OptiTrans
Interreg Europe

BASELINE STUDY

Mobility in the Province of Granada

afora
TRÁFICO Y TRANSPORTE

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The Provincial Agency for Energy of Granada (APEGR) is one of the partners of the partnership integrated in the European project called OptiTrans: Optimization of Public Transport Policies for Green Mobility, this project is included in the second call of the Interreg Europe Operational Program 2014-2020; it is co-financed by the European Regional Development Fund (ERDF).

In this project, a total of 7 European regions are included: Thuringia (Germany), Tartu (Estonia), Baia Mare (Romania), Zadar (Croatia), Thessaly (Greece), Abruzzo (Italy) and Granada (Spain).

Within this project, each partner is responsible for the development and edition of the baseline study related to the mobility in their own territories. In the case of Granada, we have proceeded to develop this document that includes the "baseline study" on mobility in the province of Granada.

In order to carry out the study, the territory is divided into two different areas: the metropolitan area, which is managed by the public transport authority, called the Metropolitan Transport Consortium of the Granada Area, and the rest of the territory, with a rural character and less traffic.

We have proceeded to collect all the information of interest, both the main socio-economic statistics, and the information that characterizes mobility in the province of Granada, in order to respond to a whole series of questions on the state of the art of public transport in the province of Granada. The main changes that have been presented, main supports, identification of the main driving forces of public transport in the region as well as the economic background associated with public transport.

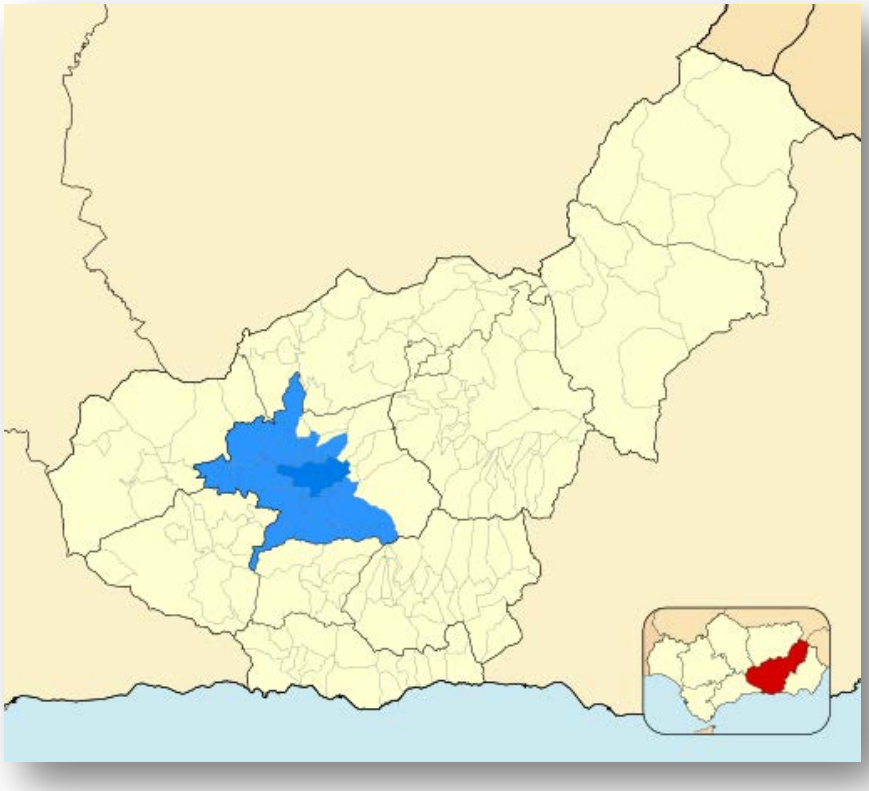
In the same way, the whole document is organized with the information which has been analyzed independently for each part of the territory of Granada. Thus, we have compiled information related to Metropolitan Area of Granada on the one hand and from the rest of the territory on the other.

There is a document called "Baseline study methodology" which determines a similar structure in the document between the different regions involved in the project to be able to compare the information among all the territories. It has the following sections:

- Territorial characteristics.
- Main characteristics of public transport in Granada area.
- Main actors of public passenger transport in Granada area.
- National and regional policies, identifying the disadvantages and initiatives for a sustainable public transport.
- SWOT Analysis, describing the main strengths, weaknesses, opportunities and threats.
- Analysis and identification of the main regional experiences and lessons learned, as good practices that give us experience to learn about.
- Main conclusions acquired from the baseline study on mobility in the Granada region.

BASELINE STUDY.

METROPOLITAN AREA OF GRANADA



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1. TERRITORIAL CHARACTERISTICS. METROPOLITAN AREA OF GRANADA

First, it is defined the metropolitan area and their main socioeconomics characteristics in order to define it properly. The metropolitan area is the urban conglomeration that appears for the first time in the Land Use Planning of Granada (POTAUG) approved in 1999 by Decree 244/1999

This geographical area corresponds with the scope of action of the Metropolitan Transport Consortium of the Granada area (CTAGr), which appears as a consequence of the POTAUG in 2006. Thus, for the baseline study of the mobility of the metropolitan area, we consider as the field of the study is integrated by the main nucleus which is the city of Granada, and the metropolitan considered the area included in the metropolitan area that does not correspond to the capital city. Thus, the metropolitan area is the capital city and the metropolitan crown (Source: Metropolitan Mobility Observatory OMM 2015).

The following municipalities form the metropolitan area of Granada: Albolote, Alfacar, Alhendin, Armilla, Atarfe, Cájar, Cenes de la Vega, Cijuela, Cúllar-Vega, Chauchina, Churriana de la Vega, Dílar, Fuente Vaqueros, Gójar, Granada, Güevéjar, Huétor-Vega, Jun, Láchar, Maracena, Monachil, Ogíjares, Otura, Peligros, Pinos Genil, Pinos-Puente, Pulianas, Santa Fe, Víznar, La Zubia, Las Gabias, Vegas del Genil.

Next, we will define some data that determine the socioeconomic characteristics of the metropolitan area of Granada.

Metropolitan area				Granada City	
Area (km²)	Population (2015)	Density (inhab/km²)	Nº municipalities	Capital population (2015)	Capital area (km²)
830	530.408	616	32	235.800	88

Data table 1: Socioeconomic characteristics of the metropolitan area of Granada. Source: *Observatorio de la Movilidad Metropolitana* (OMM) 2015

The following table shows the main socioeconomic indexes of the metropolitan area of Granada, the activity rate and the disposable income, those data influence notably in the movements of the citizens. Therefore, they are very important to understand the results.

The unemployment rate is very high, although it has improved from previous years

(nº people/home)	Activity rate	Unemployed (%)	GDP² (€)
2,5	58,2%	28,8%	16.142

1: Data of the IV trimester of 2015 according to INE for all the provinces

2: Data of the IV trimester of 2014 according to INE for all the provinces

Table 2: Other socioeconomics data of interest Source: *Observatorio de la Movilidad Metropolitana OMM. 2015*

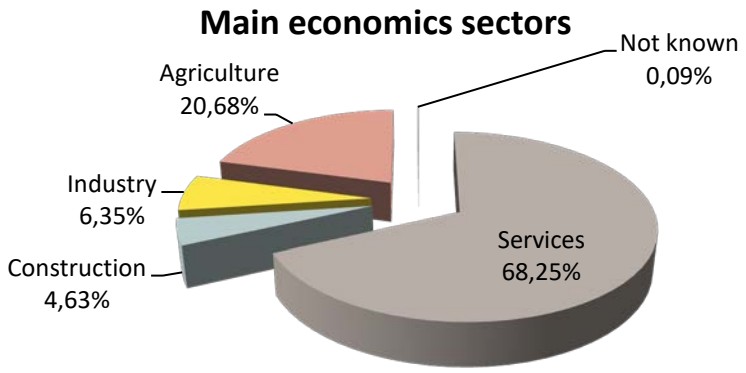


Illustration 1: major economic sectors. Source: Report of the labour market in Granada. Data 2016. Ministry of employment

1.1 MAIN INDICATORS OF ECONOMIC DEVELOPMENT AND INFRASTRUCTURE

Below there is a summary table with key data on public transport by road and rail of Granada and its metropolitan area.

Indicators	2010	2011	2012	2013	2014	2015
Percentage of GDP destined for Public Transport			Not found			
Percentages of workers in public transport			Not Found			
Number of public transport companies (road)	14	14	14	14	14	14
Number of public transport companies (railways)	1	1	1	1	1	1
Investment in railways			Not Found			
Number of public transport lines	58	58	60	58	60	60
Travel-line by public road transport (in millions)	10,7	10,8	10,3	10	9,7	9,4
Travel on public transport by rail			Not Found			
Kilometers of public transport by road (km)	1.542	1.542	1.530	1.505	1.520	1.523
Kilometers of public rail transport			Not Found			
Annual passenger-km public transport by road (in millions)	139,4	148,3	142,8	134,1	131,2	127,8
Number of rail passengers			Not Found			
Electrified train network (km)			Not Found			
Motorization (car / motorbike) (veh / 1000 hab)	483/190	479/187	462/178	452/174	450/170	455/174

Table 3: Indicators related to public transportation in the metropolitan area of Granada. Source: Reports of the Observatory of Metropolitan mobility WMO 2011, 2012, 2013, 2014 and 2015

The results show an inflection curve, due to the strong economic crisis suffered in Spain since 2008, which reduce the investment in infrastructures. The province of Granada (as well as the entire country) has been showing signs of recovery from 2013-2014, not in all cases has it been achieved yet.

We can obtain some conclusions from the analysis of the previous table:

- In recent years, the number of companies operating passenger transport by road in the metropolitan area has not changed, staying in 14 companies that manage metropolitan concessions.
- In the same way, the number of lines has not suffered keeping with 60 lines.
- On the other hand, demand has suffered a fall in recent years, from 10.8 million trips in 2011 to 9.4 million trips in 2015, that is a decrease of approximately 13%.
- Similar result is obtained in the passenger-km volume, which decreases by 14% in the last 4 years.
- The indices of motorization have suffered a decrease. This is optimistic data because it supposes a reduction of vehicles and motorcycles for every 1,000 inhabitants. It is significant especially in the case of cars, which goes from 483 cars / 1,000 inhabitants to a total of 455 cars / 1,000 inhabitants

Investments made in the road network

In relation to investments made in the road network, the following table summarizes the amounts that have been engaged in recent years:

Investments made in the road network						**Unit: Thousand euros**
	2010	**2011**	**2012**	**2013**	**2014**	**2015**
Investments made in the road network dependent on the State	194.875	116.704	162.663	188.531	371.098	405.699
Investments made in the road network dependent on territorial entities	67.883	29.325	41.876	24.680	36.085	44.323
Investments made in the road network dependent on the Autonomic Communities	57.790	22.334	27.353	16.870	19.105	32.800
Investments made in the road network dependent on Provincial Councils	10.093	6.991	14.523	7.810	16.979	11.523

Table 4: Investments made on roads in the province of Granada. Source: Statistical yearbooks Ministry of Public Works years 2012 and 2015

In the case of the investments made in the road network, we can see again and due to the economic crisis a fall in the investments from 2008. But it seems to improve since 2014.

Modal Split

Another indicator of mobility in the metropolitan area of Granada is the modal split of the last years. The modal split shows which types of transport use the citizens and their proportion with the total number of journeys. The following tables and figures include the data collected in this aspect, which are a clear diagnosis of current mobility.

This indicator is essential because the distribution of trips according to modes of transport in the urban area is an indicator of the quality of mobility and it has a clear relationship with the levels of air pollution, due traffic is one of the main causes of poor air quality in cities.

The modal split of traffic is a basic indicator to set up transport policies. The sustainable balance of mobility and the promotion of public ways of transport is one of the main objectives in large cities. (*Source: CAT-MED Platform for Sustainable Urban Models*).

We have obtained information from two studies that include data on modal split. One of them corresponds to the Sustainable Urban Mobility Plan of Granada (PMUS Granada), prepared in 2012. The other document has been prepared by the Metropolitan Mobility Observatory (MMO), a national organization, which collects the information from the Metropolitan Transport Consortium of the Granada Area.

In the information provided by the Sustainable Urban Mobility Plan of Granada (in its chapter Diagnosis page 99) you can see information about the modal split into all types of motorized and non-motorized transport for the year 2007:

Mode	Total travels	%
Walking	319.815	53,7%
Car	114.215	19,2%
Motorcycle	25.793	4,3%
Bus	120.949	20,3%
Taxi	4.625	0,8%
Other	7.215	1,2%
Bicycle	2.414	0,4%
Total	**595.026**	**100,0%**

Table 5: Modal Split Granada Capital. 2007. Source: PMUS Granada. Home survey 2004 -2007

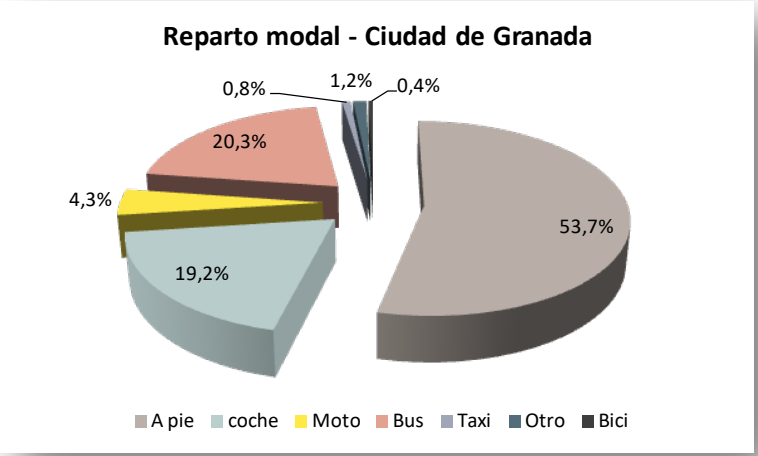


Illustration 2: Modal Split de Granada Capital. 2007. Source: PMUS Granada. Home survey 2004 -2007

As we can see, in the city of Granada, pedestrian mobility is the predominant one, with almost 54% of trips. The presence and use of the car rises to 19.2%, it is a percentage not very high, lower than the usual values in Spanish cities.

The use of the bus in the capital presents significant values (20.3% of total trips, almost 44% without foot traffic), which implies a high value for the usual in Spain. In the case of the bicycle, 0.4%, it is a very low value, Granada is a city with a complicated orography and the results are not completely updated, due to the cyclist boom that occurred in recent years. . In conclusion, the modal split presents an optimal scenario with possibilities of improves in the future years.

In the case of the metropolitan area, the information is available thanks to the Metropolitan Transportation Plan, which collects information about the modal split into all types of motorized and non-motorized transport. This information is from latest home mobility survey that exists , of the year 2001:

Modal Split: Metropolitan area	
Walking	44 %
Car	32%
Motorcycle	5%
Urban bus	15%
Interurban Bus	1%
Taxi	1%
Bicycle	2%

Table 6: Modal split metropolitan area of Granada. 2001. Source: Plan de transporte metropolitano de Granada

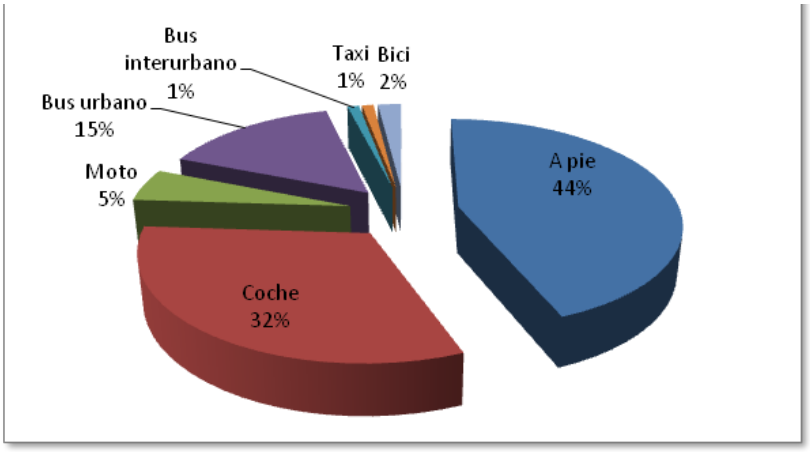


Illustration 3: Modal split of the metropolitan area of Granada. 2001. Source: Metropolitan Transport Plan of Granada

If we compare this data with the results of the capital, firstly the percentage of trips on foot decreases. The use of the car increases because there are a significant percentage of inhabitants of the metropolitan areas that travel to Granada by car. In the use of the bus, the percentage decreases from 20% to 16% (as the sum of urban and interurban bus), which indicates the loss that the global number of municipalities represents compared to the high use of the urban area of Granada. Finally, it is significant the use of the bicycle, which amounts to 2%, which shows a greater use in the rest of the municipalities of the metropolitan area than in the city of Granada.

Analyzing the existing data in the studies carried out by the OMM Metropolitan Mobility Observatory, the modes of transport are not collected in a disaggregated form, but it allows separating the information for reasons of travel.

Analyzing the distribution of trips according to modes of transport for all the reasons, the following distribution is obtained, having obtained information from 2 different surveys (those carried out in 1994 and in 2015):

Mode of transport	1994	2015
Car+ motorcycle	32%	49,6%
Public Transport	10,4%	13,1%
Walking+ by bike	47,9%	36%
Other	9,7%	1,3%

Table 7: Modal split of the metropolitan area of Granada - all the reasons. Years 1994 and 2015 Source: OMM Metropolitan Mobility Observatory 2014 and 2015.

This table allows us to analyze how mobility habits have changed in the last 21 years. The public transport has suffered a slight increase, going from 10% to 13%. The use of private vehicle rises from the 32% used in 1994 to 49.6% today, which shows this irrational and excessive use of private vehicles. On the other hand, trips on foot and by bicycle have decreased from 48% to 36% of trips. Therefore it is observed that in the last 20 years mobility patterns have changed, reducing trips on foot and by bike and increasing the use of the car and the motorbike.

Among the different reasons for travel, the most common and repeated on working days is the reason for work, so it has been considered interesting to know the modal split on a daily work trip, although only Metropolitan information is available for the year 2001:

Mode of transport	Percentage of use
Car + motorcycle	63,4%
Public Transpor	9,7%
Walking+bike	26,9%

Table 8: Modal split in the metropolitan area of Granada - work reason. 2001. Source: Observatorio de la Movilidad Metropolitana OMM 2015

In this case, the travels in individual motorized mode (car + motorcycle) are in a proportion of 2 out of 3 trips, excessively high. The participation of public transport is barely 10%, which shows that attention should be paid to this habitual daily mobility.

1.2 OTHER MOBILITY INDICATORS IN PUBLIC TRANSPORT

Below there are other important mobility indicators of public transport in the metropolitan area of Granada. These indicators have been obtained through the mobility surveys (those conducted in 1994 and 2015), which allow comparing and knowing the data necessary for the proper planning of public transport:

Year	Travels per day	Average time of travel[1] (min)	Nº travels per person per day	Intermodal travels[1] (%)
1994	1,21	19,2	-	6,8
2015	1,12	19,2	2,3	6,8

1: Data from Censo de Población y vivienda 2001.

Table 9: Other Mobility Indicators. Source: Observatorio de la Movilidad Metropolitana OMM 2014 y 2015

These values indicate the level of use of public transportation in the metropolitan area of Granada. In recent years has been an important decrease of 100,000 travelers day, from 1.21 billion to a total of 1.12 million trips (a decline of 7%), with a time average trip of approximately 19 minutes. The rate of daily trips per person in the year 2015 is 2.3, with 6.8% travel with modal Exchange.

2. CHARACTERISTICS OF PUBLIC TRANSPORT IN THE METROPOLITAN AREA OF GRANADA

In this section we will try to describe a general vision of the situation of public transport in the metropolitan area of Granada.

The concession is an administrative contract between the Administration, in this case, the Andalusian, and a private company that, through an open competition, is awarded this contract to be able to exploit the service, routes and expeditions exclusively. Thus, no other company can move travelers between the routes of another company. Therefore, there is no competence; it is operated under the figure of a monopoly, although previously it has had to propose the best offer, which must remain throughout the concession period.

It is important to remark this system of concessions because at the moment, the Junta de Andalucía is beginning the process of renewing many concessions, which have already expired. It is an excellent opportunity to introduce new ideas, improvements, good practices and changes searching for the optimization of public transport by road, metropolitan and for the rest of the territory of the province of Granada.

2.1 PUBLIC TRANSPORT IN THE METROPOLITAN AREA OF GRANADA

Nowadays there are different modes of public transport in the city of Granada, which shows a wide range of systems that are not repeated anywhere else in the province. All of them are analyzed, one by one, in a more detailed way in the section dedicated to the public transport offer existing in the city. This range consists of the urban bus system and the High Capacity Line (mass transit system or BRT), both managed by the City of Granada. It also joins the interurban transport and the Metropolitan of Granada, both managed by the Metropolitan Transport Consortium of the Granada Area. Finally, it is complemented by new bicycle rental systems without fixed parking that are private, taxis and motorcycle rental system, also private.

The main factors that support the development of public transport in the metropolitan area of Granada can be defined by different reasons. The city of Granada and its metropolitan area are located between two prominent geographical elements, the Sierra Nevada and the Vega de Granada. All cities in the metropolitan area have grown in a significantly reduced space and, therefore, there is certain cohesion between them, because of that the distances are not too large and the user considers the use of public transport to reach its destination.

