



Transports
Metropolitans
de Barcelona

TMB INTERNACIONAL









1. TMB Internacional. Who are we?

- 1.1 Introduction
- 1.2 TMB Group
- 1.3 Strategic lines





2. Activity

2.1 What do we do?




Who we are
TMB as a global operator

-  Metro
-  Bus
-  Tram
-  Cable car
-  Funicular
-  Tourist bus
-  Personal mobility
-  On-demand transport





Decarbonisation

-  Energy transition
-  Electromobility
-  Green hydrogen
-  Climate change and sustainability

Digital solutions-applied technology

-  Digitalisation, process automation and sensorisation
-  Big data analysis
-  Digital channels

Customer experience

-  Accessibility
-  Inclusive mobility
-  Leisure transport
-  Journey map

2.2 How do we do it? — A service adapted to the project

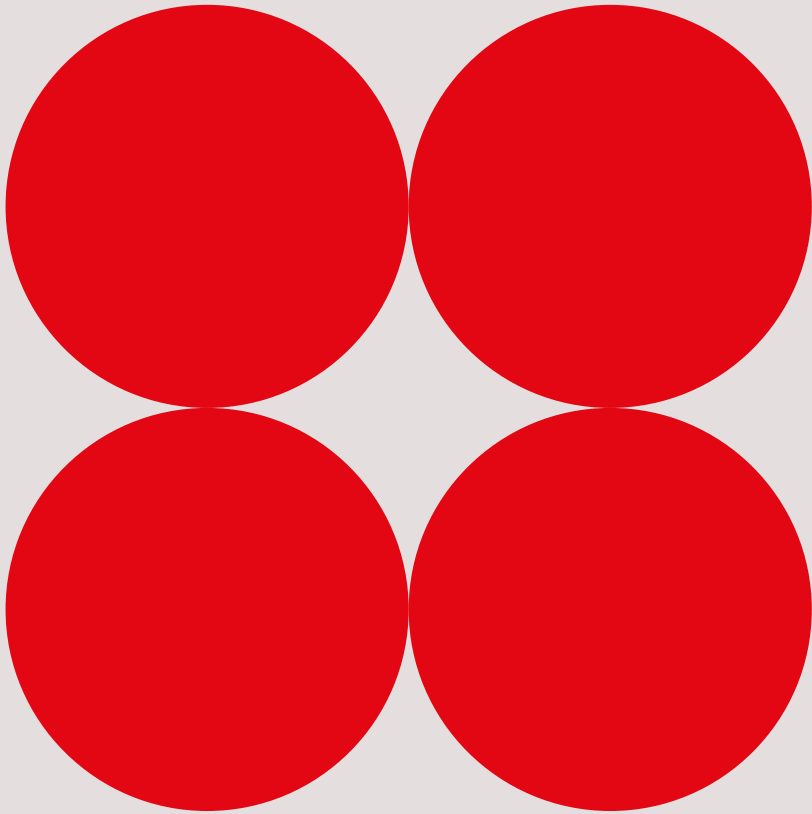
At each stage of the project
Adapting to different roles

3. Some of our projects

- 3.1 Operation
- 3.2 Shadow operation
- 3.3 Operation and maintenance advisory services
- 3.4 Preparation of technical tender specifications: operation of lines, purchase of trains, buses
- 3.5 Oversight of train and bus design and construction
- 3.6 Start-up advice services
- 3.7 Transport planning
- 3.8 Implementation of accessibility systems
- 3.9 Technical advice on tram systems



1. TMB Internacional. Who are we?



1.1 Introduction

Transports Metropolitans de Barcelona (TMB) is the main public transport operator in the metropolitan area of Barcelona and a benchmark in the field of public transport and mobility in Spain, Europe and the rest of the world.

TMB has been exporting its knowledge and experience in public transport management to the rest of the world for over 20 years. We use our experience to advise on a range of public transport projects at the international level.

We are a **leading manager** in terms of national and international **urban transport by metro, bus and other modes of tourist and leisure transport.**

The goal of **TMB International** is to contribute to **improving mobility in cities**, in line with TMB's mission. We export our knowledge to other regions, including the rest of **Spain, Latin America, North Africa and Europe.**

1.2 The TMB Group

TMB is the umbrella name for the companies Ferrocarril Metropolità de Barcelona, SA (FMB) and Transports de Barcelona, SA (TB), which manage the metro and bus networks respectively on behalf of the Àrea Metropolitana de Barcelona. The TMB Group also encompasses other companies that manage fare-based products through the Hola Barcelona e-commerce platform and other transport services, as well as the TMB Foundation, which safeguards TMB's historical heritage and promotes public transport values through social and cultural activities.

TMB's activity focuses on scheduled passenger transport through the bus and metro networks, tourist services, fare-related business, and external

consulting services in Spain and abroad.

In 2019, TMB's transport network (metro, bus and tourist bus networks) reached an all-time high in terms of passenger numbers, carrying 627 million users.

As Barcelona's main public transport operator, TMB's **mission** is to offer comprehensive mobility services, including metro trains and buses, that:

Contribute to **improving citizen mobility** and sustainable development

Guarantee the **provision of excellent service** for the public

Promote **equal opportunity** policies and social responsibility

Efficiently use public resources



1.3 Strategic lines

Mobility Services

Improving the metro and bus networks and increasing their efficiency, as well as the quality of the services on offer throughout the metropolitan area, improving infrastructures and promoting intermodality with the incorporation of new personal and shared mobility services, including last and first mile modes of transport, taking advantage of the benefits and advantages of new technologies.

New Businesses

Achieving alternative and complementary sources of income, boosting non-fare and fare-based revenues linked to TMB products and encouraging participation in international business.

People

Creating a new TMB company culture in which people are the cornerstone of TMB's activity, fostering teamwork and the talent of its people.

Society

TMB is fully committed to society and the environment in which it operates, with special emphasis on social responsibility and sustainable development, as well as universal accessibility, civic-mindedness, coexistence and increased safety.

Sustainability and the environment

For TMB, sustainability and the environment are a priority, and the company implements energy-saving policies and promotes sustainable fleets and infrastructures.

Efficiency and effectiveness

TMB must be a benchmark in control and responsible public management.

Digital transformation

Digitalisation is the way for TMB to improve public transport services in all its internal and external areas, including operation and maintenance, as well as the management of its internal processes and customer care and service.

Values and Culture

TMB must promote transparency as an institutional cornerstone, through a culture of evaluation and performance, improved autonomy and acceptance of responsibilities, in which the values of equality, integrity, honesty and respect prevail, with a vocation and commitment to public service.

Institutional environments

TMB's good reputation must be enhanced and TMB must contribute to society by actively participating in mobility decision-making bodies, promoting proposals, encouraging or creating research projects with other partners and institutions, and fostering international contacts.

2. Activity

What do we do?

TMB Internacional aims to help improve mobility in cities, based on TMB's values including the humanisation of the service, universal accessibility and a philosophy of well-being, development and responsibility.



Metro

- 1 Porto Metro
- 2 Seville Metro
- 3 Bilbao Metro and accessibility
- 8 Algiers Metro
- 9 Paris Metro
- 11 Dublin Metro
- 12 Vienna Metro
- 13 Istanbul Metro
- 14 Yekaterinburg Metro
- 16 Auckland Metro
- 18 Buenos Aires Metro
- 19 Santiago de Chile Metro
- 20 Lima Metro
- 26 Bogota Metro
- 27 Medellín Metro
- 28 Panama Metro
- 29 Guatemala City Transmetro



Bus

- 6 Mallorca Buses
- 10 Perpignan Buses
- 15 Bangladesh BRT
- 17 Sao Paulo Buses
- 21 Lima Metropolitan BRT
- 22 Mecca Buses
- 23 Antibes Buses
- 24 Beziers Buses
- 25 Panama Buses



Tram

- 4 Zaragoza Tram
- 5 Barcelona Tram
- 7 Orán Tram

What do we do?

TMB Internacional's work consists of sharing TMB's expertise in a number of areas with companies and organisations around the world.



