



**DRIVING**

**OPERATIONAL**

**EFFICIENCY**

**EVERY**

**DAY**



Keolis

Moving further together



**140km**  
of lines of  
driverless  
metros

**1983**  
First driverless  
metro in Lille

**10**  
driverless  
metro lines

**330m.**  
driverless metro  
passengers in 2016

Keolis is a pioneer and world leader in driverless metro operations and maintenance.

We launched the world's first driverless metro in Lille in 1983 and since then have built on our expertise to launch, operate and maintain several metro systems around the world. Today we operate and maintain 10 driverless metro lines totalling 140km of lines and we are mobilising on a further 91km in two cities.



# WORLD LEADERS IN DRIVERLESS METRO OPERATIONS



**METROS IN OPERATION**



**METROS IN MOBILISATION**



**CONSULTING SERVICES**



## METROS IN OPERATION

1

### LONDON, UK

Over 99% operational performance achieved for the Docklands Light Railway (DLR) system since Keolis took over in December 2014. **120 million passengers p.a., 45 stations, 40km of CBTC.**

2

### RENNES, France

One of the most innovative driverless metro operations with 99.99% punctuality & regularity outcomes, and power consumption savings of 12% thanks to timetable optimisation. Second line in mobilisation (12.5km). **15 stations, 9km of driverless metro.**

3

### LYON, France

Smooth integration of the metro into the transport network. 4 metro lines (1 driverless and 2 moving towards driverless) that take 50% of the overall passenger flow, **200 million passengers p.a., 44 stations, 32km of lines.**

4

### LILLE, France

The first driverless metro in the world (1983). High frequency with 66-second intervals at peak times to maximise capacity. **150 million passengers p.a., 60 stations, 44km of lines.**

## METROS IN MOBILISATION

5

### HYDERABAD, India

Early operator involvement during design and construction. Upon completion this system will be 72km long. CBTC metro with expected patronage of 1.5 million per day.

6

### SHANGHAI, China

Launch of the driverless line 8.3 with partner Shanghai Shentong Metro Group. The first driverless metro in Shanghai.

## CONSULTING SERVICES

7

### PARIS, France

Driverless GoA4 metro expertise and consultancy services for the Grand Paris Express, a network of four new metro lines that will be built across Paris. The new network is scheduled to open in stages during 2023.

# KEOLIS' VALUE PROPOSITION

## OPERATIONAL EFFICIENCY AND ZERO HARM APPROACH

Our industrial approach is based on a set of robust processes, methods and best practices that have been tested, proven and are shared between all the networks we operate to drive continuous improvement. Keolis constantly strives **to provide excellent transport services and optimal safety** for our passengers and employees. Our portfolio of metro, heavy rail, light rail and bus networks deliver key performance objectives based on local requirements. Our **Excellence Centre for Metro** provides leadership, worldwide best practices and engineering services at each step of a metro project: design, implementation, testing and commissioning of trial runs, operations and maintenance and capacity enhancement.



## THINKING LIKE A PASSENGER

Services are shaped by transport organisations and authorities, and also by individual passenger choices and expectations. Keolis embraces this customer culture, prompting our unique 'Thinking Like a Passenger' approach. By 'Thinking Like a Passenger', we aim to provide a **personalised travel experience for each of the 3 billion** people that we transport annually, structuring our service around three key pillars: collective design, smart choices and a richer travel experience.

## INNOVATION

Keolis believes that innovation helps enhance a city's attractiveness and contributes to 'Smart City' policies. The Group supports elected representatives in their **drive to use digital technologies to make cities better places to live**, enhancing inhabitants' comfort and fostering economic development.