At the urban level, it is worth mentioning the historic center of Granada capital, with difficult access by private vehicle, and also difficult to transform it. This may be another factor of the increase in the use of public transport to access the city center. Granada is a medium-sized city easily accessible by foot or bicycle which is the consequence of the high percentage of non-motorized trips in the modal split.

The rental systems for electric bicycles and motorcycles, implemented in recent months, will be decisive in the near future for a consolidation of sustainable transport in the city and its metropolitan area.

2.2 OFFER OF PUBLIC TRANSPORTATION IN THE CITY OF GRANADA AND ITS METROPOLITAN AREA

In this section we describe the main characteristics of the urban and interurban transport offer of Granada and its metropolitan area.

We describe the current public transport systems that currently coexist in Granada.

2.2.1. URBAN PUBLIC TRANSPORT SYSTEM + LAC OF THE CITY OF GRANADA

The urban bus network of the city of Granada is made up of two connected systems. With this system the network is useful for the users and it covers all the territory and demands of mobility of the citizens.

The entire urban public transport system is managed and operated by a private company, Rober, under an administrative concession with duration of 10 years.

The whole of the urban public transport of the city is formed in total by 29 lines + the mass transport line known as LAC (High Capacity Line).

High Capacity Line (LAC)

To establish the connection between the lines that arrive from the north or the south with the center, a vertebrating line is created: the High Capacity Line, which at the beginning was going to be the only one running along the highway axis of Constitución Ave. Gran Vía, Reyes Católicos and Acera del Darro, with a high frequency of passage. It was a single urban line, but with the characteristics of amass transport system with early payment to access the stop, reserved platform and high capacity vehicles.

After the first results and analysis, they realized that they need to improve the road axis so now there are four more lines that cross the city center by the Gran Vía (lines SN1, SN4, C1 and C2).

Illustration 4: Vehicles used in the urban transport system and in the LAC system

Network of connection with the neighborhoods

There are some radial lines that connect all neighborhoods with the city center. At different points along the High Capacity Line, connections and exchanges of lines can be made, for example in: Caleta, Cruz del Sur-Villarejo, Plaza de San Isidro, Doctor Olóriz, Avda. De Andaluces, Fuentenueva, Jardines del Triunfo, Cathedral, Humilladero and Palace of Congresses-Violón.

Below, there is the map of the urban bus lines formed by the LAC and the network of urban buses that connect the different neighborhoods of the city. You can see perfectly how the LAC covers the entire central area of the city from East to West (along with the other 4 lines that have been transposed to this central road axis), the rest of the lines work like connectors of the different neighborhoods with these lines and with the center of the city.

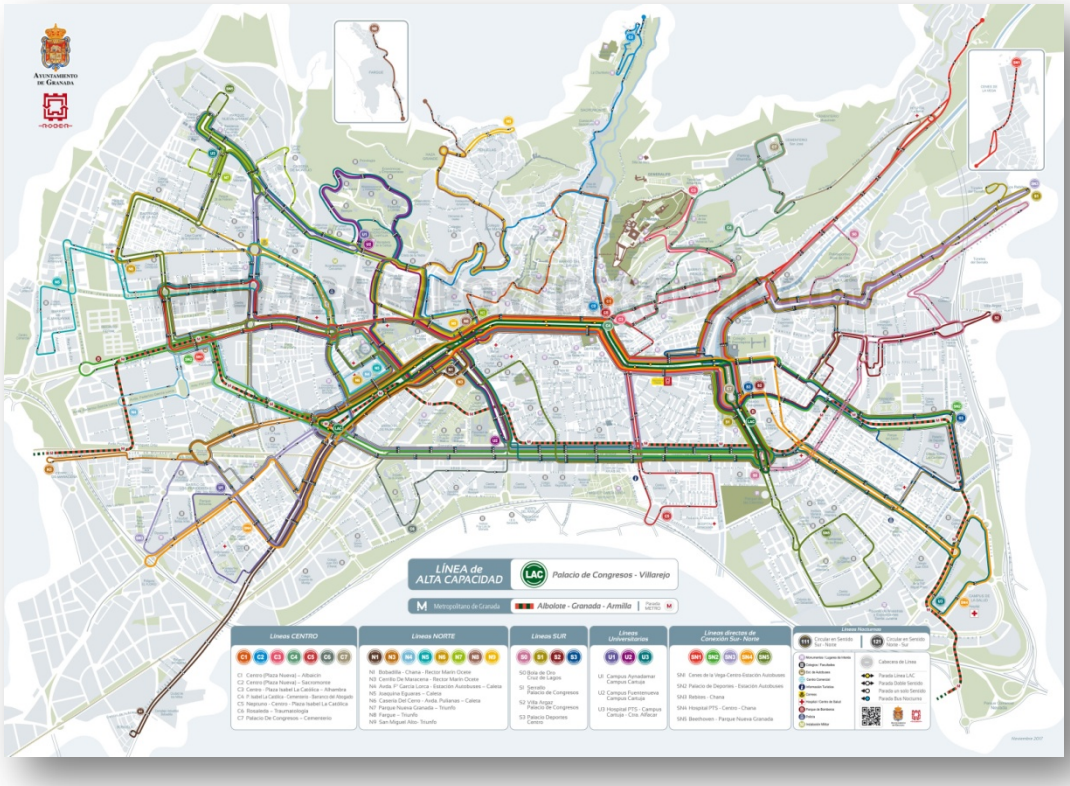


Illustration 5: Map of the urban bus lines of Granada. Source: Granada City Hall

The result is a network of lines that cover practically all the city. The main element is the LAC line, which offers a high capacity offer in the corridor with the highest volume of passengers. This line is complemented by the Center lines (C1 to C7) that serve the central and historical center of the city, specifically those that are difficult to access and limited to road traffic. It is also integrated with North (N), South (S) and direct connections of South - North (SN), which creates the network. In general it is a good urban transport service, covering all the needs of the population, both resident and visitor.

The two web pages with the most interesting information to complete and know all the details re the following:

http://www.movilidadgranada.com/busurbano_index.php

http://www.transportesrober.com/

Urban transport rates

The cost of the trip depends on the type of ticket that is used. The urban transport of the city of Granada offers a wide variety of transport tickets: single ticket (€ 1.40), monthly pass (€ 41), young pass and university pass (both € 0.61), and disabled pass (€ 0.57).

2.2.2. INTERURBAN TRANSPORT (METROPOLITAN AREA)

The interurban transport of the metropolitan area of Granada is the service of public transport by bus that joins all the municipalities of the metropolitan area of Granada. It is managed by the Consortium of Metropolitan Transport of the Area of Granada. This Public Transport Authority is integrated by the Junta de Andalucía, the Provincial Council of Granada and the municipalities that together with Granada form its metropolitan area, with different percentages of participation.

Illustration 6: Corporate image of the vehicles that provide metropolitan public transport service

The functions of the Transport Consortium are the following:

- To Promote and finish the works of the Intermodal Transport Plan of the Granada Area.
- Planning and ordering of infrastructures and transport services that are declared of metropolitan interest in the Intermodal Transport Plan.
- Coordination of services, infrastructures and transport facilities, with promotion of the unified image of the Transport System of the Granada Area.
- Cooperation in the provision of Transport Services, as well as the construction and operation of infrastructures and facilities of metropolitan interest.
- Establishment of the rate framework for the services in the territorial area of the Consortium.
- Management of Transport Services attributed or entrusted by the consortium Administrations, including their participation in the exercise of inspection functions.

- Proposed establishment of rates, public prices and special contributions, in accordance with current legislation, related to the exercise of their activities and services.

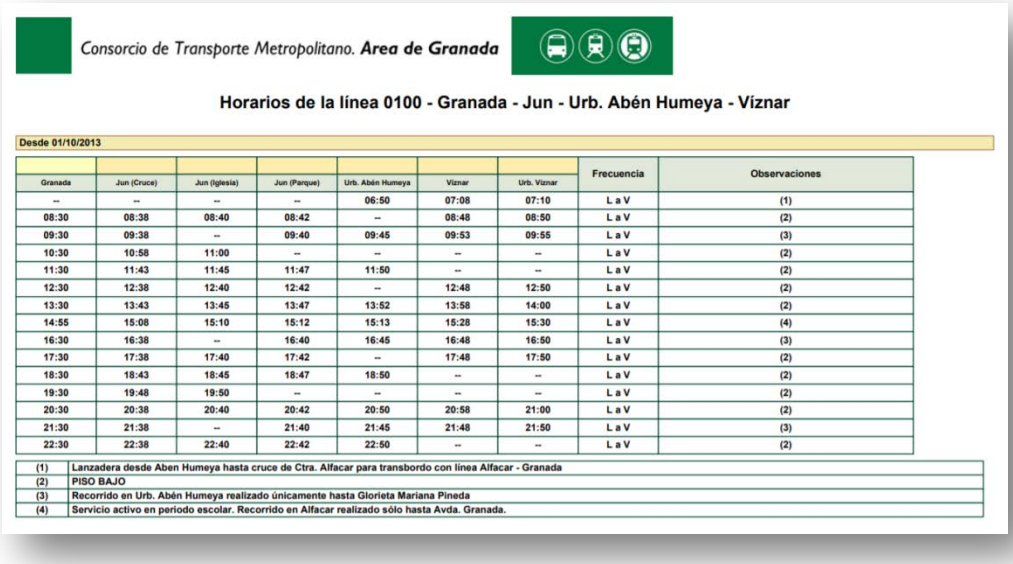
Transport offer

The offer of regular public transport services are included in administrative concessions, organized and planned by the Junta de Andalucía, which in the case of the Granada Transport Consortium, assumes the competence of those concessions with metropolitan routes.

In total, in the metropolitan area of Granada there are 14 concessions, operated by 14 different companies. In addition, there is a new administrative concession for the exploitation of the Metropolitan rail service, which operates a new company: Metropolitan Trams of Granada, S.A.U.

The Consortium of Metropolitan Transport of Granada coordinates a total of 66 lines, whose complete information of schedules, stops, itineraries on map, etc. It is collected on the consortium's website (http://siu.ctagr.es/es/lineas.php). In addition, a customer service telephone number is offered (+34.955.038.665) where you can also obtain information of all the metropolitan lines of the 8 transport consortiums that exist in Andalusia.

As an example, it shows the information that appears on the web of one of the lines:



Consorcio de Transporte Metropolitano. **Area de Granada**

Horarios de la línea 0100 - Granada - Jun - Urb. Abén Humeya - Víznar

Desde 01/10/2013

Granada	Jun (Cruce)	Jun (Iglesia)	Jun (Parque)	Urb. Abén Humeya	Víznar	Urb. Víznar	Frecuencia	Observaciones
--	--	--	--	06:50	07:08	07:10	L a V	(1)
08:30	08:38	08:40	08:42	--	08:48	08:50	L a V	(2)
09:30	09:38	--	09:40	09:45	09:53	09:55	L a V	(3)
10:30	10:58	11:00	--	--	--	--	L a V	(2)
11:30	11:43	11:45	11:47	11:50	--	--	L a V	(2)
12:30	12:38	12:40	12:42	--	12:48	12:50	L a V	(2)
13:30	13:43	13:45	13:47	13:52	13:58	14:00	L a V	(2)
14:55	15:08	15:10	15:12	15:13	15:28	15:30	L a V	(4)
16:30	16:38	--	16:40	16:45	16:48	16:50	L a V	(3)
17:30	17:38	17:40	17:42	--	17:48	17:50	L a V	(2)
18:30	18:43	18:45	18:47	18:50	--	--	L a V	(2)
19:30	19:48	19:50	--	--	--	--	L a V	(2)
20:30	20:38	20:40	20:42	20:50	20:58	21:00	L a V	(2)
21:30	21:38	--	21:40	21:45	21:48	21:50	L a V	(3)
22:30	22:38	22:40	22:42	22:50	--	--	L a V	(2)

(1)	Lanzadera desde Aben Humeya hasta cruce de Ctra. Alfacar para transbordo con línea Alfacar - Granada
(2)	PISO BAJO
(3)	Recorrido en Urb. Abén Humeya realizado únicamente hasta Glorieta Mariana Pineda
(4)	Servicio activo en periodo escolar. Recorrido en Alfacar realizado sólo hasta Avda. Granada.

Illustration 7::Line 0100 hours Information Granada - Víznar. Source: CTAGr

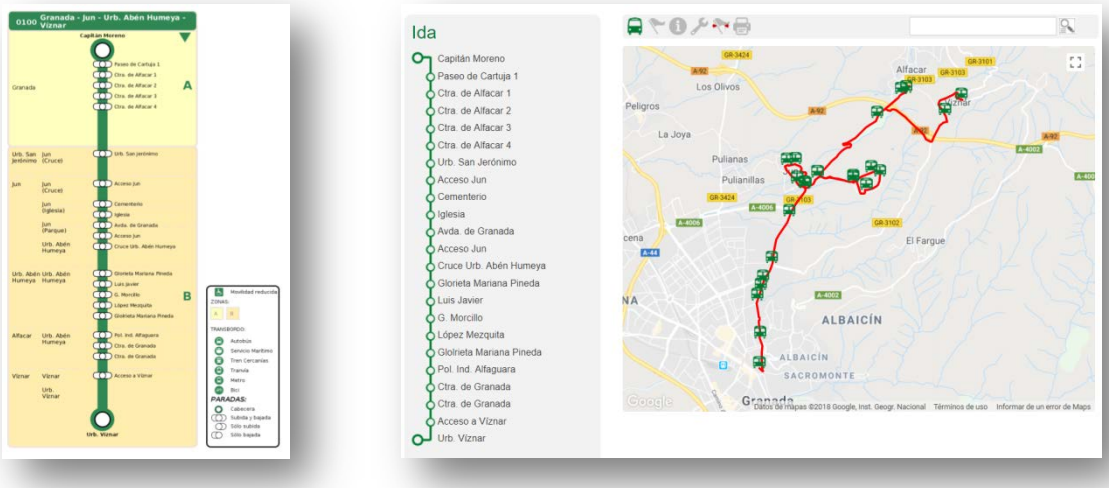


Illustration 8: stops and route of the line 0100 information Granada - Víznar. Source: CTAGr

Rate system

The Metropolitan Public Transport of the Metropolitan Area of Granada has a fare integration system through a wallet card without transport contact. In the past, the cost of travel was established based on the distance traveled along the route and each operator applied different rates for the same distance.

If we use the Unique Ticket card the following advantages are established:

- Using the Unique Ticket card the cost of the trip becomes cheaper compared to the cost of the single ticket.
- It allows the transfer with other metropolitan buses, including the urban public transport of Granada. In transfers, the bonus obtained is even higher.
- It can be used in all bus journeys that take place within the Metropolitan Area of Granada, regardless of the transport company that provides the service. In addition, several people can travel with the same card, since it is not personalized.
- The rate is zonal and is established according to the movements carried out between the four zones (zones A, B, C and D) in which the territorial area of the metropolitan area of Granada is divided.

Illustration 8: zoning of the metropolitan area of Granada. Source: CTAGr

Metropolitan transport rates

The following table shows the current rates of metropolitan transport, there are 2 types of rate: single ticket and the Unique ticket card wallet from the Consortium, contactless and rechargeable, which presents strong benefits including saving the price:

Number of steps	Single ticket	Unique Ticket
0	1,50 €	0,99 €
1	1,50 €	0,99 €
2	1,70 €	1,17 €
3	2,90 €	2,00 €

Table 10: Metropolitan intercity transport rates. 2017 source: CTAGr

The use of the Unique Ticket allows savings over single ticket between 31 and 34% of its price.

You can use the transport card of the Consortium of Transport to pay in the urban transport of Granada. In this case the cost of the tickets is 0,82€ instead of 1,40€.

Granada - Airport Service (Line 245)

This route is a metropolitan service so it is included under the competences of the Metropolitan Transport Consortium of the Granada area, applying a particular rate, either with a single ticket or using the transport card (with a discount of 10%):

Number of steps	Single Ticket	Card
0	2.90 €	2.60 €

Table 11: Special rates. 2017 Source: Granada transport Consortium

Transfers

Another advantage introduced by Transport Consortium of Granada, with the fare integration, was the possibility of multimodal transfers, with a significant saving in the rate, as it is shown in the following table, for the four possibilities at present.

Number of steps	BUS -> BUS	BUS -> METRO	METRO -> BUS	BUS -> AERPORT	Transfer time
0	0.62 €	0.62 €	0.79 €	2.23 €	60 min.
1					
2			0.97 €	2.05 €	75 min.
3			1.80 €	1.22 €	90 min.

Table 12: Rates for transfers. 2017 Source: Consortium of metropolitan transport in the Area of Granada

There are some considerations regarding transfer:

- The maximum transfer time between urban services is determined for 0 and 1 jumps.
- The transfer time is counted from the date and time of the first cancellation.
- 1st cancellation: the start of a trip in the service with the transport card, not having previously made any journey in another service.
- Transfer: access to the service, having made a previous trip in another service during the transfer times indicated from the first cancellation
- Valid rates for all transport services assigned to the Fared Integrated System of the Granada Area.

2.2.3. BUS LINES

The exact data of kilometers of bus lane network available in the city of Granada has not been found, but this network has been increasing little by little. The PMUS of Granada does not have information about then in its proposals.

In the city of Granada, the existing bus lanes allow the use of urban and intercity buses, as well as allowing access to taxis and authorized vehicles (understood as emergency and official vehicles). In addition, the city bus lanes also allow the passage and use of two-wheeled vehicles, motorcycles and bicycles.

Although the majority does not have a physical separation from the rest of the lanes, the City Council of Granada has implemented a series of registration cameras that fines from 7:30 a.m. to 10:00 p.m. to protect the correct use of this infrastructure.

The following figure shows the current network, which is concentrated in the downtown area of the city, marking a clear north-south axis, along the Andalucía Avenue, Constitución Avenue, Gran Vía de Colón and Acera del Darro :

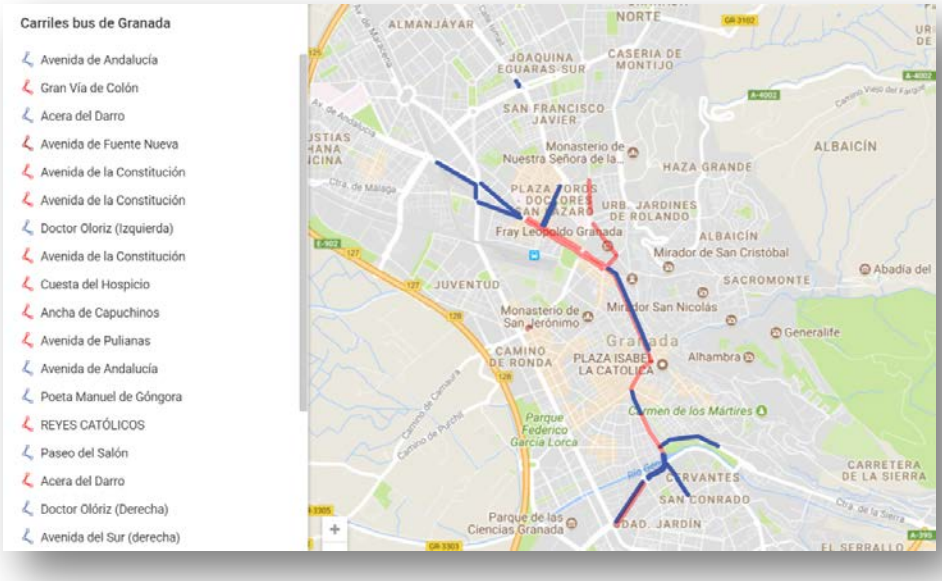


Illustration 9: Bus lines in Granada. Fuente: movilidadgranada.com

2.2.4. TAXIS

According to the Institute of Statistics and Cartography of Andalusia (IECA), in 2015, the city of Granada had 538 licenses for the taxi service. According to studies carried out by the taxi industry, an average of 18,000 services per day is estimated in the city, with an average of 1.8 travelers per trip. This data means moving on average, approximately, about 25,000 people a day.

The vehicle fleet has 121 hybrid vehicles.

There are distributed throughout the city 68 taxi stops, as shown below in the attached figure. These stops have a total of 378 places.