Modes of transport



Decarbonisation



Digital solutions



Customer experience



2.1 What do we do?

Modes of transport.
TMB as a global operator



Metro



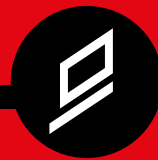
Bus



Tram



Cable car



Funicular



Tourist bus



Personal mobility



On-demand
transport

Modes of transport.

TMB as a global operator

Metro

TMB is an operator of conventional and automatic transport lines and has extensive experience in the design, implementation and operation of lines on all continents.

The **Barcelona metro** network consists of 8 lines plus the **Montjuïc funicular**. In total, it comprises **125.4 kilometers of network** and **165 stations**. Of these lines, **5 are conventional and 3 are automatic**.

With an extensive service schedule, the TMB metro network is currently used by more than **278.24 million passengers a year**, 39% of all passengers in the region.

45% of the Barcelona metro network uses automatic trains.

For TMB it is crucial to use technology to achieve maximum safety, increased flexibility, greater reliability, improved efficiency, more information and a personalised service.

TMB is committed to providing comprehensive safety in the provision of the service. This is based on:

- **The safety of people and facilities**
- **Traffic safety**
- **Workforce safety**



Modes of transport. TMB as a global operator

Bus

TMB has experience in the design and implementation of bus fleets. The **Barcelona bus network** comprises **106 lines** which, with more than **1,100 vehicles**, cover a total distance of **839.21 km**. The bus network is structured into **diagonal, vertical and horizontal sections**, together with a **fourth block of numbered lines**. This network serves Barcelona and 10 municipalities within the metropolitan area.

TMB's commitment to **sustainability** and improving air quality is reflected in the fact that it has the **cleanest bus fleet in Europe**. One of TMB's strategic objectives is to switch to green energy in its bus network, placing it at the forefront in this area.

Between **2021 and 2025** it will **incorporate 508 renewable technology buses**, of which **223 will be electric and 46 hydrogen-powered**. In addition to the substantial investment it is making in electric bus charging infrastructure, TMB has driven forward the construction and commissioning of a **hydrogen station open to the public**.

TMB, as well as wanting to become a European benchmark in terms of mobility management, also wants to be a leader when it comes to social responsibility.



Modes of transport.

TMB as a global operator

Tram

TMB is part of the TRAM public transport business group, which operates Barcelona's tram systems.

The TRAM system comprises **two networks**, each with three lines, with a dedicated platform and connected to the city's urban transport network via various interchanges. On the one hand, is the Diagonal - Baix Llobregat tram, known as the **Trambaix**, and on the other is the Sant Martí - Besòs tram, known as the **Trambesòs**.

The Barcelona tram network, which is currently being extended, has **6 lines, 41 vehicles and 56 stops**, and covers a distance of **29.22 kilometres**.

To facilitate access for people with reduced mobility, the floors of the tram units are lowered.

TMB has also participated in **tram projects in several cities**, including **Seville** and **Zaragoza**, providing technical support services for their start-up and operation.



Modes of transport. TMB as a global operator

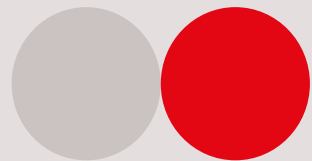
Cable car

One of the transport services managed by TMB is the Montjuïc Cable Car. This is located on the mountain of the same name and offers a transport service to the top.

The route consists of **three stops** (initial, intermediate and final) and offers unique panoramic views of the city of Barcelona. The Montjuïc cable car is a vital mobility element in terms of access to the mountain of Montjuïc.

The cable car travels a distance of **752 metres** and **climbs 84.55 metres**. It has **55 cabins** that each hold **eight people**, allowing it to carry **2,000 people per hour**. The ticketing system consists of round-trip tickets that can be purchased at the ticket offices or online.

The journey takes approximately **15 minutes** with no stops. The Montjuïc cable car has established itself as a key tourist attraction for visitors to the city of Barcelona.



Modes of transport.

TMB as a global operator

Funicular

One of the transport systems that TMB operates in Barcelona is the funicular railway.

The Montjuïc Funicular is public transport comprising a cable car that connects the city of Barcelona with the mountain of Montjuïc, as well as with the facilities of the Lluís Companys Olympic Stadium which is located on this site.

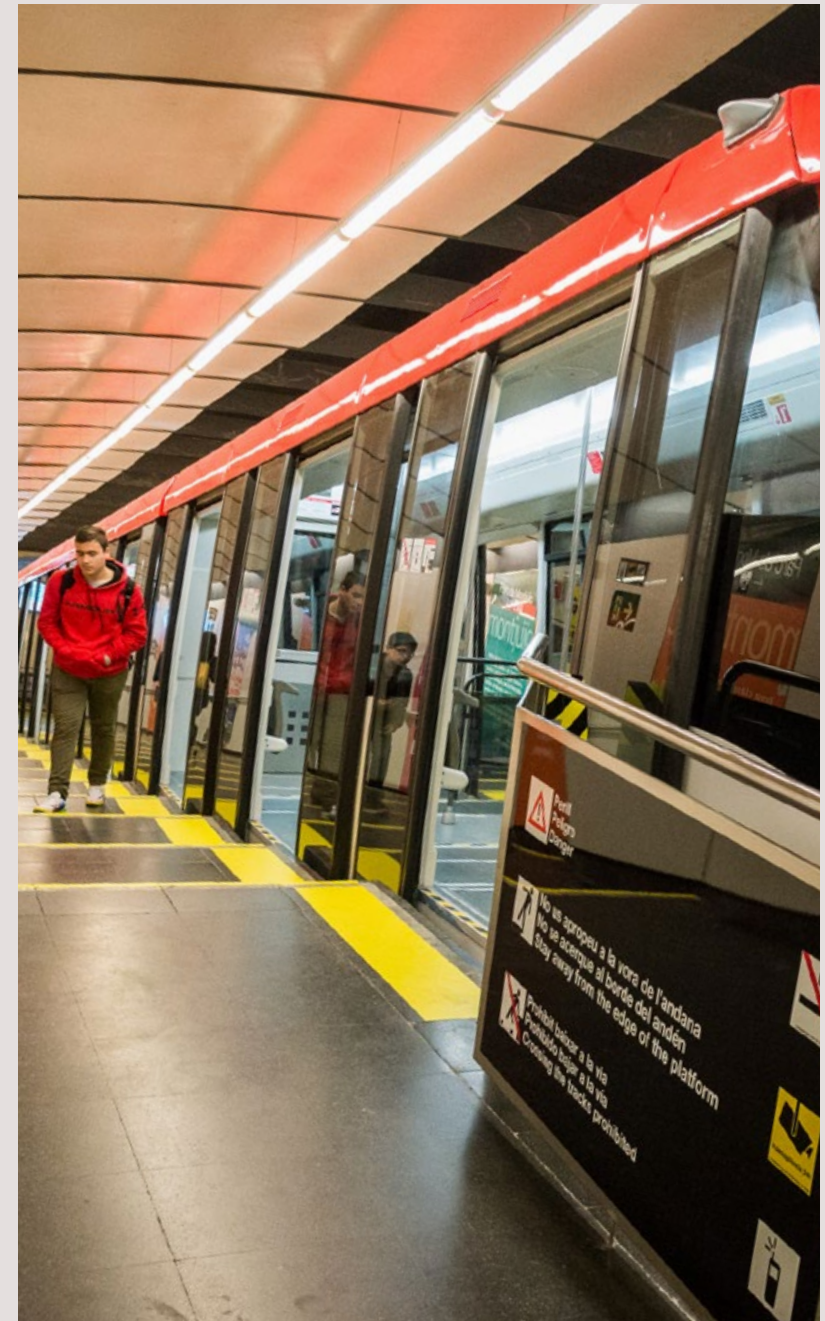
The system includes **two stations**: the one closest to the city is integrated into the Barcelona metro station of **Paral·lel**, at an **altitude of four metres above sea level**, where it connects to lines L2 and L3.

The second station is located on **Avenida del Estadio** in Montjuïc Park, at an **altitude of eighty metres**

above sea level. This station provides access to the Montjuïc cable car, which runs to the castle.

