEN	C

Table 138: Indicator CRR R.5 Rating: Transport infrastructure score (WEF)

4.7.2. Resilience Indicator

	Índice de resiliencia					Max valor 2019
	2015	2016	2017	2018	2019	
España	35,9	35,9	36,0	36,0	36,0	45
Alemania	41,8	41,9	41,9	41,9	41,9	45
Francia	34,5	34,5	34,6	34,5	34,5	45
Reino Unido	26,1	26,1	26,1	26,2	26,2	45
Italia	32,3	32,5	31,2	30,5	30,6	45
Polonia	26,7	26,7	26,7	26,8	26,8	45
Irlanda	18,2	18,2	17,5	17,5	17,5	45
Turquía	12,8	12,7	12,6	12,6	12,5	45
Portugal	22,2	22,2	22,2	22,2	22,2	45
EEUU	18,9	18,9	18,9	19,6	19,6	45
México	11,1	11,4	12,4	12,5	12,5	45
Japón	29,8	29,4	29,5	29,4	29,4	45
Corea del Sur	30,6	30,6	30,6	31,0	31,0	45
Maximo:	41,926		Máximo Valor:	VER TABLA	10	
Mínimo:	11,131		MIN:	0	0	

Table 139: Resilience Indicator Values

Subindicadores de resiliencia		Pesos	Punt. Max.	Total Max puntuación	Total Max puntuación reducida
CRR R.1	Densidad de ferrocarril / Densidad de carreteras (km líneas FC/ km carreteras)	1	10	10	9
CRR R.2	km de carreteras / Superficie país (100 km2)	1	10	10	9
CRR R.3	km carreteras secundarias / km Carreteras principales	1	10	10	9
CRR R.4	km de carreteras de gran capacidad/ Superficie país (100 km2)	1	10	10	9
CRR R.5	Infraestructura de transporte. Score GCI (WEF)	1	10	10	9
		5		50	45
		% Valorado de la Max. Puntuación del Criterio	90,0%	45	

Table 140: Resilience Indicators Weights

	Evaluación de resiliencia								Subindicadores considerados
	2010	2015	2016	2017	2018	Calificación 2019			
España		8,0	8,0	8,0	8,0	8,0	MUY BIEN	B	5
Alemania		9,3	9,3	9,3	9,3	9,3	EXCELENTE	A	5
Francia		7,7	7,7	7,7	7,7	7,7	BIEN	C	5
Reino Unido		5,8	5,8	5,8	5,8	5,8	SUFICIENTE	E	5
Italia		7,2	7,2	6,9	6,8	6,8	SUFICIENTE ALTO	D	5
Polonia		5,9	5,9	5,9	6,0	6,0	SUFICIENTE ALTO	D	5
Irlanda		4,0	4,0	3,9	3,9	3,9	INSUFICIENTE	FX	5
Turquía		2,8	2,8	2,8	2,8	2,8	MUY INSUFICIENTE	F	5
Portugal		4,9	4,9	4,9	4,9	4,9	INSUFICIENTE	FX	5
EEUU		4,2	4,2	4,2	4,4	4,4	INSUFICIENTE	FX	5
México		2,5	2,5	2,8	2,8	2,8	MUY INSUFICIENTE	F	5
Japón		6,6	6,5	6,6	6,5	6,5	SUFICIENTE ALTO	D	5
Corea del Sur		6,8	6,8	6,8	6,9	6,9	SUFICIENTE ALTO	D	5

Table 141: Resilience Criterion Rating

The highest overall score in this indicator is obtained by Germany, Spain, and France, followed by the United Kingdom, Italy, Poland, Japan, and South Korea. The United States stands out unfavorably with an insufficient rating.

4.8. Engineering and Innovation

The evaluation of innovation based on indicators aims to answer the following questions: Are the resources allocated to engineering in the design, construction, maintenance, management, and operation of the public works sector adequate? Is the investment in innovation appropriate? What new techniques, materials, technologies, and operational methods are being implemented to improve public works? Is progress being made in digitization, monitoring, and sensorization throughout the entire lifecycle of public works? Is the information provided to users adequate?

The chosen indicators are:

8 ENGINEERING AND INNOVATION	
CRR I.1	% of GDP spent on Research and Development (R&D) (OECD R&D)
CRR I.2	Gross domestic expenditure on R&D ($) / Population (OECD R&D)
CRR I.3	% of GDP allocated to basic research expenditure (OECD R&D)
CRR I.4	Total R&D personnel per 1,000 employees (OECD R&D)
CRR I.5	% of GDP for private funding of R&D (OECD R&D)
CRR I.6	% of GDP for public funding of R&D (OECD R&D)
CRR I.7	Digitalization. Participation in new technologies. GCI Score (WEF)
CRR I.8	Digitalization. Information and communication technology infrastructure index (ND Index)
CRR I.9	Digitalization. Number of internet users
CRR I.10	Resident patent applications (per million inhabitants)
CRR I.11	Engineering. Regulatory transparency. Index of trade in services restrictions (OECD)
CRR I.12	Engineering. Barriers to competition. Index of trade in services restrictions (OECD)
CRR I.13	Engineering. Movement restrictions. Index of trade in services restrictions (OECD)
CRR I.14	Engineering. Restrictions on the entry of foreign engineers
CRR I.15	Innovation Index. ND Gain Index
CRR I.16	Number of patents related to road transportation per million inhabitants (OECD)

To thoroughly analyze engineering and innovation in road infrastructure, it's essential to have an in-depth understanding of new techniques, materials, and technologies being applied in roads, as well as the innovations being implemented, the state of road engineering, progress in digitization, and the resources allocated to engineering and innovation funding.

Despite the efforts to obtain specific and reliable data for the road infrastructure sector, concrete data has proven elusive. In the absence of such data, a global analysis of R&D and innovation across different countries has been adopted as a surrogate for evaluating the state of roads. For this purpose, the Main Science and Technology Indicators, Volume 2021, published in 2022 by the OECD[2], have been selected. This extensive report provides a set of indicators that reflect the level and structure of efforts made by OECD member countries and seven non-member economies (Argentina, People's Republic of China, Romania, Russian Federation, Singapore, and South Africa) in the field of science and technology. These indicators cover resources dedicated to research and development, patent families, and international trade in R&D-intensive industries. The Innovation Index from the ND Gain and the number of road transport-related patents per million inhabitants from the OECD have also been considered.

[2] Main Science and Technology Indicators, Volume 2021 Issue 2 | READ online (oecd-ilibrary.org)

To assess the progress in digitization, three indicators have been included: Participation in New Technologies (GCI - WEF -), Index of Information and Communication Technology Infrastructure (ND Gain Index, ICT infrastructure), and the number of internet users.

For analyzing the state of engineering in the road sector, it would have been desirable to have precise information on the training of road engineers, the number of engineers working in the design, construction, maintenance, and management of roads per unit of economic investment. Particularly valuable data would have related to the economic investment in engineering compared to the investment directed at the construction, maintenance, operation, and management of road networks. Unfortunately, obtaining such data has proven unattainable. Therefore, four OECD indicators related to engineering have been considered: regulatory transparency, barriers to competition, restrictions on the movement of engineers, and restrictions on the entry of foreign engineers. All these indicators are related to the Index of Trade in Services Restrictiveness periodically prepared by the OECD[3].

[3] Services Trade Restrictiveness Index (oecd.org)

4.8.1. Innovation Indicators

4.8.1.1 Indicator CRR I.1: % of GDP allocated to Gross Domestic Expenditure on R&D (OCDE R&D)

CRR I.1	% del PIB destinado al Gasto interior bruto en I+D (OCDE R&D)				
	2015	2016	2017	2018	2019
España	1,22%	1,19%	1,21%	1,24%	1,25%
Alemania	2,93%	2,94%	3,05%	3,11%	3,17%
Francia	2,23%	2,22%	2,20%	2,20%	2,19%
Reino Unido	1,63%	1,64%	1,66%	1,70%	1,71%
Italia	1,34%	1,37%	1,37%	1,42%	1,46%
Polonia	1,00%	0,96%	1,03%	1,21%	1,32%
Irlanda	1,18%	1,18%	1,26%	1,17%	1,23%
Turquía	0,88%	0,94%	0,95%	1,03%	1,06%
Portugal	1,24%	1,28%	1,32%	1,35%	1,40%
EEUU	2,79%	2,85%	2,91%	3,01%	3,18%
México	0,43%	0,39%	0,33%	0,31%	0,28%
Japón	3,24%	3,11%	3,17%	3,22%	3,21%
Corea del Sur	3,98%	3,99%	4,29%	4,52%	4,63%
Maximo:	4,63%	MAX ((Media+(F. max*Desv Est.)):		3,56%	10
Mínimo:	0,28%	MIN ((Media-(F min *Desv));>0):		0,27%	1
Media:	1,92%	Percentil 90%:	3,22%	3,30%	9,000
Media+(Factor max*Desv Estándar):	3,56%	Percentil 10%:	0,94%	Unidad:	272,969
Media-(Factor min*Desv Estándar):	0,27%		Desv. Est.:	1,10%	

Table 142: Indicator CRR I.1 Values: % of GDP allocated to Gross Domestic Expenditure on R&D (OCDE R&D)

CRR I.1	% del PIB destinado al Gasto interior bruto en I+D (OCDE R&D)						
	2015	2016	2017	2018	Calificación 2019		
España	3,6	3,5	3,6	3,7	3,7	INSUFICIENTE	FX
Alemania	8,3	8,3	8,6	8,8	8,9	MUY BIEN	B
Francia	6,4	6,3	6,3	6,3	6,3	SUFICIENTE ALTO	D
Reino Unido	4,7	4,7	4,8	4,9	4,9	INSUFICIENTE	FX
Italia	3,9	4,0	4,0	4,1	4,3	INSUFICIENTE	FX
Polonia	3,0	2,9	3,1	3,6	3,9	INSUFICIENTE	FX
Irlanda	3,5	3,5	3,7	3,5	3,6	INSUFICIENTE	FX
Turquía	2,7	2,8	2,9	3,1	3,2	INSUFICIENTE	FX
Portugal	3,7	3,8	3,9	4,0	4,1	INSUFICIENTE	FX
EEUU	7,9	8,1	8,2	8,5	9,0	MUY BIEN	B
México	1,4	1,3	1,2	1,1	1,0	MUY INSUFICIENTE	F
Japón	9,1	8,8	8,9	9,1	9,0	EXCELENTE	A
Corea del Sur	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A

Table 143: Indicator CRR I.1 Rating: % of GDP allocated to Gross Domestic Expenditure on R&D (OCDE R&D)

4.8.1.2 Indicator CRR I.2: Gross Domestic Expenditure on R&D ($) / Population (OCDE R&D)

CRR I.2	Gasto interior bruto en I+D ($)/Población (OCDE R&D)				
	2015	2016	2017	2018	2019
España	427	444	479	506	522
Alemania	1.397	1.487	1.617	1.717	1.763
Francia	909	952	977	1.019	1.070
Reino Unido	701	733	770	811	838
Italia	498	550	575	619	649
Polonia	266	270	307	382	442
Irlanda	818	842	977	990	1.073
Turquía	227	250	269	290	289
Portugal	369	405	436	471	505
EEUU	1.581	1.651	1.740	1.892	2.066
México	79	76	66	63	57
Japón	1.326	1.263	1.315	1.361	1.364
Corea del Sur	1.508	1.578	1.758	1.943	1.992
Maximo:	206600,00%	MAX ((Media+(F. max*Desv Est.)):		173241,99%	10
Mínimo:	5700,00%	MIN ((Media-(F min *Desv));>0):		871,85%	1
Media:	87056,92%	Percentil 90%:	173080,00%	172370,14%	9,000
Media+(Factor max*Desv Estándar):	173241,99%	Percentil 10%:	25640,00%	Unidad:	0,005
Media-(Factor min*Desv Estándar):	871,85%		Desv. Est.:	57456,71%	

Table 144: Indicator CRR I.2 Values: Gross Domestic Expenditure on R&D ($) / Population (OCDE R&D)

CRR I.2	Gasto interior bruto en I+D ($)/Población (OCDE R&D)						
	2015	2016	2017	2018	Calificación 2019		
España	3,2	3,3	3,5	3,6	3,7	INSUFICIENTE	FX
Alemania	8,2	8,7	9,4	9,9	10,0	EXCELENTE	A
Francia	5,7	5,9	6,1	6,3	6,5	SUFICIENTE ALTO	D
Reino Unido	4,6	4,8	5,0	5,2	5,3	SUFICIENTE	E
Italia	3,6	3,8	4,0	4,2	4,3	INSUFICIENTE	FX
Polonia	2,3	2,4	2,6	2,9	3,3	INSUFICIENTE	FX
Irlanda	5,2	5,4	6,1	6,1	6,6	SUFICIENTE ALTO	D
Turquía	2,1	2,3	2,4	2,5	2,5	MUY INSUFICIENTE	F
Portugal	2,9	3,1	3,2	3,4	3,6	INSUFICIENTE	FX
EEUU	9,2	9,6	10,0	10,0	10,0	EXCELENTE	A
México	1,4	1,4	1,3	1,3	1,3	MUY INSUFICIENTE	F
Japón	7,9	7,5	7,8	8,1	8,1	MUY BIEN	B
Corea del Sur	8,8	9,2	10,0	10,0	10,0	EXCELENTE	A

Table 145: Indicator CRR I.2 Rating: Gross Domestic Expenditure on R&D ($) / Population (OCDE R&D)

4.8.1.3 Indicator CRR I.3: % del PIB destinado a gasto en investigación básica (OCDE R&D)

CRR I.3	% del PIB destinado a gasto en investigación básica (OCDE R&D))				
	2015	2016	2017	2018	2019
España	0,27%	0,26%	0,26%	0,26%	0,29%
Alemania					
Francia	0,54%	0,50%	0,50%	0,50%	0,50%
Reino Unido	0,27%	0,30%	0,29%	0,31%	0,31%
Italia	0,33%	0,32%	0,30%	0,31%	0,31%
Polonia	0,32%	0,29%	0,30%	0,39%	0,53%
Irlanda	0,22%		0,20%		
Turquía					
Portugal	0,29%	0,29%	0,29%	0,29%	0,30%
EEUU	0,46%	0,46%	0,46%	0,47%	0,48%
México	0,14%	0,12%	0,10%	0,09%	0,09%
Japón	0,39%	0,39%	0,42%	0,41%	0,40%
Corea del Sur	0,69%	0,64%	0,62%	0,64%	0,68%
Maximo:	0,69%	MAX ((Media+(F. max*Desv Est.)):		0,58%	10
Mínimo:	0,09%	MIN ((Media-(F min *Desv));>0):		0,14%	1
Media:	0,36%	Percentil 90%:	0,54%	0,44%	9,000
Media+(Factor max*Desv Estándar):	0,58%	Percentil 10%:	0,20%	Unidad:	2028,206

Table 146: Indicator CRR I.3 Values: % del PIB destinado a gasto en investigación básica (OCDE R&D)

CRR I.3	% del PIB destinado a gasto en investigación básica (OCDE R&D))						
	2015	2016	2017	2018	Calificación 2019		
España	3,6	3,4	3,4	3,4	4,1	INSUFICIENTE	FX
Alemania							
Francia	9,1	8,3	8,3	8,3	8,3	MUY BIEN	B
Reino Unido	3,6	4,3	4,1	4,5	4,5	INSUFICIENTE	FX
Italia	4,9	4,7	4,3	4,5	4,5	INSUFICIENTE	FX
Polonia	4,7	4,1	4,3	6,1	8,9	MUY BIEN	B
Irlanda	2,6		2,2				
Turquía							
Portugal	4,1	4,1	4,1	4,1	4,3	INSUFICIENTE	FX
EEUU	7,5	7,5	7,5	7,7	7,9	BIEN	C
México	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Japón	6,1	6,1	6,7	6,5	6,3	SUFICIENTE ALTO	D
Corea del Sur	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A

Table 147: Indicator CRR I.3 Rating: % del PIB destinado a gasto en investigación básica (OCDE R&D)

4.8.1.4 Indicator CRR I.4: Total number of personnel in R&D per 1,000 employees (OCDE R&D)

CRR I.4	Nº total de personal en I+D por cada 1.000 empleados (OCDE R&D)				
	2015	2016	2017	2018	2019
España	11	11	11	11	11
Alemania	15	15	16	16	16
Francia	16	16	16	16	16
Reino Unido	13	13	14	14	15
Italia	11	12	13	14	14
Polonia	7	7	9	10	10
Irlanda	17	17	16	14	14
Turquía	5	5	6	6	7
Portugal	11	11	12	12	12
EEUU					
México	2	2	2	2	2
Japón	13	13	13	13	13
Corea del Sur	17	17	18	19	19
Maximo:	1900,00%	MAX ((Media+(F. max*Desv Est.)):		1883,98%	10
Mínimo:	150,00%	MIN ((Media-(F min *Desv));>0):		506,69%	1
Media:	1195,33%	Percentil 90%:	1700,00%	1377,29%	9,000
Media+(Factor max*Desv Estándar):	1883,98%	Percentil 10%:	500,00%	Unidad:	0,653
Media-(Factor min*Desv Estándar):	506,69%		Desv. Est.:	459,10%	

Table 148: Indicator CRR I.4 Values: Total number of personnel in R&D per 1,000 employees (OCDE R&D)

CRR I.4	Nº total de personal en I+D por cada 1.000 empleados (OCDE R&D)						
	2015	2016	2017	2018	Calificación 2019		
España	4,9	4,9	4,9	4,9	4,9	INSUFICIENTE	FX
Alemania	7,5	7,5	8,1	8,1	8,1	MUY BIEN	B
Francia	8,1	8,1	8,1	8,1	8,1	MUY BIEN	B
Reino Unido	6,2	6,2	6,8	6,8	7,5	BIEN	C
Italia	4,9	5,5	6,2	6,8	6,8	SUFICIENTE ALTO	D
Polonia	2,3	2,3	3,6	4,2	4,2	INSUFICIENTE	FX
Irlanda	8,8	8,8	8,1	6,8	6,8	SUFICIENTE ALTO	D
Turquía	1,0	1,0	1,6	1,6	2,3	MUY INSUFICIENTE	F
Portugal	4,9	4,9	5,5	5,5	5,5	SUFICIENTE	E
EEUU							
México	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Japón	6,2	6,2	6,2	6,2	6,2	SUFICIENTE ALTO	D
Corea del Sur	8,8	8,8	9,5	10,0	10,0	EXCELENTE	A

Table 149: Indicator CRR I.4 Rating: Total number of personnel in R&D per 1,000 employees (OCDE R&D)

4.8.1.5 Indicator CRR I.5: % of GDP from private funding for R&D (OCDE R&D)

CRR I.5	% del PIB de Financiación privada destinada a I+D (OCDE R&D)				
	2015	2016	2017	2018	2019
España	0,56%	0,56%	0,58%	0,61%	0,61%
Alemania	1,93%	1,92%	2,02%	2,05%	2,04%
Francia	1,23%	1,24%	1,24%	1,24%	1,24%
Reino Unido	0,80%	0,85%	0,89%	0,93%	0,92%
Italia	0,67%	0,71%	0,74%	0,78%	0,82%
Polonia	0,39%	0,51%	0,54%	0,64%	0,67%
Irlanda	0,58%	0,58%	0,64%	0,59%	0,77%
Turquía	0,39%	0,44%	0,47%	0,55%	0,60%
Portugal	0,53%	0,57%	0,61%	0,64%	0,67%
EEUU	1,76%	1,83%	1,84%	1,93%	2,08%
México	0,07%	0,07%	0,06%	0,05%	0,05%
Japón	2,53%	2,43%	2,48%	2,55%	2,54%
Corea del Sur	2,97%	3,01%	3,27%	3,46%	3,56%
Maximo:	3,56%	MAX ((Media+(F. max*Desv Est.)):		2,56%	10
Mínimo:	0,05%	MIN ((Media-(F min *Desv));>0):		0,00%	1
Media:	1,19%	Percentil 90%:	2,54%	2,56%	9,000
Media+(Factor max*Desv Estándar):	2,56%	Percentil 10%:	0,41%	Unidad:	351,709
Media-(Factor min*Desv Estándar):	-0,19%		Desv. Est.:	0,92%	

Table 150: Indicator CRR I.5 Values: % of GDP from private funding for R&D (OCDE R&D)

CRR I.5	% del PIB de Financiación privada destinada a I+D (OCDE R&D)						
	2015	2016	2017	2018	Calificación 2019		
España	3,0	3,0	3,0	3,1	3,1	INSUFICIENTE	FX
Alemania	7,8	7,8	8,1	8,2	8,2	MUY BIEN	B
Francia	5,3	5,4	5,4	5,4	5,4	SUFICIENTE	E
Reino Unido	3,8	4,0	4,1	4,3	4,2	INSUFICIENTE	FX
Italia	3,4	3,5	3,6	3,7	3,9	INSUFICIENTE	FX
Polonia	2,4	2,8	2,9	3,3	3,4	INSUFICIENTE	FX
Irlanda	3,0	3,0	3,3	3,1	3,7	INSUFICIENTE	FX
Turquía	2,4	2,5	2,7	2,9	3,1	INSUFICIENTE	FX
Portugal	2,9	3,0	3,1	3,3	3,4	INSUFICIENTE	FX
EEUU	7,2	7,4	7,5	7,8	8,3	MUY BIEN	B
México	1,2	1,2	1,2	1,2	1,2	MUY INSUFICIENTE	F
Japón	9,9	9,5	9,7	10,0	9,9	EXCELENTE	A
Corea del Sur	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A

Table 151: Indicator CRR I.5 Rating: % of GDP from private funding for R&D (OCDE R&D)

4.8.1.6 Indicator CRR I.6: % of GDP from public funding for R&D (OCDE R&D)

CRR I.6	% del PIB de Financiación pública destinada a I+D (OCDE R&D)				
	2015	2016	2017	2018	2019
España	0,50%	0,48%	0,47%	0,47%	0,47%
Alemania	0,82%	0,84%	0,84%	0,87%	0,88%
Francia	0,79%	0,72%	0,71%	0,69%	0,69%
Reino Unido	0,45%	0,43%	0,43%	0,44%	0,46%
Italia	0,51%	0,48%	0,44%	0,47%	0,47%
Polonia	0,42%	0,37%	0,40%	0,43%	0,51%
Irlanda	0,31%	0,30%	0,30%	0,29%	0,28%
Turquía	0,34%	0,33%	0,32%	0,33%	0,31%
Portugal	0,55%	0,55%	0,54%	0,55%	0,56%
EEUU	0,69%	0,66%	0,65%	0,66%	0,66%
México	0,34%	0,30%	0,25%	0,24%	0,22%
Japón	0,50%	0,47%	0,47%	0,47%	0,47%
Corea del Sur	0,94%	0,90%	0,93%	0,93%	0,96%
Maximo:	0,96%	MAX ((Media+(F. max*Desv Est.)):		0,83%	10
Mínimo:	0,22%	MIN ((Media-(F min *Desv));>0):		0,23%	1
Media:	0,53%	Percentil 90%:	0,86%	0,60%	9,000
Media+(Factor max*Desv Estándar):	0,83%	Percentil 10%:	0,30%	Unidad:	1492,145
Media-(Factor min*Desv Estándar):	0,23%		Desv. Est.:	0,20%	