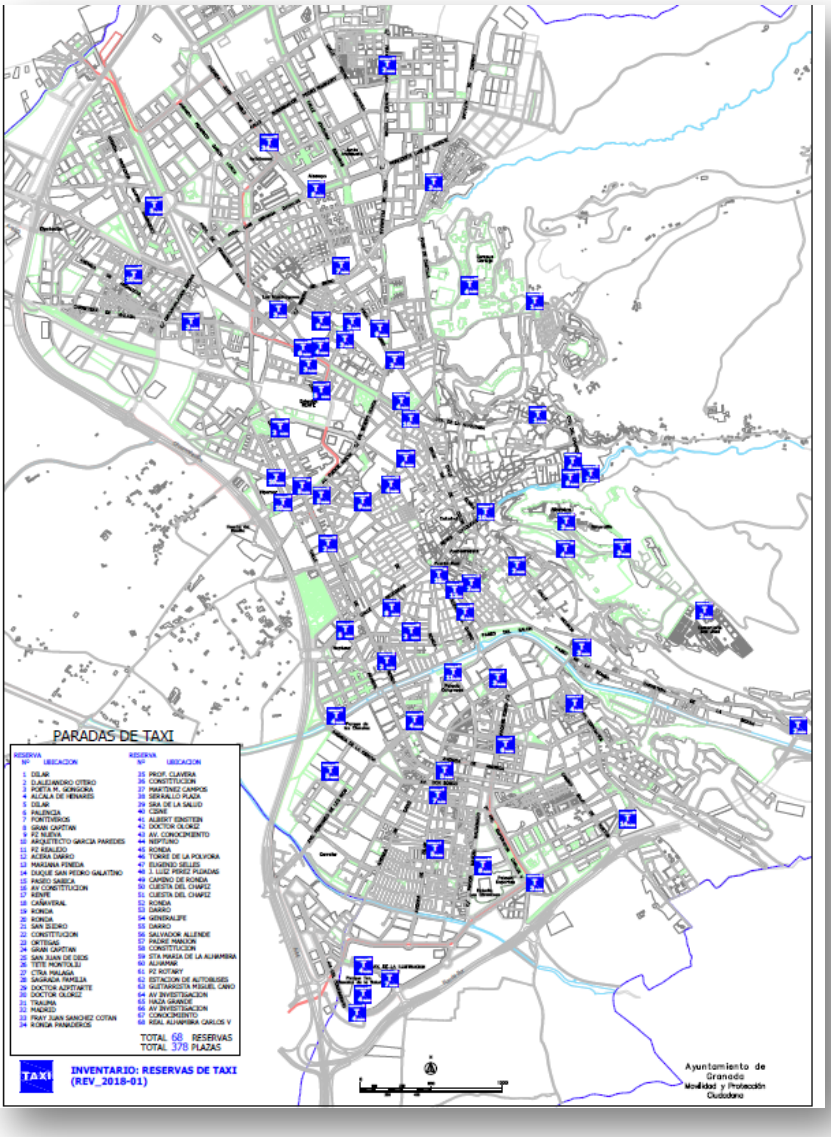


Illustration 10: Location of taxi stops in Granada capital (2018). Source: Hon. Granada City Hall

There is a wide network of stops, so the taxi system in the city can be considered as very accessible for the population.

At the metropolitan level, and according to IECA data, there were a total of 641 taxi licenses in the metropolitan area in 2015. The municipalities of Armilla has (18 licenses, 23901 inhabitants, which means an average of 0.75 licenses / 1000 inhabitants), Santa Fe (15 licenses, an average of 0.99

licenses / 1000 inhabitants) and Chauchina (9 licenses, an average of 1.66 licenses) / 1000 inhabitants). The average in the rest of the municipalities is 2.1 licenses per municipality. Only the municipality of Láchar (3303 inhabitants) does not have any taxi license. Therefore, there is an acceptable offer in the metropolitan area, based on the fact that the city of Granada, with greater mobility, has a ratio of 2.29 licenses / 1000 inhabitants and the metropolitan area as a whole with a ratio of 1.2 licenses. /1000 hab.

Association of metropolitan taxis of Granada

This association, founded in January 2017, emerges with the idea of unify taxis that service within the metropolitan area of Granada. This association currently includes 13 associated municipalities (Víznar, Huétor Santillán, Cogollos Vega, Alfacar, Peligros, Albolote, Atarfe, Pinos Puente, Fuente Vaqueros, Otura, Alhendín, Dílar and Maracena).

Its objective is to serve and provide service 24 hours a day to the user of the metropolitan area , with a single telephone customer service: +34.958.576.448.

Another important aspect has been the labeling of all the vehicles included in the association in a specific, unique way, so that the user can identify them more easily.

Illustration 11: Corporate image on the vehicles. Source: www.taximetropolitanogranada.com

The use of new technologies is very important. They have developed *1Taxi!* It is an Application that makes possible to have a computerized fleet management system, offering a fast and efficient service. For this, vehicles have GPS to receive services through the Auriga system.

They have a varied fleet, which allows offering vehicles of large capacity (7 seats) and even vehicles adapted to PMRs.

One of the main advantages of this Association is the unification rate. After the division of the Metropolitan Taxi Institute, the rates became dependent on each City Council, which caused a disparity in them. With the creation of the Association, the 13 municipalities once again have a unified tariff, the same as in the municipality of Granada.

They also want to serve those municipalities that today do not have licenses (Láchar and Cijuela)

2.2.5. BICYCLE

The introduction of the bicycle as a transport is becoming more and more widespread in a greater number of cities. In other Andalusian cities, such as Seville and Malaga, it has already been introduced with great success. Especially in the case of Seville where the bicycle reaches quotas in the modal split of 10%.

In order to get these changes, it is necessary to improve and adapt, not only bicycle infrastructures, but also road safety and respect for citizens.

The benefits of bicycle transport are widely known for users and the city. It is one of the most efficient and sustainable modes of transport.

Bicycles are essential to promote sustainable mobility, it is economical, it can be used by people of all ages and does not pollute or make noise. In addition it improves our health with the practice of physical exercise.

Currently in the city of Granada there is no a proper infrastructure to define a good bicycle transport system. One of the main factors against is orography, although nowadays, this problem could be solved by the use of electric bicycles, although they suppose a high cost. The ideal would be to introduce them via the public electric bicycle system.

Illustration 12: Cyclist mobility in the streets of Granada. Source: PMUS Granada

In the image shown below you can see how the bike lanes that exist today are disconnected and do not have enough continuity to be an efficient network

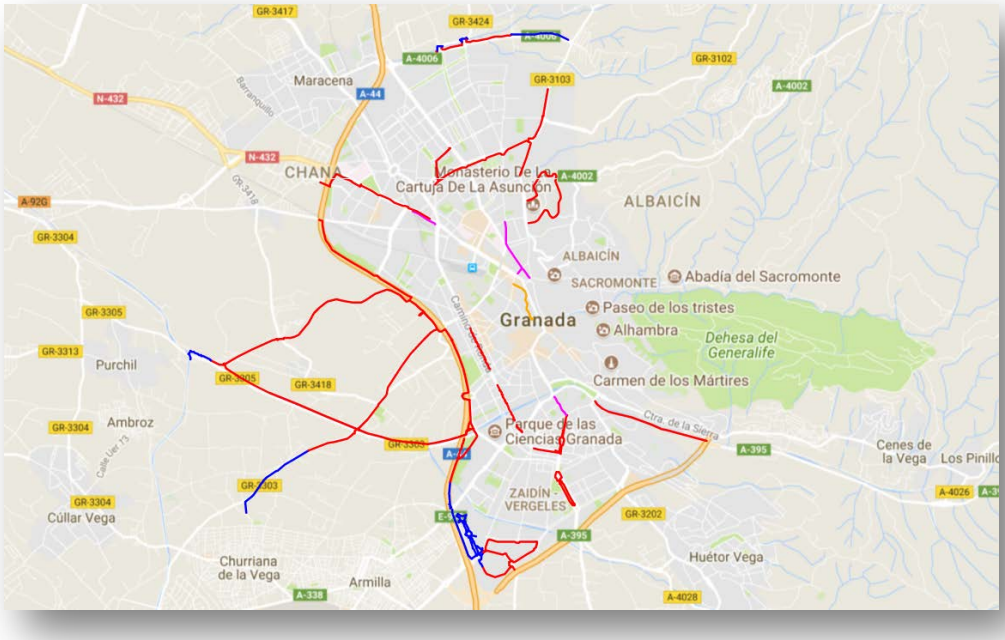


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Illustration 13: Bike lines in Granada. Source: www.movilidadgranada.com

http://www.movilidadgranada.com/bici_index.php#carrilbici

Although the network is still discontinuous today, there are 7 main axes that can be identified in the city's bike lane network, such as the Emperador Carlos V, Circunvalación, Norte, Churriana-Granada, PTS and Camino de Ronda bike lanes.

Illustration 14: Bus-Bike Line Poeta Manuel de Góngora. Source: www.movilidadgranada.com

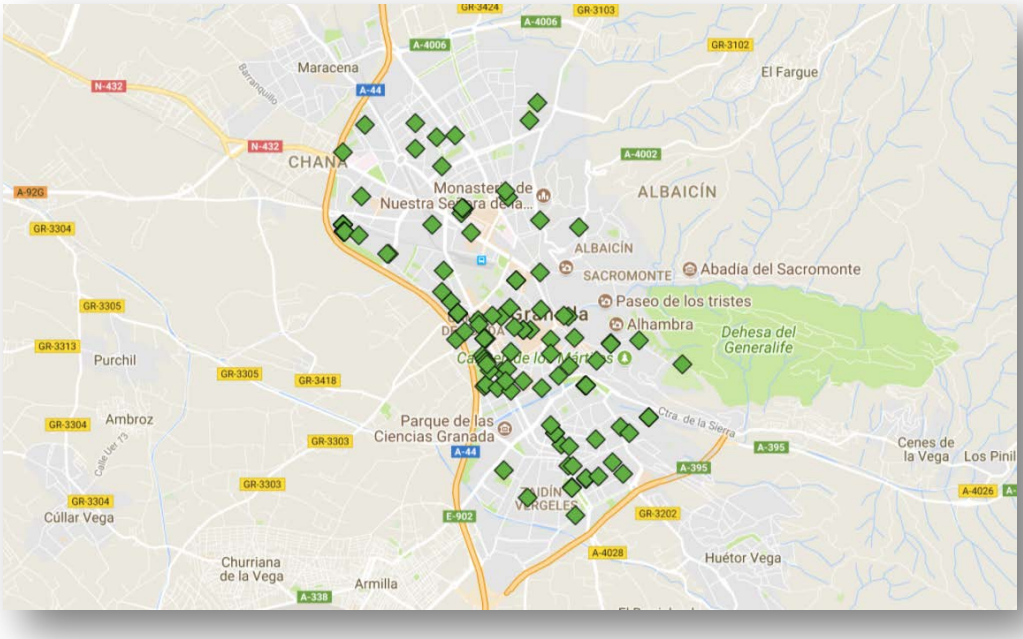
In the rest of the metropolitan area, it is a network destined for leisure and sports use in each of the municipalities that form the metropolitan area because it has not got cohesion.

The Center for Integral Mobility Management of the city of Granada has carried out different studies and analyzes the bicycle accidents in the city. In the last 4 years, the number of accidents in the city involving a bicycle has been maintained, from 66 to 69 accidents, at the same time the use of bicycles have increased, which indicates the low level of accidents. Any deceased has been registered in accidents with bicycle involved since it is being studied. And of the 198 accidents in the last 3 years (2015-2017), only 12 serious injuries have been reported using the bicycle.

The accident rate presented in this mode of transport shows that 89.3% of accidents occur at points without cycling infrastructure, compared to 10.7% that did exist.

You can access all the data of the cyclist accident studies in the city of Granada at the following link: http://www.movilidadgranada.com/bici_accidentalidad.php.

As a complement to the infrastructures, the other necessary element of promotion of this transport system is a good network of parking points for bicycles. In the city of Granada there were 81 parking points in 2017. We can find all these information on the website of the Center for Comprehensive Mobility Management, (http://www.movilidadgranada.com/bici_par.php).



IIllustration 15: Park points in Granada (2017). Fuente: www.movilidadgranada.com

Since 2017, the CGIM of Granada has been carrying out studies related to the mobility of cyclists, which allows having better information of the use of this transport system. The average of the use of the bicycle in Granada in the year 2017 reaches a modal split of 4.59%, although there are some points in the city that can rise to 13, 67% in Reyes Católicos (downtown area). Therefore, it is a mode of transport that is increasing, motivated by the awareness measures, implementation of the public bicycle, increase of the cycling infrastructure and the point of parking.

You can find more details in the following link: http://www.movilidadgranada.com/bici_aforos.php.

In the last months a new actor has arrived to participate in bicycle mobility in the city of Granada. It is called **oBike** and is a bicycle shared service without parking through a mobile application.

The service has 250 bicycles distributed throughout the city. The peculiarity of it is that users are allowed to leave vehicles in any public space without requiring a pre-established parking space.

Illustration 16: Bicycle from Oblike. Source: oBike España

The system works through an app, available for Android and IOS, which allows the user, once registered, to locate the nearest bicycle on his mobile and rent it by scanning an existing QR code on the vehicles.

Users can register through Facebook accounts or through their mobile phone. Once its use has been completed, the vehicle can be deposited in any nearby public space, suitable for that purpose and must proceed to block it.

Illustration 17: Operation of the oBike system. Source: oBike Spain

Bicycles are available in all neighborhoods of the city although they are mainly concentrated in the university areas and in the center, where there is an estimated higher demand from students and tourists.

Recently the company has announced that it will launch a rental service for electric bicycles that suits better to the orography of the city.

Since the end of November another operator has entered in the bicycle rental market without fixed parking, is the Korean company **OFO**, which has implanted in the city of Granada with 1,000 bicycles. In the same way as we mentioned above, you can rent the bicycle through a mobile application that locates the nearest bicycle through the internet and allows you to unlock it.

In any case, it is too early to analyze due to its short period of implementation, although there are precedents of difficulties of these services, both due to the high level of vandalism that these Chinese systems tend to suffer (bicycles do not present the heavy and solid structures of the traditional systems of anchoring stations) as well as the spreading and abandonment effect that they usually cause, as there are no fixed parking points. The advantages of traditional vandalism control systems for being heavy bicycles (a disadvantage when using them) are faced with the commented systems of oBike and OFO that, due to their slight structure, tend to suffer greater damages.

2.2.6. SCOOTER SHARING

Nowadays, the motorcycle has a very important role in the modal split in the city of Granada. Granada is one of the cities that have the most motorcycles and mopeds in the country.

This vehicle has been consolidated because it allows a smoother driving and easier parking. In total, there are 26,557 of motorcycles in the city of Granada (source: IECA 2016) as well as more than 44,000 motorcycles throughout the metropolitan area (according to data from the Mechanical Traction Tax of June 2011).

Due to the importance of this way of transport, the company MUVING has been implanted in the city recently. With a system similar to the one explained above for shared bicycles, this is a motor sharing service in which, through a mobile application, it connects you with the nearest motorcycle. The main innovation of this system and that makes it interesting in this study is that it is a shared vehicle system by electric motorcycle. So it is a clean and silent vehicle, without emissions and without noise pollution.

In the city of Granada this service is not having special relevance, although there is also a large fleet (around 50 electric motorcycles to share) compared to the push that is occurring in other cities including Andalusia as Malaga (164 units) and Cádiz (100 units), cities that also went through this process of sowing and testing. In any case, the data of average travel times per use is around 12-13 minutes, according to sources from the company.

Therefore, it is still early to have more data in Granada.

Illustration 18: Corporate image of the Muving e-scooter shared vehicle system. Source: Muving

2.2.7. A NEW TRAM IN GRANADA: METROPOLITANO

The last public transport system that has been added to the public transport offer of the metropolitan area of Granada has been the Tram, inaugurated in September 2017.

The *Metropolitano de Granada* is a tram service that provides services to the city of Granada and its metropolitan area, it is managed by the Ministry of Development and Housing through the Public Works Agency of the Junta de Andalucía. The main data are summarized in the following table.

DEMAND	
Population served (500 meters from a station):	133.636 inhabitants.
Demand estimate for the first year:	11 million users.
Estimation of demand in the third year:	13 million users.
ROUTE	
Total length:	16 Kilometers
Layout:	83% surface and 17% underground
Number of stations:	26 (23 on surface and 3 underground)
Average distance between stops:	600 meters
SPEED AND TIMES	
Speed-trains:	70 km / hour of maximum speed and 20.6 km / hour of average or commercial speed (including stop at stations).

Time travel between head and finish (Albolote - Armilla):	47 minutos.
TRAIN FLEET	
Fleet of trains:	70 km / hour of maximum speed and 15 units of the URBOS III of CAF
Mobile material:	2.65 m wide and 32.33 m long with a capacity of 221 seats (54 seats).
Track width:	1435 mm

Table 10: Metropolitan Granada technical information. Source: Metropolitan Granada. 2017

Environmental data

The metropolitan expects to remove from circulation a total of 8000 vehicles per day, which means a reduction in CO2 emissions of 3234 tons / year.

Infrastructure

The infrastructure connects the main places of interest of the metropolitan area through a total distance of 16 kilometers, with 26 stops and 3 stations; the intermediate average separation is 640 meters. The route allows access to the main points of interest of the city of Granada and its metropolitan area. It drives along the towns of Albolote, Maracena, Granada and Armilla. The Metropolitan cross the city from north to south.The duration of the trip is 22 minutes between Albolote and La Caleta, and 26 minutes from La Caleta to the stop in Armilla.

Illustration 19: Corporate image of the Metropolitan of Granada. Source: Metropolitano de Granad

Intermodality

This new mode of transport will contribute to improve urban mobility, structuring the north-south axis of the metropolitan area, which has experienced the greatest population growth in the last decade.

Intermodality is a key element in the infrastructure. From the design phase it was important the connection with the existing public transport network, both urban and intercity buses, as well as with the taxi and the train. It also improves the interaction with private mobility modes, the car and the bicycle.

The bus station has its own stop making easy the access to the city center and other places of interest for travelers, from the province of Granada, as well as from the rest of Andalusia and Spain.

In the following scheme we can see the distribution of stops, their name and different intermodality connection offered by each one.

Illustration 20: Scheme of stops and information of the metropolitan line. Source: Metropolitano de Granada

The area of the train station - Avenida de Andaluces and the university campus - is an important area where, in addition to placing a stop, the space has been redistributed because in the future high speed train will arrive to this station, and it will be an important point of access to the city.

The situation of a Park and Ride parking Juncaril station, in the municipality of Albolote, will allow access from the private vehicle to the Metropolitan; this one also includes parking for bicycles.

First three months

The service began on September 21th of 2017, so there are data of passengers transported until December 31st, corresponding therefore to the first 3 months. During this period it has transported a total of 2,603,683 travelers, which suppose a daily average of 26600 travelers/day, it is close to the

estimated demand for the first year of 30000 daily travelers. Therefore, there has been a good acceptance.

It was in the month of December of 2017 when the Metropolitan reached the 900.000 users, which means an average working day of 31138 travelers. 71% of trips are concentrated on weekdays, which show that the main reasons for travel are work and studies. Finally, 88% of travels on the railroad correspond to the Single ticket card of the Transport Consortium of Granada, encouraging the use of it as a multimodal payment system

2.3 CHARACTERISTICS OF TRANSPORT NETWORKS

The basic aspects of the urban and metropolitan transport lines of Granada are described below. The length of bus lines refers to the sum of the lengths between the line headers, adding the round trip. When several lines share part of the route, that section is counted as many times as lines pass through it. The same happens in the stop-lines indicator, when there are bus stops where different lines come together, they are counted once per line (Source: Observatorio de la Movilidad Metropolitana OMM, data for 2015).

Nº Lines		Length lines(km)		Average length(km)		Veh-km(millions)	
Urban	Metropolitan	Urban	Metropolitan	Urban	Metropolitan	Urban	Metropolitan
31	60	340	1.523	11	25,4	7,2	7,9

Table 11: Characteristics of lines buses metropolitan urban and interurban buses. Source: OMM 2015

These data show how the number of lines has been increasing in the last 5 years, 13% in the case of urban transport, and 3% in the metropolitan case.

If we compare the data of average length with the average values of the different metropolitan areas of Spain, it is indicated that the average length of the lines is 17 km by urban bus, 6 km more than the case of Granada, so, the routes present shorter lengths than in other Spanish cities. There is also a big difference between the average metropolitan lengths of 56 km, compared to the case of the metropolitan area of Granada, of 25.4 km, which gives an idea of the conformation of this metropolitan area with a reduced extension.

Finally, analyzing the vehicle-km, in the urban case the results are very similar to 2010. In the metropolitan case, it has been increased from an offer of 6.5 million veh-km in 2010 to 7.9 million veh-km in 2015, a rise of 20% in expeditions, mainly based on the work of the Metropolitan Transport Consortium of Granada, which through agreements with the operators, has increased the offer with new shipments, as well as the start-up of special extraordinary services (night services, etc.),that shows the advantage and benefits generated by the public transport authority and the promotion of public transport in the metropolitan area of Granada.

Material

In this section, we will define the mobile material that serves the fleets of both urban and interurban transport (within the metropolitan area). In this section appears data about the size of the fleets and their average age.

Fleet(number)		Average age vehicles (years)	
Urban bus	Interurban bus	Urban bus	Interurban bus
187	122	9,3	7,5

Table 12: Characteristics of the fleet. Source: Observatorio de la Movilidad Metropolitana OMM 2015

The size of the fleet is significant from the frequency level of a public transport service. Thus, while the urban transport of Granada is provided with 187 vehicles for 31 lines (an average of 6 vehicles per line), in the metropolitan transport only requires 122 vehicles for 60 lines, which is an average of 2 vehicles per line, which offers a lower frequency.

If we analyze the average ages of the fleet, and we compare it with the results of the year 2010 (when the average ages were 7 years in urban bus and 7.2 in interurban bus according to OMM 2010), there is an aging, especially in the urban case, that means that employing a superior fleet, the cost of its renewal is also greater. In the metropolitan case an adequate renovation is observed, with the same average age

Quality of service

One of the factors that can most influence to favor the use of public transport is the quality of public transport. Improving the quality of public transport services is essential so that it can be competitive with the private vehicle, thus helping to achieve more sustainable mobility. In this section several we introduced some indicators that can give us information about the quality of collective public transport services in the metropolitan area of Granada, such as: commercial speed, average passage interval, hourly amplitude, accessibility for PMR. (Source: Observatorio de la Movilidad metropolitana OMM)).

- The **total travel time** are travel times and waiting time. Travel time can be evaluated through the average speed of the vehicles and the waiting time through the interval of time that passes between the passage of one service and the next.
- The time interval between two services determines the waiting time of the traveler, being associated with a worse perception and greater penalty.