The **average gradient of the route is 10.1%, with a maximum gradient of 18%**. The majority of the route is covered, with the exception of the last few metres, which are in the open air. Both stations are adapted for people with reduced mobility. The funicular is capable of carrying approximately **8,000 passengers per hour in each direction**.

The funicular is part of the **integrated fare system** and the ticket costs the same as a metro or bus journey.



Modes of transport.

TMB as a global operator

Tourist bus

TMB also offers a tourist bus service, the so-called Barcelona Bus Turístic (BBT), to improve mobility for visitors to the city.

According to the latest studies, it is **the most widely used tourist transport by visitors to the city of Barcelona.**

It has a fleet of **65 double-decker vehicles**, of which **13 are hybrid-powered**. There are **3 routes**, blue, red and green, and between them they cover a total of **50.6 km of urban distance** and **44 stops**. On average, these buses carry **4 million passengers a year**.

The main competitive advantage of Barcelona Bus Turístic lies in its partnership strategy with the main players in the market (Turismo de Barcelona, Gremio de Hoteleros, etc.) as well as in its in-depth knowledge of the operation and regulation of the bus transport service, since the same professionals regulate the city's public bus transport network.



Modes of transport.

TMB as a global operator

Personal mobility

TMB is entrusted with managing the **bicycle sharing system in the Área Metropolitana de Barcelona (Ambici)**, which provides first and last mile coverage with public transport.

The project will provide up to **2,600 electric bicycles** in **236 parking stations**, and will **integrate with the city's public transport system** to facilitate intermodality with other means of transport, such as the bus service, Bus Metropolitano, the metro, tram and railway, among others.

The metropolitan public bicycle service improves capillarity with the Área Metropolitana de Barcelona transport network.

It organises the different transport nodes, improving intermodality and creating quality public spaces for passenger transfer between the different axes. The main features of the service are:

- **100% electric bicycles**
- **Modular stations** with fixed anchorage
- **Recharging takes place at the stations themselves**
- The access system comprises various methods such as **optical reading via a mobile app**
- Maintenance and logistics designed to keep the equipment **working optimally** and **rebalancing supply and demand** at the stations



Modes of transport.

TMB as a global operator

On-demand bus

Demand Responsive Transit or DRT is a new **more sustainable, smart form of local transport** that works on demand and adapts to the needs of the passenger. TMB's 'Bus on demand' service has been operating since 2018 in the city of Barcelona.

The stops are fixed and routes are shared with other users with similar needs. The **timetables are calculated on the basis of requests**. Users indicate when they want to travel, the stop where they will get on, the stop where they will get off and how many people will be travelling. The bus does not have a fixed route, instead an **algorithm calculates the shortest possible route** between the requested stops.

In 2018, TMB carried out a pilot test of elMeuBus in Torre Baró, and in 2021 it was decided to extend this service to a larger area. In its 2025 strategic plan, TMB states its intention **to extend the on-demand bus service** to more areas and neighbourhoods, **with up to 20 lines serving 50 neighbourhoods**.

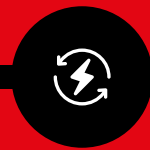
This service improves transport energy efficiency while ensuring access to areas where there is less demand.



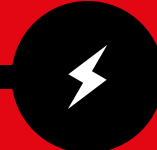
2.1 What do we do?

Decarbonisation

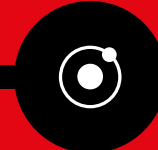
TMB contributes to a sustainable city model through its multimodal transport offer and the decarbonisation of its activity. 59% of journeys in TMB's area of influence are made on the transport network operated by TMB in Barcelona.



Energy transition



Electromobility



Green hydrogen



Climate change and sustainability

Decarbonisation



Energy transition

TMB strives to be increasingly efficient in the generation and use of energy and to minimise polluting emissions into the atmosphere.

TMB is developing an energy transition strategy to reduce emissions in the networks it operates within the Barcelona metropolitan area.

How?

By progressively making its bus fleet more sustainable

The introduction of 410 buses of different types (46 hydrogen, 210 electric, 154 CNG hybrids), and 120 electric vehicles to renew the auxiliary fleet (cars, vans) is planned by 2024.

By promoting synergies between the metro and buses

For example, the chargers in two of the bus depots will be supplied with electricity from the receiving substations of two metro lines (9 and 10).

By using green energy

Since 2016, all low-voltage electricity purchased by TMB has come from renewable sources with Guarantees of Origin (GoO).

In addition, since 2018, all high-voltage electricity has also come from renewable

Continuously reducing energy use and costs for ongoing operations and maintenance is vital for achieving the energy transition goals.

How?

By reducing the specific consumption of trains, buses and equipment

By securing the cheapest energy and power prices

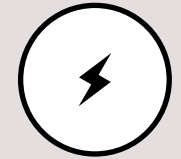
By using complementary green sources

By designing appropriately to curb/reduce maintenance and operating costs

By recovering energy

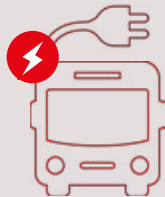
One of the main objectives is to reduce energy consumption in the metro by 6% by implementing technologies that allow the energy generated by the trains to be recovered.

Decarbonisation



Electromobility

For TMB, moving towards a sustainable fleet is an important step in the fight against climate change. This objective is included in its 2025 Strategic Plan, which envisages the incorporation of 410 clean energy buses.



TMB's objectives in terms of electric mobility

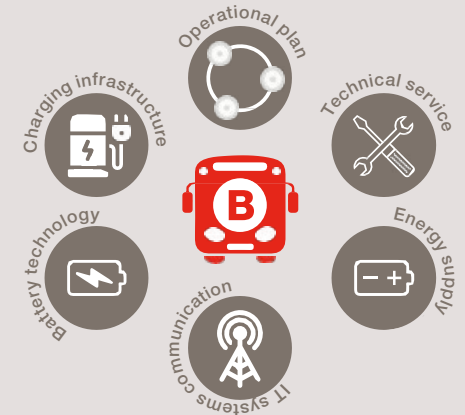
TMB is working hard to achieve an efficient and economically sustainable electricity supply model. This is essential for complying with the emerging regulations, which are currently in the transition phase.

TMB is committed to using the metro's electric infrastructure at additional times (night-time recharging) and harnessing this energy.

In their 15 years of service life, electric buses achieve significant reductions compared to diesel buses: 1 t of CO₂, 540 kg of NO_x and 6 kg of PM.

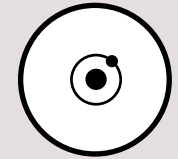
Key measures in the Bus Fleet Electrification Plan

- Acquisition of 210 electric buses of different types (midi, standard, bendy, double decker) in the period 2021- 2024
- Acquisition of 120 electric vehicles to renew the auxiliary fleet (passenger cars, vans, mobile workshops)
- Creation of the electric bus charging infrastructure and power and energy supply infrastructure
- Management and optimisation of charging processes and energy consumption
- **Use of the metro's electrical infrastructure** at additional times (night-time charges)
- High voltage power supply and **electrification of 3 depots**
- On-street chargers for **opportunistic charging** on certain lines (H16, H12, V15)



H16 Barcelona's first bus line to become 100% electric with opportunistic charging.

Decarbonisation



Green hydrogen

In 2022, TMB incorporated the first 8 hydrogen buses into its fleet.



TMB's first hydrogen buses

TMB is strongly committed to hydrogen buses, and it plans to acquire 46 vehicles of this type by 2025. In this way we are diversifying our renewable energy sources.

The eight buses TMB has purchased are the H2 City Gold LHD model from Caetano Bus. These are 12 metres long, and their technological core is the 60-kilowatt fuel cell from the Japanese firm Toyota. The engine and electronics are by Siemens.

The manufacturer estimates a daily consumption of 20 kg of hydrogen and a range of 300 km.



The hydrogen station

TMB launched a public tender for the creation of the infrastructure needed to supply hydrogen to its buses. The successful bidder was Iberdrola, who created the first public plant in Spain to supply green hydrogen.

