Metropolitan Mobility Observatory of Spain (MMO)

Summary Report 2019 and advance 2020

The **MMO** is an initiative to analyze urban mobility in close collaboration with the Spanish Public Transport Authorities (PTA) of the main metropolitan areas, the Ministry of Transport, Mobility and Urban Agenda and the Ministry for Ecological Transition and Demographic Change. It has also the active collaboration of the National Railway Operator (RENFE), the Collective Urban Transport Association (ATUC), General Traffic Directorate (DGT), Spanish Federation of Municipalities and Provinces (FEMP) and Workers Union (CCOO).

This report includes information from **23 PTA** (out of 25 included in the MMO), which represents 54,4% of the nation's population. The rest of the information was provided by the collaborators: RENFE, DGT and the National Statistics Institute.

This report contains the complete information for year 2019. However, the outbreak of the Covid-19 pandemic in March 2020, which has affected the entire public transport system, has prompted us to **bring forward the 2020 data available at the time of publication**. The report adequately reflects the current delicate situation of urban mobility as well as the **major challenges for its recovery.**

PTAs: Madrid, Barcelona, Valencia, Seville, Bizkaia, Asturias, Malaga, Mallorca, Saragossa, Cadiz Bay, Gipuzkoa, Camp de Tarragona, Alicante, Granada, Almeria, County of Pamplona, Campo de Gibraltar, Corunna, Lleida, Jaen, Leon, Caceres and Valladolid.

Main Figures 2019-2020

➢ In 2019, A total of **3,848 billion public transport journeys** were made, 1,876 billion by bus and 1,972 billion by rail modes. Despite the similarity, the great difference between the lengths of both networks is remarkable: 165,830 km of bus lines and 3,587 km of rail network. In 2020, **2,003 billion public transport journeys** were made, 971 billion by bus and 1032 billion by rail modes.

➢ The annual public transport demand for the 23 areas in 2019 is **27,570 billion passenger-km** (36% for bus and 63% for rail modes) **12,265 billion passenger-km** in 2020, 53,9% less than in 2019.

➢ In 2019, the public transport supply was about **674 million vehicle-km for bus** services and **345 million car-km for rail modes,** and in 2020, was reduced to **583 million vehicle-km for bus** services and **322 million car-km for rail modes** (not including Cercanias RENFE)

➢ In 2019, **investment** increased considerably compared to 2018, with a value of **756 million euros**, most of which were dedicated to the maintenance or acquisition of infrastructure (72%) and new material (28%) . Around 72% of the amount of the investment was dedicated to rail modes.

➢ During 2019, the **number of annual journeys per inhabitant** in public transport differs according to the size of the metropolitan area. The average is **132** trips per inhabitant per year in large areas and **59 in** mid-sized and small areas.

➢ In 2019, tariffs reached a **coverage ratio of 59%** of total operation costs. It includes all modes in each Metropolitan Areas, those with metro/rail/tram services have a lower coverage ratio than those where the supply consist of only buses.

General characteristics of the metropolitan areas on January 1st, 2020

	Metropolitan area (PTA Action Sphere)					Main city			Main city/ Metropolitan area population ratio
	Surface (km2)	Population (inhab.)	Density (inhab/km2)	Number of municipalities	Built-up area (km2)	Surface (km2)	Population (inhab.)	Density (inhab/km2)	
Madrid	8.028	6.663.394	830	179	919	605	3.266.126	5.399	49%
Barcelona	3.239	5.118.678	1.580	164	634	101	1.636.762	16.150	32%
Valencia	1.551	1.822.608	1.175	60	306	138	794.288	5.742	44%
Seville	4.221	1.489.789	353	45	226	141	688.592	4.873	46%
Biscay	2.217	1.152.651	520	112	n.d.	41	346.843	8.460	30%
Asturias	10.602	1.022.800	96	78	n.d.	187	219.686	1.177	21%
Malaga	1.432	1.046.552	731	15	75	395	574.654	1.456	55%
Majorca[1]	3.623	880.113	243	53	212	214	409.661	1.918	47%
Cadiz Bay	3.312	820.129	248	12	n.d.	14	116.027	8.171	14%
Saragossa	3.258	789.779	242	32	258	938	674.997	720	85%
Gipuzkoa	1.980	723.576	365	89	n.d.	73	187.415	2.567	26%
Tarragona Camp	2.999	626.277	209	132	189	65	134.515	2.063	21%
Granada	861	536.771	624	33	94	88	232.462	2.641	43%
Almeria	2.127	522.687	246	18	n.d.	296	196.851	666	38%
Alicante	354	470.888	1.329	5	74	201	331.577	1.647	70%
Valladolid	955	404.305	424	25	125	198	298.412	1.508	74%
Lleida	5.586	361.911	65	149	182	212	138.956	655	38%
Pamplona	92	351.777	3.838	18	50	25	201.653	8.037	57%
Gibraltar Camp[2]	1.530	272.804	178	8	432	88	122.097	1.392	45%
Corunna	-	-	-	-	-	38	245.711	6.384	-
Jaen	3.231	223.221	69	15	n.d	1.759	112.999	64	51%
Leon	913	203.461	223	16	21	39	124.303	3.185	61%
Caceres[3]	n.d.	96.120	n.d.	1	21	1.760	96.120	55	100%

1: Data of 2018, as data for 2019 was not available.
2. Metropolitan area's surface data of 2015, built-up area data of 2007 and cities surface data of 2015.
*3. Data of 2017, as data for 2019 was not available.*
Source: compiled by authors based on data provided by the PTAs

Evolution of population and other socioeconomic indicators

Between 2013 and 2020, the **population** in the metropolitan areas has experienced **a slight growth of 1.1%,** most of which has taken place in the **periphery** (+2.8%). In the main cities the population has remained almost the same (+0.03%). The population in the suburbs of Madrid and Cadiz Bay has increased the most since 2013: 4.4% and 15.2% respectively. As for the cities, Leon and Cadiz have had the sharpest decreases in population during this period, with values around -5%.