Average commercial speed (km/h)		Time interval (min)		Open time (hours)		Accessibility PMR (%)		% population less than 300m from a stop	
Urban	Metropolitan	Urban	Metropolitan	Urban	Metropolitan	Urban	Metropolitan	Urban	Metropolitan
12,2	21	11	20	17	16	85	43	96	93

Table 13: Quality of the service. Source: Observatorio de la Movilidad Metropolitana OMM 2015

The average of commercial speeds in urban public transport ranges between 12 and 17 km /h, so in the case of Granada has a low value compared to other capitals. At the interurban level, the values oscillate between 15 and 35 km /h, in that case, the metropolitan area of Granada has an intermediate value.

The average intervals, which indicate the frequency of the service, present intermediate values for both urban and metropolitan, without changes in the last 5 years.

Both in the case of Granada and in the metropolitan area have enough hours of service, with 16-17 hours of service.

The percentages of accessibility show how the urban fleet is much better adapted, almost the entire fleet, compared to the metropolitan fleet, where only 43% of the fleet is adapted for person with reduce mobility.

Finally, the coverage of the public transport network, both urban and metropolitan is excellent, where more than 93% of the population is located less than 300 m from a stop.

Intelligent Transportation Systems

Intelligent Transportation Systems provide clear benefits in terms of efficiency, sustainability and transport safety. That is why these new technologies are increasingly applied in the field of management and operation of public transport. Two of the ITS systems are, on the one hand, the operational assistance systems (SAE), which allow the real-time location of transport vehicles, and on the other hand, intelligent ticketing (or e- ticketing), which uses smart cards that allow the integration of different operators and modes of transportation.

Bus stops with real-time information are other systems related to the reliability of public transport. Although the information in real time improve the perception that the user has about the transport system, the installation of panels with information about waiting time at stops is still a measure of low application (*Source: Observatorio de la Movilidad Urbana OMM*).

SAE		% Fleet with e-ticketing		% stops with real-time information	
Urban	Metropolitan	Urban	Metropolitan	Urban	Metropolitan
100%	29%	100%	100%	5%	0%

Table 14: Coverture of ITS in the fleet. Source: Observatorio de la Movilidad Metropolitana OMM 2015

The urban public transport of Granada has excellent levels of technology. 100% of the fleet has SAE coverage and e-ticketing. In the case of metropolitan public transport, SAE coverage is still insufficient (only 29%) while the entire fleet does have an e-ticketing system. On the other hand, the percentage of stops with information in real time is minimal, only 5% in urban stops and no intercity stop.

2.4 SUPPORT OF PUBLIC TRANSPORT SYSTEMS

In this section of the BASELINE STUDY we will try to describe what the support system is for each of the public transport systems that currently exist in the city of Granada and its metropolitan area.

- ***Metropolitan transport of Granada***

The Consortium of Metropolitan Transport of the area of Granada is made up of 45% by the Junta de Andalucía, 5% by the Diputación de Granada and the remaining 50% by the municipalities that form it based on its demography.

In the concession systems, there is a public transport operator that manages and exploits a whole series of services and routes, which set a rate which in case of being the operator of the service, is the fare received by travelers income.

The difference with the metropolitan case, is that in this case, better rates are offered to the user, seeking to promote it, and the difference in revenue between the rates established by the Consortium and the reference rate assigned to the operator, is paid by the user Consortium, whose budget has already commented on the distribution established among all the administrations that comprise it.

In addition to this, the Transport Consortium invest in a series of additional costs such as the implementation and maintenance of stops, purchase and supply of canceling machines to operators, a centralized call center with all the information of all the routes of the metropolitan area and a long etcetera (see: http://www.ctagr.com).

The existing information of the budget of the Transport Consortium of Granada in recent years has been compiled, according to data that appear on the website of this public transport authority. The following table shows the annual amounts as well as the variation suffered over the year or previous years (there is a gap for the years 2015 and 2016):

Year	Budget	Variation
2009	12.951.517,31 €	-
2010	14.313.899,98 €	10,5%
2011	14.271.714,57 €	-0,3%
2012	13.468.647,00 €	-5,6%
2013	13.501.642,99 €	0,2%
2014	12.357.015,32 €	-8,5%
2015	12.880.380,99 €	4,2%
2016	12.880.380,99 €	0,0%
2017	12.945.106,52 €	0,5%
2018	13.036.344,00 €	0,7%

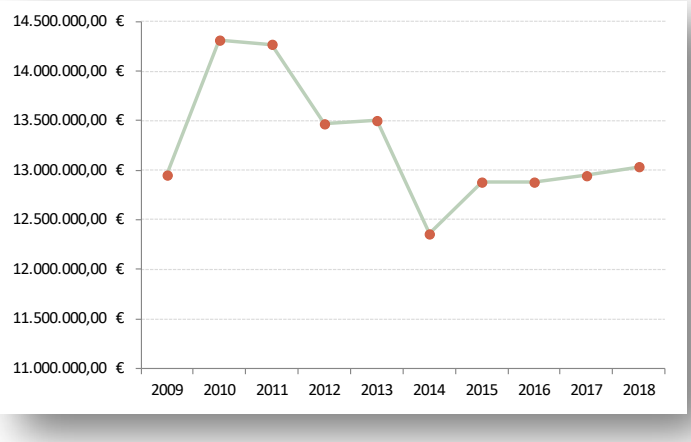


Table 15: Budget of CTAGr 2009 - 2018. Source: CTAGr

The budget of the Consortium of Transport of Granada has fluctuated in the last 10 years between 12.3 and 14.3 million euros, during 2010 reached its maximum. After that it suffered a continuous decline until 2014, after this year it has been presenting small increases to the 13 million euros for this year 2018.

- ***Tram (Metropolitano de Granada)***

Once again the figure of the administrative concession has been reproduced, in which a transport operator has been awarded the concession for the exploitation of this tram line during the next 10 years.

However, the cost of the investment has come from public administration. 83% of the financing of the Metropolitan of Granada come from the Junta de Andalucía and the remaining 17% is contributed by the municipalities based on their demographic weight, so the municipality of Granada assumes 80% of that contribution municipal. Within the regional contribution are included the contribution of the General State Administration.

3. MAIN ACTORS OF THE PUBLIC TRANSPORTATION OF PASSENGERS IN THE METROPOLITAN AREA OF GRANADA

Between the actors operating in the urban and interurban mobility of the metropolitan area of Granada there are public and private companies. Then, there is a brief description of them:

- **Public:**
  - Ministry of development
  - Junta de Andalucía
  - Metropolitan Transport Consortium of the Granada Area
  - Granada City Council and the rest of the municipalities that form the metropolitan area
  - Diputación de Granada

These actors have been selected because they are identified as the administrations that participate most actively in the search for sustainable urban and interurban mobility. It must also be take into account that these are the main investors in the main transport infrastructures in the city of Granada and the metropolitan area.

Within the Granada City Council, one of the main actors in relation to transport management and mobility is the Center for Integral Management of Mobility, belonging to the Delegation for Citizen Protection and Mobility (www.movilidadgranada.com).

- **Private:**
  - Rober Transportation
  - Grupo Avanza
  - Gremial of the taxi of Granada
  - Association of metropolitan taxis of Granada
  - Muving
  - Obike
  - OFO
  - Associations of the bicycle in Granada

Transportes Rober is the current concessionaire of the Urban Transport in the city of Granada, therefore they are the responsible that it works properly and of the technological improvements and sustainability measures that must be applied in the future. Grupo Avanza is one of the most important transport companies in the region and has a large number of intercity transport concessions, it is very

important in the area and also it is the new winner of the exploitation concession of the Tram of Granada. We must also mention the association of the Taxi of Granada, as an association with the ability to influence the mobility of the city, which is joined by the Association of metropolitan taxis of Granada, recently created, which arose with the idea of solving the demand of Taxis in the metropolitan area. Three new players have appeared in recent months, these are the companies Muving, Ofo, and Obike, two pioneering systems in sustainable mobility through mobile applications. For its part, among others, Biciescuela Granada, is an association that promotes the use of bicycles in the city as a way of transport.

Center for Integral Management of Mobility

The CGIM was inaugurated in March 2007 with the objective of managing all aspects related to mobility in the city of Granada.

The general objectives of the CGIM focus on:

- Information to the Citizen
- Planning and management of the Road Network and Transport Systems to optimize the modal split
- Protection of most vulnerable areas
- Protection and promotion of the use of Public Transport to improve the Sustainable Mobility
- Minimization of delays and regularization of speeds on journeys
- Improvement of Road Safety.

To fulfill those objectives, the tasks on which the CGIM function revolves are summarized in:

- Information: radio, electronic information panels, web page
- Attention to the citizen: reports on the operation of the traffic light installations, telephone information to the citizen, etc.
- Traffic lights centralization and traffic control: CCTV and magnetic detectors, traffic lights adjustments, incident announcements, coordination and collaboration with the Local Police
- Control of access to restricted areas
- Bus lane control: definition of bus lanes, management of cameras, etc.
- Control of tourist zone: cameras of the zone, collaboration with Local Police
- Traffic engineering: design of crossings,monitoring works, projects, traffic simulations, data collection, Road Safety Plans

The following figure shows the CGIM website, in which it appears all the information relating to Traffic, Restricted Zones, Recommended itineraries, Public Transport, Parking, Road and bicycle education.

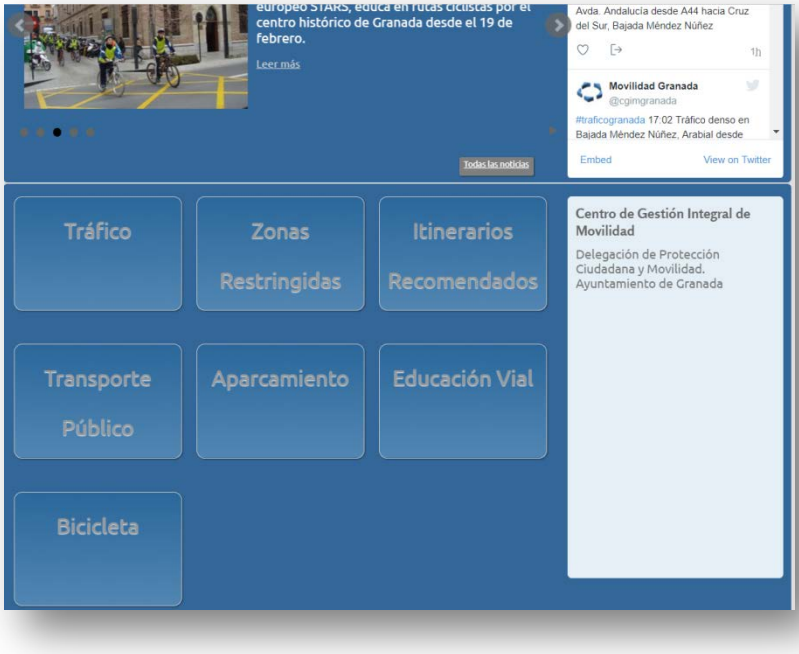


Illustration 22: View of the CGIM website that collects different sources and data. Source: CGIM Granada

4. NATIONAL AND REGIONAL POLICY: INITIATIVES FOR SUSTAINABLE PUBLIC TRANSPORT

The main strategies, national and regional plans that set the policy to follow with initiatives for a sustainable public transport are summarized in:

- Innovation Plan for transport and infrastructure 2017-2020 (National)
- Land Use Planning of Andalusia (POTA) (Autonomic)
- Plan PISTA 2020 Infrastructure Plan for the Sustainability of Transport (Autonomic)
- Andalusian bicycle plan 2014 - 2020 (Autonomic)
- Andalusian Strategy for Urban Sustainability (Autonomic)
- Andalusian Energy Strategy 2020 (Autonomic)
- Program of Agreements 1389A1 and 1389A2 of the Diputación de Granada (regional)
- Agenda 21 Local of Granada (Local)

- **Innovation Plan for transport and infrastructure 2017-2020**

It is a Plan developed by the Ministry of Public Works (*MInisterio de Fomento*). The objectives of the Innovation Plan for Transport and Infrastructure are the following:

- Increase the **incorporation of technology** to people daily life, encouraging innovation in security, accessibility and sustainability.
- Increase the **economic and social profitability of investments**, increasing the efficiency and effectiveness of public and private investment.
- Make **Spain a more attractive place for companies** and for innovative investments in the field of mobility and transport.
- **Increase the investment and technology** from outside our borders and consolidate Spain's international leadership.

This document is based on establishing the main strategies and guidelines to follow, focused on new technologies and economic and social efficiency.

- **Land Use Planning of Andalucía (POTA)**

It is a document developed by the Junta de Andalucía from the Regional Ministry of Environment and Planning. The POTA clearly establishes that public administrations are obliged to "**promote a multimodal and integral transportation** system based on public transport services and the promotion of journeys in non-motorized ways (by bicycle, on foot), in front of the automobile. The transport system will contribute to the reduction of unnecessary mobility. It will try to get the balance between the rural world and the urban world. Public Transport will contribute to the development of the system of medium-sized cities that avoid the phenomena of urban congestion. The transportation system must be universal and public. It must offer service to all people, regardless of their geographical location, purchasing power, mobility capacity, gender, age, race and culture."

- **Plan PISTA 2020 Infrastructure Plan for the Sustainability of Transport**

It is a Plan developed by the Junta de Andalucía through the Ministry of Development and Housing, Which stablishes the regional policies on infrastructure. The objectives of the PISTA are the following:

- Articulate the territory of Andalusia, internally and externally, through the Intermodal System of Transport and Communications.
- Increase the participation of public transport, specifically railways, of passengers and goods.
- Go forward in the constitution of an environmentally sustainable transport system.
- Enhance the effects of infrastructure on regional development.
- Adapt the transport system to the regional territory in compatible way with the particular characteristics of each city and Mediterranean urbanism.
- Improve the quality and safety of transport.

In general, it develops a guide to improve the infrastructure in Andalusia with the aim of boosting public transport under criteria of efficiency.

- **Andalusian Bicycle Plan 2014-2020**

The Junta the Andalucía has drafted the main and innovative regional policies in terms of mobility by bicycle in the Andalusian Bicycle Plan (2014-2020); its objectives are the promotion of urban and metropolitan travel by bicycle through the creation of cyclist infrastructure networks. It aims are to achieve 15% of the modal distribution by bicycle for urban areas and 10% in metropolitan areas.

It allows giving support and impulse to a transport mode of difficult implantation, with actions, cycling networks and measures that encourage it.

- **Andalusian Strategy for Urban Sustainability**

It has been also drafted by the Ministry of Environment and Territory Planning of the Junta de Andalucía.

It includes regional policies on mobility, the Andalusian Urban Sustainability Strategy sets clear strategic lines: "i) to make mobility and transport decisive factors for quality of life, social cohesion and progress , ii)to improve the energy efficiency of transport reducing energy consumption and the emissions, and iii) avoid the expansion of urban spaces which depend on the automobile, slowing down disorderly urban planning, considering public transport as a basic service in the new urban developments and not allowing new developments without a planned accessibility in public transport".

It is an autonomic policy that combines transport and the environment, energy saving and sustainability.

- **Andalusian Energy Strategy 2020**

This Strategy has been defined by the Andalusian Energy Agency. It includes the main lines of Andalusian energy policy in the 2020 horizon. This new planning framework continues to move towards a low-carbon, sufficient, intelligent and quality energy model in line with European guidelines.

- **Program of Agreements 1389A1 and 1389A2 of the Diputación de Granada**

Diputación de Granada has drawn up a program of agreements, which include agreements 1389A1 and 1389A2, which are managed by the Granada Energy Agency. They are programs for the promotion of electric vehicles and to promote non polluting vehicles. The objective is to improve vehicle fleets: one of them seeks to improve the public fleet, while the second seeks to improve the fleet of private vehicles through incentives. It is based on an ordinance that works through taxes.

- 1389A1. Sustainable urban mobility plan and Mobility Ordinance Covenant of Mayors

The Tax on Vehicles of Mechanical Traction (IVTM) is a direct tax that taxes the ownership of vehicles of this nature, apt to circulate on public roads, whatever their class and category. The parameter that is considered to fix the tariffs is the concept of "Fiscal Power", numerical parameter that the Ministry of Economy defines for each vehicle, based on its brand, power, benefits among other factors.

The program focuses on incentivizing with a bonus of this tax. The objective of the "bonus" is to encourage the acquisition of emission-free vehicles by reducing taxes on mechanical traction vehicles (IVTM) in order to reduce the emissions produced by the combustion of vehicles.

The bonus defined in the "Fiscal Ordinance for the promotion of sustainable mobility" of the Deputation of Granada would be summarized in:

Type of vehicle	Bonus on IVTM	Period
Vehicles that are not internal combustion with zero pollutant incidence (electric, fuel cell and solar)	75%	All the life of the vehicle
Hybrid vehicles (electric motor - internal combustion)	75%	5 years from first enrollment
Vehicles liquefied petroleum gas (LPG) or compressed natural gas (CNG)	50%	5 years
Vehicles "bifuel"	40%	3 years
Fuels not derived from fossil fuels (biogas, methane, methanol)	75%	5 years
Energy-efficient internal combustion vehicles A and B	From 40% to 5%	6 years

Table 16: Bonus included in the fiscal ordinance for the promotion of sustainable mobility

- 1389A2. Infrastructures for the promotion of electric vehicles and car sharing. Electric Bicycles/motorcycles.

This program aims to encourage the change of mobility of its citizens towards more sustainable modes, through the implementation of charging points for electric vehicles and meeting points for the use of car sharing.

Electric cars still have costs difficult to assimilate by municipalities except through renting schemes or similar. In this way, this program proposes to acquire electric bicycles or motorcycles for the use of municipal technicians within the municipality, as well as an exemplary measure for the citizens.

- **Agenda 21 Local of Granada**

It has a local character and it was developed by the own city council of Granada, the objectives of Agenda 21 in matter of mobility are based in the recovery of the urban transport and the diminution of the private motorized transport. They try to foment cleaner modes of transport. To achieve these objectives, the following actions will be carried out:

- Impulse of the Transport Consortium of the Metropolitan Area of Granada
- Support in the implementation of the Tram
- Integrated Bicycle Transportation System

- Extension of the bike path
- Optimized transport on demand with taxi
- Set up new collective transport lines in the center

- **Other documents, strategies and plans**

There are other complementary documents, in addition to the documents and previous plans, that give us some information of the political keys of sustainable mobility at all levels (European, national, regional and local), such as:

- Green Paper "Towards a new culture of urban mobility". It is a Document of the year 2007, which was already beginning to mark the cultural change that should be introduced in the urban areas searching and improving efficient and sustainable mobility.
- Urban Mobility Action Plan of the EU (2009). During the period 2009 - 2012 it was proposed the implementation of 20 actions at European level. One of the measures proposed to accelerate the generalization of sustainable urban mobility plans, was based on 2 points: provide support to local authorities in the development of PMUS, and exchange of good practices and educational activities for professionals in urban mobility .
- White Paper: it is looking forward a single European transport area: for a competitive and sustainable transport policy (2011)
- Spanish Sustainable Mobility Strategy (2009). It emerges as a national reference framework that integrates the main policies that facilitate sustainable mobility and low carbon. It is set in 48 structured measures in five areas. Among those measures, the promotion of alternative mobility to the private vehicle and the use of more sustainable modes.
- First draft of the Sustainable Mobility Law of Andalusia (2014). It establishes measures to promote the use of public transport and encourage non-motorized mobility. This law fights against the dispersed and expensive city, where the private vehicle occupies a position of total predominance. The new law will promote the use of public transport; encourage non-motorized mobility, it also includes measures to rationalize investments in infrastructure and services.

Questions to involved actors

With all the information collected and analyzed, a questionnaire has been sent to the actors involved in the process of improvement and support to public transport. It has a series of questions which allow us to sketch the current situation in terms of national and regional policies and their work.

4.1 WHAT CHALLENGES DO PUBLIC TRANSPORTATION SERVICES FACE?

The challenges public passenger transport faces are very varied and respond to different causes:

1. The recent economic crisis has reduced investments in sustainable mobility in cities
2. The dispersion of urban centers, due the increase of residential areas in the periphery of cities and in the municipalities of metropolitan areas make it difficult for citizens to access work areas by public transport, increasing the use of private vehicles.
3. There is a weakness in the public transport service, affected by the vicious circle that involves competition with the private vehicle. In addition, the existence of numerous taxi services and individuals to meet the demand in schedules not served by public transport services. Therefore, public transport only attends to captive demand and is presented as uncompetitive compared to the automobile.

4.2 WHAT TYPES OF SUPPORTS ARE AVAILABLE TO INCREASE THE USE OF PUBLIC SYSTEMS?

The operating companies consider that there is support for the user but there is no for the operating companies themselves. The user can be more or less subsidized in the rate, but that does not result in the quality of the service, because it does not reach the company that exploits it.

In many cases, the user would be willing to pay a little more if the service meets their needs, like in rail transport, where different categories formulas are proposed (tourist, tourist plus, preferred) or even payments by use.

Therefore, if resources are limited to encourage the use of public transport, operators propose that it is better to invest in service than in tariff, or at least keeps a balance.

It is very important to get promotion support, coordinated between municipalities and Administration (Consortium in metropolitan area), as well as the introduction of new technologies in the offer, and the adaptation of the concession to the new reality.

