



FEATURE ARTICLE

Sustainable mobility

longer asset service life

Signalling or switching problem on a metro, engine fault on a bus, overhead line failure on a commuter rail link — these are just some of the issues we regularly deal with on a public transport network. But beyond these routine problems caused by normal wear and tear, there's a more fundamental question about the service life of our transport infrastructure and how to optimally improve it. Against a backdrop of climate emergency and energy crisis, what are the wisest investments? Repair or replace? Refurbish or recycle? *Pulse* opens the black box of industrial asset management and unpacks the financial decisions that will help make the transportation of the future more resilient.

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“Asset management.” Behind the rather impersonal vocabulary, the question affects all stakeholders in the mobility value chain. First, passengers and transport workers, who personally suffer the fallout of any fault on their network. Then, the public transport authorities (PTAs), who are accountable to their users and must prepare the mobility of tomorrow by making the right investment decisions at lowest cost. Manufacturers, whose orderbooks depend directly on the investment choices by the PTAs. And transport operators, who maintain the networks and whose on-the-ground expertise is vital for helping PTAs with their investment decisions.

WHAT EXACTLY IS AN “ASSET”?

“Asset” is the accounting and financial term for rolling stock (literally, “movable assets”) and all infrastructure (real estate, etc.) that make up a transportation system. In the mobility sector, assets include the tracks of a rail network, a diesel bus, a tram, an information system or a metro station. In other words, all the infrastructure and all the vehicle fleets we need to deliver transport services.

AN OBSESSION: LONGER SERVICE LIFE

“Asset management aims to optimise the long-term operation of vehicles, equipment and infrastructure by guaranteeing their availability, safety and performance,” says Marie-Eve Decroocq, vice president, transportation consulting at CGI Business Consulting. An asset’s lifespan has three main phases. First, the acquisition phase, which is the asset’s “before” life. This includes its design and the R&D needed for its manufacture, but also the sourcing of materials, the tests performed to validate or further develop the first prototypes and its market launch and contract arrangements. The second phase is the asset’s service life, or “during” period, which is the phase all public transport users are familiar with. An asset’s service life includes everything needed for its operation for passenger service, but also its maintenance and any refurbishment or upgrades. Third, the “after”

phase is called “end of life”. The end of an asset’s life can be simply its dismantling (see *Pulse 8*). Increasingly, PTAs and operators are looking to extend the service life of their assets, or repurpose them for new uses — for reasons of both economic and environmental sustainability.