In the first phase, each year it will supply 51 tonnes of green hydrogen from renewable sources to TMB buses, and will also provide a service for other companies in the area. The current infrastructure can supply more than a hundred buses

This is the first time this type of renewable energy vector has been generated in Spain for commercial use and with fleet capacity, making TMB and Iberdrola pioneers in the decarbonisation of heavy urban mobility.

Why green hydrogen?

- It allows TMB to position itself as a technological leader.
- It offers society experience in sustainable mobility.
- Hydrogen is a technically viable solution that will become even more competitive in the coming years.
- It provides a solution to the weight, autonomy and charging time limitations of electric buses.
- It means a significant reduction in battery weight.



Decarbonisation



Climate change and sustainability

Every day, TMB works to promote sustainability in the cities in which it operates.

How?

By utilising groundwater from the metro to irrigate the city's parks and gardens or for other uses.

We make 25% of the total groundwater in the metro network available to the public authorities: 72.47 litres/second, equivalent to the water consumed by 60,000 people in Barcelona every day.

By reducing the water consumed by transport facilities

From 2017 to 2021 we managed to reduce water consumption by 10%. From every 10 litres we use when washing buses and metros, we reuse 8 litres.

By reducing energy consumption by incorporating innovative technologies

Between 2017 and 2021, this consumption was reduced by more than 36 million kWh, equivalent to the energy consumed by 4,500 homes over an entire year.

By environmentalising material, fleet, product and service procurement

By defining and incorporating environmental criteria into the purchasing process

By carrying out awareness-raising, training and communication campaigns

Within the company and externally

By optimising waste production and management

We separate more than 65 types of waste. From 2017 to 2021, we reduced the amount of waste generated by 16%.

By implementing an Environmental and Energy Management System based on the ISO 14001 and ISO 50001 standards

For the ongoing improvement of the organisation's environmental and energy performance and as a guarantee of compliance with environmental regulations, undergoing an annual internal and external audit.



2.1 What do we do?

Digital solutions-applied technology

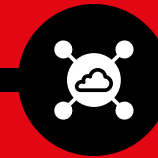
TMB is a benchmark company in the field of technology applied to mobility. Optimal public transport operation is achieved thanks to continuous innovation and the efficient management of the advanced technological systems it has at its disposal.



Digitalisation, process automation and sensorisation



Big data analysis



Digital channels

Digital solutions-applied technology



Digitalisation, automation, sensorisation

Smart Motors - Davana

TMB is currently a major user of new digitalisation apps. Since 2014 TMB has been a shareholder in Smart Motors (Thinking Forward XXI SL), the company that created the DAVANA digitalisation platform.

The solutions portfolio applies new technologies to generate added value by monitoring different critical assets and improving operation and fault management.

 <https://brochure.smartmotors.app/books/lotv/#p=8>

Highlights

- Through the use of sensors, we achieve exhaustive real-time control of the state of the railway machinery and its facilities.
- Integration of technological developments to improve our services and decision making
- The DAVANA platform facilitates preventive maintenance work and reduces reaction time in the event of a breakdown
- This technology provides increased safety, accurate, real-time information and digitalisation with a flexible, scalable and integrative platform

Functionalities

- Monitoring and control of various elements in the field of signalling (electrical parameters, track circuit, signal fading, etc.)
- Monitoring of infrastructure elements, such as automatic track auscultation and rail wear, on-board vertical acceleration measurements, rail temperature measurements, with fixed and on-board sensors, measurement of track opening, thermal conditions in tunnels, bridge monitoring, viaduct environmental conditions, and so on
- Digitalisation of the rolling stock fleet
- Geolocation, automatic maintenance planner, condition analysis of various elements
- Operation: people counting, comfort monitoring, real-time digital twin of driver's console
- Passenger information

Application

- Technologies such as artificial intelligence, IoT Analytics and 5G help sensor development and their communication with the platform created, for full digitalisation of the train service.
- This technology, together with effective use of Big Data, makes it possible to have all the necessary data available in real time, to channel it and rationalise it, with the aim of achieving the utmost service excellence and efficiency.

Digital solutions-applied technology



Big Data Analysis

Counterest - Pulse

The system developed by COUNTEREST (PULSE) allows the real-time detection of passenger volumes on platforms, in lobbies, inside trains, and so on, based on the use of closed-circuit television (CCTV) images and Deep Learning, a subset of Artificial Intelligence techniques. With occupancy data, operations managers can take immediate corrective action and plan future services.

Highlights

- The cameras located on platforms, in corridors, vestibules and carriages make it possible to analyse user behaviour, peak times, trajectories, and so on. The data is reliable and allows the desired information to be organised efficiently
- The system allows changes to be made on the fly to adapt it better to the requirements or to apply it to new uses (tracking)
- The DAVANA platform facilitates preventive maintenance work and reduces reaction time in the event of a breakdown
- COUNTEREST PULSE is designed with a scalable modular architecture that allows rapid implementation in new locations and customisation of the desired monitoring type

Functionalities

- Application of Artificial Intelligence (AI) to video surveillance systems to provide valuable information for business decision making: people counting, fleet operation and planning, queue management, etc.
- This data enables the offer to be planned according to passenger forecasts or to be adapted according to real-time traffic flow
- The data allows decisions to be made in real time and short, medium and long-term projections can be made quickly and easily to anticipate any situation

Implementation

System installed in **stations** on lines **L1** and **L5** of the Barcelona Metro: **150 platforms and concourses and 50 trains**



Digital solutions-applied technology



Digital channels

A commitment to the future

OUR DIGITAL CHANNELS ARE AN INCREASINGLY IMPORTANT PART OF THE SERVICE WE OFFER

- More and more customers require digital services for planning their transport, while travelling to stay informed, or to buy or validate their tickets.
- Digital users are demanding and also expect personalised services that minimise their effort and add value to their use of public transport and their daily activities.
- To this end, TMB has web and app channels that offer customers digital services and an omnichannel experience through a user profile.

THE FOUNDATIONS OF THE DIGITAL ENVIRONMENT

- We have technology that supports digital services.
- We have a specialised multidisciplinary team (digital marketing, digital product management, analysts and technologists).
- We have a method (Agile) that supports creation and evolution according to the needs of the business and our customers at all times. It combines business vision, functional vision and technical vision in iterative work with specialised teams. This allows us to materialise more quickly (reduced time to market) than with classic Waterfall methods.
- We have a digital strategy that defines goals and the approaches for achieving these (channel mix, objective of each channel, etc.).

All this is reflected in the creation and management of digital channels (websites, apps, networks and other digital marketing tools) which are the key to achieving the company's goals (effective and personalised communication), transferring revenue from offline to online (digital sales and ticketing), digital positioning, boosting the company's image, and so on.

OUR DIGITAL CHANNELS

At TMB we manage a number of websites and their subdomains, e-commerce and mobile apps, some aimed at the general public and others at more specific segments such as tourism:

- www.tmb.cat
- Barcelonabusturistic.cat
- Telefericdemontjuic.cat
- Catalunyabusturistic.com
- Holabarcelona.com
- [TMB App](#)
- [Hola Barcelona App \(coming soon\)](#)
- [Barcelona Bus Turístico App](#)
- [El Meu Bus App](#)
- [TMB GO](#)

SOME FIGURES

Data on TMB web and app use (June 2022):

TMB.CAT

- 983,000 sessions
- 594,000 unique users
- 260,000 € turnover

TMB App

- 44,123 downloads
- 1,100,000 sessions
- 233.000 unique users
- 878.000 € turnover



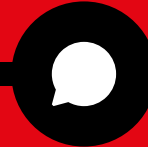
2.1 What do we do? Customer experience



Accessibility



Inclusive mobility



Journey map



Leisure transport

Customer experience



Accessibility

In 2010, the TMB Universal Accessibility Master Plan was drawn up with the help of several organisations representing people with functional diversity.

TMB has a Universal Accessibility Technical Office that manages accessibility from a technical, transversal perspective that is integrated with the rest of the company.

