EMT MADRID
Consultoría

EMT Madrid
Consulting Service

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EMT MADRID
Consultoría

International strategy and consulting

EMT provides expert advice, has an outstanding international presence and exports its 'know-how'.

EMT's Consulting Department works as a consulting company aimed at companies, municipalities and transport authorities, helping them to improve their service.

Differential factors

EMT's Consulting Department provides advisory services to Madrid City Council and other public administrations.

It is an expert in the design of operations centres equipped with refuelling, loading, testing, inspection and fleet maintenance facilities for different propulsion technologies (CNG, electric, hybrid and diesel).

Extensive experience in the use of alternative fuels and innovative and sustainable vehicle technologies.

Transport operator with over 70 years' experience.

World leader in the application of Information Technology (IT) in urban transport, including ad hoc software development (bus and driver designation).

Consulting Service

Operations Management

- Systems providing aid in the Management of Transport Systems
    • Operations Management Software
    • Software for designating vehicles and driving personnel
    • Control and reporting system implementation
    • Optimisation software for bus service timetable planning
    • GIS/GPS applied to transport management
- Service planning and operation design
- Security system
- Management of communication with users
- Tariff integration studies

Vehicle engineering and fleet accessibility

- Automotive engineering and maintenance systems
- Advice on defining fleet requirements and the vehicle acquisition process
- Fleet emissions calculations

Sustainable mobility

- Traffic studies
- Alternative fuels
- Connected mobility
- Mobility as a Service (MaaS)

Innovation and technology

- Integration of ticketing systems with the operations management platform
- Results analysis
- Real-time video surveillance systems
- Digital applications to provide service information in real time (online) to users
- On-board equipment design
- Operations Assistance Systems Implementation

Business advice

- Traffic studies
- Transport System Audits
- Resource optimisation and efficiency improvement plans
- Process engineering and implementation of Quality Systems
- Operations Costs Studies (Total Operation Cost, CTO)
- Company results analysis and dashboard creation

Infrastructure design

- Fuel supply and electric recharge facility design
- Inspection and maintenance facility design for bus, tow truck and bicycle fleets
- Mobility service operations centre design

Personnel selection and training

- Training with simulation tools
- Personnel selection for mobility and maintenance services
- Efficient and safe driving training

Consulting Service

Personnel selection and training

Business advice

Operations Management

Vehicle engineering and fleet accessibility

Infrastructure design

Sustainable mobility

Innovation and technology
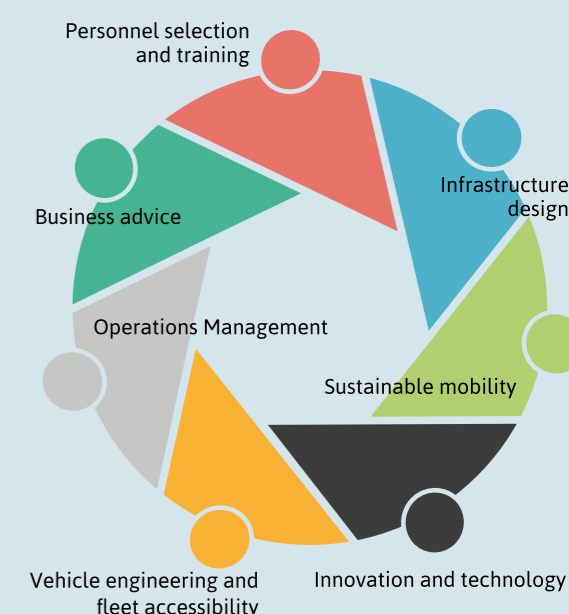
Research projects in Europe

Leadership and development

MOMENTUM

Modelling Emerging Transport Solutions for Urban Mobility

Project belonging to the H2020 programme to develop decision-making support tools aligned with the impact of new transport options and behavioural changes derived from information and communication technologies (ICT) in urban mobility.

ECCENTRIC

Innovative solutions for suburban mobility and emission-free freight in urban centers.

Project belonging to the CIVITAS initiative to implement sustainable mobility solutions in peripheral areas of the city, as well as to develop an innovative urban goods distribution system.   *https://civitas.eu/eccentric*

IMOVE

Unlocking Large-Scale Access to Combined Mobility through a European MaaS Network.

Project in the Horizon 2020 Programme whose objective is to support the deployment and improvement of MaaS (Mobility as a Service) in Europe. *https://www.imove-project.eu/*

IKAAS

Intelligent Knowledge as a Service.

Project in the Horizon 2020 Programme, to develop a secure Smart City platform based on Big Data, cloud operations and the Internet of Things, to collect information from different sensors and develop services for citizens. *http://ikaas.com/*

FREVUE

Electric Freight Vehicles in Urban Europe.

This project, under the Seventh Framework Programme, aims to demonstrate the feasibility of using electric vehicles to distribute goods in cities. *https://frevue.eu/*

ASSURED

Project in the Horizon 2020 programme, coordinated by the UITP, that aims to advance the electrification and rapid charging of buses and heavy vehicles. EMT participates as an expert in the User group. *https://assured-project.eu/*

MOVEUS

ICT cloud-based platform and mobility services available, universal and safe for all users.

Project in the 7th Framework Programme that aims to change the mobility habits of European users by enhancing mobility services through offering a more intelligent use of their ITS resources as well as integration with ICT. *www.moveus-project.eu*

MADEV

MADrid Electric Vehicles.

Project belonging to the ELENA programme from the European Investment Bank to promote both the public and private sectors' investment in charging infrastructure and the purchasing of electric vehicles. *www.eib.org*

Participation in Networks

UITP

International Association of Public Transport

Global network that brings together all stakeholders in public transport and all sustainable modes of transport. It includes 1,600 members from 99 countries. *www.uitp.org*

ITF

International Transport Forum of the Organisation for Economic Cooperation and Development (OECD)

Global organisation that covers all modes of transport *https://www.itf-oecd.org/*. Its objectives include promoting greater participation by transport in economic growth and reducing the impact of this sector on the environment.

POLIS

Cities and Regions for Transport Innovation

POLIS is one of the main networks of European cities and regions for the dissemination and development of solutions and innovative policies in mobility and urban transport *https://www.polisnetwork.eu/*

EUROCITIES

Network that includes more than 135 cities across Europe in 39 countries and that works in six areas in order to share knowledge and experiences, thus promoting synergies, projects and external funding sources. *http://www.eurocities.eu/*

CIVITAS

Network of cities for better and cleaner transport in Europe and in other regions of the world. *https://civitas.eu*

CIVINET SPAIN AND PORTUGAL

CIVITAS network for Spain and Portugal. Network for Local Authorities (Cities, Provinces, Regions, etc.) in Spain and Portugal to advance in the promotion of sustainable mobility, energy saving and emissions reduction. *https://civitas.eu/civinet/civinet-españa-y-portugal*

CONAMA FOUNDATION

Spanish, independent and non-profit organisation that promotes the exchange of knowledge for sustainable development. *www.conama.org*

Success stories

Pamplona, Spain

Advice on the design of the Operations Assistance System Study on alternatives for the new Operations Centre in the Pamplona district municipalities association.