SQUARING AVAILABILITY, COSTS AND SAFETY

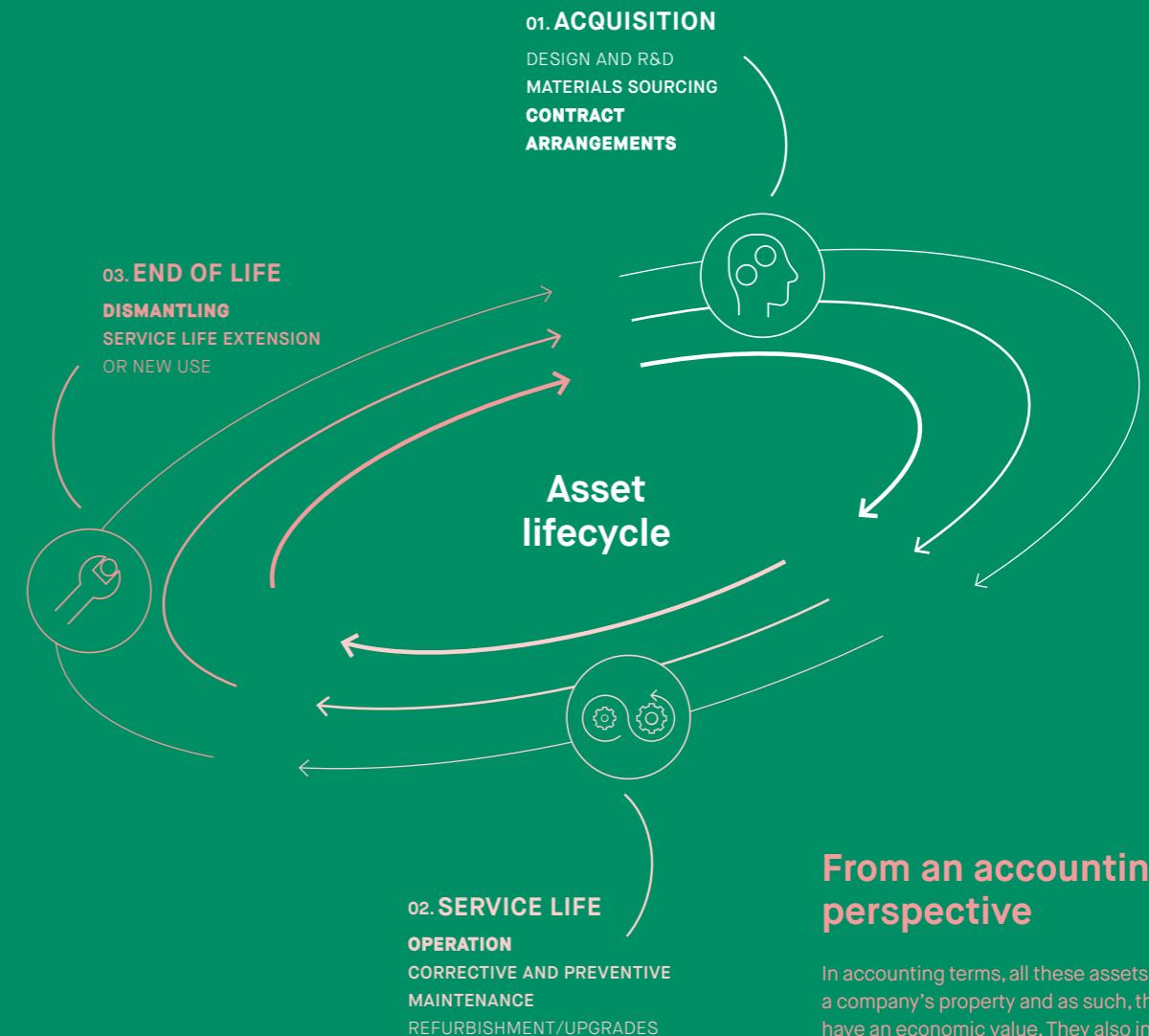
For PTAs, managing the ageing state of a transport infrastructure is a high-stakes task. Faced with growing urbanisation, traffic congestion, ever greater demand for transport in terms of quantity and quality (greener, safer, etc.), what’s the best way forward? What’s the right investment decision that will not only ensure continuity of service, but also allow improvements for a safer, more reliable and higher-quality mobility service?

Investment decisions must meet three criteria: availability of the technology, its cost and the level of safety it provides. “The central issue of a [transport] company’s strategy can be summed up by the need to strike a balance between maximum availability of assets, acquisition and operating costs and safety requirements in service,” says Laurent Mezzini, Business Unit Director, Railway Systems at SYSTRA.

If these three key criteria are met, the PTA can identify and manage potential risks, optimise investment and operating costs and enhance the availability and performance of its network over the long term, in line with the mobility strategy for the area it serves.

Focus: service life explained

In the lifecycle approach, the life of an asset has three main stages:



From an accounting perspective

In accounting terms, all these assets are a company’s property and as such, they have an economic value. They also include inventories, receivables, fixed assets (or property, plant and equipment) and cash. An asset is the opposite of a company’s liabilities, which consist of its equity capital, expenses and debts. In other words, assets and liabilities are everything the company owns or owes.