Table 152: Indicator CRR I.6 Values: % of GDP from public funding for R&D (OCDE R&D)

CRR I.6	% del PIB de Financiación pública destinada a I+D (OCDE R&D)						
	2015	2016	2017	2018	Calificación 2019		
España	5,0	4,7	4,6	4,6	4,6	INSUFICIENTE	FX
Alemania	9,8	10,0	10,0	10,0	10,0	EXCELENTE	A
Francia	9,4	8,3	8,2	7,9	7,9	BIEN	C
Reino Unido	4,3	4,0	4,0	4,1	4,4	INSUFICIENTE	FX
Italia	5,2	4,7	4,1	4,6	4,6	INSUFICIENTE	FX
Polonia	3,8	3,1	3,5	4,0	5,2	SUFICIENTE	E
Irlanda	2,2	2,1	2,1	1,9	1,8	MUY INSUFICIENTE	F
Turquía	2,6	2,5	2,4	2,5	2,2	MUY INSUFICIENTE	F
Portugal	5,8	5,8	5,6	5,8	5,9	SUFICIENTE	E
EEUU	7,9	7,4	7,3	7,4	7,4	BIEN	C
México	2,6	2,1	1,3	1,2	1,0	MUY INSUFICIENTE	F
Japón	5,0	4,6	4,6	4,6	4,6	INSUFICIENTE	FX
Corea del Sur	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A

Table 153: Indicator CRR I.6 Rating: % of GDP from public funding for R&D (OCDE R&D)

4.8.1.7 Indicator CRR I.7: Digitalization. Digitalization. Participation in new technologies. GCI (WEF) score

CRR I.7	Digitalización. Participación en la nuevas tecnologías. Puntuación GCI (WEF)				
	2015	2016	2017	2018	2019
España					98,3%
Alemania					92,1%
Francia					96,6%
Reino Unido					98,3%
Italia					95,5%
Polonia					89,3%
Irlanda					93,3%
Turquía					86,0%
Portugal					89,9%
EEUU					98,3%
México					94,4%
Japón					98,3%
Corea del Sur					100,0%
Maximo:	100,00%	MAX		100,00%	10
Mínimo:	86,00%	MIN ((Media-(F min *Desv));>0):		88,20%	0
Media:	94,64%	Percentil 90%:	98,30%	11,80%	10,000
Media+(Factor max*Desv Estándar):	101,07%	Percentil 10%:	89,42%	Unidad:	84,773
Media-(Factor min*Desv Estándar):	88,20%		Desv. Est.:	4,29%	

Table 154: Indicator CRR I.7 Values: Digitalization. Digitalization. Participation in new technologies. GCI (WEF) score

CRR I.7	Digitalización. Participación en la nuevas tecnologías. Puntuación GCI (WEF)						
	2015	2016	2017	2018	Calificación 2019		
España					8,6	MUY BIEN	B
Alemania					3,3	INSUFICIENTE	FX
Francia					7,1	BIEN	C
Reino Unido					8,6	MUY BIEN	B
Italia					6,2	SUFICIENTE ALTO	D
Polonia					0,9	MUY INSUFICIENTE	F
Irlanda					4,3	INSUFICIENTE	FX
Turquía					0,0	MUY INSUFICIENTE	F
Portugal					1,4	MUY INSUFICIENTE	F
EEUU					8,6	MUY BIEN	B
México					5,3	SUFICIENTE	E
Japón					8,6	MUY BIEN	B
Corea del Sur					10,0	EXCELENTE	A

Table 155: Indicator CRR I.7 Rating: Digitalization. Digitalization. Participation in new technologies. GCI (WEF) score

4.8.1.8 *Indicator CRR I.8: Digitalization. Index of Information and Communication Technologies Infrastructure. (ND Gain Index. ICT infrastructure)*

CRR I.8	Digitalización. Índice de las Infraestructuras de tecnologías de información y comunicación. (ND Index)				
	2015	2016	2017	2018	2019
España	0,622	0,632	0,648	0,656	0,671
Alemania	0,698	0,694	0,699	0,706	0,710
Francia	0,698	0,706	0,713	0,719	0,725
Reino Unido	0,702	0,712	0,701	0,703	0,710
Italia	0,542	0,554	0,566	0,598	0,603
Polonia	0,531	0,542	0,549	0,553	0,558
Irlanda	0,631	0,633	0,635	0,641	0,640
Turquía	0,454	0,469	0,491	0,514	0,524
Portugal	0,607	0,623	0,641	0,656	0,665
EEUU	0,620	0,650	0,654	0,657	0,661
México	0,466	0,475	0,488	0,498	0,512
Japón	0,670	0,679	0,678	0,680	0,687
Corea del Sur	0,714	0,722	0,730	0,730	0,732
Maximo:	73,21%	MAX		75,05%	10
Mínimo:	45,40%	MIN ((Media-(F min *Desv));>0):		50,95%	0
Media:	63,00%	Percentil 90%:	71,34%	24,09%	10,000
Media+(Factor max*Desv Estándar):	75,05%	Percentil 10%:	50,33%	Unidad:	41,503
Media-(Factor min*Desv Estándar):	50,95%		Desv. Est.:	8,03%	

Table 156: Indicator CRR I.8 Values: Digitalization. Index of Information and Communication Technologies Infrastructure. (ND Gain Index. ICT infrastructure)

CRR I.8	Digitalización. Índice de las Infraestructuras de tecnologías de información y comunicación. (ND Index)						
	2015	2016	2017	2018	Calificación 2019		
España	4,7	5,1	5,7	6,1	6,7	SUFICIENTE ALTO	D
Alemania	7,8	7,7	7,9	8,2	8,3	MUY BIEN	B
Francia	7,8	8,1	8,4	8,7	8,9	MUY BIEN	B
Reino Unido	8,0	8,4	8,0	8,0	8,3	MUY BIEN	B
Italia	1,3	1,9	2,4	3,7	3,9	INSUFICIENTE	FX
Polonia	0,9	1,3	1,7	1,8	2,0	MUY INSUFICIENTE	F
Irlanda	5,0	5,1	5,2	5,5	5,4	SUFICIENTE	E
Turquía	0,0	0,0	0,0	0,2	0,6	MUY INSUFICIENTE	F
Portugal	4,1	4,7	5,5	6,1	6,5	SUFICIENTE ALTO	D
EEUU	4,6	5,8	6,0	6,1	6,3	SUFICIENTE ALTO	D
México	0,0	0,0	0,0	0,0	0,1	MUY INSUFICIENTE	F
Japón	6,6	7,0	7,0	7,1	7,3	BIEN	C
Corea del Sur	8,5	8,8	9,1	9,2	9,2	EXCELENTE	A

Table 157: Indicator CRR I.8 Rating: Digitalization. Index of Information and Communication Technologies Infrastructure. (ND Gain Index. ICT infrastructure)

4.8.1.9 Indicator CRR I.9: Digitalization. Number of individuals using the internet

CRR I.9	Digitalización. % de personas que usan internet				
	2015	2016	2017	2018	2019
España	78,7%	81,7%	84,6%	86,1%	90,7%
Alemania	87,6%	86,0%	84,4%	87,0%	88,1%
Francia	78,0%	79,3%	80,5%	82,0%	83,3%
Reino Unido	92,0%	91,2%	90,4%	90,7%	92,5%
Italia	58,1%	60,6%	63,1%	74,4%	78,0%
Polonia	68,0%	72,0%	76,0%	77,5%	80,4%
Irlanda	83,5%	83,8%	84,1%	84,5%	85,0%
Turquía	53,7%	59,2%	64,7%	71,0%	74,0%
Portugal	68,6%	71,2%	73,8%	74,7%	75,3%
EEUU	74,6%	81,0%	87,3%	88,5%	90,0%
México	57,4%	60,7%	63,9%	65,8%	70,1%
Japón	91,1%	91,4%	91,7%	91,3%	92,7%
Corea del Sur	89,9%	92,5%	95,1%	96,0%	96,2%
Maximo:	96,20%	MAX		100,00%	10
Mínimo:	53,70%	MIN ((Media-(F min *Desv));>0):		63,48%	1
Media:	79,95%	Percentil 90%:	91,88%	36,52%	9,000
Media+(Factor max*Desv Estándar):	96,43%	Percentil 10%:	63,42%	Unidad:	24,644
Media-(Factor min*Desv Estándar):	63,48%		Desv. Est.:	10,98%	

Table 158: Indicator CRR I.9 Values: Digitalization. Number of individuals using the internet

CRR I.9	Digitalización. % de personas que usan internet						
	2015	2016	2017	2018	Calificación 2019		
España	4,8	5,5	6,2	6,6	7,7	BIEN	C
Alemania	6,9	6,5	6,2	6,8	7,1	BIEN	C
Francia	4,6	4,9	5,2	5,6	5,9	SUFICIENTE	E
Reino Unido	8,0	7,8	7,6	7,7	8,2	MUY BIEN	B
Italia	1,0	1,0	1,0	3,7	4,6	INSUFICIENTE	FX
Polonia	2,1	3,1	4,1	4,5	5,2	SUFICIENTE	E
Irlanda	5,9	6,0	6,1	6,2	6,3	SUFICIENTE ALTO	D
Turquía	1,0	1,0	1,3	2,9	3,6	INSUFICIENTE	FX
Portugal	2,3	2,9	3,5	3,8	3,9	INSUFICIENTE	FX
EEUU	3,7	5,3	6,9	7,2	7,5	BIEN	C
México	1,0	1,0	1,1	1,6	2,6	MUY INSUFICIENTE	F
Japón	7,8	7,9	8,0	7,9	8,2	MUY BIEN	B
Corea del Sur	7,5	8,2	8,8	9,0	9,1	EXCELENTE	A

Table 159: Indicator CRR I.9 Rating: Digitalization. Number of individuals using the internet

4.8.1.10 Indicator CRR I.10: Patent applications by residents (per million inhabitants)

CRR I.10	Solicitudes de patentes de residentes (por millón de habitantes)				
	2015	2016	2017	2018	2019
España			83	71	67
Alemania			887	885	884
Francia			374	369	363
Reino Unido			282	280	272
Italia			215	220	227
Polonia			115	125	115
Irlanda			139	181	190
Turquía			112	94	100
Portugal			77	86	95
EEUU			904	873	869
México			11	12	10
Japón			2.053	2.005	1.943
Corea del Sur			3.097	3.150	3.319
Maximo:	331900,00%	MAX ((Media+(F. max*Desv Est.)):		202122,49%	10
Mínimo:	1000,00%	MIN ((Media-(F min *Desv));>0):		0,00%	1
Media:	64497,44%	Percentil 90%:	201460,00%	202122,49%	9,000
Media+(Factor max*Desv Estándar):	202122,49%	Percentil 10%:	7020,00%	Unidad:	0,004
Media-(Factor min*Desv Estándar):	-73127,62%		Desv. Est.:	91750,04%	

Table 160: Indicator CRR I.10 Values: Patent applications by residents (per million inhabitants)

CRR I.10	Solicitudes de patentes de residentes (por millón de habitantes)						
	2015	2016	2017	2018	Calificación 2019		
España			1,4	1,3	1,3	MUY INSUFICIENTE	F
Alemania			4,9	4,9	4,9	INSUFICIENTE	FX
Francia			2,7	2,6	2,6	MUY INSUFICIENTE	F
Reino Unido			2,3	2,2	2,2	MUY INSUFICIENTE	F
Italia			2,0	2,0	2,0	MUY INSUFICIENTE	F
Polonia			1,5	1,6	1,5	MUY INSUFICIENTE	F
Irlanda			1,6	1,8	1,8	MUY INSUFICIENTE	F
Turquía			1,5	1,4	1,4	MUY INSUFICIENTE	F
Portugal			1,3	1,4	1,4	MUY INSUFICIENTE	F
EEUU			5,0	4,9	4,9	INSUFICIENTE	FX
México			1,0	1,1	1,0	MUY INSUFICIENTE	F
Japón			10,0	9,9	9,7	EXCELENTE	A
Corea del Sur			10,0	10,0	10,0	EXCELENTE	A

Table 161: Indicator CRR I.10 Rating: Patent applications by residents (per million inhabitants)

4.8.1.11 Indicator CRR I.11: Engineering. Regulatory transparency. Trade in Services Restrictiveness Index (OECD)

CRR I.11	Ingeniería. Transparencia regulatoria. Índice de restricción del comercio de servicios (OCDE)				
	2015	2016	2017	2018	2019
España	0,028	0,028	0,028	0,028	0,028
Alemania	0,014	0,014	0,014	0,014	0,028
Francia	0,028	0,028	0,028	0,014	0,014
Reino Unido	0,028	0,028	0,028	0,028	0,028
Italia	0,028	0,028	0,028	0,028	0,028
Polonia	0,028	0,028	0,028	0,028	0,028
Irlanda	0,014	0,014	0,014	0,014	0,014
Turquía	0,028	0,028	0,028	0,028	0,042
Portugal	0,028	0,028	0,028	0,028	0,028
EEUU	0,014	0,014	0,014	0,014	0,014
México	0,028	0,028	0,042	0,042	0,042
Japón	0,001	0,001	0,001	0,001	0,001
Corea del Sur	0,001	0,001	0,001	0,001	0,001
Maximo:	4,20%	MAX ((Media+(F. max*Desv Est.)):		3,83%	1
Mínimo:	0,10%	MIN ((Media-(F min *Desv));>0):		0,42%	10
Media:	2,13%	Percentil 90%:	2,80%	3,41%	-9,000
Media+(Factor max*Desv Estándar):	3,83%	Percentil 10%:	0,10%	Unidad:	-264,094
Media-(Factor min*Desv Estándar):	0,42%		Desv. Est.:	1,14%	

Table 162: Indicator CRR I.11 Values: Engineering. Regulatory transparency. Trade in Services Restrictiveness Index (OECD)

CRR I.11	Ingeniería. Transparencia regulatoria. Índice de restricción del comercio de servicios (OCDE)						
	2015	2016	2017	2018	Calificación 2019		
España	3,7	3,7	3,7	3,7	3,7	INSUFICIENTE	FX
Alemania	7,4	7,4	7,4	7,4	3,7	INSUFICIENTE	FX
Francia	3,7	3,7	3,7	7,4	7,4	BIEN	C
Reino Unido	3,7	3,7	3,7	3,7	3,7	INSUFICIENTE	FX
Italia	3,7	3,7	3,7	3,7	3,7	INSUFICIENTE	FX
Polonia	3,7	3,7	3,7	3,7	3,7	INSUFICIENTE	FX
Irlanda	7,4	7,4	7,4	7,4	7,4	BIEN	C
Turquía	3,7	3,7	3,7	3,7	1,0	MUY INSUFICIENTE	F
Portugal	3,7	3,7	3,7	3,7	3,7	INSUFICIENTE	FX
EEUU	7,4	7,4	7,4	7,4	7,4	BIEN	C
México	3,7	3,7	1,0	1,0	1,0	MUY INSUFICIENTE	F
Japón	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Corea del Sur	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A

Table 163: Indicator CRR I.11 Rating: Engineering. Regulatory transparency. Trade in Services Restrictiveness Index (OECD)

4.8.1.12 Indicator CRR I.12: Engineering. Barriers to competition. Trade in Services Restrictiveness Index (OECD)

CRR I.12	Ingeniería. Barreras a la competencia. Índice de restricción del comercio de servicios (OCDE)				
	2015	2016	2017	2018	2019
España	0,009	0,009	0,009	0,009	0,009
Alemania	0,019	0,019	0,019	0,019	0,019
Francia	0,009	0,009	0,009	0,009	0,009
Reino Unido	0,000	0,000	0,000	0,000	0,001
Italia	0,009	0,009	0,009	0,009	0,009
Polonia	0,009	0,009	0,009	0,009	0,009
Irlanda	0,009	0,009	0,009	0,009	0,009
Turquía	0,019	0,019	0,019	0,028	0,028
Portugal	0,009	0,009	0,009	0,028	0,009
EEUU	0,001	0,001	0,001	0,001	0,001
México	0,001	0,001	0,001	0,001	0,001
Japón	0,001	0,001	0,001	0,001	0,001
Corea del Sur	0,009	0,009	0,009	0,009	0,009
Maximo:	2,80%	MAX ((Media+(F. max*Desv Est.)):		1,98%	1
Mínimo:	0,10%	MIN ((Media-(F min *Desv));>0):		0,00%	10
Media:	0,91%	Percentil 90%:	1,90%	1,98%	-9,000
Media+(Factor max*Desv Estándar):	1,98%	Percentil 10%:	0,10%	Unidad:	-454,847
Media-(Factor min*Desv Estándar):	-0,15%		Desv. Est.:	0,71%	

Table 164: Indicator CRR I.12 Values: Engineering. Barriers to competition. Trade in Services Restrictiveness Index (OECD)

CRR I.12	Ingeniería. Barreras a la competencia. Índice de restricción del comercio de servicios (OCDE)						
	2015	2016	2017	2018	Calificación 2019		
España	5,9	5,9	5,9	5,9	5,9	SUFICIENTE	E
Alemania	1,4	1,4	1,4	1,4	1,4	MUY INSUFICIENTE	F
Francia	5,9	5,9	5,9	5,9	5,9	SUFICIENTE	E
Reino Unido					9,5	EXCELENTE	A
Italia	5,9	5,9	5,9	5,9	5,9	SUFICIENTE	E
Polonia	5,9	5,9	5,9	5,9	5,9	SUFICIENTE	E
Irlanda	5,9	5,9	5,9	5,9	5,9	SUFICIENTE	E
Turquía	1,4	1,4	1,4	1,0	1,0	MUY INSUFICIENTE	F
Portugal	5,9	5,9	5,9	1,0	5,9	SUFICIENTE	E
EEUU	9,5	9,5	9,5	9,5	9,5	EXCELENTE	A
México	9,5	9,5	9,5	9,5	9,5	EXCELENTE	A
Japón	9,5	9,5	9,5	9,5	9,5	EXCELENTE	A
Corea del Sur	5,9	5,9	5,9	5,9	5,9	SUFICIENTE	E

Table 165: Indicator CRR I.12 Rating: Engineering. Barriers to competition. Trade in Services Restrictiveness Index (OECD)

4.8.1.13 Indicator CRR I.13: Engineering. Restrictions on movement. Trade in Services Restrictiveness Index (OECD)

CRR I.13	Ingeniería. Restricciones al movimiento. Índice de restricción del comercio de servicios (OCDE)				
	2015	2016	2017	2018	2019
España	0,048	0,048	0,048	0,048	0,048
Alemania	0,097	0,097	0,097	0,097	0,097
Francia	0,065	0,081	0,081	0,081	0,081
Reino Unido	0,097	0,097	0,113	0,113	0,113
Italia	0,323	0,323	0,323	0,323	0,323
Polonia	0,323	0,323	0,323	0,323	0,323
Irlanda	0,113	0,113	0,113	0,113	0,113
Turquía	0,097	0,097	0,097	0,097	0,097
Portugal	0,323	0,323	0,323	0,323	0,323
EEUU	0,129	0,129	0,129	0,129	0,129
México	0,129	0,129	0,129	0,129	0,129
Japón	0,048	0,048	0,048	0,048	0,048
Corea del Sur	0,097	0,081	0,081	0,081	0,081
Maximo:	32,30%	MAX ((Media+(F. max*Desv Est.)):		29,71%	1
Mínimo:	4,80%	MIN ((Media-(F min *Desv));>0):		0,00%	10
Media:	14,60%	Percentil 90%:	32,30%	29,71%	-9,000
Media+(Factor max*Desv Estándar):	29,71%	Percentil 10%:	4,80%	Unidad:	-30,291
Media-(Factor min*Desv Estándar):	-0,50%		Desv. Est.:	10,07%	

Table 166: Indicator CRR I.13 Values: Engineering. Restrictions on movement. Trade in Services Restrictiveness Index (OECD)

CRR I.13	Ingeniería. Restricciones al movimiento. Índice de restricción del comercio de servicios (OCDE)						
	2015	2016	2017	2018	Calificación 2019		
España	8,5	8,5	8,5	8,5	8,5	MUY BIEN	B
Alemania	7,1	7,1	7,1	7,1	7,1	BIEN	C
Francia	8,0	7,5	7,5	7,5	7,5	BIEN	C
Reino Unido	7,1	7,1	6,6	6,6	6,6	SUFICIENTE ALTO	D
Italia	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Polonia	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Irlanda	6,6	6,6	6,6	6,6	6,6	SUFICIENTE ALTO	D
Turquía	7,1	7,1	7,1	7,1	7,1	BIEN	C
Portugal	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
EEUU	6,1	6,1	6,1	6,1	6,1	SUFICIENTE ALTO	D
México	6,1	6,1	6,1	6,1	6,1	SUFICIENTE ALTO	D
Japón	8,5	8,5	8,5	8,5	8,5	MUY BIEN	B
Corea del Sur	7,1	7,5	7,5	7,5	7,5	BIEN	C

Table 167: Indicator CRR I.13 Rating: Engineering. Restrictions on movement. Trade in Services Restrictiveness Index (OECD)

4.8.1.14 Indicator CRR I.14: Engineering. Restrictions on the entry of foreign engineers. Trade in Services Restrictiveness Index (OECD)