Zaragoza, Spain

Redefinition of the bus network after the launch of the light rail transport system.

Madrid - Spain

Technical assistance in Mobility to Madrid City Council

Kyzylorda, Kazakhstan

Design of warehouses, workshops, refuelling stations and definition of bus technical specifications for the change to a Compressed Natural Gas fleet

Valencia, Spain

Technical assistance service for the management of the municipal parking located at "Plaza de Brujas" in the city of Valencia.

Tenerife, Spain

Services planning and analysis of planning tools on the market for TITSA

Mexico City, Mexico

Planning and design of the operation of a new electricity line
https://www.c40cff.org/projects/mexico-city-eje-8

Hanoi, Vietnam

Workshop and bus model design

Da Nang, Vietnam

Workshop, depot and bus model design

Lima, Peru

Technical assistance in the operation of the BRT in COSAC New ticketing system for public transport.
Consolidation of transport systems **12 million kilometres per year**.
We have a **bus depot**, as well as a central office and a staff of **500 people**.
154 CNG buses, 78 articulated buses and 76 conventional buses.
155,000 people use the service every day.

La Paz, Bolivia
El Alto, Bolivia

Transport system consolidation

Mendoza Argentina

Technical personnel and senior management training for the "El C48" public transport company

Main figures

Each year, EMT buses travel more than 90 million kilometres and transport over 425 million people. The service operates 365 days a year and 24 hours a day, which makes its transport system a key service for the city.

EMT also manages a network of public car parks (10,800 spaces), the municipal tow-truck service, the public bicycle system in Madrid, BiciMAD and the Madrid Cable Car service.

EMT is at the forefront of the incorporation of Smart Transport Systems and their application to improving the service provided to citizens.

The company is at the **forefront of smart transport systems and their application to the relationship with the people who use the service.** EMT Madrid is committed to improving the service provided to citizens and its focus on them.

Geographic distribution of EMT Madrid services

EMT: global mobility operator in the city of Madrid

The Empresa Municipal de Transportes de Madrid is a public company that was created in 1947 and it is the property of Madrid City Council. EMT Madrid is integrated into the Regional Transport Consortium that coordinates, in its role as the official authority, the public transport provided in the Community of Madrid.

EMT is the reference company for the Mobility Services provided by Madrid City Council and it operates all the public transport services including bus; public electric bicycle rental; Cable car; public car parks and the municipal tow-truck system.

EMT's main activity is to operate and manage the urban bus service in Madrid. It is the largest company in its sector in Spain and one of the most important in Europe.

BUS

5 **Operations Centres**
+9,500 **people on its staff**
2,049 **buses**
212 **lines**
3,795-km **network**
10,515 **stops**
310,000 **km/day**
+92,000,000 **km/year**
+420,000,000 **people transported/year**
+1,590,000 **people transported/day**

TOW TRUCKS

79 **tow trucks**
7 **depots**
86,428 **interventions per year**

BiciMAD

65,723 **holders of annual subscription**
3,573,859 **trips per year**
2,496 **bicycles***
207 **stations***
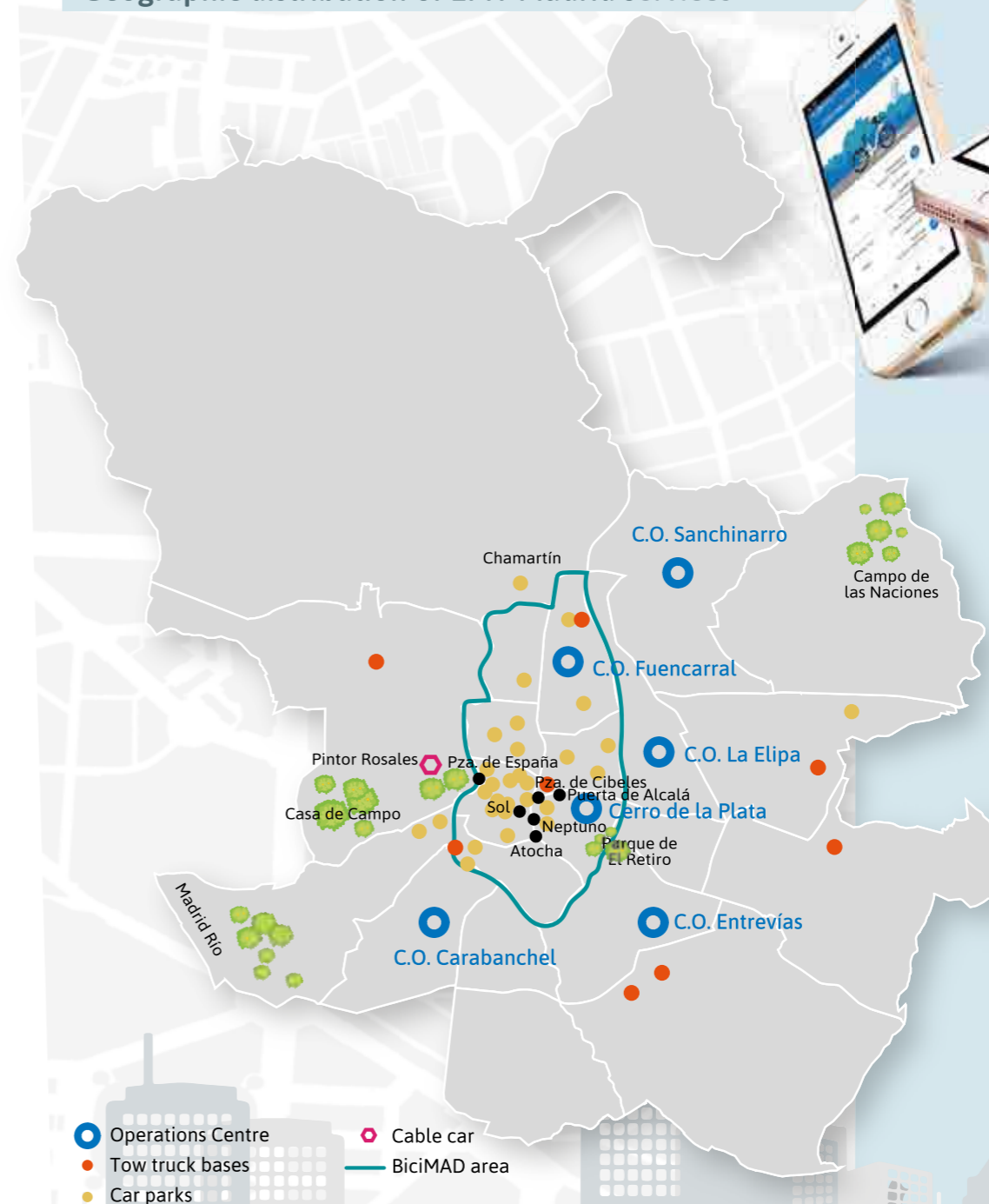* Extended in 2019