*Variation of population in metropolitan areas between 2013 and 2020*
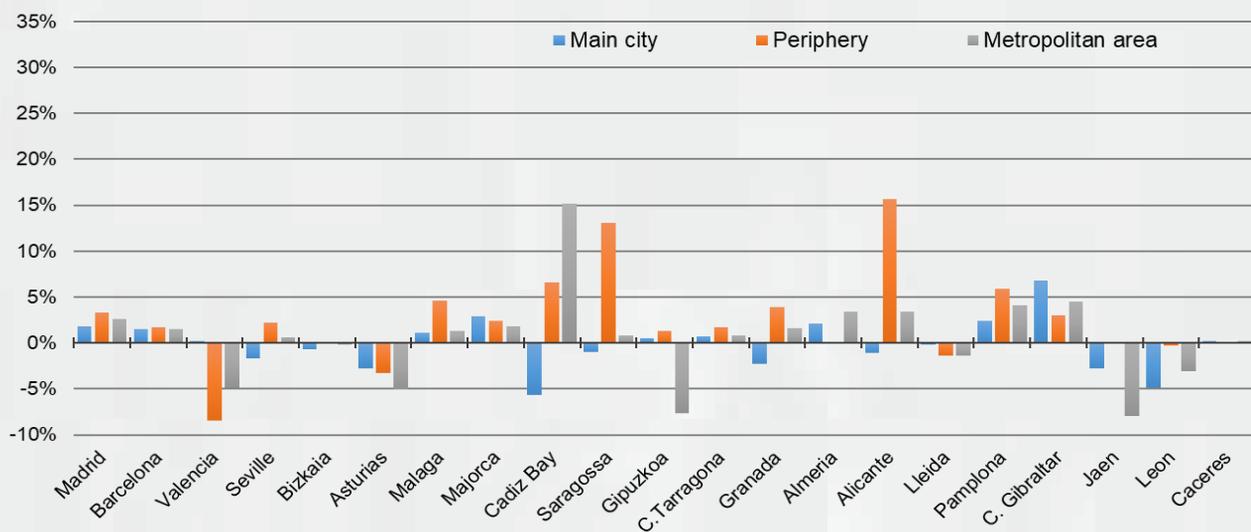
Cadiz Bay and Zaragoza have incorporated various municipalities throughout the years, hence the significant variations.
Source: compiled by authors based on data provided by the PTAs.

Following the trend of previous years, the **unemployment rate** in 2019 has decreased by 5.7% compared to 2018 and by 46% compared to 2013 (year with a very high unemployment rate due to 2008 economic crisis). Lleida, Tarragona and Madrid are the areas which have had the biggest decrease in unemployment rate this last year: -23%, -22% and -13% respectively.

The **motorisation rate** in 2020 has increased by 0,45% compared to 2019. From 2013 to 2020, motorization rate has had a very **uneven distribution** depending on the area (as shown in the figure below). Lleida and Tarragona have significantly increased their motorisation rate (8,8% and 5,3%), whilst Cadiz and Barcelona have decreased theirs (-8,1% and -6,6%, respectively).

*Variation of the motorisation rate (nºvehicles/1000 inhabitants) (2013-2020)*
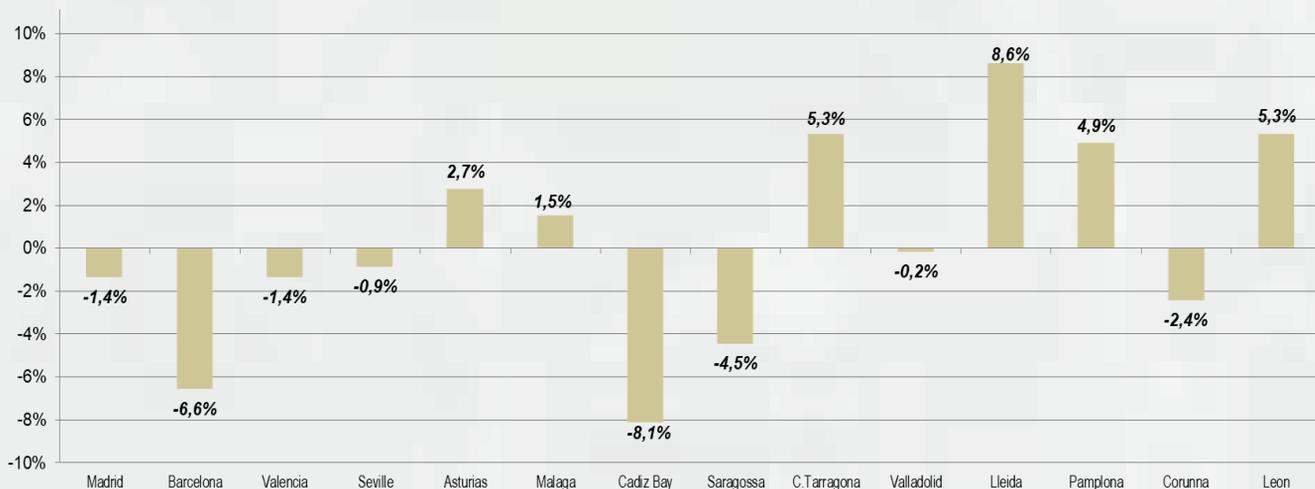
Valencia, Bilbao and Alicante since 2014. Valladolid since 2018. Jaen since 2016. Source: compiled by authors based on data provided by the PTAs.

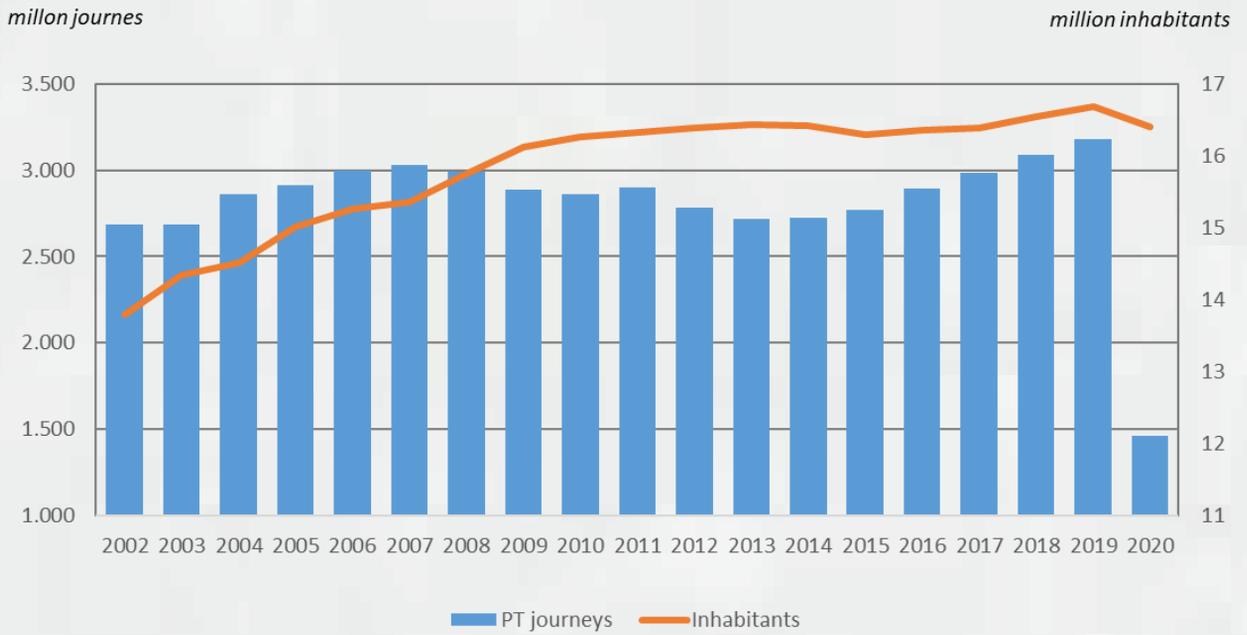## Demand for Public Transport and covid-19 impact