CRR I.14	Ingeniería. Restricciones a la entrada de ingenieros del extranjero. Índice de restricción del comercio de servicios (OCDE)				
	2015	2016	2017	2018	2019
España	0,047	0,047	0,047	0,047	0,047
Alemania	0,047	0,047	0,047	0,047	0,047
Francia	0,024	0,024	0,024	0,024	0,024
Reino Unido	0,024	0,024	0,024	0,024	0,024
Italia	0,071	0,071	0,071	0,071	0,071
Polonia	0,036	0,036	0,036	0,036	0,036
Irlanda	0,024	0,024	0,024	0,024	0,024
Turquía	0,036	0,036	0,036	0,047	0,047
Portugal	0,024	0,024	0,024	0,024	0,024
EEUU	0,024	0,024	0,024	0,024	0,024
México	0,071	0,071	0,071	0,071	0,071
Japón	0,012	0,012	0,024	0,024	0,024
Corea del Sur	0,047	0,036	0,047	0,047	0,047
Maximo:	7,10%	MAX ((Media+(F. max*Desv Est.)):		6,41%	1
Mínimo:	1,20%	MIN ((Media-(F min *Desv));>0):		1,23%	10
Media:	3,82%	Percentil 90%:	7,10%	5,18%	-9,000
Media+(Factor max*Desv Estándar):	6,41%	Percentil 10%:	2,40%	Unidad:	-173,841
Media-(Factor min*Desv Estándar):	1,23%		Desv. Est.:	1,73%	

Table 168: Indicator CRR I.14 Values: Engineering. Restrictions on the entry of foreign engineers. Trade in Services Restrictiveness Index (OECD)

CRR I.14	Ingeniería. Restricciones a la entrada de ingenieros del extranjero. Índice de restricción del comercio de servicios (OCDE)						
	2015	2016	2017	2018	Calificación 2019		
España	4,0	4,0	4,0	4,0	4,0	INSUFICIENTE	FX
Alemania	4,0	4,0	4,0	4,0	4,0	INSUFICIENTE	FX
Francia	8,0	8,0	8,0	8,0	8,0	MUY BIEN	B
Reino Unido	8,0	8,0	8,0	8,0	8,0	MUY BIEN	B
Italia	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Polonia	5,9	5,9	5,9	5,9	5,9	SUFICIENTE	E
Irlanda	8,0	8,0	8,0	8,0	8,0	MUY BIEN	B
Turquía	5,9	5,9	5,9	4,0	4,0	INSUFICIENTE	FX
Portugal	8,0	8,0	8,0	8,0	8,0	MUY BIEN	B
EEUU	8,0	8,0	8,0	8,0	8,0	MUY BIEN	B
México	1,0	1,0	1,0	1,0	1,0	MUY INSUFICIENTE	F
Japón	10,0	10,0	8,0	8,0	8,0	MUY BIEN	B
Corea del Sur	4,0	5,9	4,0	4,0	4,0	INSUFICIENTE	FX

Table 169: Indicator CRR I.14 Rating: Engineering. Restrictions on the entry of foreign engineers. Trade in Services Restrictiveness Index (OECD)

4.8.1.15 Indicator CRR I.15: Innovation index. ND Gain Index

CRR I.15	Índice de innovación. ND Gain Index				
	2015	2016	2017	2018	2019
España	0,282	0,276	0,217	0,152	0,128
Alemania	1,000	1,000	1,000	1,000	1,000
Francia	1,000	0,995	1,000	0,996	0,980
Reino Unido	1,000	0,988	0,941	0,905	0,843
Italia	0,672	0,682	0,667	0,690	0,722
Polonia	0,575	0,524	0,483	0,518	0,478
Irlanda	0,078	0,078	0,060	0,073	0,055
Turquía	0,318	0,365	0,471	0,406	0,441
Portugal	0,417	0,328	0,292	0,300	0,319
EEUU	1,000	1,000	1,000	1,000	1,000
México	0,052	0,050	0,050	0,058	0,048
Japón	1,000	1,000	1,000	1,000	1,000
Corea del Sur	1,000	1,000	1,000	1,000	1,000
Maximo:	100,00%	MAX:		100,00%	10
Mínimo:	4,78%	MIN:		0,00%	1
Media:	63,03%	Percentil 90%:	100,00%	100,00%	9,000
Media+(Factor max*Desv Estándar):	118,83%	Percentil 10%:	6,53%	Unidad:	9,000
Media-(Factor min*Desv Estándar):	7,24%		Desv. Est.:	37,20%	

Table 170: Indicator CRR I.15 Values: Innovation index. ND Gain Index

CRR I.15	Índice de innovación. ND Gain Index						
	2015	2016	2017	2018	Calificación 2019		
España	3,5	3,5	3,0	2,4	2,1	MUY INSUFICIENTE	F
Alemania	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Francia	10,0	10,0	10,0	10,0	9,8	EXCELENTE	A
Reino Unido	10,0	9,9	9,5	9,1	8,6	MUY BIEN	B
Italia	7,0	7,1	7,0	7,2	7,5	BIEN	C
Polonia	6,2	5,7	5,3	5,7	5,3	SUFICIENTE	E
Irlanda	1,7	1,7	1,5	1,7	1,5	MUY INSUFICIENTE	F
Turquía	3,9	4,3	5,2	4,7	5,0	SUFICIENTE	E
Portugal	4,8	3,9	3,6	3,7	3,9	INSUFICIENTE	FX
EEUU	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
México	1,5	1,4	1,4	1,5	1,4	MUY INSUFICIENTE	F
Japón	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A
Corea del Sur	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A

Table 171: Indicator CRR I.15 Rating: Innovation index. ND Gain Index

4.8.1.16 Indicator CRR I.16: Number of patents related to road transport per million inhabitants (OECD)

CRR I.16	Nº de patentes relacionadas con el transporte por carretera/Millón de habitantes (OCDE)				
	2015	2016	2017	2018	2019
España	0,370	0,427	0,386	0,584	0,350
Alemania	13,295	14,552	17,545	19,516	14,620
Francia	4,150	3,926	4,701	4,850	4,741
Reino Unido	2,508	2,850	2,770	1,916	1,995
Italia	1,951	1,425	2,226	2,808	1,781
Polonia	0,215	0,134	0,180	0,167	0,097
Irlanda	0,213	0,526	0,624	0,308	0,304
Turquía	0,120	0,091	0,117	0,073	0,082
Portugal	0,386	0,048	0,388	0,292	
EEUU	4,314	5,026	4,700	4,541	3,245
México	0,297	0,216	0,039	0,055	0,035
Japón	17,076	17,107	16,989	19,906	12,369
Corea del Sur	30,608	33,983	26,671	27,378	25,806
Maximo:	3398,30%	MAX ((Media+(F. max*Desv Est.)):		1920,28%	10
Mínimo:	3,53%	MIN ((Media-(F min *Desv));>0):		0,00%	1
Media:	595,27%	Percentil 90%:	1892,51%	1920,28%	9,000
Media+(Factor max*Desv Estándar):	1920,28%	Percentil 10%:	9,26%	Unidad:	0,469
Media-(Factor min*Desv Estándar):	-729,75%		Desv. Est.:	883,34%	

Table 172: Indicator CRR I.16 Values: Number of patents related to road transport per million inhabitants (OECD)

CRR I.16	Nº de patentes relacionadas con el transporte por carretera/Millón de habitantes (OCDE)						
	2015	2016	2017	2018	Calificación 2019		
España	1,2	1,2	1,2	1,3	1,2	MUY INSUFICIENTE	F
Alemania	7,2	7,8	9,2	10,0	7,9	BIEN	C
Francia	2,9	2,8	3,2	3,3	3,2	INSUFICIENTE	FX
Reino Unido	2,2	2,3	2,3	1,9	1,9	MUY INSUFICIENTE	F
Italia	1,9	1,7	2,0	2,3	1,8	MUY INSUFICIENTE	F
Polonia	1,1	1,1	1,1	1,1	1,0	MUY INSUFICIENTE	F
Irlanda	1,1	1,2	1,3	1,1	1,1	MUY INSUFICIENTE	F
Turquía	1,1	1,0	1,1	1,0	1,0	MUY INSUFICIENTE	F
Portugal	1,2	1,0	1,2	1,1			
EEUU	3,0	3,4	3,2	3,1	2,5	MUY INSUFICIENTE	F
México	1,1	1,1	1,0	1,0	1,0	MUY INSUFICIENTE	F
Japón	9,0	9,0	9,0	10,0	6,8	SUFICIENTE ALTO	D
Corea del Sur	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A

Table 173: Indicator CRR I.1 Rating: Number of patents related to road transport per million inhabitants (OECD)

4.8.2. Engineering and Innovation Indicator

	Índice de Ingeniería e innovación				
	2015	2016	2017	2018	2019
España	59,6	60,2	62,6	63,1	73,8
Alemania	93,4	94,1	102,2	104,7	102,8
Francia	95,0	93,4	97,0	101,2	108,9
Reino Unido	74,2	75,2	76,7	77,1	96,5
Italia	48,7	49,6	52,1	58,5	66,0
Polonia	45,3	45,2	50,1	55,1	61,3
Irlanda	67,0	64,7	69,0	65,5	70,9
Turquía	34,8	35,5	39,0	38,5	37,9
Portugal	55,0	55,7	59,2	55,7	62,5
EEUU	92,0	95,5	102,6	103,7	113,4
México	32,7	31,9	29,2	29,5	35,6
Japón	115,7	114,7	123,9	125,3	130,7
Corea del Sur	120,5	124,3	134,8	135,6	145,7
Maximo:	145,721		Máximo Valor:	VER TABLA	10
Mínimo:	29,247		MIN:	0	0
Media:	76,797				10,000
Media+Factor max*Desv Estándar	123,695				
Media-Factor min*Desv Estándar	29,899		Desv. Estándar:	31,265	

Table 174: Engineering and Innovation Indicator

CRR I.5	% del PIB de Financiación privada destinada a I+D (OCDE R&D)	1	10	10	9
CRR I.6	% del PIB de Financiación pública destinada a I+D (OCDE R&D)	1	10	10	9
CRR I.7	Digitalización. Participación en la nuevas tecnologías. Puntuación GCI (WEF)	1	10	10	9
CRR I.8	Digitalización. Índice de las Infraestructuras de tecnologías de información y comunicación. (ND Index)	1	10	10	9
CRR I.9	Digitalización. % de personas que usan internet	1	10	10	9
CRR I.10	Solicitudes de patentes de residentes (por millón de habitantes)	1	10	10	9
CRR I.11	Ingeniería. Transparencia regulatoria. Índice de restricción del comercio de servicios (OCDE)	1	10	10	9
CRR I.12	Ingeniería. Barreras a la competencia. Índice de restricción del comercio de servicios (OCDE)	1	10	10	9
CRR I.13	Ingeniería. Restricciones al movimiento. Índice de restricción del comercio de servicios (OCDE)	1	10	10	9
CRR I.14	Ingeniería. Restricciones a la entrada de ingenieros del extranjero. Índice de restricción del comercio de servicios (OCDE)	1	10	10	9
CRR I.15	Índice de innovación. ND Gain Index	1	10	10	9
CRR I.16	Nº de patentes relacionadas con el transporte por carretera/Millón de habitantes (OCDE)	1	10	10	9
		16		160	
		% Valorado de la Max. Puntuación del Criterio	90,0%	144	144

Table 175: Engineering and Innovation Weights

	Evaluación de Ingeniería e innovación							Subindicadores considerados	Max valor 2019
	2015	2016	2017	2018	Calificación 2019				
España	4,7	4,8	4,6	4,7	5,1	SUFICIENTE	E	16	144
Alemania	8,0	8,0	8,1	8,3	7,6	BIEN	C	15	135
Francia	7,5	7,4	7,2	7,5	7,6	BIEN	C	16	144
Reino Unido	6,3	6,4	6,1	6,1	6,7	SUFICIENTE ALTO	D	16	144
Italia	3,9	3,9	3,9	4,3	4,6	INSUFICIENTE	FX	16	144
Polonia	3,6	3,6	3,7	4,1	4,3	INSUFICIENTE	FX	16	144
Irlanda	5,3	5,5	5,1	5,2	5,2	SUFICIENTE	E	15	135
Turquía	3,0	3,0	3,1	3,1	2,8	MUY INSUFICIENTE	F	15	135
Portugal	4,4	4,4	4,4	4,1	4,6	INSUFICIENTE	FX	15	135
EEUU	7,9	8,2	8,1	8,2	8,4	MUY BIEN	B	15	135
México	2,6	2,5	2,2	2,2	2,5	MUY INSUFICIENTE	F	16	144
Japón	9,2	9,1	9,2	9,3	9,1	EXCELENTE	A	16	144
Corea del Sur	9,6	9,9	10,0	10,0	10,0	EXCELENTE	A	16	144

Table 176: Engineering and Innovation Criterion Rating

The OECD indicators related to research and development (R&D) showcase the global strategic position of countries across various sectors of the economy concerning research. The indicator "% of GDP allocated to gross domestic expenditure on R&D" in the analyzed countries varies widely, with a maximum of 4.63% (South Korea) and a minimum of 0.28% (Mexico). Spain falls in the lower range (1.25%), surpassed by all EU countries except Ireland (1.23%). It's logical that the most technologically advanced countries in the world invest more in R&D, such as South Korea (4.63%), the United States (3.18%), Japan (3.21%), and Germany (3.17%). France (2.19%) and the United Kingdom (1.71%) are in an intermediate position. These percentages remain relatively constant over the five years analyzed (2015 to 2019), highlighting the increasing technological gap.

The indicator "% of GDP from private funding allocated to R&D" provides an interesting insight: the United States, Germany, Japan, and South Korea exceed 2% of GDP in private funding. Undoubtedly, private impetus is a significant factor in increasing R&D financing, as shown by the indicator "% of GDP from public funding allocated to R&D," where no country surpasses 1%, and the differences in investment percentages are narrowing (Spain's results are equivalent to the United Kingdom, Italy, and Japan).

When observing gross R&D investment per population, the results are similar: Spain ($522 per capita), the United States ($2,066 per capita), and Germany ($1,763 per capita).

The three selected indicators to evaluate digitalization show very similar results among the analyzed countries. Spain, however, ranks among the top countries: 90.7% of the population uses the internet (surpassed only by the United Kingdom, Japan, and South Korea); the World Economic Forum's score in the indicator "participation in new technologies" is 98.3% (only surpassed by South Korea); however, the Notre Dame Index "ICT Infrastructure" gives Spain a value of 0.671, trailing behind Germany (0.710), France (0.725), the United Kingdom (0.710), and South Korea (0.732).

As mentioned, since it was not possible to obtain specific economic investment data for the engineering sector or the number of engineers and their training related to engineering, four OECD indicators were used to analyze the state of engineering: regulatory transparency, barriers to competition, restriction on the movement of engineers, and restriction on the entry of foreign engineers. All of these are related to the index of trade in services restrictions periodically developed by the OECD. In these indicators, Spain falls in an intermediate position among the analyzed countries: performing well in restrictions on the movement of engineers, sufficient in barriers to competition, and insufficient in restrictions on the entry of foreign engineers and regulatory transparency.

The overall evaluation of the Engineering and Innovation criterion awards the highest ratings to South Korea (10), Japan (9.1), and the United States (8.2), followed by Germany (7.6), France (7.6), and Italy (6.7). Spain receives a rating of 5.1.

4.9. Assessment of the Road Sector through Objective Indicators

The assessment based on the established criteria is as follows:

	Evaluación de Capacidad							Subindicadores considerados	Max valor 2019
	2015	2016	2017	2018	Calificación 2019				
España	8,7	8,7	8,7	8,7	8,7	MUY BIEN	B	8	72
Alemania	8,0	8,0	8,0	8,0	8,0	MUY BIEN	B	8	72
Francia	8,6	8,6	8,6	8,6	8,6	MUY BIEN	B	8	72
Reino Unido	4,9	4,8	4,8	4,8	4,8	INSUFICIENTE	FX	8	72
Italia	5,7	5,7	5,5	5,4	5,5	SUFICIENTE	E	8	72
Polonia	5,2	5,3	5,3	5,3	5,3	SUFICIENTE	E	8	72
Irlanda	6,1	6,1	6,1	6,1	6,0	SUFICIENTE ALTO	D	8	72
Turquía	2,0	2,0	2,0	2,0	2,0	MUY INSUFICIENTE	F	8	72
Portugal	6,0	6,0	6,0	6,0	6,0	SUFICIENTE ALTO	D	8	72
EEUU	6,7	6,7	6,7	7,2	7,2	BIEN	C	8	72
México	3,4	3,3	3,3	3,4	3,4	INSUFICIENTE	FX	8	72
Japón	4,8	4,8	4,8	4,9	4,9	INSUFICIENTE	FX	8	72
Corea del Sur	5,9	5,8	5,8	6,0	6,0	SUFICIENTE	E	8	72

Table 177: Capacity Criterion Rating

	Evaluación de Prestaciones							Subindicadores considerados	Max valor 2019
	2015	2016	2017	2018	Calificación 2019				
España	8,2	8,2	8,2	8,2	8,2	MUY BIEN	B	11	99
Alemania	7,0	7,0	7,0	7,0	7,0	BIEN	C	11	99
Francia	8,1	8,1	8,1	8,1	8,0	MUY BIEN	B	11	99
Reino Unido	4,0	3,9	3,9	3,9	4,1	INSUFICIENTE	FX	11	99
Italia	5,1	5,0	4,9	4,9	5,0	SUFICIENTE	E	11	99
Polonia	6,0	5,9	5,9	5,9	6,2	SUFICIENTE ALTO	D	11	99
Irlanda	6,5	6,4	6,4	6,4	6,8	SUFICIENTE ALTO	D	10	90
Turquía	4,0	3,9	3,8	3,8	4,0	INSUFICIENTE	FX	10	90
Portugal	7,1	7,1	7,1	7,1	7,3	BIEN	C	10	90
EEUU	8,1	8,1	8,1	8,3	8,1	MUY BIEN	B	10	90
México	5,8	5,6	5,5	5,5	5,3	SUFICIENTE	E	9	81
Japón	4,0	4,0	4,0	4,0	4,1	INSUFICIENTE	FX	10	90
Corea del Sur	5,4	5,3	5,3	5,3	5,4	SUFICIENTE	E	10	90

Table 178: Performance Criterion Rating

	Evaluación de Financiación							Subindicadores considerados	Max valor 2019
	2015	2016	2017	2018	Calificación 2019				
España	4,0	3,9	3,6	3,5	3,4	INSUFICIENTE	FX	9	81
Alemania	5,1	5,3	5,9	6,3	6,6	SUFICIENTE ALTO	D	9	81
Francia	5,8	5,5	5,3	5,4	5,4	SUFICIENTE	E	9	81
Reino Unido	4,9	4,7	4,9	4,7	5,0	SUFICIENTE	E	9	81
Italia	4,2	3,0	2,9	4,9	3,2	INSUFICIENTE	FX	9	81
Polonia	3,1	3,9	3,9	3,3	3,0	INSUFICIENTE	FX	8	72
Irlanda	4,4	4,2	3,8	4,5	5,1	SUFICIENTE	E	7	63
Turquía	7,1	6,3	5,4	5,5	5,4	SUFICIENTE	E	8	72
Portugal								0	0
EEUU	6,1	6,2	6,2	6,2	6,4	SUFICIENTE ALTO	D	9	81
México	3,8	3,2	2,2	2,4	2,7	MUY INSUFICIENTE	F	8	72
Japón	9,8	10,0	10,0	9,8	10,0	EXCELENTE	A	9	81
Corea del Sur	10,0	10,0	10,0	10,0	10,0	EXCELENTE	A	8	72

Table 179: Financing Criterion Rating

	Evaluación de Adaptación al futuro y desarrollo sostenible							Subindicadores considerados	Max valor 2019
	2015	2016	2017	2018	Calificación 2019				
España	5,8	5,0	4,4	4,3	4,7	INSUFICIENTE	FX	13	117
Alemania	6,5	6,7	8,0	8,9	8,3	MUY BIEN	B	13	117
Francia	7,1	6,7	6,8	7,3	7,2	BIEN	C	13	117
Reino Unido	6,1	6,2	7,0	7,4	8,0	MUY BIEN	B	12	108
Italia	6,1	4,2	4,3	8,3	5,7	SUFICIENTE	E	13	117
Polonia	5,8	6,6	6,2	5,3	4,9	INSUFICIENTE	FX	13	117
Irlanda	5,5	5,1	4,7	6,0	7,0	BIEN	C	12	108
Turquía	6,3	4,3	3,4	3,8	3,7	INSUFICIENTE	FX	9	81
Portugal	5,7	5,0	5,8	5,9	5,4	SUFICIENTE	E	8	72
EEUU	7,5	7,6	7,4	7,3	7,3	BIEN	C	8	72
México	6,3	3,8	3,0	3,3	3,3	INSUFICIENTE	FX	7	63
Japón	7,4	7,9	7,9	8,1	8,0	MUY BIEN	B	8	72
Corea del Sur	6,6	5,8	5,7	5,0	5,1	SUFICIENTE	E	8	72

Table 180: Adaptation to the Future and Sustainability Criterion Rating

	Evaluación de operación y mantenimiento								Subindicadores considerados	Max valor 2019
	2010	2015	2016	2017	2018	Calificación 2019				
España		5,0	4,9	5,7	5,4	5,2	SUFICIENTE	E	6	54
Alemania									0	0
Francia		4,6	4,4	4,2	4,1	4,0	INSUFICIENTE	FX	6	54
Reino Unido		5,7	4,8	4,0	4,5	4,3	INSUFICIENTE	FX	6	54
Italia									0	0
Polonia		2,6	2,4	2,7	2,6	2,6	MUY INSUFICIENTE	F	6	54
Irlanda		2,7	2,6	2,6	2,6	2,3	MUY INSUFICIENTE	F	5	45
Turquía		1,5	1,5	1,5	1,6	1,6	MUY INSUFICIENTE	F	6	54
Portugal									0	0
EEUU		7,4	8,3	8,2	8,2	7,9	BIEN	C	6	54
México		3,3	3,6	3,2	3,3	4,6	INSUFICIENTE	FX	5	45
Japón		10,0	10,0	10,0	10,0	10,0	EXCELENTE	A	6	54
Corea del Sur		6,6	5,9	6,5	6,4	7,1	BIEN	C	6	54

Table 181: Operation and Maintenance Criterion Rating

	Evaluación de seguridad							Subindicadores considerados	Max valor 2019
	2015	2016	2017	2018	Calificación 2019				
España	8,2	8,1	8,1	8,1	8,2	MUY BIEN	B	7	63
Alemania	7,4	7,5	7,5	7,4	7,6	BIEN	C	7	63
Francia	7,9	7,9	7,9	8,0	8,1	MUY BIEN	B	7	63
Reino Unido	8,5	8,5	8,6	8,7	8,7	MUY BIEN	B	7	63
Italia	6,7	6,8	6,7	6,7	6,8	SUFICIENTE ALTO	D	7	63
Polonia	6,2	6,2	6,4	6,5	6,5	SUFICIENTE ALTO	D	7	63
Irlanda	8,9	8,7	9,0	9,2	9,2	EXCELENTE	A	5	45
Turquía	2,9	3,0	3,0	3,3	4,2	INSUFICIENTE	FX	7	63
Portugal	7,3	7,4	7,2	6,9	7,1	BIEN	C	5	45
EEUU	6,0	5,5	5,7	5,8	5,9	SUFICIENTE	E	7	63
México								0	0
Japón	4,8	5,1	5,4	5,9	6,3	SUFICIENTE ALTO	D	7	63
Corea del Sur	1,6	1,6	1,7	1,9	2,0	MUY INSUFICIENTE	F	7	63