CAR PARKS

23 **car parks**
10,800 **spaces**
86 **BiciPark spaces**
94 **chargers for passenger cars**

CABLE CAR

1,200 **people / hour maximum capacity**
80 **cabins**

EMT Madrid is the **reference company in Mobility Services for Madrid City Council** and it operates the services for the collective transport of people travelling by bus, the public electric bicycle rental, the city cable car, the various car parks and the municipal tow truck system.

EMT also provides technical assistance to the City of Madrid in relation to urban mobility.

Map labels:
C.O. Sanchinarro
Campo de las Naciones
Chamartín
C.O. Fuencarral
C.O. La Elipa
Pintor Rosales
Pza. de España
Pza. de Cibeles
Puerta de Alcalá
Casa de Campo
Sol
Cerro de la Plata
Neptuno
Parque de El Retiro
Atocha
Madrid Río
C.O. Entrevías
C.O. Carabanchel

Legend:
- Operations Centre
- Tow truck bases
- Car parks
- Cable car
- BiciMAD area

Bus service

EMT is responsible for the **detailed planning** of routes and bus stops, including their location, accessibility and security conditions for the people who use the service and access at stops and exchanges with other routes on the EMT network. EMT works in coordination with Madrid City Council in carrying out these tasks.
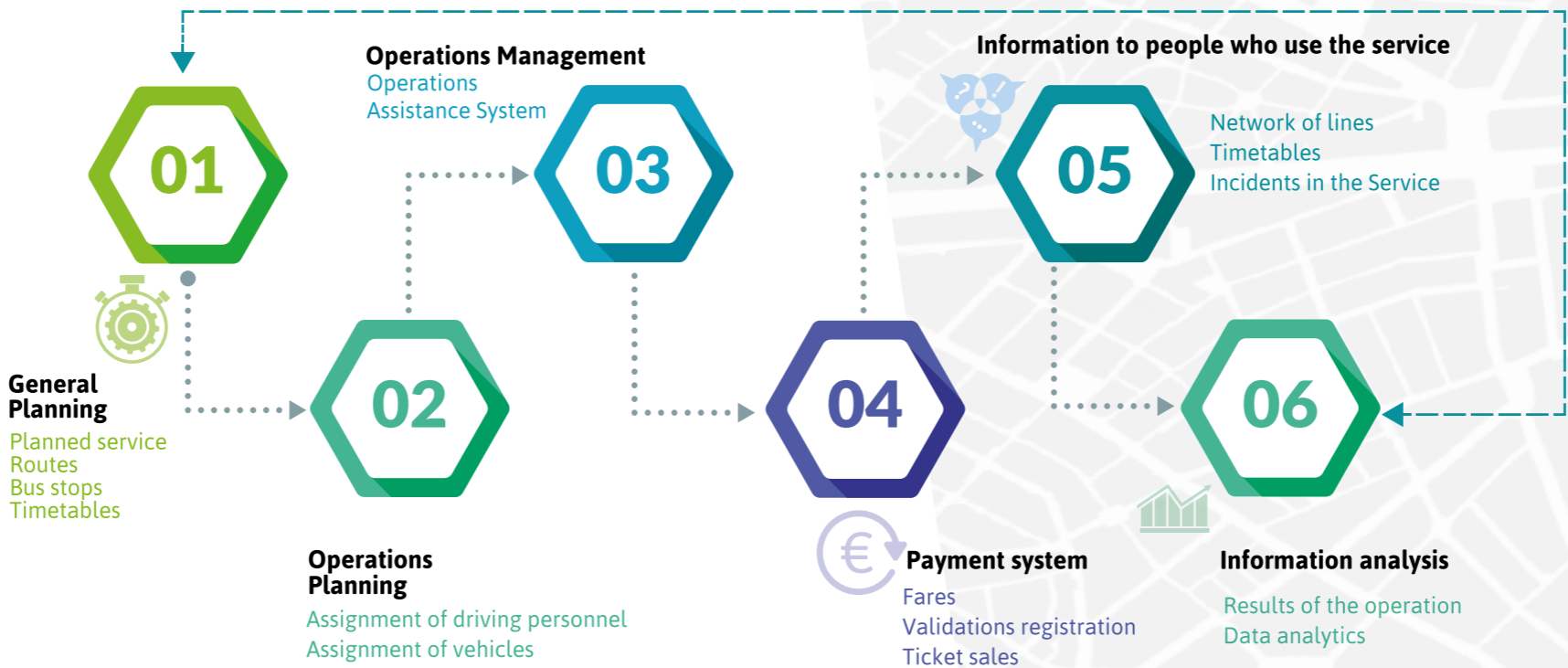
The **service schedule** for each route is adapted to the time period, day of the week and time of year and the basic guidelines are established by the Regional Transport Consortium with EMT being responsible for preparing and implementing the schedule. Based on these parameters, the number of buses per hour is defined by a computer application designed and developed specifically by EMT.
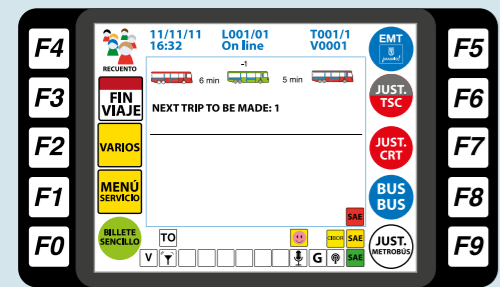
BIT Console
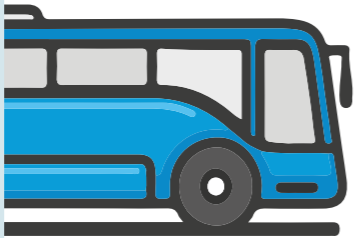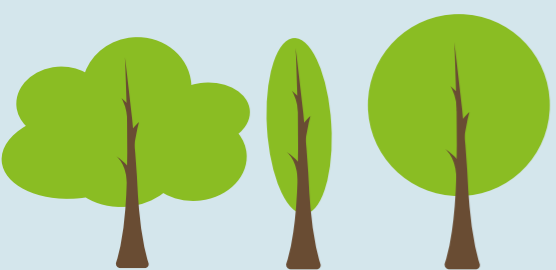
The **provision of the services** is the second tier in the organisation of the operations provided and it is carried out through five Operations Centres, which are the logistical bases to which the human and material resources are allocated to carry out both the service as well as fleet maintenance.

