

PULSE



ENLIGHTEN

CITIZEN ENGAGEMENT:
A KEY ENABLER OF SMART
CITIES?

INSPIRE

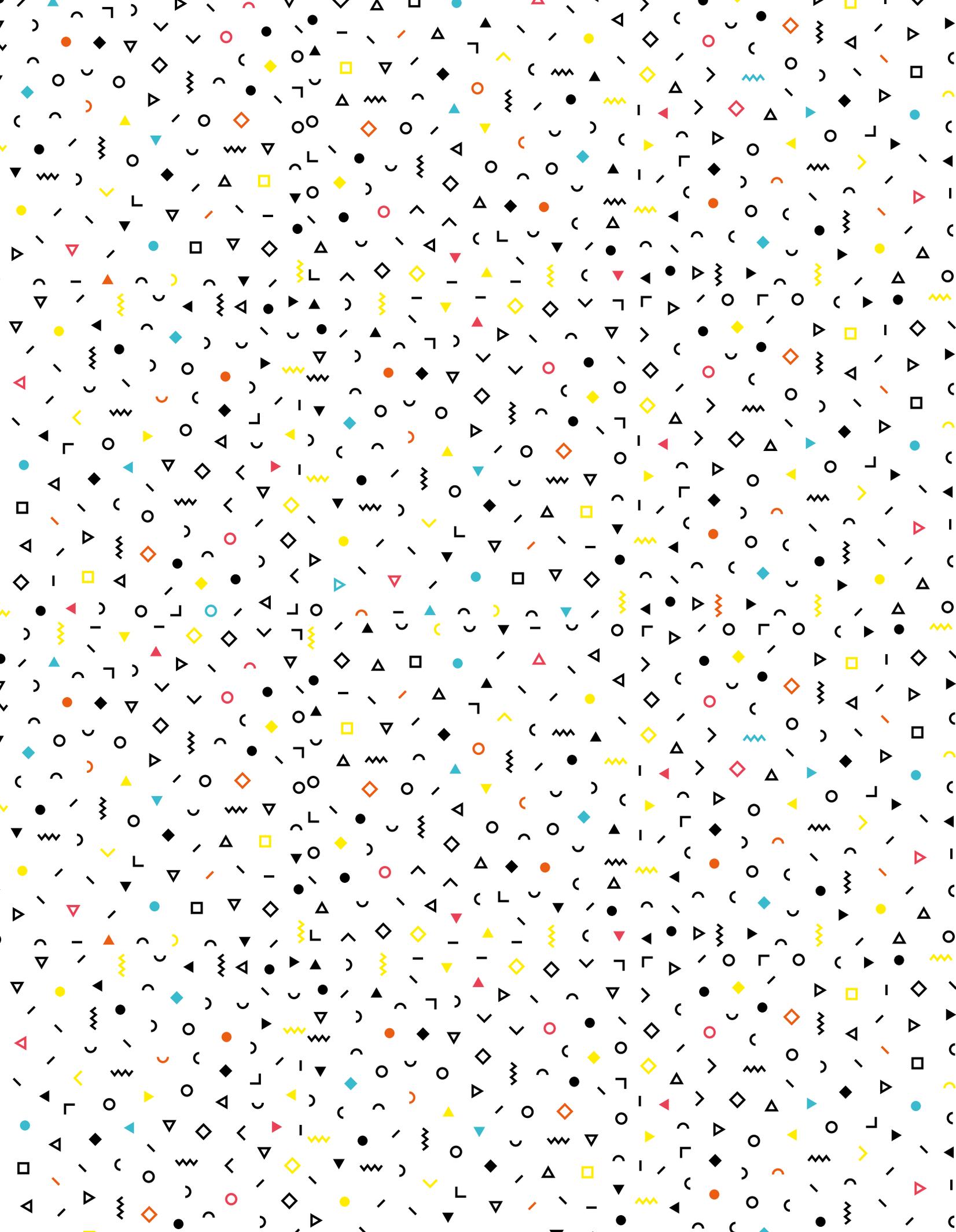
A BRIEF HISTORY
OF OUR TWO-WHEELED
COMPANIONS

EXPLORE

UNDERGROUND
MOVIES

ACCOMPLISH

PAVING
THE WAY FOR
AUTONOMOUS
MOBILITY



In today's fast changing world, people expect transport to be more personalised, digitised and kinder to the environment. Mobility must rise to these and other challenges, while continuing to provide high-quality services every day.

This is what we strive to do. We see these challenges as a tremendous opportunity to develop bold, innovative approaches that keep us ahead of the game and better meet the needs of citizens everywhere.

These advanced solutions are the focus of this new magazine, Pulse, designed especially for you.

Whether you're an operator, policymaker, researcher or urban planner in any part of the world, we'll keep your finger on the pulse with insights and analysis on all the rapidly evolving trends in transportation and mobility. Informative but accessible, Pulse will keep you on the cusp of all the latest developments worldwide. We want to inspire and enlighten you, with the aim of working together to develop mobility services that are more shared, sustainable and passenger-centric, creating a better experience for all.

Enjoy your magazine.

JEAN-PIERRE FARANDOU

Keolis CEO

CONTRIBUTORS



Francis Pisani

Journalist, writer, teacher
and conference
speaker

Specialised in information technologies and communications, Francis published in 2015 his latest book “A journey through Smart Cities: Between Datapolis and Participolis”, a world tour of the urban projects and laboratories, giving a good grasp of the future of living in cities. We brought him and **Éric Chareyron**, CEO of Keoscopie Observatory of Mobility Trends, face to face and asked them about the relationship between citizen engagement and the development of smart cities.



Éric Chareyron

CEO of Keoscopie Observatory
of Mobility Trends

Having a background in economics with a focus in transportation and land use, **Éric** is currently director of prospective, lifestyles and mobilities at Keolis. In 2007, he launched Keoscopie, a major observatory of lifestyles and mobility investigating the impact of national and regional socio-demographic changes on mobility trends. With this innovative approach, he aims to help local communities develop a customised mobility strategy, in line with citizens' needs.



Lars Backström

CEO of Västtrafik AB,
Sweden's second-largest transport
authority

Lars Backström aims to double the use of Gothenburg's public transport by 2025. His secret? He plans to track the people who don't want to use transport services and convince them to do so. For that he won't rely on just having good public transport but he'll focus on improving the experience of it. He showed us his city and shared his views on what public transport could become. Quite an inspiring conversation.

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A BRIEF HISTORY OF OUR TWO-WHEELED COMPANIONS





Takeoff for taxis?

DUBAI'S AUTONOMOUS AIR TAXI

What if your taxi could take off and fly over the crowded streets below?

It sounds like science fiction, but a futuristic fleet of flying taxis could start carrying passengers in Dubai later this year. The city's Road and Transport Authority (RTA) has signed an agreement with German company Volocopter to provide aircraft for a test phase of its innovative 'Autonomous Air Taxi' (AAT) project. Volocopter's drones are capable of carrying two people at speeds of up to 100 km/h. The electric motors of its 18 rotors are powered by nine independent batteries, providing back-up in the event of rotor or battery failure.

According to HE Mattar Al Tayer, RTA's Director-General and Chairman, AAT echoes Dubai's plans to transform a quarter of passenger journeys in Dubai into autonomous transport by 2030.

A WORLD OF CHANGE

If we know one thing about the future of mobility it is that we can expect to see enormous changes in the coming decade. Roads that generate solar power, flying taxis, 1,000 km/h travel over land and robot railway staff are among the innovations on the horizon.

by
Robert Jack

What should come first?
DRIVERLESS CARS OR DRIVERLESS TRAINS?

Driverless cars are seen as the future, but should we be talking more about driverless trains? In a world of driverless cars, mass transit will remain essential in order to keep the arteries of large cities flowing freely. To do so, driverless metro systems will play a prominent role, as it is proven technology that can help deliver increased frequencies, higher speeds and 24/7 services.

Consulting firm Wavestone recently carried out a study, which reviews 25 automatic metro lines out of the 40 lines listed in the world. It shows that France is the country with the greatest mileage of driverless metros (with 120 km of automated lines) and that Keolis operates the greatest line mileage worldwide (with 104 km of lines operated).

A Big Help with Big Data
PROVIDING 'INFOSTRUCTURE' TO 20 EMERGING CITIES

WhereIsMyTransport, a start-up based in London and Cape Town, is helping 20 cities in 10 countries across Africa and the Middle East to harvest 'Big Data'. It is working with informal public transport, or paratransit, as well as official public transport operators, to take the mystery out of travel information. WhereIsMyTransport has calculated that transport uncertainty in South Africa alone has an annual economic cost of USD 104 billion. It recently won the International Transport Forum's 2017 Promising Transport Innovation Award.



Taxi!
AFRICA'S ANSWER TO UBER

Francophone Africa is a part of the world not yet conquered by Uber, and local entrepreneurs are coming up with their own taxi-hailing apps. Launched in January 2016 by a Congolese entrepreneur, Africab is now present in three African cities: Abidjan (Ivory Coast), Cotonou (Benin) and Lomé (Togo). It uses the app developed by London-based Addison Lee. Taxijet is also present in Abidjan, and has ambitious rollout plans. Launched in June 2016 by three Ivorian entrepreneurs, it reportedly receives around 100 bookings a day.

Green thinking

PEDAL POWER MEETS SOLAR POWER



Riding a bicycle became more environmentally friendly in the Dutch town of Krommenie in 2014 following the opening of the world's first cycle path made from solar panels. The SolaRoad consists of 72 metres of solar cells, embedded in concrete and protected by a one centimetre thick layer of transparent, skid-resistant tempered safety glass. It is reported to be producing almost 10,000 kWh of electricity per year, enough to power two households. This innovative €3.5 million project is a public-private partnership between the Dutch province of Noord-Holland and three engineering firms.

There are 35,000 km of segregated cycle-tracks in the Netherlands. If they could all be converted to SolaRoad and produce as much solar energy as the Krommenie trial it would provide enough power for an industrialised city of almost half a million people.

Catch the Hyperloop...

PARIS TO AMSTERDAM IN 45 MINUTES



Travelling between Paris and Amsterdam takes around three and a half hours on the Thalys high-speed train, which travels at speeds of up to 300 km/h. But the promoters of a completely new land-based mode of transport have an ambitious plan to slash this journey to just 45 minutes.

This innovation, named Hyperloop, comprises a sealed tube through which a pod may travel free of air resistance or friction at speeds of more than 1,000 km/h. A Dutch start-up unveiled its own 30-metre-long test facility this June in Delft, backed by the Delft University of Technology, Dutch railway company NS and multinational construction firm BAM. It aims to open its commercial Paris-Amsterdam route by 2021.

They can even dance

RISE OF THE ROBOTS

The world in a nutshell
**13 CITIES,
3 UNIVERSAL
OBJECTIVES**

How will the digital revolution shape the future of mobility, and how can we ensure that the future of mobility is tailored to the needs of smart cities? To help answer these questions, Keolis has teamed up with Netexplo, an independent observatory that studies the impact of digital technology, to produce a World Mobility Report.

This research included an 'International Digital Mobility Observatory' in 13 smart cities across five continents. It found that, regardless of the location, be it Stockholm or Santiago, Hong Kong or Hyderabad, three universal objectives emerge for passengers:

- The ability to receive answers in real time while on the move, including an alternative solution in the event of disruption.
 - Personalised information tailored to the passenger's unique current and ongoing needs.
 - Step-by-step coaching through every stage of a journey, thanks to a digital pocket guide providing door-to-door guidance.
- To address these expectations, Keolis has identified three pillars for the passenger experience of tomorrow.



Discover more at: www.goo.gl/Ev7xLH

A humanoid robot was trialed in three stations by the French railway company SNCF in 2016. Could this soon become a familiar sight for travellers?

The robot, Pepper, was programmed to answer the kind of questions that people routinely ask railway staff, such as information about fares and departure times, and surrounding facilities. The answers are displayed on a screen on Pepper's torso. Designed in France by a Japanese-owned company, Pepper is the first humanoid robot to use artificial intelligence to recognise basic human emotions and adapt its behaviour to the mood of the person it is conversing with. Standing 1.4 metres tall, Pepper comes loaded with advanced speech recognition and is able to communicate in 20 languages. It can even dance and play games.

