Evaluation of Public Works in Spain

Urban Public
Transport
2023

Asociación
Caminos

Urban Public Transport is a complex and dynamic system that articulates the urban centers and metropolitan areas of large cities and facilitates the movement of people. The complexity of the system is determined by the structure of the urban core and the surrounding metropolitan area.

As a dynamic system, it continuously adapts to the growth of cities and the mobility needs of people. The infrastructure of the system is the various modes of transport: buses, subways, trains, trams, etc., which interact with each other and have connection nodes and transfer stations.

The efficiency of metropolitan public transport depends on many factors, among which the territorial and demographic structure of the metropolitan area stands out. As indicated by the Metropolitan Mobility Observatory (WMO), which analyzes 23 Spanish metropolitan areas, whose total area is about 62,200 km2 (12.3% of the national area) and have a population of more than 25 million inhabitants (more than 54% of the total population of Spain). In 2019, the main figures that summarize metropolitan mobility were the following:

▪ In 2019, 3,848 million trips were made on public transport: 1,876 million bus trips and 1,972 million in railway modes.

▪ The average travel distances for the different modes in 2019 were: 5.5 km for urban buses, 6.9 km for the metro, 17.7 km for metropolitan buses, 19.1 km for Cercanías Renfe and 18. 7 km for narrow gauge and regional railways.

	Área metropolitana							Ciudad Capital			Ratio Concentración población**
	Superficie (km²)	Población	Densidad (hab/km²)	Nº municipios	Superficie urbanizada (km²)	Ratio Superficie*	Densidad urbana (hab/km²)	Superficie (km²)	Población	Densidad (hab/Km²)	
Madrid	8.028	6.663.394	830	179	919	11%	7.247	605	3.266.126	5.399	49%
	3.239	5.118.678	1.580	164	634	20%	8.074	101	1.636.762	16.150	32%
	1.551	1.822.608	1.175	60	306	20%	5.956	138	794.288	5.742	44%
	4.221	1.489.789	353	45	226	5%	6.598	141	688.592	4.873	46%
	2.217	1.152.651	520	112	n.d.	n.d.	n.d.	41	346.843	8.460	30%
	10.602	1.022.800	96	78	n.d.	n.d.	n.d.	187	219.686	1.177	21%
	1.432	1.046.552	731	15	75	5%	13.991	395	574.654	1.456	55%
	3.623	880.113	243	53	212	6%	4.151	214	409.661	1.918	47%
Cádiz	3.312	820.129	248	12	n.d.	n.d.	n.d.	14	116.027	8.171	14%
	3.258	789.779	242	32	258	8%	3.061	938	674.997	720	85%
	1.980	723.576	365	89	n.d.	n.d.	n.d.	73	187.415	2.567	26%
Tarragona	2.999	626.277	209	132	189	6%	3.317	65	134.515	2.063	21%
	861	536.771	624	33	94	11%	5.723	88	232.462	2.641	43%
	2.127	522.687	246	18	n.d.	n.d.	n.d.	296	196.851	666	38%
	354	470.888	1.329	5	74	21%	6.363	201	331.577	1.647	70%
	955	404.305	424	25	125	13%	3.234	198	298.412	1.508	74%
	5.586	361.911	65	149	182	3%	1.992	212	138.956	655	38%
Pamplona	92	351.777	3.838	18	50	55%	6.985	25	201.653	8.037	57%
Gibraltar²	1.530	272.804	178	8	432	28%	631	88	122.097	1.392	45%
	-	-	-	-	-	-	-	38	245.711	6.384	-
	3.231	223.221	69	15	n.d.	n.d.	n.d.	1.759	112.999	64	51%
	913	203.461	223	16	21	2%	9.611	39	124.303	3.185	61%
	n.d.	96.120	n.d.	1	21	1%	4.577	1.760	96.120	55	100%

*Superficie urbanizada/ superficie total del área metropolitana
**Población de la ciudad capital/ población del área metropolitana
1: Datos del informe de 2018 al n.d. de datos actualizados.
2: Superficie del área metropolitana es dato de 2015, superficie urbanizada es dato de 2007 y superficie de la ciudad capital es dato de 2015.
3: Datos del informe de 2017 al n.d. de datos actualizados.
Fuente: elaboración propia a partir de datos proporcionados por las ATP.

...ength of bus lines in the 23 metropolitan areas amounts to ...0 km, while the length of the railway networks is 3,587 km.

