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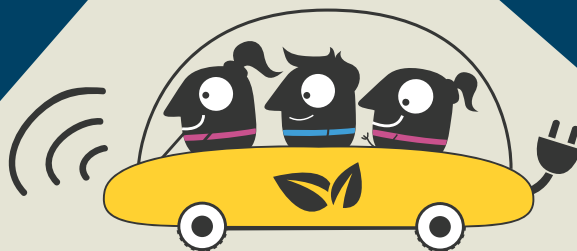
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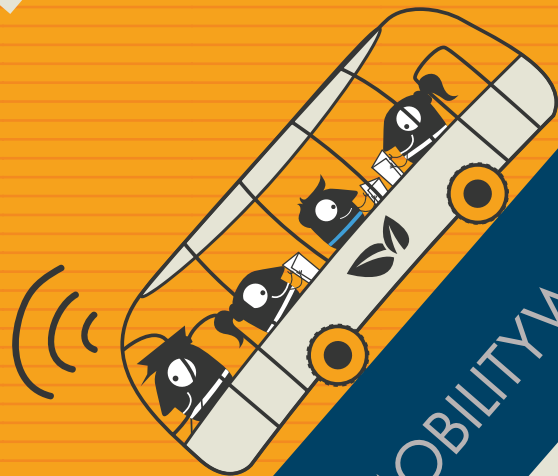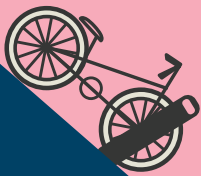
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The thinking city as a service

Karen Vancluysen and **Kevin Borras** on what Mobility as a Service means in a smart-city context

What is needed for public authorities to make MaaS become a widespread reality?

In many ways, the answer depends on your understanding of MaaS. Is it about the shift from driving to sharing or is it about a digital platform enabling the booking and payment of a wide range of mobility services - or both? City and regional authorities have been working in both areas for many years. MaaS did not invent them. What MaaS has done is bring the notion of moving from ownership to sharing into mainstream transport industry thinking and make the case for including personal transport modes (taxis, car sharing and car hire) in mobility packages offered to the user.

Generally speaking, authorities support initiatives that can reduce private car use and ownership; they can also be an important enabler of such initiatives, through policy, regulation and potentially financial support. But these initiatives should also support wider transport policy and societal goals, such as the promotion of sustainable modes (walking, cycling and public transport) and service offerings that are affordable and accessible for all. Car sharing therefore should always be a complementary mode of transport. MaaS packages should have a strong public transport dimension and should avoid targeting high-earning, tech-savvy users only. It is for this reason that Polis advocates public sector oversight of third party-driven MaaS developments to ensure they integrate with policy, rather than remain distinct from it, and key issues such as affordability, inclusion, access and service levels are guaranteed to the user.

There are several articles in this issue that focus on, or at the very least mention, bike-and car-sharing schemes and its initiatives such as these that form the basis of MaaS in 2017. But what next? What will 2018 bring that will tilt balance from science fiction into science fact?

The notion that the concept of shared mobility will in the not-too-distant future also include the ability to summon an autonomous vehicle using the same smartphone app that you used to rent a bicycle is certainly the subject of much discussion and it rather depends on what your definition of "not-too-distant future" is, but the experts will happily tell anyone that will listen that it's going to happen within the next 25

> **The proliferation of MaaS is, if nothing else, a huge exercise in behavioural change...**

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years. Maas Global's Whim app has every chance of being the first to offer the ultimate in mobility as a service but founder Sampo Hietanen agrees that it's "some years off." Local Motors' Olli is a 3D-printed autonomous shuttle that is aiming to revolutionise short-distance transport needs, such as cross-campus trips and those arduous journeys when you are weighed down with shopping bags and have to make two journeys on foot between the out of town mall and your car which seems to have moved another 200m away. A 3D-printed, driverless, electric shuttle bus will be along in a minute or two. If MaaS is about making life easier then that's a perfect example of how it will do just that.

The proliferation of MaaS is, if nothing else, a huge exercise in behavioural change. The basic tenet of MaaS is that it solves a problem, but what if you live in a town or city that is already well-served by public transport? Changing your behaviour to take advantage of a MaaS intiative is not going to be a huge leap into the unknown. Will ordering a MaaS mode become as commonplace as ordering a coffee?

Take Croydon, for example. A town of 400,000 inhabitants on the outskirts of South London where *Thinking Cities* has its headquarters: it has one of the busiest mainline railway stations in the UK, it has a stop on the London Overground service, it has an extensive tram network and is served by numerous bus routes and a recently installed bike-share scheme at the Croydon Cycle Hub. Does that not sound like the type of conurbation that would be open to trialling a MaaS scheme, particularly for the last mile? Maybe we will find out in the next issue of *Thinking Cities*, but if MaaS can be tailored to meet the needs of cities and regions of differing sizes, varying topography and shifting demographics, then the aforementioned flexibility in affordability, accessibility and service levels are going to be crucial to its long-term success. Piloting a MaaS scheme in a city that is almost entirely reliant on the car is not something to be attempted by the faint-hearted.

It is not about how many cars there are and what the modal share is now. If MaaS can help achieve the city's goal then there is a use case. That problem justifies these efforts, rather than maintaining the status quo.

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THINKING Highways

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In memory of Maurizio Tomassini 1945-2017
Former president and founding member of POLIS

Cityview

Senior transport officials from forward-thinking cities around the world discuss their plans for the future and how they are addressing the mobility issues that matter most to their citizens.

Seleta Reynolds is General Manager at Los Angeles' Department of Transportation and also serves as the president of NACTO, the urban mobility network of US American cities. Prior to her keynote speech at the 2017 Polis Conference closing plenary session, Ms Reynolds told *Thinking Cities* what drivers lead to change in LA's transport system, why cities cooperate across borders and what role the private sector plays

An American emblem

Los Angeles is home to 3.98 million people. What are the greatest transport challenges you are facing in the city?

As the largest city in the largest state in the United States, Los Angeles grapples with almost every urban challenge facing cities today – from congestion to affordability to equity to safety. Our strategy is to focus our efforts on projects and policies that offer triple bottom line wins.

For example, our Vision Zero program aims to eliminate fatalities by 2025, focusing on the streets in Los Angeles where there are the largest concentration of severe and fatal injuries for people walking and biking. In Los Angeles, half of these streets are in neighbourhoods that experience other negative public health outcomes like childhood obesity, that result from decades of disinvestment and a lack of places to walk

and bike safely. Targeting infrastructure and safety investments in these neighbourhoods allows us to reach past traffic safety and, empowering the community, improving other outcomes at the same time.

For many European cities, addressing the air quality challenge is one of the most pressing factors in making urban mobility more sustainable and cities more liveable. Does

The City of Los Angeles has pledged to operate a 100%-electric bus fleet by 2030. In addition, the BlueLA program aims to bring electric car-share vehicles to low-income communities