Table 182: Security Criterion Rating

	Evaluación de resiliencia								Subindicadores considerados	Max valor 2019
	2010	2015	2016	2017	2018	Calificación 2019				
España		8,0	8,0	8,0	8,0	8,0	MUY BIEN	B	5	45
Alemania		9,3	9,3	9,3	9,3	9,3	EXCELENTE	A	5	45
Francia		7,7	7,7	7,7	7,7	7,7	BIEN	C	5	45
Reino Unido		5,8	5,8	5,8	5,8	5,8	SUFICIENTE	E	5	45
Italia		7,2	7,2	6,9	6,8	6,8	SUFICIENTE ALTO	D	5	45
Polonia		5,9	5,9	5,9	6,0	6,0	SUFICIENTE ALTO	D	5	45
Irlanda		4,0	4,0	3,9	3,9	3,9	INSUFICIENTE	FX	5	45
Turquía		2,8	2,8	2,8	2,8	2,8	MUY INSUFICIENTE	F	5	45
Portugal		4,9	4,9	4,9	4,9	4,9	INSUFICIENTE	FX	5	45
EEUU		4,2	4,2	4,2	4,4	4,4	INSUFICIENTE	FX	5	45
México		2,5	2,5	2,8	2,8	2,8	MUY INSUFICIENTE	F	5	45
Japón		6,6	6,5	6,6	6,5	6,5	SUFICIENTE ALTO	D	5	45
Corea del Sur		6,8	6,8	6,8	6,9	6,9	SUFICIENTE ALTO	D	5	45

Table 183: Resilience Criterion Rating

	Evaluación de Ingeniería e innovación								Subindicadores considerados	Max valor 2019
	2010	2015	2016	2017	2018	Calificación 2019				
España		4,7	4,8	4,6	4,7	5,1	SUFICIENTE	E	16	144
Alemania		8,0	8,0	8,1	8,3	7,6	BIEN	C	15	135
Francia		7,5	7,4	7,2	7,5	7,6	BIEN	C	16	144
Reino Unido		6,3	6,4	6,1	6,1	6,7	SUFICIENTE ALTO	D	16	144
Italia		3,9	3,9	3,9	4,3	4,6	INSUFICIENTE	FX	16	144
Polonia		3,6	3,6	3,7	4,1	4,3	INSUFICIENTE	FX	16	144
Irlanda		5,3	5,5	5,1	5,2	5,2	SUFICIENTE	E	15	135
Turquía		3,0	3,0	3,1	3,1	2,8	MUY INSUFICIENTE	F	15	135
Portugal		4,4	4,4	4,4	4,1	4,6	INSUFICIENTE	FX	15	135
EEUU		7,9	8,2	8,1	8,2	8,4	MUY BIEN	B	15	135
México		2,6	2,5	2,2	2,2	2,5	MUY INSUFICIENTE	F	16	144
Japón		9,2	9,1	9,2	9,3	9,1	EXCELENTE	A	16	144
Corea del Sur		9,6	9,9	10,0	10,0	10,0	EXCELENTE	A	16	144

Table 184: Engineering and Innovation Criterion Rating

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

Criterios de Carreteras		Pesos	Punt. Max.	Total Max puntuación	Total Max puntuación reducida
CRRIC	Capacidad	1	10	10	10
CRRIP	Prestaciones	1	10	10	10
CRRIF	Financiación	1	10	10	10
CRRIA	Adaptación al futuro y desarrollo sostenible	1	10	10	10
CRRIO	Operación y mantenimiento	1	10	10	10
CRRIS	Seguridad	1	10	10	10
CRRIR	Resiliencia	1	10	10	10
CRRII	Ingeniería e Innovación	1	10	10	10
		8		80	80
		% Valorado de la Max. Puntuación de los Criterios	100,0%	80	

Table 185: Weights assigned to the criteria for the formation of the Assessment of the Road Sector

	Evaluación de la Carreteras							Subindicadores considerados	Criterios considerados
	2015	2016	2017	2018	Calificación 2019				
España	6,6	6,5	6,4	6,4	6,4	SUFICIENTE ALTO	D	75	8
Alemania	7,3	7,4	7,7	7,9	7,8	BIEN	C	68	7
Francia	7,2	7,0	7,0	7,1	7,1	BIEN	C	75	8
Reino Unido	5,8	5,6	5,6	5,7	5,9	SUFICIENTE ALTO	E	74	8
Italia	5,5	5,1	5,0	5,9	5,4	SUFICIENTE	E	69	7
Polonia	4,8	5,0	5,0	4,9	4,8	INSUFICIENTE	FX	74	8
Irlanda	5,4	5,3	5,2	5,5	5,7	SUFICIENTE	E	67	8
Turquía	3,7	3,4	3,1	3,2	3,3	INSUFICIENTE	FX	68	8
Portugal	5,9	5,8	5,9	5,8	5,9	SUFICIENTE	E	51	6
EEUU	6,7	6,8	6,8	7,0	6,9	SUFICIENTE ALTO	D	68	8
México	3,9	3,5	3,2	3,3	3,5	INSUFICIENTE	FX	58	7
Japón	7,1	7,2	7,2	7,3	7,4	BIEN	C	69	8
Corea del Sur	6,6	6,4	6,5	6,4	6,6	SUFICIENTE ALTO	D	68	8

Table 186: Evaluation of the Road Sector based on objective indicators

The evaluation of each country in each year in the overall assessment has been carried out using the maximum rating of the country and the corresponding year (without making any adjustments or limiting the maximum and minimum), with the purpose of not distorting the evaluation if data for a specific criterion is unavailable. This aspect is important to consider since the overall assessment only includes the criteria for which there are reliable data.

As shown in the following table, in the year 2019: Spain, France, Ireland, Poland, and the United Kingdom have been rated with all the criteria; Germany, Portugal, and Italy have not been rated for Operation and Maintenance; Portugal has not been rated for Financing; the United States, Japan, and Turkey have not been rated for Engineering and Innovation, and Mexico has not been rated for Safety.

The highest-rated country considering the established indicators is Germany (7.8), followed by Japan (7.4), France (7.1), the United States (6.9), South Korea (6.6), and Spain (6.4).

Spain obtains the highest rating in Capacity (8.8) and Performance (8.2), one of the highest in Safety (8.2) and Resilience (8.0), and one of the lowest in Financing (3.3).

4.10. Objective Indicators Sensitivity Analysis

A sensitivity analysis has been conducted by varying the weights assigned to each Criterion. In general, when the weights of the criteria are modified, the evaluation of the countries fluctuates slightly, without substantially altering the overall assessment. The following results are provided based on the varying weights of the Criteria.

4.10.1. Emphasis on Capacity, Performance, and Safety (3); on Financing; Future Adaptation and Sustainable Development; and Operation and Maintenance (2); on Resilience and Innovation (1).

Criterios de Carreteras		Pesos	Total Max puntuación	Total Max puntuación reducida
CRRIC	Capacidad	3	30	30
CRRIP	Prestaciones	3	30	30
CRRIF	Financiación	2	20	20
CRRIA	Adaptación al futuro y desarrollo sostenible	2	20	20
CRRIO	Operación y mantenimiento	2	20	20
CRRIS	Seguridad	3	30	30
CRRIR	Resiliencia	1	10	10
CRRII	Ingeniería e Innovación	1	10	10
		17	170	170
		100 % Valorado de la Max. Puntuación de los Criterios	170	

Table 187: Sensitivity Analysis. Emphasis on the Criteria: Capacity, Performance, and Safety (3)

	Evaluación de la Carreteras							Subindicadores considerados	Criterios considerados
	2015	2016	2017	2018	Calificación 2019				
España	6,9	6,8	6,8	6,7	6,8	SUFICIENTE ALTO	D	75	8
Alemania	7,2	7,3	7,5	7,7	7,6	BIEN	C	68	7
Francia	7,3	7,2	7,1	7,2	7,2	BIEN	C	75	8
Reino Unido	5,7	5,6	5,6	5,7	5,9	SUFICIENTE	E	74	8
Italia	5,6	5,2	5,1	5,9	5,4	SUFICIENTE	E	69	7
Polonia	5,0	5,2	5,2	5,0	5,0	SUFICIENTE	E	74	8
Irlanda	5,8	5,7	5,6	5,9	6,1	SUFICIENTE ALTO	D	67	8
Turquía	3,7	3,3	3,1	3,2	3,4	INSUFICIENTE	FX	68	8
Portugal	6,3	6,2	6,3	6,2	6,3	SUFICIENTE ALTO	D	51	6
EEUU	6,8	6,9	6,9	7,1	7,0	BIEN	C	68	8
México	4,2	3,8	3,4	3,5	3,8	INSUFICIENTE	FX	58	7
Japón	6,5	6,6	6,7	6,8	6,9	SUFICIENTE ALTO	D	69	8
Corea del Sur	6,0	5,8	5,9	5,8	6,0	SUFICIENTE ALTO	D	68	8

Table 188: Sensitivity Analysis. Emphasis on the Criteria: Capacity, Performance, and Safety (3). Evaluation of the roadways

4.10.2.Sensitivity Analysis. Emphasis on the Criteria: Capacity, Performance, and Safety (2); all other criteria (1)

Criterios de Carreteras		Pesos	Total Max puntuación	Total Max puntuación reducida
CRRIC	Capacidad	2	20	20
CRRIP	Prestaciones	2	20	20
CRRIF	Financiación	1	10	10
CRRIA	Adaptación al futuro y desarrollo sostenible	1	10	10
CRRIO	Operación y mantenimiento	1	10	10
CRRIS	Seguridad	2	20	20
CRRIR	Resiliencia	1	10	10
CRRII	Ingeniería e Innovación	1	10	10
		11	110	110
		100 % Valorado de la Max. Puntuación de los Criterios	110	

Table 189: Sensitivity Analysis. Emphasis on the Criteria: Capacity, Performance, and Safety (2); all other criteria (1)

	Evaluación de la Carreteras							Subindicadores considerados	Criterios considerados
	2015	2016	2017	2018	Calificación 2019				
España	7,1	7,0	6,9	6,9	7,0	BIEN	C	75	8
Alemania	7,4	7,4	7,6	7,8	7,7	BIEN	C	68	7
Francia	7,4	7,3	7,3	7,4	7,4	BIEN	C	75	8
Reino Unido	5,8	5,7	5,7	5,7	5,9	SUFICIENTE ALTO	E	74	8
Italia	5,6	5,3	5,2	5,8	5,5	SUFICIENTE	E	69	7
Polonia	5,1	5,2	5,2	5,1	5,2	SUFICIENTE	E	74	8
Irlanda	5,9	5,8	5,7	6,0	6,2	SUFICIENTE ALTO	D	67	8
Turquía	3,5	3,3	3,1	3,2	3,3	INSUFICIENTE	FX	68	8
Portugal	6,2	6,2	6,2	6,1	6,2	SUFICIENTE ALTO	D	51	6
EEUU	6,8	6,8	6,8	7,0	7,0	BIEN	C	68	8
México	4,1	3,7	3,4	3,5	3,7	INSUFICIENTE	FX	58	7
Japón	6,4	6,5	6,6	6,7	6,8	SUFICIENTE ALTO	D	69	8
Corea del Sur	5,9	5,8	5,9	5,9	6,0	SUFICIENTE ALTO	D	68	8

Table 190: Sensitivity Analysis. Emphasis on the Criteria: Capacity, Performance, and Safety (2); all other criteria (1). Evaluation of the roadways.

4.11. Conclusions of the assessment based on objective indicators.

As observed in the Sector Assessment Tables, Spain is generally well-positioned compared to the analyzed countries, particularly excelling in the criteria of Capacity, Performance, and Safety. In Capacity, it holds a leading position, closely followed by Germany and France; in Performance, it ranks among the top positions along with Germany and the U.S.; in Safety, it also ranks among the top positions, alongside the U.K., Ireland, France, and Germany.

However, Spain faces an Insufficient rating in terms of Financing (occupying the lowest position along with Mexico, Poland, and Italy).

In the Innovation criterion, Spain holds a mid-level position (5.1) due to limited innovation funding.

It's worth highlighting the strong overall positions of Germany, France, and Japan (though Germany couldn't be evaluated in maintenance).

Furthermore, the insufficient positions of Turkey and Mexico stand out.

4.11.1. Capacity Criterion

Traditionally, the provision and characteristics of roads are considered to determine their capacity to absorb demand. Hence, the ratios considered relate to road density per population and per country area.

After analyzing the available databases, it was decided to group roads primarily based on two classifications: the International Road Federation (IRF), specifically their World Road Statistics reports prior to 2019, and EUROSTAT, which was used for European countries. The following road classifications were considered:

- Total road network: Highways, main or national roads, secondary or regional roads, and local and urban roads (ERF; World Road Statistics, IRF).
- Interurban roads: High-capacity roads, main or national roads, and secondary and regional roads.
- High-capacity roads: Motorways and expressways (ERF; IRF World Road Statistics; EUROSTAT data used for European countries).
- National or main roads: Excluding high-capacity roads (ERF; IRF World Road Statistics; EUROSTAT data used for European countries).
- Regional or secondary roads: Excluding high-capacity roads (ERF; IRF World Road Statistics; EUROSTAT data used for European countries).
- Other roads (local, communal, and other networks) (ERF; IRF World Road Statistics; EUROSTAT data used for European countries).

In these annual statistics, roads with high capacity are considered to follow the classic concepts of motorways: separate carriageways, grade-separated crossings, designed primarily for motor vehicles, and with limited access points.

It's worth noting that in Spain, the IRF's statistics on road networks before 2019 only considered toll highways as high-capacity roads, excluding expressways. This classification changed in the 2020 edition, including expressways as high-capacity roads under the categories "Motorways" and "Highways". To address this, the expert team decided to adjust the classification during the

analyzed period, adding Spanish expressways as high-capacity roads (and similar roads in other countries). For European countries (including Turkey), EUROSTAT data was used, where these roads are distinguished. In the case of Portugal, to avoid distorting the indicators, the EUROSTAT classification was maintained, though the "other roads" data was modified, estimating a figure of 78,122 km. For non-European countries, the World Road Statistics classification was retained.

It's also important to clarify that data on equivalent lanes for high-capacity roads couldn't be obtained. This criterion is significant for comparing investments per equivalent kilometer. It's evident that countries with high population density and large metropolitan areas have a higher equivalent kilometer factor for high-capacity roads compared to countries with lower density, such as Spain. For the purposes of this report, equivalent kilometers have only been considered in high-capacity road operation and maintenance investment ratios, with an estimated equivalent kilometer factor for each country.

Considering the aforementioned details, in the Capacity Criterion, Spain obtains the highest rating with 8.8 out of 10, followed by France (8.6) and Germany (8.0). Mexico (3.4) and Turkey (2.0) stand out with low ratings.

In general, European countries receive the highest ratings, closely followed by the U.S. (7.2).

In the indicators related to road capacity, Spain excels in road provision per inhabitant, especially in km of high-capacity roads (0.37 km of high-capacity roads per 1,000 inhabitants), closely followed by the U.S. (0.33) and Portugal (0.30). These ratios are crucial for the final assessment of the Capacity criterion.

In the indicator "km of high-capacity roads / population density," the U.S. has a ratio of 3.21, with Spain (0.187) far behind; the rest of the analyzed countries have ratios lower than 0.1.

In summary, considering the Capacity indicators, it can be concluded that Spanish roads are well-positioned in terms of capacity and provision, particularly in their high-capacity road network.

4.11.2. Performance Criterion

The density of the vehicle fleet in relation to different types of roads represents an indication of performance. Generally, a lower number of vehicles per km of road indicates better performance. However, the reality is more complex, and factors such as the number of lanes on high-capacity roads and the level of service of the roads need to be considered. Unfortunately, data on the level of service, the Average Daily Traffic (ADT), and the distribution of congestion hours are not available.

The indicator CRR P.5 "km of High-Capacity Roads / km of Interurban Roads" provides valuable information about the quality provision of roads and, consequently, the performance they offer for interurban road transport.

Vehicle fleet data have been collected from the "World Road Statistics" report by IRF (International Road Federation), and traffic data from the OECD.

The World Economic Forum (WEF) has two indicators directly related to roads: "Road Connectivity" and "Quality of Road Infrastructure." The values of these indicators are considered relevant for estimating the performance of a country's road network.

The use of new technologies, particularly Google Maps, allows for easy and agile calculation of the distance between two cities via the fastest route, as well as the calculation of the geodesic straight-line distance between them. Following this process, the four most important cities in each country were selected, and these two parameters were calculated between the most important city and the other three. With these values, the Route Factor was obtained, defined as the average (Road Distance / Direct Distance) for each country. This factor ranges from a minimum of 1 (the optimal scenario, where the road follows a straight line connecting the two cities) and indicates the average additional distance (beyond the direct route) required to travel across the country.

The "Average Annual Congestion Hours per Inhabitant" indicator is based on data provided by the EU report "Transport in the European Union. Current Trends and Issues. March 2019" for European countries.

In the Performance Criterion, the highest ratings are for Spain, the United States, and France.

Japan's rating is significant, obtaining a low score in the "vehicle fleet/km of high-capacity roads" ratio (likely due to high-capacity roads not being considered in urban and peri-urban areas).

In Turkey and Japan, the Route Factor is very high (above 1.4). Due to Spain's rugged topography and an average altitude above 660 meters (18% of the territory is above 1,000 m), the Route Factor reaches a value of 1.249, higher than all the analyzed European countries (except Turkey).

Concerning congestion hours, among the analyzed countries (all European), the UK stands out with significant congestion (45.2 hours of congestion per inhabitant annually), followed by Ireland, Italy, and France. In the case of Germany, it's illustrative that despite the high population density, it's similar to Spain (29.9 hours), indicating Germany's high capacity.

Among the two World Economic Forum (WEF) indicators related to roads: "Road Connectivity" and "Quality of Road Infrastructure," the former awards the highest rating to Spain and the United States (100 out of 100), followed by Germany, France, Portugal, and the UK. The latter, "Quality of Road Infrastructure," gives high ratings to Japan, Portugal, and South Korea, followed by Spain, Germany, and France. As detailed in the corresponding annex, the set of WEF indicators that make

up "The Global Competitiveness Index" (GCI) refers to 141 countries worldwide. Spain ranks seventh in the "2nd Pillar: Infrastructure" (with a rating of 90 out of a maximum of 100).

4.11.3. Financing Criterion

One of the most representative indicators is road investment as a percentage of national GDP. The evolution of this indicator over the years provides valuable information about the level of infrastructure development in the country and the state of its conservation. A high percentage of GDP (above 0.8%) indicates that the road network is either in the process of creation (as in the case of Poland, Japan, and South Korea, or Spain before 2006) or that the network is being renewed (as seen in Japan from 2006 to 2014). Generally, if this percentage drops below 0.4% (as is the case with Spain from 2016 onwards: 0.35% in 2016 and 0.28% in 2019), it indicates that new infrastructure is not being created. Moreover, if this percentage falls below 0.3%, it's an indication that the investment is also insufficient to adequately cover the needs for conservation, maintenance, and management of the infrastructure.

Analyzing the accumulated investment (4 years) in roads as a percentage of the accumulated national GDP (4 years) eliminates a possible seasonal factor in road investment and provides a clearer view of the investment trend. In Spain, this ratio reached or exceeded 0.8% of the accumulated GDP between 2006 and 2010, only to sharply decrease from that point onwards to 0.4% of GDP (representing a 50% decrease in investment relative to GDP).

The other investment-related indicators behave similarly to the investment/GDP ratio, making them complementary and providing disaggregated information. The investment data have been extracted from the OECD: Road infrastructure investment (current €).

Some interesting insights derived from the indicators used are reflected in the following table:

Indicator	Average	Min Value	Max Value
Road investment as a percentage of GDP	**0,49%**	**0,18%**	**1,17%**
Road investment per capita	**161€**	**17€**	**523€**
Road investment per km of roads	**29.249€**	**4.894€**	**129.057€**
Road investment per vehicle	**274€**	**1.128€**	**45€**
Road investment per unit of land area (km²)	**28.504**	**1.100€**	**109.552€**

Spain's funding for roads is insufficient compared to other countries, as it allocates a lower percentage of its GDP to road financing. This low investment in roads and the lack of annual stability in the percentage allocated to road funding can lead to a significant deterioration of the road infrastructure over the medium and long term. Increasing funding needs exponentially if low investment levels persist.

When observing the historical evolution of the Funding Criterion among the analyzed countries, it's evident that Spain has gone from holding one of the top positions in 2006 (with a total evaluation score of 7.75) to one of the poorest positions in the most recent year analyzed (2019), with a rating of 3.3. The dramatic decline in investment in recent years has also affected other criteria (such as operation and maintenance), as well as the overall evaluation of roads, which has decreased by nearly 30% over the past decade.

4.11.4. Adaptation to the future and sustainability Criterion

From the annual growth rates of certain indicators relative to investment (expressed as indices, with a value of 100 assigned to the value reached in 2015), we can deduce whether the investment in roads is adjusted to the growth of demand, motorization, population, and economic growth. As can be seen in the table below, the average of the indices is close to 100. That is, the investment tends to align with the growth of the most relevant factors, with the exception of population growth.

As observed, Spain has very low indices (in all cases well below the average), indicating an investment deficit in recent years and a deterioration in the upkeep of the road network.

Indicator	Average	Min Value	Max Value	Spain (2019)
1. Annual cumulative growth index. Road investment / Motorization rate (Index 100 in 2015)	**94,4**	**41.8**	**136,7**	**74,4**
2. Annual cumulative growth index. Road investment / GDP (Index 100 in 2015)	**94.0**	**49,3**	**142.8**	**70,1**
3. Annual cumulative growth index. Road investment / Domestic passenger traffic by road (Index 100 in 2015)	**99,5**	**85,1**	**133,7**	**89,3**
4. Annual cumulative growth index. Road investment / Domestic freight traffic by road (Index 100 in 2015)	**92,5**	**48,8**	**143,8**	**67,9**
5. Annual cumulative growth index. Road investment / Population (Index 100 in 2015)	**80,6**	**49,1**	**147,9**	**79,7**

In relation to environmental sustainability, the growth index of greenhouse gas emissions from transportation activity has been analyzed, with a reference value of 100 in the year 2015 (disaggregated data for vehicles not available). The results indicate that in the year 2010, Spain has the highest index (109.3): from 2015 to 2019, Spain has grown by 9.3%, surpassing all the analyzed countries. Although not included in the tables, the Nordic countries are the ones making the most progress in reducing greenhouse gas emissions, while developing countries with significant growth show higher annual percentages of greenhouse gas emissions.