Pepper has already been deployed at airports - Glasgow (Scotland), Oakland (California), and Songshan and Taoyuan (China). Other social and baggage-carrying robots have also been in action at airports, including Geneva (Switzerland), Schiphol (The Netherlands) and San Jose (California).



JOINT INTERVIEW



CITIZEN ENGAGEMENT: A KEY ENABLER OF SMART CITIES?



**What's the role of citizens
in the development of smart cities?**

**It's a crucial question,
so we asked two experts
to shed some light.**

**Francis Pisani is a journalist,
lecturer and conference speaker
specialising in urban innovation.
Éric Chareyron is CEO of Keoscopie
Observatory of Mobility Trends.**



*by
Pascal Beria*





Francis Pisani

is a journalist specialising in information and communication technologies. He travelled the world looking at examples of smart cities, publishing his findings in numerous countries. In 2015, he brought out a book entitled “A journey through smart cities: between datapolis and participolis”.



Éric Chareyron is director of prospective, lifestyles and mobilities at Keolis. He set up the company’s Keoscopie observatory, which studies lifestyles and mobility practices.

He also supports local authorities in their thinking about the cities of tomorrow.



THERE’S A LOT OF TALK ABOUT SMART CITIES, BUT WHAT DO THEY LOOK LIKE IN PRACTICE?

Francis Pisani:

There’s no really satisfactory definition of a smart city. Or rather, we have so many definitions it’s hard to know which one to use. In reality, there are no ‘smart cities’ as such — just projects, initiatives and ways of addressing issues to help make our urban centres smarter. There are basically two kinds. There’s the data-driven model, where you gather, combine and analyse data to gain insights. Then there’s the approach based on citizen participation. I’d also say that a smart city should reflect three key principles. First, it must be inclusive. You can’t say a city is ‘smart’ if it creates insecurity and inequality. Second, it must be sustainable.



In other words, part of a virtuous dynamic, where it can develop and support itself, without compromising its ability to meet requirements in the future. And third, it must be resilient.

I don't think you can protect a city from everything that might happen. But you can put mechanisms in place so it can recover quickly from a disruption and return to normal. If we take public transport, for example, it means knowing how quickly you can get the infrastructure back into service. All this calls for a shift in attitudes.

Éric Chareyron:

There are two key enablers. First, unlocking the power of data and new tools to make public policies more efficient. And second, responding to the need for cities to be more harmonious, where citizens across the spectrum of diversity are involved in the transformation process.

When we talk about smart cities today, we tend to think of the major urban centres like San Francisco, Amsterdam, Songdo, Barcelona, Paris or Lyon. Yet in France, 30 million people, over 40% of the population, live in small or medium-sized towns, or in rural areas. So, I think it's important to talk in terms of 'smart regions'. Plus, there's a lot more overlap and interconnection among geographic areas today. People are increasingly moving between places,

which are closely interlinked. In a typical family, one person might work at home, the other in the city, while the children attend school in a nearby town. At the same time, they have leisure and social activities spread across various other locations. So, it's actually more meaningful to talk about networks of smart geographic areas.

When discussing smart approaches to mobility, for example, it's important to take account of all people travelling in a region — who they are, why they come here, and so on. After all, a smart city isn't just for the benefit of the people who live there. All these perpetual interactions need to be factored into our thinking. Analysis of data from mobile operators shows that the number of people visiting a city in the course of a month is two or three times more than the number of people living there. That's hugely significant!

F

FRANCIS, YOU MENTIONED CITIZEN PARTICIPATION. INCREASINGLY, WE'RE SEEING CITIZENS TAKING POWER IN THE DESIGN OF THEIR CITIES, AIDED IN PARTICULAR BY NEW COMMUNICATION TECHNOLOGIES. BUT IS THIS TAKING POWER AWAY FROM POLICYMAKERS?

F. P.: I think citizens are being incredibly creative, which doesn't need permission from anyone. But they're not taking power, they're simply exercising the power they have. We want to see more democracy, not stifling the democracy that already exists. And just because citizens are getting involved, it doesn't mean local authorities are losing power.

For the authorities, it's no longer enough to say they've done this

When discussing smart approaches to mobility, for example, it's important to take account of all people travelling in a region — who they are, why they come here, and so on.

Éric Chareyron

**Jakarta:
a citizen's-eye view**

The Indonesian capital is one of the most congested places in the world. In 2009, Henry Soelistyo, aged just 20 at the time, created Lewatmana.com, a website offering aerial views of the city's busiest roads and junctions. Citizens found the site useful, and it was soon expanded so they can upload information on traffic conditions as they travel. Businesses are also involved, helping fund the infrastructure by advertising on the site. A citizen-led initiative that's enabling the authorities of one of the world's most crowded conurbations to address the issue of mobility.





For the authorities, it's no longer enough to say they've done studies to legitimise their decisions on urban planning. They need to work with citizens in a participative approach.

Francis Pisani

or that study to legitimise their decisions on urban planning or infrastructure projects. To justify a project, they need to work with citizens in a participative approach. The rise of participatory (or participative) democracy through networked collaboration is valuable for critiquing and scrutinising political decisions.

However, it raises the issue of how you avoid any one group monopolising the process and having too much say, when they don't represent all citizens. So, the challenge for the authorities is to ensure that everyone's voice is heard.

É. C.: I don't see any contradiction. I also think citizen participation is vital to the development of smart cities. Increasingly today, people want to voice their opinions. With that in mind, it's clearly in the interests of the authorities to take these opinions into account, rather than risking more serious issues down the line, since it's the whole of society that's changing.

Citizen participation is about people having a say in the way their cities are designed and managed. It's most effective when the widest diversity of opinions, lifestyles and vulnerabilities are reflected, giving legitimacy to the proposals put forward and making them more likely to be heard.

S

SINCE IT'S SO IMPORTANT, HOW CAN THE AUTHORITIES INVITE CITIZEN PARTICIPATION IN NEW URBAN PROJECTS, FOR EXAMPLE?

É. C.: That's the real question. How can we get citizens involved when we need their input, such as for new public transport services? There are several levers we can use, though it's often the public who take the initiative. There are digital tools, of course, which make it easier to gather opinions. But we mustn't overlook all those people who don't use those tools or aren't really comfortable with them — which is half of France in 2017, according to one figure. So, we need to find other ways for people to participate as well, such as public meetings.

These must be led by a facilitator, so everyone has a fair say. They have their limitations though, because they're mostly attended by the discontented. It's sometimes necessary to conduct opinion polls to gauge whether a project is viewed positively or negatively across a more representative sample of the population. At Keolis, we've also invited people from diverse backgrounds to take



↑ Songdo: desperately seeking citizens

The South Korean city of Songdo is the prototype for a technology-driven vision of cities. Built from scratch on land reclaimed from the sea, it's created to be a 'ubiquitous city', with sensors everywhere and all buildings connected and reachable within 15 minutes by bicycle. With its modern architecture, wide roads and green spaces, it's a perfect place to live. Except it lacks one thing — life. Most of the city's infrastructure remains deserted. Proof that it's hard for a city, however cleverly conceived, to develop without the support of a pre-existing local community.



▲ Lausanne: democracy time

Swiss democracy involves a greater degree of citizen participation than most places. In Lausanne, it was going to take 12 years to redevelop an area of the city, with plans for two eco-neighbourhoods and relocation of a stadium. The local authority initiated the debate, but it was discussion between citizens that got the project off the ground. Proof that citizen-led democracy operates on a totally different timeframe!

part in roundtable sessions, led by a sociologist, providing an opportunity for more considered and constructive debate. Another solution is citizen forums, where larger groups can discuss particular issues related to their city with experts and decisionmakers. These are a great way to gather ideas and opinions from the public and at the same time give them more detailed information. I'm one of those who think that citizens in a smart city need information and clarity, so they can make informed decisions, both for themselves and the wider community.

F. P.: I agree, but it can be tricky to initiate citizen participation in new cities or neighbourhoods. Let me give you an example. A while back I visited Songdo, South Korea. The city was designed with high-speed cables laid underground, then buildings constructed on top. Overall, the urban planners have managed to create a real business dynamic.

But as a city, I noticed a real lack of dynamic. The pace of urban expansion is such that the creation of new districts is inevitable. So, the question is how to involve people when they don't actually live there yet, because it hasn't been built. There's an obvious dimension to all this, which hasn't yet been resolved: how do you create an urban political, social and economic dynamic that's different from what's been done before.

W

WHICH CITIES ARE INNOVATING IN THE RIGHT DIRECTION?

F. P.: Mark Zuckerberg once said that you don't start communities, you give them the tools they need for "elegant organisation". So, the question is how to provide citizens with tools that are simple and effective. Let me take the example of Santiago, Chile, which provided cyclists with an app that lets them plot their journeys, progressively building a map of the best routes across the city, which can be viewed by everyone.

É. C.: To promote greater mobility, we're pushing for digital solutions to be as intuitive as possible for users, which is often far from the case. Today, we have super-powerful algorithms, but the basic design principles of robustness, clarity and usability are often overlooked.

On the issue of citizen participation, I'd cite the example of Orléans, France, where we introduced a new bus network. In partnership with the city authorities, we committed to incorporating 70% of the requests put forward by local citizens at the consultation meetings. We also did the same thing in Bordeaux. The question was how we transition from our position as experts in mobility solutions, which is a role we must continue to play, to being experts in incorporating citizen requests into those solutions. It takes

It takes humility to admit that what we do as experts can be improved by listening to citizens and involving them in the development process.

Éric Chareyron

Hyderabad: transport mapped

Until recently, taking the bus in the Indian megacity was quite a feat. With no transport map, no one really knew which route to take, or if they needed to change buses to get where they wanted to go. Providing route information via mobile phone or online didn't work, because so few people had phones or web access. So, a group of students decided to map the bus network. The printed maps were then given to the ubiquitous street-corner cigarette sellers, who ensure they're widely available to the public, while earning a bit of extra cash in the process. An initiative by citizens for citizens in a low-technology context.



humility to admit that what we do as experts can be improved by listening to citizens and involving them in the development process. It's important to recognise that behind all the workstreams and dataflows, there's human behaviour.

The task is to discern the individuals behind the statistics, which is at the heart of what we do at our Keoscopic observatory.

A

ARE CITIZEN-LED INITIATIVES COMPATIBLE WITH POLICIES TO BOOST ECONOMIES AND MAKE REGIONS MORE ATTRACTIVE, OR COULD THERE BE A CONFLICT?

É. C.: It's still the elected politicians who make the decisions. How those decisions are put into practice can always be amended. But the overall roadmap must remain in the hands of the authorities. That's why we need to find ways to ensure that people understand the thinking

behind projects and are given the opportunity to discuss them and propose changes.

F. P.: Cities are a social construct, and societies are defined around the notion of conflict. There's no society without conflict. So, it's not about avoiding disagreements, but finding ways forward. I think a community that's happy and feels good about itself is more attractive. If citizen participation makes people feel more positive, then I reckon a participatory city is a more attractive city. But if you asked me whether people live better in a smart city, I honestly wouldn't know what to say.

O

ON THAT POINT, DOES CITIZEN PARTICIPATION GUARANTEE THE SUCCESS OF A SMART CITY?

F. P.: Of course not, but it reminds me of Churchill's famous remark: "Democracy is the worst form of government, except for all the others". Citizen participation doesn't come with any guarantees, but it underpins the notion of responsibility. If people are part of the process, if they engage, it hopefully gives them a sense of responsibility. I don't know if it makes a city wiser or smarter, but it creates a very different kind of political and social space.

É. C.: I disagree. I think it's one of the keys to the success of smart regions – provided, of course, that participation is genuinely representative of the diversity of opinions and that time is allowed for dialogue and mediation between experts and citizens. But I think we have everything to gain by putting citizen participation at the heart of the process of developing networks of smart regions. ●

■
If people are part of the process, if they engage, it hopefully gives them a sense of responsibility. I don't know if it makes a city wiser or smarter, but it creates a very different kind of political and social space.