Through its "connected mobility" approach, Keolis uses technology to:

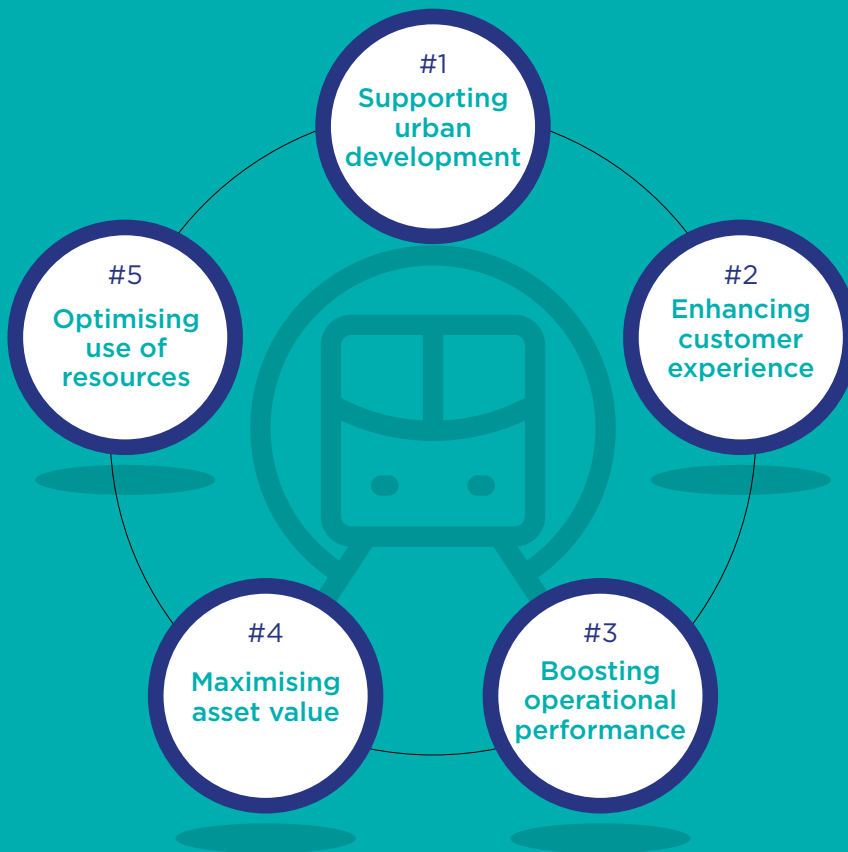
- **Simplify citizens' daily lives** by devising and deploying new services and mobility solutions to meet passengers' ever-growing demands for ultra-personalised solutions
- **Improve asset performance** and predictive maintenance with connected infrastructure
- **Increase efficiency** and simplify operating processes with connected employees
- **Develop and integrate new mobility modes** in the public transport offer.

# FIVE PILLARS OF EXCELLENCE



Our value creation metro scorecard ensures that **we achieve daily operational excellence by enhancing performance, customer experience and economic efficiency.** Thanks to the scorecard we can actively maintain long-term commitments by helping authorities choose the most sustainable, localised choice to develop and improve their networks.

The scorecard is divided into five pillars. Each pillar reflects our approach at different stages of a metro's life cycle from its launch to its modernisation or extension.





PILLAR #1

# SUPPORTING URBAN DEVELOPMENT

KEOLIS HAS A PROVEN TRACK RECORD OF SUCCESSFULLY MANAGING METRO LAUNCHES, MODERNISATIONS, AUTOMATIONS AND LINE EXTENSIONS. WE ARE COMMITTED TO WORKING IN PARTNERSHIP WITH AUTHORITIES TO IDENTIFY OPPORTUNITIES FOR NETWORK DEVELOPMENT AND IMPLEMENT MODERNISATION PROGRAMMES THAT ARE ROBUST, ACHIEVABLE AND SUSTAINABLE.



## BUILDING THE FOUNDATIONS FOR SUCCESSFUL NEW-BUILD PROJECTS

Creating a new metro system from the ground up is challenging for any city. It involves a complex process requiring story project management and relevant stakeholders to be kept well-informed and involved at every stage. We provide expertise from the earliest stages of a project, drawn from a bank of proven experience. Our priorities when reviewing the design of metro systems are to ensure that:

- **passenger expectations and needs are met**
- **the operator's view is fully taken into account**
- **seamless integration is achieved** with existing infrastructure and transport networks.





## MOVING SMOOTHLY TOWARD DRIVERLESS OPERATIONS

One of the main benefits of driverless systems is the ability to adapt the transport offer to local needs and to increase passenger numbers (providing the right number of trains, adapting timetables, etc.).