Public transport demand **was growing slowly but steadily up to 2020**, when the Covid-19 pandemic started. Demand in 2019 had grown by 17% compared to demand in 2013, but in 2020 it experienced an unprecedented decrease of 39,5% compared to 2013 and of 48,2% compared to 2019. The 2020 pandemic has affected both bus and rail journeys in a similar way: bus demand decreased by 50,6% in 2020 compared to 2019, and train demand did the same by 47%. Other relevant data is demand for public transport per capita. In 2013, the value was of 165,2 journeys/inhabitant, in 2019 it reached 190,4 journeys/inhabitant and in 2020 fell to 100,1 journeys/inhabitant, a value never before registered in this observatory.

Variation of public transport journeys between 2013 and 2019
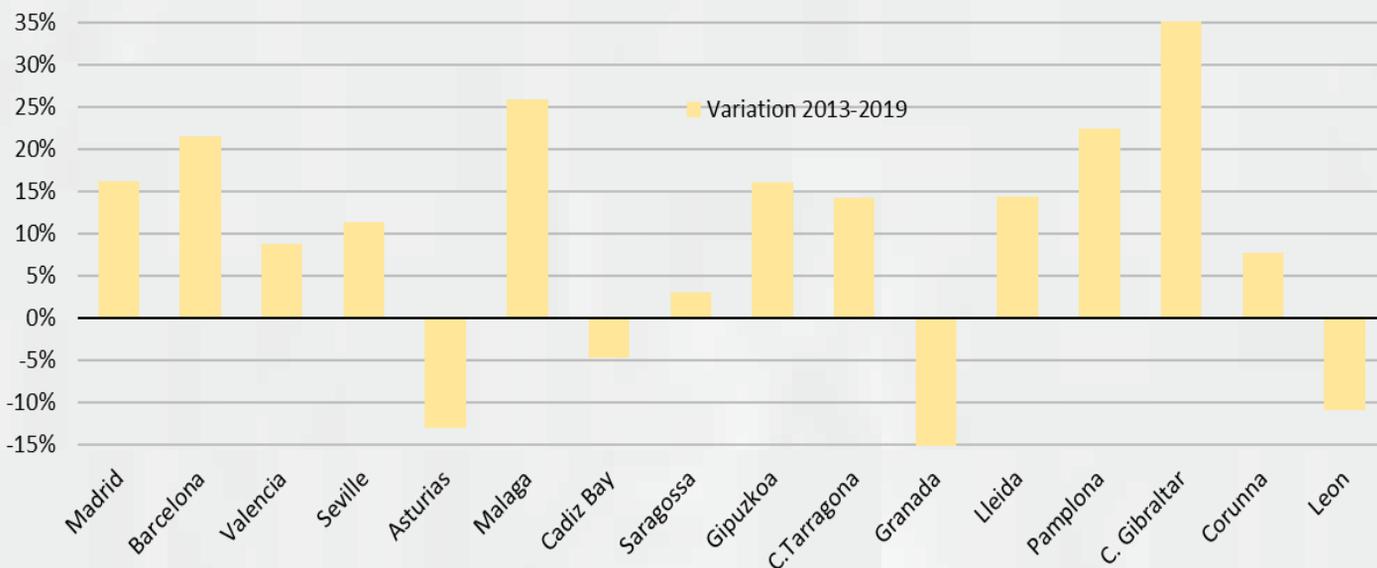
Source: compiled by authors based on data provided by the PTAs.

Evolution of public transport journeys as compared to population (2002—2020)

million journes | million inhabitants

Source: compiled by authors based on data provided by the PTAs.

Impact of Covid-19 in demand of PT

At a time when public transport demand was at its highest levels and car use was beginning to decline, Covid-19 has drastically changed the positive trend that had taken so long to achieve. Since then, **mobility sectors have been profoundly affected**, initially by widespread restrictions on mobility, and later on due to a situation in which we move less than we used to. Since the beginning of the de-escalation, **a negative perception in terms of health safety has spread**, particularly affecting public transport (which has been more affected than individual modes), despite several international studies demonstrating that public transport is not a risk environment and despite the efforts made by the transport authorities in terms of security and cleanliness to increase travelers' confidence. We do not yet have sufficient perspective on what has happened and, even at the time of writing, the pandemic cannot be said to have been overcome. It is therefore ambitious to analyze how the pandemic has affected public transport demand as we do not know how it will recover in the future. In the next figure we can see the evolution of the number of travelers throughout 2020. Notice the sharp decrease of the curve in the months of lockdown (March, April, May, June), and how the recovery of demand is being slower than expected.