Francis Pisani

▽
**TAKEOFF-
A BIGGER**

ROLE

**FOR CABLE CARS
IN URBAN TRANSPORT?**

*by
Robert Jack*



When you think about the different ways that people get around cities, cable cars are not the first thing that come to mind. We associate them with skiing holidays and mountain resorts, but a growing number of cities around the world are also harnessing their potential.

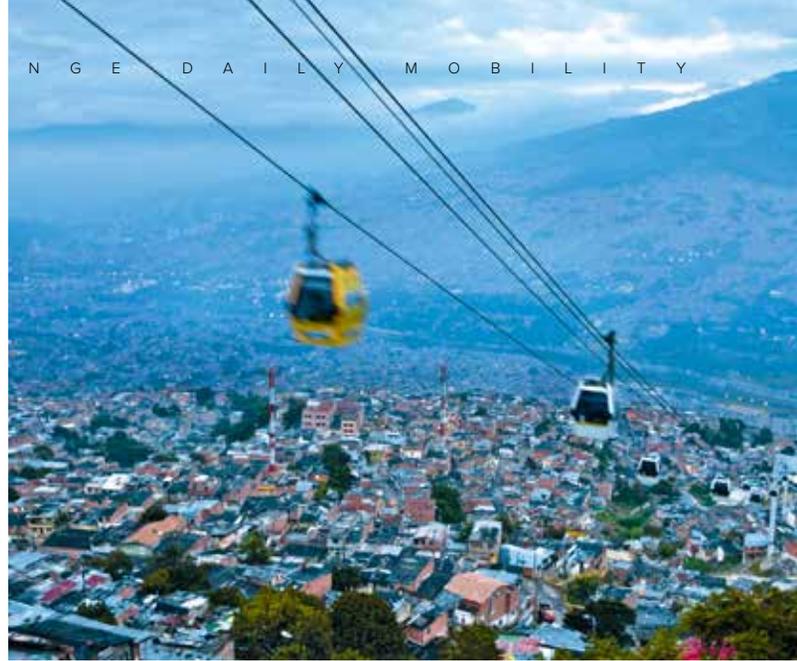
Perhaps the most commonly cited example is Medellín, the second-largest city in Colombia, where around one million people now travel on three 'Metrocable' lines every month (and two more lines are planned). But there are also urban cable cars in London, Barcelona, Berlin, New York, Singapore, Ankara, Rio de Janeiro and many more cities worldwide.

Cable cars are especially useful for crossing difficult topography, but are also energy efficient and environmentally sound. And contrary to common perception, they don't necessarily have to travel in a straight line.

This automated mode of transport is especially useful for crossing difficult topography, such as mountains and rivers, but it has other advantages too. Unlike the alternatives of metro, light rail and high-frequency bus services (BRT), it does not require expensive tunnelling or reallocation of road space. Cable cars have a comparatively small footprint (stations and supporting towers), and can therefore offer a relatively low cost option that is quick to implement. Smaller, less complex systems can take as little as one year to design and build. As well as being energy efficient and environmentally sound, cable cars are easily accessible for people with reduced mobility. They are also one of the safest forms of transport.

Furthermore, cable car transport is flexible. Not only can the number of cabins vary, but the size of cabins can differ dramatically, with capacity for between two and two hundred people. Line capacity has reached 3,000 pphpd (persons per hour per direction) in Medellín and Caracas, and theoretically it could be much higher. And while cable cars cannot compete with light rail and metro in terms of average operating speeds (20-40 km/h for light rail, 40-60 km/h for metro), the system in Medellín, for example, achieves speeds of up to 16 km/h.

Contrary to common perception, they don't necessarily have to travel in a straight line. The Caracas Metrocable, which opened in the Venezuelan capital in 2010, was the first cable car system to implement 90 degree turns – there are two of them on the initial 1.8 km line. Meanwhile, the Mount Faber Line in Singapore, which has linked the main island of Singapore with the resort island of Sentosa since 1974, features a mid-station on the top floor of a skyscraper.



From a passenger's perspective, it's a very pleasant way to travel. Cable cars enjoy their own right of way, allowing their passengers to glide serenely over whatever mayhem is taking place on the streets below. The bird's eye views attract tourists, providing extra revenue for the system and enhancing the appeal of a city (Tripadvisor.com ranks Metrocable as the Number 1 thing to do in Medellín). And adverse weather conditions do not disrupt these services as often as some land-based transport modes, such as trams. Cable cars operate in some of the world's harshest and most unforgiving climates, but there are two forms of extreme weather that are likely to disrupt services – the threat of lightening and very strong winds.

Arguably, the urban cable car has had its greatest impact in South America. In cities like Rio, Medellín, Caracas and La Paz it has transformed the lives of citizens by ending the isolation of hillside barrios.

In Medellín, thanks to two 'Metrocable' lines, disadvantaged neighbourhoods have effectively been brought into the city, providing opportunities for their residents. Cable car stations have also become hubs for community facilities such as health centres, schools and libraries, further enhancing the social benefits for residents. A study by Columbia University in New York City found the homicide rates in the slums of Medellín where Metrocable serves dropped by two-thirds between 2003 and 2008.

And this mode of transport is about to take off in other regions of the world. Since November 2016, Brest, in France, has been home to

▲ Medellín

Nearly one million people every month travel on the three 'Metrocable' lines in Medellín, Columbia's second largest city. Line K was the first to open in 2004. It links Acevedo metro station to the hillside barrio of Santo Domingo, and has brought economic and social benefits to this isolated and impoverished part of the city. Another two lines opened in 2008 and 2009. Line J links the Metro with the elevated district of La Aurora, whereas Line L takes tourists from Santo Domingo to Arví park.

▼ New York City

An aerial tramway has linked New York's Upper East Side with Roosevelt Island in the East River since 1976, but it could soon have a new cross-river companion. Real estate developer Daniel Levy claims that his 'East River Skyway' could cover the distance between Lower Manhattan and Williamsburg in just five minutes and carry 200,000 people per day. And with the impending closure of the L train subway in 2019 to repair damage caused during Hurricane Sandy, the idea has won support from elected officials.



“*The idea of building a cable car in an urban area was new in France, but it quickly emerged as the best solution for connecting Brest to the Capucins eco-neighbourhood, which is right in the city centre but cut off by the river [Penfeld]. We wanted a more cost-effective alternative to building a vertical lift bridge spanning a quarter of a mile, but we still needed sufficient clearance to allow boats through. It was also important for us to develop a ‘green’ solution, helping make the city friendlier to pedestrians rather than cars. The plans got a positive response, and the service has been a huge hit since it opened in late 2016. We had reckoned on 675,000 passengers in the first year, but we’re likely to tip the one-million mark by December 2017.*”



VICTOR ANTONIO,
Tram & Cable car project manager,
Brest metropolis, France



an urban cable car known as Line C on the public transport network. Its two cabins can each carry up to 60 people, or 1,200 persons per hour, on their 400-metre journey over the Penfeld river. The success is undeniable: in August 2017, the attendance levels are four months ahead of the forecasts with 600,000 passengers recorded and, as a result, local shops close to Line C have seen visitor numbers grow by 40%. The local government had originally thought of building a footbridge instead, but this would not have allowed enough clearance space for the naval vessels that pass underneath, and pedestrians would have been exposed to high winds. And all this for three times the cost of a cable car.

Other French cities could soon follow in the wake of Brest. There are 13 cable car projects under investigation in Île-de-France, the region surrounding Paris. The most advanced is the 4.5 km 'Câble A Téléal' in the department of Val-de-Marne. There was an overwhelmingly positive response to a public consultation by the region's transport authority, IDF Mobilités, on this project last autumn.

There are limitations to this mode of transport, of course. First, the capacity is not as high as metro, light rail or BRT. Maintenance and electricity costs are relatively high, caused by the continuously moving cable. There are



also aesthetic disadvantages – many people consider the overhead wires unsightly, while others fear the visual intrusion of cable car riders passing over their homes. Brest has solved this problem by equipping its cable cars with 'smart glass'. The floor-to-ceiling windows offer panoramic views, but they turn opaque when the cabins pass over nearby homes.

Some sceptics point to the Emirates Air Line cable car in east London. The city opened this 1.1 km link across the River Thames in 2012, ahead of the Olympic Games. During the Games it attracted up to 10,000 passengers a day, but these numbers decreased soon after and they remain below expectations.

Cable cars can overcome obstacles that are impossible for other modes of transport. In some circumstances they can offer a unique and cost-effective solution that extends the reach of public transport. But, some cities have shown that cable cars are like any other mode of transport – if you don't fully integrate them into the wider transport network, they won't perform to their potential. ●

▲ **Constantine**
The Algerian city of Constantine is known as the 'City of Bridges' due to the numerous picturesque bridges that span its mountainous terrain. Since 2008, the city has also been home to the Télécabine de Constantine, one of the world's most successful urban cable car systems. The 1 km line has three stations and 33 cabins, each carrying up to 15 people. The system carries around three million commuters across the Rhumel Gorge every year.

■ In some circumstances, cable cars can offer a unique and cost-effective solution. But if you don't fully integrate them into the wider transport network, they don't perform to their potential. ■

Ankara

The Turkish capital has shown how cable cars can complement an existing public transport network. The 3.2 km Yenimahalle Teleferik has linked the hillside towns of Sentepe and Yenimahalle with Ankara's metro system since 2014, with 106 cabins each capable of carrying 10 people. It also demonstrates how cable cars can adapt to dense urban neighbourhoods. Two of the stations straddle roads, allowing traffic to flow underneath, while another occupies a traffic island.





END OF THE LINE FOR PAPER TICKETS

FOUR WAYS TO INNOVATE

For travellers, having to queue at a ticket office or machine is inconvenient and annoying. However, it could soon be a thing of the past, thanks to the latest advances in smart ticketing technology. Here's a rundown of the pros and cons of four solutions offering viable alternatives.

*by
Jean-Pierre Montal*

1

M-TICKET

PRINCIPLE

After payment through an app, the traveller's ticket information is sent straight to it as a 2D barcode, or QR code, which they simply scan at the barrier, allowing them to travel as a regular ticket does. M-tickets are already used by the Athens, London and New York underground systems.

PROS

Simple: m-tickets can be bought easily, right up to the time of travel – without having to queue. Reliable: m-tickets can never be lost – unless you lose your smartphone!

CONS

M-ticket apps can only be used on smartphones (and in 2016 only 50.6% of the world's population owned one¹) and require an Internet connection.

1-eMarketer Worldwide Internet and Mobile Users – April 2016.

2

OPEN PAYMENT

PRINCIPLE

As they enter a network, commuters touch in using their contactless bankcard or smartphone. At the end of their journey, they touch out in the same way to trigger payment, which is charged directly to their bank account. Open payment is in use in Beijing and London.

PROS

Flexible: all that's needed is a contactless bankcard. What's more, payment matches the journey and is made immediately.

CONS

Specific network equipment is required (such as validators with integrated bankcard readers, as well as large data processing capacity). This solution is mainly aimed at occasional travellers who don't need a travel pass.

3

SMS TICKET

PRINCIPLE

The customer simply sends a text message containing a specific code and then gets a message back enclosing all the ticket details: type of ticket and validity date, together with a QR code, barcode or digit-based code which an inspector can scan. SMS-based ticketing has been rolled out in several towns in France (Belfort, Rouen and others), Switzerland (Geneva, Zurich and Berne) and Italy (Milan, Florence and Pisa).

PROS

Accessible: text messaging doesn't require a smartphone. And if the user's phone runs out of charge, ticket inspectors can check their ticket details using their dedicated app.

CONS

SMS-based tickets work well on open networks (buses, city bikes, trams, etc.) but are less effective in closed networks, requiring scanning codes for entry.

4

POST PAYMENT

PRINCIPLE

Commuters use a travel card that's valid for an entire network. Each journey is logged and payment is calculated and debited at the end of the month. This system is already in use in Seoul, South Korea, and in the French town of Besançon, which helped pioneer the solution.