Photos: LADOT
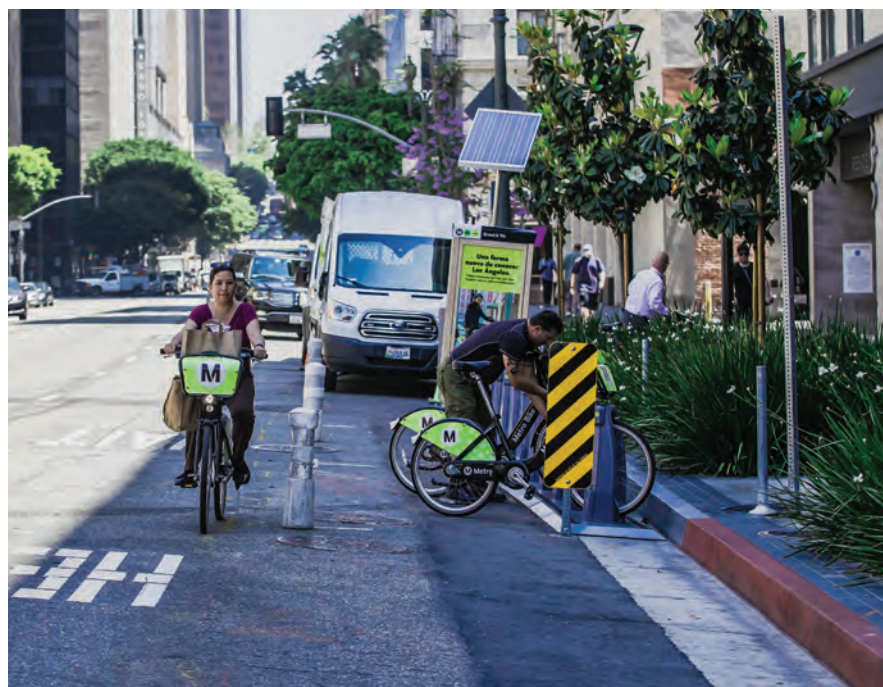
> *American cities are strongest when we share our knowledge and endeavour to find areas of alignment around major policy issues, such as how cities will prepare for the arrival of autonomous vehicles*

the same apply for LA and other NACTO (National Association of City Transportation Officials) cities?
One of the great American environmental success stories was Los Angeles' transformation from a city where the air was so dirty that children could not play outside, to one with much cleaner air where kids can be outside every day of the year. But we have a long way to go. Mayor Garcetti's 'Sustainable City pLAn' and his strong commitment to electric vehicles and transit are emblematic of many US Mayors' continued focus on environmental sustainability.

Safety, socio-economic equity, and affordable housing are other key drivers.

You are serving as the president of NACTO. Which American cities currently lead the urban transport transformation?
American cities are strongest when we share our knowledge and endeavour to find areas of alignment around major policy issues, such as how cities will prepare for the arrival of autonomous vehicles. Cities like Portland, Chicago, New York, San Francisco, Washington DC, and Seattle have unleashed

creative solutions to creating streets as vibrant open spaces, protected bikeways, dedicated bus lanes, and a variety of designs that have created a new playbook for urban street design. NACTO's strength is our ability to convene and document lessons learned so that all cities can begin to incorporate these approaches. We have a long way to go, but in the last 10 years, the progress has been powerful.

How does NACTO help you and LA to achieve your urban transport goals?
Most cities, affiliates, and transit agencies who belong to NACTO

In 2016, the city launched Bike Share in partnership with Metro

are there because they are leaders in transportation transformation. Los Angeles' Department of Transportation, LADOT's, current strategic plan calls on us to deliver a city that is safe and healthy, liveable and sustainable, and to create a great place to work that is transparent and responsive to its customers. Within each of these goals, LADOT has a series of actions and benchmarks to set our intentions and track our progress.

NACTO just released the Blueprint for Autonomous Urbanism, which follows our policy paper on AVs and articulates a clear position that cities must nudge, guide, and invest in a future that is connected, electric, and shared. NACTO's encyclopaedia of modern street design guides, its policy papers, and the aforementioned Blueprint for Autonomous Urbanism give us powerful tools to communicate with policymakers and change our approach to design. They are a permission slip to innovate. The annual Designing Cities conference (the largest one to date held this year

As the arrival of connected and autonomous vehicles looms, we continue to look for creative ways to grow that relationship, thinking about things like curb pricing and other opportunities to continue to fill our role of delivering public transit as a public good and not for private profit

The People St. Program converts on-street parking into parklets as a way to expand the sidewalk

in Chicago with over 800 attendees) offers us unprecedented opportunities to collaborate and share best practices.

NACTO's international members are cities in Canada and Mexico. What is the most fruitful part of city cooperation across borders in your experience? Which European developments would you consider particularly interesting for US cities to learn from and vice versa?

Although our governance structures are different, we share many common goals with cities in our neighbouring countries. And in a time when the US is sending confusing signals to the world at the federal level, alliances among cities are more important than ever. Cities get things done. NACTO's Global Street Design Guide is an excellent example of our interest in reaching out beyond US borders to convene and share inspiring best practices, whether in Addis Ababa or Quito or Quebec or Houston. Good ideas can and do flourish when we partner. The European approach to thinking through autonomous transit in particular is an area where the US has a long way to go.

You are the keynote speaker for the 2017 Polis Conference's closing plenary, which addresses the changing role of local authorities in urban transport provision. The private sector is playing a growing role in light of new mobility services, so according to your experience: Is it possible to ensure that third party services will support transport policy goals?

It is critical to understand that real partnerships take time to develop trust in a relationship. For too long, public and private interests have stayed in their silos, content to work towards our individual goals, sometimes in spite of each other. It is clear that this is no longer an acceptable approach.

The public sector cannot solve our enormous urban challenges alone, and private interests cannot ultimately be successful without a legible infrastructure system that eases operation. However, it is not reasonable to expect this to change overnight or for us to come into alignment with each other. In Los Angeles, we have taken an aggressive approach to public-private partnerships with services like electric car sharing and bike sharing. We do not regulate ridesharing services like Uber and Lyft, so we are sidelined in that conversation. As the arrival of connected and autonomous vehicles looms, we continue to look for creative ways to grow that relationship, thinking about things like curb pricing and other opportunities to continue to fill our role of delivering public transit as a public good and not for private profit. ©

Above: The People St. Program creates pedestrian plazas by closing a portion of streets to vehicular traffic

Left: Seleta Reynolds

FYI

Seleta Reynolds is General Manager of the Los Angeles Department of Transportation (LADOT). She is responsible for implementing Great Streets for Los Angeles, a plan designed to reduce traffic fatalities, double the number of people riding bikes, and expand access to integrated transportation choices for Angelinos and the region.

Ms. Reynolds has over 18 years of transportation experience throughout the United States. She has advised transportation technology companies like WalkScore, contributed to the state-of-the-practice as an Association of Pedestrian and Bicycle Professionals Board Member, mentored young professionals through Women's Transportation Seminar, and nurtured research on Transportation Research Board committees. Ms. Reynolds serves as the President of the National Association for City Transportation Officials (NACTO).

Polis' **Marko Lovric** spoke with **Frank Vanden Bulcke**, Director of Ghent's Mobility Company about the impact of Ghent's circulation plan, the power of parking policy and the difficulties to finance a public transport system that deserves the name

Making space for mobility

Ghent's most recent major mobility measure has been the implementation of the new circulation plan, earlier this year. Has it been a success?
We can absolutely confirm that it has. Initially, it was expected that users of our city would only really accept the plan by summer 2017 but the acceptance has actually spread much

Cyclist numbers in Ghent have increased by 14 per cent in four months

the B401 - a major traffic artery for cars to drive into the centre - has dropped by almost 20 per cent during these first months after launch. Simultaneously, the traffic flow on the R40 ring road did not deteriorate, despite the fact that cars are being diverted here to avoid the centre. The complete evaluation report is scheduled for spring 2018. That report will provide a more complete picture of the situation before and after the implementation of the plan.

How was it possible for the circulation plan to have such an imminent impact?

We decided to first roll out a full parking plan that almost doubled the area in which motorists must pay for parking. In addition, parking time in the city centre has been reduced to three hours while rates have risen fundamentally and are up to almost 300 per cent now. Ultimately, price and time are key drivers to steer the behaviour of the people. As a consequence, prior to the introduction of the circulation plan, the number of cars coming into

faster. The circulation plan is part of Ghent's SUMP, our sustainable urban mobility plan.

What impact does the circulation plan have on traffic and vehicle numbers?

There are a number of traffic arteries in the inner city where the traffic

dropped immediately. There were also many more cyclists on the streets. At the two locations where we continuously count cyclists, their number increased by 14 per cent during the first four months after the launch, compared to the same period last year.

Additionally, the traffic volume on

Ghent's centre was already reduced and parking capacity was freed up.

The parking plan was complemented by additional mobility measures such as a car-sharing plan and the development of a cycling network that is also part of the SUMP.

Local newspapers have held Ghent's circulation plan responsible for a decrease of inner city business revenues for shops and hotels. Do you think the circulation plan has shortcomings?