Infrastructure

TMB manages and adapts transport services and infrastructures to eliminate all barriers and achieve universal accessibility. With over 100 years of history, it is expected that 100% of stations will be accessible by 2025-26. In addition, the entire network has tactile displays on vending machines (all with voice navigation), accessible turnstiles and platforms, and SOS posts. The bus network also has optimal accessibility, allowing everyone to use buses autonomously and comfortably: low-floor vehicles, with side-tilt and retractable ramps, acoustic and light signals, priority use regulations and reserved spaces, etc.

Digital solutions

NAVILENS SYSTEM

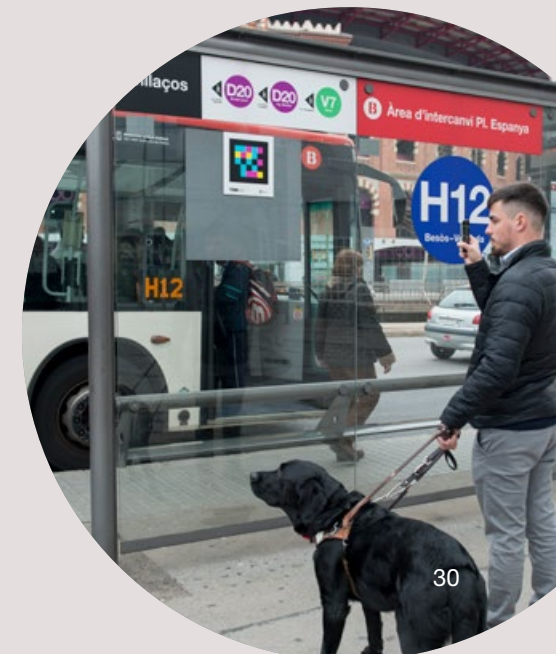
Smart tags that make signage and information about bus and metro services available to visually impaired people by scanning the tags via the app on their mobile device. The system is currently operational across the entire bus network and at all stations in the metro network.

TMB APP BUS STOP ASSISTANT

This helps with locating and boarding the bus, as it tells you the number of bus that is approaching the stop. Users can also send a message to the driver to let them know that there is a visually impaired person at the next stop who wants to get on. (TMB + Municipal Institute for People with Disabilities)

Training and quality audits

TMB believes that training is crucial: equipping the bus and metro network staff with the knowledge and tools they need to properly assist users with disabilities, with the aim of improving accessibility to the public transport service.



Customer experience



Inclusive mobility

TMB has a Global Project for inclusion and against sexual harassment on public transport.

This covers the following five areas:

- Disability perspective
- Origin or cultural perspective
- Gender perspective
- Generational perspective
- Sexual diversity and gender identity perspective

Social responsibility

TMB's social responsibility policies are an international example in the fight against sexual aggression and LGTBI-phobia. This was clearly demonstrated by the award the company recently received from the International Transport Union (UITP) in the area of diversity, inclusion and gender equality, for its Global Project for inclusion and against sexual harassment in public transport.

Gender perspective

One of this project's objectives is to include the gender perspective within the organisation as a public transport company. TMB has deployed equality plans for the legal representation of staff, the promotion of female talent and the incorporation of women into the organisation at all levels and in all types of jobs.

Prevention of gender-based harassment and LGTBI-phobia

TMB has also developed and is implementing protocols against gender-based harassment and LGTBI-phobia for TMB network users.

The measures we have taken to ensure an inclusive service include the installation of cameras with real-time transmission on all trains in the metro network by 2025, and improved lighting in our facilities. All buses will also have online video surveillance through a project that is already underway.



Customer experience



Journey map

Our view of the customer as the focus of all our actions leads us to study customer satisfaction on a recurring basis using a variety of tools:

Fraud studies

A solution developed internally by TMB to estimate the level of fraud on the Metro and Bus network. Only the field work is outsourced, so the study's intellectual property belongs to TMB. It is a robust tool, implemented throughout the organisation for more than 15 years, which provides data reliability and granularity at line and business unit level.

Studies to measure the quality of the services provided

A study in operation since 2006, fully developed by TMB, which provides indicators of the objective quality of the service provided to customers on the metro and bus network. The system is based on the creation of scorecards to monitor the quality indicators defined. It allows the evaluation and monitoring of these indicators and the identification

of possible opportunities for improvement as well as corrective actions for continuous improvement. It also permits certification in the UNE-13816 quality standard.

Customer satisfaction and experience studies

TMB carries out these studies annually on the metro and bus networks by means of 4,000 face-to-face customer surveys. These are carried out through TMB's digital customer database (JoTMBé). They provide annual customer satisfaction reports for the metro and bus network, by business unit, and scorecards with monthly customer satisfaction indicators for each stage of the metro and bus journey.

Segmented surveys using ddtags and the TMB Go app

This new technology (ddtags) allows surveys to be carried out at the time of the trip, in real time, to determine customer satisfaction at the time of their journey. In this way, it is possible to find out the main pain points that customers experience with our products and services so that we can correct them, offer a better customer experience, and build customer loyalty.



Customer experience



Leisure transport

The tourism services take into account the 360° of the tourist's experience during their visit to the city of Barcelona.

The main services are:

- Specific hop on - hop off products: Barcelona Bus Turístic
- Passes that allow the use of metro, bus, train, funicular, tram and suburban trains: Hola Barcelona Travel Card
- Cable: Montjuïc Cable Car
- Barcelona Night Tour Bus
- Barcelona Christmas Tour
- Catalunya Bus Turístic

Specific passes for tourists: Hola BCN Travel Card

The Hola BCN Travel Card is a very important source of income for the company and increases the use of public transport during off-peak hours.

The main competitive achievement has been the significant increase in sales of this type of ticket, beginning with a turnover of 11 million euros in 2012 and now totalling around 32 million euros.

Barcelona Bus Turistic (BBT)

This offers a transport solution for visiting customers and allows them to discover the city of Barcelona via three alternative routes. These three routes run close to the main monuments and landmarks in the city of Barcelona, thereby providing an all-round experience for visitors to Barcelona.

- Visitors can hop on and off and change lines as many times as they wish during the period the ticket is valid for. This provides a flexible service adapted to the customer's needs.
- The service is staffed by a bus driver and a guide who is responsible for the reception, sales and explanation of the tour. All the buses have an audio guide system in 18 languages and a WIFI system so that customers can connect free of charge.

360° experience

TMB has a range of tourist-oriented services that together create a flexible and unique experience.