PROS

Customised travel: monthly charges are automatically adjusted based on the lowest fares available to passengers (for example, "regular traveller", or all-inclusive "1 and 2 zone" fares). It's also extremely easy to use as the card is valid on all public transport services in a given area.

CONS

Like open payment, post payment systems require substantial operator investments.

FARE EVASION AND TICKET CHECKING — TWO KEY ISSUES

Will smart ticketing result in more fare evasion?

Some experts think that by offering quicker, easier-to-use and in some cases cheaper means of purchase (like sms ticketing or post payment, for example), smart tickets are more likely to be adopted by the very travellers most likely to commit fare evasion, such as teenagers and students. So, the result could be less fare dodging.

Nonetheless, there is a danger that ticket validation will disappear under smart ticketing, which might cause a rise in fare evasion. Stamping a ticket is such a socially essential and symbolic part of travel that the gesture will have to evolve with pricing and ticketing systems, in order not to be a serious impediment to technological development.



PRACTICAL, REALISTIC, EFFECTIVE



SENIOR MOBILITY SOLUTIONS COME OF AGE



With population ageing, the mobility of older citizens is an increasing challenge for society as a whole. We take a look at the issues and some of the long-term solutions available for improving senior mobility.

*by
Jean-Pierre Montal*

First, we need to clear the road ahead! This means redressing some of the misconceptions and stereotypes that often blur our vision and lead us to the wrong conclusions.

SENIORS — A DIVERSE POPULATION

The first obstacle we need to overcome is the “senior” myth. We all know, of course, that the population is ageing. As a proportion of the global population, the number of people aged 60 and over is forecast to double from 11% in 2000 to 22% by 2015⁽¹⁾. In France, the number⁽²⁾ of over-85s is expected to reach 4.8 million by 2050, compared with 1.5 million today. But the idea of the “average senior citizen”, with clearly identified set habits is a pure invention with no factual basis. The World Health Organization (WHO) defines seniors as people aged 60 and over, whereas employers tend to make this distinction for anyone over 45. “People age at different rates and experience the ageing process in different ways. A 60-year-old who regularly uses a smartphone and an 80-year-old who has no concept of the Internet obviously don’t have much in common. Lumping them together in the same sociological category doesn’t make any sense,” says Pierre-Marie Chapon, an expert in population ageing and managing director of consultancy firm VAA Conseil. “Mention the elderly and two stereotypes spring to mind: the always-on-the-go senior or the homebound, care-dependent person. But in reality, senior profiles are much more diverse and hard to pin down.” Fully comprehending this diversity is absolutely essential to understanding the day-to-day lives of older populations, which to a large extent are shaped by their degree of mobility: people who get out and about lead healthier lives (see box, “Reversing the downward spiral”).

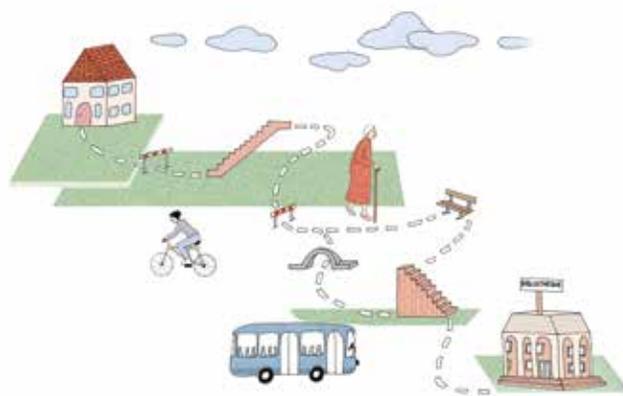
(1) World Health Organization

(2) Icade study: Adapting cities to ageing citizens



“PERILOUS JOURNEY”

As they get older, people tend to keep to their travel patterns, so a pensioner who used to take the bus to work is likely to continue using the same means of transport. Nonetheless, the older they are, the more people see travel as an arduous, complicated experience, or even “a perilous journey”, according to Nicolas Menet, a sociologist at Adjuvance, a consultancy firm specialising in population ageing, innovation and startups. “When thinking about their planned trip, they tend to focus on the tricky



parts and then, gradually, choose not to go out at all.” As a result, the amount of time spent travelling gets less and less. In France, it has fallen from an average of 50 minutes for 60 to 74 year-olds to 28 minutes for the over 75s. In fact, a growing proportion of older citizens end up never leaving their homes for a week at a time. This is true for 14% of 75 to 85 year-olds and 30% of over 85s⁽³⁾.

Safety is another concern for seniors who use public transport, and the older they get, the less safe they feel. Several factors contribute to this: discomfort and a lack of cleanliness onboard or at stops, noise that prevents them from hearing next-stop announcements, and narrow pavements. Whatever the reason, this inevitably leads to shrinking horizons, with older people not venturing far from home and then gradually not going out at all.

(3) Elderly pedestrians and urban walkways. Cerema, Urban and Regional Development department, Central and Eastern France, 2016

FRUGAL INNOVATION IS THE WAY TO GO

The key to encouraging older citizens to make more use of public transport is to focus on real needs. “We must steer clear of ‘plans’, ‘measures’ and ‘policies’ when it comes to senior citizens,” warns Pierre-Marie Chapon. “On the contrary, we should aim to make targeted, practical and long-term improvements – not necessarily involving technology – that bring immediate benefits to passengers.” This can include improving the design of seats, making timetables easier to read, installing more grab handles and bars, and clearly distinguishing information buttons from emergency buttons. “This is what’s known as ‘frugal innovation’: instead of reinventing everything, the goal is to make existing networks easier to access and use,” explains Nicolas Menet. Listening carefully to elderly passengers is essential. In Lyon, for example, buses are fitted with a real-time “trip sharing” feature that lets passengers convey their feelings while onboard to get an accurate picture of their expectations.

Another aspect of frugal innovation is training, especially for bus drivers. Waiting for elderly passengers to be seated and then moving off again more smoothly can have a profound effect on their travel experience and their perception of bus travel in general. The city of Berlin provides another example of frugal solutions, with guides on hand at selected stations to assist older passengers. As well as



municipal and public transport employees, the public also need to be “educated” about the specific needs and difficulties that ageing adults face when out and about. The Austrian city of Salzburg ran an awareness campaign to encourage schoolchildren and young adults to offer assistance to fellow older passengers on public transport. This type of support between the generations makes elderly passengers feel safer and removes some of the barriers they may face.



PRACTICAL DIGITAL SOLUTIONS

Digital technology is another key lever – provided the focus is on practical improvements. Digital tools will only be adopted if they offer immediate benefits, such as clearer route displays, clearer information about connecting services, walking distances to and from stops, clearly marked areas under repair/construction, and timetable changes. Improvements such as these can alleviate some of the stress and hurdles facing older passengers, ensuring a smoother travel experience. However, the main obstacle here is that few over-76s make use of digital services, especially for transport. Some cities, such as Helsinki, have taken a proactive, educational approach to this issue. The city’s Adult Education Centre offers courses in media and IT for the over-65s (22% of adults who attend the centre), with mentoring and coaching. This type of response addresses the needs of today’s older generations and should be implemented quickly to improve their lives. As a result, today’s 50-year-olds – tomorrow’s senior citizens – will be more likely to use digital tools developed to make travelling easier.

NEW MODES OF TRANSPORT FOR GREATER MOBILITY

In addition to these highly practical, passenger-centric improvements, new modes of transport that enhance the mobility of our more vulnerable fellow citizens are also being developed, helping tackle the issue of the first and last mile in particular. These include car-sharing schemes and on-demand transport services, which have gained real ground in recent years. Other solutions already rolled out include self-service electric bike hire scheme for short trips, as well as shared autonomous vehicles, set to become a growing part of the mobility mix in the near future (see feature article on page 24). These and other solutions will enable ageing adults to lead better and more independent lives. ●



REVERSING THE DOWNWARD SPIRAL

Mobility is a critical issue but is often misunderstood. This is mainly because senior citizens themselves don't clearly convey their expectations: they often see bad travel experiences as part and parcel of growing old. But another reason is that some stereotypes are hard to break. It's generally thought that older people are reluctant to use public transport because they're still attached to their cars. The truth is they often give up driving because of heavy traffic and parking congestion. This can lead to 'disengagement', a theory well-known to population ageing experts, who observe that older adults naturally withdraw from their day-to-day activities. Similarly, another important dimension is that, as people age, they feel more distanced from public services. If public transport service providers don't take account of these natural shifts in behaviour, a downward spiral sets in and people simply stop travelling on a daily basis. As well as a worrying trend, this is potentially a real public health issue: if people don't get out and about, their quality of life and wellbeing deteriorate. As we've seen, public transport is a major social issue with surprisingly broad repercussions.



NICOLAS MENET,
sociologist at consultancy firm Adjvance,
France, which specialises in population ageing,
innovation and startups.

CUSTOMISED TRAVEL SERVICES IN HONG KONG

In the densely populated city of Hong Kong, a fleet of 1,270 minibuses provides a 24-hour service covering all districts. There are two different colours of minibus – green and red. The green minibuses serve specific routes and offer the fastest option. Red minibuses operate on routes that are not always fixed. Passengers can get on and off anywhere between the starting station and the terminal, bringing them close to home.



<https://goo.gl/UGmMWu>

SMART TRAVEL APP FOR BERLIN

As part of its holistic approach to mobility, Germany's capital is building smart features into facilities along its extensive public transport network to make travel easier for more vulnerable users. These include an application that alerts passengers about possible problems on their routes, such as an escalator under repair or a lift out of order, and suggests an alternative route.



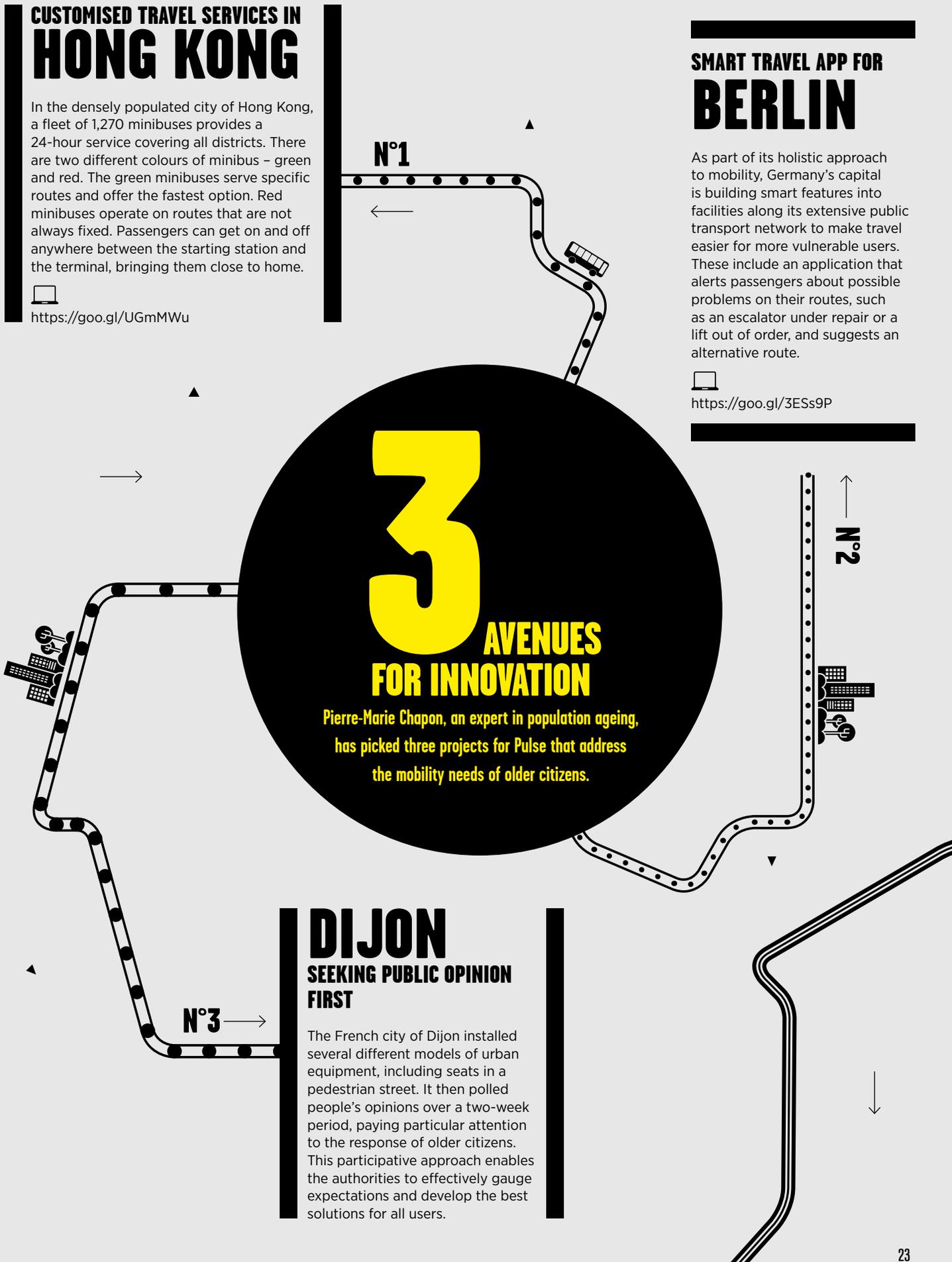
<https://goo.gl/3ESs9P>

3 AVENUES FOR INNOVATION

Pierre-Marie Chapon, an expert in population ageing, has picked three projects for Pulse that address the mobility needs of older citizens.

