



Public Transport Governance in Greater Barcelona

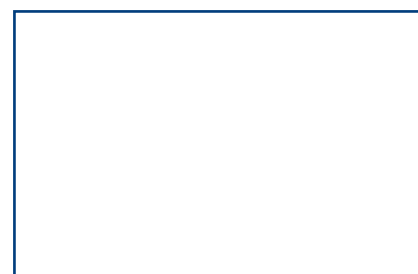
Discussion Paper



Frederic Lloveras Minguell
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The scope of the work

The present document provides an overview of the Metropolitan Area of Barcelona (AMB) in the governance of transport in the metropolitan region. It identifies the issues related to transport systems that the AMB deals with, and how it responds to those challenges.

It also attempts to define the institutional set up in the area, and how the different bodies, administrations and operators interact with each other in order to provide effective public transport services. Financial interrelationship among stakeholders is described, as well as tendering processes, concessions and types of management and control.

The Integrated Fare System allows most of the metropolitan transport services to establish common fares and ticketing. This has led to an increase in intermodal trips and an overall rise in public transport use among the population.

Finally, this study also puts forward the challenges faced by public transport services in the metropolitan area, and how the AMB has developed strategies to tackle these issues. The present document describes current practice and also highlights actions that are in the planning or in-progress phase. The measures herein explained are aimed at improving, among others, the following issues:

- delivering effective and coordinated bus services at the metropolitan level
 - regulation of bus service and type of concessions used
 - strategies for route planning
 - mechanisms for striking the good balance between delivering user benefits and covering operational and maintenance costs, choosing fare structures and ensuring financial sustainability within the fare integration system
- management and regulation of transport data
- the importance and management of commuter terminals
- measures to encourage sustainable mobility.

The Barcelona metropolitan region and its public transport system

Territorial context of the Barcelona metropolitan area

A metropolitan area is a territorial, social, demographic, economic and cultural fact that has been forming over the last century, as a product of the growth and connection of urban systems around the city of Barcelona. According to OECD's data from 2014, Barcelona's is the seventh most populated metropolitan area in Europe, and the most densely populated.

According to regional data, the metropolitan area in Barcelona is made up by 36 municipalities with more than 3.2 million inhabitants. This data considers an area which spreads over 636 km² and has an occupied surface of 46.5%, mainly located around the central agglomeration, the remaining areas being predominantly agricultural.

Although the area constitutes just 2% of the Catalan territory, it holds 43% of the Catalan population, giving way to a high density of inhabitants. Its economic value to the region is emphasised by the fact that it generates half of the GDP in Catalonia.

It should be noted that, when referring to the area in terms of geography, the term "the metropolitan area" is used, whereas "the Metropolitan Area of Barcelona" or the acronym "AMB" is used to refer to the public body.

Figure 1. Population and area of Catalonia and the metropolitan area of Barcelona



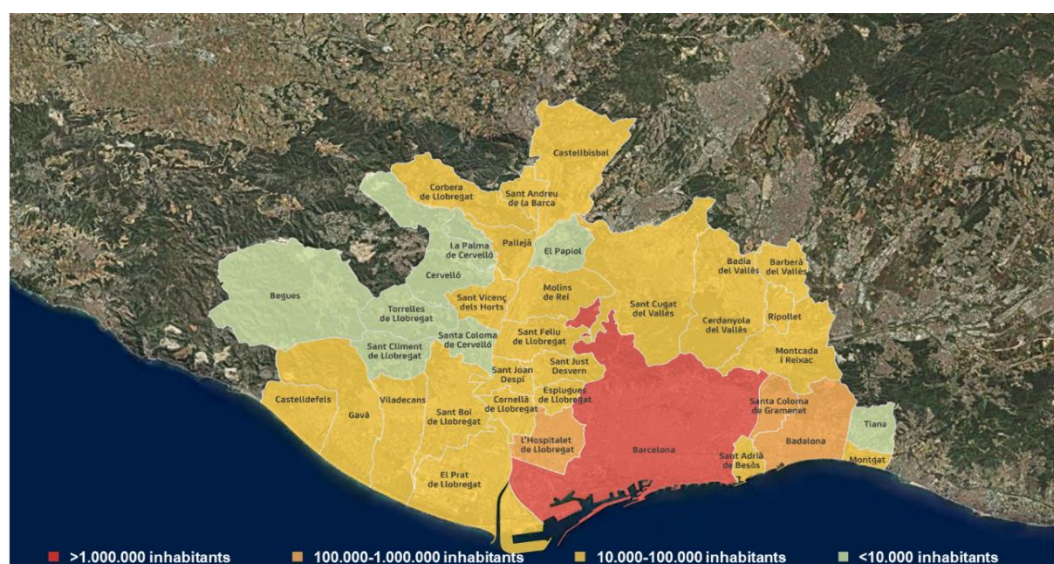
Source: AMB (2017).

The Barcelona metropolitan area occupies a strategic position in the South of Europe, as it is in the middle of the Mediterranean corridor, which links Spain with the rest of the continent. This fact is emphasised by the growing influence its port and airport have on national and international mobility in Southern Europe.

When it comes to mobility, data from 2016 show that the residents in the metropolitan area make 9.1 million daily trips (3.3 daily trips per person). The residents of the city of Barcelona account for 52% of this mobility. The main reasons for the trips are going to work (12.7%), shopping (10.7%) and

accompanying others (8.2%), without taking into account going back home (44.1%). As for the modal share, 43% of trips are made by foot, 28% by public transport and 29% by private vehicle.

Figure 2. Population in the metropolitan area of Barcelona



Source: AMB (2017).

The Barcelona metropolitan area inside the integrated fare system in the region

The organisation of public transport in the metropolitan area is influenced by the overlapping management/institutional layers, described below from lower to higher territorial scale.

Metropolitan Area of Barcelona

As mentioned before, the metropolitan area of Barcelona consists of 36 municipalities and 3.2 million inhabitants, living in the urban conurbation of Barcelona, which spans over 636 km² in the immediate surroundings of the city.

The Metropolitan Area of Barcelona (AMB) is the public entity that owns and manages all the public transport systems within the metropolitan area. These systems include the metro and bus of the city of Barcelona, as well as other urban or suburban bus services connecting the 36 municipalities in the area. The metropolitan suburban tramway is an exception to this norm, as although it is fully within the limits of the metropolitan area, it is not managed by the AMB but the Metropolitan Transport Authority (ATM), which will be described later on.

Metropolitan Region of Barcelona (RMB)

Consisting of 164 municipalities, it has 5 million inhabitants and covers 3,235 km². The RMB is formed by the metropolitan area of Barcelona and 128 other neighbouring municipalities. It should be noted that the metropolitan region is not related to the “region” concept used when referring to the total Catalan territory.

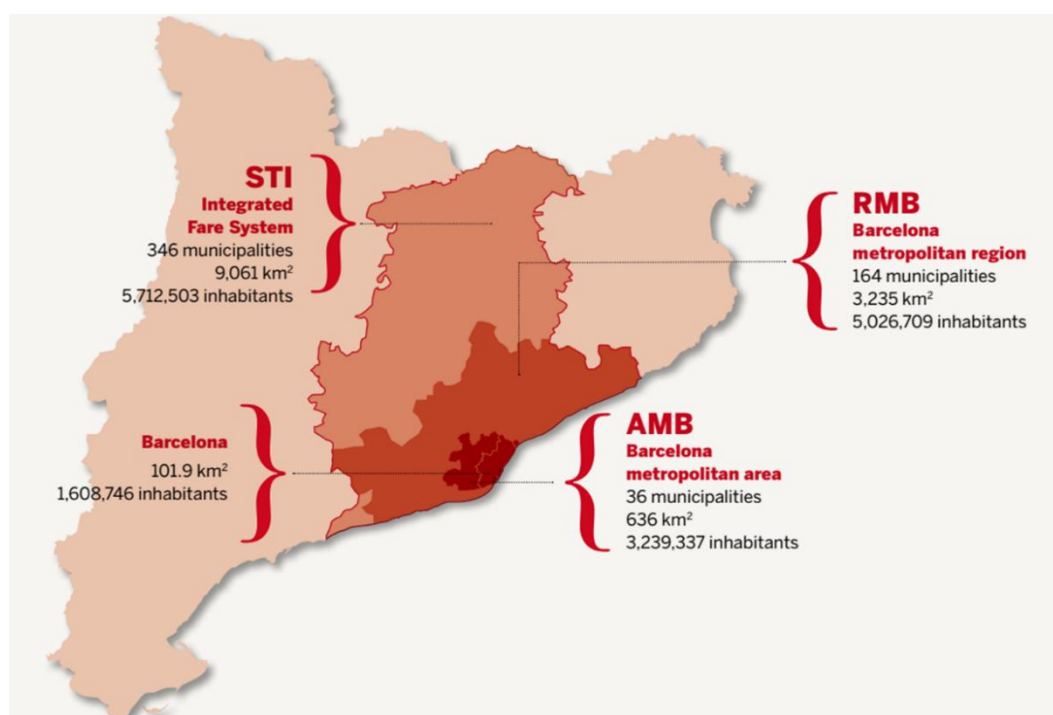
The RMB is a planning unit defined by the Catalan Government (Generalitat de Catalunya onwards), for urban development matters, mobility and transport. Catalonia is divided into seven planning units, one of which (and the most important with respect to population and economy) is the RMB.