General Planning
Planned service
Routes
Bus stops
Timetables

01

Operations Management
Operations Assistance System

03

02

Operations Planning
Assignment of driving personnel
Assignment of vehicles

04

Payment system
Fares
Validations registration
Ticket sales

Information to people who use the service

05

Network of lines
Timetables
Incidents in the Service

06

Information analysis
Results of the operation
Data analytics

The Regional Transport Consortium establishes the basic guidelines for programming the service on each route (depending on the time period, the day of the week and the time of year). EMT is responsible for planning, preparing and implementing this service. The daily service is assigned (1,900 buses and 3,700 shifts on a working day) and the bus supply per hour defined for each line, based on these parameters, and thanks to a computer application designed and developed specifically by EMT.

The service is managed from the Control Centre that monitors the bus fleet 24 hours a day and regulates the available supply to guarantee compliance with the assigned service and resolve any incidents that may occur.

The Control Centre has 35 regulation posts who undertake tasks relating to regulation, incident management, information gathering for the Management, supervision and coordination with other transport system centres and with Madrid City Council. In each of the posts, an average of 6 lines are tracked simultaneously.

EMT Madrid has a **Continuous Training and Professional Development Plan** that guarantees that the performance of its driving staff is aligned with the internal and external quality requirements of the transportation system

The **OAS (Operations Assistance System)**, which is tailored to EMT's needs, consists of two auxiliary subsystems (location and communication) that provide the position of all the buses in real time. This system constitutes the operational and functioning of the entire EMT´s network´s Control Centre and it is also supported by the Operations Support Units. with the assistance provided by street-level Operations Support Units.

SAM
SERVICIO DE ATENCIÓN MÓVIL

The **Mobile Passenger Care Service (MCS)** informs and provides personal and professional assistance to users on the street. This team also provides training tasks for people with disabilities to give them autonomy when they travel by bus.

The mission **of the Information Management Centre (CGI)** is to inform users of any incidents or changes that occur in the service provided by EMT.

The **Customer Service Office (CSO)** informs, manages and responds to the suggestions, complaints and queries from users in order to detect opportunities for improvement in the services provided.
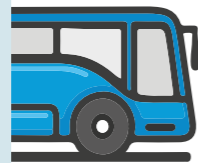
Experience in sustainable fleets

EMT is **totally committed** to sustainability and the search for alternatives to minimise the impact of transport on the environment.

Our goal is to provide the best service to the citizens of Madrid with the highest quality standards in combination with a **strict respect for the environment.**

All our buses have a kneeling system and a low floor to improve accessibility for the people who use the service.
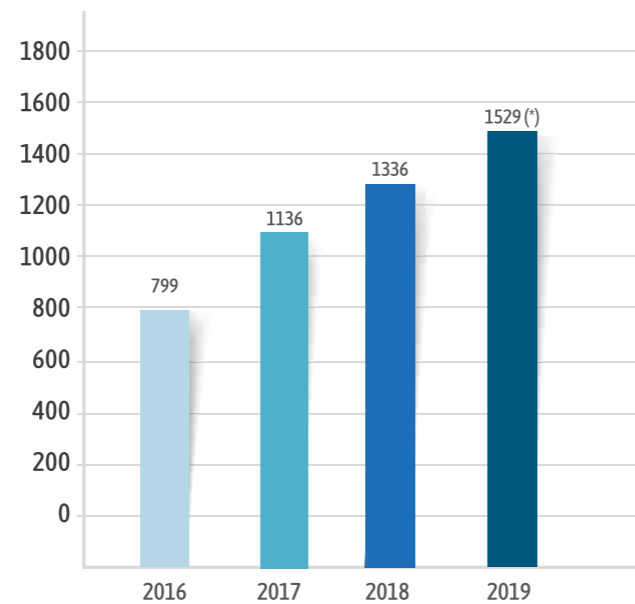
Currently, we use different technologies and alternative, environmentally-friendly fuels.
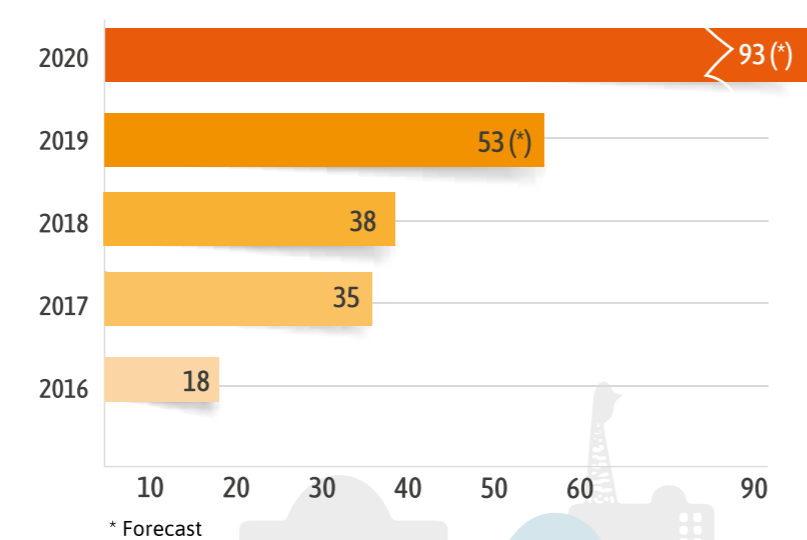
EMT Madrid has more than 60 years experience in the design, acquisition and commissioning of different types of buses. Since 2000, sustainable technology vehicles have been incorporated into the fleet.
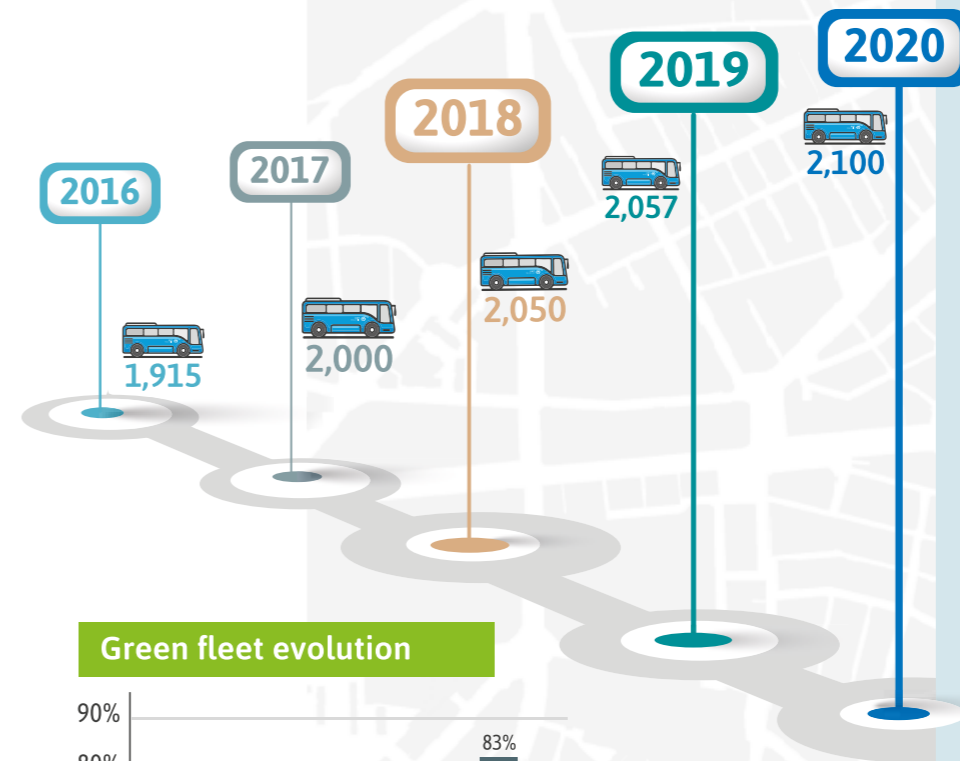
CNG fleet evolution