Other indicators deserving attention are those related to vehicle decarbonization:

- The average CO_2 emissions from newly registered light vehicles stand at 120 g/km.
- The average number of electric vehicle charging points per million inhabitants is 218. Spain has one of the lower values: 148. Notable values are achieved by Germany (584), France (436), and the United Kingdom (445).
- The average percentage of renewable energy in total energy consumption in transportation is 7%. Spain's value is 7.6%.

In the final index for adaptation to the future and sustainable development, the top countries are Japan, Germany, and the United Kingdom, due to their significant road investments and modest increases in greenhouse gas emissions (Japan has been steadily reducing emissions at a rate of 0.99% in recent years). Spain has the lowest index among the analyzed European countries.

4.11.5. Operation and maintenance Criterion

It should be noted that investment in operation and maintenance is very difficult to separate from infrastructure creation investment: budgetary allocations are not always clearly defined, and in some cases, the national accounting of certain countries does not distinguish this separation, making the data potentially unreliable.

The investment needs for operation, conservation, and maintenance are related to the state of the infrastructure and the requirements for adaptation to new technical, functional, and technological standards. There has been much debate among experts, international road associations, and multilateral organizations about the necessary investment for proper maintenance. While there is no widespread consensus on an exact percentage, the necessary conservation investment is considered to be between 2% and 4% of the asset value, depending on the condition of the infrastructure. Calculating the asset value requires establishing agreed-upon criteria that can closely approximate reality. Attempts have been made to establish the asset value of roads, but the criteria to be used are not standardized, and verifiable and contrasting data are not readily available.

Similar to the discussion on the Financing Criterion, the percentage of GDP allocated to conservation represents an indicator that can provide insights into the adequacy of investment for maintenance needs. To further refine and support this indicator, investment per capita, investment per equivalent kilometer of roads (see comments in the methodology chapter), and the percentage of investment allocated to conservation relative to total road investment have been considered.

Conservation data has been obtained from the OECD: Road infrastructure maintenance investment (current €). Although this data may not fully reflect the reality of investment in conservation, as the distinction between creation investment and conservation investment is often unclear.

Unfortunately, data for Germany, Portugal, and Italy could not be obtained, so these countries are not evaluated in this criterion.

As previously mentioned, the most significant ratio for evaluating the Operation and Maintenance Criterion is the percentage of investment in operation and maintenance relative to the asset value, but it is not feasible to obtain this value for road infrastructure. Therefore, the investment in operation and maintenance relative to GDP has been used, although it was not available for all countries (Germany, Portugal, and Italy). This ratio averages at 0.14%, with a maximum of 0.47% in Japan and a minimum of 0.02% in Ireland and Turkey. Spain's percentage of GDP allocated to operation and maintenance is 0.15%.

Another indicative ratio is the percentage of investment in operation and maintenance relative to total investment. The resulting average value is 30.1%, which is almost one-third of the total road investment. The maximum value is 66%, and the minimum is 2.6%. Spain has stabilized this percentage in recent years (around 54%).

The investment in O&M per equivalent kilometer of roads yields an average value of €8,836/km. This value is very high, probably due to the figures from Japan and South Korea (€57,739 and €21,616, respectively). It's likely that the investment data from these countries (collected from the OECD) are not accurate.

Once again, the countries with the highest rating are the US and Japan (66%). Germany is likely to be among the top-performing countries, although investment data for Germany could not be obtained.

Regarding the percentage of GDP allocated to investment in Operation and Maintenance, Spain invests 0.15%, the lowest value in recent years. Investment per equivalent kilometer of road is among the lowest in the analyzed countries (€2,587/km equivalent in 2019), which has translated into a poor state of road conservation.

Overall, in the Operation and Maintenance Criterion, Spain receives a rating of sufficient.

4.11.6. Safety Criterion

The selection of indicators corresponds to the ones commonly used: accidents with casualties and fatalities per 100,000 inhabitants; accidents with casualties and fatalities per kilometer of road; the fatality rate (number of fatalities/number of casualties); and casualties from domestic road traffic.

The data originates from the IRF and is included in their reports: World Road Statistics from various years. In the case of Spain, this data has been cross-referenced with the Statistical Yearbook of the Ministry of the Interior.

The average number of accidents with casualties is 313 per 100,000 inhabitants, with France and Poland having the lowest values around 80. Germany, Japan, Portugal, the US, and South Korea have very high values, exceeding 300, and in the case of the US, it exceeds 500. Fatalities per 100,000 inhabitants are very high in the US (11) and South Korea (13), and moderate in the rest of the countries (around 4 in most European countries). In Ireland and Turkey, the rate exceeds 6.

The countries with the highest ratings are Ireland, the United Kingdom, Spain, and France. Turkey and South Korea are the lowest rated (4.2 and 2, respectively).

4.11.7. Resilience Criterion

To analyze resilience, it would be necessary to have data related to the technical characteristics of road design, such as terrain conditions and their vulnerability to adverse phenomena, drainage capacity of the infrastructure (to check if the return period of floods is adequate for prevention), stability of road embankments and cut slopes, organization and equipment of maintenance teams to efficiently and rapidly respond to any eventuality, a comprehensive system for winter road maintenance, etc.

Since it's not feasible to obtain all these data for the entire road network (which would be a labor-intensive task), an alternative approach has been taken by considering alternative transportation systems to roads, both the railway system and the existence of alternative roads. Therefore, the chosen indicators refer to the density of the railway system in relation to road density and the ratio of kilometers of major highways to the country's surface area.

As the alternative to main roads (which bear the majority of long-distance traffic for both people and goods) are secondary roads, the ratio of kilometers of major highways to kilometers of primary roads has been considered.

Another indicator pertains to the kilometers of major highways in relation to the country's surface area, as high-capacity roadways typically have wide platforms usually consisting of separate carriageways with bypasses, and in the event of a disruption on one carriageway, traffic can be diverted to the other.

Lastly, an indicator from the World Economic Forum, which evaluates the transport infrastructure of countries worldwide, has been considered. It's believed that a country with a robust transport network is better prepared and more resilient to disruptions in the overall transportation system.

It hasn't been easy to find indicators that can provide meaningful information for this criterion. As previously mentioned, the chosen indicators refer to the density of the railway system in relation to road density and the ratio of kilometers of major highways to the country's surface area. For major highways, the alternative is high-speed rail lines, and the ratio of kilometers of major highways to the country's surface area has been considered due to the resilience provided by the wide platforms of major roadways, which usually consist of separate carriageways with bypasses, allowing traffic to divert in case of disruptions.

Germany, Spain, and France achieve the highest overall rating for this indicator, followed by the United Kingdom, Italy, Poland, Japan, and South Korea. Notably, the United States has an insufficient rating in this aspect.

4.11.8.Innovation Criterion

To analyze engineering and innovation in roads, it is necessary to have a deep understanding of new techniques, materials, and technologies applied to roads, as well as innovations implemented in road infrastructure, the state of road engineering, advancements in digitization, and the resources allocated for engineering and innovation.

Despite efforts to obtain specific and reliable data for the road infrastructure sector, such data has not been found. In its absence, a global analysis of R&D&I (Research, Development, and Innovation) in different countries has been chosen as a proxy to assess the state of roads. For this purpose, a selection of indicators from the report "Main Science and Technology Indicators, Volume 2021," published by the OECD in 2022, has been used. This comprehensive report provides indicators reflecting the level and structure of efforts made by OECD member countries and seven non-member economies (Argentina, People's Republic of China, Romania, Russian Federation, Singapore, and South Africa) in the field of science and technology. These indicators cover resources dedicated to research and development, patent families, and international trade in R&D-intensive industries. Additionally, the ND Gain Innovation Index and the number of road transport-related patents per million inhabitants from the OECD have been considered.

To assess the progress of digitization, three indicators have been included: Participation in new technologies (GCI - WEF), the ICT (Information and Communication Technology) infrastructure index (ND Gain Index), and the number of internet users.

For a proper analysis of the state of engineering in the road sector, it would have been ideal to have precise information on the training of road engineers, the number of engineers involved in the design, construction, maintenance, and management of roads per unit of economic investment. Particularly valuable would have been data on economic aspects related to investment in engineering compared to investment in construction, maintenance, operation, and management of road networks. Unfortunately, this data has not been available. Therefore, four OECD indicators related to engineering have been used: regulatory transparency, barriers to

competition, restrictions on the movement of engineers, and restrictions on the entry of foreign engineers. All of these indicators are related to the Trade in Services Restrictiveness Index periodically compiled by the OECD.

The OECD indicators related to research and development show the global strategic position in all sectors of the economy for the countries in terms of research. The indicator "% of GDP allocated to gross domestic expenditure on R&D" for the analyzed countries shows a wide range: from a maximum of 4.63% (South Korea) to a minimum of 0.28% (Mexico). Spain falls in the lower range (1.25%), surpassed by all EU countries except Ireland (1.23%). It's logical that the most technologically advanced countries in the world invest more in R&D: South Korea (4.63%), the United States (3.18%), Japan (3.21%), and Germany (3.17%). France (2.19%) and the United Kingdom (1.71%) are in an intermediate position. These percentages remain relatively constant over the five years analyzed (2015 to 2019), indicating an increasing technological gap.

The indicator "% of GDP from private funding allocated to R&D" presents an interesting figure: the United States, Germany, Japan, and South Korea exceed 2% of GDP from private funding. Private impetus is undeniably a determining factor in increasing R&D funding, as evidenced by the indicator "% of GDP from public funding allocated to R&D": no country exceeds 1%, and the differences in investment percentages converge (Spain's results are equivalent to the United Kingdom, Italy, and Japan).

If we observe gross investment in R&D per population, the results are similar: Spain ($522 per capita), the United States ($2,066 per capita), Germany ($1,763 per capita), etc.

The three selected indicators for evaluating digitization show very similar results among the analyzed countries. However, Spain ranks among the top countries: 90.7% of the population uses the internet (only surpassed by the United Kingdom, Japan, and South Korea); the World Economic Forum's score in the "participation in new technologies" indicator is 98.3% (only surpassed by South Korea); however, the University of Notre Dame's indicator "ICT infrastructure index" assigns Spain a value of 0.671, surpassed by Germany (0.710), France (0.725), the United Kingdom (0.710), and South Korea (0.732).

As previously mentioned, since it was not possible to obtain economic investment specifically dedicated to engineering in the analyzed sector or the number of engineers and their training related to engineering in the road sector, four OECD indicators have been used to assess engineering: regulatory transparency, barriers to competition, restrictions on the movement of engineers, and restrictions on the entry of foreign engineers. All of these are related to the Trade in Services Restrictiveness Index periodically compiled by the OECD. In these indicators, Spain is in an intermediate position among the analyzed countries: very good in restrictions on the movement of engineers, sufficient in barriers to competition, and insufficient in restrictions on the entry of foreign engineers and regulatory transparency.

The global innovation index from the University of Notre Dame has also been analyzed. The best results are achieved by Germany, the United States, Japan, and South Korea (with the maximum score of "1"). Next in line are France (0.98), the United Kingdom (0.84), and Italy (0.722). Spain ranks among the lower-performing countries in the analysis (0.128).

The overall assessment of the Engineering and Innovation criterion assigns the highest ratings to South Korea (10), Japan (9.1), and the United States (8.2), followed by Germany (7.6), France (7.6), and Italy (6.7). Spain receives a rating of 5.1.

5. Qualitative evaluation. Expert surveys.

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 Roads 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 roads 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 191: 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 192: Asignación numérica de la evaluación cualitativa por los expertos

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

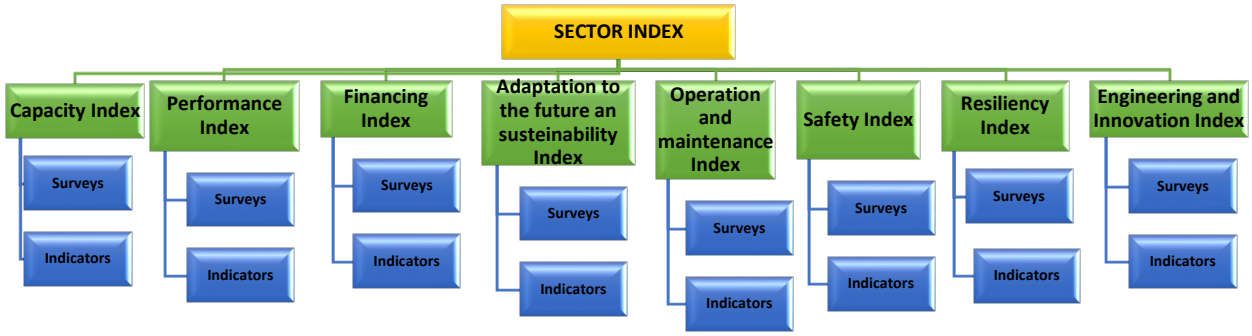


Figure 3: Scheme of the evaluation system for public works sectors

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

In general[4], 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%

[4] 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.

5.1. Survey for expert evaluation

A total of 29 responses have been obtained with the following results.

5.1.1. Capacity

Peso	EVALUACIÓN DE CAPACIDAD (Encuestas a expertos) (Max 10)			
1	1.1. ¿Cómo valora la red de las carreteras de gran capacidad, desde el punto de vista de la capacidad y de la cobertura del territorio?	8,2	MUY BIEN	B
1	1.2. ¿Cómo valora la infraestructura de las carreteras convencionales desde el punto de vista de la capacidad y de la cobertura del territorio?	8,1	MUY BIEN	B
1	1.3. ¿Cómo valora la capacidad de las carreteras para absorber la demanda actual?	7,5	BIEN	C
1	1.4. ¿Cómo valora la capacidad de las carreteras actuales para absorber a la previsible demanda futura en los próximos 10 años?	6,6	SUFICIENTE ALTO	D
	TOTAL EVALUACIÓN CAPACIDAD POR LOS EXPERTOS:	7,6	BIEN	C

Maximo:	8,2
Mínimo:	6,6
Media:	7,6
Desviación Estándar:	0,8

Table 193: Expert assessment of capacity

Comments, suggestions, and recommendations from the experts

- Some sections of the high-capacity road network experience congestion during specific days or periods.
- Completion of ongoing high-capacity road projects and the execution of two additional projects are necessary.
- The overall road infrastructure in the country is notably good, but there is room for improvement.
- Access to major cities in Spain requires capacity solutions, which vary depending on the regions.
- The potential implementation of tolls on high-capacity roads may impact the future demand for conventional road networks.
- While the network's capacity is generally considered adequate, there's a need for a comprehensive intermodal state planning to address specific ongoing and future challenges.
- The current issue in Spain's road system is the lack of investment in maintenance and conservation.
- Real mobility studies using artificial intelligence can help establish the service needs of the road network.
- Anticipating demographic and social changes is essential for road network planning.

- A more intensive and strict management of heavy traffic during potential congestion periods is needed. Offering alternative routes for congested sections and improving user information are essential.
- The conventional road network under the jurisdiction of Autonomous Communities should undergo rehabilitation and improvements.
- Enhancement of public transportation is crucial.
- Updating supply and demand studies, improving crossings, and implementing 2+1 road configurations can enhance network capacity and road safety.
- Better intermodal planning tools and improved coordination among administrations are necessary.
- A comprehensive road planning is a requirement.
- An extraordinary investment plan is needed to ensure minimum quality for all roads and a strong maintenance effort. A national infrastructure pact is essential.
- New actions are necessary to complete itineraries, including new projects and general/local improvements in terms of capacity and road safety.
- Converting conventional roads with higher accident concentrations and capacity issues into 2+1 roads with physical separation between directions is highly recommended. Promoting collective transport with park-and-ride facilities and dedicated bus lanes for congested areas is beneficial.
- Significant capacity growth may result from autonomous driving in the 2030 and subsequent scenarios.
- Specific action should be taken in certain sections based on mobility and projected demand.
- Proper maintenance of the network and continued elimination of level crossings is important.
- There's a significant disparity between the high-capacity and conventional road networks, and improvements and adaptations are needed in the coming years.

5.1.2. Performance

Peso	EVALUACIÓN DE PRESTACIONES (Encuestas a expertos) (Max 10)			
1	2.1. ¿Cómo valora las prestaciones que aportan las carreteras a los usuarios?	7,7	BIEN	C
1	2.2. ¿Cómo valora los equipamientos y los servicios prestados en la red de gran capacidad?	7,2	BIEN	C
1	2.3. ¿Cómo valora los equipamientos y los servicios prestados en la red convencional de carreteras?	6,6	SUFICIENTE ALTO	D
1	2.4. ¿Cómo valora la gestión de tráfico y la información a los usuarios de la carretera?	6,1	SUFICIENTE ALTO	D
1	2.5. ¿Cómo considera la cobertura del territorio de la red de carreteras?	7,7	BIEN	C
1	2..6. ¿Cómo valora la información al usuario en los incidentes que se producen en la red viaria?	5,7	SUFICIENTE	E
	TOTAL EVALUACIÓN PRESTACIONES POR LOS EXPERTOS:	6,8	SUFICIENTE ALTO	D

Maximo:	7,7
Mínimo:	5,7
Media:	6,8
Desviación Estándar:	0,8

Table 194: Expert assessment of road performance

Comments, suggestions, and recommendations from the experts

- User information is nonexistent, only provided on signs.
- Service areas need to be increased across the entire network to improve performance, and existing ones must be improved as many are very poor. The overall pavement condition is very bad.
- Utilization of informative panels has significant room for improvement.
- The equipment and services provided by the network have a wide range of potential for enhancement.
- User information is generic, not specific.
- The equipment of the roads in Spain on the main network is generally adequate. On secondary roads, it is sometimes lacking, but budget constraints should be considered. The implementation of ITS (Intelligent Transportation Systems) on Spanish roads can be considered good, and efforts are being made to introduce new technologies.
- There's a long way to go in communicating traffic incidents to users. Adequate traffic and incident information would lead to greater safety and reduced CO_2 emissions from traffic.
- Traffic management needs to be improved with new technological advances, involving network managers.

- Although there has been improvement in recent years in transmitting information to users, further improvement is necessary, particularly in ensuring the information is accurate and in real time.
- Use artificial intelligence among vehicles to provide real-time problem information.
- Increased systems for user information, complementing the ITS network, are needed. Additionally, mobile network coverage needs improvement, as many sections lack it.
- Expansion of ITS and, primarily, their utilization is crucial.
- The implementation of new technologies is important.
- Digital transformation and better maintenance.
- Greater investment in road network preservation would be desirable. Specifically, road surfaces are quite aged in the network, as well as horizontal signage. Additionally, a push for widespread V2X implementation would enhance communication with users.
- Progress should continue on ongoing initiatives (e.g., DGT 3.0) to provide real-time incident information to drivers. Greater coordination between infrastructure and traffic managers is desirable. Furthermore, research and definition of aspects that can lead to improvements in road safety and traffic management due to the introduction of vehicles with higher levels of autonomy, as well as coexistence with traditional vehicles, is necessary.

5.1.3. Financing

Peso	EVALUACIÓN DE FINANCIACIÓN (Encuestas a expertos) (Max 10)			
1	3.1. ¿Cómo valora la inversión actual por parte de todas las administraciones públicas en la creación y conservación de las carreteras?	4,4	INSUFICIENTE	FX
1	3.2. ¿Cómo valora la consistencia y estabilidad de las actuales fuentes de financiación en las carreteras de todas las administraciones públicas?	4,5	INSUFICIENTE	FX
1	3.3. ¿Cómo considera que se está gestionando la inversión en carreteras por parte de todas las administraciones públicas?	5,3	SUFICIENTE	E
1	3.4. ¿Cómo considera la actual participación de la inversión privada en el proyecto, construcción y/o explotación de las carreteras en España?	5,2	SUFICIENTE	E
	TOTAL EVALUACIÓN FINANCIACIÓN POR LOS EXPERTOS:	4,9	INSUFICIENTE	FX

Maximo:	5,3
Mínimo:	4,4
Media:	4,9
Desviación Estándar:	0,5

Table 195: Expert assessment of road financing

Comments, suggestions, and recommendations from the experts

- More specific management specifications should be established for private companies managing public assets.
- It's a huge mistake to have liberalized the highway network.
- The lack of investment in maintenance is growing alarmingly.
- Spain has invested a lot of money in creating a large high-capacity road network. Now it's time to maintain it, and that requires a very high budget. Therefore, it's necessary to seek sources of financing. However, expanding the network doesn't seem very necessary right now, making private investment challenging to fit in.
- Regarding funding sources, the route of the General State Budgets can be appropriate as long as budget allocations are stable.
- Considering the effectiveness of investment, the coexistence of different administrations (national, regional, and local, each with different budgets and investment criteria) makes overall road investment inefficient.
- Regarding private participation (concession formulas), it may be a suitable solution in certain situations. However, more information is needed about the performance of concessions in Spain to design appropriate concession systems. For example, from the perspective of road operation, realistic quality and service criteria must be established.
- Dimensioning the aging of the network over different time periods through simulations and establishing conservation strategies while considering safety, user comfort, and the preservation of daily assets.
- Change legislation to make road investment more appealing to investors.

- Develop a maintenance plan to restore deteriorated infrastructure agreed upon in the Congress of Deputies.
- More budget and more Public-Private Partnerships (PPPs).
- Undoubtedly, it is essential to properly maintain roads to prevent the loss of their asset value. Failing to invest in ordinary conservation today will multiply the cost in extraordinary conservation in a few years. Low-cost actions such as signage provide significant returns from a road safety and driving assistance perspective.
- Regarding funding sources, a state pact would be necessary to ensure the required investment levels for the proper maintenance of the road network.
- Concerning investment management, coordination is necessary among administrations at different levels.
- Regarding private participation, detailed studies of concession formulas are deemed necessary to ensure their usefulness and effectiveness, always under adequate supervision.
- Investment must be increased, especially in maintenance.