Integrated fare system of Barcelona (IFS)

The 346 municipalities forming Barcelona's area of influence make up an area greater than the two mentioned above. This is an area that resembles the RMB, but it is larger because it adapts to the historical reality of the transport networks, and so includes the starting stations of the train commuting services that connect with the city of Barcelona. This area is under the integrated fare system (IFS), but it is not under a specific planning instrument

The railway infrastructure reaches some municipalities that are not in the RMB but in a larger commuter area. These municipalities ask to be included in the IFS, and thus the area has been subject to several expansions since its creation. The IFS was recently enlarged from 296 to 346 municipalities while on the other hand the planning territorial unit of the RMB has stayed the same. At present, the IFS area has 5.7 million inhabitants, but as its boundaries are dynamic, the integrated fare system grows over time.

Figure 3. The four territories in public transport management



Source: TMB (2017).

The numerous existing public transport networks serving the metropolitan area can be classified in the following groups: metropolitan transport networks (Box 1), integrated regional transport networks (Box 2) and other networks.

Box 1. Metropolitan transport networks

The systems found completely within the metropolitan area are managed by the AMB (with the exception of the tramway). These are the following:

Ferrocarril Metropolità de Barcelona (Metro of Barcelona)

The metro in Barcelona consists of 8 lines, 85.8 million veh/km and an annual demand of 381 million users (TMB, 2017). The AMB is the administration in charge of the service, but the operator, the public operator TMB, has a high degree of autonomy. The metro infrastructure is owned by the Generalitat. (Figure 4)

Trambaix and Trambesòs (TRAM)

The Trambaix and Trambesòs are 2 suburban tramway networks, inside the metropolitan area of Barcelona, with 2.5 million veh/km and an annual demand of 27 million users in total (ATM, 2016). The tramway is a unique case, as even though it is fully inside the metropolitan area limits, it is the ATM who manages the service rather than the AMB. The tramway system is operated via a concession by a group of private companies. The ATM is the public body that concedes the concession. (Figure 5)

Transports de Barcelona (Urban bus in Barcelona)

The urban bus of Barcelona consists of 99 lines, 41 million veh/km and an annual demand of 196 million users (TMB, 2017). The operator, as in the Metro, is the public operator TMB. As with the Metro, the AMB is the administration in charge of the service, but the operator, TMB, has a high degree of autonomy. (Figure 6)

Other bus lines in the metropolitan area

The urban bus of Barcelona consists of 107 lines, 37.4 million veh/km and an annual demand of 87 million users (AMB, 2016). There are 8 companies or private groups acting as operators for these lines, but the AMB manages them directly. (Figure 7)

NitBus (Night bus)

Barcelona's night bus network (NitBus) consists of 20 lines (AMB, 2017d). There are 2 companies acting as operators for these lines, but the AMB manages them directly. (Figure 8)

Others

These services are not included in the integrated fare system. Other bus services in Barcelona include the Aerobús, which connects the airport to the city centre and two touristic bus networks, Barcelona Touristic Bus and City Tour Barcelona. A part from the bus, there are also several minor transport lines such as the Montjuïc Funicular Railway, the Blue Tramway or the Montjuïc Cable Car. (Figure 9)

Figure 4. Barcelona Metro



Source: ATM (2017)

Figure 5. Barcelona Tram



Source: ATM (2017)

Figure 6. Barcelona Bus



Source: ATM (2017)

Figure 7. Metropolitan bus



Source: ATM (2017)

Figure 8. Nitbus Barcelona



Source: ATM (2017)

Figure 9. Touristic bus Barcelona



Source: MCRIT (2017)

Box 2. Integrated regional transport networks

The transport networks within the integrated fare system (IFS) exceeding the boundaries of the metropolitan area are the following:

Rodalies de Catalunya (RENFE)

The network of suburban trains consists of 6 lines, 101 million veh/km and an annual demand of 108 million users (ATM, 2016). The Generalitat is the administration in charge of the service. The Spanish State is the owner of the operator (RENFE) and the owner of the infrastructure (ADIF).

Ferrocarrils de la Generalitat de Catalunya (FGC)

This suburban railway network consists of 2 corridors, 31 million veh-km and an annual demand of 81 million users (ATM, 2016). The operator is a public operator (FGC Operator). The owner of the service is the Generalitat de Catalunya but as FGC is a public operator, the Generalitat delegates the practical management and control of the service.

Other bus transport operators

There are around 30 private urban or suburban transport companies that operate via a concession or other contracts issued by the Generalitat.

Figure 10. Rodalies Catalunya



Source: ATM (2017)

Figure 11. FGC



Source: ATM (2017)

Figure 12. expres.cat Bus



Source: ATM (2017)

Other networks

There are other transport services that connect the metropolitan region with the exterior, and thus do not form part of the integrated fare system. These services fall out of the scope of this document, and will therefore only be mentioned to offer a complete view of the public transport supply in the city. They are the following:

- Regional railway services: they cover the Catalan territory, are managed by the Catalan Government and are operated by the public operator Renfe.
- Regional bus services: they operate in the Catalan territory, are managed by the Catalan Government and are operated by several private companies.
- Long-distance railway services (conventional and high-speed trains): they connect Catalonia with the rest of Spain, are managed by the Spanish central government and are operated by Renfe. Unlike the previously mentioned, these are not public but commercial services, and so, according to European directives, must be economically profitable without depending on subsidies.
- Long-distance bus services: they connect Catalonia with the rest of Spain, are managed by the Spanish central government and are operated by Renfe.

The following tables sum up the supply and demand of transport systems in the IFS. The concepts of direct and indirect management will be clarified in the section that follows.

Table 1. Supply and demand of transport systems in the IFS

Transport systems in the IFS	Annual veh/km		Annual Passengers	
	(million)	(% over IFS)	(million)	(% over IFS)
Metro	85.8	24.0	381.5	40.0
Bus TMB	40.6	11.3	195.8	20.5
TOTAL TMB (direct management)	126.3	35.3	577.3	60.5
Other metropolitan buses (indirect management)	37.4	10.4	86.6	9.1
TOTAL AMB (TMB + indirect management)	163.7	45.7	663.9	69.6
FGC	31.5	8.8	81.4	8.5
RENFE	101.6	28.4	108.2	11.3
Tramway	2.5	0.7	26.8	2.8
Other urban buses	13.6	3.8	33.9	3.6
Other interurban buses	45.1	12.6	39.8	4.2
TOTAL IFS	358.0	100	954.0	100

Source: ATM (2016).

Governance and institutional set up

The public transport system in the metropolitan area has a complex organisational structure. It mainly consists of four independent railway networks (Rodalies de Catalunya, Ferrocarrils de la Generalitat de Catalunya, Metro and Tramway) and several urban and interurban bus networks.

The three territorial levels described in the previous section are replicated in three institutional levels as follows:

- The AMB is responsible for planning and managing public transport systems in the metropolitan area, except for the tramway, which is managed by the Authority of Metropolitan Transport (ATM).
- The ATM is the public entity that manages and cooperates all planning instruments in the RMB. The ATM is a consortium formed by the Catalan Government, the AMB, the Barcelona City Council and the AMTU.¹

As will be explained later, the ATM is responsible for, among other things, deciding on public transport tariffs, establishing financial agreements, developing mobility plans (such as the Mobility Master Plan in the RMB) and developing public transport infrastructure (Infrastructures Master Plan in the RMB).

- The Department of Territory and Sustainability of the regional government of Catalonia (Generalitat de Catalunya) is responsible for managing the concessions with the transport operators that are not managed by the AMB.