There are actually no clear figures regarding the turnover of the businesses in that area of the city, including the hotels. We determine that the centre itself still attracts a lot of people, but the peripheral zone right around the centre complains about less sales. A city should act from a long-term vision in any case. It is the attractiveness and accessibility of a city centre that will determine the profit margins in the centre. With the circulation plan and the parking plan, we managed to ensure that the driver who really has to be in the centre can still get there and will find a parking lot. Others can drive to the park and ride belt around the city. In the medium term, Ghent will continue to invest in the construction of six car parks around the city.

Has public transport become the true backbone of mobility in Ghent?

Unfortunately not. In order to be a real success, there should be additional supply of public transport services at the moment as the circulation plan is launched. De Lijn, the Flemish public transport company, is, however, facing budget cuts and as a consequence the city of Ghent is confronted with a drop in supply rather than an increase. That's why the city has taken responsibility and provides additional funding, for example for the evening network. If this additional offer would not be provided, public transport services

Castle of the Counts, Ghent

in Ghent would be completely shut down by 23:30h.

In order to promote Park&Ride to commuters, the city itself provides a shuttle bus from the parking facilities. Ideally this would be integrated into the regular parking transport offer.

We hope that in the future public transport in the city will be strengthened, also taking into account the basic accessibility requirements the Flemish government wants to apply. In the end, public transport should indeed be the backbone of urban mobility to make and maintain liveable cities. The growth of cities the world over will certainly bring additional challenges.

In 2015, Ghent was announced as a finalist in the European SUMP

Award for your monitoring and evaluation activities in the SUMP process. What have you learned in those evaluation processes that improved the new SUMP?

An important aspect is to start elaborating the evaluation process in an early stage. This gives you time to define clear targets and indicators, to discuss the evaluation process with the stakeholders, to set up collaboration with internal and external partners and to conduct baseline measurements. We also participated in CIVITAS ELAN, in which we could extend our expertise in evaluating SUMP measures

We have extended our unit responsible for monitoring and evaluation in recent years. Right now, we are evaluating our latest circulation plan. We

Further findings

Frank Vanden Bulcke (*left*) will further elaborate the findings of Ghent's circulation plan in a presentation at the 2017 Polis Conference in Brussels, December 6 and 7, in session 3E.

was launched which simulated the future situation. In this way, people could already investigate which new routes they could use soon. This was a very good tool in communication. Shortly after the launch of the circulation plan, this route planner was put back offline once the commercial route planners such as OpenStreetMap, Waze, Google Maps, Here, Apple maps and TomTom were adapted to the new situation. It is important in the context of the launch of a new circulation plan to involve the suppliers of such professional route planners much in advance in order that they can prepare themselves well for the new situation.

Ghent is one of three cities in Europe that has been granted 5 million for Urban Innovation Action. What are your plans for this and how will it change people's lives?
The multi-modal approach of Traffic Management as a Service (TMaaS. eu) enables citizens to gain immediate access to up-to-date information about their choice of transport and their route, for example by sending personal push messages through social media. The platform gives users the option of directly giving feedback on those messages. All mobility data will be monitored and used to evaluate and prepare mobility measures when needed.

Co-creation sessions and an inclusive design approach with the major Flemish universities will put the citizen in the driver's seat. The needs from inhabitants and traffic operators will serve as an input for our diverse

partners in the project. They will develop the www.tmaas.eu platform that can be used in any small-to-medium sized city around the world.

Will MaaS be the future virtual traffic control centre? The new approach to traffic management puts less focus on owning a vehicle and more focus on providing information on the existing transportation possibilities to our citizens. Traffic Management as a Service will help prepare the City of Ghent for innovations like Mobility as a Service and put us on the map as a trailblazer for innovative and smart mobility.

After continuous work throughout almost 30 years, Ghent has built up a thorough system of SUMP practice. What is your key advice to other cities working hard to make sustainable urban mobility plans a reality?
It is important to make action plans containing realistic goals. The advantage of a SUMP is that after several decades such sustainable urban mobility has become the basic reasoning for many of us. The sustainability idea becomes, at that point, an integrated way of thinking and acting. ©

collect and analyze data for a period of four years to evaluate whether the pre-set goals are met. An important portion of the data collection is conducted by our own traffic research unit. Besides, we are looking for innovative methods to collect and analyze more relevant traffic data.

A multimodal route planner including walking, cycling and car use was launched for Ghent along with the circulation plan. What are its most innovative features?
In the run-up to the implementation of the circulation plan, a route planner

FYI
Frank Vanden Bulcke is the head of the Mobility Company in Ghent, one of the most innovative city services in Belgium. With a team of 160 employees, he is concerned with (bicycle) parking, bicycle routes, transport management, traffic guidance and related transport services in Ghent.

Educated as an engineer and expert in urban planning and traffic management, Frank Vanden Bulcke has previously served as Mobility Manager for the Flemish government and as an undersecretary for the Minister of Mobility.

Martin Hale introduces the technology with the potential to optimise road transport and public services - opportunity charging

A new opportunity

Transport engineers are currently trying to work out the most efficient ways to power vehicles and as new technologies are introduced road transport is set for some exciting changes.

When the first electric buses launched, in order to have a maximum range during the day they were fitted with large batteries that had to be charged overnight.

However, there are benefits to switching to smaller batteries that can be charged little and often using "opportunity charging". Not only can the weight and size of vehicles be reduced, operators can reduce the logistical burden of overnight charging at bus depots.

Opportunity charging is carried out by fast chargers at bus stops with a pantograph that lowers onto contact rails on the roof of the bus. The time taken for passengers to embark and disembark is used to charge the batteries. This means that the bus receives small top-ups of charging regularly throughout the day as it travels along its route. In theory, this enables the first ever 24/7 service of buses as they never have to return to the depot for charging or refuelling.

The pantographs are coupled with AC-DC converters that convert alternating current (AC) that flows in the mains to direct current (DC) that is used to charge batteries. They can be housed in existing street furniture or a new mast. A single mast, in theory,

> **By increasing the numbers of electric vehicles on the roads and decreasing reliance on diesel vehicles there will be fewer particulates, meaning less damage to health as well as lower greenhouse gas emissions**

can serve an entire fleet of electric buses or a few masts could serve a whole town. This means that the capital cost of the vehicle can be reduced as bus manufacturers can simplify their vehicles by cutting out the large battery and using a single stationary pantograph rather than one on each bus. Furthermore, because a vehicle's weight is proportional to the energy required to move it, the lower weight buses reduce the energy consumption along every mile travelled.

These benefits really speak for themselves, but savings are also found in the depot. This is because opportunity charging eliminates the need for electric buses to be charged overnight, the power supplies it takes to feed them, the mains power needed to plug them in and the footprint to park them. As a result, operators can focus their resources on passenger services, with buses only needing to park when the timetable dictates.

Pollution levels can also be reduced, which is more important now than ever. When diesel and other fuels are burned, a mixture of gases, vapours, liquid aerosols and particle are created. This includes carbon dioxide as well as particulates, which are sooty or ashy particles.

Until recently, carbon dioxide has been the subject of much legislation as it increases the greenhouse effect and therefore climate change. However, new legislation is focusing on particulates as health organisations have identified them as potentially posing a risk to health and being linked with breathing and respiratory problems. A report published in The Lancet in October 2017 showed that pollution was linked to nine million deaths worldwide in 2015.

In light of this, governments around the world are increasingly paying close attention to such research and are increasingly putting pressure on road transport operators to reduce emissions. The ultimate goal is to improve health and work towards greener operation of transport networks.

By increasing the numbers of electric vehicles on the roads and decreasing reliance on diesel vehicles there will be fewer particulates, meaning less damage to health as well as lower greenhouse gas emissions.

Airports are also looking to minimise their overall impact on emissions at and around their sites so "opportunity charging" on bus routes that serve airport terminals and shuttle buses can also help to do this.

The UK's first permanent opportunity charging system is due to go live in the UK in February 2018 in the historic town of Harrogate, North Yorkshire, where a new fleet of eight fully electric buses will run on power supplied by three ABB OppCharge masts.