5.1.4. Adaptation to the future and sustainability

Peso	EVALUACIÓN DE ADAPTACIÓN AL FUTURO Y DESARROLLO SOSTENIBLE (Encuestas a expertos) (Max 10)			
1	4.1. ¿Cómo valora los planes de carreteras para la adaptación a las demandas futuras de los usuarios?	4,9	INSUFICIENTE	FX
1	4.2. ¿Cómo valora la adaptación de las carreteras a los nuevos sistemas de gestión del tráfico?	4,9	INSUFICIENTE	FX
1	4.3. ¿Considera que la normativa y la legislación de las carreteras permite proteger adecuadamente el medio ambiente?	6,8	SUFICIENTE ALTO	D
1	4.4. ¿Cómo valora las acciones que se están tomando para reducir las emisiones de CO2 y otros gases de efecto invernadero en los procesos de construcción, conservación y mantenimiento de las carreteras?	5,9	SUFICIENTE	E
1	4.5. ¿Cómo valora la adaptación de los servicios prestados en el corredor de las carreteras a los vehículos alternativos a los de combustión interna?	4,2	INSUFICIENTE	FX
1	4.6. ¿Cómo valora los programas de adaptación de la infraestructura de carreteras a las nuevas tecnologías, como la conducción automática y la interacción entre los vehículos y la carretera?	4,4	INSUFICIENTE	FX
1	4.7. ¿Considera adecuadas las medidas que se adoptan para reducir el impacto ambiental y el tratamiento de los residuos en la construcción y conservación de las carreteras?	5,9	SUFICIENTE	E
	TOTAL EVALUACIÓN ADAPTACIÓN AL FUTURO Y DESARROLLO SOSTENIBLE POR LOS EXPERTOS:	5,3	SUFICIENTE	E

Maximo:	6,8
Mínimo:	4,2
Media:	5,3
Desviación Estándar:	0,9

Table 196: Expert assessment of road financing

Comments, suggestions, and recommendations from the experts

- More emphasis should be placed on environmental preservation and non-polluting vehicles.
- We are missing the opportunity to use European funds for truly relevant road investments. Many of the ongoing projects will be entirely useless and could be done through other means.
- Autonomous driving is still distant, but servicing alternative vehicles to internal combustion engines is a reality that needs attention.
- The issue with Road Plans is that they cover time horizons that often exceed the duration of a single legislative period. Due to the political use of these road plans, they are rarely completed and are continuously modified by successive governments. Regarding new technologies, the existence of European Directives "obligates" Spain to continue advancing in this field. However, it must be considered that the age of the vehicle fleet and the percentage of vehicles with alternative energies do not allow for its full development.

- In general, there are no road plans with a strategic vision. Also, there is a lack of planning concerning the introduction of vehicles with alternative propulsion systems.
- On the environmental side, there is legislation for environmental impact assessment that aims to minimize environmental impacts. However, there is still much to be done in other areas, such as decarbonizing the sector. In that sense, for example, the treatment of construction waste is an area where collaboration with administrations responsible for the environment is needed to advance the incorporation of aggregates from waste as construction material, such as milling.
- More electric vehicle charging points and more environmental assessments of solutions in projects are needed.
- Urgent improvement of pavements is needed to significantly reduce CO_2 emissions.
- Expand services for electric vehicles using service stations by installing fast-charging systems.
- Ecodesign, LCA (Life Cycle Assessment).
- Political commitment is necessary to complete approved road plans. Additionally, investments in the network of alternative energy vehicle charging stations are needed, and support for vehicle upgrades to ensure they have the necessary connections should continue.
- Greater strategic planning is required.
- From an environmental perspective, reliable and objective information on greenhouse gas emissions linked to road construction processes and the operation and traffic phase is essential. Furthermore, the administration needs life cycle assessment calculation tools to adequately quantify the impacts occurring throughout the lifecycle, allowing for an objective choice of the most sustainable solutions.
- There is a need to advance the incorporation of environmental criteria in public procurement, beyond the criteria applicable to bidders. This means establishing criteria that effectively contribute to more sustainable construction and management.
- Lastly, promotion of research in new communication technologies for the vehicle-infrastructure sector is necessary, involving road and traffic managers collaborating with technology centers and research organizations.
- Improving management by involving the Road Authority.

5.1.5. Operation and Maintenance

Peso	EVALUACIÓN DE OPERACIÓN Y MANTENIMIENTO (Encuestas a expertos) (Max 10)			
1	5.1. ¿Cómo valora la inversión en conservación y mantenimiento de las carreteras?	4,4	INSUFICIENTE	FX
1	5.2. ¿Cómo considera los medios técnicos y de organización aplicados a la operación, conservación y mantenimiento de las carreteras?	6,6	SUFICIENTE ALTO	D
1	5.3. ¿Cómo valora el estado de conservación y mantenimiento de las carreteras?	5,2	SUFICIENTE	E
1	5.4. ¿Cómo valora la atención a la vialidad invernal, a la siniestralidad y a las incidencias que se producen en las carreteras?	7,5	BIEN	C
	TOTAL EVALUACIÓN OPERACIÓN Y MANTENIMIENTO POR LOS EXPERTOS:	5,9	SUFICIENTE	E

Maximo:	7,5
Mínimo:	4,4
Media:	5,9
Desviación Estándar:	1,4

Table 197: Expert assessment of road operation and maintenance

Comments, suggestions, and recommendations from the experts

- Ordinary maintenance is well sized, but managing extraordinary maintenance needs improvement.
- There is significant disparity among different administrations.
- It's necessary to change the road conservation model and demand indicators to achieve objectives.
- There is technical capacity, but lacking investment and administrative management capacity.
- The major issue with conservation lies in roads owned by the autonomous regions, where the investment is clearly insufficient due to limited regional funding and their limited investment capacity.
- More money needs to be invested in road maintenance. The condition of roads varies greatly based on the responsible administration and its budget. Overall, they manage the available funds well.
- The road quality in the national network is very good.
- Better management of extraordinary maintenance, especially for pavement.
- Promote agile management teams within the administration and provide them with adequate budgets.
- Public administrations should be aware of where it's most cost-effective to invest their money. Ensuring citizens' mobility should be a top priority, leading to increased spending on road maintenance and less spending on other vital matters.
- There is a need for greater coordination between administrations.

- It would be beneficial to review administrative procedures to simplify certain aspects when possible.

5.1.6. Safety

Peso	EVALUACIÓN DE SEGURIDAD (Encuestas a expertos) (Max 10)			
1	6.1. ¿Cómo valora las medidas adoptadas en la actualidad para prevenir la siniestralidad en las carreteras?	6,6	SUFICIENTE ALTO	D
1	6.2. ¿Cómo valora el equipamiento de las carreteras para prevenir o reducir los efectos de los accidentes en la red de gran capacidad?	7,1	BIEN	C
1	6.3. ¿Cómo valora el equipamiento de las carreteras para prevenir o reducir los efectos de los accidentes en la red convencional?	5,5	SUFICIENTE	E
1	6.4. ¿Cómo considera las medidas que se están tomando para reducir en el futuro la siniestralidad en las carreteras?	5,9	SUFICIENTE	E
	TOTAL EVALUACIÓN SEGURIDAD POR LOS EXPERTOS:	6,3	SUFICIENTE ALTO	D

Maximo:	7,1
Mínimo:	5,5
Media:	6,3
Desviación Estándar:	0,7

Table 198: Expert assessment of road safety

Comments, suggestions, and recommendations from the experts

- There are still too many cases of road accidents.
- Safety measures vary significantly among different administrations.
- The installed Intelligent Transportation Systems (ITS) are insufficient, as well as traffic monitoring to address reckless driving.
- Reference is still mainly based on the number of fatalities, but the number of accidents is not adequately considered. Fatal accidents can be reduced not only through improved passive vehicle safety but also by considering the contribution of infrastructure.
- Spain has good road safety statistics compared to other countries in our region. This demonstrates that things are being done well. Road equipment varies widely based on the importance of the network. In the national road network, it is good, but in other roads with less traffic, improvement is naturally possible.
- Currently, the measures taken on the roads to prevent accidents and reduce their effects are very good. We must continue working to achieve accident reduction goals, but this is a matter influenced by other factors, not just the infrastructure aspect.

5.1.7. Resilience

Peso	EVALUACIÓN DE RESILIENCIA (Encuestas a expertos) (Max 10)			
1	7.1. ¿Cómo valora la capacidad de las carreteras para recuperar, en un tiempo razonable, el estado de servicio inicial cuando se producen situaciones adversas?	6,6	SUFICIENTE ALTO	D
1	7.2. ¿Considera que la normativa y la legislación permite adoptar medidas para prevenir la infraestructura de carreteras ante incidentes naturales o provocados?	6,4	SUFICIENTE ALTO	D
1	7.3. ¿Cómo valora la capacidad de las carreteras para proteger y minimizar los efectos sobre los usuarios y el entorno ante situaciones de riesgo?	6,1	SUFICIENTE ALTO	D
1	7.4. ¿Cómo valora las alternativas a las carreteras cuando por causas naturales o provocadas se producen cortes en las carreteras?	5,6	SUFICIENTE	E
1	7.5. ¿Cómo valora los planes de contingencia que se aplican en las carreteras para prevenir la infraestructura ante incidentes naturales o provocados?	5,9	SUFICIENTE	E
	TOTAL EVALUACIÓN RESILIENCIA POR LOS EXPERTOS:	6,1	SUFICIENTE ALTO	D

Maximo:	6,6
Mínimo:	5,6
Media:	6,1
Desviación Estándar:	0,4

Table 199: Expert assessment of road resilience

Comments, suggestions, and recommendations from the experts

- Comprehensive maintenance works effectively in responding to natural or intentional accidents.
- Resilience varies significantly among administrations.
- User information is deficient, preventing the more efficient use of the alternatives offered by the road network.
- Enhance driver information through panels and radio broadcasts.

5.1.8. Engineering and Innovation

Peso	EVALUACIÓN DE INGENIERÍA E INNOVACIÓN (Encuestas a expertos) (Max 10)			
1	8.1. ¿Considera que la inversión en la ingeniería de diseño, construcción, gestión y conservación de carreteras es adecuada?	5,0	SUFICIENTE	E
1	8.2. ¿Cómo valora los conocimientos y la actitud técnica de los ingenieros actuales de la carretera?	7,9	BIEN	C
1	8.3. ¿Considera adecuados y ajustados a las nuevas tecnologías los conocimientos impartidos en las universidades a los ingenieros?	5,7	SUFICIENTE	E
1	8.4. ¿Cómo valora la utilización de nuevas técnicas y materiales en la construcción, conservación y mantenimiento de las carreteras?	6,8	SUFICIENTE ALTO	D
1	8.5. ¿Cómo valora las medidas adoptadas en la licitación pública para favorecer la innovación en las carreteras?	5,2	SUFICIENTE	E
1	8.6. ¿Cómo valora la investigación, desarrollo e innovación que se está desarrollando en España con relación alas carreteras?	6,0	SUFICIENTE ALTO	D
1	8.7. ¿Cómo valora la tecnología actual que se está aplicando en las carreteras?	6,5	SUFICIENTE ALTO	D
1	8.8. ¿Cómo considera el avance en la digitalización y monitorización del comportamiento de los elementos de las carreteras?	5,3	SUFICIENTE	E
	TOTAL EVALUACIÓN INGENIERÍA E INNOVACIÓN POR LOS EXPERTOS:	6,1	SUFICIENTE ALTO	D

Maximo:	7,9
Mínimo:	5,0
Media:	6,1
Desviación Estándar:	1,0

Table 200: Expert assessment of road engineering and innovation

Comments, suggestions, and recommendations from the experts

- We need to make more progress towards adopting new technologies in the construction and maintenance of roads in a sector with a long way to go.
- Allow the use of new materials and provide flexibility in construction procedures.
- The high level of Spanish engineering in roads has been achieved by engineering companies. The administration has not been on par with them in terms of tendering systems or project management over time, which prevents engineering companies from capitalizing on their human capital.
- Conservation still isn't a fundamental element in universities.
- Investment in roads can be improved. Regarding R&D, different administrations launch aid calls for companies' research. Bidders who apply innovations to road-related works

and services are positively valued in tenders. In recent years, road administrations have shown a commitment to BIM methodology in the road sector.

- Civil engineering is a sector that needs more investment in innovation. However, there are challenges, such as low profit margins in construction, which can make it difficult to retain talent in the sector. It's also challenging to introduce innovation in tendering due to the inflexibility of contract terms.
- Digitalization should be seen as a tool to make road construction and operation more efficient, not as an end in itself.

5.2. Supplementary Questionnaire

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

CP.1	What infrastructure and road equipment measures do you consider necessary in the next 10 years?
CP.2	Approximately, what amount of investment do you estimate is necessary to address the infrastructure and equipment needs in the next 10 years?

CP.1 What infrastructure and road equipment measures do you consider necessary in the next 10 years?

- Much more maintenance.
- They are quite diverse, including connectivity, improvement of road safety, and various others.
- Advancements are needed in the following areas:
    - Improvement of access to ports.
    - Construction of service and rest areas along major highway routes, every 50 km.
    - Enhanced information and user services on the road.
    - Improvement of road conservation and maintenance, especially the pavement.
    - Increased investment, particularly in the conservation and operation of roads.
- There should be a consistent and realistic road policy across all responsible administrations. There needs to be genuine road plans, not, at best, mere investment programs.
- Conservation measures, in general. In Spain, we have an excellent road network that needs to be preserved and equipped for future smart roads.
- Adaptation to climate change and electrification, including autonomous driving.
- Pavement reinforcements and new materials to accommodate autonomous vehicles.
- Completion of expressways, pavement rehabilitation, improvement of access to towns, unified conservation management, digitization, and ITS systems.
- Essentially, an energetic plan for conservation and updating of ITS systems.
- Improvement and adaptation of access to major urban centers.
- A smart road planning is necessary to ensure efficient investments, including continuous and effective information for all users, not only for automated and connected vehicle users but also for drivers of non-automated vehicles.
- Urgent process of full digitization of the network.
- Creation and improvement of rest areas, parking lots, data acquisition, monitoring, conservation scheduling, design improvements, dedicated lanes, 2+1 roads, etc.

- Improvements in maintenance and rehabilitation of the network, adaptation for usage-based payment, improvements in the alignment of already constructed roads, adaptation for electric vehicles.
- 2+1 road design, which significantly improves safety (primarily for head-on collisions).
- Closures of corridors and complete city bypasses.
- General improvement of pavement quality.
- Enhancing vehicle-road connectivity and vehicle-to-vehicle communication.
- Use of connected and autonomous vehicles.
- Increasing capacity at access points to major cities.
- Connectivity.
- Overall, the road equipment in Spain is considered good (at least on the main network). However, we see that the lack of investment in road conservation has led to elements such as pavements or road markings not being in optimal condition. Urgent action plans are needed to improve this.
- Closure of the M-50 in Madrid.
- Conservation.
- Infrastructure adaptation for connected vehicles (communication and information systems).
- Equipment for vehicles with alternative fuels.
- Intermodal parking (for travelers); intermodal transfer stations (for cargo).
- Improvement of urban environments in sections with high congestion. Roadway management and use of all accessible road data by the administrator.
- Conservation and development of road plans.

CP.2.- Approximately, what amount of investment do you estimate is necessary to address the infrastructure and equipment needs in the next 10 years?

- A comprehensive investment plan is needed to improve road surfaces, especially for high-capacity roads.
- In the improvement, rehabilitation, and conservation of existing networks (state, autonomous communities, and provincial councils), the combined annual budget should not be less than 12,000 million euros. For the creation of new infrastructure, no more than 1,000 million euros per year would be required. What is essential in any case is to significantly enhance the management of these networks, which in most cases (with Vizcaya being a potential exception) is very deficient, carried out by individuals subject to the whims of incompetent politicians or serving interests that have little to do with the common good. At present, the highest level of incompetence is found in the management of the state road network, which is living off the assets of past decades (but those are dwindling).
- However, the solution cannot solely rely on private financing, at least until potential funders are willing to assume risks and not demand excessively high returns on their investments. Moreover, regarding the usage-based payment approach, there is no guarantee that the funds collected will genuinely be allocated to improvements, rehabilitation, and routine maintenance. Usage-based payment reflects a political desire

to shift modal transfers, without considering the real efficiency of each mode. As for those advocating that usage-based payment be carried out through certain management systems that can be implemented by specific concessionaire companies, they are merely looking to create new avenues for business, for which there are no guarantees, and which might not be beneficial to the common good.

- Since 2008, we have had a maintenance deficit of over 7 billion euros, and despite that, our roads, compared to countries in our vicinity, are in more than acceptable condition. I believe that increasing value is being placed on infrastructure maintenance over time. For instance, MITMA has budgeted 1.3 billion euros for this year, and yet it is still insufficient.
- Around 50 billion euros for the state network and 70 billion for regional and local networks.
- 2% annually of the asset value of the network.
- 5 billion euros per year.
- I do not have enough information to estimate a realistic amount.
- Over the given period, an investment of approximately 40 to 50 billion euros would be necessary, with a significant portion allocated to smart roads and the enhancement of maintenance levels required for automated vehicles.
- 30 billion euros.
- 2-3% of the annual investment asset value.
- The investment in roads should be around 8 to 10 billion euros per year.
- Current needs: 1.6 billion euros for the state network; 1.6 billion euros for regional networks; and 700 million euros for provincial councils.
- 60 billion euros.
- The figure often referenced in international organizations like the World Bank to maintain the asset value of a road network is around 2% annually of that value. Presently, Spain falls short of this figure, so before considering road improvement, efforts should focus on increasing investment in road conservation.
- For the state network, at least 40 billion euros (50% road surface and 50% infrastructure).
- At least five times the current investment.

5.3. Overall evaluation of the roads by the experts

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

Evaluación del sector de la carretera por los expertos (Max: 10)		29		
Pesos del criterio	CRITERIOS	CALIFICACIÓN AICCP		
1	CAPACIDAD	7,6	BIEN	C
1	PRESTACIONES	6,8	SUFICIENTE ALTO	D
1	FINANCIACIÓN	4,9	INSUFICIENTE	FX
1	ADAPTACIÓN AL FUTURO Y DESARROLLO SOSTENIBLE	5,3	SUFICIENTE	E
1	OPERACIÓN Y MANTENIMIENTO	5,9	SUFICIENTE	E
1	SEGURIDAD	6,3	SUFICIENTE ALTO	D
1	RESILIENCIA	6,1	SUFICIENTE ALTO	D
1	INGENIERÍA E INNOVACIÓN	6,1	SUFICIENTE ALTO	D
Sector carretera. Evaluación ponderada por los expertos		6,1	SUFICIENTE ALTO	D
Respuestas recibidas: 29				

Table 201: Overall evaluation of the roads by the experts

6. Overall assessment based on objective indicators and expert evaluations

Evaluación del sector de la carretera por los expertos (Max: 10)		29		
Pesos del criterio	CRITERIOS	CALIFICACIÓN AICCP		
1	CAPACIDAD	7,6	BIEN	C
1	PRESTACIONES	6,8	SUFICIENTE ALTO	D
1	FINANCIACIÓN	4,9	INSUFICIENTE	FX
1	ADAPTACIÓN AL FUTURO Y DESARROLLO SOSTENIBLE	5,3	SUFICIENTE	E
1	OPERACIÓN Y MANTENIMIENTO	5,9	SUFICIENTE	E
1	SEGURIDAD	6,3	SUFICIENTE ALTO	D
1	RESILIENCIA	6,1	SUFICIENTE ALTO	D
1	INGENIERÍA E INNOVACIÓN	6,1	SUFICIENTE ALTO	D
Sector carretera. Evaluación ponderada por los expertos		6,1	SUFICIENTE ALTO	D
Respuestas recibidas: 29				

Table 202: Overall roads assessment by the experts

Evaluación del sector de la carretera por indicadores objetivos (Max: 10)				
Pesos del criterio	CRITERIOS	CALIFICACIÓN AICCP		
1	CAPACIDAD	8,7	MUY BIEN	B
1	PRESTACIONES	8,2	MUY BIEN	B
1	FINANCIACIÓN	3,4	INSUFICIENTE	FX
1	ADAPTACIÓN AL FUTURO Y DESARROLLO SOSTENIBLE	4,7	INSUFICIENTE	FX
1	OPERACIÓN Y MANTENIMIENTO	5,2	SUFICIENTE	E
1	SEGURIDAD	8,2	MUY BIEN	B
1	RESILIENCIA	8,0	MUY BIEN	B
1	INGENIERÍA E INNOVACIÓN	5,1	SUFICIENTE	E
Sector carretera. Evaluación ponderada por indicadores objetivos		6,4	SUFICIENTE ALTO	D
Indicadores considerados: 75				

Table 203: Overall roads assessment based on objective indicators

Evaluación final del sector de la carretera (Max: 10)				
Pesos del criterio	CRITERIOS	CALIFICACIÓN FINAL AICCP (50% evaluación por indicadores; 50% evaluación por expertos)		
1	CAPACIDAD	8,1	MUY BIEN	B
1	PRESTACIONES	7,5	BIEN	C
1	FINANCIACIÓN	4,1	INSUFICIENTE	FX
1	ADAPTACIÓN AL FUTURO Y DESARROLLO SOSTENIBLE	5,0	SUFICIENTE	E
1	OPERACIÓN Y MANTENIMIENTO	5,6	SUFICIENTE	E
1	SEGURIDAD	7,2	BIEN	C
1	RESILIENCIA	7,1	BIEN	C
1	INGENIERÍA E INNOVACIÓN	5,6	SUFICIENTE	E
Sector carretera. Evaluación ponderada final		6,3	SUFICIENTE ALTO	D

Table 204: Final roads evaluation based on objective indicators and by the experts

Evaluación del sector de la carretera por los expertos (Max: 10)	
CRITERIOS	Diferencias (Indicadores- expertos)
CAPACIDAD	1,1
PRESTACIONES	1,3
FINANCIACIÓN	-1,5
ADAPTACIÓN AL FUTURO Y DESARROLLO SOSTENIBLE	-0,6
OPERACIÓN Y MANTENIMIENTO	-0,7
SEGURIDAD	1,9
RESILIENCIA	1,9
INGENIERÍA E INNOVACIÓN	-0,9
Sector carretera. Diferencias (indicadores-expertos)	0,3

Table 205: Differences between objective evaluation and 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. **"Report Card for America's Infrastructure." American Society of Civil Engineers (ASCE)**
2. **"The Global Competitiveness Report (GCI)." World Economic Forum (WEF)**
3. **"The Global Adaptation Index (ND-Gain Indicators)." University of Notre Dame (USA)**
4. **"Transport in the European Union." European Commission.**