The move towards driverless systems reduces round-trip times, which means the system will require fewer trains for a given frequency, potentially achieving up to 8% in rolling stock savings. As a pioneer in driverless metro systems we have acquired considerable expertise in fine-tuning times for stations, managing turn-backs in a more efficient way and optimising running times to get the best value out of driverless metros.

## CREATING EFFICIENT AND INTEGRATED NETWORKS

At Keolis we believe that integrated transport services are essential to providing seamless connected journeys for our passengers. The metro is often the backbone of an integrated network, which can also include buses, trams, bikes, park and ride facilities and even new modes of transport such as autonomous vehicles.

Keolis collaborates proactively with other operators to ensure we provide an integrated journey for all passengers. We understand the complex nature of operating different transport modes and offer our unique expertise to optimise their integration.

### CASE STUDY

#### Hyderabad: €15m savings thanks to design review

The concessionaire for the Hyderabad Metro, Larsen & Toubro, involved Keolis in the early design stage to obtain our operational view on the metro system and to optimise life cycle costs. As a result, we identified the potential for significant efficiency improvements. By reviewing the alignment, depot and station designs, we were able to propose more than €15 million in savings, in both investments and operational costs. We also proposed measures that will **reduce station transit time by 10%**, such as signage improvements and the segmentation of entry and exit flows. These are just some of the key measures to enhance the passenger experience for millions of commuters every day.

#### Automation to increase capacity

Keolis is currently working in partnership with the Lyon Transport Authority on the GoA4 full automation of 2 conventional metro lines. Our key challenge is to ensure the seamless transition of the existing system in a high traffic environment with minimum impact on passengers.

To **guide design choices and provide the operator view** on systems design, we have involved our best systems experts. We are also strongly involved in defining testing and commissioning scenarios.

To **minimise the impact of network upgrades on operations** our strategic planning teams play a key role in making sure that works do not affect normal train operations and that we minimise the impact on the customer experience.

From a **competency management** perspective we anticipate changing needs and build consistent transition programmes. With the two metro lines in Lyon currently transitioning to become automated, we have already anticipated career paths for the 50 existing drivers, some of whom are moving towards more customer-focused roles.

**10 lines**  
of driverless operations

**4 lines**  
in mobilisation

**3 lines**  
in capacity enhancement

## PILLAR #2

# ENHANCING CUSTOMER EXPERIENCE

**METRO CUSTOMERS EXPECT A SEAMLESS JOURNEY, AS WELL AS COMFORT AND HIGH-QUALITY FACILITIES. WE PROVIDE THESE BY INTEGRATING OUR 'THINKING LIKE A PASSENGER' CULTURE INTO METRO OPERATIONS TO ENSURE THAT WE ALWAYS DELIVER A POSITIVE CUSTOMER EXPERIENCE AND REMAIN THE TRANSPORT SERVICE OF CHOICE.**

## COLLECTIVE DESIGN

At Keolis we believe in creating mobility together. Our on-the-ground observations of transport habits and developments allow us to cater our services to local needs and expectations. We interact with passengers in real-time throughout their journeys to ensure 'mobile wellbeing' for everyone, every day. In doing so, we promote a participative innovation process in which our employees, passengers and public transport authorities work together to co-construct future transport solutions.

## SMART CHOICES

Keolis recognises that each and every passenger is unique. We create intelligent, efficient and integrated multimodal transport solutions to suit each individual. Through our mastering of the entire service chain and synergy between customer-facing staff and the use of digital tools we provide a fulfilling passenger experience at every stage of the journey.



**925 m.**  
metro passengers  
expected by 2020



## RICHER EXPERIENCE

By combining operational excellence and customer service expertise, we provide a service that passengers can trust in which every journey is worry-free. This is done through:

- **passenger-focused timetables** and by regularly reviewing our train schedules so that our service provides passengers with the quickest and most convenient journey time
- **easily accessible travel** information and rapid online ticket purchase
- **available ticketing facilities**, gates, lifts, escalators and information panels to increase convenience
- **reliable train services**, dynamic capacity adjustments, and effective crowd management plans to actively minimise overcrowding and delays and efficiently manage disruptions.