...improvement in engine technology and the type of fuel in ...buses continued: in 2019, the most used fuel was CNG ... while 37% of the fleet used diesel; the hybrid bus ...ued to improve, with 11.3%; 8.6% used biodiesel and the ...er of electric buses slightly increased(3.4%).

...ng 2019, 756 million euros have been invested in the 17 ...mportant areas.

...arding transportation means, 72% has been invested in rail ...

... revenues in all areas were 2,285 million euros, with ...ting costs that amounted to 3,117 million euros, which gave ...erage coverage ratio of 59%.
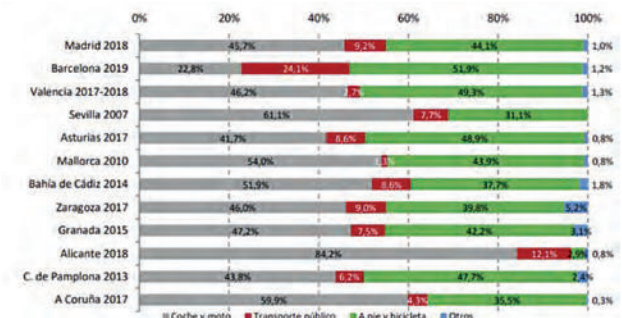
...ualitative evaluation focuses exclusively to Spain and is ...on the responses obtained from a questionnaire sent to a ...ed group of experts in the sector. The responses obtained ...processed anonymously and on a confidential basis To ...te the assessment, the analysis has been grouped into ...of for all sectors, called "Criteria":

The methodology designed by Asociación Caminos carries out an objective evaluation, which analyzes quantitative indicators in countries with similar economic and social environment. As well, a qualitative evaluation is carried out, based on the opinions of a selected group of experts and comparing the following countries: Spain, Germany, France, United Kingdom, Italy, USA, Mexico, Brazil, Peru, Egypt, Israel, Saudi Arabia, Japan, China and India. The quantitative evaluation takes into account the most representative indicators of the sector, obtained from publicly accessible databases which are available in important multilateral organizations (EUROSTAT, OECD, World Bank, UN, World Economic Forum, International Transport Forum, UITP, etc.).

CAPACITY	PERFORMANCE	FINANCING	ADAPTABILITY TO FUTURE AND SUSTAINABILITY
OPERATION AND MAINTENANCE	SAFETY	RESILIENCE	ENGINEERING AND INNOVATION

• Evaluation of the Urban Public Transport

Indicators:
Experts:

Rating		
Spain	7.1	C
Germany	7.1	C
France	7.8	C
United Kingdom	7.5	C
Italy	5.4	E
USA	6.0	D
Brazil	5.1	E
Colombia	5.4	E
Canada	5.7	E
Egypt	2.9	F
South Africa	3.9	FX
Japan	6.4	D
China	6.5	D
India	3.0	FX
South Korea	5.6	E
Australia	5.5	E

▪ Comparative analysis of Urban Public Transport in an international context

The best countries rated considering the agreed indicators are the following European countries (except Italy): France (7.8), the United Kingdom (7.5), and then Germany and Spain (7.1). China (6.5), Japan (6.4) and the USA (6.0) are rated the worst; Italy (5.4) only achieves the rating of sufficient.

Spain obtains a good rating in Capacity (7.9) and Resilience (7.3), excellent in Performance (10.0) and very good in Safety (8.4). In Financing it obtains a sufficient rating (5.0).

Evaluation of Urban Public Transport with indicators (Max 10)		
CRITERIA		
CAPACITY	7.9	C
PERFORMANCE	10.0	A
FINANCING	5.0	E
ADAPTABILITY TO THE FUTURE AND SUSTAINABILITY	5.8	E
OPERATION AND MAINTENANCE	5.9	E
SAFETY	8.4	B
RESILIENCE	7.3	C
ENGINEERING AND INNOVATION	6.2	D
Evaluation by Objective Indicators	**7.1**	**C**
Indicators considered: 51		

Evaluation of Urban Public Transport by experts (Max 10)		
CRITERIA		
CAPACITY	6.6	D
PERFORMANCE	7.1	C
FINANCING	4.9	FX
ADAPTABILITY TO THE FUTURE AND SUSTAINABILITY	6.2	D
OPERATION AND MAINTENANCE	6.1	D
SAFETY	7.7	C
RESILIENCE	6.5	D
ENGINEERING AND INNOVATION	6.4	D
Evaluation by experts	**6.4**	**D**
Answers received: 27		

Key results of the study

The Urban Public Transport nowadays satisfies the demands needs, nevertheless, it is not designed or conceived as an effective option for attracting the demand of other means of transport.