PORTABLE CHARGING INFRASTRUCTURE

Opportunity charging technology has been taken one step further, with the most recent development being a portable OppCharge system that can be transported by truck and installed at short notice. Applications of portable OppCharge systems include providing temporary power to transport crowds at major cultural, music and sporting events or as a spare for permanent sites.

The solution is on show in Manchester city centre and London Heathrow airport for a 16-week tour with a portable ABB OppCharge mast and a Volvo 7900e electric bus.

The Volvo 7900e has up to 80 percent lower energy consumption then an equivalent diesel bus. It also has a 79 kWh capacity battery, which is significantly smaller and lighter than the 360 kWh battery on board a conventional overnight-charging electric buses. The charger can recharge a bus on its route between three to six minutes.

During the first eight weeks, the demonstrator bus and mast are operating on Manchester's Metroshuttle 2 route, a free-to-use service that provides access to key locations across the city centre. It will then be transported south by truck for installation at Heathrow Airport, where it will spend the following eight weeks shuttling passengers between car parks and terminals. As the connection bases are already being in place, installers will be able to set it up quickly on a plug-and-play basis.

OPPCHARGE INFRASTRUCTURE

OppCharge takes the form of modules that can deliver 150, 300 or 450 kW, depending on the desired speed of the charge and the size of the batteries. These modules are then connected to a pantograph that is either installed in a mast structure or hung from a roof or ceiling.

ABB has based OppCharge on its existing fast-charger technology that is already widely used for electric cars. So far ABB has an installed base of 6,000 fast chargers worldwide, as well as 15 OppCharge systems. Motorists are able to charge their vehicles frequently and without breaks due to the high level of availability and reliability of the OppCharge technology.

CONNECTING DIGITALLY

In-built intelligence and communication are vital and will support smart and future-proofed operation. When a bus arrives at a charging point, Wi-Fi connects to the infrastructure. This results in a digital handshake between the charger and the vehicle and only after the software connection is deemed safe does the pantograph descend. After charging, the pantograph disengages only when it is safe to do so.

All of ABB's fast chargers are connected to a network operations centre via the cloud. This means that if any issues arise, in over 60 percent of cases ABB's technicians can resolve them remotely, with no need to send a technician to site. In the other 40 percent of cases, being connected via the cloud allows ABB's remote service technicians to identify and diagnose any issues in real time. They can then schedule an engineer to visit site equipped with the right tools and spares so that they can solve issues within minutes of arriving.

For example, if an issue with an AC-DC converter was identified, it could be switched off remotely by an ABB technician and the charger could work on the remaining power modules. This would allow buses to continue being charged, just at a slower rate due to the lower power rating. A technician can be scheduled to visit the site and swap out the faulty module to return the converter to full power.

All opportunity charging systems are governed by the international standard for off-board charging, EN IEC 61851-23, as well as the ISO 15118 standard for vehicle-to-grid communication and the DIN 70121 specification for digital communication in electromobility.

THINKING LONG-TERM

While the first applications of opportunity charging are electric buses it also has great potential for longer-distance road passenger and freight transport,

> *When a bus arrives at a charging point, Wi-Fi connects to the infrastructure. This results in a digital handshake between the charger and the vehicle and only after the software connection is deemed safe does the pantograph descend*

as well as public services such a refuse collection or emergency services.

It could result in greater efficiencies, for example using the same charging stations that are used for buses on electric refuse trucks. Or in the future, ambulances could charge their batteries automatically at the hospital's reception facility.

These benefits can also be stretched to long-distance electric trucks and coaches, which would no longer need to be fuelled by diesel and could be optimised to travel between opportunity charging sites at major cities or service stations.

Transport operators are developing new ways to enhance the efficiency of electric vehicles, as they are becoming more common. Opportunity charging is similar to the way in which drivers normally refuel their vehicles, but operators can make the most out of their resources as one mast can serve many vehicles. ©

FYI
Martin Hale is head of EV Charging Infrastructure at ABB, UK & Ireland

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Small city, big smarts

Many of Canada's cities are on a quest to get "smarter." Rising urbanization, digitization, competition, budget pressures and expectations all necessitate a new way of thinking. Many cities are now embracing 'Smart City' principles as they attempt to embrace the future and address the complex issues they face.

One of Canada's Smart City leaders is St. Albert, Alberta – a mid-sized city (pop. 65,000) with big-city credentials. Already recognized among Canada's best places to live, St. Albert is also known as a leading Smart City innovator and reference site. The City of St. Albert believes a Smart City is one that fosters local innovation and collaboration, and applies new technologies and data sources for broad community benefit. Its Smart City efforts are directly aligned to the community's vision, and focused on increasing organizational efficiency and accountability, driving economic growth and partnership opportunities, improving local program and

Travis Peter of the City of St. Albert, Alberta, on how the community has become one of Canada's leading Smart Cities

service delivery, and maintaining its high quality of life into the future.

In building its Smart City program, the City of St. Albert applied a three-pronged strategic approach:

1. Approve one of Canada's first Smart City strategies - a Smart City Master Plan, which provides a coordinated, prioritized and multi-faceted roadmap.

2. Establish a foundation of successful Smart City initiatives across the community, to address key priorities and to position the city well into the future.

3. Connect with others and develop unique cross-sector partnerships that catalyze collaborative projects, generate new intelligence and awareness, and support Smart City market growth in Alberta.

ALL PART OF THE MASTERPLAN
Too often cities pursue Smart City initiatives and spending without a coordinated direction, or without broad stakeholder consultation. The City of St. Albert recognized this in developing a Smart City Master Plan, one of the first of its kind in Canada. The strategy provides a roadmap for St. Albert and other communities to follow to apply new technologies and collaborative innovation models. The Master Plan serves as an enabler for many of the community's goals and priorities, and a lens through which St. Albert views the future.

The Master Plan identifies 22 strategies and 65 supporting actions, each prioritized based on a defined methodology. It also includes a detailed action plan with cost and timing estimates, performance measures, stakeholder input, and other supporting context. The plan was developed through one of the community's largest stakeholder engagements, involving the oversight of a dedicated steering committee of elected officials and residents and the input of over 2,000 residents and stakeholders.

Since the inception of its Master Plan, the City of St. Albert has implemented or commenced several high priority initiatives. A few of its higher-profile projects include:

● **Community Connectivity –** One of the foundations of a modern Smart City is ubiquitous connectivity – the ability for people to access

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internet content and online services at any time, from anywhere, and in a fast, reliable and affordable manner. In St. Albert, municipal leaders partner with telecommunication providers to offer free wireless internet services in public spaces and to plan new infrastructure investments. A significant extension of the municipal fibre-optic network has also been undertaken to connect all civic facilities and other fixed assets. Now over 50 per cent complete, the project has generated significant cost savings and service improvements. For example, the City's traffic intersections are now able to transmit real-time video and support advanced automation features, municipal employees can access files seamlessly within any City facility over a secure wireless network, digital transformation and instant collaboration efforts can be supported, and excess network capacity can now be licensed to community organizations and internet service providers.

● **Intelligent Transportation -** Technology and data are fuelling improved mobility in cities around the world. In St. Albert the integration of modern Intelligent Transportation Systems (ITS) is a high priority, particularly on major thoroughfares. ITS supports the automation and optimization of travel in the community, effective data collection and informed decision-making, and local mobility that is as coordinated, safe, fast and convenient as possible. The City has already centralized intersection monitoring and incorporated adaptive priority systems for emergency vehicles. In 2018, the City of St. Albert will complete a defined ITS Strategy that will describe how

Attendees at St Albert's Smart City Symposium

the City could incorporate several new ITS components, such as automated traffic management, traveller information services, active data collection and sharing, and proactive asset management. The City has also taken great steps to modernize public transit, purchasing Canada's first electric transit vehicles and incorporating "Smart Bus" systems that offer improved accessibility, modern rider conveniences, remote fleet monitoring, improved rider analytics, real-time schedule notifications, and instant telecommunications that support a large regional project to enable electronic fare payment.