Number of travelers per month
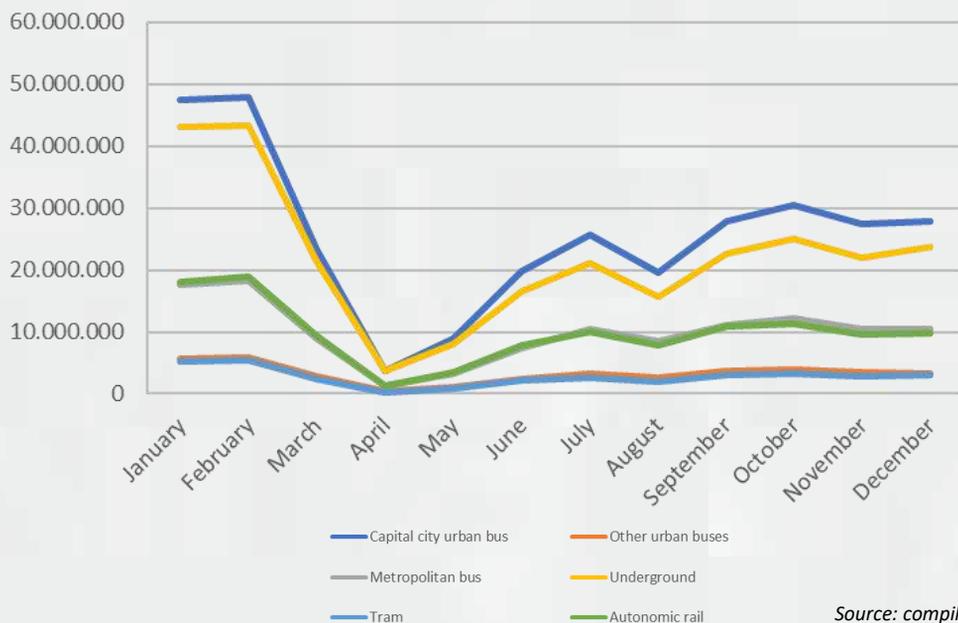
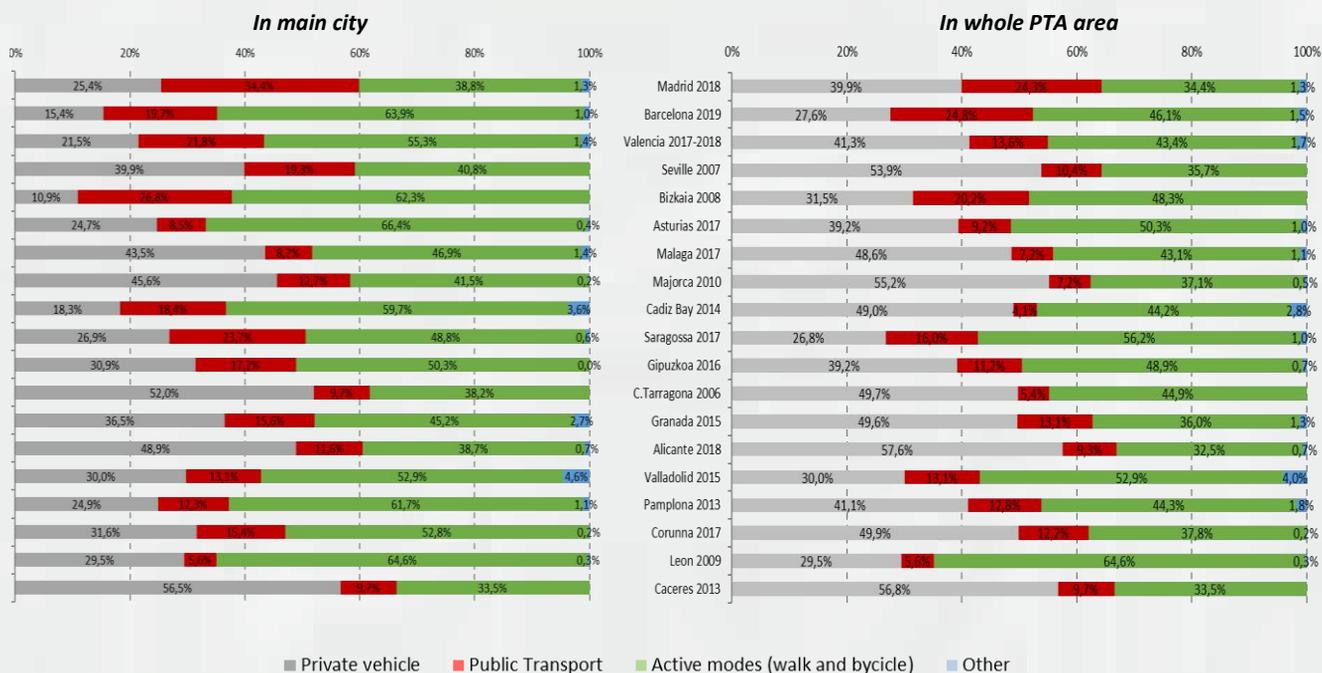Source: compiled by authors based on data provided by the PTAs.

Modal Split

The average modal share for **public transport** in the metropolitan areas is 11,6%. This figure varies greatly depending on the area: in Barcelona, it reaches 24.8% while in Cadiz Bay it is 4.1%.

On average, non-motorized travel (walking and cycling), accounts for 44% of the trips, whilst private cars and motorcycles account for 43,3% of the journeys.

The case of the two main big cities, Barcelona and Madrid, is quite remarkable: the first one has a rate of 63,9% non-motorized travel, whilst 34,4% of the trips in Madrid are made using public transport. These two cities show different characteristics: while in the first one there is a deep-rooted habit of walking/biking, in the latter there is a great use of the public transport system.

Modal share of trips

In main city

City	Private vehicle	Public Transport	Active modes (walk and bycicle)	Other
Madrid 2018	25,4%	34,4%	38,8%	1,3%
Barcelona 2019	15,4%	19,7%	63,9%	1,0%
Valencia 2017-2018	21,5%	21,8%	55,3%	1,4%
Seville 2007	39,9%	19,3%	40,8%	
Bizkaia 2008	10,9%	26,8%	62,3%	
Asturias 2017	24,7%	8,5%	66,4%	0,4%
Malaga 2017	43,5%	8,2%	46,9%	1,4%
Majorca 2010	45,6%	12,7%	41,5%	0,2%
Cadiz Bay 2014	18,3%	18,4%	59,7%	3,6%
Saragossa 2017	26,9%	23,7%	48,8%	0,6%
Gipuzkoa 2016	30,9%	17,2%	50,3%	0,0%
C.Tarragona 2006	52,0%	9,7%	38,2%	
Granada 2015	36,5%	15,6%	45,2%	2,7%
Alicante 2018	48,9%	11,6%	38,7%	0,7%
Valladolid 2015	30,0%	13,1%	52,9%	4,6%
Pamplona 2013	24,9%	12,3%	61,7%	1,1%
Corunna 2017	31,6%	15,4%	52,8%	0,2%
Leon 2009	29,5%	5,6%	64,6%	0,3%
Caceres 2013	56,5%	9,7%	33,5%	

In whole PTA area

City	Private vehicle	Public Transport	Active modes (walk and bycicle)	Other
Madrid 2018	39,9%	24,3%	34,4%	1,3%
Barcelona 2019	27,6%	24,8%	46,1%	1,5%
Valencia 2017-2018	41,3%	13,6%	43,4%	1,7%
Seville 2007	53,9%	10,4%	35,7%	
Bizkaia 2008	31,5%	20,2%	48,3%	
Asturias 2017	39,2%	9,2%	50,3%	1,0%
Malaga 2017	48,6%	7,2%	43,1%	1,1%
Majorca 2010	55,2%	7,2%	37,1%	0,5%
Cadiz Bay 2014	49,0%	4,1%	44,2%	2,8%
Saragossa 2017	26,8%	16,0%	56,2%	1,0%
Gipuzkoa 2016	39,2%	11,2%	48,9%	0,7%
C.Tarragona 2006	49,7%	5,4%	44,9%	
Granada 2015	49,6%	13,1%	36,0%	1,3%
Alicante 2018	57,6%	9,2%	32,5%	0,7%
Valladolid 2015	30,0%	13,1%	52,9%	4,0%
Pamplona 2013	41,1%	12,8%	44,3%	1,8%
Corunna 2017	49,9%	12,2%	37,8%	0,2%
Leon 2009	29,5%	5,6%	64,6%	0,3%
Caceres 2013	56,8%	9,7%	33,5%	

Legend: ■ Private vehicle ■ Public Transport ■ Active modes (walk and bycicle) ■ Other

Public Transport Supply

The supply of bus services (in terms of vehicles-km) has increased by 4,85% between 2013 and 2019. In 2020 it decreased by 22,3% compared to 2019. Concerning the **bus networks density**, the average is 5.22 km per 1,000 inhabitants. Asturias and Majorca are much above this value, with more than 10 km per 1,000 inhabitants. Relating route density with surface area, Corunna and Barcelona reach the highest figures, with 9.18 km/km^2 and 8.3 km/km^2, respectively, being 2.24 km/km^2 the average.