One of the objectives is to set off the services to the demand, to be more competitive. In the case of the metropolitan area of Granada, this could be achieved by creating reserved platforms for public transport and improving intermodality.

It should also improve the information on the real needs of the population to adapt the services provided. Finally, and it is also very important to raise the awareness of the population about the advantages of using public transport.

5. SWOT ANALYSIS

In this chapter we will discuss the situation of the Public Transport Service. We will be carried out a SWOT analysis to analyze the different Weaknesses, Threats, Strengths and Opportunities that Public Transport has in the metropolitan area of Granada.

The SWOT analysis model is a mechanism that helps companies and public organizations analyze themselves the advantages and disadvantages they have and, consequently, carry out the relevant actions to make improvements in them.

The opportunities and threats will be analyzed from an external point of view to the service, while the strengths and weaknesses of the system of this type of public service are studied analyzing the internal situation of the same.

Next, it is shown the SWOT Analysis of the Public Transport Service, with the purpose of obtaining information on the public transport service of the city of Granada and its metropolitan area, which can be used to set specific objectives

STRENGTHS	***OPPORTUNITIES***
▪ New transport system that support intermodal travels ▪ It has just been inaugurated a new public transport system (Metropolitan) ▪ The Metropolitan Transportation Consortium has more passengers each year ▪ Integrated card ▪ Different types of rates and subscriptions ▪ The implementation of passenger transport systems that improve intermodal exchange	▪ New generations of users more aware of the environment. ▪ The small size of the city of Granada. ▪ Conservation of the environment ▪ New electric vehicles ▪ Large population of young people in the city. ▪ Development and increase in the use of Apps for the management and use of Public Transport ▪ The expansion of more sustainable public transport lines. ▪
WEAKNESSES	***THREATS***
▪ There is not a suitable network of bike lanes ▪ Displeased citizen with the new LAC line ▪ Disseminated cities in the metropolitan area ▪ Long travel times ▪ There is few Bus/VAO lane ▪ Current environmental problems of poor air quality in the city of Granada due to the pressure of the private motorized mobility of the urban agglomeration ▪ The configuration of the transport network, it is conditioned by the territorial characterization of the metropolitan area of Granada. ▪ The configuration of the metropolitan area of Granada is the most dispersed of Andalusia, integrated by the city of Granada and 31 adjacent municipalities.	▪ Economic slowdown ▪ Citizens are moving to the outskirts of cities for the price of housing ▪ Difficulties and delays in the integration of TP services ▪ Progressive deterioration of air quality linked mainly to the predominance of private transport over public transport

Table 17: Analysis SWOT. Source: Own elaboration

6. ANALYSIS AND IDENTIFICATION OF THE MAIN EXPERIENCES AND LESSONS LEARNED

An added value of this study of the province of Granada, and specifically of the metropolitan area, is the identification and knowledge of good practices in public transport that have been implemented in recent years. All this knowledge has to be used to implement those good practices for their use in their own territories.

It includes a sort of good practices selected from the province of Granada, and a selection of other good practices selected from other OptiTrans regions.

6.1 EVALUATION OF GOOD PRACTICES SELECTED

There are two good practices that highlights during the last years in the metropolitan area of Granada.

- Granada Comparte (Granada Sharing)
- Moovit

Granada Comparte

The Granada Comparte project is based on the concept of car sharing. It is a project promoted by the Provincial Energy Agency of Granada and the Diputación de Granada, and co-financed by the Andalusian Energy Agency and the Institute for Energy Diversification and Saving (IDAE), through a program of subsidy for the sustainable energy development of Andalusia, and within the framework of the 2008-2012 Action Plan of the Energy Saving and Efficiency Strategy in Spain (PAE4 +).

The car-sharing system uses the web www.granadacomparte.com as a meeting point, search and travel proposal. Anyone who wants to share a trip , either by proposing their own car, or looking for someone who already does, go to this website where either "you create trip" or "you travel".

Currently there are a total of 250 registered members, who offer or use this service.

Through a search tool it indicates the municipalities of origin and destination of travel (in each case, city, place and address), allowing also filter by "look for people to carry "," look for people to take you", or both.

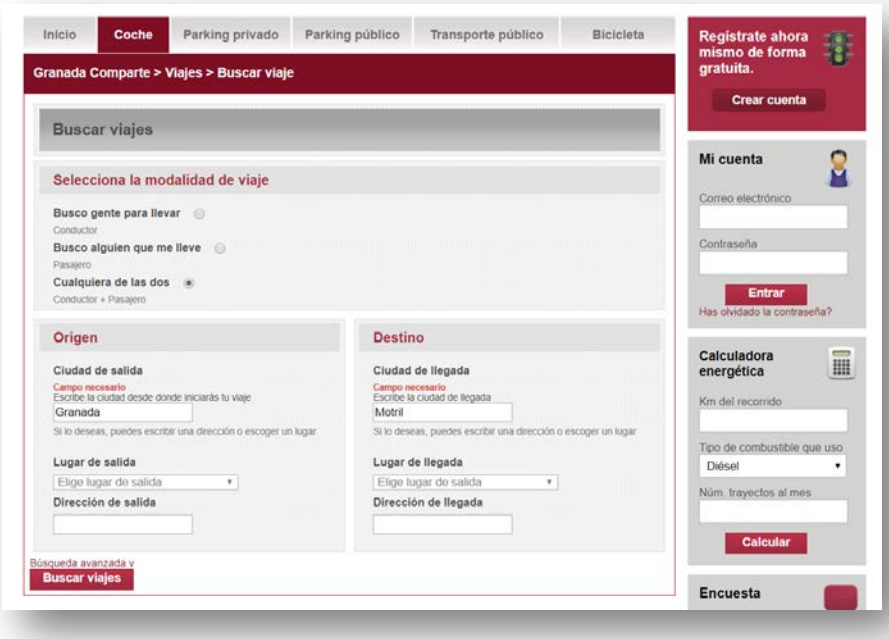


Illustration 21: Search tool for travelling searching. Fuente: www.granadacomparte.com

It is not a business for those registered in the system, as it can happen in other systems like blablacar, shared vehicles that are actually offered, are people who make their trips with certain frequency with recurring motive (jobs, studies) and seeks the use of a car that has only one occupant for economic, energy and environmental savings.

Thus, for each trip, information is provided about the driver, the reason for the trip, frequency, schedules, etc. which allows other interested people to have the appropriate information.

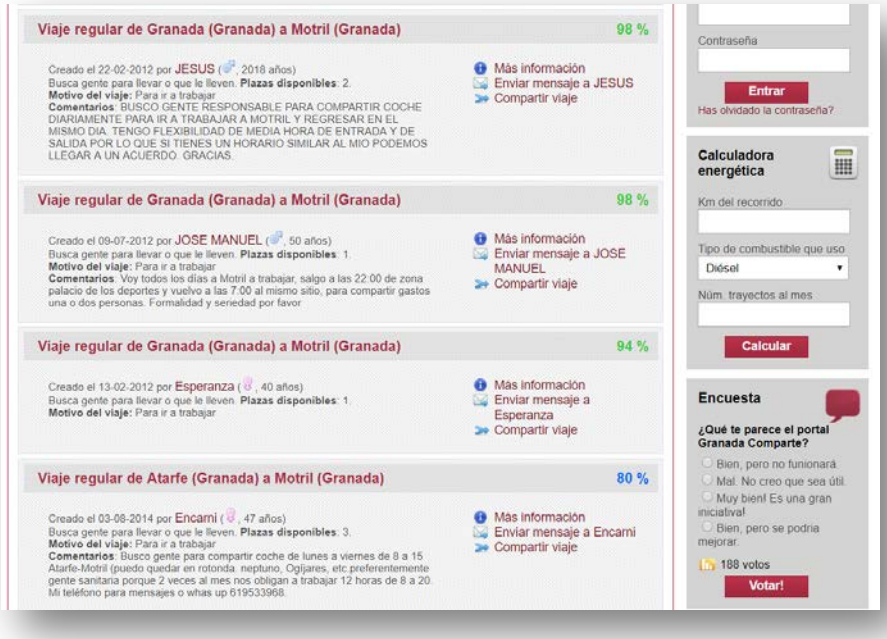


Illustration 22: Information of searching. Source: www.granadacomparte.com

How it works throughout the territory of the province of Granada, it is a good practice both at the metropolitan level and in the rest of the rural area of the province.

Moovit

Moovit is an App that facilitates and improves public transport management. It is a free App, with information from more than 1,500 cities in 78 countries, including the city of Granada. This App has already reached more than one million downloads on the mobile. It is available free for iOS and Android, so it allows getting data of train, bus, tram and metro. People who have this app on their mobile with GPS transmit real-time information about traffic conditions, which can help others.

The key to its success is that it allows travelers and public transport users to share data about transportation or about their own travel experience such as alternatives routes, delays, traffic jams, etc.

Moovit offers to their users the best possible combination, as well as other alternatives, which are shown on a map, taking into account the current place and time.

In addition, it has a huge database, which makes it a complete management and planning tool. For example, within its menu, you can locate the Moovit public transport index. It works easily. First, we select the city, and the App displays historical and statistical data of average travel time, waiting times, average travel distance by public transport, average number of transfers, as well as the Average walking distance.

Illustration 23: Example of information of time travel in Granada. Source: Moovit

Moovit considers itself the world's largest transport data and Statistics Company. It offers a sort of tools to help cities and transport operators plan for the future of urban mobility. The main tools are:

- Urban mobility statistics
- Mobility surveys
- Transit data study: A tool for transport data management with an easy-to-use graphical interface that allows you to create, edit and manage public transport information. Based on the global GTFS standard, the data of stops, stations, lines, routes, trips, and schedules, can be accessed and used immediately by any website or external application.
- Bus locator in real time
- Trip Planner: A service that allows obtaining public transport directions between locations.

6.2 OTHER GOOD PRACTICES SELECTED FROM OTHER OPTITRANS REGIONS

Taking advantage of the synergies of a European project with different regions developing their own baseline studies of mobility, some information has been exchanged between partners. Some of the main good practices carried out in these regions have been selected due to its possible adaptation in the metropolitan area of Granada:

- MyCicero. Abruzzo (Italia)
- CityMobil2. Trikala (Grecia)
- Building of cycling paths. Tartu (Estonia

MyCicero. Abruzzo

MyCicero project began with the objective of improving the quality of public transport in some regions of Italy. It was especially indicated to avoid the evasion of the payment of the ticket. MyCicero is a platform that allows:

1. Find the stops and know the schedules: it has a stop search as well as real-time information on possible delays and arrival times.

2. Search for travel solutions using public transport: the application calculates the route and offers useful information such as waiting times, changes, position on the map, walking routes, etc.

3. Purchase of travel tickets: it is possible to buy tickets for a specific trip directly from the app, it can be viewed on screen to be shown to the reviewer.

4. Renew the subscriptions: it is possible to do it in a simple way introducing the user data and credit card number, renewing both urban and metropolitan subscriptions.

In the Abruzzo region there was no electronic payment before the appearance of MyCicero system for its use in public transport. This system has been developed by a private company and the App has been implemented and used in the Abruzzo region since 2013.

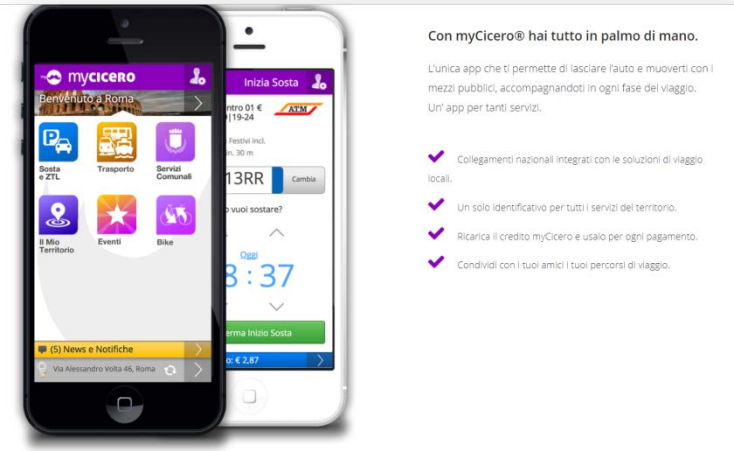


Illustration 24: App MyCicero. Source www.mycicero.it

It is a good practice of success, the possibility of paying easily from the smartphone was designed to encourage the use of public transport. The objective of this proposal has been achieved, in recent years there has been an increase in the use of urban public transport.

The main difficulties at the beginning were that users had to learn and change their travel habits (purchase of transport title, validation, renewal of subscriptions, etc.), which generated many doubts and queries.

CityMobil2

CityMobil2 is a research project, co-funded by the European Commission, which includes a total of 45 participants, among which are research organizations, universities, and industries. It started in 2012 and ended in August 2016, it was coordinated by the universities of Rome and Florence.

This project has shown how autonomous vehicles can be used in different concepts (partly autonomous shared car, cybercars, BRT systems), which can help in more sustainable urban mobility. The objective has been the implementation of an autonomous public transport system, in which 12 countries participated. Each has investigated and proposed different beneficial transport services. The seven best cases were selected. At the same time, the project developed two teams of autonomous road vehicle systems and distributed them among the seven cities for demonstrations between 3 and 6 months.

With these objectives, CityMobil2 developed a pilot platform for autonomous road vehicle systems, implemented in different urban environments in Europe. These autonomous transport systems have vehicles without driver in public transport.

It is considered that they play a useful role in the combination of transport, because they can provide a good transport service (individual or collective) in areas of low demand that complements the main public transport network. A dozen local authorities were interested in being one of the five places to organize a 6-month demonstration. Everyone recognized the potential of autonomus vehicle as part of their public transportation network. Two fleets of six vehicles each were supplied for these demonstrations. The success of the project was that the project itself acquired the vehicles and put them at the disposal of the selected pilot points. One of the beneficiary cities of this project has been Trikala, a municipality of 81,000 inhabitants.

Illustration 25: Demonstration in the city of Trikala. Source: www.citymobil2.eu

The total budget was 15.5 million euros, with a contribution from the EU of 9.5 million euros.

The main success was to define the "safe way" to integrate autonomous vehicles in the urban road.

The project can be a good practice for other cities or regions, for the development of metropolitan areas with increases in mobility of residents and the need for a reduction in pollution.

Building of bicycle paths. Tartu (Estonia)

Tartu presents a compact territory and most destinations are easily accessible on foot or by bicycle. The percentage of pedestrians is very high at present (40% of trips), but the proportion of cyclists is quite small (approximately 3%). With the aim of increasing the percentage of light traffic and improving connections between neighborhoods and urban centers (including peripheral municipalities), it was decided to build new bicycle routes of at least 50-60 km. The planning of these routes was based on a logical network of bicycle lanes developed in all the main exit directions of the city.

The design of these roads was based on the daily routes that had previously been identified through a mobility survey process. In addition to the creation of these new bicycle routes, the existing roads were also repaired.

The cost of the project reached 10 million euros for the construction of all the works. This project began in October 2013 and it will finish in May 2018.

As a result of the project, the modal split of bicycle trips has grown to over 6% and continues to improve. For this success, it has been necessary to involve the citizens of the city of Tartu, cyclists, businessmen and representatives of the local government of the peripheral municipalities. There are many beneficiaries of the project citizens and resident from Tartu and municipalities of the periphery. Likewise, it is a good opportunity for improve tourist mobility.

7. CONCLUSIONS

Once the baseline study of the mobility of the metropolitan area of Granada has been developed, which has followed the established methodology defined in the OptiTrans project; we are able to establish the following conclusions that are extracted from this entire document:

- The metropolitan area of Granada has 32 municipalities, it covers an area of 830 km² (which is approximately 7% of the total area of the province of Granada) and a population of 0.53 million inhabitants (58% of the total the province). It represents the region with the greatest economic, social and mobility capacity in the province.
- The management of public transport in the metropolitan area of Granada is carried out by two important public agencies. At the municipal level, the city of Granada has the Center for Mobility Management, while the metropolitan area has a public transport authority called the Metropolitan Transport Consortium of the Granada Area. The existence of both organisms allows multiple studies, analyzes, sources and data on mobility and public transport in particular. They also offer wide and complete information to the user.
- The modal split shows an important mobility walking, both in the city of Granada and in the metropolitan area. The use of private vehicles in the city of Granada is lower than in other similar Spanish cities, thanks to a good network of alternative public transport systems. At the metropolitan level, this percentage is higher, so they should applied more measures to promote public transport. The bicycle is still in quite low percentages, both in the city (0.4%) and in the metropolitan area (2%), where there is no good cycling infrastructure. Finally, in the case of public transport, in the city of Granada the use is 20.3% and 13% in the metropolitan area.
- The capital of the metropolitan area has a wide range of alternative transportation systems, which allows less use of private vehicle in the city, such as: urban bus, High Capacity Line (LAC), metropolitan intercity bus, tram (Metropolitan), taxis, private and public bicycle and shared motorcycle.

- In Spain, and therefore in Granada, interurban public transport is regulated under the figure of administrative concessions, which allows, to a passenger transport operator, the operation of a series of services and routes exclusively to the successful bidder. Under this figure the service is provided at risk and venture of the private company, so that the financing is paid by the passenger transport operator. The existence of public authority in the metropolitan area of Granada allows subsidizing a series of additional routes and services, which are not very profitable but are socially necessary
- In the field of study, the main actors of public transport are divided between public agents (state administration, autonomic administration, public transportation authorities of Granada and local) and private agents, highlighting in this group the urban public transport company of Granada (Transportes Rober), interurban transport operators (Alsa and Avanza Group), the shared motorcycle company (Muving) and the bicycle sharing companies (Obike, OFO).

- There is a wide range of plans and strategies that regulate initiatives for sustainable public transport, at national, regional and local levels. They are focus on aspects of innovation, infrastructure, cycling, urban sustainability, energy efficiency and sustainable mobility

- Public transport services are still facing the economic crisis as well as the dispersion of urban centers, the increase of residential areas in the periphery and a cultural problem of the irrational use of private vehicles.

- Although there is a bonus in public transport, it is still necessary more promotion proposals with the introduction of new technologies. Transport services on demand should multiply, which would optimize the use and exploitation of public transport, improve travel times (which are now heavily penalized to attract travelers) and be completely competitive. Equally, the creation of reserved platforms and intermodality must be improved.

- Finally, it is necessary to promote carpooling measures, especially in points of great attraction of trips such as universities and in business, industrial and service parks

8. BIBLIOGRAPHY

Below, there is a summary table with the information collected to carry out this study.

THEME	INFORMATION	SOURCE
Socioeconomics	Socioeconomics Data	Observatorio de la Movilidad Metropolitana OMM 2015
	Economics sectors	Informe del Mercado de Trabajo en Granada en 2015. Ministerio de Empleo.
	Public Transport indicators	Informes Observatorio de la Movilidad Metropolitana OMM 2012-2015
	Roads investment	Anuario Ministerio de Fomento
	Modal split	Informes Observatorio de la Movilidad Metropolitana OMM. Plan de transporte metropolitano de Granada: Plan de Movilidad Sostenible.
Offer of Public Transport	Urban Transport	Autobuses Rober. Delegación de movilidad Ayuntamiento de Granada
	Interurban Transport	Consorcio de Transportes del Área Metropolitana de Granada
	Taxis	PMUS Granada
	Bycicle	PMUS Granada. Delegación de movilidad del Ayuntamiento de Granada. Obike. OFO
	Motorcycle	PMUS Granada. MUVING
	Underground	Metropolitano de Granada
National and Regional Politics to Promote Public Transport.		Plan de innovación para el transporte y las infraestructuras 2017-2020
		El Plan de Ordenación del Territorio de Andalucía (POTA)
		Plan PISTA 2020 Plan de Infraestructuras para la Sostenibilidad del Transporte
		Plan Andaluz de la bicicleta 2014-2020
		Estrategia Andaluza de Sostenibilidad Urbana.
		Estrategia Energética Andaluza 2020
		Agenda 21 Local de Granada

9. LIST OF INTERVIEWED ACTORS

Below, there is a list of the main actors interviewed during the development phase of this baseline study of the metropolitan area of Granada.

Organization	Interviewed person
Metropolitan Transport Consortium Granada Area	**Christian Muñoz Monge. Director Técnico y Gerente**
Portillo Avanza Group	**Rafael Durbán Carmona. Director Cercanías Andalucía**
Granada City Council	**Mª Dolores Trespando Corredera**
University of Granada	**Alejandro Grindlay**
Provincial Energy Agency of Granada. OptiTrans	**Gonzalo Esteban López**

BASELINE STUDY.

RURAL AREA (REST OF THE TERRITORY)

CONTENIDO

1. TERRITORIAL CHARACTERISTICS. GRANADA RURAL AREA

This baseline study of the state of the art of mobility in the province of Granada has differentiated 2 territories. On the one hand, the metropolitan area of Granada, formed by Granada and the municipalities of its metropolitan area. On the other hand, the rest of the territory of the province of Granada, which has rural characteristics and less traffic. This second territorial area is analyzed and studied from the point of view of mobility, public transport and other modes and clean transport systems.

Indicate the difficulties met during the process of searching and gathering information, this is a territory with a level of detail, volume of information and existing studies much lower than the metropolitan case.

The existence of a public transport authority in the metropolitan area is the appropriate tool for the existing information and studies, compared to the rest of the rural area, which has not been studied with the same intensity or detail, there is not as much information as the metropolitan case.