● **Local Innovation Ecosystem –** Modern communities should catalyze their innovation ecosystems and support the conditions for cross-sector collaboration, greater creativity, robust entrepreneurship, and a "living lab" approach to the testing and commercialization of new ideas. St. Albert has made this a priority, as it believes its size, demographics and reputation make it an ideal place for this type of activity. Several local strategies

support this, including partnerships between the municipality, chamber of commerce, local business incubator, university and others to host innovation forums, idea sharing nights, recognition programs, community roundtables and more. Companies are also welcome to test new ideas or products in the community, and grow their business with support from the community.

● **Remote Sensing and Controls –** Infrastructure sensors and device-to-device connections can provide critical data and real-time asset monitoring and controls. This supports automation and operational efficiencies, rapid incident response, heightened situational awareness, minimal service interruptions and other benefits. This is important for the City of St. Albert, which has pursued several projects such as radio frequency monitoring devices on its residential garbage bins to support real-time information during collection. Several municipal facilities and fleet vehicles are also monitored and controlled in real-time, devices are placed

on underground infrastructure to monitor conditions, sensors are located within priority locations to monitor environmental conditions, and the City has even commenced a project to replace all local water meters to enable remote data transmission (eliminating the need for costly manual collection) and instant notices to users for usage and potential leaks.

● **Digital Services and Engagement –**
Flexibility and convenience are basic requirements of the digital age. Municipal residents demand easy access to the information and services they require, from any place, at any time, and in a manner responsive to their personal needs. The City of St. Albert responds to this, with several online services that offer access to facility bookings, licence renewals, municipal performance information, real-time transit information, property information, a non-emergency issue reporting app, program registrations, digital facility tours, electronic billing, governance processes (e-town halls, webcasted meetings, electronic agendas and meeting records, digital consultation platforms, etc.) and more under development. The City has also integrated mobile technology into its operations, with portable devices for field and emergency personnel to access property and other files instantly, computer aided dispatch, cloud computing platforms, a secure web platform for flexible online census enumerations, and much more.

HARD WORK PAYS OFF
In addition to the above innovative projects, collaborative partnerships

> *The Master Plan identifies 22 strategies and 65 supporting actions, each prioritized based on a defined methodology*

and outreach are a key focus of St. Albert's Smart City efforts. For example, City officials work regularly with other municipalities to support their Smart City efforts, advance collaborative projects, and contribute to knowledge networks. Officials also work closely with academic leaders in the region and across Canada to support pure and applied research, such as St. Albert's participation in a national connected vehicle test bed and its support of student-led research and project work.

St. Albert municipal officials are also regularly called upon to address others and offer recommendations on the design of future policy, strategy and programs that could support broader Smart City adoption and digital strategies. For example, local officials have participated in dozens of urban innovation sessions, think tanks, international conferences and expert roundtables. In 2017, the City of St. Albert was even called upon to offer expert testimony to standing committees of the Government of Alberta and the Parliament of Canada, confirming its reputation as a respected advisor.

The City's commitment to collaboration is highlighted by its leadership of the Alberta Smart City Alliance – the province's only cross-sector collaboration on Smart Cities, designed to serve as a knowledge network and a means to support collaborative

testing and market adoption of Smart municipal solutions across Alberta. While the City of St. Albert leads the Alliance's efforts, it works closely with its co-founders (IBM Canada, Cisco Systems, the University of Alberta, the Northern Alberta Institute of Technology, the City of Edmonton, and the City of Calgary) and over 300 other members from across Alberta. To date, the Alliance has grown substantially and has hosted multiple large events, international delegations, foreign missions and other collaborative initiatives that have brought leaders and civic innovators together.

St. Albert's many successes have contributed to its reputation as one of the best places to live in Canada, and placed it as a Canadian Smart City leader. Despite this sterling reputation, St. Albert is also a community that recognizes how its future competitiveness depends largely on what it will do today. It believes in the value of using data to make better informed decisions, and the importance of a strong technology and innovation foundation for its continued economic growth, service effectiveness and corporate efficiency. Through its Smart City initiative, St. Albert is demonstrating its commitment to become one of the most progressive, open and effective municipal governments in Canada. ⓒ

FYI
Travis Peter is the City of St. Albert's Smart City and Innovation Manager and the Director of the Alberta Smart City Alliance

For more information on St. Albert's Smart City efforts and successes, visit **www. stalbert.ca/smartcity**. For more information on the Alberta Smart City Alliance, visit **www.smartcityalliance.ca**.

Fixing the boulevard of broken dreams

Complete streets in installments:
a story from Queens, New York,
by **Justin Hyatt**

> ## *Queens is rolling out numerous safety measures and installing bicycle paths all along the corridor. The effects have been stunning*

In the past 10 years, New York City has been experiencing a rapid growth in cycling, in addition to receiving a multitude of public space improvements and bicycle infrastructure upgrades. The west side of Manhattan carries the Hudson River Greenway, claimed to be the busiest cycle path in the US.

This is good news for the Big Apple, as NYC is still a very car-clogged metropolis, despite the fact that it has the densest subway network in North America and one of the busiest in the world. This is especially true in Manhattan as its grid system means that virtually every street is a through street.

While all five boroughs in New York City have their own stories to tell, with their ongoing efforts to provide safer streets for pedestrians and quality bicycle lanes for its citizens, this article focuses on the

borough of Queens and in particular Queens Boulevard.

THE STORY OF QUEENS BOULEVARD

Dubbed by locals as "the boulevard of death" Queens Boulevard has not typically provided a serene backdrop for picnics or a place to leisurely chat with your friends while crossing the street.

This particularly long thoroughfare, stretching all the way from the edge of Manhattan to Long Island City, has in fact been the scene of many collisions, tragic fatalities and numerous injuries. Locals will testify that pretty much everyone knows someone who has been affected by its unsafe road traffic.

However, all that is fortunately changing. Watch out, here's the spoiler: today the borough is rolling out numerous safety measures and installing bicycle paths all along the corridor. The effects have been stunning. In those sections where the new infrastructure has already been built, no further traffic fatalities have occurred. And the work keeps moving forward.

HOW DID THIS HAPPEN?

Integral to the developments has been the involvement of Transportation Alternatives (TA), a non-profit organization dedicated to the promotion of sustainable mobility and the improvement of cycling, walking and public transit in the city.

In particular, TA helped launched local chapters in each of the boroughs, including one in Queens. These volunteer groups amount to the bread and butter of action and campaigning for local issues. Thus, the Queens TA chapter began campaigning for

bicycle paths and complete streets, around 2012.

In this period, a lot of traffic fatalities and injuries were still occurring, and the volunteers combed the area, talked to locals, and collected signatures, while also working with the local political establishment.

On the one hand, obtaining local support for a redesign of the boulevard, given the horrifying lack of existing safety measures was an "easy sell" as mentioned by one campaigner. However, any time major changes are introduced on the busiest corridor in a place like New York City, a lot of hard work will still have to be included.

In fact, numerous reasons contributed to providing positive momentum for change.

As already alluded to, the sheer fact of injury and fatality meant that citizens would have open ears to calls for change. This was particularly the case after the deaths of a number of children on Queens Boulevard, which prompted the forming of a group called "Three Children Too Many" which eventually turned into "Families for Safer Streets". This group, working closely with TA, appeared at numerous events, speaking at press gatherings or local political meetings, getting coverage in the newspaper, and fully supported the redesign campaign.

Vision Zero for New York City

A major milestone then occurred in 2014, when mayor of New York City Bill de Blasio announced "Vision Zero" which is the target of zero traffic fatalities or serious injuries by the year 2024.

This further fueled the campaigns for complete streets and meant that support could come from both below and above. In practical terms it meant that groups like Transportation Alternatives could refer to the vision as outlined by the city, when confronting local stakeholders.

It also meant that the Department

> *In 2015 the first parts of Queens Boulevard received bike paths and safety upgrades, with new sections being added in every subsequent year*

of Transportation (DOT) has been generally amenable to the upgrade of infrastructure according to sustainable mobility concepts and Vision Zero outlook.

In the typical order of events, before the DOT approves a stretch of a corridor for upgrade, TA and its volunteer corps pursue the task of gaining widespread local support for the upgrade, as described above.