Annex 6: Roads Indicators from Major Spanish Organizations

ANNEXE 1

List of Tables

Table 1: Spanish Road Network 6
Table 2: Rating system for Indicators, Criteria, and Sectors 10
Table 3: Indicator CRR C.1 values: Kilometers of roads per 1,000 inhabitants 18
Table 4: Indicator CRR C.1 rating: Kilometers of roads per 1,000 inhabitants 18
Table 5: Indicator CRR C.2 values: Kilometers of interurban roads per 1,000 inhabitants 19
Table 6: Indicator CRR C.2 rating: Kilometers of interurban roads per 1,000 inhabitants 19
Table 7: Indicator CRR C.3 values: Kilometers of high-capacity roads per 1,000 inhabitants 20
Table 8: Indicator CRR C.3 rating: Kilometers of high-capacity roads per 1,000 inhabitants 20
Table 9: Indicator CRR C.4 values: Kilometers of roads per country's area (km²) 21
Table 10: Indicator CRR C.4 rating: Kilometers of roads per country's area (km²) 21
Table 11: Indicator CRR C.5 values: Kilometers of interurban roads per country's area (km²) 22
Table 12: Indicator CRR C.5 rating: Kilometers of interurban roads per country's area (km²) 22
Table 13: Indicator CRR C.6 values: Kilometers of high-capacity roads per country's area (km²) 23
Table 14: Indicator CRR C.6 rating: Kilometers of high-capacity roads per country's area (km²) 23
Table 15: Indicator CRR C1.7 values: Equivalent kilometers of high-capacity roads per country's area (km²) 24
Table 16: Indicator CRR C1.7 Rating: Equivalent kilometers of high-capacity roads per country's area (km²) 24
Table 17: Indicator CRR C.8 values: Kilometers of high-capacity roads per population density 25
Table 18: Indicator CRR C.8 rating: Kilometers of high-capacity roads per population density 25
Table 19: Capacity Indicator Values 26
Table 20: Capacity Criterion Rating 26
Table 21: Weight and maximum reduced score of Capacity Indicators 26
Table 22: Indicator CRR P.1 values: Vehicle Fleet per 1,000 Inhabitants 31
Table 23: Indicator CRR P.1 rating: Vehicle Fleet per 1,000 Inhabitants 31
Table 24: Indicator CRR P.2 values: Vehicle Fleet per kilometer of roads 32
Table 25: Indicator CRR P.2 Rating: Vehicle Fleet per kilometer of roads 32
Table 26: Indicator CRR P.3 values: Vehicle Fleet per kilometer of high-capacity roads 33
Table 27: Indicator CRR P.3 Rating: Vehicle Fleet per kilometer of high-capacity roads 33
Table 28: Indicator CRR P.4 values: Vehicle Fleet per kilometer of interurban roads 34
Table 29: Indicator CRR P.4 Rating: Vehicle Fleet per kilometer of interurban roads 34
Table 30: Indicator CRR P.5 Values: Kilometers of high-capacity roads per kilometer of interurban roads 35
Table 31: Indicator CRR P.5 Rating: Kilometers of high-capacity roads per kilometer of interurban roads 35
Table 32: Indicator CRR P.6 Values: Domestic passenger road traffic (10^6 passenger-km) per kilometer of interurban roads 36
Table 33: Indicator CRR P.6 Rating: Domestic passenger road traffic (10^6 passenger-km) per kilometer of interurban roads 36
Table 34: Indicator CRR P.7 Values: Domestic freight road traffic (10^6 ton-km) per kilometer of interurban roads 37

Table 35: Indicator CRR P.7 Rating: Domestic freight road traffic (10^6 ton-km) per kilometer of interurban roads 37
Table 36: Indicator CRR P.8 Values: Route Factor (Road Distance / Direct Distance) 38
Table 37: Indicator CRR P.8 Rating: Route Factor (Road Distance / Direct Distance) 38
Table 38: Indicator CRR P.9 values: Annual hours of congestion on roads per inhabitants 39
Table 39: Indicator CRR P.9 Rating: Annual hours of congestion on roads per inhabitants 39
Table 40: Indicator CRR P.10 Values: Road Connectivity. GCI Score (WEF) 40
Table 41: Indicator CRR P.10 Rating: Road Connectivity. GCI Score (WEF) 40
Table 42: Indicator CRR P.11 Values: Quality of Road Infrastructure. GCI Score (WEF) 41
Table 43: Indicator CRR P.11 Rating: Quality of Road Infrastructure. GCI Score (WEF) 41
Table 44: Performance Indicator Values 42
Table 45: Performance Criterion Rating 42
Table 46: Weights and maximum reduced score of Performance Indicators 42
Table 47: Indicator CRR F.1 Values: Investment in roads / National GDP (current €) 45
Table 48: Indicator CRR F.1 Rating: Investment in roads / National GDP (current €) 45
Table 49: Indicator CRR F.2 Values: Investment in roads / inhabitants (current €) 46
Table 50: Indicator CRR F.2 Rating: Investment in roads / inhabitants (current €) 46
Table 51: Indicator CRR F.3 Values: Investment in roads / kilometers of roads (current €) 47
Table 52: Indicator CRR F.3 Rating: Investment in roads / kilometers of roads (current €) 47
Table 53: Indicator CRR F.4 Values: Investment in roads / vehicle fleet (current €) 48
Table 54: Indicator CRR F.4 Rating: Investment in roads / vehicle fleet (current €) 48
Table 55: Indicator CRR F.5 Values: Investment in roads / Country's Area (km²) (current €) 49
Table 56: Indicator CRR F.5 Rating: Investment in roads / Country's Area (km²) (current €) 49
Table 57: Indicator CRR F.6 Values: Investment in roads / kilometers of high-capacity roads 50
Table 58: Indicator CRR F.6 Rating: Investment in roads / kilometers of high-capacity roads 50
Table 59: Indicator CRR F.7 Values: Investment in roads / Domestic passenger road traffic (10^6 Passenger-km) 51
Table 60: Indicator CRR F.7 Rating: Investment in roads / Domestic passenger road traffic (10^6 Passenger-km) 51
Table 61: Indicator CRR F.8 Values: Investment in roads / Domestic freight road traffic (10^6 ton-km) 52
Table 62: Indicator CRR F.8 Rating: Investment in roads / Domestic freight road traffic (10^6 ton-km) 52
Table 63: Indicator CRR F.9 Values: Investment in roads / Total investment in land transport infrastructure 53
Table 64: Indicator CRR F.9 Rating: Investment in roads / Total investment in land transport infrastructure 53
Table 65: Financing Indicator 54
Table 66: Financing Indicators Weights 54
Table 67: Financing Criterion Rating 54
Table 68: Indicator CRR A.1 Values: Year-on-year cumulative growth index. Road investment / motorization rate (Index 100 in 2015) 59
Table 69: Indicator CRR A.1 Rating: Year-on-year cumulative growth index. Road investment / motorization rate (Index 100 in 2015) 59
Table 70: Indicator CRR A.2 Values: Cumulative year-on-year growth index. Road investment / GDP (Index 100 in 2015) 60

Table 71: Indicator CRR A.2 Rating: Cumulative year-on-year growth index. Road investment / GDP (Index 100 in 2015) 60
Table 72: Indicator CRR A.3 Values: Cumulative year-on-year growth index. Road investment / Domestic road passenger traffic (Index 100 in 2015) 61
Table 73: Indicator CRR A.3 Rating: Cumulative year-on-year growth index. Road investment / Domestic road passenger traffic (Index 100 in 2015) 61
Table 74: Indicator CRR A.4 Values: Cumulative year-on-year growth index. Road investment / Domestic road freight traffic (Index 100 in 2015) 62
Table 75: Indicator CRR A.4 Rating: Cumulative year-on-year growth index. Road investment / Domestic road freight traffic (Index 100 in 2015) 62
Table 76: Indicator CRR A.5 Values: Cumulative year-on-year growth index. Road investment / Population (Index 100 in 2015) 63
Table 77: Indicator CRR A.5 Rating: Cumulative year-on-year growth index. Road investment / Population (Index 100 in 2015) 63
Table 78: Indicator CRR A.6 Values: Greenhouse gas emission growth index from transportation (t CO2 equivalent) (Index 100 in 2015) 64
Table 79: Indicator CRR A.6 Rating: Greenhouse gas emission growth index from transportation (t CO2 equivalent) (Index 100 in 2015) 64
Table 80: Indicator CRR A.7 Values: Percentage of electric and plug-in hybrid vehicles / Registered light vehicles. 65
Table 81: Indicator CRR A.7 Rating: Percentage of electric and plug-in hybrid vehicles / Registered light vehicles 65
Table 82: Indicator CRR A.8 Values: Percentage of CO2 emissions generated by road transport out of total transportation emissions. 66
Table 83: Indicator CRR A.8 Rating: Percentage of CO2 emissions generated by road transport out of total transportation emissions 66
Table 84: Indicator CRR A.9 Values: CO2 emissions from registered light vehicles (g/km) 67
Table 85: Indicator CRR A.9 Rating: CO2 emissions from registered light vehicles (g/km) 67
Table 86: Indicator CRR A.10 Values: Electric vehicle charging points per million inhabitants 68
Table 87: Indicator CRR A.10 Rating: Electric vehicle charging points per million inhabitants 68
Table 88: Indicator CRR A.11 Values: Percentage of urban area population exposed to high noise levels 69
Table 89: Indicator CRR A.11 Rating: Percentage of urban area population exposed to high noise levels 69
Table 90: Indicator CRR A.12 Values: Percentage of renewable energy in total energy consumed in transportation 70
Table 91: Indicator CRR A.12 Rating: Percentage of renewable energy in total energy consumed in transportation 70
Table 92: Indicator CRR A.13 Values: Development of climate change mitigation technologies related to transportation (OECD) 71
Table 93: Indicator CRR A.13 Rating: Development of climate change mitigation technologies related to transportation (OECD) 71
Table 94: Adaptation to the future and sustainability indicator Values 72
Table 95: Adaptation to the future and sustainability indicator Rating 72
Table 96: Weights and maximum reduced scores for the Indicators of Adaptation to the Future and Sustainability 72

Table 97: Indicator CRR O.1 Values: % Investment in operation and maintenance / National GDP 76
Table 98: Indicator CRR O.1 Rating: % Investment in operation and maintenance / National GDP 76
Table 99: Indicator CRR O.2 Values: Investment in O&M / inhabitants 77
Table 100: Indicator CRR O.2 Rating: Investment in O&M / inhabitants 77
Table 101: Indicator CRR O.3 Values: Investment in O&M / equivalent road kilometers 78
Table 102: Indicator CRR O.3 Rating: Investment in O&M / equivalent road kilometers 78
Table 103: Indicator CRR O.4 Values: Investment in O&M / Total investment in roads 79
Table 104: Indicator CRR O.4 Rating: Investment in O&M / Total investment in roads 79
Table 105: Indicator CRR O.5 Values: Investment in O&M / Domestic road passenger traffic (€/million passenger-km) 80
Table 106: Indicator CRR O.5 Rating: Investment in O&M / Domestic road passenger traffic (€/million passenger-km) 80
Table 107: Indicator CRR O.6 Values: Investment in O&M / Domestic road freight traffic (€/million tonne-km) 81
Table 108: Indicator CRR O.6 Rating: Investment in O&M / Domestic road freight traffic (€/million tonne-km) 81
Table 109: Operation and maintenance Indicator Values 82
Table 110: Operation and maintenance Indicator Weights 82
Table 111: Operation and Maintenance Criterion Rating 82
Table 112: Indicator CRR S.1 Values: Accidents with casualties/ 100,000 inhabitants 85
Table 113: Indicator CRR S.1 Rating: Accidents with casualties/ 100,000 inhabitants 85
Table 114: Indicator CRR S.2 Values: Accidents with casualties/ km of roads 86
Table 115: Indicator CRR S.2 Rating: Accidents with casualties/ km of roads 86
Table 116: Indicator CRR S.3 Values: Fatalities/ km of roads 87
Table 117: Indicator CRR S.3 Rating: Fatalities/ km of roads 87
Table 118: Indicator CRR S.4 Values: Fatalities/100,000 inhabitants 88
Table 119: Indicator CRR S.4 Rating: Fatalities/100,000 inhabitants 88
Table 120: Indicator CRR S.5 Values: Lethality index (Number of fatalities/Number of casualties) 89
Table 121: Indicator CRR S.5 Rating: Lethality index (Number of fatalities/Number of casualties) 89
Table 122: Indicator CRR S.6 Values: Number of casualties/Interior road traffic (Million passenger-kilometers) 90
Table 123: Indicator CRR S.6 Rating: Number of casualties/Interior road traffic (Million passenger-kilometers) 90
Table 124: Indicator CRR S.7 Values: Fatalities/Interior road traffic (Million passenger-kilometers) 91
Table 125: Indicator CRR S.7 Rating: Fatalities/Interior road traffic (Million passenger-kilometers) 91
Table 126: Safety Indicator Values 92
Table 127: Safety Indicator Weights 92
Table 128: Safety Criterion Rating 92
Table 129: Indicator CRR R.1 Values: Railway density / Road density 95
Table 130: Indicator CRR R.1 Rating: Railway density / Road density 95
Table 131: Indicator CRR R.2 Values: km of roads / Country area (100 km2) 96
Table 132: Indicator CRR R.2 Rating: km of roads / Country area (100 km2) 96
Table 133: Indicator CRR R.3 Values: km of secondary roads / km of main roads 97
Table 134: Indicator CRR R.3 Rating: km of secondary roads / km of main roads 97

Table 135: Indicator CRR R.4 Values: km of high-capacity roads / Country area (100 km²) 98
Table 136: Indicator CRR R.4 Rating: km of high-capacity roads / Country area (100 km²) 98
Table 137: Indicator CRR R.5 Values: Transport infrastructure score (WEF) 99
Table 138: Indicator CRR R.5 Rating: Transport infrastructure score (WEF) 99
Table 139: Resilience Indicator Values 100
Table 140: Resilience Indicators Weights 100
Table 141: Resilience Criterion Rating 100
Table 142: Indicator CRR I.1 Values: % of GDP allocated to Gross Domestic Expenditure on R&D (OCDE R&D) 103
Table 143: Indicator CRR I.1 Rating: % of GDP allocated to Gross Domestic Expenditure on R&D (OCDE R&D) 103
Table 144: Indicator CRR I.2 Values: Gross Domestic Expenditure on R&D ($) / Population (OCDE R&D) 104
Table 145: Indicator CRR I.2 Rating: Gross Domestic Expenditure on R&D ($) / Population (OCDE R&D) 104
Table 146: Indicator CRR I.3 Values: % del PIB destinado a gasto en investigación básica (OCDE R&D) 105
Table 147: Indicator CRR I.3 Rating: % del PIB destinado a gasto en investigación básica (OCDE R&D) 105
Table 148: Indicator CRR I.4 Values: Total number of personnel in R&D per 1,000 employees (OCDE R&D) 106
Table 149: Indicator CRR I.4 Rating: Total number of personnel in R&D per 1,000 employees (OCDE R&D) 106
Table 150: Indicator CRR I.5 Values: % of GDP from private funding for R&D (OCDE R&D) 107
Table 151: Indicator CRR I.5 Rating: % of GDP from private funding for R&D (OCDE R&D) 107
Table 152: Indicator CRR I.6 Values: % of GDP from public funding for R&D (OCDE R&D) 108
Table 153: Indicator CRR I.6 Rating: % of GDP from public funding for R&D (OCDE R&D) 108
Table 154: Indicator CRR I.7 Values: Digitalization. Digitalization. Participation in new technologies. GCI (WEF) score 109
Table 155: Indicator CRR I.7 Rating: Digitalization. Digitalization. Participation in new technologies. GCI (WEF) score 109
Table 156: Indicator CRR I.8 Values: Digitalization. Index of Information and Communication Technologies Infrastructure. (ND Gain Index. ICT infrastructure) 110
Table 157: Indicator CRR I.8 Rating: Digitalization. Index of Information and Communication Technologies Infrastructure. (ND Gain Index. ICT infrastructure) 110
Table 158: Indicator CRR I.9 Values: Digitalization. Number of individuals using the internet 111
Table 159: Indicator CRR I.9 Rating: Digitalization. Number of individuals using the internet 111
Table 160: Indicator CRR I.10 Values: Patent applications by residents (per million inhabitants) 112
Table 161: Indicator CRR I.10 Rating: Patent applications by residents (per million inhabitants) 112
Table 162: Indicator CRR I.11 Values: Engineering. Regulatory transparency. Trade in Services Restrictiveness Index (OECD) 113
Table 163: Indicator CRR I.11 Rating: Engineering. Regulatory transparency. Trade in Services Restrictiveness Index (OECD) 113
Table 164: Indicator CRR I.12 Values: Engineering. Barriers to competition. Trade in Services Restrictiveness Index (OECD) 114
Table 165: Indicator CRR I.12 Rating: Engineering. Barriers to competition. Trade in Services Restrictiveness Index (OECD) 114

Table 166: Indicator CRR I.13 Values: Engineering. Restrictions on movement. Trade in Services Restrictiveness Index (OECD) 115
Table 167: Indicator CRR I.13 Rating: Engineering. Restrictions on movement. Trade in Services Restrictiveness Index (OECD) 115
Table 168: Indicator CRR I.14 Values: Engineering. Restrictions on the entry of foreign engineers. Trade in Services Restrictiveness Index (OECD) 116
Table 169: Indicator CRR I.14 Rating: Engineering. Restrictions on the entry of foreign engineers. Trade in Services Restrictiveness Index (OECD) 116
Table 170: Indicator CRR I.15 Values: Innovation index. ND Gain Index 117
Table 171: Indicator CRR I.15 Rating: Innovation index. ND Gain Index 117
Table 172: Indicator CRR I.16 Values: Number of patents related to road transport per million inhabitants (OECD) 118
Table 173: Indicator CRR I.1 Rating: Number of patents related to road transport per million inhabitants (OECD) 118
Table 174: Engineering and Innovation Indicator 119
Table 175: Engineering and Innovation Weights 119
Table 176: Engineering and Innovation Criterion Rating 119
Table 177: Capacity Criterion Rating 121
Table 178: Performance Criterion Rating 121
Table 179: Financing Criterion Rating 121
Table 180: Adaptation to the Future and Sustainability Criterion Rating 122
Table 181: Operation and Maintenance Criterion Rating 122
Table 182: Security Criterion Rating 122
Table 183: Resilience Criterion Rating 123
Table 184: Engineering and Innovation Criterion Rating 123
Table 185: Weights assigned to the criteria for the formation of the Assessment of the Road Sector 124
Table 186: Evaluation of the Road Sector based on objective indicators 124
Table 187: Sensitivity Analysis. Emphasis on the Criteria: Capacity, Performance, and Safety (3) 125
Table 188: Sensitivity Analysis. Emphasis on the Criteria: Capacity, Performance, and Safety (3). Evaluation of the roadways 125
Table 189: Sensitivity Analysis. Emphasis on the Criteria: Capacity, Performance, and Safety (2); all other criteria (1) 126
Table 190: Sensitivity Analysis. Emphasis on the Criteria: Capacity, Performance, and Safety (2); all other criteria (1). Evaluation of the roadways. 126
Table 191: Qualitative evaluation rating system by the experts 136
Table 192: Asignación numérica de la evaluación cualitativa por los expertos 136
Table 193: Expert assessment of capacity 138
Table 194: Expert assessment of road performance 140
Table 195: Expert assessment of road financing 142
Table 196: Expert assessment of road financing 144
Table 197: Expert assessment of road operation and maintenance 146
Table 198: Expert assessment of road safety 147
Table 199: Expert assessment of road resilience 148
Table 200: Expert assessment of road engineering and innovation 149
Table 201: Overall evaluation of the roads by the experts 154

Table 202: Overall roads assessment by the experts 155
Table 203: Overall roads assessment based on objective indicators 155
Table 204: Final roads evaluation based on objective indicators and by the experts 156
Table 205: *Differences between objective evaluation and experts* 156
Table 206: Rating system of the sector index used by Asociación Caminos and its equivalence with the system used in this report 169

ANNEXE 2

List of figures

Figure 1: Investment made in infrastructure for different modes of transportation (Transportation and Infrastructure 2019. MITMA) 8
Figure 2: Major corridors of Spain's road network 8
Figure 3: Scheme of the evaluation system for public works sectors 137
Figura 4: Criterios analizados en el Informe IRC, ASCE 2021 169
Figura 5: Esquema de la composición del Indicator GCI del WEF 170
Figura 6: Ponderación del Indicator de infraestructuras del índice GCI del WEF (2019) 171
Figura 7: Indicatores de infraestructuras del Indicator GCI del WEF (2019) 171
Figura 8: Valoración global de España en el Indicator GCI del WEF (2019) 172
Figura 9: Resumen de los Indicatores de vulnerabilidad y preparación de ND Gain 173
Figura 10: Matriz de dispersión: vulnerabilidad vs. preparación de ND Gain 174
Figura 11: Ranking global del índice ND Gain de 2020 174
Figura 12: Ranking de Vulnerabilidad y preparación del índice ND Gain de 2020 175
Figura 13: Posición de España en la matriz de dispersión y evaluación anual de ND Gain 175
Figura 14: Satisfacción con la calidad de las infraestructuras, Comisión Europea. 2019 176
Figura 15: % de vehículos eléctricos enchufables sobre el total de vehículos matriculados, Comisión Europea. 2019 177
Figura 16: Horas anuales de congestión por vehículo, Comisión Europea. 2019 177

ANNEXE 3

Acronyms

ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS
BTS	BUREAU OF TRANSPORTATION STATISTICS (USA)
DGMT	DIRECTORATE GENERAL FOR MOBILITY AND TRANSPORT (EC)
EC	EUROPEAN COMMISSION
FRA	FEDERAL RAILROAD ADMINISTRATION
ITF	INTERNATIONAL TRANSPORT FORUM
OECD	ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT
USA	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)
PCA	PRINCIPAL COMPONENT ANALYSIS
IRF	INTERNATIONAL ROAD FEDERATION
WRA	WORLD ROAD ASSOCIATION (AIPCR)

ANNEXE 4

Bibliography and references

- World Bank “Connecting to Compete. Trade Logistics in the Global Economy” Años 2010-2018”
- World Economic Forum “The Global Competitiveness Report” Años 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.**
- OECD-International Transport Forum-Report "Transport Infrastructure Investment - Options for Efficiency" (Ed 2022)
- OECD-International Transport Forum-Report "Key Transport Statistics 2019 Data"
- European Commission “Statistical pocketbook”. Años 2010-2022
- Ministerio de Fomento de España- Los transportes y las infraestructuras - informe anual 2019 y 2020
- Ministerio de Fomento de España - Anuario Estadístico 2019 y 2020
- Eurostat- Report "Energy, transport and environment indicators" 2022 Edition
- Eurostat- Report "Energy balance sheets 2015 DATA" - 2019 edition
- International Energy Agency - Report "Energy efficiency indicators, Highlights" 2019
- Ministerio de Fomento - Evolución de los Indicatores económicos y sociales del transporte terrestre. Nov 2016.
- Ministerio de Medioambiente – “Guía para la elaboración de estudios del medio físico. Contenido y metodología”. Año 2004
- Comisión Europea. Transport in the European Union. Current Trends and Issues. March 2019.
- Ministerio de Fomento de España. Observatorio del transporte y la movilidad 2019.
- Ministerio del interior de España. Anuario estadístico de accidentes 2019. DGT
- International Road Federation (IRF). World Road Statistics. 2012, 2016, 2017, 2018 y 2019.
- Federal Highway Administration (EEUU). Highway Statistics.
- International Transport Forum. Road safety annual report.
- Roads in Japan.
- Roads in EEUU
- Roads length notes definitions (GB)
- 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**

ANNEXE 5

Roads Indicators from Key International Organizations

For the Roads sector, indicators from the following international organizations have been analyzed:

- OECD-International Transport Forum. **https://www.itf-oecd.org/**
- EUROSTAT.**https://ec.europa.eu/info/departments/eurostat-european-statistics_es**
- International Road Federation (IRF) **https://worldroadstatistics.org/**
- World Bank. **https://worldroadstatistics.org/**
- World Economic Forum **https://www.weforum.org/**
- European Comission **https://ec.europa.eu/commission/index_es**
- International Energy Agency **https://www.iea.org/**
- Federal Highway Administration (FHWA) de EEUU **https://www.fhwa.dot.gov/**
- American Society of Civil Engineers. **https://www.fhwa.dot.gov/**

These international organizations, which have been used as references, also have complementary databases that enable the creation of new quantitative indices. These basic data, carefully selected, along with information from databases of various countries, have been the primary source of information to configure the Roads indicators.