At the regional level, the document that analyzes more and better the territorial model and the system of territorial articulation in the province of Granada is the Land Use Planning of Andalusia (POTA), which in the case of Granada would be defined by a Regional Center configured by the Metropolitan Area of Granada (analyzed in its own basic study of the Optitrans project), several networks of medium-sized cities with head offices in Motril, Loja, Guadix and Baza, and a network of settlements in rural areas in the area of the Alpujarra and the Valley of the Lecrín.

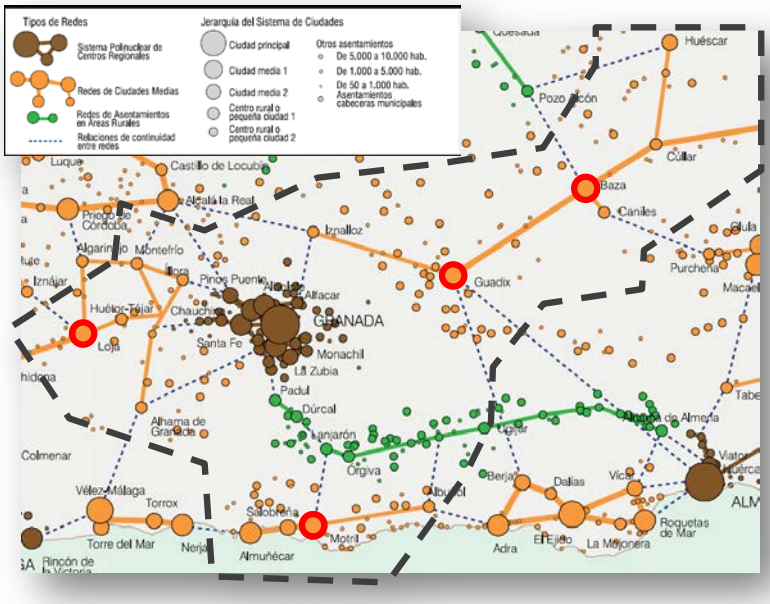


Illustration 1: Regional System of cities of Granada. Source: Land Use Planning of Andalusia (POTA)

1.1 MAIN DEMOGRAPHIC INDICATORS

First, we define the rural area of Granada for this study. It is the rest of the province of Granada in which Granada and all its metropolitan area are excluded. In the process of gathering information, data has been obtained from the entire province, divided into 10 different regions. One of them would correspond to the metropolitan area (the Vega de Granada region), so we have separated this region from the rest, some socioeconomic information is also available from the rural area of the province of Granada.

The counties and municipalities that make up the rural area of Granada would be the following:

Comarca de Alhama: Agrón, Alhama de Granada (Ventas de Zafarraya), Arenas del Rey **(**Fornes**),** Cacín **(**El Turro**),** Chimeneas**,** Escúzar, Játar, Jayena, La Malahá, Santa Cruz del Comercio, Ventas de Huelma y Zafarraya.

Comarca de la Alpujarra Granadina: Almegíjar, Alpujarra de la Sierra, Bérchules, Bubión, Busquístar, Cádiar, Cáñar, Capileira, Carataunas, Cástaras, Juviles, Lanjarón, Lobras, Murtas, Nevada (Mairena, Picena), Órgiva, Pampaneira, Pórtugos, Soportújar, La Taha, Torvizcón, Trevélez, Turón, Ugíjar y Válor.

Comarca de Baza: Baza**,** Benamaurel**,** Caniles**,** Cortes de Baza**,** Cuevas del Campo**,** Cúllar**,** Freila y Zújar.

Comarca Costa Granadina: Albondón, Albuñol**,** Almuñécar**,** Gualchos**,** Ítrabo**,** Jete**,** Lentegí**,** Los Guájares**,** Lújar**,** Molvízar**,** Motril **(**Carchuna-Calahonda**,** Torrenueva**),** Otívar**,** Polopos**,** Rubite**,** Salobreña**,** Sorvilán y Vélez de Benaudalla.

Comarca de Guadix: Albuñán, Aldeire, Alquife, Beas de Guadix, Benalúa, Cogollos de Guadix, Cortes y Graena, Darro, Diezma, Dólar, Ferreira, Fonelas, Gor, Gorafe, Guadix (Bácor-Olivar), Huélago, Huéneja, Jérez del Marquesado, La Calahorra, La Peza, Lanteira, Lugros, Marchal, Polícar, Purullena y Valle del Zalabí.

Comarca de Huéscar: Castilléjar, Castril, Galera, Huéscar, Orce, Puebla de Don Fadrique.

Comarca de Loja: Algarinejo, Huétor-Tájar, Íllora, Loja, Moclín, Montefrío, Moraleda de Zafayona, El Salar, Villanueva Mesía y Zagra.

Comarca de los Montes: Alamedilla, Alicún de Ortega, Benalúa de las Villas, Campotéjar, Colomera, Dehesas de Guadix, Dehesas Viejas, Deifontes, Gobernador, Guadahortuna, Iznalloz (Domingo Pérez de Granada), Montejícar, Montillana, Morelábor, Pedro Martínez, Píñar, Torre-Cardela, Villanueva de las Torres.

Comarca del Valle de Lecrín: Albuñuelas, Dúrcal, El Padul, El Pinar, El Valle, Lecrín, Nigüelas y Villamena..

Illustration 2: Counties of the province of Granada. Source: Andaltura

There are 9 counties that surround the main region, Vega de Granada, where the capital and the entire metropolitan area are located. It is also observed that there is only one bordering region with the sea, called Costa Granadina, which have a different character from the rest, because the main tourist towns of the province are concentrated in it, and therefore, they are especially attractive to travel in vacation seasons.

The following table shows the main socioeconomic indicators, such as the population, area, density and number of municipalities in the region:

County	Area 2013(km²)	Population 2011(inhab)	Density (inhab/km²)	Nº de municipalities
Alhama	975,7	17.926	18,4	12
Baza	1.731,5	41.180	23,8	8
Guadix	1.483,9	39.221	26,4	26
Huéscar	1.814,4	16.709	9,2	6
Alpujarra Granadina	1.140,2	24.472	21,5	25
Costa Granadina	786,9	125.974	160,1	17
Loja	1.185,5	60.305	50,9	10
Los Montes	1.455,3	29.821	20,5	18
Valle de Lecrín	420,0	21.061	50,1	8
TOTAL	**10.993,4**	**376.669**	**34,3**	**130**

Table 1: Socio-economic data of the rural area of Granada by counties. 2011. Source: Own elaboration based on OTEA Granada (Territorial Observatory of Studies and Analysis).

The total area of the rural area is 10.993 km2, with a total population of 376.699 inhabitants, which gives an average density of 34,3 inhabitants /km². These values contrast with that of the metropolitan area, where only 861 km2 were available but the population rose to 530.408 inhabitants. We can see the difference between regions with density data, where the metropolitan area rises to 616 inhabitants / km2, compared to the density of the rural area, with only 34, 3 inhabitants / km2. The rural area has suffered a strong migration and loss of inhabitants, the **average is 2.900 inhabitants per municipality**, that is, municipalities of small size.

As a particular case to be noted from the rural area, we must particularize the case of the Costa Granadina region, whose indicators have very different values from the rest of the counties. In the previous table you can see how, despite being one of the regions with the smallest area, it has the largest population of all. If the population values are between 15.000 and 40.000 inhabitants (only Motril rises to 60.000 inhabitants), the Costa Granadina region multiplies these values between 3 and 8 times. It is even one of the regions with the largest number of municipalities in the smallest area, which demonstrates again the particularity and differences of this region, which makes the presence of the coast and the beach make it an exception, full of small municipalities, very urbanized and high populations.

1.2 MAIN INDICATORS OF TRANSPORT AND INFRASTRUCTURE

It has been compiled different data from the car fleet, transport authorizations, as is to be shown and infrastructures.

First, the table related to the transport sector in the different regions of the province of Granada is shown in order to define the current status of this sector in the rural area. Different aspects of it will be analyzed, whose definitions would be:

Vehicle fleet is the number of vehicles with motor, except mopeds and special vehicles, which theoretically circulate. It includes the registrations, for years, less the reductions and the modifications for reforms (changes of power, of utilization).

Transportation authorizations: Transportation authorization is understood as the document corresponding to the permit or administrative license obtained by a natural or legal person to carry out transport activities. Depending on the type of service carried out by the company that has this type of authorization, a distinction is made between public passenger transport and private transport "Less than 10 travelers" include taxis, transport of passengers with driver and ambulances that provide public service. "10 and more travelers" include vehicles dedicated to the transport of passengers.

County	Vehicle fleet (2014)		Motorization index (cars/1.000inhab)	Transportation authorizations (2015)	
	Cars (ud)	Motorcycles (ud)		Less than 10	More than 10
Alhama	8.924	1.123	497,8	6	12
Baza	21.050	2.966	511,2	33	9
Guadix	19.495	2.427	497,1	30	43
Huéscar	8.417	1.023	503,7	20	19
Alpujarra Granadina	10.415	1.450	425,6	21	43
Costa Granadina	50.091	10.058	397,6	74	51
Loja	27.791	3.554	460,8	19	47
Los Montes	15.143	1.476	507,8	13	15
Valle de Lecrín	9.643	1.480	457,9	8	7
TOTAL	**170.969**	**25.557**	**454**	**224**	**246**

Table 2: Vehicle park and public transport authorizations (by county). Source: Own elaboration based on OTEA Granada (Territorial Observatory of Studies and Analysis).

In the rural area of the province of Granada, the tourist vehicle park raises to 170.969 vehicles, divided by the population, obtaining a motorization index of 454 vehicles / 1.000 inhabitants, a high ratio. This fact demonstrates the needs in public transport, so population needs their own vehicles. As an exception, again highlights the coast of Granada, where its motorization index is reduced to 397 vehicles / 1.000 inhabitants, which is produced by the high population that is concentrated in this region.

Another indicator that shows the socioeconomic situation of the rural area is the knowledge of the infrastructure network of this part of the territory. The following table shows the data related to the kilometers of road network according to their Administration in each region of the rural area of the province of Granada.

County	State (km)	Autonomic (km)	Province(km)	Municipalities (km)	TOTAL
Alhama	0	120,2	80,5	50,9	251,6
Baza	0	151,5	121,2	88,8	361,5
Guadix	0	159,9	147,9	58,5	366,3
Huéscar	0	212,2	104,8	43,9	360,9
Alpujarra Granadina	5,4	246,8	75	50,9	378,1
Costa Granadina	142,1	91,4	117,5	24,3	375,3

County	State (km)	Autonomic (km)	Province(km)	Municipalities (km)	TOTAL
Loja	1,6	204,2	136,3	66,7	408,8
Los Montes	57,8	123	255,9	152,2	588,9
Valle de Lecrín	35,2	28,5	44,6	35,8	144,1
TOTAL	**242,1**	**1337,7**	**1083,7**	**572**	**3235,5**

Table 3: Kilometers of road network according to administration by districts of the rural area of Granada. 2013. Source: Own elaboration based on OTEA Granada (Territorial Observatory of Studies and Analysis)

In total, the territory of more than 10.000 km2 that covers the rural area of the province of Granada has a network of road infrastructure of 3.235 km. It is distributed among different administrations, Junta de Andalucía (40%) , Province of Granada (34%), and State and municipalities (25%, with a share of 30/70 respectively). Some differences are detected by regions. Specifically, the region of the Costa Granadina has 142.1 km of state road network (more than 50% of the total network of this area), which shows that this region has the best accessibility and coverage, despite to be coastal, indicating the importance of it and the levels of travel attraction. They mark it as one of the regions with the greatest movement, attraction of travel, economy and population. The rest of the regions do present more similar values among them (some even without any section of state route), indicating the lack of resources and connectivity at higher levels than the ones within each region.

1.3 OTHER INDICATORS. MOBILITY AND ECONOMIC DISTRIBUTION

A clear identification of the territorial areas with the highest concentration of economic activity can be observed, highlighting the coastal coastal area (Motril, Almuñecar and to a lesser extent Salobreña) and other municipalities of a more dispersed or isolated nature that function as comarca centers that attract travelers. In order of importance (and the number of business activities) are Baza, Loja and Guadix.

The following table shows the municipalities in the rural area with the highest number of jobs:

Town	Nº new workers
Motril	5.946
Almuñécar	3.348
Baza	2.604
Loja	2.212
Guadix	2.117
Salobreña	1.203

Table 4: Distribution of main municipalities by number of workers 2012 Source: granadacomparte.

The last one of the selected indicators has been the one corresponding to the distribution by economic sectors of each region, which allows analyzing the characteristics of similarity between regions.

The following table shows the percentage distribution by economic sectors of each region of the rural area of Granada in 2009.

County	Agriculture(%)	Industry (%)	Construction (%)	Service (%)
Alhama	29,48	10,14	16,17	43,68
Baza	18,71	11,35	15,64	54,28
Guadix	12,42	11,78	16,55	59
Huéscar	22	6	9,67	62,3
Alpujarra Granadina	14,27	10,36	16,38	58,98
Costa Granadina	24,65	5,56	15,94	53,85
Loja	32,78	12,79	14,94	39,49
Los Montes	30,93	7,64	16,86	44,57
Valle de Lecrín	7,63	16,04	22,58	53,75
Average	**21,4**	**10,2**	**16,1**	**52,2**

Table 5: Percentage distribution by economic sectors and regions of the rural area of Granada. 2009. Source: Own elaboration based on OTEA Granada (Territorial Observatory of Studies and Analysis).

As we can see, the services sector has the most weight in the global balance (over 50%), but the important role of agriculture (higher than 20%), which, unlike the metropolitan area, is more important in the rest of the regions (except for the region of Valle de Lecrín, which, due to its orography and location, shows a more prominent role in industry and construction).

2. CHARACTERISTICS OF PUBLIC TRANSPORT IN THE RURAL AREA OF GRANADA

As we mentioned in the document of the metropolitan area of Granada. It is important to understand the intercity regional public transport that operates at the regional level and at the province level (province of Granada).

The concession is an administrative contract between the Administration, in this case, the Andalusian, and a private company that, through an open competition, is awarded this contract to be able to exploit the service, routes and expeditions exclusively. Thus, no other company can move travelers between the routes of another company. Therefore, there is no competence; it is operated under the figure of a monopoly, although previously it has had to propose the best offer, which must remain throughout the concession period.

It is important to remark this system of concessions because at the moment, the Junta de Andalucía is beginning the process of renewing many concessions, which have already expired. It is an excellent opportunity to introduce new ideas, improvements, good practices and changes searching for the optimization of public transport by road, metropolitan and for the rest of the territory of the province of Granada

2.1 PUBLIC TRANSPORT IN RURAL AREA

Unlike the case of the metropolitan area, where existed a wide range of options of public transport (urban bus, LAC High Capacity Line of Granada, Metropolitan, bicycle, shared car, shared motorcycle, taxi, etc.) in the rest of the rural territory of Granada, public transport is practically reduced to regular interurban public transport, in addition to the taxi, which suffers from significant difficulties to maintain its licenses.

2.1.1. INTERURBAN PUBLIC TRANSPORT BY BUS

This interurban public transport service has been provided based on existing concessions, which have been awarded to different companies and have been operating for more than 10-15 years.

After the compilation of the information related to the concessions **completely inside the territory of the province of Granada**, we show the most interesting data which describe the current situation (data from 2016):

Concession	Denomination	Passengers	Annual km	Incomes (€)	Ratio €/km	Rate (€)
VJA-049	Fuentes de Cesna - Loja	7.014	28.614	10.598	0,37	1,51
VJA-087	Villanueva de Mesia - Loja	15.449	39.156	25.992	0,66	1,68
VJA-105	Limones - Granada	23.848	83.824	62.663	0,75	2,63
VJA-110	Calicasas - Granada	79.434	182.780	96.889	0,53	1,22

Concession	Denomination	Passengers	Annual km	Incomes (€)	Ratio €/km	Rate (€)
VJA-113	Alcubillas - Loja	7.119	14.112	8.438	0,60	1,19
VJA-114	Gorafe y Guadix a Bacor	1.369	28.320	3.184	0,11	2,33
VJA-115	Villanueva de las Torres y Guadix a Alicun de Ortega	3.581	28.614	12.808	0,45	3,58
VJA-117	Loja y alrededores	8.407	29.518	9.893	0,34	1,18
VJA-135	Lenteji - Almuñécar	20.866	20.787	24.309	1,17	1,16
VJA-136	Dehesas Viejas - Granada	16.713	94.663	73.527	0,78	4,40
VJA-140	Montefrío - Alcalá La Real	2.375	16.624	3.147	0,19	1,33
VJA-173	Guadahortuna - Granada	90.484	333.515	243.625	0,73	2,69
SUM/AVERAGE		276.659	900.527	575.073	0,64	2,08

Table 6: Main data of interurban public transport concessions in the rural area of Granada. 2016. Source: Own elaboration based on Territorial Delegation of Development in Granada. Junta de Andalucía

There are a total of 12 concessions with their exclusive itineraries within the province of Granada. There are other concessions with routes that connect the territory of Granada with other provinces, even with the rest of Spain, but attention will be paid to the concessions that link the rural territory of the province with the main points of attraction for trips.

The previous table shows the information related to these 12 concessions, of which three data of interest are available: the total number of passengers traveling (a total of 276.659 passengers per year), the total annual kilometers traveled by these lines (approximately 900.000 km) and the income generated by these concessions (about 575.000 euros per year).

With these values, 2 values have been obtained: the income obtained per km traveled in each of the 12 concessions, and the average rate paid by the user. The fare is between 1.20 and 4.40 euros per trip, although 60% of the routes have a rate lower than 2.00 euros. The **average rate** of the 12 concessions reaches a cost **of 2.08 euros / trip**, which could be considered an economic cost of travel by public transport.

The analysis of the income obtained gives us more conclusions. The economic balance of a public passenger transport company in an interurban transport concession is around 1.20 - 1.30 € / km. In the previous table, it is observed how absolutely all the concessions show income below this equilibrium level (except for the Lenteji - Almuñecar concession, which reaches € 1.17 / km), which allows concluding that none of these concessions are profitable The result will be that once they expire (all are close to them, since 90% of Andalusian interurban public transport concessions are already expired) none of them will be of interest to the operating companies, and must opt for other imaginative solutions (transport to the demand), change the concession map of Granada or they will be deserted, disappearing.

Finally point out as, the only "profitable" concession of the previous ones, correspond to the region Costa Granadina already identified as having a well differentiated behavior to the rest of the rural territory. It indicates again the differentiation that exists in this rural area with the rest.

These concessions are financed directly by the income of the users, not receiving any additional contribution or subsidy. This fact will also make private companies of public transport of passengers choose not to apply for renewals of these concessions, as they cannot get the necessary income.

In addition to the 12 concessions included entirely in the province of Granada, there are other concessions that run through Granada, connecting with other parts of Andalusia and Spain. **In the case of Andalusia**, there are **16 concessions more**, all expired, which connect the province of Granada with Seville, Cordoba, Jaen and Malaga, Monachil, Güejar-Sierra, Motril, Huércal Overa, Dílar, and Beas de Granada,... operated by companies such as Alsa, Autogranadina Empresa Torres, Liñán, Transportes Francisco Delgado Molina, Autedia SA, Transportes Arana, and Transportes Trinidad Nievas.

Among them, the following concessions highlight, which are operated by the company Alsa, possibly the most important public transport company in Spain:

- VJA-160. Seville and Granada by Antequera, Córdoba and Málaga
- VJA-167 Siles-Málaga-Almería, by Córdoba, Granada and Jaén
- VJA-174. Baza and Puebla de don Fadrique, with links to Úbeda, Castril and Baco
- VJA-194. Dúrcal-Zujaira for Granada (from Granada to Chauchina for Santa Fe and from Granada to Abrucena)

The first 2 concessions allow to link the Andalusian territory from east to west, connecting till 6 of the 8 Andalusian provinces.

At the national level, the main concessions that allow to link the province of Granada with the rest of Spain are:

Concession	travellers 2016	Company	Expiration
VAC-025 - Murcia-Sevilla by Granada	126.682	Alsa (Nex Continental Holdings S.L.U.)	21/12/2013
VAC-092 - Madrid-Granada-Almuñécar	599.263		2/03/2012

Table 7: National concessions with connection to Granada. Source: Ministry of Public Works

In the case of national concessions, both are out of date, waiting to be renewed, which shows how most of the concessions of interurban public transport in the province of Granada have expirated, waiting to be renewed and updated.

Likewise, Alsa, one of the most important public transport company in Spain, has an important role, which in addition to transport a high number of passengers in Granada, also presents other types of services such as discretionary transport, school transport, international transport, etc.

2.1.2. TAXIS

The service is complemented by the taxi service, which in this rural area, and except in very specific cases, is used for intercity travel.

The information on the number of taxis has been compiled in the municipalities that form the different regions already mentioned, so that the following table summarizes both the number of total licenses per district (and their ratio per 1.000 inhabitants), as well as identify the main municipalities that present a significant number of licenses (more than 10 licenses).

Municipality	Taxi Licenses	Ratio licenses/1000 inhab
Comarca de Alhama	6	0,33
Comarca de la Alpujarra Granadina	20	0,82
Comarca de Baza	29	0,70
Municipio de Baza	16	0,77
Comarca Costa Granadina	74	0,59
Municipio de Almuñécar	23	0,84
Municipio de Motril	36	0,60
Comarca de Guadix	35	0,89
Municipio de Guadix	18	0,96
Comarca de Huescar	20	1,20
Comarca de Loja	21	0,35
Comarca de los Montes	12	0,40
Comarca del Valle de Lecrín	9	0,43
PROMEDIO	**25,1**	**0,60**

Table 8: Taxi licenses by county. 2015. Source: Andalusian Institute of Statistics and Cartography (IECA)

The average number of licenses per district is around 25 licenses. The region of the Costa Granadina has a total of 74 licenses, although 59 of them are concentrated in the two main municipalities of this region, such as Almúñecar and Motril. Thus, it is observed again that this region presents very different characteristics to the rest.