Local support thus entails working with the Community Board (CB) system of New York, which is the lowest level of government. Each borough is divided into a number of Community Boards. Three such community boards are featured in the parts of Queens Boulevard that have been targeted by the campaign these past five years.

The Community Board provides the opportunity for any citizen to participate in meetings and also collectively vote on policy to be adopted. Thus, when local support reaches the chambers of a community board and turns the vote in the direction of complete streets, the DOT then takes note of the results and is able to plan for the upgrade.

While a fuller and more detailed explanation goes beyond the scope of this article, it should be understood that naturally resistance does

occur, and also that positive support for the changes should be rightfully attributed as well to key players in the local political establishment, who have served to improve the state of their city and district, and also worked closely with citizens and civil society organizations.

TWO PHASE PROCESS

In 2015 the first parts of Queens Boulevard received bike paths and safety upgrades, with new sections being added in every subsequent year.

It should be noted that infrastructure change comes in two phases. The first phase is the "operational phase" where quick and easy adjustments are added, as can be seen in the photo. This is then to be followed a few years later by the "capital phase" which is the permanent change of infrastructure.

The usefulness of following such a process is that first of all changes (and relief) can be brought to the citizens immediately, without needing to wait years before anything happens. Second, by the time the permanent change is introduced, citizens and local stakeholders have had the chance to observe the new situation and provide important feedback to guide the final designs to be implemented.

The story of Queens Boulevard is thus the success story of unrelenting effort and dedication by citizens, activists and a strong support cast of local politicians, city departments and even the mayor, to bring about much needed change and improve the lives for all citizens. Ⓒ

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Environment and Active Travel

This section looks at the impact that urban and regional mobility has on the environment and on health, and how the adverse impact can be reduced

A problem shared

Conor Walsh traces a brief history of bikeshare and reveals the results of the first UK-wide public survey

The making of the modern city at the turn of the last century was a time of invention and intervention, not least in our transport system. Railroads and ships moved people and goods at an unprecedented rate while heavy industry moved out and light industry moved in.

Later in the century saw the arrival of the car and motorised transport to the masses - the modern engineering marvel to move people around a

> *The evolution of bike share had been reliant on advances in technology in other sectors that provided technological fixes and ultimately created a more user-friendly system*

city easily and at a pace that we had not seen before. The car has had an instrumental role in the shaping of our cities since; space sequestered for roads and car parks, public transport projects shelved, the suburban sprawl it facilitated.

The largely unchecked growth of car use and ownership has now been checked. Our cities are barely liveable and certainly not 'healthy'. Those in charge are starting to realise that we need that asphalt to be green space again, the air to be breathable and for their citizens to be more active.

What if local transport authorities could have a public transport solution that reduced congestion, improved air quality and came in cheaper than a few bus stops? The good news is they can, and they are. Not least in China where a 'Free-Floating' or 'Dockless' bike-share system took off in 2015. This transport revolution has now made its way to Europe and not a moment too soon.

WHAT IS BIKESHARE?

The growth and subsequent problems associated with private motor vehicles in cities led to the first Public Bicycle Sharing System (PBSS) which we now call bike share. The 'White Bikes' of Amsterdam (inset above), which were painted white to denote their use, offered riders free use of a bike for journeys around Amsterdam. The scheme, which ultimately failed as bikes were unable to be secured after use, prompted changes to create the second

Copenhagen's City Bike scheme has been in operation for 22 years

generation of schemes.

Second generation schemes overcame this issue with the introduction of a coin deposit system. The Copenhagen City bikes that launched in 1995 became the first organised Public Bicycle Sharing System with the use of a coin deposit system.

Third generation schemes which arrived a decade or so later were an upgrade from the City Bikes with docking stations becoming the start and end-point of all journeys. These schemes functioned more like a public transport mode with the addition of docking stations, cashless payment and a much larger number of bikes to facilitate the peak flows of commuters. Schemes such as Paris, London and New York were all early adopters in this regard and have been a success since inception. These three cities share similarities that allude to why they might have been successful early adopters.

Firstly, they all suffered from the relentless growth of cars throughout the later half of the 20th century. Secondly, the public transport systems, especially underground or Metros, become as overcrowded as the overground systems that had little room for expansion. Finally, each of the three cities were global destinations attracting millions of tourists each year.

The evolution of bike share to this point was reliant on advances in technology in other sectors that provided technological fixes and ultimately created a more user-friendly system. Skip forward to the latter half of 2017 and we are in the throws of, not so much an evolution, but a revolution in bike sharing. But, firstly, why should we be excited about bike share?

HOW CAN BIKE SHARE GET MORE PEOPLE CYCLING?

For the initiated the positive aspects of cycling outweigh the negative experiences. It's easy to brush off

the barriers as part of the commute when you've been cycling for 10 years. However, for many, these barriers stop them from cycling at all. Bike share can help, and is helping to overcome some of these barriers. Results from the Bikeplus Annual survey in the UK suggest this.

> *It will be interesting to see how motivations for using bike share will differ in a free-floating system – arguably it could become more cost-effective and more convenient than the traditional station-based models*

Part of the survey looked at 'New Cyclists' who are those who haven't cycled in at least five years. We could argue here that these users were between contemplation and preparation on the stages of change model before starting to cycle. In this instance the desired behaviour is cycling and the bike share scheme facilitated this. Let us consider this case study of new cyclists in UK bike share.

We firstly looked at the gender split in new cyclists compared to the survey sample. The gender split of the whole survey sample was that of 57 per cent male and 43 per cent female which compares favourably to the 2:1 ratio split you see in the cycling population. However, segment this group to compare new cyclists and those who already cycle, and you see that women become the majority group with 53 per cent of new cyclists being female. What light can we shed on why these new cyclists progressed from the contemplation stage through to action?

We asked why they used the scheme. When looking at the responses from new cyclists they rated the shared aspect of the scheme as motivations at a higher rate than experienced cyclists. These

were the ability to avoid the worry of maintenance, storage and theft. Looking at their travel behaviour and we see new cyclists were much more likely to use bike share for commuting than the survey sample. The ability to have convenient city centre access to a bicycle without the drawbacks of ownership is paramount to attracting new cyclists, not forgetting the attractive cost and convenience of bike share that was cited as motivating factors in over 50 per cent of the respondents to the survey.

It will be interesting to see how motivations for using bike share will differ in a free-floating system - arguably it could become more cost-effective and more convenient than the traditional station-based models. Bike share can truly be the gateway drug to facilitate long-term behaviour change. And numbers of bike share schemes are growing fast.

WHAT'S DOCKLESS OR FREE-FLOATING BIKE SHARE?
'Dockless' or 'free-floating' schemes from China are the driving force in the growth of bike share worldwide. These schemes have done away with docking stations meaning users are free to pick-up a bike wherever they

see one and deposit it with similar freedom. With the use of an app and mobile Internet users can locate, reserve and unlock a bike in minutes. Other technological additions such as geo-fencing allows operators of some schemes to use virtual stations or preferred parking locations to incentivise redistribution across a network.

Like their forbearers these schemes have remained true to their original purpose of offering low-cost point-to-point journeys across a town or city. No longer do you turn up to a set of full docking stations in your morning commute or get to a station to find no bikes to use. Station-based operators are overcoming such challenges with better planning and real-time information. Such peak flow problems can occur with dockless schemes but with the pre-planning offered through the app means you're less likely to be stranded without a bike. This pertains to the user experience that doesn't necessarily explain why we've seen the unprecedented growth in dockless bike share schemes across the world. This growth can be largely attributed to the capital costs involved in setting up a dockless scheme, or rather, the lack of capital costs involved in delivering a city-wide bike share scheme.

In previous generations there was significant capital costs that came with delivering a scheme that to cash-strapped transport authorities was a barrier to delivery. Now transport authorities can, with the help of a private operator, deliver a scheme of any scale to their city without the level of capital costs associated with third generation station-based schemes. The opportunity for local transport authorities to deliver a city-wide public transport service which cuts congestion, improves air quality and improves the health of its users. This doesn't come without its own challenges though, dockless bikes pose their own unique problems to

local authorities and users.