The most notable opinions of the experts are:

▪ There is a lack of coordination of powers and transport policies between the different Public Administrations. The offer is very unequal from one city to another.

▪ In large metropolitan areas, a shortage of platform infrastructure for public transportation is detected.

▪ Cities must improve the operation of public transport through the implementation of various measures, such as give traffic light priority to public transport, apply stricter private vehicle parking policies, etc.

Final evaluation of Urban Public Transport (Max 10)		
CRITERIA		
CAPACITY	7.3	C
PERFORMANCE	8.6	B
FINANCING	5.0	E
ADAPTABILITY TO THE FUTURE AND SUSTAINABILITY	6.0	D
OPERATION AND MAINTENANCE	6.0	D
SAFETY	8.1	B
RESILIENCE	6.9	D
ENGINEERING AND INNOVATION	6.3	D
Final Weighted Evaluation	**6.8**	**D**

▪ It is necessary to develop mobility studies conducted by highly qualified multidisciplinary technical teams, without political implications.

▪ Substantial improvements are required when providing real-time information and its necessary to develop low-emission zones that limit the indiscriminate use of private vehicles.

In relation to the main public transport infrastructure needs which are necessary in the next 10 years, experts point out the following:

▪ Improve intramodality and integrate new means of transport (such as carsharing, carpooling) with public transport networks.
For Low Emission Zones to become reality which is compatible with the economic and social development of cities, the transport infrastructure must be better coordinated to promote sustainable mobility and urban planning plans.

▪ Promote intermodal stations and reserved lanes.

▪ Renew and decarbonize the urban and interurban bus fleet; implement priority bus systems (BRT type), favor alternative fuels to internal combustion fuels (electric, green hydrogen, hydro-generators), implement segregated priority lanes for public transport within cities and at the entrance through the main roads, build modal interchanges, consider mobility as a service, fully integrate all means of transport into fare systems, achieve universal accessibility in all stations.

▪ Some experts estimate that the investment needs in urban and metropolitan public transport must make spending compatible with the income from public coffers; the investment estimate could be between €90 and €110 per inhabitant per year.

• Capacity

Do the resources and capacity of the public works sector meet current demands?

Use of public transportation. Daily trips / Population
Use of public transportation. Daily trips / Surface
Capacity (Buses + Wagons) / Daily trips
Capacity (Buses+Cars) / Population
Capacity (Buses+Wagons) / Surface

	Rating	
Spain	7.9	C
Germany	7.8	C
France	7.3	C
United Kingdom	9.4	A
Italy	5.7	E
USA	4.1	FX
Brazil	6.2	D
Colombia	7.4	C
Canada	3.6	FX
Egypt	2.7	F
South Africa	5.5	E
Japan	5.9	E
China	7.6	C
India	3.5	FX
South Korea	6.8	D
Australia	4.6	FX

Five indicators have been used to evaluate Capacity. The first two analyze the use of public transport; The following evaluate the capacity of the buses and railway cars in relation to daily trips, population and area. The "daily trips/population" presents an average of 0.46, with a maximum of 0.83 (Brazil) and a minimum of 0.18 (Egypt). Spain is aligned with other European countries (0.6), very similar to Italy (0.59), lower than Germany and the United Kingdom (0.67) and higher than France (0.47).

The indicator "daily trips/surface area (km2)" has an average value of 2.98. Spain, together with the United Kingdom, has the highest value in the EU (4.47). The following indicators refer to the existing transport supply and its relative capacity to satisfy this demand. The selected indicators are related to the average capacity of public transport services with respect to trips, population and surface area.

▪ Evaluation by experts and comments

1.1. How do you assess the coverage of the territory and infrastructure of the urban public transport sector in Spain in cities with a population greater than 50,000 inhabitants?	7.6	C
1.2. How do you assess the coverage of the territory and infrastructure of the urban public transport sector in cities with a population greater than 50,000 inhabitants?	5.4	E
1.3. How do you assess the capacity of the urban public transport sector in Spain to absorb current demand?	7.1	C
1.4. How do you assess the capacity of the urban public transport sector in Spain to absorb the foreseeable future demand in the next 10 years?	6.5	D
Capacity Evaluation by experts	**6.6**	**D**

- ▪ Urban Public Transport currently responds to existing demand, which is largely captive, but is not conceived or designed as an effective option to attract demand from other modes of transport.
- ▪ There is a lack of coordination of powers and transport policies between the different Public Administrations. The offer is very unequal from one city to another. There is a shortage of platform infrastructure reserved for public transport.