The Generalitat de Catalunya owns exclusive competencies in the matter of land-use planning and management of transport services that operate completely within the Catalan region. The Generalitat de Catalunya remits the development of transport services in the metropolitan area of Barcelona to the ATM and the AMB.

The following table summarises the organization structure of the public transport:

Table 2. Organisation structure of the public transport systems operating in the metropolitan area

Type	Service	Operator	Owner of the infrastructure	Owner of the service
Railway	Rodalies de Catalunya	Renfe (public operator)	ADIF (State)	Generalitat de Catalunya
	Ferrocarrils de la Generalitat	FGC Operadora (public operator)	FGC (Generalitat de Catalunya)	Generalitat de Catalunya
Tramway	Trambaix and Trambesòs	TRAM (Private company)	Several administrations	ATM
Metro	Metro	TMB (public operator)	Generalitat de Catalunya	AMB
Bus	Urban buses in Barcelona	TMB (public operator)	Several administrations	AMB
	Other buses in the AMB	Several private companies	Several administrations	AMB
Taxi	Taxi	Several private companies	Several administrations	AMB

Source: PMMU diagnosis; AMB, (2015).

The Area Metropolitana de Barcelona and its rationale behind

The municipality of Barcelona is smaller (in area and in population) than the urban area it forms with its surrounding municipalities. This fact led to the creation of a public body that could comprise the whole urban area in order to manage transversal policies in terms of urbanism, mobility and transport and environmental issues, among others.

The Barcelona Metropolitan Area (AMB) is the administrative body of the metropolitan area of Barcelona, which was established through the Law 31/2010 of the Catalan Parliament. The new metropolitan public administration replaces three entities that existed until 2011: Mancomunitat de Municipis de l'Àrea Metropolitana de Barcelona (Union of Municipalities of the Metropolitan Area of Barcelona); the Environmental Agency and the Metropolitan Transport Board (EMT). The AMB rationalises and simplifies the metropolitan governance by creating a single administration.

The Metropolitan Council is the highest governing body of the AMB. Among its powers are the appointment and termination of the presidency of the AMB; the approval of the Metropolitan Action Plan, which includes the projects and services that will be developed by the AMB during the mandate, and the approval of ordinances and regulations.

All mayors and councillors elected for town councils become metropolitan councillors and, therefore, representatives of the citizenship of the metropolitan area. The presidency of the AMB is held by the mayor of the city of Barcelona. The Metropolitan Council currently comprises 90 metropolitan councillors. Each of the 36 municipalities has a number of members in proportion to their demographic

weight. The mayors of the municipalities are ex officio members of the Council, in addition to the councillors appointed by the Town Councils whose number increases until covering the one stipulated for each municipality.

The Transport Department of the AMB is the result of the evolution of the previous Metropolitan Transport Body (EMT), created in 1986 as one of the bodies replacing the Barcelona Metropolitan Corporation. The EMT was composed of Barcelona city and 17 municipalities of its area. Since 2011, the metropolitan administration has grown in extension, and currently comprises 36 municipalities.

The AMB, as was the EMT before, is the owner and manager the public transport services (bus and metro) provided in the metropolitan area. The main transport services are provided in the city of Barcelona and its immediate surrounding area through a direct award contract with the public operator TMB, in charge for the provision of the bus (TB) and metro services (FMB).

The AMB provides its public transport services by either directly managing a public operator (TMB) or indirectly managing several private transport companies operating under administrative concession. The concessions have a period of validity of 8-10 years.

As of December 2017, the AMB staff is made up of 541 employees with an associated global budget of EUR 34 M/year. The number of staff within the Transport Department of AMB is 37 people. The volume of personnel of the Area of Mobility and Transport of the AMB is of 37 people.

The collective public transport network under the AMB responsibility is composed of metro and bus networks. Altogether, this system carries 663 million passengers a year through a network of eight metro lines and 210 bus lines, with an overall length of about 4 650 km. It has a fleet of 1 764 buses and 171 metros (AMB, 2016).

As can be seen in Table 1, the AMB is responsible for 46% of the total transport supply in the IFS, while adding up to 70% of the total demand.

The AMB funds transport projects in the metropolitan area in its competencies framework, which does not include the tramway (held by the ATM) and infrastructural projects (held by the infrastructure owner).

The main transport operator is TMB, composed of Transports de Barcelona, SA and Ferrocarril Metropolità, SA, which provide metro and bus services. Within the metropolitan area there are also eight companies or private groups that provide bus services.

Finally, there are two more transport concessions to attend specific demands: the airport connection (Aerobus) and touristic routes (Barcelona City Tour). These concessions work on their own fare system and are not integrated within the IFS in the Barcelona region.

The administration of the AMB is organised as follows:

- The Metropolitan Council is the highest governing body of the AMB. All mayors and councillors elected for town councils become metropolitan councillors, and therefore representatives of the citizenship of the metropolitan area. Each of the 36 municipalities in the metropolitan area has a number of members in proportion to their demographic weight. The president is chosen from the Metropolitan Council, and it manages the metropolitan government.
- The Governing Board performs the tasks delegated by the Metropolitan Council and the president, and so assists the president in the everyday work of the metropolitan administration.

- The AMB has other bodies guaranteeing its operation. Some of them monitor financial management, others have the function of ensuring the legality of procedures and others are responsible for institutional representation and for giving voice to metropolitan town councils.

Apart from transport and mobility, the AMB also holds competencies in different areas such as urbanism (infrastructure and urban areas development), housing, environment (management of parks and beaches), social cohesion and economic development.

Each of these competencies has an associated department working under total co-ordination with the others branches. This innovative characteristic of the AMB allows for the development of transversal planning instruments related to mobility, housing, territorial planning, environment and sustainability.

A good example is the fact that the AMB is currently developing the metropolitan Urban Master Plan (PDU) in co-ordination with the Urban Mobility Metropolitan Plan (PMMU) following the directives of the Catalan Mobility Law² that links mobility planning to urban development.

Competencies in transport and mobility

The legal framework reinforces the metropolitan administration with new competencies and objectives

1. The AMB has powers in surface transport of passengers in its 36 metropolitan municipalities, managing the service and the concessions of all the bus lines within.
2. Provision of the Barcelona Metro through an indirect management with the public operator TMB.
3. The services managed by the AMB cover 70% of the metropolitan mobility that occurs in collective transport.
4. Regulation of the taxi service inside the metropolitan area.
5. Development and approval of the Urban Mobility Metropolitan Plan that includes the definition of the basic metropolitan road network. Participation in traffic management in this network, together with the Catalan Government.
6. Planning and management of passenger transportation with tourist and cultural purposes, delegated by town councils. This also includes the bus shuttle connecting Barcelona's airport to the city centre.
7. Promotion of sustainable transport by encouraging the use of the bicycle.
8. The AMB manages and keeps the maintenance tasks in the peripheral expressway of Barcelona.

Furthermore, the AMB owns other public companies:

9. AMB Informació i Serveis SA (AMB Informació) is a metropolitan corporation directly managed by the AMB with responsibilities in information and dissemination to citizens about public transport services, promotion of metropolitan public transport, creation and maintenance of the documentation file on metropolitan transport, customer service.
10. The Metropolitan Taxi Institute (IMET) is an autonomous body dependent on the Barcelona Metropolitan Area (AMB). Its function is focused on the administration and management of taxi services in this area.

Funding structure of the AMB

The AMB administers a budget of EUR 684 Mand and the department of Mobility and Transports represents 40% of the total expenses. The AMB funds come from different sources, the most significant are:

- Direct taxes (15%): the municipalities in the metropolitan area charge a specific tax called “Metropolitan tax” that is specific for the AMB.
- Indirect taxes (25%): other surcharges in municipal taxes such as waste management.
- Regular transfers between administrations (52%): includes transfers from other administrations such as the city councils (most part), the ATM (re-distribution of Public transport ticketing revenue collection managed by the ATM), Catalan Water Supply Agency or the Port Authority of Barcelona among others.
- Patrimonial income (5%): mainly by profitable concessions to private operators such as the Airport shuttle (Aerobús) or the touristic bus among others.

This budget does not include the separate budgets of the directly-managed TMB (around EUR 800 million) and other companies in the AMB’s group such as AMB Informació or the Metropolitan Taxi Institute.

The Autoritat del Transport Metropolità (Metropolitan Transport Authority or ATM)

The Autoritat del Transport Metropolità (Metropolitan Transport Authority, or ATM) is a voluntary inter-administrative consortium set up in 1997. The AMB and other competent authorities coordinate the planning and financing of the transport system in the IFS scale through the ATM.