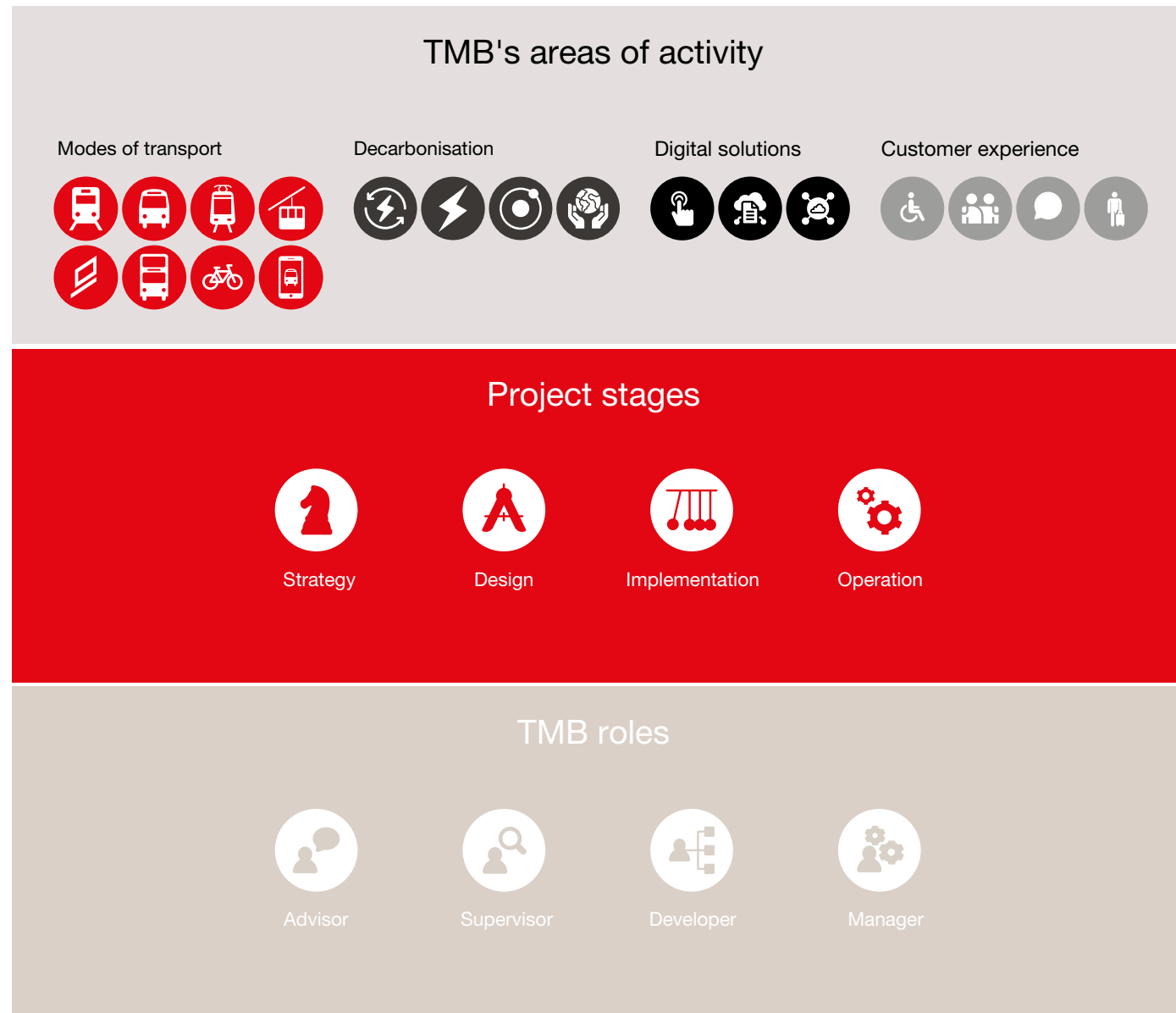
The Hola BCN Travel Card offers a comprehensive mobility service via all means of transport in the city of Barcelona (metro, bus, tram, train, etc.) and even includes an airport transfer, which ensures an optimal customer experience.



How do we do it?

We adapt to the needs of the project and the customer at each stage, adopting different roles or modes of involvement according to the customer's needs.

Our range of services stems from a desire to share our knowledge in different areas, adapting to each stage of the project — from its conception to its implementation— with the degree of involvement required by the customer at all times.



2.2 At each stage of the project



Concept/ strategy

At this stage, the best strategy for the project is considered, taking into account a number of different factors. Possible solutions are presented and their application is justified from a social, environmental, physical, populational and financial perspective. At this stage, it is likely that several transport systems, different technological solutions or diverse future user services are still being considered.



Project/ design

At this stage, taking into account the demand studies, the route and stops along the chosen system(s), the necessary rolling stock, quantity, frequency of service, necessary technological solutions and user services to be offered by the customer must be considered.

This includes developing the terms of reference or tender specifications to be prepared for the project tender, the system for evaluating the offers submitted and the awarding of the contract.



Implementation/ realisation

When the project is implemented, it is crucial that it is carried out exactly as described in the plan. TMB will ensure that each party involved acts in accordance with the customer's vision and that the project is faithfully executed on the ground.



Operation/ functioning

Once the project is complete, it enters the "**Operation or functioning**" phase, in which the transport service must be delivered in compliance with the quality, safety and environmental standards, and satisfy the expectations of the users and society.

2.3 Adapting to different roles

TMB can play different roles, depending on which approach is the most suitable for the customer, depending on the phase and system in which they need our services.



Advisory role

The customer wants to liaise with all the agents involved, so TMB will advise the customer at all times on possible options or scenarios so that it is the customer who makes the decisions and moves the project forward.



Supervisory role

The customer needs TMB to be more involved, whereby certain actions of the supplier are monitored and validated on their behalf, and accounted for according to an agreed schedule.



Developer role

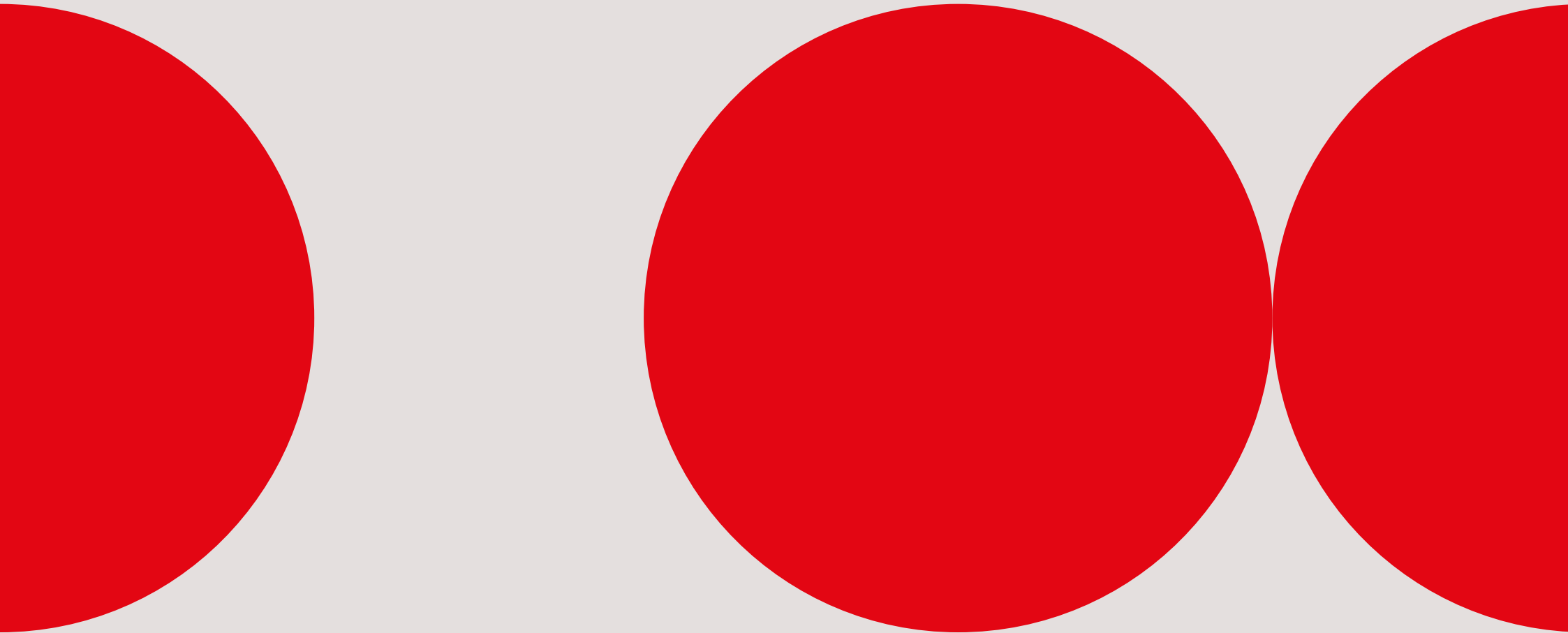
The customer needs TMB to draw up all the specifications or requirements that meet their needs, so TMB is directly responsible for defining these.



Management role

The customer already has the project drawn up and needs TMB, given its experience as an operator, to implement and manage the system for as long as the customer deems necessary.

3. Some of our projects



3.1 Operation

Performance of the management, operation and maintenance of mass transport networks, both above and below ground.