• Performance

Are the current provision and physical conditions of the public works sector adequate to meet current user expectations?

Average travel speed (km/h)
Travel by public transport / Travel by motorized use
% of the population that has convenient access to Trans. Public (SDG 11.2.1)
Network length (km) / City area (km2)
Absolute accessibility in transp. Public within the metropolitan area in 15 minutes
Absolute accessibility by bicycle within the metropolitan area in 15 minutes. OECD
Absolute accessibility by walking within the metropolitan area in 15 minutes. OECD
Traffic index (Numbeo)
Time index (Numbeo)
Dissatisfaction index (Numbeo)
Inefficiency index (Numbeo)

	Rating	
Spain	10.0	A
Germany	7.5	C
France	9.1	A
United Kingdom	6.1	D
Italy	6.7	D
USA	6.3	D
Brazil	5.4	E
Colombia	3.7	FX
Canada	7.2	C
Egypt	1.8	F
South Africa	3.7	FX
Japan	6.9	D
China	5.6	E
India	3.6	FX
South Korea	7.8	C
Australia	5.9	E

The average travel speed in urban transport in the countries analyzed is 20 km/h, ranging from a minimum of 8 km/h in Colombia and Egypt to a maximum of 33 km/h in Germany.

Spain presents a very good ratio (25.9 km/h). The data reflects the entire trip (from home to work or school activity), including walking, waiting times for public transport and the journey on transport.

The indicator "Trips in public transport/ trips in motorized use" shows the percentage of trips that occur by public transport in relation to those that occur by private transport. The "network length/ city area" indicator shows the density of the public transportation network. Accessibility indicators in public transport, by bicycle and walking show how easy it is for citizens to access different places in the city. This indicator has an average value of 0.45; That is, half of motorized trips are made by public transport.

Japan and South Korea stand out with very high values (0.81 and 0.9, respectively); Spain is in the average (0.515).

▪ Evaluation by experts and comments

2.1. How do you value the benefits that the urban public transport sector in Spain provides to users?	7.7	C
2.2. How do users rate the equipment and services provided in the urban public transport sector in Spain?	7.6	C
2.3. How do you value the management of frequencies in urban public transport services?	6.8	D
2.4. How do you value the information for public transport users?	6.4	D
Performance Evaluation by experts	**7.1**	**C**

- ▪ Cities must improve the operation of public transport, such as giving traffic light priority, applying stricter private vehicle parking policies, etc.
- ▪ Experts recommend developing mobility studies urban planning, drafted by multidisciplinary technical teams, that do not give priority exclusively to political criteria.
- ▪ Real-time information must be improved and low-emission zones developed to limit indiscriminate car use.

• Financing

Which amount of investment is allocated for financing the public works sector? Which amount is invested for the creation of infrastructure? And what about for operation and maintenance?

Bus network. Revenue / Costs

Railroad network. Revenue / Costs

Cost (bus network + railway network) / GDP per capita

	Rating	
Spain	5.0	E
Germany	5.6	E
France	10.0	A
United Kingdom	5.9	E
Italy	5.0	E
USA	3.9	FX
Brazil	6.7	D
Colombia	4.0	FX
Canada	5.2	E
Egypt		
South Africa		
Japan	10.0	A
China	10.0	A
India	3.1	FX
South Korea	6.1	D
Australia	3.9	FX

One of the peculiarities of this sector is that the management of the service varies significantly between cities. In some municipalities the Public Administrations are in charge of operating the services, while in others the operation is handled by private concessionaire companies.

The management organization Significantly affects to its financing. Income is obtained from diverse sources, such as user fees, public subsidies that some companies receive, dealerships and other sources, such as advertising revenue.