The administrations within the consortium are the Generalitat de Catalunya (51%) and local governments (49%), namely the Barcelona City Council, the AMB and the AMTU. Also notable is the presence of representatives from the state central government (AGE) on ATM's governing bodies, but only as observers.

While the AMB concentrates on managing public transport strictly within the metropolitan area, the ATM acts in the IFS boundaries.

The main aim of the ATM is to organise the co-operation between the public administrations owning collective public transport services and infrastructures in the IFS, as well as including those administrations which, such as the state government, are committed from a financial point of view or who own services that have not been assigned to other bodies.

The ATM plays an important role in the organisation of tariffs within the IFS. As has been mentioned, there are numerous networks at the disposal of the metropolitan population. These range from services within the metropolitan area limits (such as the tramway or metro), but also those connecting the metropolitan area and the other municipalities of the IFS (such as the suburban bus or train lines) and even long-distance networks.

For those services operating within the IFS limits, the ATM draws up and approves a shared system of tariffs, which establishes the integrated fare system. The ATM controls the introduction of new tickets and establishes ticket prices.

Even though the ATM's territorial planning unit is the RMB, it decides upon transport fares in the whole of the IFS. However, the interests of the municipalities outside the RMB are also taken into account when setting up public transport fares. These municipalities are represented by the Generalitat de Catalunya, which holds 51% of the participation of the ATM. Moreover, the ATM is nowadays working to include the rest of the IFS territory outside the RMB in the planning documents for which it is responsible.

One of the main purposes of the ATM is to collect the revenue generated by those tickets and then redistribute the income among the operators.

Apart from collecting and re-distributing ticket sale revenues, the ATM draws up proposals for financing agreements with the different public administrations responsible for financing public transport, and defines the system's budget allocations. Consequently, it agrees with the administration the subsidies provided to offset the deficit of services and operational costs of the different public transport services.

The ATM is funded by the members of its consortium (Generalitat de Catalunya, AMB, Barcelona city council and AMTU). Hence, the municipalities inside the metropolitan area indirectly fund the ATM by funding the AMB.

The ATM's total budget for 2017 was EUR 1.321 M, with 51% corresponding to transfers to public transport operators.

The ATM also elaborates the Master Plan of Infrastructures (PDI), which contains the entire public transport infrastructure planned for a ten-year period in the RMB, irrespective of the administration or operator involved. Through the PDI, the ATM plans the public transport infrastructures in the RMB, however, the ATM itself does not fund infrastructure improvements, as the responsibility of carrying out the constructions stands in the owner of the infrastructure, generally the Generalitat de Catalunya or the Spanish State

Finally, it also develops the Master Plan for Mobility (PDM) for the RMB, which sets over the course of six years, the specific objectives in order to achieve sustainable and safe mobility that help improve the economic competitiveness of the RMB.

In terms of a wider regional analysis, there are three other ATMs in Catalonia for other territorial planning units. There is no overlapping in terms of territory nor in competencies between the four ATMs. However, the Generalitat de Catalunya plans to implement an integrated fare system for the whole territory in the mid-term. This idea is still under development and there is still no information on how this global system will be organised.

The Generalitat de Catalunya, as the administration granting public transport concessions outside the metropolitan area, and the ATM, as the administrations regulating the IFS, together decide on which public transport concessions are integrated in the IFS.

The role of the AMTU

The AMTU corresponds to a non-profit association of city councils that manage urban transport outside the metropolitan area of Barcelona (where the AMB plays that role).

The AMTU is a member of the ATM as a representative for the city councils that provide urban public transport within the IFS. The municipalities can freely join the association (it is not mandatory in any case). The AMTU is composed of 93 city councils and two county councils.

Its main function is to be a sole interlocutor between the city councils with urban transport and regional administrations commanding the interurban transport such as ATM and the Generalitat de Catalunya. These include the city councils that receive subsidies for the urban public transport within the IFS.

The AMTU gathers the subsidies from the ATM that correspond to financing urban public transport, estimating the total amount that corresponds to each municipality and finally performing the distribution of resources between them.

The AMTU also manages subsidies focused on financing proposals for improving urban public transport, contemplated in improvement plans previously approved by the AMTU, the ATM and the Generalitat. This also includes the elaboration of technical, juridical and administrative analysis related to mobility, infrastructures and public transport. The AMTU provides technical documents related to the infrastructural planning documents, public transport and mobility. However, it has no competencies in planning or executing infrastructures.

The role of the ATM and the AMB at the metropolitan level

Essentially, the AMB exerts the co-ordination among operators, is in charge of granting concessions, plans the services within the metropolitan area and maintains a direct contact with the 36 municipalities. Moreover, it has competencies in fields other than mobility (urban planning, housing, environment, sustainability, etc.), and consequently can make policies integrating different sectors.

Table 3. Competencies in the metropolitan area

Competency	Metropolitan area
Granting concessions	AMB ³
Managing the service	AMB (through TMB and private operators)
Contact with local administrations	AMB
Proposals for financial agreements	ATM
Determine integrated fares	ATM
Determine non-integrated fares (tickets specific for certain operators)	AMB ⁴
Public transport infrastructure planning	ATM
Centralised control of demand data	ATM

The ATM is a consortium, composed by the Generalitat de Catalunya, AMB, and Barcelona city Council, created to carry out those aspects that go beyond the scope of its member's competencies. Among these aspects are the preparation of financial agreements with administrations, the establishment of tariffs and the planning of public transport infrastructure.

There is also a third element that complements the AMB and ATM, the Transport Department of the Generalitat de Catalunya, which supervises concessions to operators when their services connect the metropolitan area with the rest of the RMB, as this falls out of the AMB's scope.

Provision of transport services at metropolitan level

The role of the AMB and the ATM in public transport management and granting concessions

The AMB manages the concessions for bus services operating within the metropolitan area, while the Generalitat de Catalunya manages concessions for lines connecting the metropolitan area with the rest of Catalonia. However, the lines managed by the Generalitat de Catalunya are under the so-called “prohibition of passage”, and hence cannot serve passengers travelling inside the AMB’s scope.

The ATM is responsible for the financial balance between concessions. As will be explained in the section *Balancing the income between the different operators*, the ATM collects all ticket-generated income of the entire public transport system and re-distributes the revenues. This re-distribution depends on the zones crossed by the trip, the number of modes used and the type of ticket validated.

The two types of management of the AMB

The AMB performs two types of management in its services: direct and indirect management. On the one hand, direct management is used to manage the metro and Barcelona’s urban bus networks. In this case, the operation of transport services is run by the public operator TMB. There is no tendering process, so it cannot be considered a concession. TMB has a high degree of autonomy, but it is under the supervision of the AMB.

The president of TMB is the Mobility Councillor of the Barcelona City Council, and the vice-president is the AMB’s vice-president in the department of Mobility. TMB carries out its own planning programmes, but they must always be approved by the AMB. In addition, TMB has a direct intervention of the Barcelona City Council through its presidency at the time of planning, but the board of directors of AMB ultimately takes the decisions.

On the other hand, indirect management is used for the rest of bus lines inside the metropolitan area. This type of management consists in concessions for specific transport services to be operated by private companies that have entered and won a tendering process.

The AMB carries out the whole process of contracting and planning of the service in direct contact with the operator company.

Regulation of bus service and type of concessions used

Tendered contracts in the metropolitan area

Today the AMB runs the tendering process and the concession contracts for all the bus lines that operate inside the metropolitan area of Barcelona.

The tendering process is a competitive tendering procedure without pre-selection nor negotiation. The resulting contracts transfer part of the cost and revenue risks to the operators, as well as other quality penalties and incentives. The tender contracts tend to be for a period of eight years approximately.

Operators procure vehicles on behalf of the AMB, who holds their ownership, and provide other auxiliary installations (depots, offices...).

The AMB decides upon service supply and network development, and allows service modifications (proposed by itself or by the operator) within the following limits:

- Changes in total production (measured in yearly kilometres) are limited to a maximum of +/- 10% (depending on each contract).
- No new lines can be created, however, reinforcements of part of an existing route might be permitted.

In the tender process, the operator proposes a yearly operational cost and a goal for passenger volume. The yearly operational cost is constant throughout the contract and it is updated with a formula that considers the evolution of fuel costs and the drivers' local wages agreement.