One such issue is that of parking and how to manage the fleet of free-floating bikes. Pictures of bikes piled high on the pavements from China is of concern for authorities in the UK. For now though local authorities are cautious but sensible. Operators are abiding by doing incremental roll-outs of their fleet over time. This negates any immediate problems as seen in China while allowing local authorities to plan effectively to manage the fleets.

Onto the user experience. Earlier in the article I discussed how dockless bikes were a boon to users with greater flexibility and convenience. However, sometimes not is all as it seems. The bikes that is. Users when they want to rent a bike will fire up the app and find their closest bike on screen. However, sometimes and not uncommon is for users to find the bike is showing up on the app but nowhere to be seen on the ground.

Often users can locate another bike within a reasonable distance and get cycling. Despite advances in GPS and Bluetooth technology there are still glitches in the system. Operators are meeting this challenge head-on with better technology and planning. The use of hub locations is one such solution where by bikes are redistributed to central locations for convenience of users.

Operators also must contend with the city centre landscape of high rise buildings which can affect the accuracy of GPS. Some would argue this is a problem of having too few bikes. In a saturated market the users wouldn't need the app to locate a bike but their own eyes as they become as ubiquitous as bus stops.

WHAT'S THE IMPACT OF THIS?

Bikeplus' UK survey results suggest that for every 100 bike share trips there are between 10 and 20 of these which would have previously been taken by private car. It's difficult to measure modal change via a survey but if we can achieve the lower end of this ratio in a dockless scheme then we will have a significant reduction of car use in our cities.

More hopeful though is the modal change when e-Bikes can be introduced to a sharing system. Again, from the UK, 43 per cent of trips in a pilot scheme in Rotherham were replacing car or taxi trips. We can assume this group were early adopters and therefore seeking out a solution to their car dependency but even if we were to achieve somewhere between 30-40 per cent of trips replacing car or taxi modes we would be seeing significant changes to our cities.

Needless to say transport authorities haven't hesitated in welcoming bike share companies to their congested cities. Not least in China that has some of the most congested and polluted cities in the worlds. Data from Ofo bicycles in China suggests that congestion has eased in 19 of the cities they operate in. Moreover overall consumption of gasoline has dropped by 1.4 million tons owing to the provision and use of bike share in China. This is also at a time when the Ministry of Transport of China is implementing other measures to reduce car use such as improved road networks, improving public transport provision and better regulation. We know from experience in cycling that it is essential to have a multi-faceted approach to reduce car use and increase the modal share if you are to be successful in achieving long-term behaviour change. We await to see the impacts of the dockless systems in the UK and beyond. ⓒ

Funding NeMo

Unlocking the potential of electromobility in Europe, by **Angelos Amditis**

Decarbonising transport is a major topic for the EU, national governments and all European transport stakeholders in general. Electrification of road transport – often referred to as electromobility or e-mobility - has the potential to drastically reduce emissions contributing to climate change as well as cutting city noise pollution. Despite a continuous and impressive increase in the electric car fleet, electric vehicle supply equipment deployment and electric car sales over the past five years (with global electric car stock surpassing 2 million vehicles in 2016) and annual growth rates have been declining[1]. The wider adoption of electromobility by motorists and road transport operators is hindered by a number of market and technological challenges. If electromobility is to take off in Europe, these key barriers must first be addressed.

BARRIERS HINDERING MASS ADOPTION OF ELECTROMOBILITY

The barriers hindering mass adoption of electromobility include limited driving range of electric vehicles (EVs), charging issues, energy and grid-related issues, data exchange issues (lack of stand-

> *Electromobility actors currently have to deal with a wide range of EV charging systems hardware, services providers, standards and protocols, which can vary greatly from a technological perspective*

NeMo will boost the market share of EVs by enabling increased accessibility to charging infrastructure, ICT services and wider B2B interconnectivity
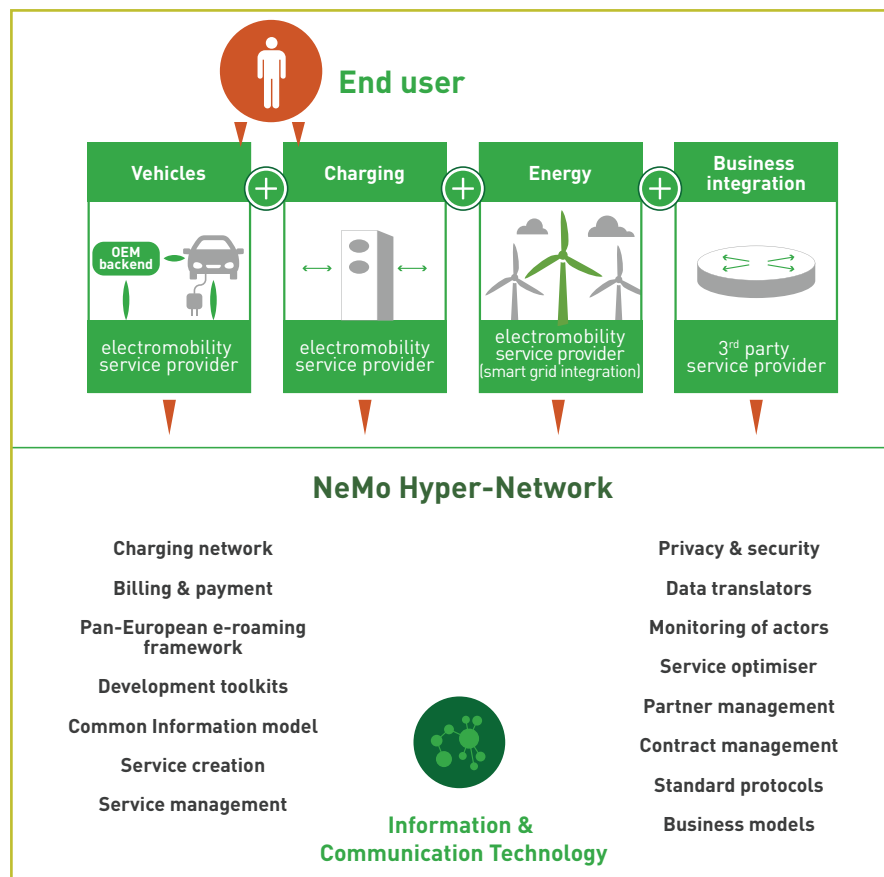
ards) and the existence of diverse e-roaming platforms.

A significant factor limiting EV driving range is the lack of inter-operability in existing charging infrastructure and other mobility services. Electromobility actors currently have to deal with a wide range of EV charging systems hardware, services providers, standards and protocols, which can vary greatly from a technological perspective.

Another important challenge is the impact on the electric grid network caused by increasing EV numbers but also by new charging technologies.

The main issue is to define and deploy a smart way to manage EV recharging. At the moment, the electromobility ecosystem is not connected to the grid in a sustainable way.

The provision of interoperable and seamless ICT services across the EU is hindered by the lack of a common data and information model and the lack of common framework for commercial agreements. For the electro-

mobility market, interoperability can lead to non-discriminatory electro-mobility services, such as charging and navigation, making them available throughout Europe without limitation, with a coherent service quality level and at a lower cost.

This lack of interoperability gave rise to the recent concept of electro-mobility roaming (or eRoaming) platforms; there are currently five major

ones in Europe. However, the problem of interoperability between these platforms remains.

MAKING ELECTROMOBILITY MORE ATTRACTIVE BOTH FOR TRAVELLERS AND BUSINESSES

The EU-funded NeMo project aims to boost the market share of EVs by providing increased accessibility to charging infrastructure, ICT services and wider B2B interconnectivity. NeMo will facilitate increased service availability, better planning and more secure grid operation. It will also create new business opportunities for electromobility actors, allowing developers of new services and products to make them available to a wider market and in a cost-effective way. The overall vision is to replicate the success of cross-border mobile phone roaming for electromobility services.

To achieve these goals, the NeMo – Hyper-Network for electromobility – project aims to deploy a "Hyper-Network" of services. The Hyper-Network will include new and existing tools, models and services which can provide seamless interoperability of services, creating an open, distributed and widely accepted ecosystem for electromobility.