▪ **Evaluation by experts and comments**

3.1. Do you consider that it is sufficient the current investment in the public transport sector in Spain?	5.4	SF
3.2. How do you assess the robustness of the current financing sources in the public transport sector in Spain?	4.6	INS
3.3. What do you think about how it is being managed the investment in the public transport sector in Spain?	4.9	INS
3.4. What do you consider about the current involvement of private investment in the public transport sector in Spain?	5.0	SF
Financing Evaluation by experts	**4.9**	**INS**

▪ Investment in the public transport field has decreased in recent years, but it is expected that in the coming years financing will increase through calls and aid from the EU Recovery, Transformation and Resilience Plan.

▪ The creation of a reasonable framework for private participation which is based on fair competition of quality and which is not only based on price, it will improve the financing and Performance of public transportation.

• Adaptability to the future and sustainability

Is the capacity and the Performance of the public works sector prepared to meet future expectations and demands? Are the resources and investment adequate for covering the future needs of the sector? How are the environmental sustainability initiatives being applied? Are active measures being applied in order to meet the established objectives for decarbonizing public works and transportation?

Massive public transport / Total public transport

Increase in urban population

CO2 emissions index. W.B.

Pollution index. WB

Energy consumption per transported passenger (MJ / (Passenger*km)). W.B.

Number of bicycles + scooters / 10,000 inhabitants

CO2 emissions (t per capita). W.B.

Average exposure of the population to pollutants (micrograms/m3 PM2.5). UN Urban Indicators

Development of climate change mitigation technologies related to transport (OECD)

% de la población de áreas urbanas expuesto a niveles altos de ruido. EUROSTAT

% of the population in urban areas exposed to high noise levels. EUROSTAT

	Rating	
Spain	5.8	E
Germany	8.9	B
France	7.7	C
United Kingdom	6.9	D
Italy	6.9	D
USA	5.6	E
Brazil	5.7	E
Colombia	5.5	E
Canada	5.9	E
Egypt	4.1	FX
South Africa	3.9	FX
Japan	8.2	B
China	5.6	E
India	3.8	FX
South Korea	7.1	C
Australia	5.6	E

The increase in the urban population shows the need to adapt to the future demands that metropolitan areas have. Spain, with 11.1%, has the highest rate of the European countries analyzed. The CO2 emissions index reports about the sustainability of public transport systems, as well as the pollution index, energy consumption per transported passenger, CO2 emissions (t/inhabitant) and the population's exposure to pollutants.

The number of bicycles and scooters per 10,000 inhabitants in Spain (10,117) is very small in relation to European countries.

▪ **Evaluation by experts and comments**

4.1. Do you consider that the expansion plans for the railway network take into account the need of adapting for meeting user demands?	5.9	E
4.2. How do you value the strategy for offering private rail transport services?	5.6	E
4.3. What do you think about the adaptation of the railway network to the climate change effects?	6.8	D
4.4. How do you assess the initiatives that are being taken to reduce CO2 consumption in the railway network?	6.4	D
4.5. How do you assess the initiatives that are being taken to reduce CO2 consumption in rolling stock?	6.4	D
4.6. How do you value the programs for adapting the railway infrastructure to new technologies and information to users?	6.6	D
4.7. Do you consider the measures adopted to reduce the environmental impact and waste treatment to be adequate?	5.8	E
4.8. Do you consider the measures adopted to reduce the environmental impact and waste treatment to be adequate?	6.2	D
Adaptability to the future Evaluation by experts	**6.2**	**D**

▪ Currently, mobility planning already incorporates many best practices for reducing emissions, waste, and investments in mobile equipment. Specific programs (e.g., PRTR) favor clean and electric systems, though there is room for improvement in the current network management.

▪ It is necessary to focus on the sustainability and conversion of the existing network to be compatible with the planned new investments. Cities should have strategic plans for sustainable transportation and mobility, which should be reviewed every four years.

• Operation and maintenance

Are public works being operated and maintained in accordance with your needs? Is the necessary investment being made in order to ensure an adequate conservation and maintenance?

Operating expenses / Inhabitants
Operating expenses / GDP
Operating expenses / Area

Rating		
Spain	5.9	E
Germany	3.2	FX
France	4.4	FX
United Kingdom	7.7	C
Italy	2.9	F
USA	4.6	FX
Brazil	4.6	FX
Colombia	10.0	A
Canada	2.9	F
Egypt		
South Africa		
Japan	1.8	F
China	8.0	B
India	2.5	F
South Korea	1.7	F
Australia		

The percentage of GDP allocated to operating expenses represents an indicator that can determinate the investment adequacy for the conservation and operation needs. The average value of the "% Operating Expenses/Real GDP" ratio is 0.01%, with a maximum of 0.03% in Colombia and a minimum of 0.001%, which corresponds to Germany, Japan, and South Korea. Spain has a percentage of 0.01%. To specify and accompany this indicator also the investment per inhabitant and per area has been considered.
The resulting average value of investment per inhabitant is 272, although the maximum is 651 and the minimum is 35. Spain has 325.