BEYOND SERVICE LIFE: THE ENERGY TRANSITION CHALLENGE

Against a backdrop of heightened climate and energy tensions, the issue of asset management is no longer the preserve of mobility experts. It's becoming a social issue and directly concerns users and their mobility habits. Which technology should we invest in first to decarbonise public transport and reduce air pollution? Electric, hybrid or hydrogen? How much of the fleet should we convert? On what timescale? How can we make this transition to low-carbon or carbon-free transport while minimising inconvenience for users? Should we retrofit our fleets or extend their service lives? Asset management is now a key factor in the energy transition. "We provide PTAs with technical solutions to help them reach their sustainable development goals, even though the short-term investment costs are higher," says Emmanuel Sorin, Maintenance Director at Keolis Group. "We help our customers understand the issues and constraints. And we offer deep insights into the pros and cons of each technical solution or energy source." With this support help, PTAs can make much more informed decisions when they acquire new trams or replace their bus fleets, for example. "We give our customers confidence and a clear picture of all possible solutions in the short, medium and long term," says Emmanuel Sorin.

TCO: THE IMPOSSIBLE EQUATION?

With rising energy costs and resources in short supply, it's becoming increasingly difficult to estimate the residual value of an asset. This uncertainty is made worse by regulations, as Bernard Soulages, Chairman of the GART Scientific Council, the French transport authorities association, explains: "The situation is complex from the perspective of our PTAs. Vehicles are one thing, but there's also infrastructure and energy costs, etc. Buying a bus that meets Euro 6 standards, for example — which are readily available today — lets us grow our service offering further than a hydrogen bus, which costs €600,000. On the risk management front, "the use of biogas mustn't be expanded if it means more land being given over

to biofuels," he adds. In terms of safeguarding investments, "the increase in the price of batteries makes it hard to switch to electric vehicles, and we're still a long way from green hydrogen and short-term profitability of hydrogen," says Bernard Soulages.

All these parameters are at the heart of the black box of asset management and make calculating the total cost of ownership (TCO) of an asset over its life extremely complex. Yet it's precisely TCO that informs any investment decision to extend the service life of an asset, or to refurbish, replace or dismantle it.

Faced with this uncertainty, some countries have adopted a more proactive policy. Italy, for example, has decided to "no longer fund the purchase of diesel buses, but to buy electric buses for urban routes and biogas for the rest of the country," says Arrigo Giana, CEO/General Manager of Azienda Trasporti Milanesi, the PTA in Milan. "Hydrogen will undoubtedly be a good alternative to biogas for long-distance routes and non-urban use in the future, but battery capacity is still a major obstacle today." A proactive policy is needed to jumpstart the transition. But above all, trust between PTAs and operators is the key to maximising the service life of assets and making transport infrastructures and networks more intelligently resilient in the future.

Focus: digital to the rescue of asset service life

Viewpoint from
Emmanuel Sorin
Maintenance Director,
Keolis Group



Pulse – What's the role of data in the lifecycle of industrial assets?

Emmanuel Sorin – Every asset has a finite lifespan. It's vital to effectively manage its use, maintenance and replacement, so we can provide a safe and high-quality service at lowest cost. Digital tools and especially data science are being used today to predict potential vehicle, equipment and infrastructure faults, trigger a response, adjust maintenance schedules and ultimately increase the reliability of transport services.

8 to 10%

reduction in maintenance costs by installing a fault detection system on overhead lines, according to a European operator (source: UITP, Digitisation and Asset Maintenance, 2019.)

Pulse – A real-world example of how data science is used in asset management?

E. S. – Proactive risk management includes condition-based and predictive maintenance, with IoT sensors, digital twins and virtual interactive replicas of infrastructure. In Doha, for example, we're advising the local PTA on how best to integrate building infrastructure management (BIM) from the construction phase of a project. BIM includes a digital twin, which helps the PTA anticipate all decisions it will need to make throughout the lifecycle of its assets.

Pulse – How do new digital tools optimise the maintenance of assets and extend their lifespan?