DIJON SEEKING PUBLIC OPINION FIRST

The French city of Dijon installed several different models of urban equipment, including seats in a pedestrian street. It then polled people's opinions over a two-week period, paying particular attention to the response of older citizens. This participative approach enables the authorities to effectively gauge expectations and develop the best solutions for all users.





PAVING THE WAY FOR AUTONOMOUS MOBILITY

While self-driving cars may be getting all the attention, driverless shuttles are on the cusp of reshaping urban transport. Indeed, they are one of the first modes of autonomous mobility to become operational, with tests having started in several cities in 2016 and the first fleets expected to be deployed by 2021.

by
Richard Venturi



Driverless electric shuttles are ushering in a new era of autonomous transport across urban areas worldwide, enhancing residents' mobility and alleviating traffic congestion and pollution through shared transport.

The massive rise in the urban population across the globe in recent decades has placed transport in many cities under increasing strain. According to UN estimates, 67% of the world population will live in urban areas by the middle of this century. This creates an enormous challenge to develop new solutions that are efficient, lasting, adapted to the needs of users and able to provide brand new services and alleviate congested mass transit networks.

Whether it takes the form of cars, shuttles or even buses, shared autonomous mobility is the perfect solution, as its flexibility allows it to easily complement existing mass transit. More specifically, it is ideal for first and last mile mobility, connecting residential areas and final destinations to transport hubs with so-called feeder shuttles and buses.

A MULTITUDE OF BENEFITS

It is difficult to overstate the advantages of shared autonomous mobility. Over the long term it will not only lower costs related to pollution, but urban residents will save money on personal car use. It also has the potential to make transport more intelligent, leading to savings from optimised services during peak





▲ Queen Elizabeth Olympic Park, London, UK.

and off-peak periods, with the number of shuttles adjusted accordingly. Additionally, as the technology develops, electric engines are expected to become less expensive than internal combustion engines, translating into further savings.

Another substantial benefit lies in their relative safety. Studies have shown that more than 90% of car accidents are caused by human error (the US National Highway Traffic Safety Administration [NHTSA] put the figure at 94% in a 2016 study). The implications are clear: less human drivers means less accidents.

Beyond the direct and indirect savings that result from shared autonomous mobility solutions, they make public transport more equitable. Entire fleets of shuttles can be adapted to passengers with special needs (e.g. people in wheelchairs or with strollers) at only a minimal extra cost.

They also free up an enormous amount of parking space. A 2017 study by the OECD's International Transport Forum (ITF) found that total parking needed for the Lisbon Metropolitan Area would plummet by 95% when shared mobility was used. This space could then be reallocated for other public uses. Surprisingly, the study also found that introducing feeder buses and shuttles leads to a

substantial increase in the overall use of high-capacity mass transit services.

THE MARKETPLACE AT FULL THROTTLE

The private sector has caught on to the promise autonomous mobility holds for urban transport in the 21st century. The market is dynamic, with a number of different industries represented, not to mention new-comers. First and foremost there are the electric shuttle manufacturers like Keolis' partner Navya, which has been designing autonomous systems for the past ten years and today makes shuttles that can transport 15 people. Then there are car makers like Tesla and BMW and tech giants like Google.

This dynamism is reflected in the autonomous mobility solutions that are already making their presence felt in big cities around the world, where a series of pilot tests have been underway for the past couple of years.

In September 2016, Lyon in France became the first city in the world to operate a driverless shuttle bus for public transport outside a closed, private road, at the end of a tram line, taking on that last mile of commuting. Las Vegas in the US became the first

North American city to test self-driving shuttles in early 2017.

Paris is one of the latest cities to carry out such a trial, with three shuttles deployed over six months in the major Europe's business district, La Défense. It has been specially chosen due to its density and the potential for first and last mile mobility. What's more, it allows Navya and Keolis to perfect the shuttles' software. For example, they have been 'taught' exactly when to sound their horns to alert pedestrians, brake when encountering an obstacle and to adapt their speed to pedestrians along their route.

Looking ahead, the airport operator Aéroports de Paris (ADP) has decided to use a driverless shuttle to provide its employees with an efficient link from its new headquarters to the local train station by September 2017. This project is particularly complex, as the shuttle will operate in a busy and open road network, stopping at traffic lights and crossing major intersections.

Keolis will also be carrying out a trial in the Queen Elizabeth Olympic Park in London starting in September 2017. The area is home to new neighbourhoods, green spaces, schools and nurseries, with a lot of young families and children.

The private sector has caught on to the promise autonomous mobility holds for urban transport. The market is dynamic, with a number of different industries represented.

The trials are becoming longer, more advanced and increasingly integrated into existing transport networks and the urban fabric. They allow city officials, passengers, residents, shuttle makers and operators to test all aspects of autonomous mobility, paving the way for seamless integration into cityscapes across the globe.



“The completely autonomous, fully electric shuttle bus service has been in operation for a year now in the Confluence eco-district of Lyon. At the time of its launch, it was the first trial of autonomous vehicles on a scheduled public transport route over any substantial period of time over any other such? We can safely say it’s been an all-round success! As well as proving extremely popular with local commuters – carrying more than 18,000 trusting passengers over a total of 14,000 km (9,000 miles) – the service has attracted plenty of attention from further afield, with delegations visiting from other French cities as well as Canada and Denmark. In the course of the trial, we’ve closely monitored how people use the service, making adjustments and improvements accordingly. Changes have been made, for example to the braking and obstacle detection systems. We’ve also improved battery power per charge and installed air conditioning. Next on the cards is a real-time passenger information system to track bus location and let customers know how long before the next shuttle arrives. Before the end of the year, we’ll be reaching out to local businesses to further promote the shuttle. We’re also looking into extending the service to Saturdays and considering how it could be used on other parts of the Lyon public transport network.”



PASCAL JACQUESSON,
Managing Director, Keolis Lyon, France



INNOVATIVE TRANSPORT FOR THE PARISIAN REGION

“These innovative transport solutions have to be tested, which is why we have decided to launch this trial of a self-driving shuttle in Ile-de-France. We have chosen to carry this out in Europe’s largest business district, La Défense, because it is a dense urban area that stands to benefit from autonomous mobility. With 170,000 employees, there is a real demand for first and last kilometre transport that driverless shuttles can fulfil. There will be a shuttle every ten minutes, with a total capacity of 11 people.

The project is another step towards green transport in Greater Paris. There will be two other trials of self-driving shuttles in the region. Together, these tests will show us how the shuttles can become part of a densely populated zone and confirm the benefits of innovative autonomous mobility.”



VALÉRIE PÉCRASSE,

President of the Regional Council of Ile-de-France (Greater Paris region), France





▲ *“Terrebonne has given the greenlight to a year-long pilot project for self-driving electric shuttles. We are now waiting for the government’s agreement before beginning. The shuttles would transport passengers in the tourist area of Old Terrebonne. With room for 15 passengers per shuttle and travelling at about 15 km/h, this new service would enhance the public transport offer, especially for the first and last kilometre. This would optimise travel time for passengers and would reduce traffic jams and pollution.”*



STÉPHANE BERTHE,
Mayor of Terrebonne, Québec, Canada

LONG-TERM CHALLENGES

This learning curve is a key phase in the development of autonomous mobility solutions. Simply put, the complex technology has to be honed before driverless shuttles become a permanent part of the cityscape.

There are also the legal challenges that autonomous vehicles face. The United Nations Economic Commission for Europe (UNECE) amended its 1968 Vienna Convention on Road Traffic in 2016 to allow for autonomous driving, provided that vehicles comply with UN vehicle regulations and that they can be controlled and deactivated if necessary by a human.

Different countries have taken different approaches to adapting their legal systems. In the US, five states have so far authorised self-driving vehicles. The UK, for its part, has taken another tack, preferring to let the industry come up with solutions before developing legislation. In France, the government gave the green light to tests of driverless vehicles on public roads in August 2016. Such trials are a way of progressively testing the legal framework, with new authorisations and exemptions for each test. And as the technology is tried and tested, existing legislation will be adapted.

In addition to the legal aspect, the question of insurance looms large. Drivers are set to become redundant, and the responsibility of car makers and the other manufacturers involved

is certain to become an issue. Insurers will have to develop innovative insurance policies to cover novel risks. One of which is cyber criminality, with the possibility that hackers can take control of vehicles from a distance. Apart from designing secure, reliable systems, one possible way to address this is to follow the example of aircraft: having different computer networks so that if one is compromised, the others can continue to operate.

Like with any new technology, it takes time to win people over. But with so many advantages for cities and their residents, it is only a question of time before driverless shuttles become a mainstay of urban life.

human driver makes a split-second decision when faced with a dangerous situation.

Beyond these technical aspects lies as big a challenge as any: getting city dwellers to accept these newcomers to urban transport and adapt their behaviour. Like with any new technology, it takes time to win people over. But with so many advantages for cities and their residents, it is only a question of time before driverless shuttles become a mainstay of urban life. If recent experience is anything to go by, this future is right around the corner and ready to hit the road. ●

“The city of Las Vegas is making major investments to improve mobility and safety and provide reliable transportation choices to residents and visitors through the use of new technologies.”



CAROLYN GOODMAN,
Mayor of Las Vegas, USA



Three artists, three cultures, three visions of the world.
We gave them carte blanche to express what they think public transport will look like in 2050.
An exhilaratingly fresh take on mobility!

PUBLIC TRANSPORT IN 2050

according to



Powerpaola

Colombia

Powerpaola was born in 1977 in Quito, Ecuador, and, at a young age, moved to Colombia. She is currently finishing an animated adaptation of her first graphic novel “Virus Tropical” and lives in Buenos Aires, Argentina.



Tatsuro Kiuchi

Japan

Tatsuro was born in Tokyo in 1966. He’s worked for clients such as The New Yorker, United Airlines, The Royal Mail and Starbucks. He’s a member of the Tokyo Illustrators Society.