2016	2017	2018	2019
799	1136	1336	1529 (*)

EMT was the first company in Europe to use CNG hybrid buses.

Electric fleet evolution

Year	Value
2020	93 (*)
2019	53 (*)
2018	38
2017	35
2016	18

* Forecast

Evolution of the fleet size in the 2016-2020 period

2016	2017	2018	2019	2020
1,915	2,000	2,050	2,057	2,100
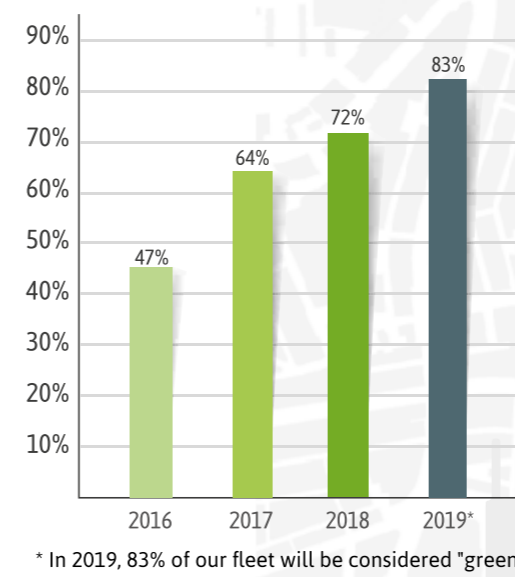
EMT has a very active fleet renewal policy. In the period 2016 - 2018, 33% of the bus fleet was renewed.
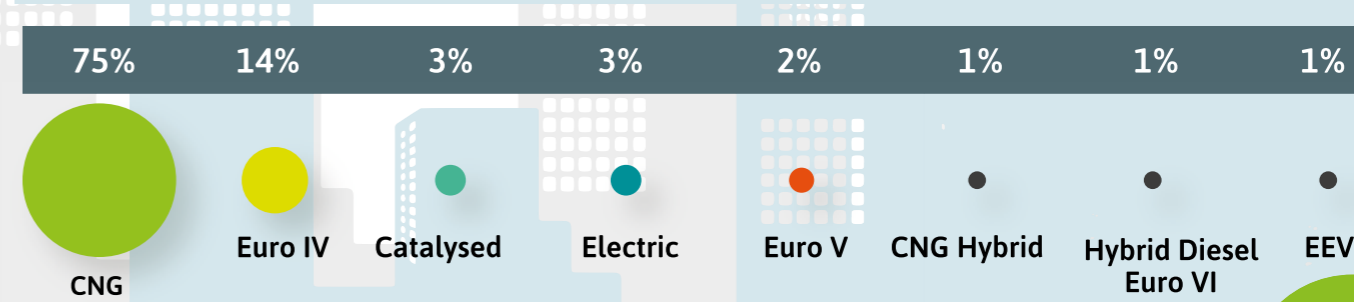
This renewal process will conclude in 2020, by which time we will have a 100% sustainable fleet (only vehicles with low or zero emissions will be used) and with a low average age.

The acquisition of new units for the fleet is part of an ambitious municipal plan jointly led by the Madrid City Council and EMT to reduce the average age of the municipal bus fleet before the end of 2020.

EMT Madrid has a vehicle prototype testing laboratory to perform tests and validates new propulsion technologies.

Green fleet evolution

2016	2017	2018	2019*
47%	64%	72%	83%

* In 2019, 83% of our fleet will be considered "green".

Estimated composition of the fleet by ecological classification by the end of 2019

75%	14%	3%	3%	2%	1%	1%	1%
CNG	Euro IV	Catalysed	Electric	Euro V	CNG Hybrid	Hybrid Diesel Euro VI	EEV

Technologies applied to mobility and the relationship with users

EMT has implemented different technological systems to carry out effective fleet management and provide value-added services.

● **The solutions provided by the Information Technology Systems (ITS) are fully integrated with the entire Operations cycle.**

● **EMT is a leader in the digital transformation of the relationship with the people who use the service.**

EMT is working on developing additional services related to the exchange of information through the **Open Data Platform and the Internet of Things**

Real-time on-board video surveillance system (10,000 cameras).

Customer Service Office (OAC) Management

Optimisation software for Automatic Bus Service Timetable Planning.

GESTOAC

Digital applications that provide information in real time (online)

Information Management Centre (CGI)

Variable Messaging Panels (VMP).

Driving and bus staff assignment.

Street fleet management software for vehicle fleets.

Company results and dashboard analysis

GPS (Global Positioning System) and GIS (Geographic Information System) applied to Transport Management.