The operator estimates the number of passengers for each of the years of the contract. If the number of yearly passengers is under the operator's estimate, it assumes the loss of these revenues. On the other hand, if the number of yearly passengers is above the operator's estimations, it receives part of the extra revenues, which ranges (between 25% and 50% of these extra revenues). However, the passenger estimation may be modified yearly to take into account the perceived trend in passenger volume.

Finally, qualitative incentives have been designed in order to complement (or penalise) the revenues of the operator's service. Incentives take into account the obtained quality, measured in terms of punctuality, bus quality, bus-stops quality, dynamic information quality, perceived quality and passengers' satisfaction. These incentives or penalties might represent up to 5.5% of the operational costs.

The process for granting concessions outside the metropolitan area of Barcelona (including services that connect the metropolitan area with the rest of RMB) is supervised by the Generalitat de Catalunya. The current concessions proceed from historical agreements that were extended recurrently. In some cases, the concessions can be tracked back several decades and even centuries, such as some of the lines operated by Sagalés since 1641. However, all the bus concessions managed by the Generalitat de Catalunya expire in 2028, and their extension is not considered in the current contracts, thus drawing a change in scenario from 2028.

The ATM only grants the concession of the Barcelona tramway. The concessions corresponding to urban buses are granted by the AMB in the 36 municipalities of the metropolitan area of Barcelona. For the municipalities outside of the metropolitan area, concessions are granted by the city council.

Financial contribution design of the tendered contracts

The financial contribution of the tendered services is calculated as the difference between costs and revenues, including incentives, and is paid by the AMB to the private operators:

$S = C - I + G$ (where S is AMB's financial contribution, C is cost, I are revenues, and G are incentives)

The annual costs of the operators are divided into two parts: operational costs and investment costs. Operational costs include wages, fuel, bus maintenance, and the general company structure (offices, etc). Investment costs are specifically defined in each contract and include all the required equipment

investments such as vehicle depreciation, new equipment inside the vehicles or financing costs, among others.

Revenues are also divided into two parts: regular revenues stemming from the ticketing of the passengers, and extraordinary revenues (which mainly include profits from advertising). All revenues from the ticketing are managed by the ATM. The management and distribution of public transport revenues will be detailed in the section *Financing the transport system*.

Tendering process

Tendering processes for bus concessions in the inner metropolitan area are managed by the AMB. These processes are scored on a scale of 100 points, divided into two main parts: 49 points for technical aspects, and 51 points for economic aspects.

During the tendering process, the operator is asked to technically define a detailed operational model of the routes included in the proposal and has to define the economic offer.

The economic offer should include:

- The yearly operational costs; the lower the price offered, the more points are assigned to the operator (there are some specifications to prevent operators from offering excessively low prices).
- The total number of passengers expected; the higher the number of passengers expected, the more points are assigned during the tendering process.

In both cases, there is a risk in offering inappropriate values. If the yearly operational cost is too low, the deficit will be underestimated since the operational cost will be higher than expected. If the goal of passengers' volume is too high, calculated revenues will be overestimated and therefore the deficit will also be underestimated.

Design of incentives through quality controls

There are several incentives that can contribute to the AMB's financial contribution to each operator. These incentives are punctuality, vehicle quality, bus stop quality, dynamic information quality and passengers' satisfaction.

Punctuality

Punctuality is calculated for each operator as an average of the annual punctuality of the line, weighted by the number of annual services. Incentives and penalties may reach up to 1% of the operational cost, and they are applied by calculating the difference between the operators punctuality with the average punctuality of the other AMB services.

In general, if the operator punctuality is 2 percentage points above the AMB average, there is an incentive. Otherwise, if the operator punctuality is 2 percentage points under the AMB average, penalties are applied.

Bus quality (vehicle)

Every vehicle is inspected while circulating by a mystery shopper twice a year. Different quality parameters of the vehicle are measured by taking into consideration the information provided on board,

maintenance, cleaning, driving quality and the driver's citizen advice. For each of these five aspects, quality incentives or penalties are designed in relation to the average results for the entire AMB services. The total amount of quality incentives or penalties may reach up to 1% of the operational cost.

Bus-stop quality

Every bus stop is controlled twice a year in order to learn the general bus-stop maintenance and problems. Some of the bus stops have to be maintained by the operators (mainly bus-stop poles), while in others it is the local administration, or other service companies, who are in charge of the upkeep (mainly for the case of bus-stop shelters). However, in all instances, the operators are in charge of providing their own transport service information. The total amount of quality incentives or penalties may also reach up to 1% of the operational cost.

Dynamic information quality

All buses come with GPS co-ordinated with an Intelligent Transportation Management System (ITMS), which is mandatory by contract and must be provided by the operator. The GPS provides information of their position and informs about the time remaining to arrive to the next bus stops. This information is displayed on the information panels in bus stops and mobile apps, i.e. *AMBtempsbus*, which is an AMB free service for users to get live information on the minutes remaining for their bus to reach the bus stop. In this regard, operators are in charge of providing confident information to the web services that process such arrival time information. The delivery of this information is mandatory and the formats must adapt to the Webservices and Databases provided by AMB Informació, the company in charge of aggregating and publishing this data. Therefore, a quality index has been designed with an incentive and penalty range up to 0.5% of the operational cost.

Passengers' satisfaction

Finally, a satisfaction index has been designed to measure the quality perceived by passengers. It is based on a survey conducted yearly among 6 000 bus transport users to measure the satisfaction they perceive on the quality of tendered companies services. The total amount of quality incentives or penalties may reach up to 1% of the operational cost.

Tendered contracts in the rest of the Metropolitan Region

The concession contracts held by the Generalitat de Catalunya with the bus operators running in the Metropolitan Region follow the next conditions. There is a part of the concession contract that is submitted at risk by the operator. It comes from the origin of the concession, where the operator could adapt a minimum amount of transport offer to keep a positive economical balance for the company. The tariff had to be approved by the public administration. There are no subsidies for this part of the contract.

On top of that, the public administration adds a new concession contract to provide the proper amount of transport offer to fit a territorial balance. It results into an increase of the service, which in this case it is partially sustained by public subsidies.

This second contract is based on a model of "Net Cost" where the costs and ticket income are forecasted by the public administration and the need subsidies are calculated. Thus, the operator runs at risk for the cost and the demand as the amount of subsidies are previously decided.

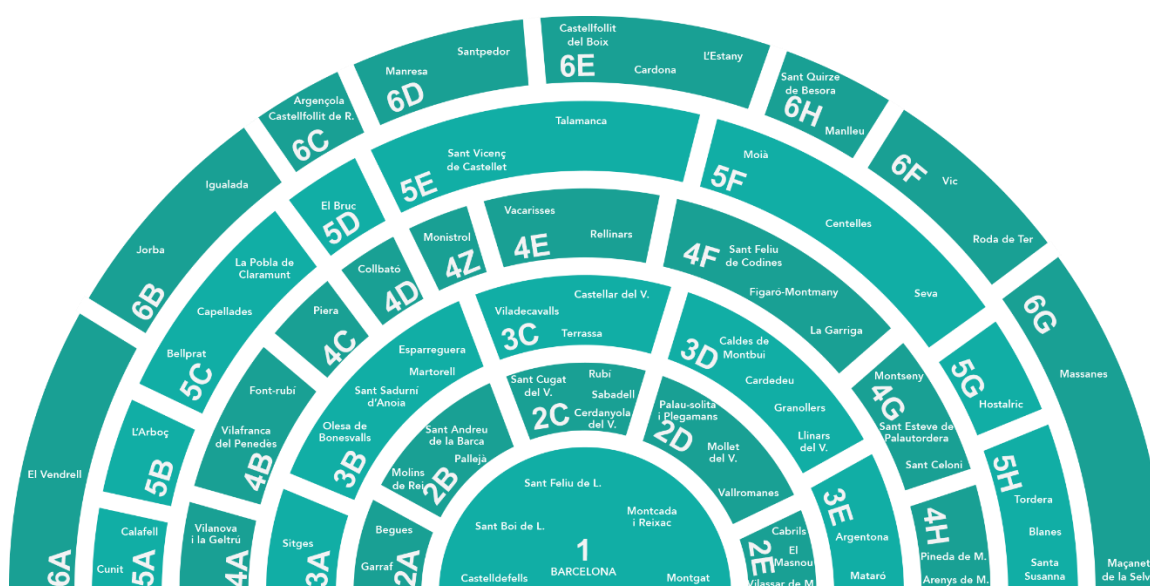
In order to provide a certain stability in the case of a big recession in terms of demand of passengers, the estimation of economical subsidies are recalculated annually.