**1.5 m.** fans shuttled by Keolis to and from stadiums during UEFA EURO 2016



### CASE STUDY

#### Connecting with passengers

'Empty desk' initiatives are organised on a quarterly basis in Lyon, France, where administrative and support staff visit the field for a day to listen and speak with passengers on their journeys. These initiatives help employees stay in touch with passenger needs.

#### Highest customer satisfaction rate ever

Keolis is the operator of the Docklands Light Railway (DLR) metro in London, the only UK metro network run by a private operator. Keolis started operating DLR in December 2014. Since then we have exceeded contract objectives in terms of punctuality, quality of service and customer satisfaction. Service delivery has been consistently above 99% for the first two years of Keolis operation. And customer satisfaction has reached new heights achieving a year end average of 89, the highest level in DLR's history. In 2016, over 120 million passengers travelled on the network, an average of more than 380,000 every weekday.

### FOCUS ON

#### Digital commuters

Kisio Digital, Keolis' digital factory, has developed PlanBookTicket, an integrated app that public transport authorities can use to help passengers at each stage of their journey. PlanBookTicket includes a journey planner that integrates all transport modes, real-time information, purchasing of tickets and m-ticketing services.

## PILLAR #3

# BOOSTING OPERATIONAL PERFORMANCE

OUR INTERNATIONAL METRO SYSTEMS DELIVER SAFE, PUNCTUAL AND RELIABLE SERVICES ON A REGULAR BASIS AND WE ADAPT THESE TO MANAGE LARGE PASSENGER FLOWS FOR MAJOR EVENTS SUCH AS UEFA EURO 2016.



## SAFE AND SMOOTH PASSENGER FLOWS

We keep passenger flows moving at all times to ensure maximum safety by providing:

- **visible front-line staff** at the most crowded points of the network to guide passengers and minimise congestion between entry and exit flows
- **real-time communication** with passengers via their electronic devices to guide and simplify their journey
- **critical station equipment** that is always available and functioning, including ticketing facilities, gates, lifts and escalators to minimise queues
- **dynamic adjustment of metro capacity** with extra trains scheduled via centralised monitoring of passenger flows using CCTV and sensors
- **effective crowd management plans** for special events in each city.

## EFFECTIVE AND RAPID RESPONSE TO INCIDENTS

Almost nothing can affect customer satisfaction more than service disruption. This is why, if an incident does occur, we restore services rapidly and effectively to reduce the impact on passenger journeys. We do this thanks to:

- **resilient timetables**
- **robust incident response procedures**
- **integrated operations and maintenance**
- **skilled incident response teams for serious disruptions**
- **alternative solutions that we can adopt in the event of disruptions.**





## MAXIMISING SYSTEM POTENTIAL WITHOUT UNDERMINING SAFETY

As global leaders in driverless metro operations, we seek and develop expertise that will keep us at the forefront of highly functional metro systems. Our 'Zero Harm' business culture provides optimum safety for both passengers and staff. We provide technical expertise in handling critical points on the metro line. At the same time, we maximise line capacity, optimise vehicle commercial speed and make the most of Automatic Train Supervision systems.

**99.99%**  
punctuality and regularity outcomes on Rennes metro

**Zero**  
fatalities on all our metro operations since the 1983 Lille metro launch



### CASE STUDY

#### Digital solutions to assist match-goers during UEFA EURO 2016

In addition to the extra services scheduled to transport over 20,000 passengers each match day during UEFA EURO 2016, Transpole (Keolis' subsidiary in Lille, France), launched a specialised app designed to help supporters find their way around, plan their journeys and access real-time traffic information.

The tournament also gave Transpole the opportunity to innovate. In a world first, near-field-communication (NFC) technology in an electronic bracelet enabled fans to validate their transport ticket at the flick of a wrist. 5,000 of these rechargeable bracelets were distributed during the event, each containing a 'day pass'.