Timo Kuilder

Netherlands

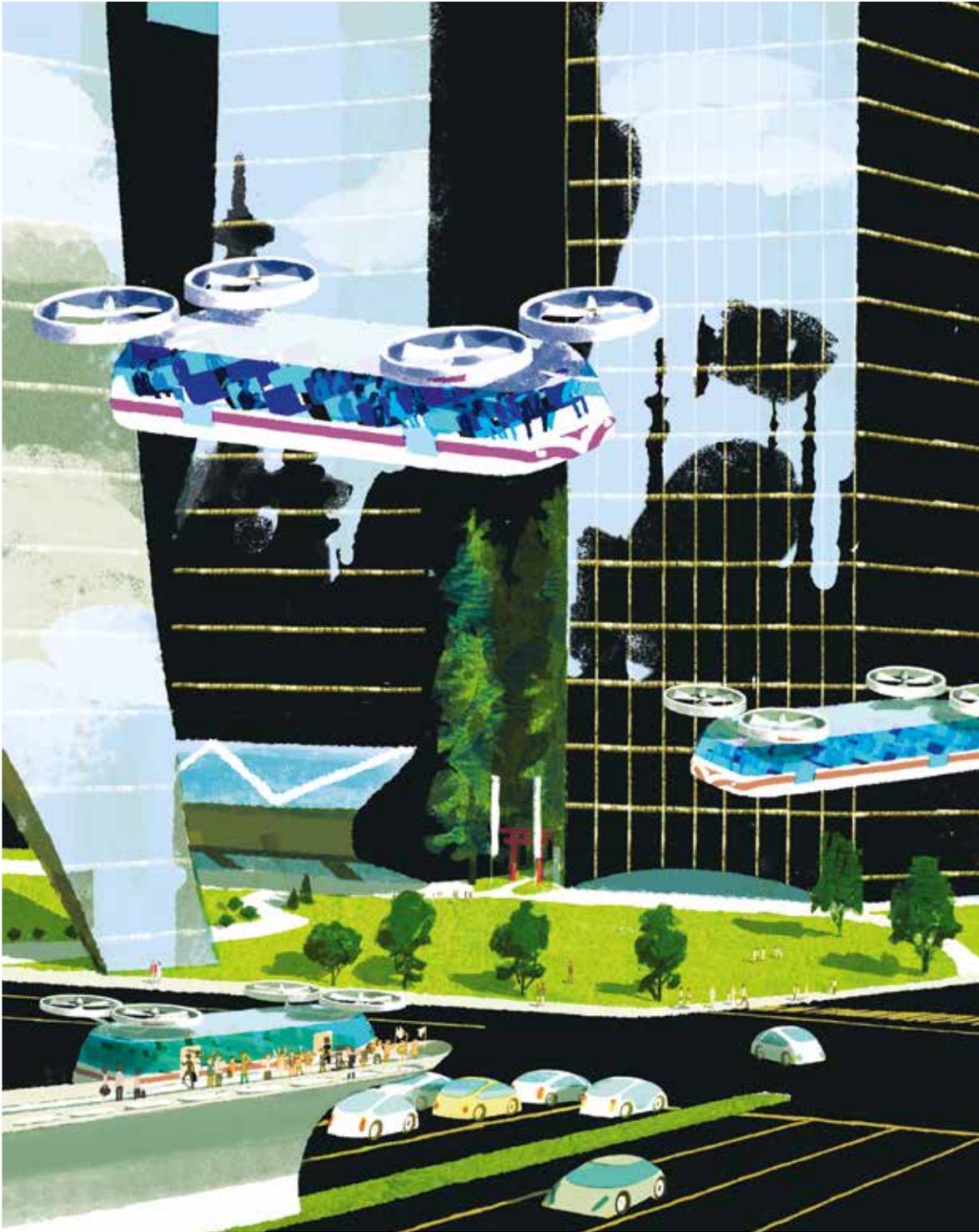
Timo is a freelance illustrator based in Amsterdam. His art can be described as bold, graphic and minimal. He combines personal work with commercial commissions. He has been working with Facebook, Monocle, Adobe, Bloomberg, Twitter and WeTransfer among others.



POWERPAOLA

Thinking ahead to 2050, I'm optimistic. I see all our energy being renewable and all our water filtered and reusable. Our cities will be in harmony with nature. There won't be any cars. Instead we'll rely on safe and comfortable public transport or alternatively we'll simply walk or bike. We'll also use virtual reality headsets (made from recycled materials, of course) to travel by flying carpet, hot air balloon or winged horse...

powerpaola.blogspot.fr



TATSURO KIUCHI

I wonder whether we'll have flying cars by 2050. In reality, I don't think many cars will actually fly. But seeing how popular drones have become, I think there's a good chance our skies will be filled in one way or another. I'm not sure what type of vehicles they'll be though. Most will be autonomous, but I doubt they'll be able to fly. That would just congest the skies. So I reckon only public transport services will be allowed to operate in the air, using large flying buses.

tatsurokiuchi.com



TIMO KUILDER

By 2050, I hope most public transport will be electric and more sustainable. I think many people will be working from home, meaning fewer commutes. We'll also have more urban nature. Cities will all have their own Elon Musk Hyperloop, and cars will be autonomous. Extra-wide buses – the size of trains – will be solar and wind powered and their huge windows will double up as screens.

z wartekoffie.com

UNDERGROUND MOVIES

The Tube, London's iconic underground railway network, has been the backdrop to many box office blockbusters. From *The Bourne Ultimatum*, *Harry Potter and the Order of the Phoenix* and *V for Vendetta*, to popular television programmes.

by Robert Jack



▲ The filming of the 2016 action thriller *London Has Fallen* required a bomb crater at Charing Cross station. It was actually a 3D picture drawn on the ground, but Kate Reston, manager of Transport for London's Film Office, says it was very realistic. "It's one of those things that you can walk over, but people walked around it."



Have you seen the dramatic chase scene in *Skyfall* where James Bond (Daniel Craig) chases Silva (Javier Bardem) through London Underground?

Kate Reston, Manager of Transport for London's Film Office, did. It's even one of the scenes that she enjoyed the most. But this short, action-packed section of the film was the product of a lot of detailed behind the scenes work. She worked on the project for 14 months, culminating in three weeks of filming on-site.

Released in 2012, this box office blockbuster is one of many cinema and TV productions that brought London's world-famous 'Tube' network to worldwide audiences. The Bourne Ultimatum,

Harry Potter and the Order of the Phoenix and V for Vendetta are among the major movies that have filmed on the Underground, along with television productions like Sherlock and Sense8.

LONDON, A GENUINE PLAYGROUND FOR MOVIE DIRECTORS

Reston has been assisting filming on the London Underground since 1992. It used to be a function of the Press Office but a dedicated Film Office was later created to deal with enquires, oversee filming, liaise with front-line and operational staff and ensure that shooting is done safely. This year, Reston and her team have also taken on responsibility for filming on other parts of Transport for London (TfL) network, such as the Docklands Light Railway and London Overground. Filming on London's buses is overseen by individual bus operators.

The world's oldest metro system offers an abundance of choice to filmmakers, from the grandeur of the 1930s art deco stations to the futuristic stations on the Jubilee line – Canary Wharf was transformed into a space station for the latest *Star Wars* movie, *Rogue One*.

PROTECTING THE BRAND

"There is only one London Underground," says Reston. "And one of the reasons it has such positive international recognition is because we've worked hard over the years to protect the integrity of the brand and how it's used."

Every year there are around 500 requests to film on the Tube, from students through to major television and film production companies. A location permit costs from €680 per hour (for a crew of up to five people). Larger feature films can involve



During the shooting of Skyfall, Javier Bardem and director Sam Mendes slid down the escalators of Charing Cross station. What we don't see in the movie is that they had to use special equipments to avoid hitting the "Stand on the right" signs.

Whether it's filming dancers in tunnels, Spiderman riding the Tube, an astronaut at the ticket machine or Stormtroopers travelling down the escalator, there's never a dull moment in my role. Every job we do is different. The job has taught me to always be prepared for the unexpected.

It can create some interesting contrasts when the movie world meets the world of public transport, especially when there are hair stylists and makeup artists preparing the actors for their scene beside TfL Film Office staff in hi-vis (looking far from glamorous) giving instructions to the crew.

On one occasion, when a very well-known actor was filming inside a station for a day, a fully-carpeted gazebo was installed, with an easy chair, footstool, dressing table and air conditioning unit!

Most of the movie stars I meet are very interested in the transport network and the surroundings. They often don't realise all of the work that goes on behind the scenes at TfL and the amazing assets that are available for filming.

Karen Pegram,
Support Manager for Transport for London's Film Office



larger crews and entail a lot more work. TfL's Film Office accommodates approximately 6-12 feature films each year.

Scripts must be approved before a permit is granted. TfL won't permit the filming of scenes that include vandalism or graffiti, assaults on passengers or staff, fare evasion or suicides.

"You never see an airline put their name to a plane disaster movie," Reston explains. "It's our brand, it's our company – and so if we are going to lend that out to a production company then we'll have some say on what people can film."

FILMING LOCATIONS

Skyfall was partly filmed on the Jubilee line platforms at Charing Cross, which have been partly redundant since the line was extended eastwards in 1999. They are also used for training purposes and on occasion, as a handy avenue, to re-regulate the Jubilee line service, if required, and therefore provide a fantastic, passenger-free location for filming. Other self-contained options include the 2.4 km Waterloo & City Line, which is closed on Sundays and Aldwych (disused) Underground station.

Filming also takes place out on the live network during off-peak hours and occasionally during evenings and weekends, where there are over 400 Underground, Overground, Docklands Light Railway (DLR), TfL Rail and Emirates Airline locations to choose from. Reston's "track trained" team accompanies all film crews to make sure that

everything is done safely and that the travelling public is not inconvenienced.

Last year, commuters travelling to Woolwich Arsenal on the DLR were surprised to find themselves in Athens. Signs at the station were written in Greek and English for the filming of action thriller Jason Bourne. While this required closing some areas of the station, the DLR kept commuters moving, and many were able to catch a glimpse of the A-lister Matt Damon.

BIG BENEFITS

Currently, access to film with TfL generates €570,000 annually which is invested back into the transport network, depending on where it needs it the most. This non-fare revenue is increasingly important as from next year TfL will no longer receive Government funding for the day-to-day running of its transport services.

There's also a dividend for the UK economy. According to VisitBritain, Great Britain's tourist authority, more than a third of all potential visitors to Britain want to visit places they have seen on screen.

And it's obviously rewarding for the teams working on the networks. "I am very loyal to the Underground. It's an amazing transport network and it's fantastic that people want to use it in their films," says Reston. "We encourage anyone thinking about filming on the Underground or anywhere on the TfL network to get in touch with us." ●