Financing the transport system

The Integrated Fare System

The Integrated Fare System (IFS) includes 346 municipalities, and is divided in 39 fare zones. It integrates under the same fare system all public transport systems operating within the IFS limits. Fare zones are organised concentrically around Barcelona. Figure 4 shows all the existing zones.

Figure 13. Fare zones in the IFS



Source: ATM (2015).

Passengers can use the same ticket or card to travel on any transport mode within the IFS (except for special services such as the touristic bus and the Aerobús), and can also transfer over to a different mode using the same ticket for free. Users must validate their ticket each time, and the free fare is applied automatically for a maximum of four trip-stages (the first validation plus three extra validations) within one hour and 15 minutes. For journeys crossing more than one zone, 15 additional transfer minutes are added for each additional zone crossed.

Although multi-journey cards are benefited from the IFS and the free-transfer policy, single tickets are not included in both the IFS and the transfer policy. Single ticket fares are set directly by operators, and so prices may vary across services.

A multi-journey card can be used in any trip inside the IFS area. However, different fares apply according to the number of zones crossed in a trip (from beginning to end), and so the appropriate card must be used in each journey. Card prices range from one to six zones, and so for trips crossing more than six zones, the six-zone-fare applies.

Table 4. Available tickets in the IFS

Ticket	Number of trips	Validity	Number of users
T-10	10	Until February of the year following the year of purchase	Multi-personal
T-50/30	50	30 days	One user (not personalised)
T-70/30	70	30 days	Multi-personal
T-Month	Unlimited	30 days	One user (personalised, ID required)
T-Trimester	Unlimited	90 days	One user (personalised, ID required)
T-Day	Unlimited	1 day	One user (not personalised)

Other non-integrated transport tickets

Some operators offer their own transport tickets, below the fares established in the IFS, but these do not enable free transfer onto other transport modes.

Mechanisms to balance the user benefits and covering the operational and maintenance costs

One of the main functions of the ATM is to act as a financial pillar of the entire metropolitan public transport system. This guarantees there are sufficient economic resources to carry out an ongoing improvement programme of the public transport within the metropolitan area of Barcelona.

In the year 2014, the ATM Board of Directors agreed a Framework Plan for the period 2014-31 for the funding/financing of the public transport system and the refinancing of debt. The Framework Plan focuses on two different areas of action:

- Firstly, to balance the current needs of the system and the contributions made by the administrations in the period 2014-16 by increasing the contributions made by the administrations (funding agreement) and by containing expenditure on the part of the transport operators (contracts programme).
- Secondly, to refinance, with financial institutions, the system's debt from the period 2009-13 and to establish new means of financing to balance the system's accounts over the period 2014-16 (Financing Agreement with financial institutions).

The aim is therefore to balance the system's cost resulting from operational expenses with its income from subsidies and revenue. In this way, for the first time, there will be a stable, long-term framework (2014-31) which will help to manage the system by regulating income and costs.

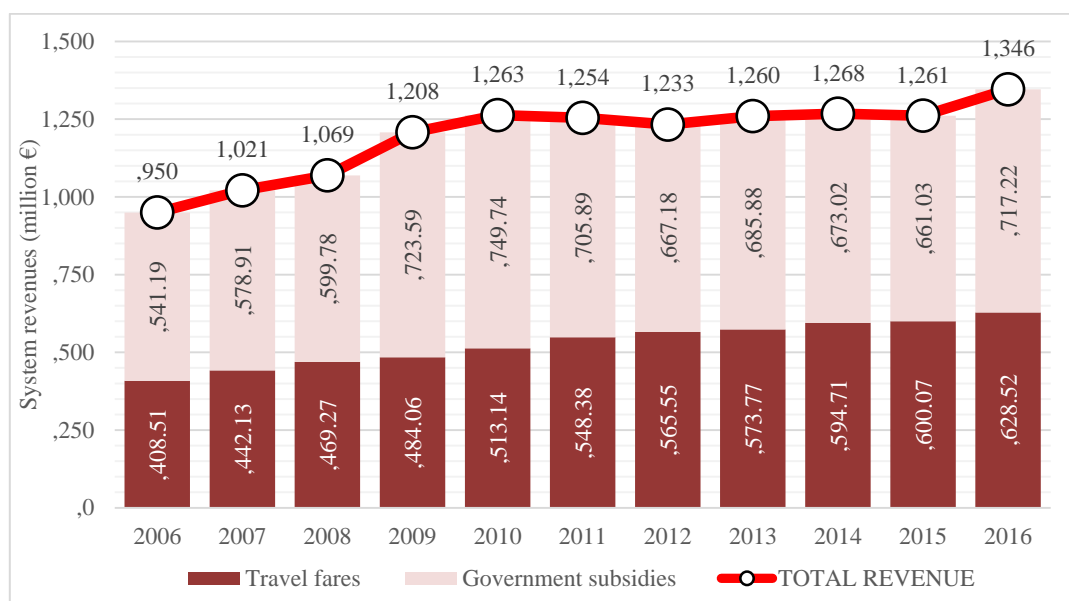
There are two main sources of revenue: government subsidies and travel fare income.

As can be seen in Figure 5, government subsidies account for just over 50% of the total system's revenues, while revenues from travel fares make up for a little under 50%.

The Generalitat de Catalunya supplies around 50% of public subsidies to the transport system, with the Central Government, the municipality of Barcelona and the AMB equally supplying the rest of the subsidies.

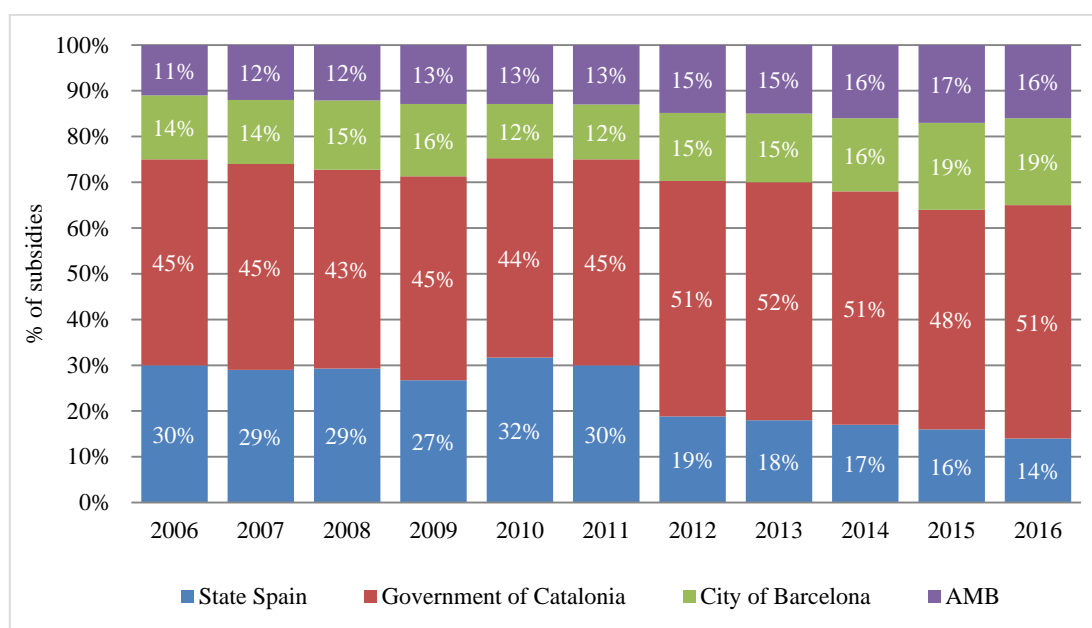
The Central Government subsidies have decreased since 2010, while the Government of Catalonia has steadily increased its subsidies in the last 10 years.

Figure 14. Yearly total revenue of the public transport system



Source: ATM (2017).

Figure 15. Public transport system's subsidies



Source: ATM (2017).

Balancing the income between the different operators

Income from ticket selling

The ATM is responsible for collecting all the ticket-generated income of the entire public transport system. This means assembling all the revenues generated by all the tickets used in all the operators of the system.

Revenues stemming from operator-specific tickets (e.g. single-trip tickets) are passed onto the corresponding operator. Revenues stemming from uni-modal trips (i.e. when there has been no transfers between transport modes) are passed onto the corresponding operator. Revenues stemming from multi-modal trips (i.e. when there has been at least one transfer between transport modes) are distributed among the corresponding operators according to the fare zones passed over in each stage of the journey.