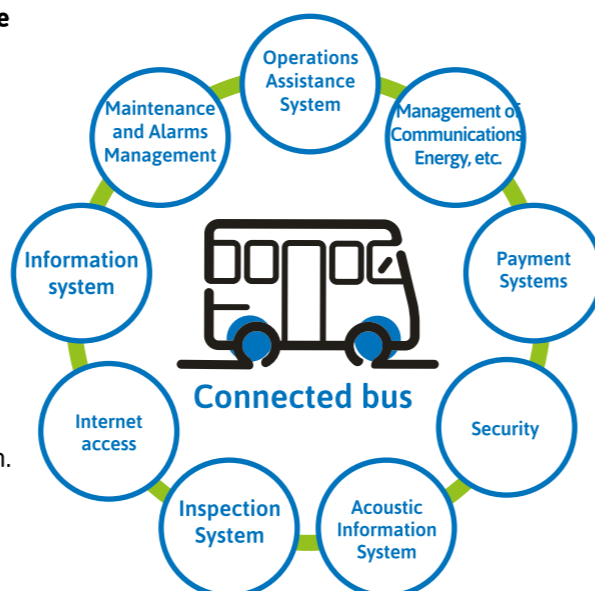Billing System Integration with a management platform.

Main technological achievements

EMT has led important technological developments in the areas related to Sustainable Urban Mobility, Accessible Mobility and Information for the people who use the service.

2000 — 2009

All EMT buses are connected and have on-board equipment to provide corporate services such as ticket validation, communications management, maintenance, on-board security, WiFi access, *ticketing* inspection and service operation.

Connected bus

- Operations Assistance System
- Maintenance and Alarms Management
- Management of Communications Energy, etc.
- Information system
- Payment Systems
- Internet access
- Security
- Inspection System
- Acoustic Information System

2005

Mobile applications have been available since 2005 that bring the service closer to users (more than 2,000,000 downloads). Currently more than 1,000,000 queries are made per day (waiting times, itineraries, location of stop, journeys between two points, etc.)

2011

In 2011, EMT became the **first urban transport company in the world to offer free WiFi on board** its buses.

The interactive map **Navigate through Madrid** allows you to obtain information about the EMT service from the web page, based on the city's layout. This system receives more than five million queries per month.
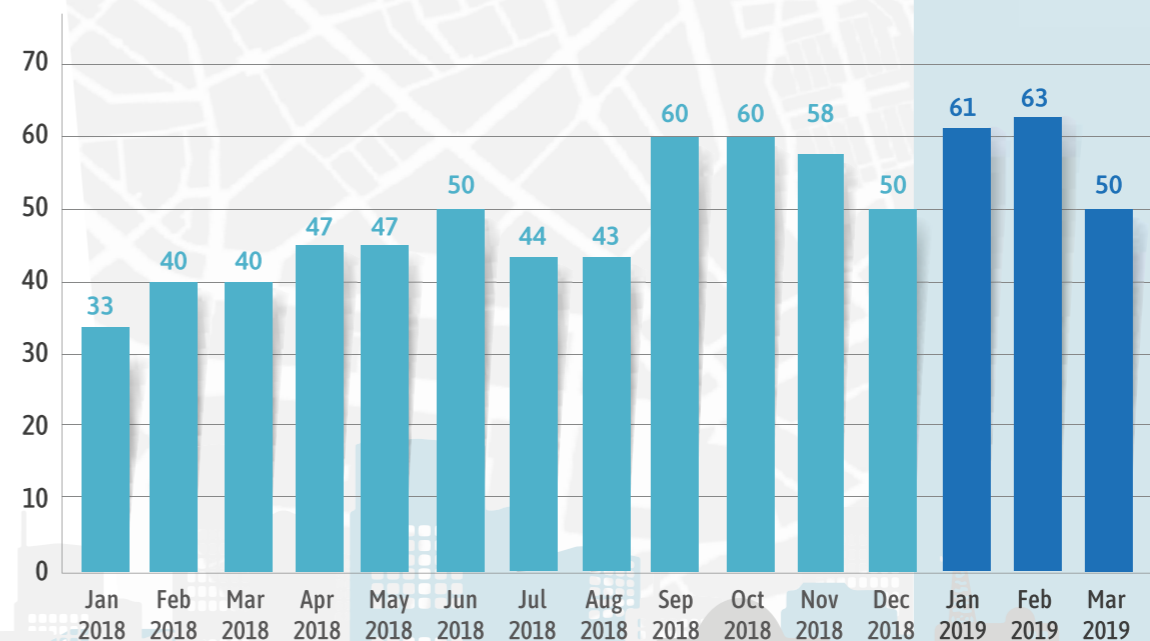
NAVEGA POR MADRID
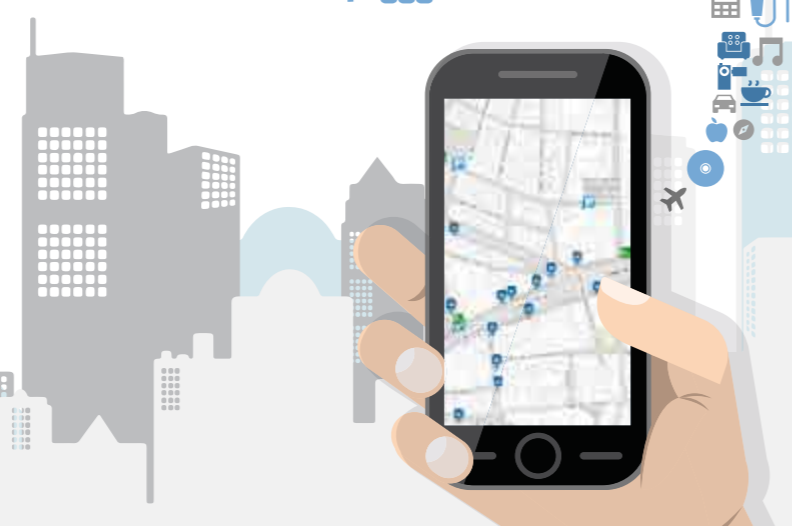
OPEN DATA

2012 — 2017

The Open Data architecture is a specific development whose software feeds the local services of the EMT systems and displays the information and standard way (Web Services and XML) and in a single location.

EMT Madrid's Open Data platform is accessible from the internet and is available to citizens and businesses under an innovative access model that presents various new features, including an open protocol for the exchange of information between citizens, companies and public agencies common to all.

- Data datagrams (messages) standardised to facilitate public exchange and understanding of the information that is shared on the system.
- Protocol for the exchange of information between citizens, companies and public organisations, open and common for all.
- Easy integration with the sensors and internet of things elements already present in the city.
- The requested data is automatically provided when this is generated.

In 2012, EMT launched the **"Open Data"** information platform in real time through the internet. Thanks to this, companies and citizens can obtain all the information on the EMT service in real time: *mobilitylabs.emtmadrid.es*

Almost 40 applications have been developed and up to 63 queries per second are answered (February 2019).