Project Name/	Location	Customer Name	Start	End	Description of the Project:
Metro de Barcelona operation	Barcelona, Spain	ATM (Autoridad de Transporte Metropolitano de Barcelona)	1924	Current	5 conventional lines
Metro de Barcelona operation	Barcelona, Spain	ATM (Autoridad de Transporte Metropolitano de Barcelona)	2009	Current	3 automatic lines
Bus de Barcelona operation	Barcelona, Spain	ATM (Autoridad de Transporte Metropolitano de Barcelona)	1922	Current	More than 1,100 buses and 2,600 stops.
OyM Buses Perpignan	Perpignan, France	Agglo Perpignan	2011	2022	Perpignan metropolitan area bus operation, 250,000 inhabitants
OyM buses Beziers	Beziers, France	Communauté d'Agglomération Beziers	2019	2028	Operation Bus: Urban public passenger transport and construction of a bus depot, renewal of the gas fleet
OyM buses Antibes	Antibes, France	Agglo Antibes	2015	2019	Urban transport Antibes area, 30 lines, school transport, T-on-D



3.1 Operation



Metro operation in Barcelona and its Metropolitan Area

As the Metro de Barcelona operator, TMB maintains high-quality self-imposed standards to ensure excellent service. Metro de Barcelona's goal for 2025 is to provide a better offer in the best possible conditions. To this end, the following improvements are envisaged:

- Commissioning of the central section of Line 9/10
- Extension of L1 in Badalona with 2 new stations
- Extension of L3 in Esplugues de Llobregat with 2 new stations
- Extension of L4 in Barcelona with 3 new stations
- Incorporation of 96 new trains for network extensions, as well as improved frequencies, technological innovations and better user information.
- 100% of stations and interchanges accessible



Public Transport Antibes France 2015-2019

The consortium comprising TMB and Vectalia (a group of transport and services companies based in Alicante) won the tender to operate urban and school bus transport in the urban area of Antibes. The network to be managed is made up of 30 urban lines and 58 school transport lines, as well as an on-demand service.



3.1 Operation



Bus operation in the Perpignan metropolitan area

TMB, together with Vectalia, was responsible for operating urban transport in the metropolitan area of Perpignan for a ten-year period.

TMB's contribution to the group that was assigned the contract was essentially its experience as the operator of a large intermodal transport network and its knowledge in the following specific areas:

- Analysis and definition of the necessary infrastructure —stops, traffic light priority, accessibility— to operate a transport network.
- Analysis and definition of rolling stock needs and the workshops to maintain this.
- Definition of the basic elements in the operation, high-level service lines, training content for operational staff, selection, etc.
- Definition and development of the marketing policy, passenger information and communication, surveys at origin/destination, data analysis and use, etc.



Public transport Béziers community

The public transport network in this urban area in the south of France, including 60 vehicles, serves 125,000 inhabitants. The contract began on 1 January 2019 and is expected to run for 10 years.

During the tendering process, in which major European companies participated, the Vectalia/TMB proposal stood out because of its innovative approach to public transport:

- Commitment to the energy transition, including the purchase of 33 natural gas buses, based on TMB's experience of operating in a large city with more than 400 vehicles that run on this fuel.
- Creation of a new commercial image involving a change of visual identity and the implementation of new information and customer service systems, such as a new commercial office in the city centre, a new travel information point, a new website, an online shop and a mobile application with the possibility of validating tickets by phone.
- A new financial strategy based on a new range of prices to boost customer loyalty: a fare review exercise aimed at increasing customer loyalty, with a special focus on the most disadvantaged social groups with adapted fares.

3.1 Operation



Bus operation in Barcelona and the Metropolitan Area

TMB has been the main operator of the Barcelona bus network for more than 100 years, constantly evolving to remain at the forefront of the sector. The following improvements are planned for the near future:

- Extension of the on-demand bus on 20 local lines serving 50 neighbourhoods
- Improved bus network efficiency: achieving a 10% increase in commercial speed on the main lines and routes affecting 85% of customers, by implementing improvements such as traffic light priority, creating more bus lanes, upgraded roads, and so on
- Last-mile bus pilot project with an autonomous vehicle in the Zona Franca industrial area
- Incorporation of 508 new clean technology buses, 233 of which will be electric and 46 hydrogen buses
- Commitment to green hydrogen, driving the construction and commissioning of a hydrogen plant open to public use in the Zona Franca area
- New green depot in Zona Franca, for 550 vehicles, digitalising management and operations, energy efficiency and the use of renewable energies



3.2 Shadow operation

Comprehensive support throughout the process, from the conceptualisation of the system and definition of technical, organisational and operational specifications, development of the operating model and associated plans, recruitment and training to the implementation or supervision of system testing and dry runs.

Project Name/	Location	Customer Name	Start	End	Description of the Project
Project management services and technical support for operating L1 in the Panama Metro system	Panama City, Panama	Panama Metro	2010	2014	Start-up and subsequent operation of line 1 in the Panama Metro system.
Project management services and technical support for operating L2 in the Panama Metro system	Panama City, Panama	Panama Metro	2014	2019	Start-up and subsequent operation of line 2 in the Panama Metro system.
Technical support in the design of the Dublin Metro extension	Dublin, Ireland TII	TII (Transport Infrastructure Ireland)	2017	2018	Technical support operator vision
Mecca Bus	Mecca	Modern Bus Company Limited	2017	2027	Advising on procurement, operation and maintenance services for the Mecca Public Transport Programme.
Auckland Metro	New Zealand	KiwiRail	2020	2020	Control centre design integrating metro and train operators



3.3 Operation and maintenance advisory services

Consultancy services specialising in the operation and maintenance of mass transport networks, both above and below ground.

Project Name/	Location	Customer Name	Start	End	Description of the Project
Porto Metro	Porto, Portugal	Metro do Porto-Ensitrans - SENER	2008	2009	Technical support
Supervision and control of L1 Seville Metro operations	Seville, Spain	Agencia Obra Pública Junta Andalucía	2009	2012	Technical support for operating the 18 km and 22 stations of the Seville Metro
Technical Support for managing the Zaragoza Tram	Zaragoza, Spain	Zaragoza City Hall - Tranvía Zaragoza	2011	2025	Control and supervision of the Zaragoza tram operations involving 25 stops and 12 km
Sustainable urban transport in Greater Dhaka (Bangladesh)	Greater Dhaka (Bangladesh)	Bangladesh Government - ALG, S.A.U.	2012	2016	Development of a sustainable surface transport system
SITP Cuenca	Cuenca (Ecuador)	Municipal Autonomous Decentralised Government of Cuenca	2013	2014	Integrated fare system for mass public transport in the canton of Cuenca
Astana BRT	Astana (Kazakhstan)		2014	2014	Technical consulting for the BRT Bus master plan
Consultancy services for Lines 3 and 6 of the Santiago de Chile metro system	Santiago de Chile	Metro de Santiago	2014	2016	Specialised advice on the design and operational implementation of the automatic lines
Metro L1 Quito.	Quito	Metro Quito - Deloitte	2018	2019	Financial, economic and technical design of the first line in the Quito Metro
Lima 2 Metro	Lima	Metro de Lima Línea 2, S.A.	2019	2021	Definition of operational plans
SPTTrans. Bus Operational and Control Centre	Sao Paulo	The World Bank	2020	2021	Technical advice on the SPTTrans Common Operational Picture (COP) to integrate various modes of transport

3.3 Operation and maintenance advisory services



Definition of operation plans for the Lima L2 Metro (automatic line)

Line 2 of the Lima Metro is the first automatic line in the Andean country, with a route of more than 27 kilometres underground and 27 stations.

In 2021, TMB completed the following Operating plans:

- Operational Contingency Plan: this describes how to deal with the most common service contingencies (failure of the electrical supply, lack of communication, evacuations, etc.)
- Special Contingency Plan: this addresses situations such as seismic risk, tsunami and fire.
- Strategic Operating Plan: sets out the strategy for automatic line operations in the medium term.
- Annual Operating Plan: this describes the annual plan of operation with the objectives for each year.
- Service Provision Plan: includes timetables, intervals, work shifts, etc.
- Operating Regulations: this defines the regulations for operating the line
- Cleaning Plan: designed for an automatic line and its special features



3.3 Operation and maintenance advisory services



Advisory services for Line 3 and Line 6 of the Santiago de Chile Metro (Automatic Lines)

In 2014, TMB provided specialist advisory services for the design and implementation of automatic lines 6 and 3 in the Santiago Metro system.