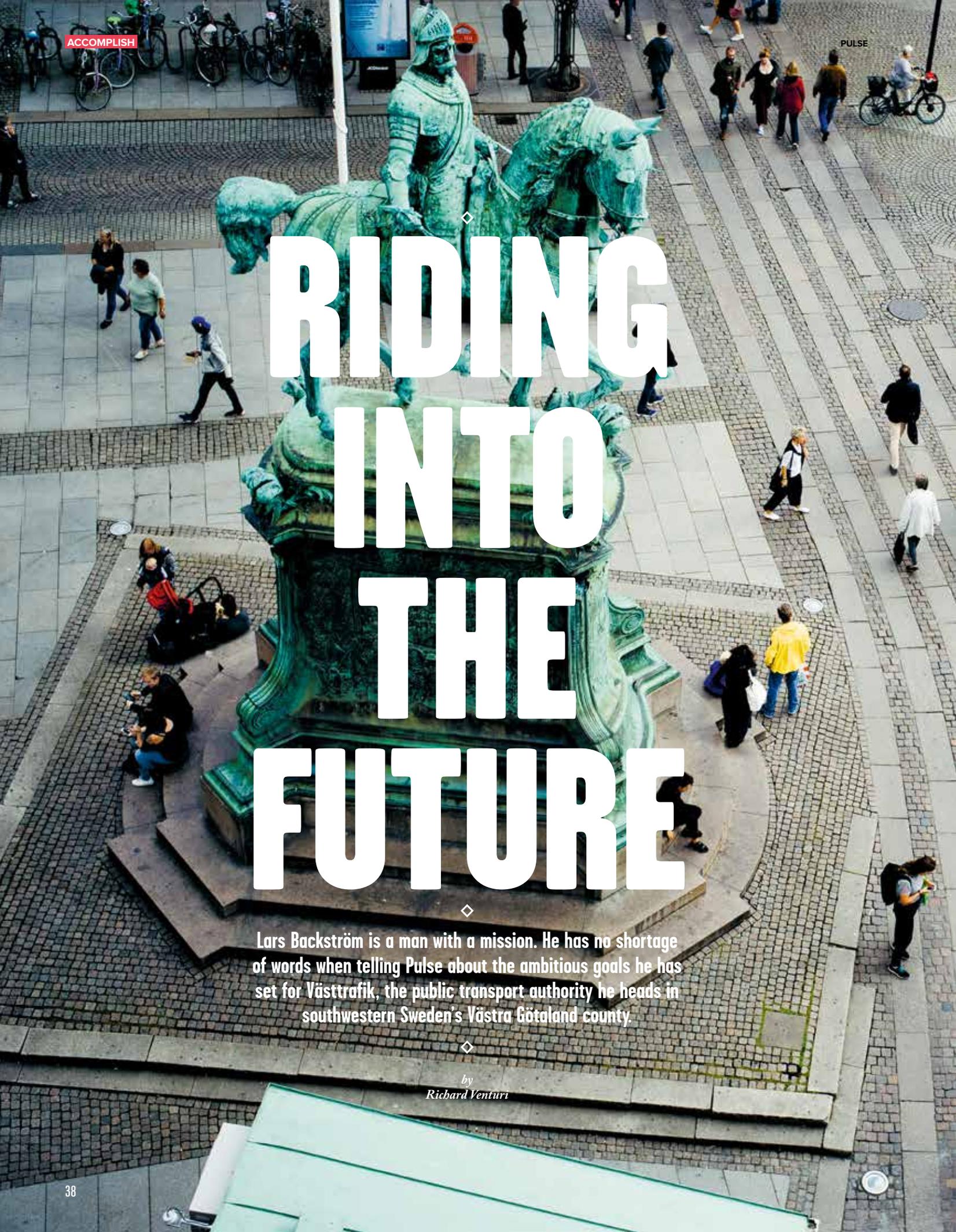
▲ *Designed by Sir Norman Foster and located in a drained dock, Canary Wharf station on the Jubilee line has been compared to an underground cathedral. Its futuristic design has seen it appear on film as a space station (Rogue One: A Star Wars Story, 2016) and a laboratory (Code 46, 2004).*



▲ *The shooting of a scene for the film Harry Potter and the Order of the Phoenix took place at Westminster Tube station one Sunday in 2006. In the film, Arthur Weasley is impressed as he enters the station. "Trains! Underground! Ingenious, these muggles," he extolls.*

A CAR? YES, BUT IT'S SHARED!





RIDING INTO THE FUTURE

Lars Backström is a man with a mission. He has no shortage of words when telling Pulse about the ambitious goals he has set for Västtrafik, the public transport authority he heads in southwestern Sweden's Västra Götaland county.

by
Richard Venturi



to be the best we can be.” Of course, this was easier said than done. Lars says he was convinced Västtrafik needed to have commercial goals to turn its operations around. Ridership was flagging when he was recruited. He immediately realised that if it were to grow, Västtrafik would have to do more than simply increase the number of trips taken it would have to attract new riders. So he set the ambitious goal of doubling ridership, the so-called “public transport x2” concept developed in Sweden that has grown popular in cities around the world. But doubling ridership required changing the authority’s image altogether. “You don’t attract more customers by just providing more public transport. Like in any other business, you have to play to people’s emotions. People are not completely rational. If they were, they wouldn’t buy BMWs or Porsches to go to work.”

Eight years ago, Lars was appointed CEO of Västtrafik (see box on the following page). At the time, the authority was run like you would expect any such organization enjoying a monopoly to be run. The focus was on providing standardised service to people who have to use public transport and ensuring the network functions smoothly, securely and on a regular basis.

Mention public transport today and most people think of protecting the environment and making congested cities more breathable. Though this is increasingly vital in urban areas, there is more to buses, subways and streetcars than sustainability. Lars Backström, the head of Sweden’s second largest public transport authority, certainly doesn’t need any convincing of this.



TEAMWORK

Lars knows how much the brand is key to this transformation and the business results. And building a strong brand image meant rallying everyone together, which was particularly important as different operators work under the Västtrafik banner. To this end, he developed common indicators for all stakeholders and established certain important routines, such as holding Monday morning management meetings to go over goals and track progress. “It’s in Keolis’ best interest if Transdev is successful and vice versa. It leads to emulation, and they can also share best practices to help each other.” The key to brand association for Lars consisted of viewing the transport business like a franchise. “The customers don’t care who our partners are and who is doing what, their relationship is with Västtrafik. But at the same time, without the

THE CUSTOMER FIRST

Lars saw more needed to be done. Having been educated in the US, he worked in IT, advertising and the hospitality industry before managing the largest taxi company in Sweden’s second city, Gothenburg, his hometown and core of Västtrafik’s operations. From the moment he was brought onboard by the regional council, he decided to shake things up. “My vision has been to transform Västtrafik into a modern services company that puts the customer first. For me, we needed to change our mindset: stop thinking that transport is a different type of business and see having a monopoly as a responsibility



VÄSTRA GÖTALAND

As Sweden's second largest county, it contains **49 municipalities**, including the country's second city, Gothenburg (Göteborg in Swedish). With just over 1.6 million inhabitants, Västra Götaland has 17% of Sweden's population.

Some **375,000 passengers** make **940,000 trips daily** throughout Västtrafik's network. Renewable energy is responsible for a full 65% of the 390,000 passenger kilometres generated every day.

Västtrafik's fleet includes **2,700 buses, trains and ferries** that stop at **21,000 locations** across the county, making it the second largest public transport authority in the country.



franchisee [the operator], there is no business. In that sense we're the same as McDonald's or Burger King. If one partner isn't successful, it will hurt everyone – we're all working under the same brand.”

PARTNERSHIPS TO GO THE DISTANCE

When asked about the reasons for joining Västtrafik, Lars smiles, admitting that despite being initially attracted to the commercial challenges of his position, he very quickly became interested in the wider issues surrounding public transport. He recognised how it could be a key partner in driving the energy

transition forward. “It is absolutely key for us to look to environmental sustainability. We've been working with Volvo, who are based here in Gothenburg. They called me and presented their strategy for a route for electrified buses. It was a no-brainer, really.”

Lars is referring to Gothenburg's groundbreaking cooperative transport project, ElectriCity. Launched in 2015, it has brought together Volvo, Västtrafik, the City of Gothenburg, Keolis, Ericsson and several research institutions to develop and test an electrified bus route. Not only do the vehicles on route 55 run on renewable energy, but there are also indoor bus stops.

For Västtrafik, ElectriCity represents a unique opportunity to participate in a transport project that could pave the way for the public transport of tomorrow. It shows how partnerships with other actors bring together different skills, leading to innovative and novel solutions. This, in turn, can boost ridership. “It was an instant success; it has been something unique and new. And riders were certainly attracted to it.”

Innovating for the benefit of the community like this is clearly something public transport is well placed to do, and it can push people who wouldn't normally use public transport to try it out. The massive interest in the project attests to this potential. In its first two years some 100 delegations from all over the world have visited Gothenburg to





find out more about the project. It has also been listed as one of the top 100 sustainable solutions for urban environments in the world by think tank Sustania, has been singled out for its innovation by the UN and won the 2016 Euro-China Green & Smart City Award for sustainable transport and mobility.

The success of ElectriCity has led to the extension of the trial period till 2020, with the addition of two electric high-capacity buses on route 16. In Lars' mind, there is no doubt the project has helped burnish the image of public transport and increase ridership.

MOBILITY AS A SERVICE

Ever forward-looking, Lars is convinced the future of public transport and the recipe for sustainable cities lie in catering to individual needs. "The challenge is how to use our data to improve our services and create value from them. Airbnb created new value out of something that's been around a long time, renting accommodation. We can do the same in public transport." He feels mobility as a service may be one response to this challenge. "We want to create a platform where we offer our services and allow others, like Whim, to use them as a platform to provide theirs," he says, referring to the Finnish multimodal transport



app that links cities and public transport networks.

There are a lot of initiatives for, and interest in, combined mobility (for example, from Siemens and Ericsson), but Lars stresses that as of yet the players don't know what the product will be as it will be difficult to piece together the different modes with one point of entry.

Lars' commitment to digitisation is also exemplified by the 'Västtrafik to go' app (see Box 1), launched in April 2016. Västtrafik is fully invested in open data. "Ultimately, it can help us make sure our customers get the right information when things aren't working as they should be."

This may well prove extremely valuable sooner rather than later. Gothenburg is to undergo an extended period of at least several years of major public works, with the construction of a rail tunnel under the city.

"It will definitely be a challenge for us in dealing with it, but it will also give us an opportunity to prove public transport is better," he says with a smile.

If the last eight years are anything to go by, Västtrafik is well placed to do so. "Since 2009, we've increased our ridership more than anywhere else in Sweden – slightly over 40% since I started. Just under 400,000 people today make 940,000 trips per day." To put this into perspective, the Gothenburg metropolitan area has just under 1 million inhabitants.

"We've also managed to increase customer satisfaction a lot. A full 96% percent of people polled onboard express satisfaction with their latest trip. And overall, just over 80% of riders have a positive image of Västtrafik, up from a mere 50% five years ago."

No doubt the coming years will be a challenge. But given Västtrafik's track record, not only does it look set to meet it with flying colors, it will likely serve as an inspiration for cities and transport authorities far and wide. ●



VÄSTTRAFIK TO GO

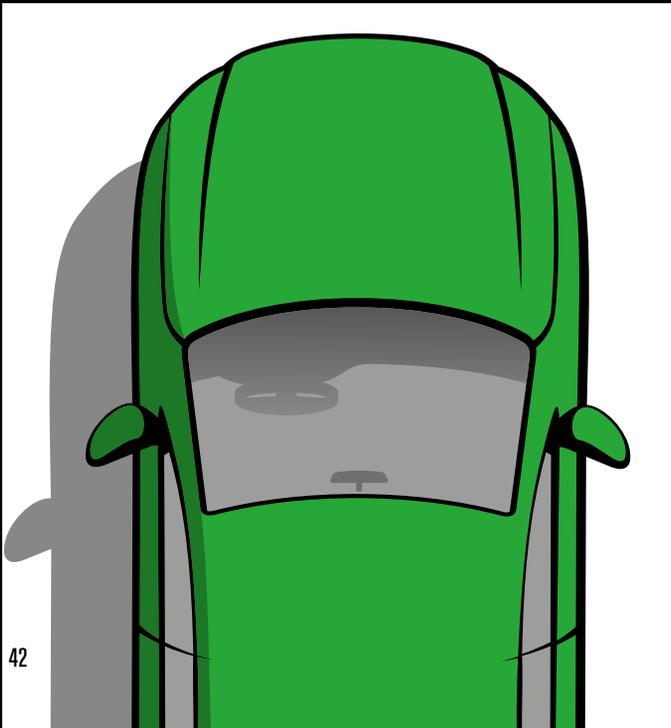
Launched in April 2016, the application has been downloaded some 500,000 times since. Its e-ticketing service has been a particular success, allowing customers to purchase one-day, three-day or monthly e-tickets and driving up revenues by 20%.

By allowing Västtrafik to draw on their data to improve their services and create value, it has shown that transit authorities can be e-commerce players in their own right and helped change customers' perception of public transport.

Beyond this, it has made public transport in Västra Götaland more accessible.

NEW SPOTS OPENING UP FOR PARKING

by William Mengebier



It wasn't so long ago that underground garages were seen as dark, dirty and dangerous places, a sinister setting favoured by Hollywood filmmakers. Gloomy and dimly lit, they were a place in which to park your car and leave quickly.

The image of parking facilities has improved markedly over the past decades, with safer, better illuminated lots and garages that are more welcoming for consumers. In recent years, the pace of change has accelerated, with the industry undergoing a veritable reinvention in response to an array of global forces.