Since rail transports cover long distances as they are more efficient, the **rail network density** is higher for larger population's areas. The average in Spain is 206,38 km length per million inhabitants and 95,65 km per 1,000 km^2, an average which is exceed in the case of Asturias due to the great length of FEVE commuter lines with a density of 768 km per million inhabitants, or in Leon, with 569 km per 1,000 km^2.

In 2020, the **number of bus lines**, as well as their **length** has had an average **increase** of 1,94% and 1,4% respectively (compared to 2019), continuing with the trend of the previous year. In 2020, rail networks have not changed in size with respect to those existing in 2019, with Madrid (682 km) and Barcelona (756 km) remaining the largest networks.
In order to know the passenger capacity offered in the public transport networks, the number of **seat-km** offered by each mode is measured. In 2019, 51,583 billion seat-km were offered in bus and 87,892 billion seat-km in rail. In 2020, 38,026 billion seat-km were offered in bus and 81,642 billion in rail, 22% and 5,6% less than in 2019, respectively.
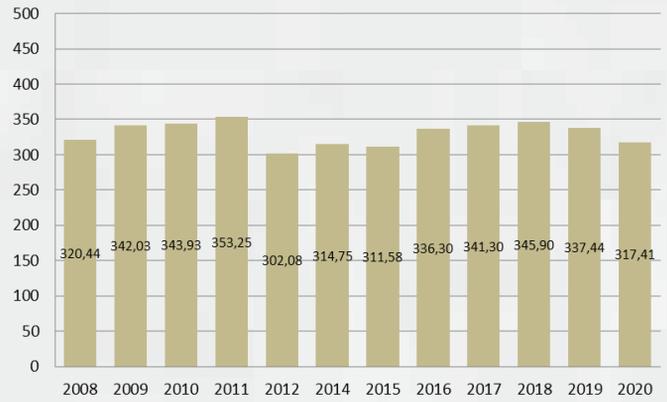Between 2013 and 2020, the length of bus lines in the studied areas increased by 19,2 % and the length of the rail network grew by 13.1%.

Public Transport supply of bus services (billion vehicles-km)
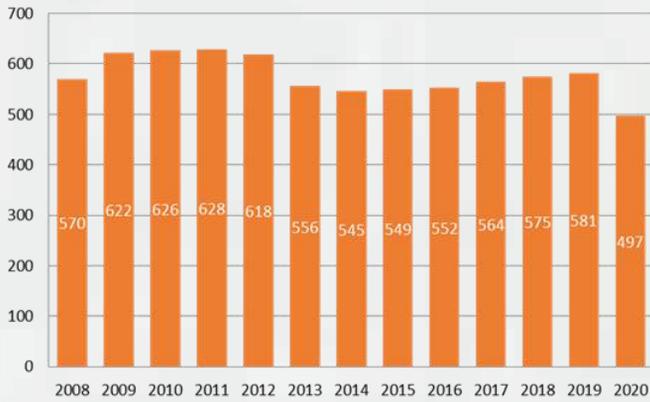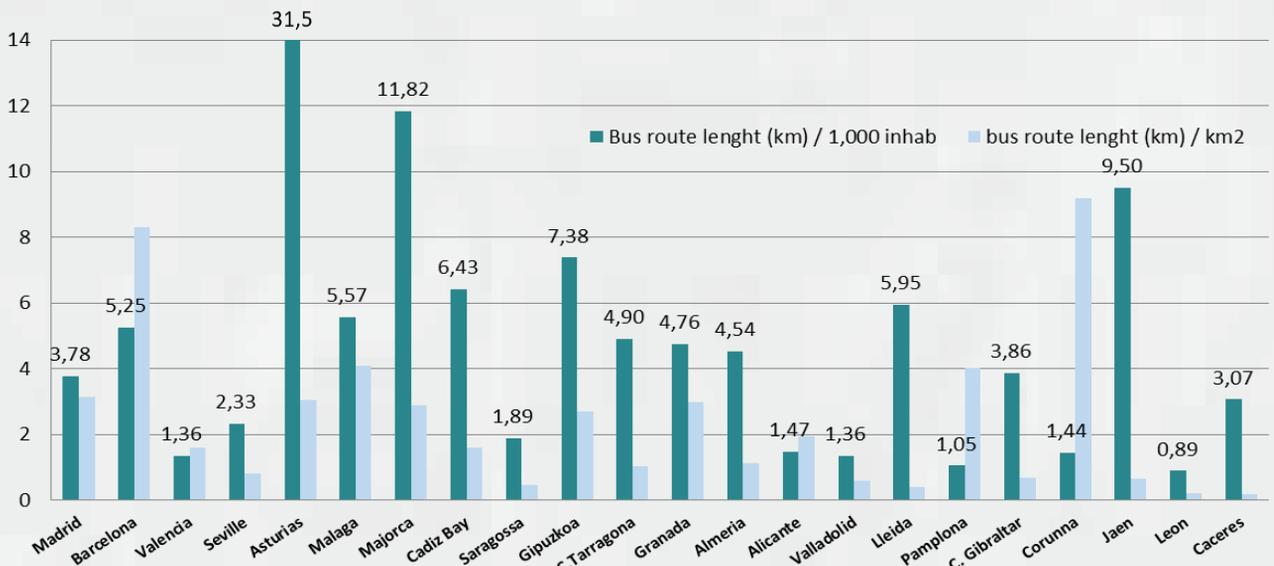

Source: compiled by authors based on data provided by the PTAs.