Below, you will find detailed information about evaluations, indices, and indicators from the major organizations that assess Roads.

- *"Report Card for America´s infrastructure*." American Society of Civil Engineers (ASCE).
- "The Global Competitiveness Report". World Economic Forum.
- "Transport in the European Union". European Commission.

1.- *"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"[5] from 2021, analyzes eight criteria: capacity, physical condition, financing, future needs, operation and maintenance, public safety, resilience, and innovation.

Figura 4: 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[6] 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 206: 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/2017/01/Roads-2021.pdf

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

[6] 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.

2.- *"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)" [7] 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

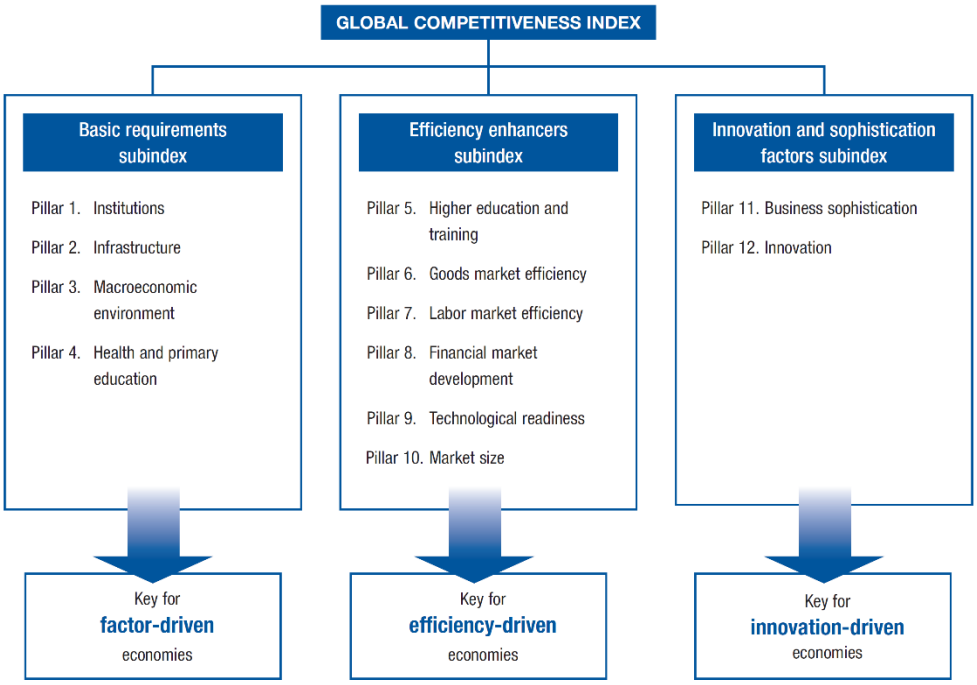


Figure 5: Outline of the Composition of the GCI Indicator by the WEF

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.

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

[7] WEF_TheGlobalCompetitivenessReport2019.pdf (weforum.org)

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 6: Ponderación del Indicator de infraestructuras del índice GCI del WEF (2019)

Roads represent 25% of the total transport infrastructure rating.

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

Figura 7: Infrastructure indicators of the GCI (Global Competitiveness Index) from the WEF (World Economic Forum) in 2019

In the field of roads, two indicators are used: Road Connectivity, where Spain achieves 100% and holds the top position, and Road Quality, with a rating of 78.4%, placing it in the 11th position.

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

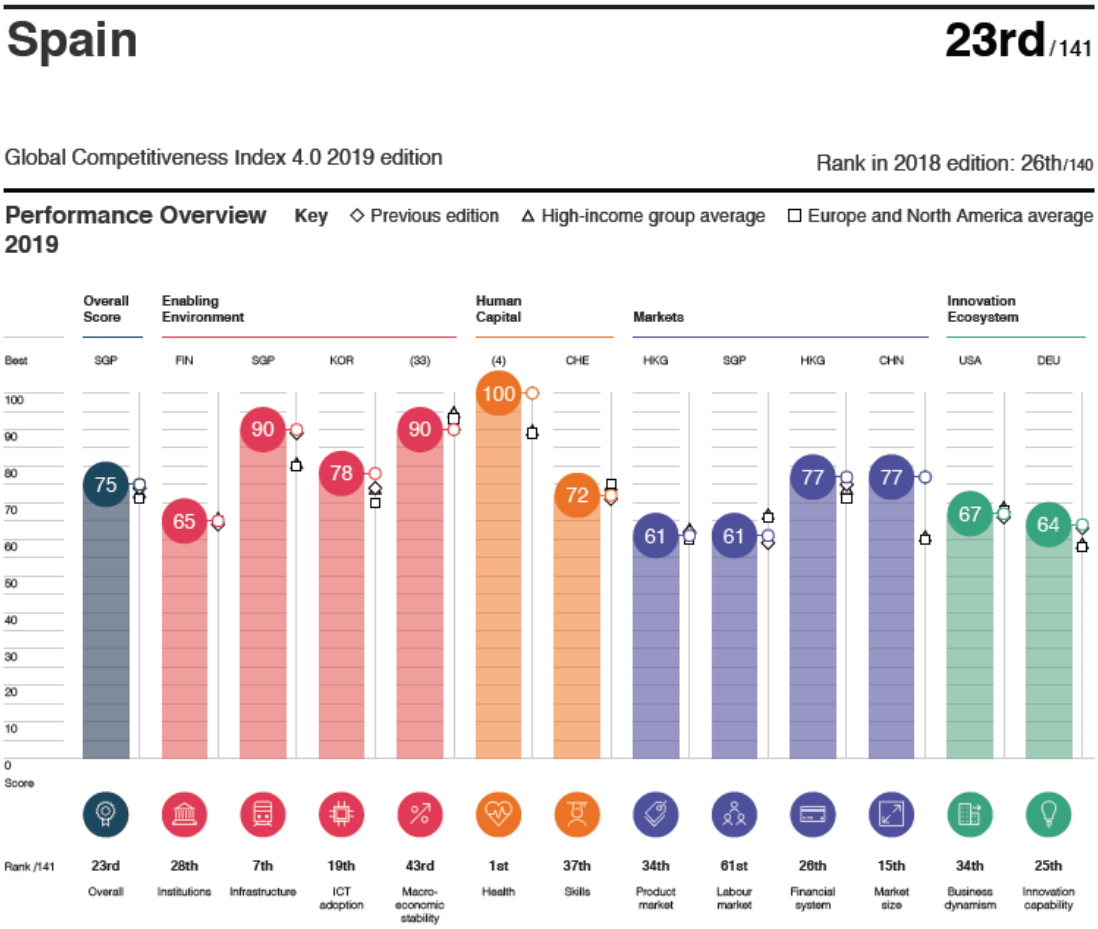


Figura 8: Spain's overall assessment in the GCI indicator of the World Economic Forum (2019)

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

The Global Adaptation Index (ND-GAIN) [8] by the University of Notre Dame is an open-source index that assesses a country's **vulnerability**[9] to climate change and its **readiness**[10] 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.

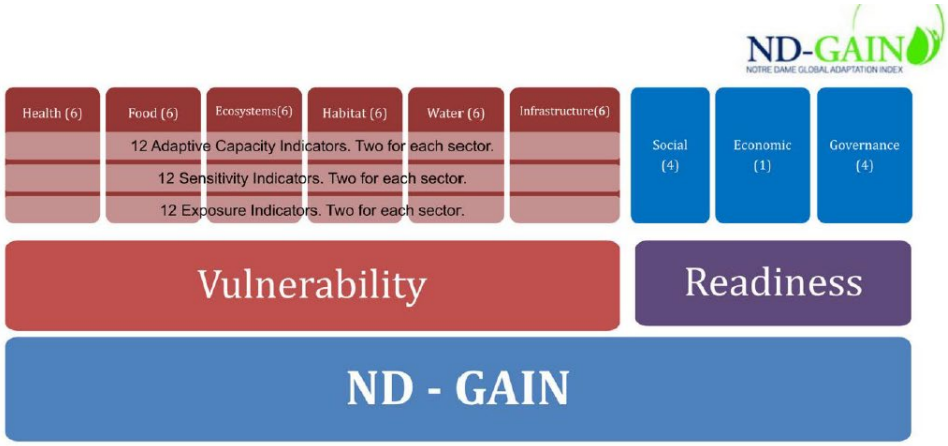


Figure 9: Summary of the vulnerability and readiness indicators from ND-GAIN

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.

[8] Rankings // Notre Dame Global Adaptation Initiative // University of Notre Dame (nd.edu)
[9] ND-GAIN defines the concept of Vulnerability as: The propensity or predisposition of human societies to be negatively affected by climate threats.
[10] 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.

Figure 10: 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.

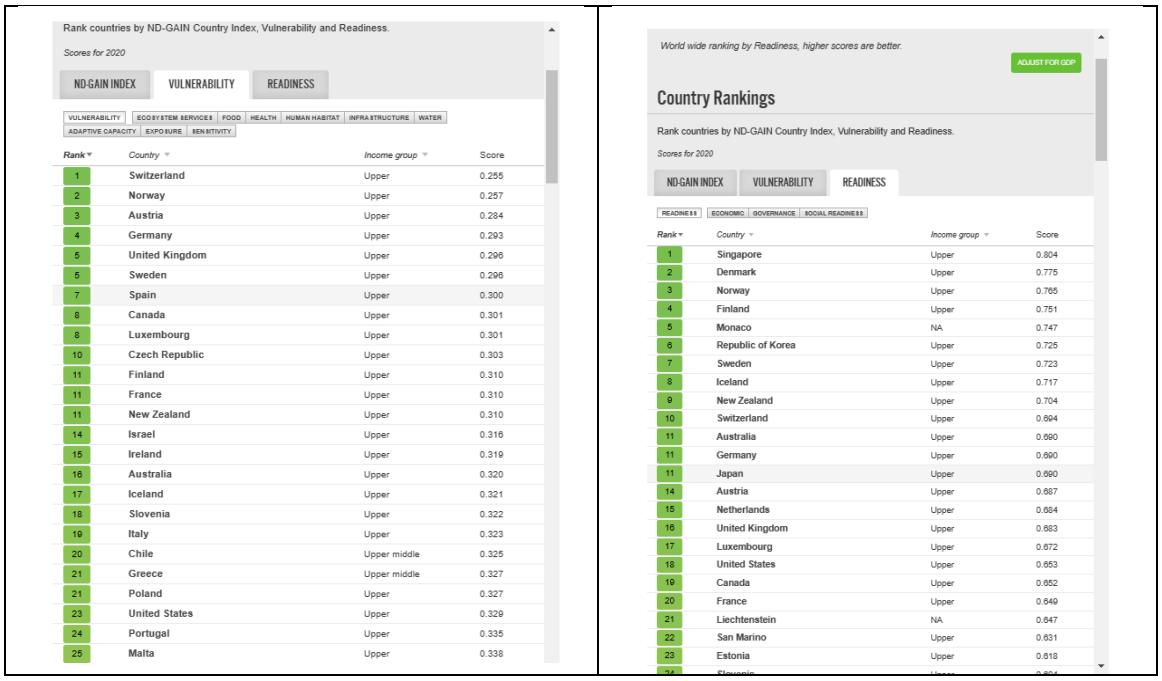
Scores for 2020

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 11: 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

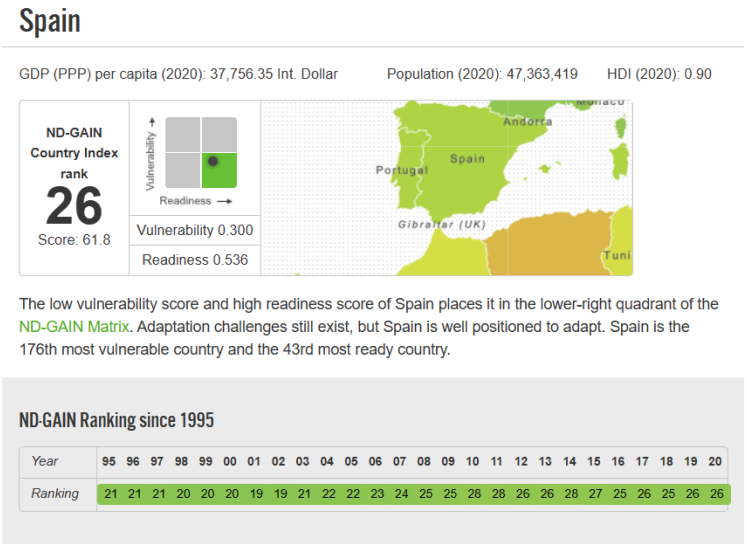
ND-GAIN INDEX | VULNERABILITY | READINESS

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 12: 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[11] 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 13: Position of Spain in the scatterplot and annual assessment of ND Gain

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

4.- "Transport in the European Union. Current Trends and Issues". European Commission[12]

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, Railroads, Maritime Transport, and Air Transport. It also provides an overall assessment of the infrastructure across EU countries.

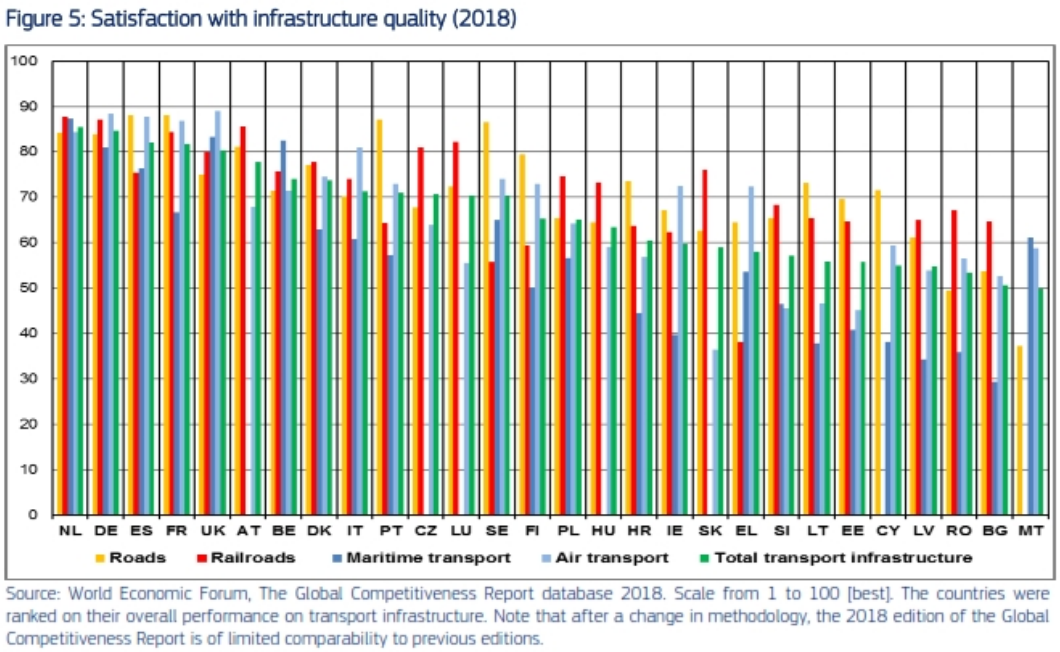
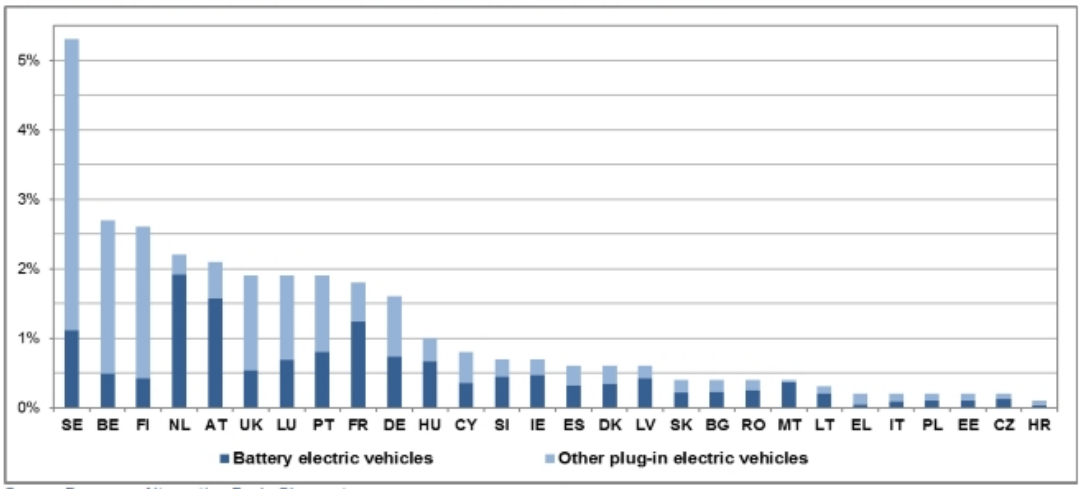


Figure 14: Satisfaction with the quality of infrastructure, European Commission, 2019

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

The percentage of plug-in electric vehicles out of the total registered vehicles in 2017 is also provided:

Figure 7: PEV market share in new passenger cars (M1) registrations (2017)

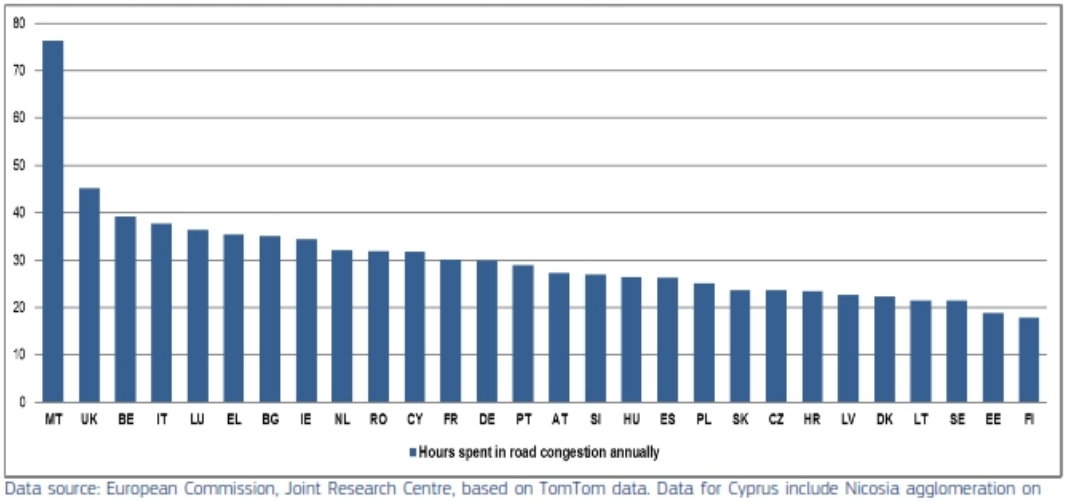


Source: European Alternative Fuels Observatory.

Figure 15: Percentage of plug-in electric vehicles out of the total registered vehicles, European Commission, 2019

As well as the annual hours of congestion per vehicle (2018):

Figure 8: Average annual hours spent in congestion per vehicle (2018)



Data source: European Commission, Joint Research Centre, based on TomTom data. Data for Cyprus include Nicosia agglomeration on both sides of the demarcation line. For methodological reasons, the data for Malta are of limited comparability with the ones for the other countries studied.

Figure 16: Annual hours of congestion per vehicle, European Commission. 2019

ANNEXE 6

Indicators from the main Spanish organizations for Roads

In Spain, there are several fundamental organizations that provide road data:

- Ministry of Development (Ministry of Public Works):
  - Transport and Logistics Observatory of Spain **http://observatoriotransporte.fomento.es/OTLE/LANG_CASTELLANO/**
  - Statistical Yearbook:

    https://www.fomento.gob.es/informacion-para-el-ciudadano/informacion-estadistica/anuario-estadisticas-de-sintesis-y-boletin/anuario-estadistico
- Ministry of the Interior:
  - Statistical Yearbook of Accidents:

    http://www.dgt.es/es/seguridad-vial/estadisticas-e-indicadores/publicaciones/anuario-estadistico-accidentes/
- Ministry for Ecological Transition:
  - Public Environmental Indicators Bank
  - Guide for the Elaboration of Studies on the Physical Environment: Content and Methodology

To complete the information, you can consult the international transportation comparison published by the Ministry of Transport, Mobility, and Urban Agenda (MITMA).: **Anuario estadístico 2019 - Capítulo 19. Comparación internacional de los transportes (mitma.gob.es)**