### FOCUS ON

#### Keolis' safety culture

Keolis has not experienced a single major safety incident on any of its metro systems in 36 years. We use strict safety standards driven by our international operations experience. As part of our business commitment to continuous improvement, we train our employees regularly to maintain a high level of professionalism. Our employees receive on average a combined total of 75,000 hours of training every year.

## PILLAR #4

# MAXIMISING ASSET VALUE

METRO SYSTEMS ARE CAPITAL INTENSIVE AND HAVE LIFE CYCLES OF 40 YEARS OR MORE. PROLONGING THE LIFE CYCLES OF THESE ASSETS IS A KEY CONTRIBUTOR TO SUCCESS. KEOLIS HAS DEVELOPED LONG-TERM ASSET STRATEGIES AND DELIVERED ASSET IMPROVEMENT PROGRAMMES THAT HAVE SUCCESSFULLY REVIVED AGEING METRO INFRASTRUCTURE.



## ENHANCING RELIABILITY

Keolis has extensive expertise in monitoring the condition of assets and developing **maintenance regimes focused on reliability**. We adapt the frequency and type of maintenance throughout the life cycle of critical assets to achieve high levels of reliability and service availability. Concise information about the condition of assets is essential. We use remote monitoring to automatically collect and analyse data from sensors installed on fixed and rolling assets to predict failures accurately and determine an appropriate response. These innovations allow us to analyse whether degradation is faster or slower than anticipated, and to adapt our maintenance regimes accordingly.

€4.5bn  
of assets maintained  
in Lyon

385  
metro trains  
maintained by Keolis

## IMPLEMENTING RELIABILITY IMPROVEMENT PROGRAMMES

Together with public transport authorities, we are responsible for ensuring the long-term sustainability of metro networks. For metros that have an ageing asset base, reliability improvement programmes are often required. This is particularly true for heavy assets with long life cycles, such as rolling stock or track equipment. We have acquired a wealth of experience in developing and implementing programmes to maintain large-scale improvements and extend life cycles.

## MINIMISING LIFE CYCLE COSTS

Increasing the life cycle of assets can make a substantial difference to both investments and operational expenditures. At Keolis we run simulations of possible scenarios to determine which option provides the most cost-effective solution for maintaining an asset, be it rehabilitation, overhaul or replacement. When developing these programmes together with transport authorities, our priorities are to make sure:

- **assets are replaced at the optimal time**
- **investments are suitably prioritised and spread over time**
- **transport authorities receive greater visibility** on their capital investments
- **performance continues to improve.**

### CASE STUDY

#### Lyon metro gets 15-year life cycle extension

Lyon's 32 trains on metro lines A and B will reach their design life cycle by 2018. Lyon's PTA asked Keolis to analyse whether life cycle extension or retirement was the best solution. After running simulations to predict the implications of deferring rolling stock renewal in terms of cost, risk and line performance, we determined that extending the life of the rolling stock would **save Lyon taxpayers nearly \$500 million over the next 15 years.**

#### Programme results exceed targets

The driverless metro line D in Lyon, France has seen rapid patronage growth with passenger journeys doubling in 15 months. Today the line carries up to 300,000 passengers a day with services at 97% capacity during peaks. Increasing demand during peaks, combined with an ageing 30-year-old line, led to a series of repeated rolling stock and signalling failures that reduced line availability by 2.5% in 2013. To address this issue, we implemented a reliability improvement programme over a 9-month period. As a result, line performance increased to 98.8%, exceeding the 98% target.

#### Bionic eyes in Boston

Keolis launched a unique experiment in Boston, providing its maintenance technicians with virtual reality glasses. Equipped workers can transfer live videos and discuss issues with experts in real time. The result is faster repairs and improved performance across the network.





PILLAR #5

# OPTIMISING USE OF RESOURCES

**KEOLIS PUSHES FOR CONTINUOUS GROWTH IN PRODUCTIVITY AND EFFICIENCY WHEN DELIVERING METRO SERVICES. WE DO THIS THROUGH OPTIMAL USE OF RESOURCES, BALANCING VALUE-FOR-MONEY OUTCOMES WITH PEOPLE-CENTRIC DECISIONS.**

## EMPLOYEE ENGAGEMENT

By making the best use of employees' potential, defining the best organisational structure and outsourcing as required, we create and nurture a culture of empowerment. At all levels of our organisation **accountability, ownership, commitment and support** are the key principles we instil in our employees.