When the operators are managed by the AMB, the ticket revenue is transferred from the ATM to the AMB and this transfers it to its managed operators. When the operators are managed by the Generalitat, the ticket revenue is transferred directly to the operators.

Income from public subsidies

The ATM is responsible for collecting all income generated by the public administration subsidies and splitting them between the public transport managers to keep a financial balance of the system.

The transport managers are: (1) AMB for the public transport within the metropolitan area, (2) AMTU for the urban public transport in the metropolitan region (and outside the metropolitan area) and (3) the Generalitat for the interurban public transport inside the metropolitan region (including the operators connecting the metropolitan area with the rest of the region). The Barcelona tramway is an exception that is managed directly by the ATM.

Transport investments within the metropolitan area

The transport investments for service improvement in the metropolitan area, such as new lines, schedule changes, vehicle renewal or bus stop improvements are managed by the AMB. The improvements in terms of new transport infrastructure are managed by the owner of the infrastructure, basically municipalities, the Generalitat de Catalunya or the Spanish Central Government.

There are several planning instruments in the metropolitan area of Barcelona. The most relevant ones are the Metropolitan Mobility Plan of Barcelona (PMMU, issued by the AMB, the Master Plan of Infrastructures (PDI) and the Master Plan for Mobility (PDM), both issued by the ATM. Their main objective is to set forth the necessary transportation network improvements within a given time frame, and to reduce the territorial disparities between areas. The total budget included in these instruments are EUR 260.2 M (for the PMMU, corresponding to a five-year-time frame), EUR 12 379.5 M (for the PDI, corresponding to a 10-year-time frame) and EUR 52.3 M (for the parts in the PDM that are not included in other planning instruments, corresponding to a five-year-time frame).

Strategies for route planning

Strategies for planning new services or upgrading of existing ones are carried out through specific planning instruments called *Transport service plans*.

At a metropolitan scale, the AMB is responsible for the planning of metro and bus systems that are entirely within the metropolitan area of Barcelona and is captured in the Metropolitan Mobility Plan of Barcelona (PMMU). On the other hand, the ATM and the Generalitat de Catalunya develop the Transport service plans for the transport systems connecting to the metropolitan area (i.e. Suburban railways).

The transport service plans related to services inside the RMB but outside the metropolitan area are managed by the ATM, while those falling outside the RMB's scope are managed by the Generalitat de Catalunya. As mentioned in chapters above, the ATM is currently working to include the whole IFS territory in its planning documents.

Because the supply of public transport in the Metropolitan Area of Barcelona is highly consolidated, service plans attempt to detect weaknesses in the current system as well as putting forward new proposals to capture new potential demand.

The transport service plans are based on the following criteria:

- Improve territorial and temporary coverage of public transport, and equity.
 - Maximise the territorial coverage of public transport, establishing transport on demand services regular transport is not efficient.
 - Enlarge the hours of service in summer periods and weekends.
 - Tend to service equity in terms of the number of expeditions per inhabitant.
- Improve bus services performance.
 - Search for synergies between urban and interurban transport networks.
 - Increase the commercial speed, optimising the number of stops and taking advantage of the new planned reserved platforms.
 - Improve regularity of frequencies (every 15', 20', 30 'or 60').
 - Improve schedule co-ordination for the main multi-modal centres.
 - In high demand lines, set sufficient frequency and suitable vehicles to avoid saturation and ensure good levels of service.
- Improve bus stop equipment
 - Bus shelter, stop sticks.
 - General accessibility and for handicapped.

Management and regulation of transport data

In the metropolitan area of Barcelona there is no system integrating mobility data for all transport modes. Instead, the corresponding administrations may be contacted for data on a specific mode.

The management and regulation for transport data is considered from two points of view: in terms of data on demand and in terms of real time transport supply.

In terms of demand data

For private transport, there are traffic counters distributed along the road network offering a wide range of information on a specific point of a given road. The administration owner of the road (local municipalities, supra-municipal administrations, Catalan regional government or the Spanish Central State) collects the data and publish it on their websites. If further detail is required, the information can be asked for.

For public transport, the ATM collects all demand transport data related to the transport modes managed by the AMB, ATM or Generalitat de Catalunya: metro, urban or suburban bus, FGC, Renfe and tramway. This information consists in the ticket validations disaggregated at any detailed level (date, time, bus line, type of ticketing used...). The AMB receives as well demand data directly from his transport operators in a database format designed by the AMB.

Moreover, the AMB regularly conducts survey campaigns to learn journey origins and destinations of the bus lines it manages indirectly.

Data for other transport modes (e.g. high-speed train, Aerobús, touristic buses or public bicycle systems) are collected by the corresponding operator.

To complete the mobility matrix of the entire metropolitan area with walking and bicycle trips, transport surveys are carried out. These surveys cover the IFS zone, and offer either a real value or an estimation for a given year. They offer extensive information on issues such as the number of trips per person, the origin and destination, the duration, the time of the day, the transport modes used, etc.

The Weekday Mobility Survey (EMEF), which is carried out yearly between October and December, is an official statistic promoted by the ATM, the Barcelona City Hall, the AMB and in the latest edition also the AMTU and the Catalan Institute of Statistics (Idescat). It has been carried out for 15 years.

The main aim of the EMEF is to learn the usual mobility habits of the population in the IFS. A report containing aggregate data is published. For further detail, a formal request must be submitted.

A new way to learn the public transport users' mobility pattern will come about between 2018 and 2019, when the new T-Mobility card will come into service. It will consist of a new payment system via a personal card, and consequently fares can be user-specific according to the frequency of the user's trips.

This card will lead to a change in the validating system, as users will validate their ticket both at the start and finish of their journey. Because of this, it will be possible to obtain complete and centralised data for each user, by tracking user trip frequency and usual starting and finishing stations.

In terms of real-time data on transport supply

All buses managed by the AMB must have a GPS and an Intelligent Transportation Management System (ITMS) and all the operators must provide confident information to the web services. This regulation is mandatory by contract, and all the information is gathered and aggregated by AMB Informació.

The ITMS provides real time information on the location of vehicles, and so can provide historical data on travelling times or Expected Time of Arrivals for each bus stop. This information is used to analyse the trends on travelling times and to plan network improvements.

AMB Informació sets up the standards in which the operators must provide this information, which must be channelled via Webservices and Databases. In the rest of the metropolitan area, the information gathered by the ITMS is managed by the ATM.

The ATM may consult the Webservices information of the AMB's ITMS via the agreements between both bodies. Real-time data analysis of the AMB's lines is carried out by AMB Informació, while the Mobility Department of the AMB analyses the data from a historic point of view. The ATM does not analyse real-time supply data, but it does so from a historic point of view, as the Mobility Department of the AMB, when planning new services.

In terms of real-time data sharing with private transport data groups (such as Google maps, citymapper), the transport operators (public and private) are responsible for providing the data. AMB does not centralize the information flow with these data operators.

Mechanisms to develop and improve existing multi-modal centres

There are several commuter terminals in the metropolitan area of Barcelona, such as Sants Estació, Plaça Catalunya or Passeig de Gràcia. These terminals can offer in a single station multiple urban and/or interurban railway and bus services.

For example, the station of Sants Estació in Barcelona acts as an important transport hub by connecting several bus stops and a central railway station. This benefits a group of transport services, including the high-speed train, several suburban and regional train services, the urban metro, urban and suburban bus lines, a taxi station and also the public bicycle system of Barcelona.

Nevertheless, in each of the existing commuter terminals, the space dedicated to each operator is clearly defined, and operators are responsible for the management of their own area. Thus, as of today, there are no multi-modal centres working as an integrated unit of management, which would allow for public-private participation in the management of the station or the exploitation of retail facilities within the station for economic benefits. In the metropolitan area of Barcelona, the multi-modal centres are not a specific concession in itself, but rather each commuter station is integrated in the concession of the line it belongs to.

The future project of La Sagrera is perhaps the station most-resembling a multi-modal centre. This will be Barcelona's second high-speed train station (after Sants Estació), and will also include several metro lines, suburban train lines and a new bus terminal. The financing of the project is based on the surplus-value of the surrounding land, which will be dedicated to retail activities related to the station. However, the centre is still under construction and its management model is yet to be defined.