Although the average number of licenses per district is 0.6 licenses / 1000 inhabitants, half of them, have lower ratios (around 0.4 licenses / 1000 inhabitants). It is significant to note the regions with large municipalities (Baza, Costa Granadina and Guadix) have an average of 0.6 - 0.9 licenses / 1000 inhabitants. The districts of the Alpujarra Granadina have a good average (with 0.82 licenses / 1000 inhabitants) and especially the Huéscar region (1.2 licenses / 1000 inhabitants).

Comparing it with the values of the metropolitan area of Granada (1.2 licenses / 1000 inhabitants), we can see that the average is around the half in rural areas.

2.2 MOBILITY OFFER IN THE MAIN CITIES OF THE RURAL AREA

We have not found any source that gives us more detail of the mobility offer throughout the rural area, it has been possible to gather information from the main cities that have already been identified in the rural area, such as Baza, Guadix, Loja, Motril and Almuñecar, with special emphasis on its relationship with the capital, Granada. These cities act as intersection centers for regional transport networks.

The offer of daily places to Granada has been obtained from these five municipalities, as well as the number of seats per 1000 inhabitants:

Town	Population(inhab)	seats/day to Granada			Seats /1.000 inhab		
		M to F	S	Sun	M to F	S	Sun
Baza	23.359	550	440	440	23,5	18,8	18,8
Guadix	20.395	660	495	495	32,4	24,3	24,3
Loja	21.574	825	605	495	38,2	28,0	22,9
Motril	60.279	935	660	605	15,5	10,9	10,0
Almuñécar	27.696	660	660	605	23,8	23,8	21,8

Table 9: Offer of public transport in the 5 main cities. 2011. Source: Compartegranada

The greatest offer of places is presented for working days, especially highlighting the city of Loja, with more than 38 seats/day/1000 inhabitants, followed by Guadix. This is because they often take advantage of the service that comes from a more distant city and use this route to Granada, as it happens with Baza, where some expeditions they also pass through Guadix. In relation to travel times, from Baza to Granada it takes approximately 1 hour and 45 minutes.

2.3 SCHOOL TRANSPORTATION IN THE RURAL AREA OF GRANADA

The responsibility of school transportation, in Andalusia, is from the autonomic administration, the Junta de Andalucía, although it is managed by a different agency from the one with competences on public transport at interurban level. School transport is managed by the Ministry of Education, through the Andalusian Public Agency of Education.

The Andalusian Public Agency of Education manages the hiring of companies that provide free school transport service to students in public schools that are obliged to travel to attend courses that are not taught in their places of residence.

This Agency is responsible for contracting the school transport service, promoting the existence of safety belts in all vehicles used for school transport. Likewise, the Agency contributes to the streamlining of the authorizations of regular transport of special use in close collaboration with the Ministry of Development and Housing, with which it works in a coordinated manner to contribute to the improvement, control and compliance with the technical prescriptions of the contracts.

The Andalusian Public Agency of Education has enhanced measures such as promoting the availability of adapted vehicles for the transport of people with reduced mobility in the fleet of suppliers, so that those routes that must be made with adapted vehicles must be provided with ramps of access, lifting platforms and special anchorages for wheelchairs.

Currently there is a low efficiency in the contracting of the school transport service because of the occupancy in the vehicles that serve municipalities in rural areas have low occupations, as occurs in interurban transport lines in these same municipalities. Different vehicles are used under independent management contracts (each ministry proceeds to contract a type of service). Although in Andalusia still does not occur, there are other autonomous communities in Spain that have proceeded to renew the concession map, so they have joined forces to link school transport and regular public transport in rural areas. Therefore, **a niche is detected where savings synergies could be generated in public transport, if both services could be coordinated to lend with half of the vehicles**.

3. MAIN ACTORS OF THE PUBLIC TRANSPORTATION IN THE RURAL AREA OF GRANADA

- **Public:**
  - Ministry of Public Works
  - Junta de Andalucía
  - Town councils of the rest of the municipalities that form the rural area
  - Provincial Council of Granada

These stakeholders involved in public passenger transport have been selected because they are identified as the administrations that participate most actively in the search for sustainable interurban mobility. These are the main investors in the main transport infrastructures of the rural area of Granada.

- **Private:** The different public transport operators that manage any of the concessions that connect or provide coverage to the municipalities of the rural area of Granada

The number of companies that provide services in one of the municipalities of rural Granada is very diverse, since there are concessions at the state level, which may have routes to reach the capital, for example. In this case you will find **some of the main national companies** such as Alsa, Grupo Avanza, etc. Secondly, there would be companies that manage some of the Andalusian concessions, which can join different provincial capitals, making stops in some of the municipalities of rural areas. In this case, also, **some of the main Spanish companies** appear, highlighting Alsa (concession VJA-160 Granada - Seville). Finally, the operating companies of the **12 previous concessions of provincial area of Granada, already of small size**, such as the companies Maresana SCL, Nidibús SL, Autocares Rona SL, Autocares Martín Corral, SL, Autocares Balerma SL, Autocares Guadix SL, would be Viajes Lentejí SL, Autocares J. Palma Lechuga SL, Arco Marfil SL and Autocares Marcos Muñoz S.L.

4. NATIONAL AND REGIONAL POLICY: INITIATIVES FOR SUSTAINABLE PUBLIC TRANSPORT

The main strategies, national and regional plans that set the policy to follow with initiatives for a sustainable public transport are summarized in:

- Innovation Plan for transport and infrastructure 2017-2020 (National)
- Land Use Planning of Andalusia (POTA) (Autonomic)
- Plan PISTA 2020 Infrastructure Plan for the Sustainability of Transport (Autonomic)
- Andalusian Strategy for Urban Sustainability (Autonomic)
- Andalusian Energy Strategy 2020 (Autonomic)
- Program of Agreements 1389A1 and 1389A2 of the Diputación de Granada (provincial)

- **Innovation Plan for transport and infrastructure 2017-2020**

It is a Plan developed by the Ministry of Public Works (*MInisterio de Fomento*). The objectives of the Innovation Plan for Transport and Infrastructure are the following:

- Increase the **incorporation of technology** to people daily life, encouraging innovation in security, accessibility and sustainability.
- Increase the **economic and social profitability of investments**, increasing the efficiency and effectiveness of public and private investment.
- Make **Spain a more attractive place for companies** and for innovative investments in the field of mobility and transport.
- **Increase the investment and technology** from outside our borders and consolidate Spain's international leadership.

This document is based on establishing the main strategies and guidelines to follow, focused on new technologies and economic and social efficiency.

- **Land Use Planning of Andalucía (POTA)**

It is a document developed by the Junta de Andalucía from the Regional Ministry of Environment and Planning. The POTA clearly establishes that public administrations are obliged to "**promote a multimodal and integral transportation** system based on public transport services and the promotion of journeys in non-motorized ways (by bicycle, on foot), in front of the automobile. The transport system will contribute to the reduction of unnecessary mobility. It will try to get the balance between the rural world and the urban world. Public Transport will contribute to the development of the system of medium-sized cities that avoid the phenomena of urban congestion.

The transportation system must be universal and public. It must offer service to all people, regardless of their geographical location, purchasing power, mobility capacity, gender, age, race and culture. "

- **Plan PISTA 2020 Infrastructure Plan for the Sustainability of Transport**

It is a Plan developed by the Junta de Andalucía through the Ministry of Development and Housing, Which stablishes the regional policies on infrastructure. The objectives of the PISTA are the following:

- Articulate the territory of Andalusia, internally and externally, through the Intermodal System of Transport and Communications.
- Increase the participation of public transport, specifically railways, of passengers and goods.
- Go forward in the constitution of an environmentally sustainable transport system.
- Enhance the effects of infrastructure on regional development.
- Adapt the transport system to the regional territory in compatible way with the particular characteristics of each city and Mediterranean urbanism.
- Improve the quality and safety of transport.

In general, it develops a guide to improve the infrastructure in Andalusia with the aim of boosting public transport under criteria of efficiency.

- **Andalusian Strategy for Urban Sustainability**

It has been also drafted by the Ministry of Environment and Territory Planning of the Junta de Andalucía.

It includes regional policies on mobility, the Andalusian Urban Sustainability Strategy sets clear strategic lines: "i) to make mobility and transport decisive factors for quality of life, social cohesion and progress , ii)to improve the energy efficiency of transport reducing energy consumption and the emissions, and iii) avoid the expansion of urban spaces which depend on the automobile, slowing down disorderly urban planning, considering public transport as a basic service in the new urban developments and not allowing new developments without a planned accessibility in public transport".

It is an autonomic policy that combines transport and the environment, energy saving and sustainability.

- **Andalusian Energy Strategy 2020**

This Strategy has been defined by the Andalusian Energy Agency. It includes the main lines of Andalusian energy policy in the 2020 horizon. This new planning framework continues to move towards a low-carbon, sufficient, intelligent and quality energy model in line with European guidelines.

- **Program of Agreements 1389A1 and 1389A2 of the Diputación de Granada**

Diputación de Granada has drawn up a program of agreements, which include agreements 1389A1 and 1389A2, which are managed by the Granada Energy Agency. They are programs for the promotion of electric vehicles and to promote non polluting vehicles. The objective is to improve vehicle fleets: one of them seeks to improve the public fleet, while the second seeks to improve the fleet of private vehicles through incentives. It is based on an ordinance that works through taxes.

- 1389A1. Sustainable urban mobility plan and Mobility Ordinance Covenant of Mayors

The Tax on Vehicles of Mechanical Traction (IVTM) is a direct tax that taxes the ownership of vehicles of this nature, apt to circulate on public roads, whatever their class and category. The parameter that is considered to fix the tariffs is the concept of "Fiscal Power", numerical parameter that the Ministry of Economy defines for each vehicle, based on its brand, power, benefits among other factors.

The program focuses on incentivizing with a bonus of this tax. The objective of the "bonus" is to encourage the acquisition of emission-free vehicles by reducing taxes on mechanical traction vehicles (IVTM) in order to reduce the emissions produced by the combustion of vehicles.

The bonus defined in the "Fiscal Ordinance for the promotion of sustainable mobility" of the Deputation of Granada would be summarized in:

Type of vehicle	Bonus on IVTM	Period
Vehicles that are not internal combustion with zero pollutant incidence (electric, fuel cell and solar)	75%	All the life of the vehicle
Hybrid vehicles (electric motor - internal combustion)	75%	5 years from first enrollment
Vehicles liquefied petroleum gas (LPG) or compressed natural gas (CNG)	50%	5 years
Vehicles "bifuel"	40%	3 years
Fuels not derived from fossil fuels (biogas, methane, methanol)	75%	5 years
Energy-efficient internal combustion vehicles A and B	From 40% to 5%	6 years

Table 10: Bonus included in the fiscal ordinance for the promotion of sustainable mobility

- 1389A2. Infrastructures for the promotion of electric vehicles and car sharing. Electric Bicycles/motorcycles.

Rural municipalities with few inhabitants have a difficult role to be able to reduce CO_2 emissions in transport, as their citizens depend on private transport, almost exclusively, to move between some municipalities and others.

Therefore, this program aims to encourage the change of mobility of its citizens towards more sustainable modes, through the implementation of charging points for electric vehicles and meeting points for the use of car sharing.

Electric cars still have costs difficult to assimilate by municipalities except through renting schemes or similar. In this way, this program proposes to acquire electric bicycles or motorcycles for the use of municipal technicians within the municipality, as well as an exemplary measure for the citizens.

- **Other documents, strategies and plans**

There are other complementary documents, in addition to the documents and previous plans, that give us some information of the political keys of sustainable mobility at all levels (European, national, regional and local), such as:

- Green Paper "Towards a new culture of urban mobility". It is a Document of the year 2007, which was already beginning to mark the cultural change that should be introduced in the urban areas searching and improving efficient and sustainable mobility.
- Urban Mobility Action Plan of the EU (2009). During the period 2009 - 2012 it was proposed the implementation of 20 actions at European level. One of the measures proposed to accelerate the generalization of sustainable urban mobility plans, was based on 2 points: provide support to local authorities in the development of PMUS, and exchange of good practices and educational activities for professionals in urban mobility .
- White Paper: it is looking forward a single European transport area: for a competitive and sustainable transport policy (2011)
- Spanish Sustainable Mobility Strategy (2009). It emerges as a national reference framework that integrates the main policies that facilitate sustainable mobility and low carbon. It is set in 48 structured measures in five areas. Among those measures, the promotion of alternative mobility to the private vehicle and the use of more sustainable modes.
- First draft of the Sustainable Mobility Law of Andalusia (2014). It establishes measures to promote the use of public transport and encourage non-motorized mobility. This law fights against the dispersed and expensive city, where the private vehicle occupies a position of total predominance. The new law will promote the use of public transport; encourage non-motorized mobility, it also includes measures to rationalize investments in infrastructure and services.

Questions to involved actors

With all the information collected and analyzed, a questionnaire has been sent to the actors involved in the process of improvement and support to public transport. It has a series of questions which allow us to sketch the current situation in terms of national and regional policies and their work.

4.1 WHAT CHALLENGES DO PUBLIC TRANSPORTATION SERVICES FACE?

The challenges that public transport faces are very varied and respond to different causes.

1. The recent economic crisis has reduced investments in sustainable mobility in cities

2. The use of public transport in rural areas is mainly by people who do not have other alternatives. Therefore, it is a low demand transport.

3. The use of public transport is very limited, only used by passengers who do not have another mode of transport (they do not have a private vehicle or someone who can take them). The reason for this limited use is that it does not fit your needs: rural public transport does not perfectly fit the needs of the inhabitants of these areas.

5. The service in rural areas is provided for two possible reasons: i) because it is part of a concession that in its totality is profitable, but these services in rural areas of low demand are a hindrance for the concessionaire and therefore, limit to the minimum required by contract; ii) because the operator uses it to locate in a certain area and expects profitability for other services such as school or additional discretionary services. Also in this case, the service will be reduced to the minimum required.

6. In any case, the conclusion is that the use of public transport in rural areas is very small and low.

4.2 WHAT ARE THE MAIN REASONS FOR NON-USE OF PUBLIC TRANSPORTATION IN RURAL AREAS?

The main reasons that can be extracted are:

1. The offer is reduced and there is a depopulation of this type of zones, with a slow but continuous migration to the big cities and metropolitan areas.
2. The current public transport has limited service hours.
3. The transport in rural areas is deficient. Therefore, the only way to reduce losses is to reduce costs, which implies a low quality service, and consequently, it is used only because there is no other alternative.
4. There is no study of each municipality, when each one really works in a different way. For example, in rural municipalities in the eastern part of the province of Granada, there are populations of 400 inhabitants who have some needs. In contrast, there are other municipalities with a more youthful population whose routes do not meet their needs. It is

necessary a study of rural needs that allows us to correct the current offer that is very standard.
For example, in the area of *Montes Orientales* (about 19-20 municipalities), there are some in decadent state and abandonment, while there are others, such as Campotejar, which has a young families, existence of rural tourism, new oil mills of oil that generate work, ... it is detected that there are new movements within the rural area.

4.3 WHAT TYPES OF SUPPORTS ARE AVAILABLE TO INCREASE THE USE OF PUBLIC SYSTEMS?

The operating companies consider that there is support for the user but there is no for the operating companies themselves. The user can be more or less subsidized in the rate, but that does not result in the quality of the service, because it does not reach the company that exploits it.

In many cases, the user would be willing to pay a little more if the service meets their needs, like in rail transport, where different categories formulas are proposed (tourist, tourist plus, preferred) or even payments by use.

Therefore, if resources are limited to encourage the use of public transport, operators propose that it is better to invest in service than in tariff, or at least keeps a balance.

Some actions have already been carried out in Andalusia and Granada (for example, a taxi system on demand), although it is necessary to make more progress in this type of initiatives.

It is very important to get promotion support, coordinated between municipalities and Administration as well as the introduction of new technologies in the offer, and the adaptation of the concession to the new reality.

One of the objectives is to set off the services to the demand, to be more competitive. It should also improve the information on the real needs of the population to adapt the services provided. Finally, and it is also very important to raise the awareness of the population about the advantages of using public transport.

4.4 WHAT ARE THE MAIN FORCES INVOLVED IN THE CHANGE OF THE PUBLIC TRANSPORTATION POLICY IN RURAL AREAS?

The main forces involved in the change in transport policy in rural areas are the municipalities that are part of the rural areas as well as the Provincial Council of Granada and the Junta de Andalucía.

In order get a real change in the use of public transport must be carried out a reordering of the market. The concessions must be designed with different parameters than now, allowing the

operators of passenger transport to offer mixed formulas with transport to the demand, and promoting intermodality.

It is necessary the optimization of resources to improve supply, for example, with better-sized transport vehicles.

It is also very important the coordination between the different competent administrations in matters of public transport and between the municipalities.

5. SWOT ANALYSIS

In this chapter we will discuss the situation of the Public Transport Service, with a SWOT to analyze the different Weaknesses, Threats, Strengths and Opportunities that Public Transport has in the rural area of the province of Granada.

The SWOT analysis model is a mechanism that helps companies and public organizations analyze themselves the advantages and disadvantages they have and, consequently, carry out the relevant actions to make improvements in them.

The opportunities and threats will be analyzed from an external point of view to the service, while the strengths and weaknesses of the system of this type of public service are studied analyzing the internal situation of the same.

The SWOT Analysis of the Public Transport Service is carried out, with the purpose of obtaining some information about this public transport service in the rural area of the province of Granada.

STRENGTH	***OPPORTUNITIES***
▪ There is always a captive demand that no have private vehicle or cannot drive ▪ The Public Transport is the most economical transportation system, compared to other modes such as the private vehicle or the taxi ▪ The implementation of passenger transport systems will improve intermodal exchange ▪ Duplicity of public transport service for regular transportation and school transportation	▪ Renewal of public transport concessions, being able to introduce new and better measures ▪ Conservation of the environment ▪ New electric vehicles ▪ The current technology allows to go to innovative solutions of optimization of public transport ▪ Development and increase in the use of Apps for the management and use of Public Transport and transport initiatives to demand
WEAKNESSES	***THREATS***
▪ Dispersion of towns with low population and high age ▪ Long travel times ▪ Reduction of mobility needs. Weak traffic ▪ Carpooling is not consolidated due to lack of confidence	▪ Economic slowdown ▪ Arrival of new trends in mobility based on the collaborative economy ▪ Difficulties and delays in the integration of Public Transport services ▪ Progressive deterioration of air quality linked mainly to the predominance of private transport over public transport

Table 11: SWOT Analysis. Source: Self-Made

6. ANALYSIS AND IDENTIFICATION OF THE MAIN EXPERIENCES AND LESSONS LEARNED

An added value of this study of the province of Granada, and specifically of the rural area, is the identification and knowledge of good practices in public transport that have been implemented in recent years. All this knowledge has to be used to implement those good practices for their use in their own territories.

It includes a sort of good practices selected from the province of Granada, and a selection of other good practices selected from other OptiTrans regions.

6.1 EVALUATION OF GOOD PRACTICES SELECTED

There are two good practices that highlights during the last years in the rural area of Granada.

- Demand Responsive Transport by taxis in rural areas with low traffic
- Project "Granada Comparte" ("Granada sharing")
- Protected cycling routes
- MedCyleTour Project

Demand Responsive Transport by taxis in rural areas with low traffic

There is a program called "*First Andalusian Program of Demand Responsive Transport with taxi vehicles in areas of weak traffic*" is entire financed by the Junta de Andalucía with the objective of creating new public transport services in towns that are currently unattended by an interurban regular public transport service, to cover the transport needs, mainly to other municipalities or to the nearest hospital center. To do this, we proceed to use the Taxi as a mode of transport since the demands and occupations are less than 5 travelers. In these cases, the taxi has a more competitive cost (€ 0.58 / km) than the bus (approximately € 1.30 / km).

This system has a double social function: it provides public transport in areas of weak traffic and also helps to maintain a basic service for the population such as the taxi. It is much more efficient than traditional public transportation in those areas. Public money is used better.

The system is based on the method of Demand Responsive Transport, with pre-established service, so the service is only carried out if there are passengers who have previously applied for it, with a call the day before to the City Council.

This public transport service would be subsidized by the Junta de Andalucía (regional body), so that the user pays a part of the cost of the trip: 8% of the total.

There are two routes in Granada with special connection Cañar – Órgiva y Gualchos – Motril:

- Route GR1: Gualchos - Motril. The objective is to join Gualchos (600 hab) with Motril, main town of the surroundings, located from 18 km of distance. There are 2 days of service per week (Monday and Friday, as detected by the City Council), with 4 daily services, 2 in each direction. Gualchos departures take place at 8:00 and 14:45, while departures from Motril take place at 8:45 and 2:00 p.m. The rate is € 1.65.

Illustration 3: Scheme demand responsive transport with taxi route Gualchos - Motril. Source: self-made

- Route GR2: Cañar - Órgiva. The service try to communicate Cañar (408 inhabitants) with Órgiva, the main nucleus in the area. There is a service of 5 days a week (from Monday to Friday), with 4 daily expeditions (two per direction), with departures from Cañar at 7:45 and 15:30 hours, and departures from Órgiva at 7: 15 and 15:00 hours. These schedules are coordinated with the interurban public transport service as it passes through Órgiva, for those users of Cañar who need to use it. The rate for the user is € 0.85.