Our comprehensive training and development programmes are a major focus at Keolis, ensuring that we maintain competent, confident and well-motivated employees. We provide the tools and knowledge to ensure that they are in the right place at the right time and are able to carry out their roles with minimum supervision. We hire and train experienced top-level managers who know how to motivate staff and provide clear objectives.

On all our networks, we create flexible organisations able to meet operational requirements, performance targets and expected response times. We outsource when it is an appropriate solution and introduce flexible working hours as required. These measures ensure we meet the needs of our employees while remaining able to adapt to changing passenger flows, peak times and special events.

## COLLABORATIVE INNOVATION

Strong partnerships with transport authorities are a Keolis trademark. Together, we identify opportunities for service improvement and cost reductions with minimal impact on passenger service. We work closely with key industry players and take advantage of improvements in railway and remote control technology to introduce cost-effective innovations.

## SUSTAINABLE TRANSPORT

A core objective at Keolis is to deliver eco-friendly business solutions. We have created a team dedicated to finding ways to reduce energy consumption, such as regenerative braking and designing depots and stations to minimise power consumption.



**195,000 hours** of initial training provided in Hyderabad for 486 employees

**+24%** capacity in Lyon metro through system and timetable optimisation

**12%** energy savings in Rennes



## IMPROVED USE OF ROLLING STOCK

Exploiting the full potential of rolling stock is crucial to generating savings. For 35 years Keolis has been optimising the use of existing fleets, thereby enabling transport authorities to extend trains' life cycles. We achieve this by:

- **continuously improving timetables and optimising commercial speeds** through a systematic analysis of running, dwell and turn-back times, patronage monitoring and forecasting
- operating short train formations during off-peaks, and coupling train units during peaks to **adapt capacity and ensure best value for money**
- designing maintenance organisations so that **a maximum number of trains are available during peaks**
- developing effective coordination between operations and maintenance to **maximise train availability for revenue service.**

### CASE STUDY

#### Regular service trial with autonomous vehicles

Keolis is innovative and constantly monitoring market trends. We signed a partnership with Navya, a leader in driverless vehicles, in 2016 because autonomous vehicles are an integral part of the mobility mix. In September 2016 as part of this partnership, we launched the first trial of a public service in a large city (Lyon). Two autonomous shuttles service a 1.3km stretch of open road, and can accommodate up to 15 passengers.

#### Rennes cuts power consumption by 12%

Keolis has been operating the Rennes metro since 2002. The system includes 21 trains at a frequency of 100 seconds. Since 2012, Keolis has been working to optimise timetables to maximise energy recovery from braking. Tests have shown that varying timetables by a few seconds can significantly reduce power consumption. After introducing revised timetables, the Rennes metro has **reduced power consumption by an average of 12%.**

# THE KEOLIS EXCELLENCE CENTRE FOR METRO

The Keolis Excellence Centre for Metro is the Group central entity that provides leadership, worldwide best practices and engineering services in railway system design, implementation, testing & commissioning, operations & maintenance optimisation and capacity enhancement, for the Keolis metro projects and networks in operation.

This Excellence Centre is based in the city of Lyon, in France, where Keolis has been operating and maintaining the multimodal public transport network, including 4 metro lines, since 1977.

It has a team of 30 senior metro experts and rail project managers with professional knowledge and hands-on experience in the areas of:

- **metro design**
- **operations**
- **rolling-stock maintenance**
- **fixed infrastructure maintenance**  
(signaling, track, power supply)
- **CBTC and automation expertise**
- **asset management**
- **ticketing and fare collection**
- **performance management and modelling**
- **operation and maintenance costing.**

Keolis also has a dedicated training institute that provides

**400 hours**  
of initial training for new metro employees in Hyderabad and Shanghai



We develop dedicated training programmes to meet the requirements of metro systems and ensure knowledge transfer in our operations around the world.



**Keolis**  
Driving operational efficiency  
every day

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MEANINGS

METROS



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