Developing multi-modality and inter-modality is one of the aims of the strategic instruments for transport planning mentioned in other sections of the present paper. These transport plans include measures such as identifying a lack of connectivity between specific transport lines or planning new interchange stations where needed. The ATM planning instrument PDI proposes new inter-modal stations in the RMB, including the metropolitan area of Barcelona as the AMB has no competencies in planning these kind of infrastructures. The responsible for constructing the new intermodal stations is the owner of the infrastructure (Generalitat de Catalunya for FGC and Metro and ADIF for Renfe). If the proposed inter-modal station connects infrastructures from different owners, each owner is responsible for its part.

On the other hand, the transport planning instruments carried out by the ATM and the AMB include other measures to encourage multi-modal trips (private and public) by developing Park and Ride stations or procuring secure bike parks. In this case, the AMB is responsible for those inside the metropolitan area of Barcelona.

Measures to encourage sustainable mobility

Leaving aside the development in new public transport infrastructure (such as new metro lines or the expansion of existing tramway networks) that correspond to other administrations, the AMB is responsible for the implementation of measures aimed at encouraging sustainable mobility, following the directives put forward in the Mobility Law 9/2003 of Catalonia.

The Mobility Law 9/2003 constitutes the framework for the development of urban mobility plans in all the municipalities of the metropolitan area, which are developed by each city council. The urban mobility plans (PMU) for the municipalities forming the metropolitan area are knit together via the Metropolitan Plan for Urban Mobility (PMMU), which is developed by the AMB. The main objective of the PMUs and PMMU is to define short-term measures to encourage sustainable mobility.

Some of the measures most recently implemented or still under execution are described below.

Low Emissions Zone

Since 1 December 2017, episode situations of environmental air pollution in the Barcelona metropolitan area can be declared. During such episodes, a series of measures will be triggered aimed at reducing emissions of nitrogen dioxide and particles of less than 10 microns in diameter. The objective is to reduce traffic by 10% in the next five years, and by 30% within 15 years in order to reach the levels recommended by the World Health Organization (WHO).

An environmental episode of high air pollution is defined as a situation in which the meteorological conditions are unfavourable for dispersion and ventilation. This may increase the concentration of one of the two targeted pollutants, and may lead to an excess of the limit values established by legislation.

In the case of an episode declaration, the circulation of all cars and vans that have not received a label issued by the General Directorate of Traffic identifying the level of emissions of the vehicle will be prohibited. The affected vehicles are vans prior to Euro 1 (registered before 1994) and Euro 1 and prior cars (registered before 1997). The restriction applies to the Low Emissions Zone (ZBE), which can be seen in the figure below.

It is estimated that the restrictions in the ZBE of Barcelona will reduce 18% the urban emissions on both NO₂ and suspended particles with a diameter of less than 10 microns (PM10).

At the same time, to compensate the restrictions on private transport, special measures to improve the public transport network will also be applied, such as:

- Increase in the public transport offer during the episode of high air pollution.
- Guidance and information about the closest P&R station.
- Creation by the ATM of a transport ticket, for use only during the episode, to attract new travellers (T-aire). The new title offers two trips on public transport at a price 10% lower than that of the 10-trip Card (T-10).
- Creation of the T-verda card (green card) managed by the AMB, which entitles vehicle owners who give up and demolish their vehicle to three years of free public transport. Beneficiaries must not acquire any new vehicle during the term of three years.

Figure 16. Low Emissions Zone of Barcelona (in green)



Source: Departament de Territori i Sostenibilitat (2017).

The declaration of poor air quality episodes is however merely a stepping stone to stronger restrictions. As of 1 January 2020, there will no longer be episode declarations. Instead, there will be a permanent prohibition of circulation within the ZBE of the above mentioned vehicles. Restrictions apply for working days from 7:00 am to 8:00 pm.

The restricted zone will be enlarged in 2025, when the same vehicle restrictions will be applied in the entire metropolitan area.

New high-performance metropolitan bus network

Since 2012 a new orthogonal bus network has been under implementation in Barcelona. The system aims to simplify and revitalise the existing bus network. The past bus network has been gradually removed to give way to a high-frequency, easily-accessible, more sustainable and better-connected network. It consists of a total of 28 bus lines which have been classified into horizontal, vertical and diagonal services. This has improved commercial speed, user-understanding and fast transfers among lines.

The new network has yielded positive results: urban bus demand in Barcelona has grown 13.7% in the past five years (2012-17) following a period of continuing decline (-14.6% between 2007 and 2012) (TMB, 2018).

This has led the AMB to consider a new bus network at metropolitan scale that reproduces the system in Barcelona. While still under study, the idea is to create a high-capacity orthogonal network that would significantly increase commercial bus speed. The network would connect the municipalities in the metropolitan area in an attempt to make the system more user-friendly, raise bus frequency, improve inter-municipal connectivity, and ultimately to encourage sustainable mobility.

T-Mobility card

The T-Mobility card is a proposal that has long been under study, and it will come into service between 2018 and 2019. It consists of a new public transport payment system via a personal card. The fares will be established according to the frequency of the user's trips.

The body defining the characteristics of the card is the ATM.

In 2014 a coalition of companies named Catalan society for Mobility (SOC MOBILITAT), - formed by Caixabank S.A, Fujitsu Technology Solutions S.A, Indra Sistemas S.A and Marfina S.L. - won the tender process to develop the T-Mobilitat project. The contract is held by the ATM.

The T-Mobilitat is a contactless card that can be used as a physical plastic card, or in electronic format via mobile phones with NFC technology. Initially, the T-Mobilitat will be used to buy the tickets and travel cards that are currently available. Later on, purchases will be virtual and tickets and travel cards will no longer be paper cards with a magnetic strip. They will be available as a plastic card or in the app. Single tickets may be paid by credit card.

The ATM aims to make T-Mobilitat useable via other devices, such as smartwatches. Paper tickets will not disappear overnight, but will exist alongside the T-Mobilitat for a period of time. The idea is that the 88 travel cards currently in use will be phased out and a flat rate introduced for fare zone 1.

The next step will be to introduce the T-Mobilitat throughout the metropolitan area, when payment will be made at the end of the journey, depending on the distance travelled. Users will pay according to their travel habits and prices will be adjusted according to the number of kilometres covered and the frequency with they travel on public transport.

Ultimately, the idea is to extend this new system to the whole of Catalonia. It will start in the metropolitan area of Barcelona, then extend to the RMB and finally it will be used in the rest of Catalonia.

The arrangements included in the contract between the ATM and SOC MOBILITAT specify that the contractor is responsible for (1) the acquisition, installation and maintenance of all the necessary equipment required by the T-Mobilitat, (2) the implementation and management of a new customer service centre, (3) the implementation and management of a new Transport Information Management Centre, which will receive real-time information on the public transport network (4) the management, commercialisation and distribution of the new card's supports (5) the management of the new selling channels, and (6) publicity contracts and the management of the generated revenue (ATM, 2014).

The Transport Information Management Centre will build a database with all the information regarding the public transport system. This will only be shared with the corresponding administrations via the ATM, and will help each administration in the planning of services. The contractor will create this centre and all the systems feeding real-time information on the network's users.

The Transport Information Management Centre will build a database with all the information regarding the public transport system. Data will be collected from public transport operators (TMB, FGC, Renfe, TRAM and other bus operators), traffic cameras and other information from local administrations and other stakeholders. Legal clauses specifying the format, regularity and proceedings of data sharing with the Centre are yet to be defined.

The necessary software will be developed by the contractor, but both the contractor and the ATM will provide personnel to the centre. Both the supply and demand data will be accessible by administrations (via special agreements with the ATM) and by the contractor.

The Mobility Department of the AMB and AMB Informació will be able to access the data provided by the Centre via institutional agreements with the ATM. The exact definition of these agreements is still under development, but both bodies have stated their desire for coordinative work.

These three measures are perhaps the most important, but there are others, such as: private vehicle restrictions linked to urban plans, creation of super blocks to limit the access of private vehicles, the expansion of the bike lane network in Barcelona or the construction of bus lanes at the entrance of Barcelona.

Notes

- 1 An association of municipalities with urban public transport services.
- 2 Law 9/2003, of 13 June, of mobility.
- 3 Or the AMB in the case of the tramway.
- 4 For the Aerobús or the touristic bus lines.

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Public Transport Governance in Greater Barcelona

This paper describes the role of the Metropolitan Area of Barcelona (AMB) in the governance of public transport in Spain's second-largest agglomeration. It sets out how the AMB is able to provide integrated transport management, planning, financing and decision-making across different administrations and bodies of the Barcelona region, based on a mandate that comprises territorial planning, environment and sustainability, housing, economic development and social cohesion.

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