The topics to be developed included:

- Organisational strategy that facilitates the aligned development of a personnel structure to operate the lines.
- Organisation of human resources for lines 3 and 6 including the control centre and its functions in nominal, degraded and emergency mode operation.

- Revision of the operational planning developed by Metro de Santiago.
- Operational lessons learned applicable to the detailed design of systems, trains and equipment.



3.3 Operation and maintenance advisory services



Technical support for operating the 18 km and 22 stations of the Seville Metro

TMB provided technical support to the Junta de Andalucía in terms of operational control of the city's first metro line. Line 1 is a metropolitan railway with light rail characteristics. Its 18-kilometre-long route is 60% underground, with some sections running on the surface, utilising exclusive or segregated platforms, with a total of 22 stations.

The construction works were carried out in two phases: the first involved the collection and analysis of data to redesign the operational project and the second involved the control and supervision of the project.



3.4 Definition of technical specifications: line operation, purchase of trains, buses

Advisory services and preparation of requirements, conditions, clauses and other technical and financial elements related to the acquisition of goods or services.



Support related to the tender documents for renewing the operator in City of Buenos Aires

SBASE is a state-owned company belonging to the Government of the City of Buenos Aires, which owns the entire underground network in Buenos Aires and is responsible for its operation. If a concession is granted, it is the controlling body and also plans and executes any network extension work.

In 2017, SBASE contracted TMB for technical assistance with the tendering process to award the concession for the operation and

maintenance of the metro in a national and international public bidding process.

TMB was involved in defining the tender strategy, proposing, specifying and agreeing the parameters for evaluating the bids, promoting competition and proposing clauses to ensure safe operation, as well as supervising the financial aspects.

Subsequently, TMB advised on the analysis of the bids received.



3.5 Oversight of train and bus design and construction

Monitoring and inspection of the manufacturing process, testing of systems in the factory and at the customer's premises to ensure functionality and quality.

Project Name/	Location	Customer Name	Start	End	Description of the Project
Oran Tram	Orán, Algeria	EMA	2008	2011	Rolling stock supervision
Algiers Metro	Algiers, Algeria	EMA	2010	2016	Rolling stock supervision
Expansion of Rolling Stock Panama Metro L1 and L2	Panama City, Panama	Panama Metro	2016	2020	Expansion 175 train carriages L1 and L2
Expansion of Infrastructure and Rolling stock Lima Metro L1	Lima, Peru	OSITRAN	2017	2019	Expansion of depots and rolling stock (120 carriages)



3.5 Oversight of train and bus design and construction



Expansion of 175 train carriages for Panama Metro Lines 1 and 2

The manufacturing follow-up of the Alstom Metropolis 9000 series trains was carried out to expand the fleet of line 1 from three carriages to five, and to supply all the rolling stock for line 2.

The shipment, transport and reception at the workshops in Panama were also monitored.

Finally, commissioning and certification tests were carried out to ensure the commercial service could be provided.



Rolling Stock Manufacturing and Commissioning Supervision Algiers Metro

The assembly process of the trams for the Algiers metro was monitored, and the quality of the process was verified.

The project included reception and validation tests in Algiers for the subsequent start-up.



Expansion of Infrastructure and Rolling stock Lima Metro L1

From 2017 to 2019, TMB supervised the construction of Alstom trains for the Lima Metro. The manufacturing supervision of the rolling stock to boost the fleet on Lima Metro's Line 1 was part of a more global project to expand the infrastructure and rolling stock for Lima Metro Line 1. TMB exclusively supervised the manufacture of the 20 additional trains comprising 6 carriages each. The main tasks can be summarised in three phases:

- Phase 1 Factory inspection and testing
- Phase 2 Inspection and testing in Lima
- Phase 3 Guarantee follow-up

To do this, TMB sent its own staff to the builder's factory and to the Lima Metro facilities.

3.6 Start-up advice services

Technical support in various fields for the start-up and initial supervision of operations in various railway systems.

This technical support work includes, among other things, the reception of rolling stock; dynamic tests with the fleet of mobile units in all test phases (from the earliest to dry runs); the preparation of the standards, regulations and certifications required for the entry into service of a collective public transport system; the training of personnel involved in the operation of the system, and so on.



Start-up and subsequent operation of the Panama Metro, lines 1 and 2

The Panamanian government set up the Secretaría de Metros de Panamá, with the status of a ministry, to initiate the construction of the first metro line in Panama City. TMB's responsibilities within the consortium:

To supervise and prepare the new line's operations

- Recruitment of operational and middle management staff
- Training of all operational staff (train drivers, control centre, middle management, operations and maintenance managers, etc.)

To supervise, from the operator's perspective, of construction site projects.

To ensure the quality of rolling stock delivered to Panama Metro.

- Monitoring of production in the factory
- Reception and start-up of trains in Panama
- Validation tests

Preparation and management of facilities, processes and people.



3.7 Transport planning

Technical advisory services for planning and optimisation projects for public transport, unimodal or multimodal, for various areas and cities, from a strategic perspective.



Conceptual design for the automation of the second metro line in Yekaterinburg, Russia.

Between 2012 and 2013, TMB undertook the conceptual design for line 2 of the Yekaterinburg metro together with the local institute Uralgiprotrans. **The work included, among other things:**

- Defining operational organisation
- Defining the high-level functional requirements for the line automation systems, such as the relationship between the various technical subsystems that are part of Line 2 (including the rolling stock and Control Centre)
- Developing a preliminary proposal for the track system of the line
- Studying the automation of Line 2 from the standpoint of cost efficiency compared to a traditional metro line
- Assessing the impact of automation on repair and maintenance management
- Developing general criteria that apply to emergency situations in a number of areas affected by line automation, such as station evacuation in case of fire, station ventilation, and tunnel evacuation.

3.7 Transport planning



Support for the SPTrans Operations and Control Centre (COP; São Paulo Municipal Bus Authority), Brazil.

In this project, carried out between 2020 and 2021 and promoted by the World Bank, we collaborated with the Sao Paulo authorities to plan their bus control centre, with the goal of promoting the design of a geo-referenced information system for mobility and its subsequent integration with other systems, both existing and future.

On the other hand, the project identified the components to be considered in a future planning system and drew up recommendations focused on integrating the Metropolitan Region's operations centres to implement the Mobility as a service (MaaS)

concept. The objective of this project was to develop a knowledge base, and define solutions and policy alternatives in relation to digitalisation and innovations applied to Operational Control Centres (OCCs) and Operational Management and Monitoring Systems (OMMSs), the incorporation of MaaS into these systems, and strategies for integrating big data and machine learning into transport planning and operations.

The project consortium also included Eurecat, MCrit and Concremat.



3.8 Implementation of accessibility systems

Drafting and implementation of projects to improve accessibility and inclusion in the field of public transport, whether unimodal or multimodal, in different areas and cities around the world.



Implementation of the NaviLens® system in various cities around the world

In addition to its deployment throughout Barcelona's public transport network, TMB has collaborated in rolling out the smart tag accessibility system in a number of cities both nationally and internationally. In the images, the NaviLens® system in the Bilbao metro and the Los Angeles metro.



3.9 Technical advisory services related to tram systems

Throughout its history, TMB has provided technical support services, with varying degrees of involvement in the planning, start-up and operation of trams in numerous cities.



Zaragoza Tram

Since 2010, together with the engineering firm Ayesa, TMB has been providing technical support for the operation of the Zaragoza tram line, which has included, among other things, quality monitoring, start-up, operational support and management control.

The line is 12.8 kilometres long and crosses the city from the south to the north, passing through the centre and the old quarter of the Aragonese capital. It links densely populated neighbourhoods such as Romareda and Actur and districts including Valdespartera and Parque Goya.



Oran Tram

For the first line of the Oran tramway, TMB, as part of the ENSITRANS consortium (comprising Metro de Lisboa, TMB, Sener and Fernoconsult), helped the owner, EMA, between 2011 and 2016 to review the rolling stock project and supervise the manufacture of 30 trams for the city's first tramway line.

TMB was responsible for monitoring production in the factory, reception in Oran and start-up, as well as certifying the reception of the rolling stock for start-up and monitoring the guarantee period.