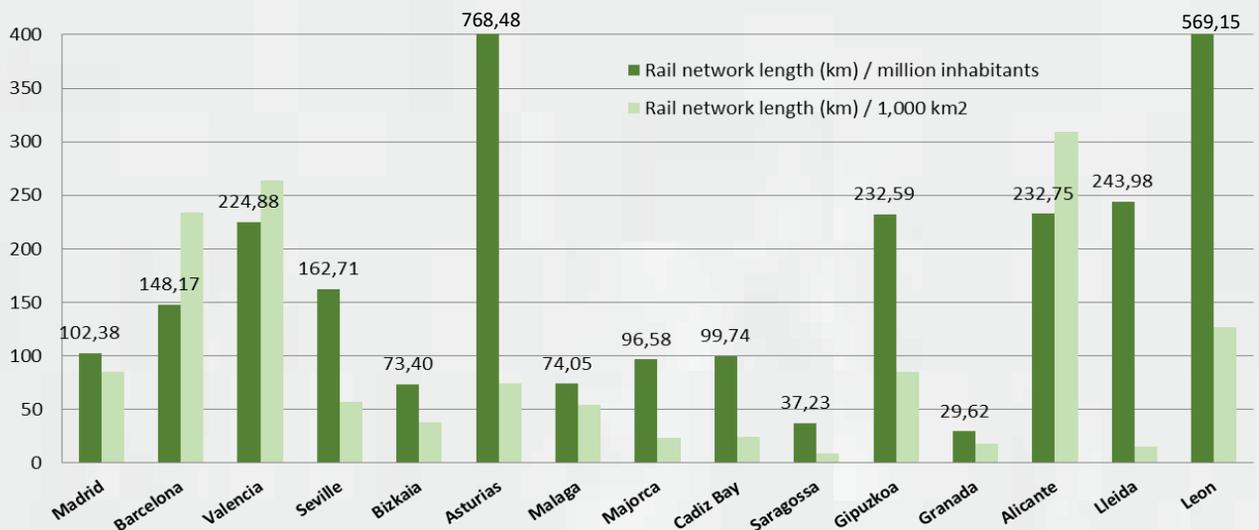## Public Transport supply of rail services (billion vehicles-km)

Source: compiled by authors based on data provided by the PTAs.

Bus network density (2019)

Cadiz Bay, Campo de Gibraltar and Jaen: only metropolitan buses. Source: compiled by authors based on data provided by the PTAs.

Rail network density (2019)

Source: compiled by authors based on data provided by the PTAs and the RENFE Directorate General of Passengers.
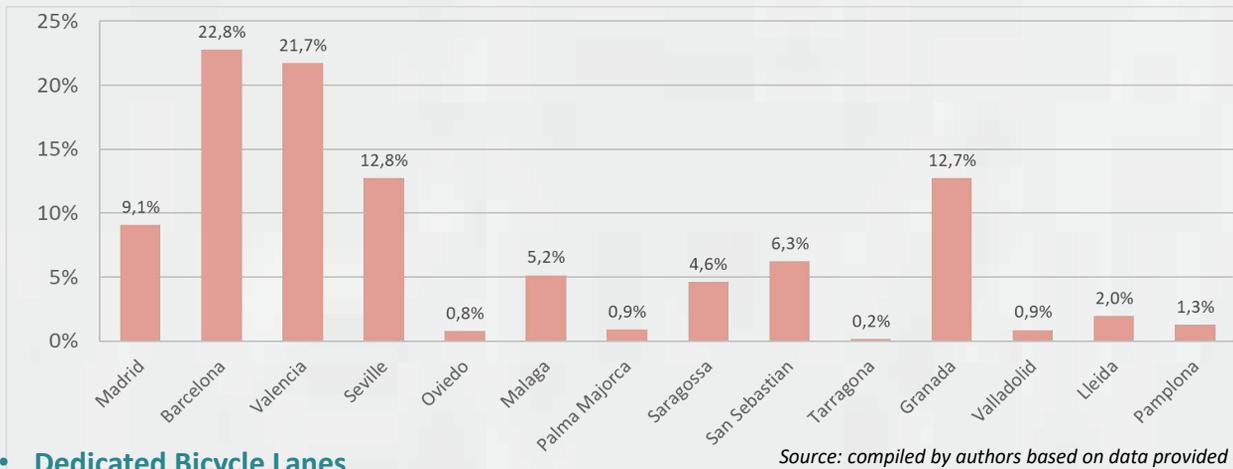
- ## Dedicated Bus Lanes

Lanes for exclusive or preferential use of public transport are essential to be competitive with private travel. These lanes are more effective if they have some type of protection. In 2019, Barcelona shows the highest length of bus lanes in its network (212 km), as well as the highest ratio of bus lanes regarding its total bus network (22.8%). It is followed by Valencia and Seville, with an average of 21.7% and 12.8% (respectively) of bus lanes on its bus network.

Length of bus lanes in main city (2019)
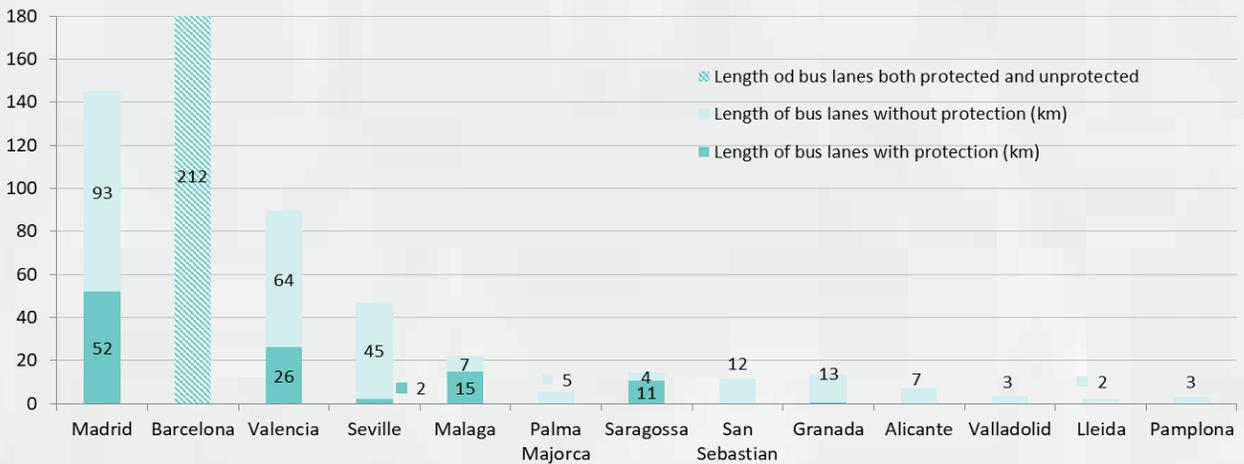
Source: compiled by authors based on data provided by the PTAs.

*Percentage of bus network with bus lanes in main city (2019)*

Source: compiled by authors based on data provided by the PTAs.

- ## Dedicated Bicycle Lanes

In Spanish cities, bicycle use is still negligible compared to other European cities. The promotion of the use of bicycles in cities begins by having an adequate, safe and efficient space for cyclists to circulate on. The next figure shows the length of three different types of bicycle lanes in Spanish cities: segregated and non-segregated bicycles lanes, and mixed traffic streets, where cycling is allowed but is not as safe as in the previous ones. In most cases, the length of these lanes remains stable with respect to 2017. As shown, **bicycle lanes keep increasing**, mainly due to the development of public bicycle sharing systems. Barcelona and Madrid are the cities with the longest lanes.