There are two new services that have had a very good acceptance by the inhabitants of these towns, during next months we will know more detail about the number of travelers, demands real, if it really covers the needs, opportunities to extend the service to more days or daily expeditions, etc.

Granada Comparte

The Granada Comparte project is based on the concept of car sharing. It is a project promoted by the Provincial Energy Agency of Granada and the Diputación de Granada, and co-financed by the Andalusian Energy Agency and the Institute for Energy Diversification and Saving (IDAE), through a program of subsidy for the sustainable energy development of Andalusia, and within the framework of the 2008-2012 Action Plan of the Energy Saving and Efficiency Strategy in Spain (PAE4 +).

The car-sharing system uses the web www.granadacomparte.com as a meeting point, search and travel proposal. Anyone who wants to share a trip , either by proposing their own car, or looking for someone who already does, go to this website where either "you create trip" or "you travel".

Currently there are a total of 250 registered members, who offer or use this service.

Through a search tool it indicates the municipalities of origin and destination of travel (in each case, city, place and address), allowing also filter by "look for people to carry "," look for people to take you "or both.

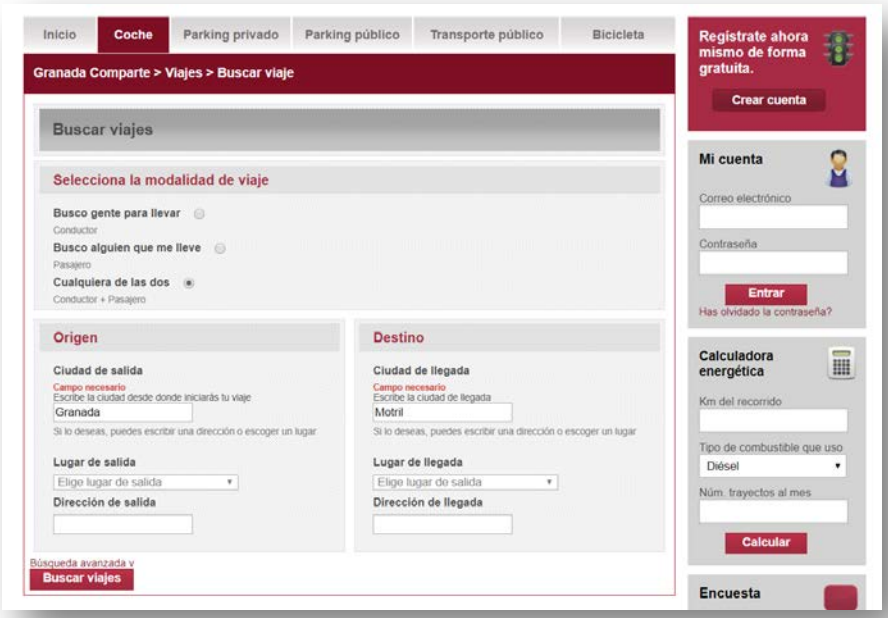


Illustration 4: Search tool for travelling searching. Fuente: www.granadacomparte.com

It is not a business for those registered in the system, as it can happen in other systems like blablacar, shared vehicles that are actually offered, are people who make their trips with certain frequency with recurring motive (jobs, studies) and seeks the use of a car that has only one occupant for economic, energy and environmental savings.

Thus, for each trip, information is provided about the driver, the reason for the trip, frequency, schedules, etc. which allows other interested people to have the appropriate information.

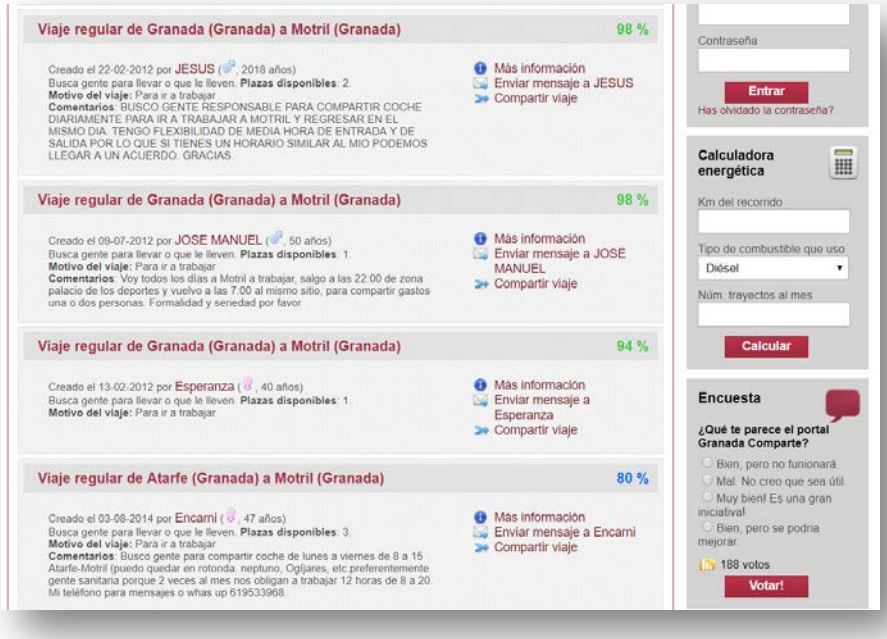


Illustration 5: Information of searching. Source: www.granadacomparte.com

How it works throughout the territory of the province of Granada, it is a good practice both at the metropolitan level and in the rest of the rural area of the province.

Protected cycling routes

The General Directorate of Traffic, DGT (the national administration responsible of the traffic management in Spain) has developed a Protected Cycling Routes Plan, a measure aimed to protect these users. In total, in Spain, there are 138 cycling routes (more than 1,600 km of road), which have been selected by the Provincial Traffic Headquarters, the traffic group of the Civil Guard (ATGC) and cycling associations.

It is a pioneering initiative in the European Union. Its objective is to protect the thousands of bicycle users who leave mainly on weekends, so that they have specially monitored routes. In addition, it is a Plan that is neither closed nor definitive.

The main measures that are being applied for these Protected Cycling Routes are:

- Signage of the route.
- Temporary reduction of the speed limit, according to the type of road.
- More monitoring of compliance with rules, especially those related to lateral distance in overtaking and inadequate speed, both drivers and cyclists.

- 3,000 more patrols of the Civil Guard to ensure greater vigilance during the months of July and August.
- Preventive controls of alcohol and other drugs in these routes and in their accesses.
- Intensification of aerial surveillance during the mornings of Saturdays and Sundays.
- The DGT will also provide detection equipment to those municipalities that request it, in order to facilitate the control tasks of the local police.
- Collaboration with the different owners of the roads with protected cycling routes, to give priority to the necessary conservation works.

In the case of the rural area of the province of Granada, there are the following protected cycling routes:

Code	Color	Route (municipalities)	Route (roads)	Length stretch (km)	Total Length (km)
ES-AN-01		Armilla - Alhama de Granada	A-338	45,3	141,5
ES-AN-02		Armilla - Velez de Benaudalla Talará - Lecrín - Restábal - Pinos del Valle	N-323 GR-3204	59,2	
ES-GR-01		Cenes de la Vega - La Peza	GR-3201	37,0	

Table 12: Protected cycling routes. Granada. 2017 Source: DGT

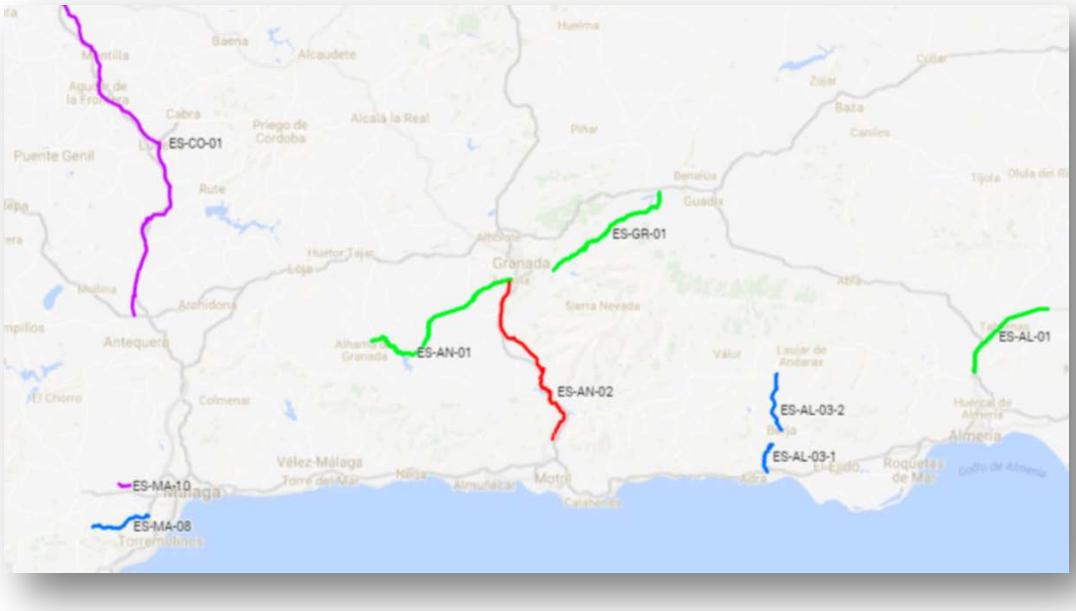


Illustration 6: Protected cycling routes. Granada. 2017 Source: DGT

In the case of the province of Granada, **there are 3 of these routes, with a total of 141.50 km**. Two of them, start in the municipality of Armilla, belonging to the metropolitan area, but they are directed towards the west the first one, and to the south the second one, in a way that they connect the end of the metropolitan area with the western and southern rural areas. The third route begins in Cenes de la Vega, also it is a municipality in the extreme of the metropolitan area, and it goes to the northeast.

Thus, the three protected cycling routes carry out the radial task of connecting the end of the metropolitan area with the rest of the rural area, connecting with the regions of Alhama de Granada (towards the west), Valle de Lecrín and Costa (towards the south) and Guadix (towards the northeast).

MedCyleTour Project - EuroVelo 8

The MedCycleTour project is based on EuroVelo 8 – Mediterranean route and aims to develop cycle tourism in the Mediterranean region by providing transnational tools to attract visitors. Funded by the Interreg Mediterranen Programme, the project has a budget of over €2.5 million.

It has 10 partners from 7 different countries covering the Mediterranean Route in its entire length: Spain (Andalusian Government – Agency of Public Works as lead partner, Andalusian Ministry of Development and Housing, and Catalonia Region), France, Italy, Slovenia, Croatia, Cyprus and Greece.

EuroVelo 8 connects many destinations that are popular tourist attractions in their own right: Granada, Barcelona, Monaco, Venice, the Croatian Coast, Cyprus,... This Mediterranean Route receives more interest than any other EuroVelo route.

Illustration 7: MedCyleTour Project - EuroVelo 8. Source: http://www.eurovelo8.com/

The main data of this project are:

- Project co-financed by the European Regional Development Fund
- 5888 km long.
- 11 countries visited
- 23 world heritage sites

The most westerly stage of EuroVelo 8 – Mediterranean Route incorporates many of the features that make the whole route so inviting: stunning scenery, historic towns and cities, delicious local food and drink and colorful festivals.

Most of this stage is located in the region of Andalucía, including the start (or end) point of Cadiz. As the oldest continuously inhabited city in Spain and one of the oldest in western Europe, Cadiz understandably has a lot of historic sites for visitors to explore. After Cadiz, the route heads south to Punta de Tarifa, the southernmost point of continental Europe. This stage takes the visitor to some of the charming towns and whitewashed villages in the interior of Andalucía. Indeed, one of the biggest attractions along the whole Mediterranean Route is located here - the UNESCO World Heritage listed Alhambra in Granada, which is a staggeringly beautiful Moorish citadel and palace.

EuroVelo 8 does return to the coastline at Málaga, Almeria, the region of Murcia and the stage's end is in Elche.

6.2 OTHER GOOD PRACTICES SELECTED FROM OTHER OPTITRANS REGIONS

Taking advantage of the synergies of a European project with different regions developing their own baseline studies of mobility, some information has been exchanged between partners. Some of the main good practices carried out in these regions have been selected due to its possible adaptation in the metropolitan area of Granada:

- MyCicero. Abruzzo (Italia)
- CityMobil2. Trikala (Grecia)
- Building of cycling paths. Tartu (Estonia

MyCicero. Abruzzo

MyCicero project began with the objective of improving the quality of public transport in some regions of Italy. It was especially indicated to avoid the evasion of the payment of the ticket. MyCicero is a platform that allows:

1. Find the stops and know the schedules: it has a stop search as well as real-time information on possible delays and arrival times.

2. Search for travel solutions using public transport: the application calculates the route and offers useful information such as waiting times, changes, position on the map, walking routes, etc.

3. Purchase of travel tickets: it is possible to buy tickets for a specific trip directly from the app, it can be viewed on screen to be shown to the reviewer.

4. Renew the subscriptions: it is possible to do it in a simple way introducing the user data and credit card number, renewing both urban and metropolitan subscriptions.

In the Abruzzo region there was no electronic payment before the appearance of MyCicero system for its use in public transport. This system has been developed by a private company and the App has been implemented and used in the Abruzzo region since 2013.

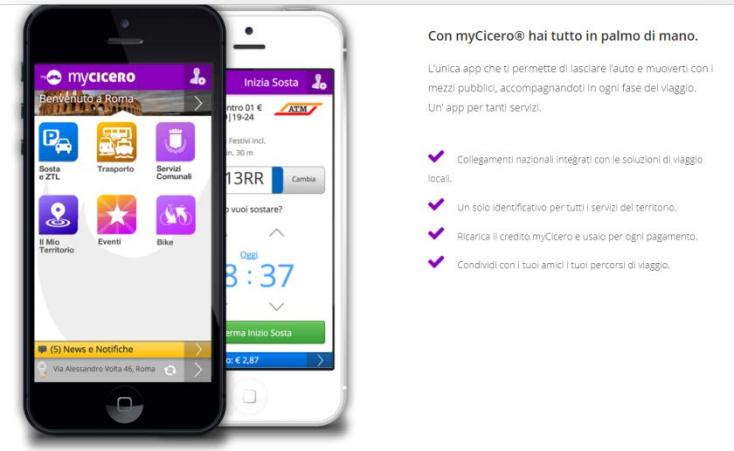


Illustration 8: App MyCicero. Source www.mycicero.it

It is a good practice of success, the possibility of paying easily from the smartphone was designed to encourage the use of public transport. The objective of this proposal has been achieved, in recent years there has been an increase in the use of urban public transport.

The main difficulties at the beginning were that users had to learn and change their travel habits (purchase of transport title, validation, renewal of subscriptions, etc.), which generated many doubts and queries.

CityMobil2

CityMobil2 is a research project, co-funded by the European Commission, which includes a total of 45 participants, among which are research organizations, universities, and industries. It started in 2012 and ended in August 2016, it was coordinated by the universities of Rome and Florence.

This project has shown how autonomous vehicles can be used in different concepts (partly autonomous shared car, cybercars, BRT systems), which can help in more sustainable urban mobility. The objective has been the implementation of an autonomous public transport system, in which 12 countries participated. Each has investigated and proposed different beneficial transport services. The seven best cases were selected. At the same time, the project developed two teams of autonomous road vehicle systems and distributed them among the seven cities for demonstrations between 3 and 6 months.

With these objectives, CityMobil2 developed a pilot platform for autonomous road vehicle systems, implemented in different urban environments in Europe. These autonomous transport systems have vehicles without driver in public transport.

It is considered that they play a useful role in the combination of transport, because they can provide a good transport service (individual or collective) in areas of low demand that complements the main public transport network. A dozen local authorities were interested in being one of the five places to organize a 6-month demonstration. Everyone recognized the potential of autonomus vehicle as part of their public transportation network. Two fleets of six vehicles each were supplied for these demonstrations. The success of the project was that the project itself acquired the vehicles and put them at the disposal of the selected pilot points. One of the beneficiary cities of this project has been Trikala, a municipality of 81,000 inhabitants.

Illustration 9: Demonstration in the city of Trikala. Source: www.citymobil2.eu

The total budget was 15.5 million euros, with a contribution from the EU of 9.5 million euros.

The main success was to define the "safe way" to integrate autonomous vehicles in the urban road.

The project can be a good practice for other cities or regions, for the development of metropolitan areas with increases in mobility of residents and the need for a reduction in pollution.

Building of bicycle paths. Tartu (Estonia)

Tartu presents a compact territory and most destinations are easily accessible on foot or by bicycle. The percentage of pedestrians is very high at present (40% of trips), but the proportion of cyclists is quite small (approximately 3%). With the aim of increasing the percentage of light traffic and improving connections between neighborhoods and urban centers (including peripheral municipalities), it was decided to build new bicycle routes of at least 50-60 km. The planning of these routes was based on a logical network of bicycle lanes developed in all the main exit directions of the city.

The design of these roads was based on the daily routes that had previously been identified through a mobility survey process. In addition to the creation of these new bicycle routes, the existing roads were also repaired.

The cost of the project reached 10 million euros for the construction of all the works. This project began in October 2013 and it will finish in May 2018.

As a result of the project, the modal split of bicycle trips has grown to over 6% and continues to improve. For this success, it has been necessary to involve the citizens of the city of Tartu, cyclists, businessmen and representatives of the local government of the peripheral municipalities. There are many beneficiaries of the project citizens and resident from Tartu and municipalities of the periphery. Likewise, it is a good opportunity for improve tourist mobility.

7. CONCLUSIONS

Once the baseline study of mobility in the rural region of the province of Granada has been developed, which has followed the methodology established and defined in the OptiTrans project, we can set the following conclusions drawn from all this document and analysis process:

- The rural region of the province of Granada has 130 municipalities, It has an area of 10,993 km² (approximately 93% of the total area of the province of Granada) and a population of 0.38 million inhabitants (the 42% of the province's total) represents the region with the lowest economic, social and mobility capacity in the province, with rural areas with low traffic and low demand.
- This region is divided into 9 districts, each with a main municipality that acts as a regional center and influences the rest. All of the 9 district have similar characteristics of high rates of motorization and park of passenger cars, low populations and low densities. Only one of the regions, Costa Granadina, does have totally different characteristics, based on its location by the sea with better accessibility and coverage in terms of transport.
- A proposal of interest would be the creation of a Center of Provincial Management of the mobility of Granada, with funds and sufficient capacity to carry out the analyzes and localized studies in the different regions and territorial sectors, which would allow adapt public transport to the real needs of the area
- As a result of this lack of data, there is no current information on modal distribution, use of public transport and private vehicles.
- In the field of study, the main actors of public transport are divided between public agents (state and regional administrations) and private agents, companies that operate interurban transport (Alsa and Avanza group).
- There are a lot of measures and initiatives for a sustainable urban transport, innovation, infrastructures, energy efficiency and sustainable mobility.
- The public transport services are facing the economic crisis, as well as the dispersion of the towns, the high captivity of the traveler (it does not have another way of transport) and a cultural problem of the irrational use of private vehicles. In conclusion, the use of public transport in the rural area of Granada is currently very small and low.
- There is a very low offer of public transport services in rural areas that make people do not use the public transport services.
- There are some successful experiences such as Demand Responsive Transport with taxis in rural areas, which must be extended to other areas. Transport services on demand should multiply which would optimize the use and exploitation of public transport, improve travel times and be more competitive.
- Finally, it is necessary to promote car sharing measures, especially in points of great attraction of recurrent trips such as universities and in business, industrial and service parks. The Public Platform (www.granadacomparte.com), is a good opportunity for that.

8. BIBLIOGRAPHY

Below, there is a summary table with the information collected to carry out this study.

THEME	INFORMATION	SOURCE
Socioeconomics	Socioeconomics data	Observatorio Territorial de estudios y análisis OTEA Granada
	Roads offer	Observatorio Territorial de estudios y análisis OTEA Granada
	Economics Sectors	Observatorio Territorial de estudios y análisis OTEA Granada
Offer of Public Transport	Interurban transport	Delegación territorial de la Consejería de Fomento. Junta de Andalucía
National and Regional Politics to Promote Public Transport.		Plan de innovación para el transporte y las infraestructuras 2017-2020
		El Plan de Ordenación del Territorio de Andalucía (POTA)
		Plan PISTA 2020 Plan de Infraestructuras para la Sostenibilidad del Transporte
		Estrategia Andaluza de Sostenibilidad Urbana.
		Estrategia Energética Andaluza 2020
Good practices	Shared car in Granada	compartegranada

9. LIST OF INTERVIEWED ACTORS

Below, there is a list of the main actors interviewed during the development phase of this baseline study of the metropolitan area of Granada.

Organization	Interviewed person
Metropolitan Transport Consortium Granada Area	**Christian Muñoz Monge. Director Técnico y Gerente**
Portillo Avanza Group	**Rafael Durbán Carmona. Director Cercanías Andalucía**
Territorial delegation of the Ministry of development in Granada. Junta de Andalucía	**José Luis Lopezosa Mora. Jefe de Servicios de Transporte**
Granada City Council	**Mª Dolores Trespando Corredera**
University of Granada	**Alejandro Grindlay**
Provincial Energy Agency of Granada. OptiTrans	**Gonzalo Esteban López**