E. S. – Digitisation brings with it new technologies that help us keep closer track of the status of each asset. Drawing on our expertise and using simulation tools, we can increase the productivity of our maintenance operations and make work easier for operators. For example, Keolis' maintenance department is working on how to capture data from the batteries on our vehicle fleets, so we can better understand their evolving status. In Boston, Massachusetts, the commuter trains operated by Keolis are fitted with sensors that count passenger numbers, record vibrations and measure the temperature inside coaches. By anticipating faults and failures, digitisation improves network performance and reduces response costs and times. The goal now is to help operators and mechanics gain the necessary skills in the digitisation of maintenance. We're also training our staff to work on alternative energy vehicles.



Business case 01 Melbourne tram network

CHALLENGES

In Melbourne, Keolis is responsible for maintaining the largest and oldest tram network in the world. The 1,750 stops along its 250 kilometres of track are served every day by a fleet of 500 trams, representing nine different tram classes with an average age of 30 years. From tracks, stops and overhead lines to signage, fleet management and passenger information systems, the scope is exhaustive. And Keolis has to meet the sizeable challenge of maintaining and renovating the ageing network in a fast-growing city, while also upholding service quality and punctuality.

SOLUTIONS

Keolis has helped Yarra Trams deploy a new generation of E-Class trams that are longer than their predecessors (33.5 metres versus 16.6) and can therefore

carry more passengers. The new vehicles also benefit from predictive maintenance thanks to onboard sensors that capture data for analysis. A special tram equipped with both sensors and cameras is used to analyse the network's tracks and roads, as a supplement to physical inspections. Keolis's unique expertise in this area led to ISO 55001 certification in August 2019, entailing the creation of around one hundred standards and the development of 26 asset class strategies.

NEXT STEPS

Scheduled for rollout from 2025, the next generation of trams (G-Class) will bring a range of technical and environmental improvements, including onboard energy storage, regenerative braking, cutting-edge accessibility technology and the latest safety systems. Project plans also include a new tram refurbishment and maintenance facility.

“The expertise of Keolis Downer’s engineers and the quality of our partnership with the Department of Transport have put us on a positive trajectory these past few years. Despite an ageing fleet, the network’s reliability has improved and rolling stock availability is no longer a concern for our passengers.”

JULIEN DEHORNOY,
CEO OF YARRA TRAMS

Business case 02 Rennes metro

CHALLENGES

Twenty years after inaugurating its first automated metro line in March 2002, Rennes opened its new Line B on Tuesday 20 September, making it the world's first city to benefit from Cityval⁽¹⁾ technology — ahead of Frankfurt and Bangkok airports. Crossing Rennes diagonally from southwest to northeast, this second automated line is the cornerstone of Rennes Métropole's new transport masterplan. The infrastructure project included three new park-and-ride facilities (2,000 car parking spaces and 500 more bicycle spaces). And on 24 October, Rennes launched a new bus network to increase the number and frequency of buses across all 43 towns in the Greater Rennes area, beyond the ring road. By 2025, Rennes is aiming for 25% more passengers on public transport.

SOLUTIONS

With its 2.65-metre-wide trains (compared to 2.08 metres before) and large glass panel surfaces, the Cityval rolling stock on Line B can carry more passengers — 179 seats compared to 158 on the Val trains. Its 21 new-generation two-car trains (25 planned) ride on pneumatic tyres and are guided by a single central rail on a concrete track. Inside, the trains have an open-space design that allows passengers to move easily within and between cars. Each car has a dynamic, real-time passenger information display. At a total cost of €1.3 billion, the Line B infrastructure project was delivered on budget.

NEXT STEPS

In the longer term, Line B will make the equivalent of 110,000 passenger-journeys a day, carrying an average of 4,000 passengers per hour per direction. Initially, the higher

number of journeys will be achieved by increasing the frequency of trains (currently every 2 min. 15 sec.). In a second phase, a third, central car will be added to the Cityval trains. The 15 stations and 35-metre-long platforms on Line B have all been designed with this in mind.

(1) Cityval: new generation of automated rubber-tyred metro (automated people mover) trains developed by Siemens.