A SHIFTING LANDSCAPE

Many of the same disruptive economic, technological and regulatory forces that have upended other industries and business models are being felt in parking. Markets in many developed economies are mature or even declining while consumer lifestyles and behaviours are continuing to rapidly evolve. Significant trends influencing the entire mobility sector are also shaking up the parking industry:

AUTOMATED CARS, which could decrease demand for city parking by as much as 90%. Kara Kockelman, a transportation engineering professor at the University of Texas found that up to a dozen regular cars could be replaced by one autonomous ride-sharing vehicle, which could be parked remotely outside the city when not in use⁽¹⁾.

RISING ENVIRONMENTAL CONCERNS, reflected in consumer desires for more livable, walkable, sustainable communities and the rise of sustainable mobility solutions as alternatives to automobiles.

CHANGING CONSUMER PRIORITIES, including the commuting/driving preferences of millennials – in the U.S., for example, people under 30 are 7.2 times more likely to take public transit than those over 60⁽²⁾.

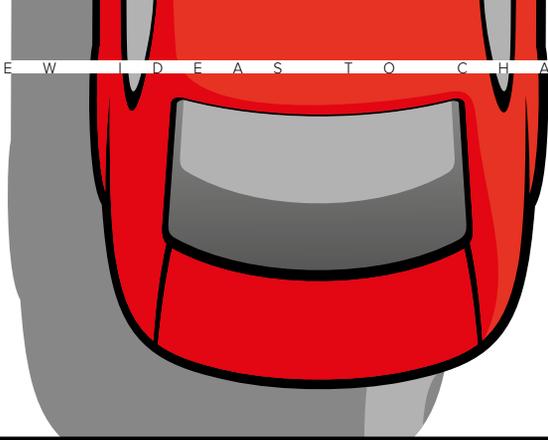
INCREASING RESTRICTIONS ON VEHICLE TRAFFIC IN CITY CENTRES; from Paris to Seattle to Mexico City to Chengdu to Oslo, local governments are seeking to improve quality of life and ease congestion that is estimated to cost the EU €100 billion annually, or 1% of gross domestic product⁽³⁾.

EMERGENCE OF NEW SHARING ECONOMY MODELS including carsharing and carpooling, diminishing demand for individual vehicle ownership.

(1) Transportation Research Record, No. 2536: 98-106, 2015

(2) Who's On Board 2014, a Transit Center/RSG study

(3) Clean transport, Urban transport, European Commission, 2011



DRIVING CHANGE

The combined effects have stirred the industry. Traditionally an arms-length, cash-only business, parking is increasingly a hotbed of technology advancements and innovations aimed at improving operational efficiency and customer service. In addition to transforming the industry itself, the long-overdue reinvention also is creating new opportunities for consumers, associated businesses and communities. Change is concentrated in three primary areas:

SERVICES:

Digitally-enabled offers allow consumers to reserve parking spots remotely, make payments or request valet services – for example, since 2013, French startup Onepark enables drivers to compare, book and pay their parking space through an app on their smartphone, in more than 500 parking facilities in 70 cities across France, Belgium and Switzerland; private garages with surplus capacity are opening access to the public such as introduced in spring 2016 in Paris by office building company Gecina for 37 of its buildings, opening up 1,300 new parking spaces, easily bookable through a dedicated app; maintenance services such as vehicle cleaning or mechanical maintenance may be offered individually or in packages to both individual owners and car rental companies; concierges can help with package delivery, errands and shopping; book lending is becoming popular, particularly at facilities providing links to public transport.

MOBILITY LINKS:

Integration with other forms of transportation is improving, including park-and-rides, combined pricing with public transit, availability of rental bicycles, electric cars and other multimodal applications, as well as providing facilities for two-wheeled vehicles. The city of Edmonton (Canada) is currently conducting a survey to understand commuters' expectations around park-and-ride (P+R) facilities. The information collected will help in planning potential locations, pricing and services for future P+Rs.

SUSTAINABLE FACILITIES:

Parking facilities are adopting and promoting sustainable mobility solutions such as solar panels, lots with water permeable surfaces, eco-friendly car washes, reserved spaces and preferential pricing policies. A parking structure at California's Pomona College, for example, provides sustainable parking for more than 1,600 campus users and a rooftop lacrosse field as well as energy-efficient lighting, a solar canopy and a fully automated lighting system to offset its energy use. These and other measures have enabled the college to reclaim four acres of open space, decrease energy usage by 20% and save 50,000 gallons of water per week. Electric mobility offers an additional promising new role for parking facilities as recharging stations. In the U.S., Park Smart – formerly Green Garage Certification – certifies sustainable garages.



Discover more at: <http://parksmart.gbci.org/>

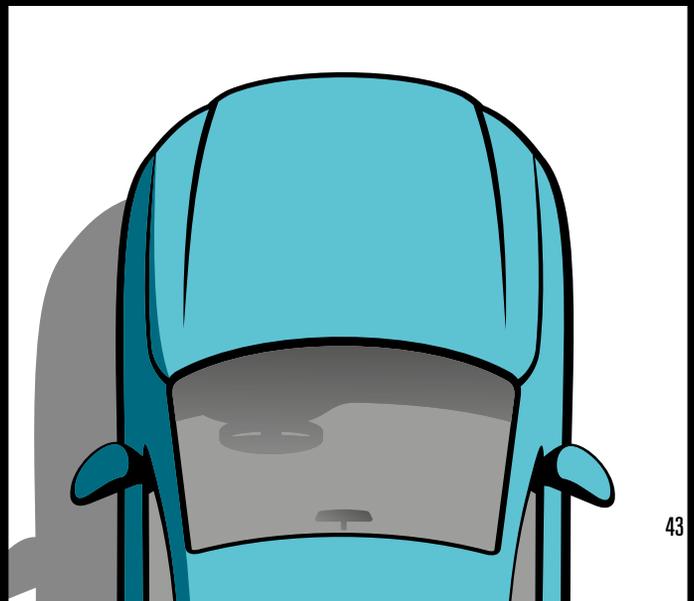
WORLD OF OPPORTUNITY

A range of innovations are revolutionising the parking sector. These include technologies for access control and payment automation, electronic cashless payment such as the Ericsson Globe in Stockholm where Automatic License Plate Recognition technology creates a cashless, barrier-free and user-friendly solution for parking, mobile apps, transmission to smartphones of real-time pricing and availability information and wireless sensing devices for traffic management. Coming soon: dynamic pricing that incentivises drivers to park cheaper at specific locations to incentivises capacity and parking garages communicating with nearby stoplights after a big event to adjust traffic. In San Francisco (USA), SF Park is developing a solution to expand its on-street dynamic pricing approach for the city's lots and garages.

In the parking sector, small steps add up to big impacts. All of these changes are creating new opportunities for both the industry and its stakeholders. Consumers are benefiting from greater ease-of-use, flexibility and efficiency. Local businesses benefit from improved parking availability and real-time information saves on both fuel use and car emissions to the environment. Communities have additional tools to address pollution, noise and congestion issues while increasing transport connectivity. From their days as dark and frightening places to today playing a key role in the mobility chain, parking facilities have come a long way.

PARKING FOR LIFE

More than just a place to deposit one's car, parking facilities are becoming urban mobility hubs, serving as charging stations for electric cars, drop-off zones for ride-sharing companies, hubs for connecting to bikes, rail and buses to get consumers from point A to B to C or even a storage site for drones. But as communities reconsider the space allotted to parking, today's lots and garages are being designed and used for an increasing number of roles. An art gallery like "The Z" in Detroit; a cultural events centre such as Tokyo's Daikoku Futo, host to night-time classic car club parties; a café and campari bar in London; an outdoor movie theater in Los Angeles; the "Eleven Eleven" concert venue in Miami; sites for street hockey matches in Winnipeg, Canada, farmers' markets and food trucks...parking facilities are being reinvented to become full social living spaces!

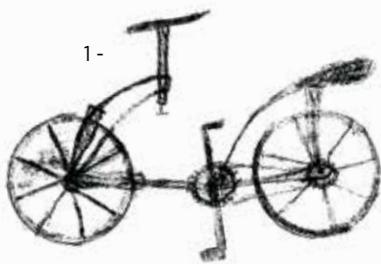


~ CURIOSITY CABINET ~

A BRIEF HISTORY OF OUR TWO-WHEELED COMPANIONS

Bicycles have been around for some 200 years.

Since their invention, they have certainly evolved! So let's back-pedal and take a look at the key stages in the history of bikes.

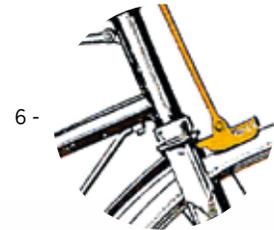
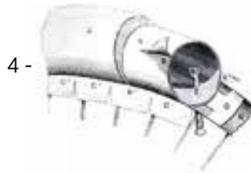
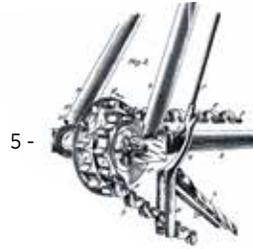


1 -
1493
THE FIRST SKETCH OF A RUDIMENTARY BICYCLE DESIGN

is attributed to Gian Giacomo Caprotti, a pupil of Leonardo da Vinci.

2 -
1817
BARON VON DRAIS, A GERMAN, INVENTS THE DRAISIENNE

Built on a wooden frame and wheels with wrought iron bracing, it had the first steerable front wheel but no gears or brakes.



3 -
1871
THE PENNY-FARTHING MAKES ITS APPEARANCE

Also known as the high-wheel or ordinary and with a huge front wheel, it was faster but more hazardous, as the rider was seated up very high. It had steering, a tubular steel frame, solid rubber tyres and was equipped with pedals on the smaller front wheel and rear rim brakes.

4 -
1888
TYRES MAKE ALL THE DIFFERENCE!

Watching his son struggle to ride his tricycle over cobbled ground, Scottish vet John Dunlop wrapped its wheels in thin rubber sheets, glued them together and inflated them with a pump. The pneumatic tyre was born and Dunlop quickly patented his idea.

5 -
1895
CYCLING SHIFTS UP A GEAR

Frenchman Jean Loubeyre designed the first-ever gear-shift mechanism (derailleur), which he called the 'Polycelere' (multispeed).

6 -
1900
SQUEEZE TO A STOP

The beginning of the last century saw the development of drum brakes, which apply friction through a set of rubber pads to the rim or tyre of the front wheel. The brake is operated by levers on the handlebars.



7 -
1930s
FIRST
MOTORIZED
BICYCLES
MARKETED

A battery is used to power the motor and amplifies the pedal strokes.

8 -
1970s
MOUNTAIN
BIKES
HIT THE
TRACKS

Mountain bikes were developed by cycling enthusiasts to ride the mountains trails of California.

9 -
2000s
BIKE-SHARING
BOOM

One after the other, major cities around the world have launched public bike-share schemes. As the trend grows, creative concepts are being rolled out: lighter, foldable frames, handlebars that can become a lock, power-assisted rear wheels and indicator systems.

10 -
2009
FROM ELECTRICAL
ASSISTANCE
TO A HUB OF
INNOVATION

Designed by the Massachusetts Institute of Technology for the city of Copenhagen, The Copenhagen Wheel looks like a regular bicycle wheel, but packs an impressive amount of smart pedal power. Sensors in the motor-equipped rear wheel monitor temperature, speed and performance, as well as air and noise pollution, congestion and road conditions. And when the rider brakes or back pedals, the wheel captures the energy and sends it back to the battery for when it's needed.

11 -
2014
NEVER GET LOST
AGAIN!

A smartphone navigation app alerts the rider to upcoming turns by buzzing through a vibration system built into the handlebars - leaving the rider to keep their eyes on the road.

12 -
2015
LATEST
INNOVATION:
THE HYDROGEN
FUEL-CELL
BICYCLE

Time already to say goodbye to the motorised bike's battery? Possibly, following the advent of a simpler, greener solution: the electric powered bike that runs on hydrogen. Hidden inside the frame of the bike, the hydrogen fuel cell gives it a range of 100 km (63 miles) and it takes just two minutes to charge (compared with 3 hours for lithium batteries, which only have a range of 40 km).

~ SPECIAL THANKS ~

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