Average accesses per second to Open Data services on EMT Madrid (January 2018 - March 2019)

Month	Value
Jan 2018	33
Feb 2018	40
Mar 2018	40
Apr 2018	47
May 2018	47
Jun 2018	50
Jul 2018	44
Aug 2018	43
Sep 2018	60
Oct 2018	60
Nov 2018	58
Dec 2018	50
Jan 2019	61
Feb 2019	63
Mar 2019	50

Main technological achievements

From a broader view of mobility in te city of Madrid per se, work has been carried out on integrating the transport and mobility elements to **incorporate the concept of SmartCities into the Company's vision**. Technologies and processes for capturing data from external sources **(Open Data platform and Internet of Things sensors) are being developed** to establish a new mobility management model based on knowledge of what is happening in the city in real time.

2013

Integration with **Google Transit Real Time** to provide information in real time on incidents and warnings.

Smart Madrid Project: allows waiting times and tourist information to be consulted at network stops using **NFC (Near Field Communication) technology and QR codes** to facilitate waiting-time and tourist information to people who use the service.

2014

On board video-surveillance: more than 10,000 video surveillance cameras are distributed throughout the EMT fleet. Their purpose is to continuously record and monitor high resolution images on board the bus in real time during the provision of the service.

- Core on-board equipment on each bus to manage the system.
- Wireless communication systems for video transmission.
- Specific software and equipment to manage, operate and maintain the system.

2018

ElectroEMT: App that allows people who use the EMT network's electric recharging points service to access, activate, reserve and pay for the service. In addition, the application provides a guide to the chosen charging station and allows access to the charges and invoices history.

2019

New payment and access validation system for buses that facilitates payment with a contactless bank card, or mobile device: EMT has created an innovative integrated contactless payment platform for bank cards and mobile devices for users paying for transport and mobility services (BiciMAD, Car Parks and Cable Car).

In the immediate future, this system will enable unified post-payment for all EMT services.

On board multimedia screen system: providing real-time information on journey times, the following stops on the route and interchanges with other lines as well as the news and incidents relating to the service.

Ecoindicator: pioneering initiative that puts technology at the service of driving efficiency by installing a device (ecoindicator) on the bus that shows, in real time, all the information related to the handling of the vehicle and that records data related to fuel savings and to comfort during the journey.

Technological projects in development

The Mobility Model is a planning tool that integrates mobility options and needs in both public transport and private vehicles in the city of Madrid and its area of influence.

Plan A
MADRID

The **main uses** of the Mobility Model include:

Quantifying the intuition of transport decision-makers and planners **when making new mobility proposals (modal transfer, variation in travel times, kilometres travelled, etc.)**

**Providing advice to the City Council on the impacts of traffic on air quality.**

Mobility model

The mobility model is a very innovative tool as the demand for the service is obtained by combining in-house data sources (public transport validations, among other data) and external sources (mobile data and other data). This allows the demand to be classified according to the season of the year (winter, summer, shoulder period), type of day of the week (working, Friday or weekend) or period of the day (rush hours and off-peak hours).

Thanks to a **sophisticated information processing and analysis** system, the city model provides **estimates of the mobility behaviour** that allow us to plan services and review the adequacy of these in meeting actual demand.

Evolution of journeys on Public Transport
Comparison: Public Transport - Private Vehicle

━━━ Private Vehicle   ━━━ Public Transport

De 7 a 8
De 13 a 14
De 17 a 18
De 22 a 23
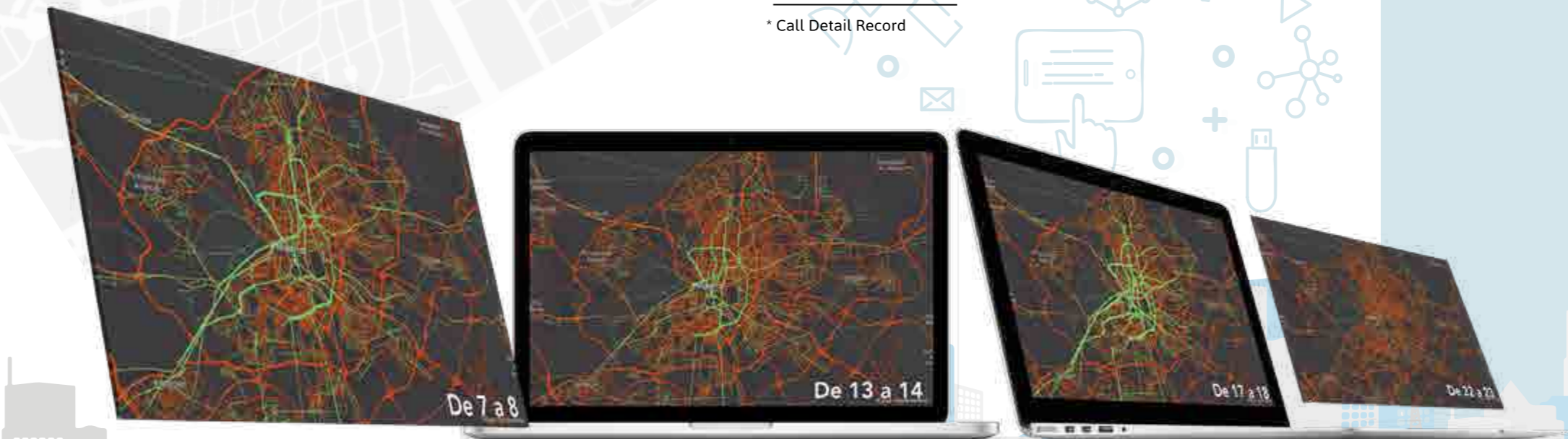
EXTERNAL DATA

- Socio-demographic characterisation
- Origin-destination matrixes obtained through CDRS* (mobile telephone records for telephone calls, SMS messages and Internet connections)
- Mobility apps
- Regulated parking system (SER Madrid)

BIG DATA

INTERNAL DATA

- Pollution sensors
- Public transport validations
- Bicycle trips
- Tracking from the EMT app
- Access to public car parks managed by EMT

* Call Detail Record
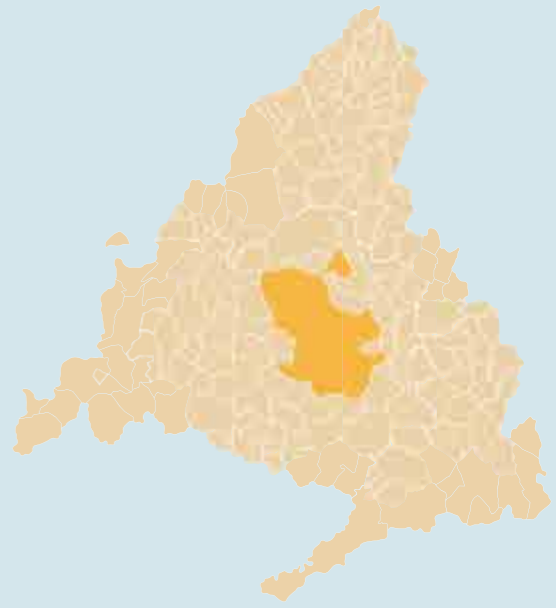
The Model includes both the road network and the current public transport capacity and allows comparison between the travel demand in the 1259 areas into which the study area is divided. This area focuses on the city of Madrid (605 zones) but also covers the rest of the metropolitan area (654 zones).