▪ Evaluation by experts and comments

5.1. How do you value the investment made in the operation, conservation, and maintenance of urban public transport networks?	5.6	E
5.2. Do you consider that the measures applied to the operation, conservation and maintenance of public transport networks are adequate to meet the users demands?	5.9	E
5.3. How do you assess the conditions of operation, conservation and maintenance of urban public transport networks?	6,3	D
5.4. How do you assess the attention to winter traffic, accidents and incidents that occur in the service in terms of public transport management?	6.6	D
Operation and maintenance Evaluation by experts	**6.1**	**D**

▪ In general, both public and private companies correctly manage the operation and maintenance of companies. Although certain aspects related to the conservation and maintenance must be improved, such as the renovation and modernization of bus stops.

• Safety

Is the public works sector safe for users? Are effective measures implemented to ensure safe performance and operation?

Number of victims / 100,000 inhabitants

Rating		
Spain	8.4	B
Germany	8.8	B
France	8.5	B
United Kingdom	8.3	B
Italy	6.4	D
USA	6.7	D
Brazil	2.2	F
Colombia	5.8	E
Canada	6.2	D
Egypt	3.1	FX
South Africa	1.0	F
Japan	6.8	D
China	5.3	E
India	2.0	F
South Korea	1.0	F
Australia	7.6	C

To evaluate the safety of urban public transport infrastructure, the most correct indicator would be the accidents and victims rates on public transport, but it is very difficult to obtain this indicator as these are not usually collected and, in many cases, they are not made public, shared and are not available to the users. Altogether, the best rated countries are the European ones (except Italy). USA, Japan and Australia achieve a sufficiently high rating, with slight differences between them. The worst countries are South Africa, South Korea and India.

▪ Evaluation by experts and comments

6.1. How do you assess the measures currently adopted to prevent accidents in urban public transport services?	7.7	C
6.2. How do you assess the level of accidents that occur in the urban public transport sector?	8.1	B
6.3. How do you value the equipment of urban public transport services in order to prevent or reduce the effects of accidents?	7.6	C
6.4. Do you consider that measures are being taken to reduce accidents in the urban public transport sector in the future?	7.3	C
Safety Evaluation by experts	**7.7**	**C**

▪ Safety should always be considered a top priority; Problems often arise from conflicts with pedestrians, cyclists, scooters, etc., which make difficult to drive the public transport driving.
▪ There is a lack of control over the drivers on the side of the operators, since there is a strong opposition to take medical, psychological, and addictive substance checks.
▪ Safety risks on public roads must be treated seriously and the number of conflict points between users, pedestrians and other modes of transportation must be nailed down.

● Resilience

When threats and adverse incidents occur, which is the capacity of public works to prevent, protect and minimize the consequences for users, the environment, the economy and national Safety? Are the public works prepared to recover its initial state within a reasonable timeframe when the threat or adverse incident has ceased?
Are there alternatives to attend to the service provision?

Network length (km) / City area (km2)
% of the population less than 1,000 m from a public transport stop (OECD)
% of the population that travels less than 30 minutes by public transport (OECD)
hours/year lost in traffic jams (Tomtom)
Public transport coverage of the urban core (ITF. Benchmarking Accessibility in Cities)
Public transport coverage of the metropolitan area (ITF. Benchmarking Accessibility in Cities)
Public transport coverage of the peri-urban area (ITF. Benchmarking Accessibility in Cities)

	Rating	
Spain	7.3	C
Germany	7.2	C
France	7.6	C
United Kingdom	7.7	C
Italy	4.6	FX
USA	7.7	C
Brazil	4.6	FX
Colombia	1.2	F
Canada	7.4	C
Egypt	4.0	FX
South Africa	5.4	E
Japan	2.2	F
China	3.5	FX
India	1.3	F
South Korea	5.3	E
Australia	4.5	FX

In the "Network length (km)/ City area (km2)" indicator, the best valued countries are France, Italy and Spain (with rates of 2.6; 1 and 0.97, respectively). Additionally, the following indicators are considered: "% of the population that is less than 1,000 m from a public transport stop"; "% of population that travels less than 30 minutes by public transport" and "annual hours lost in traffic jams".
The best overall rating of this last indicator is obtained by the European countries (except Italy), as well as Canada (9.9), Japan (9.9) and USA (9.5). Egypt, South Korea, and Australia only get a sufficient. The worst rated countries are India, Japan and Colombia.