“Line B is the cornerstone of Rennes Métropole’s new transport masterplan.”

RONAN KERLOC’H, MANAGING DIRECTOR
OF KEOLIS RENNES

Driving forces

From Christchurch to Kathmandu via Paris and Singapore, meet the men and women who get people where they need to go, in this visual tribute to the world's "driving forces".



Mohamad Al Said is a Syrian refugee who's been living in Berlin since 2015. In Syria, he studied literature and hoped to become a teacher. He now earns a living as a Berlin bus driver, thanks to a special training programme for refugees.



01 Drivers around the world

Sreni Pillai has been driving trams since 2019. She's one of seven women drivers on the electric tram network that serves Qatar Foundation's Education City campus.



Nisha Chaulagain, 25, is the youngest woman driving electric buses in Kathmandu, Nepal. After getting her licence, she began her career as a taxi driver at the age of 21.



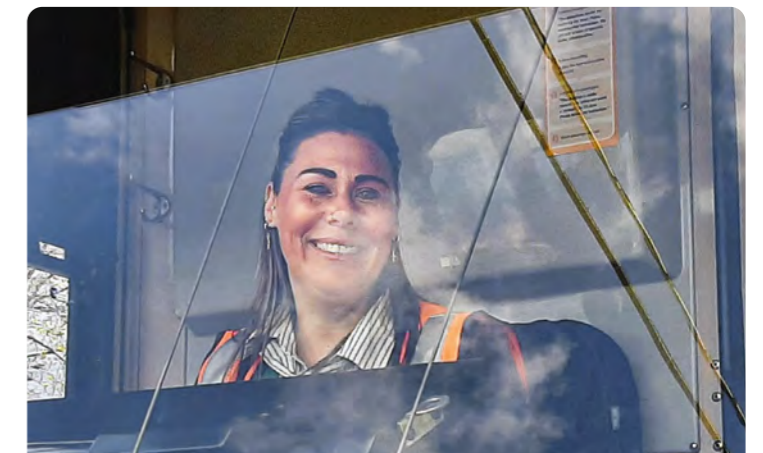
Singapore bus driver Matthew Tay, 22, has a heart-warming story to tell. Fascinated by buses since childhood, he pursued his vocation with support from his godmother – a kind and dedicated bus driver he met in 2012.



Former events manager Tom Vavasour has been driving trams in Christchurch, New Zealand, for the past five years. Despite being close to 60, he has no plans to retire because he loves his job so much!



Kelly Bendall has been driving trams in Melbourne since 2021. After working as a flight attendant for over 20 years, she lost her job because of Covid-19.



European Tram Driver Championship, Leipzig, May 2022.
The first non-European team to take part in the competition was Australian Keolis subsidiary Yarra Trams.



Pulse, new format!

A Keolis initiative, *Pulse* is aimed at shared mobility decisionmakers, stakeholders and influencers. Available in print format, as an e-magazine on pulse-mag.com and via social media, its purpose is to inform the conversation and foster dialogue around the issues and trends shaping our sector.

Check out the online version at keolis.com

And stay informed about *Pulse* via social media



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02 Recognition for drivers

Golden Bus Awards, Paris, June 2022. This contest recognises and rewards Europe's best bus drivers, based on a series of tests designed to assess not only their technical driving skills, but also their sustainable development impact and their sense of customer service.

- 1- **Best Driver 1st prize winner:**
Florent James - Caen - Keolis Caen Mobilités
- 2- **Best Driver 2nd prize winner:**
Patrice Fouquet - Poitiers - Poitiers Transport Authority
- 3- **Best Driver 3rd prize winner:**
Thibaut Corbin - Laval - Keolis Laval



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Pulse new format - tell us what you think!

You may have noticed that *Pulse* has changed with a new look, layout and structure. The aim of the overhaul is to enhance our readers understanding of the mobility issues we cover.

We'd really appreciate your feedback on this new-look *Pulse*. To do so, scan the QR code and respond to our survey - it only takes a few minutes.