Technological projects in development

The **MaaS Madrid project** responds to the new mobility needs of the citizens of Madrid. MaaS Madrid is a public initiative that guarantees transparency in the planning of routes and the protection of user data to promote multimodal options that complement public transport.

Mobility as a Service (MaaS)

As a result of the digital transformation experienced in the relationship between EMT and its users and the need for change in the current mobility model, a new concept in designing transport supply and use has emerged: Mobility as a Service (MaaS).
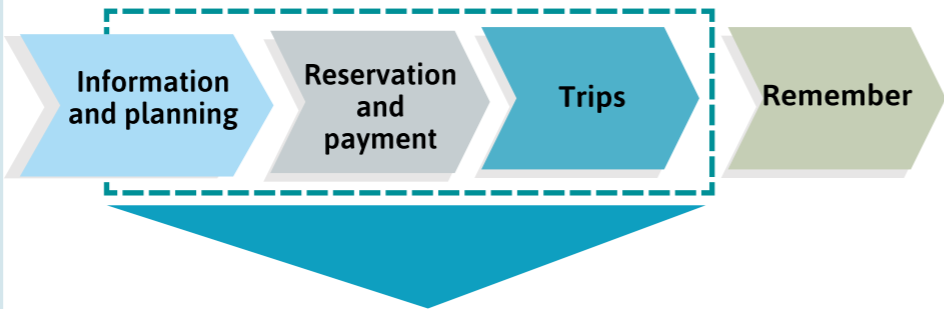
Access to more sustainable and efficient mobility services is facilitated through technological tools, while improving the travel experience, accessibility and the use of resources.

The diversification of sustainable and more efficient services, the promotion of intermodality and the savings in time and resources are among the advantages derived from the implementation of Mobility as a Service management systems.

Objectives of the MaaS Madrid project

01 Improve **service information**

02 Improve the **travel experience**

03 Promote **multimodality**

04 Improve **mobility**

05 Attract people to **the sustainable system**

Phases in the travel experience

Information and planning → Reservation and payment → Trips → Remember
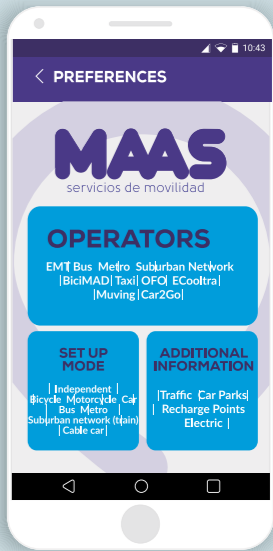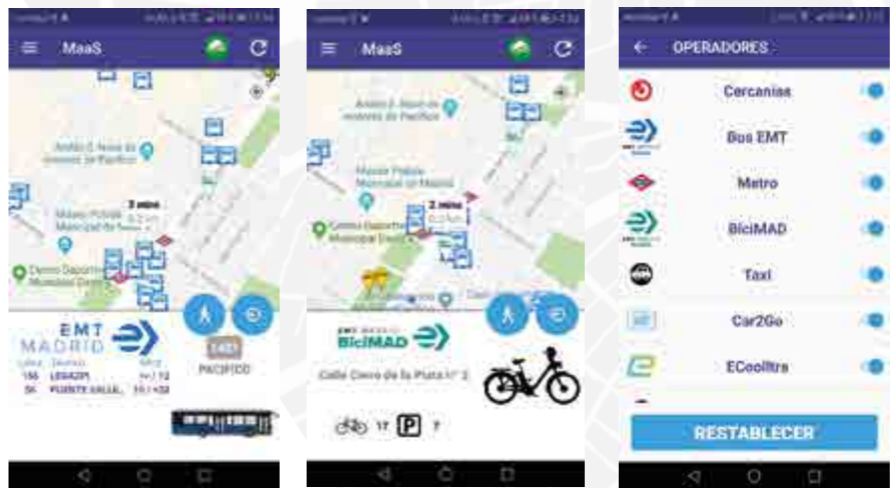
MaaS Madrid application

In order to tailor the travel experience and modulate the supply with environmental, equity and accessibility criteria, the MaaS Madrid application will include a trip planner and route selection utilities, vehicle availability, mobility service reservation system and online payment system.

The information generated by MaaS Madrid feeds, in turn, the Big Data platform used to calibrate the city model.

The information generated by the people who use the service in managing their mobility and the journeys they make as well as the results from mobility management services carried out by the different operators is stored in the Mobility as a Service developments and this, in turn, feeds the Big Data platform used to calibrate the city model.

MaaS Madrid app attributes

- Quality of the information
- Reliability
- Transparency
- Usability

MaaS Madrid Services

Public and private agreement types
Design of MaaS Roadmap
Standardisation of APIs
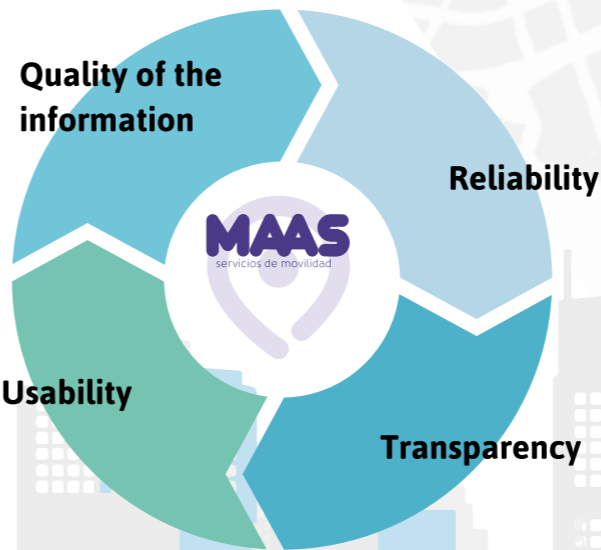
Consulting
Service

EMPRESA MUNICIPAL DE TRANSPORTES DE MADRID

consultoria@emtmadrid.es