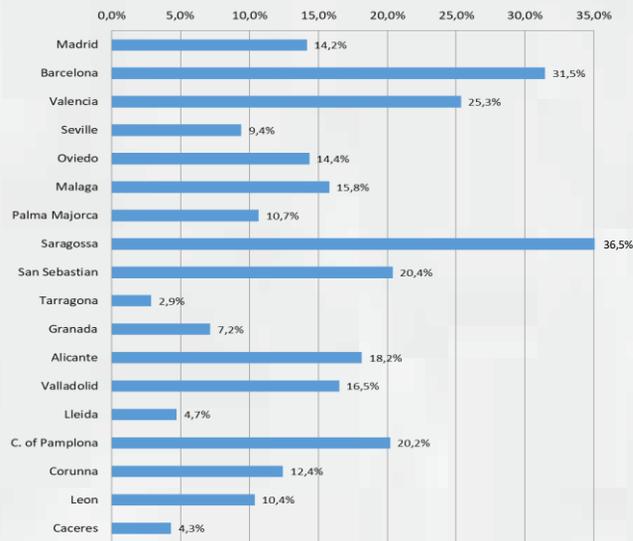*Length of the bicycle lanes in the main city (2019)*
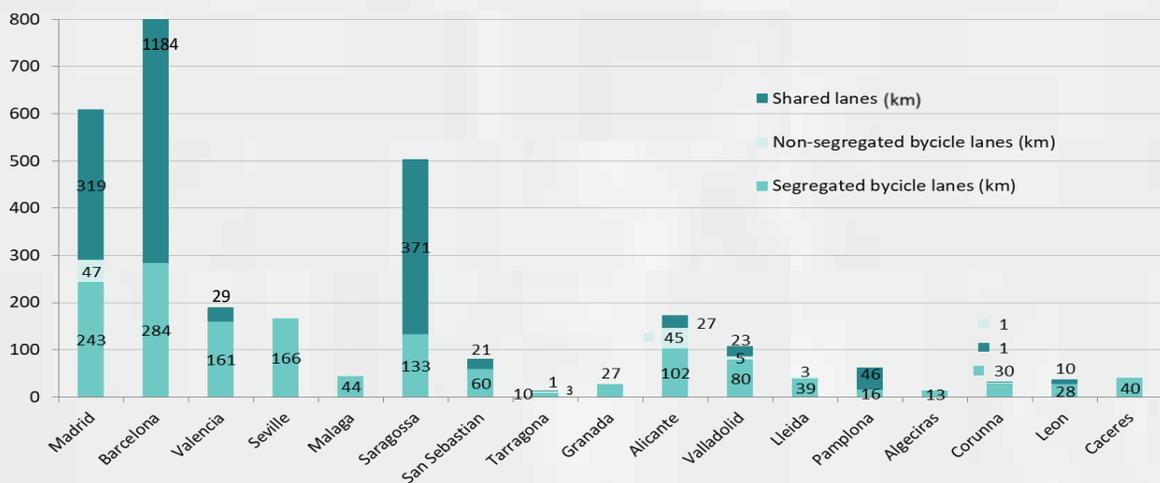
Source: compiled by authors based on data provided by the PTAs.

• ITS and information

Intelligent Transport Systems (ITS) in recent years have allowed an increase in the quality, efficiency, sustainability and safety of public transport. An example is the use of **smart cards**, which have proved to be a useful way to reduce the boarding time, thus decreasing total travel time. Another key aspect to improve users' satisfaction with the PT services is the information provided to them. The provision of **real-time information at bus stops** has proved to be very useful for PT users, especially those which do not use smartphones too much. Recently, many **mobile applications** (apps) have emerged in the public transport arena with different functionalities: maps and routes, travel planning, waiting time, real-time disruptions, users' opinion. All these are available in the different areas and for the majority of transport modes. However, there are some areas where the waiting time is not included on the apps.

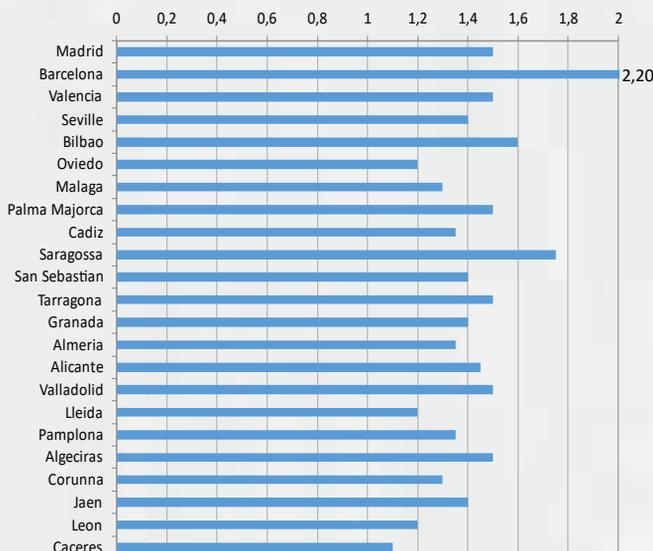**% bus stops with real-time information screens (2019)**

City	%
Madrid	14,2%
Barcelona	31,5%
Valencia	25,3%
Seville	9,4%
Oviedo	14,4%
Malaga	15,8%
Palma Majorca	10,7%
Saragossa	36,5%
San Sebastian	20,4%
Tarragona	2,9%
Granada	7,2%
Alicante	18,2%
Valladolid	16,5%
Lleida	4,7%
C. of Pamplona	20,2%
Corunna	12,4%
Leon	10,4%
Caceres	4,3%

Source: compiled by authors based on data provided by the PTAs.

Financing and fares

• Ticket and fare types

There **is big heterogeneity in fare systems** of the MA, which means there is an infinite number of transport tickets that are adapted to different territorial and demographic contexts. The only common transport ticket in all areas is the single ticket in the main city, although the co-existence of different transport modes makes their fares different within the same city. In Madrid the monthly pass is the most widely used ticket (74% of users). The wallet cards are the favourite transport pass in Bizkaia, Corunna, Jaen and Gipuzkoa, used by more than 70% of the users. Barcelona is the city with the highest tariff for the single ticket (2.20 €).