▪ Evaluation by experts and comments

7.1. How do you assess the capacity of urban public transport services to recover, in a reasonable timeframe, the initial state of service when adverse situations occur?	6.8	D
7.2. How do you assess the measures adopted to prevent urban public transport infrastructure from natural or provoked incidents?	6.8	D
7.3. How do you assess the capacity of the public transport sector to protect and minimize the effects on users and the environment in risk situations?	6.5	D
7.4. How do you assess the alternatives between the different modes of urban public transport when service stops occur due to natural or induced causes?	5.9	E
7.5. How do you assess the contingency plans that are being applied in urban public transport in order to prevent infrastructure from natural or provoked incidents?	6.3	D
Resilience Evaluation by experts	**6.5**	**D**

▪ The measures to address contingencies are insufficient.

▪ Contingency plans and protocols must be developed that are understood and accepted by drivers and the rest of the company's personnel. This requires raising awareness among drivers and, particularly, by conducting trainings.

● Engineering and Innovation

Are there adequate resources allocated to engineering in the design, construction, conservation, management and operation of the public works sector? Is the investment being made in innovation appropriate? What new techniques, materials, technologies, and operating methods are being implemented in order to improve public works? Is progress being made in digitalization, monitoring and sensorization during the public works complete? Is the information adequate for users?

Network length (km) / City area (km2)
% of the population less than 1,000 m from a public transport stop (OECD)
% of the population that travels less than 30 minutes by public transport (OECD)
hours/year lost in traffic jams (Tomtom)
Public transport coverage of the urban core (ITF. Benchmarking Accessibility in Cities)
Public transport coverage of the metropolitan area (ITF. Benchmarking Accessibility in Cities)
Public transport coverage of the peri-urban area (ITF. Benchmarking Accessibility in Cities)

	Rating	
Spain	6.2	D
Germany	7.5	C
France	7.7	C
United Kingdom	8.0	B
Italy	5.5	E
USA	9.2	A
Brazil	5.5	E
Colombia	5.2	E
Canada	6.8	D
Egypt	1.4	F
South Africa	4.0	FX
Japan	9.7	A
China	6.4	D
India	4.5	FX
South Korea	9.1	A
Australia	6.8	D

The indicator "Data availability in Google Maps (Static GTFS + Dynamic GTFS)" indicates an average of 1.08, with a maximum of 2.00 and a minimum of 0.00. Spain has a rate of 1.00, the same as France and lower than Germany (1.5) and the United Kingdom (1.74). The global assessment of the Engineering and Innovation criterion gives the best ratings to the USA (9.2), Japan (9.7), followed by Germany (7.5), France (7.7). Spain obtains a rating of 6.2 and it is below China (6.4). To analyze the progress of digitalization, three indicators have been included: Involvement in new technologies (GCI-WEF-), Information and communication technology infrastructure index (ND Gain Index. ICT infrastructure) and the number of people that use internet.

▪ Evaluation by experts and comments

8.1. Do you consider appropriate the investment made for the design, construction and engineering operations in urban public transport?	5.8	E
8.2. How do you assess the knowledge and technical capacity of current engineers?	7.4	C
8.3. Do you consider appropriate and adjusted to the new technologies the knowledge provided by universities to engineers?	5.5	E
8.4. How do you value the use of new techniques and materials in transport networks?	6.8	D
8.5. How do you assess the measures adopted in the public tender to promote innovation in the urban public transport sector?	5.6	E
8.6. How do you value the research, development and innovation that is being developed in Spain in relation to the urban public transport?	6.3	D
8.7. How do you value the current technology that is being applied?	7.1	C
8.8. How do you consider the progress in digitalization and monitoring of the behavior of the elements of the railway network?	6.6	D
Evaluation of engineering and innovation by experts	**6.4**	**D**

▪ The transportation specialty in civil engineering is excellent. Furthermore, the typical profile of a planner, consultant or manager is usually an innovative person and who has very good technology knowledge.

Asociación Caminos