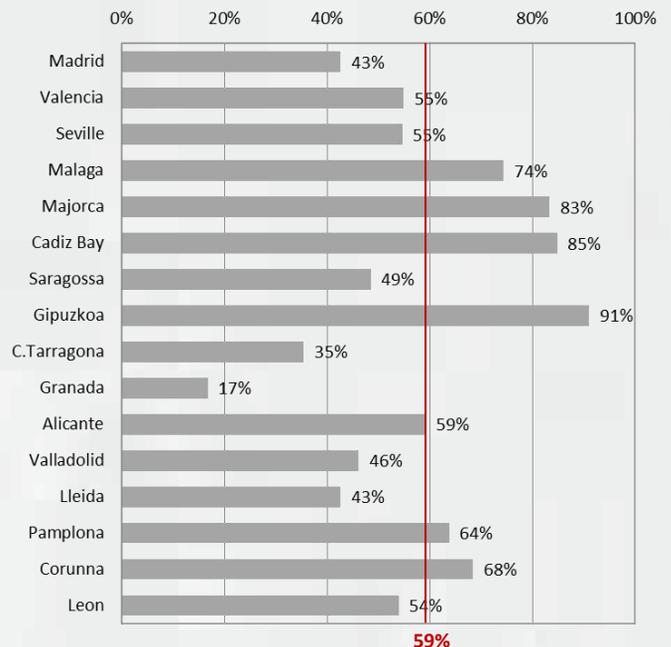**Single ticket price for the main city (Euro, 2019)**

City	€
Madrid	
Barcelona	2,20
Valencia	
Seville	
Bilbao	
Oviedo	
Malaga	
Palma Majorca	
Cadiz	
Saragossa	
San Sebastian	
Tarragona	
Granada	
Almeria	
Alicante	
Valladolid	
Lleida	
Pamplona	
Algeciras	
Corunna	
Jaen	
Leon	
Caceres	

Source: compiled by authors based on data provided by the PTAs.

• Coverage ratio

The percentage of operating costs covered by fare revenue (coverage ratio) reached on **average a 59%** in 2019. In general, MA with rail modes present lower ratios. The outstanding cases are in the one hand, Gipuzkoa and Cadiz Bay, with ratios of 91% and 85%, respectively, and in the other hand, Camp de Tarragona and Granada, both of them with a ratio of 35%. Spanish results are better than average European results, where the coverage ratio is 50% according to EMTA Barometer.

Coverage ratio for PT systems in MA (2019)

| City	%
Madrid	43%
Valencia	55%
Seville	55%
Malaga	74%
Majorca	83%
Cadiz Bay	85%
Saragossa	49%
Gipuzkoa	91%
C.Tarragona	35%
Granada	17%
Alicante	59%
Valladolid	46%
Lleida	43%
Pamplona	64%
Corunna	68%
Leon	54%

59%

Not included data from Renfe services. Seville does not include tram or metropolitan bus, just metro. Cadiz bay does not include urban bus. Data from Asturias and Caceres is not available. Source: data provided by the PTAs.

Urban accident rate

Urban accident rates have been on a general **downward trend since 2000**. This trend reached a turning point in 2013, with a sustained increase in the number of total accidents and slightly injured which lasted until 2016, when it began attenuating. However, despite the increase in the number of total accidents, the number of serious injuries remains stable, having experienced a slight decrease since 2017 so that by 2019 they have reduced by 10%.

The next figure shows **a negative evolution of urban accident indicators since 2013**, with all the indices (except for the number of serious injuries and fatalities per 100 accidents) increasing more than 10%, reaching almost 30% in the number of accidents with casualties.

Evolution of the number of traffic accidents on urban roads since 2013
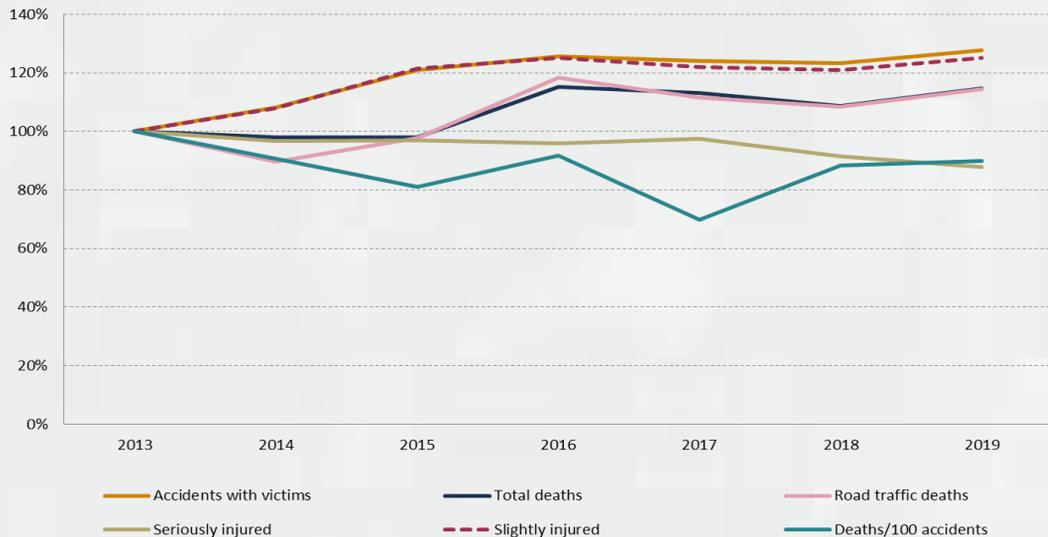
Source: "Main Figures of Road Accidents. Spain 2019." General Directorate of Traffic, 2020.

Shared mobility services

Since 2014, new forms of mobility based on technology and apps have surged. These apps allow the customer to **locate, rent and pay** a vehicle which they do not own. These new forms are becoming increasingly popular due to many reasons, the main one being their **accessibility**, as them being electric means they are not affected by the bans on combustion vehicles.

There are multiple types of vehicles available through these apps: cars, motorcycles, bicycles and Segway.

This rental service can be charged per minute or hour. There are two different types of renting within this modality: Roundtrip car-sharing or Free-floating car-sharing. In the first one the customers begins and ends their trip at the same location, whereas in the second one they can end their trip at a different location from the one they started at.

Number of companies providing new mobility services (2019 & 2020)
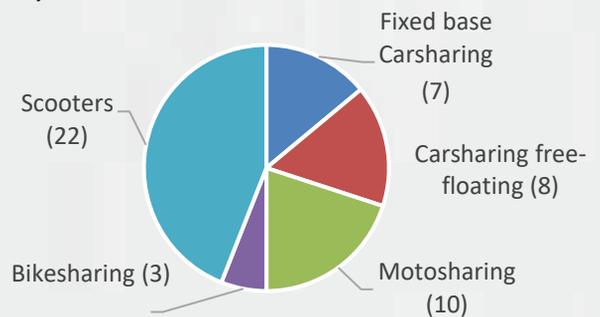
Source: compiled by authors based on data provided by PTAs.

During 2019 there has been an increase of the companies that supply this service. Even though some parts of the sector are highly volatile such as bike-sharing, due to economical and management difficulties, the situation is becoming stable specially on car-sharing and moto-sharing.

This summary illustrates key findings on the diversity of public transport systems and public transport policies in the largest Spanish metropolitan areas.

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