The NeMo Hyper-Network will be a distributed environment with open architecture based on standardised interfaces. It will provide a basis for all relevant actors (such as charge point operators, users, electricity distribution system operators) and physical objects (like charge points, vehicles and the grid) to interact and share data. This and an Open Cloud Marketplace, to be developed by NeMo, will facilitate interoperable ITS services such as integrated billing and roaming for drivers, and battery and grid related services.

DEVELOPING THE NEMO HYPER-NETWORK

To date, NeMo has selected 64 rel-

> ## The NeMo Hyper-Network will be a distributed environment with open architecture based on standardised interfaces. It will provide a basis for all relevant actors and physical objects to interact and share data

evant use cases, based on which it has proposed Common Information Models for relevant objects and data structures, including the vehicle, the charge session and smart charging, the market place, the user, grid loads and advice for vehicle preparation for drive-off.

The NeMo Common Information Models describe all the data required by electromobility actors in a harmonised way, incorporating existing information representation and exchange standards, thus enabling the interoperability of electromobility services. The project will also develop a pan-European roaming framework for electromobility by linking existing roaming platforms

and by designing a common and open European Inter-Roaming protocol. NeMo has already proposed a pan-European Inter-Roaming protocol, based on existing widely-used protocols and according to standardisation norms, to allow communication of relevant electromobility market actors.

The development of the Hyper-Network also includes the introduction

of a set of ICT interfaces which will facilitate the communication and data access for all electromobility related actors; along with the development of a core system capable of providing ICT services. The Hyper-Network will also require the development of a set of horizontal services to facilitate the creation of innovative and smart services; and the creation of a set of open application programming interfaces (APIs) enabling an open B2B marketplace for e-mobility to grow.

NeMo will develop a self-certification mechanism using conformity tools and processes to establish the quality and integrity of both data and services, enabling partners and services within the Hyper-Network to integrate more efficiently and affordably.

Finally, NeMo will address any operational and organisation issues arising from the increased B2B connectivity that pan-European eRoaming will bring, and develop new business models and scenarios.

ENGAGING ALL STAKEHOLDERS IN THE ELECTROMOBILITY VALUE CHAIN

NeMo aims to incentivise the entire energy management cycle of electromobility, including battery and smart grid recharging management. The NeMo project will engage all electromobility actors: physical (i.e. Charge Points, Power Grid, EVs) and digital (i.e. Charge Point Operators, Distribution System Operators, Electromobility or Service Providers, EV owners, etc.) to interact seamlessly

Differences between the pan-European eRoaming framework and the NeMo Hyper-Network Terminology explained

Roaming refers to a market model in electromobility. It describes the contractual relationship between Charge Point Operators and Electromobility Service Providers, and the resulting interaction of the involved market participants with each other via an eRoaming-Platform using a protocol (eg OICP or eMIP). The pan-European eRoaming framework is a new interface to interconnect eRoaming platform providers. Hyper-Network is a distributed environment with open architecture based on standardised interfaces. Actors (physical or digital) can connect and interact seamlessly, exchange data and provide integrated and interoperable ICT services within the Hyper-Network. For the first time, all E-Mobility stakeholders connected to the NeMo network are visible in the open market place.

using the NeMo Hyper-Network. This will facilitate the data exchange needed for integrated and interoperable e-mobility ICT services (both B2B and B2C).

NeMo will also provide a set of new and adapted electromobility services offered through the Open Cloud Market Place, including Hyper-Network horizontal services, grid-related services, EV driver/owner related services, and EV and battery related services.

COMPLIANCE WITH ICT INTEROPERABILITY STANDARD

According to the EC's "European strategy for low-emission mobility"[2], standardisation and interoperability will be essential if we are to make the most of the scale of the internal market. This is especially the case for electromobility and the barriers associated with the charging of electric vehicles across Europe, which need to be eliminated.

The European Commission underlines that further efforts should be made to foster the creation of an EU-wide electromobility service market, such as the cross-border interoperability of payments and the provision of real-time information on charging points.

NeMo is taking into account the ICT interoperability standard and recommendations from eMI3, a platform managed by ERTICO – ITS Europe. eMI3 which is an open group of stakeholders from the global EV market who joined forces to harmonise the ICT data definitions, formats, interfaces, and exchange mechanisms. This is done in order to enable interoperability of EV charging and services with a common language among all ICT platforms for EVs.

TEST SITES

The Hyper-Network and associated services will be tested and validated in real-world conditions involving major EV roaming platforms in Europe, the automotive industry, and charge point and grid operators. The five involved countries are Germany, Austria, France, Spain and Italy, with each covering different use cases.

A cross-country-test will demonstrate the electromobility roaming capability between countries by

LINKS
1. "Global EV Outlook 2017", International Energy Agency, June 2017
2. "A European Strategy for Low-Emission Mobility", Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, 20 July 2017

locating charging infrastructure and access services. A first test drive involving two cars and four drivers will go from Turin to Barcelona this October, in order to evaluate the current situation where drivers in Europe have to charge their vehicles, and to assess the different authentication and payment systems. The final test drive in 2019 will evaluate the benefits of NeMo for drivers in the field. The vehicles involved in both tests will be equipped with TomTom GPS and be supported by eRoaming Platform provider Hubject to define the most adequate charging points. During the trip, the driver's experience will be evaluated based on their feedback.

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NeMo runs from October 2016 to September 2019. Vehicle manufacturers, charge point operators and roaming platforms are among the 19 consortium

www.nemo-emobility.eu

What's driving local government change?

Sander Van Der Veen takes a look at the changing landscape for Electric Vehicles in the UK and how local government can be involved in pushing the progress. Could North American cities adopt a similar approach?

Late in 2016 the UK government announced it would invest £30 million in installing charge points for electric vehicles (EVs) around the country. Since then, EVs have become something of a hot-topic, with Tesla recently announcing the production start of their first mass-market EV and the Queen even mentioning EV in her 2017 speech to parliament.

Despite talk of electric vehicles being around for quite some time, it's only recently that the EV revolution has started to gather pace. A recent report by Transport & Environment shows that by the end of the year there will be more than half a million battery, electric and plug-in hybrid vehicles on Europe's roads, a solid demonstration of consumer interest. The numbers may seem low, but it represents a massive change in a very traditional industry that hasn't seen seismic changes of this nature since the introduction of the model T Ford back in 1914.

Politics, science and technology have all aligned to help the EV revolution gather pace, with a significant number of changes that have shaped the way the industry is working. The rapid development in technology, with manufacturers such as Tesla, leading the way, have made EV an anxiety free option to the traditional combustion engine. This has been spurred on namely by a dramatic reduction in cost of batteries, a level which makes EVs competitive with conventional vehicles. Also, it is possible to produce affordable EVs with ranges of over the psychologically important 300km range.

Globally, the success of the Paris climate talks has made a major political shift in helping to lower car CO_2 emission limits, with the view of gradually eliminating traditional fossil fuels. Attitude towards diesels and the damage it does is fostering the conversation towards a more sustainable mode of transport which ties in with reduction in CO_2 targets – something which

> *With added government incentive schemes and EV car sales on the rise, we will see a shift towards more public infrastructure and sustainable fleets over the coming years*

car manufacturers and politicians alike are paying attention to.

The rapid growth in EV sales in China, which is now the world's biggest market and dominated by national manufacturers has forced other manufacturers to take the EV market seriously. Non-Chinese carmakers are desperate to succeed in this expanding market and are terrified their Chinese competitors, like BYD, will soon be successfully exporting to Europe.

A prime example of this is Tesla, who have moved from something of a curio, to a globally recognised brand. Their new Model 3 - a car for which over 400,000 drivers put down USD 1,000 each without even sitting in it. Now, all the large car manufacturers are considering their EV Options.

PREPARING FOR GROWTH

A good starting place would be for local councils to lead by example wherever possible. Upgrading their own fleet to ultra-low emission vehicles (ULEV) and ensuring there is a robust charging infrastructure to support EV drivers sends out a clear message to residents. Encouraging local businesses and commercial vehicles such as taxis or buses to go electric will also help educate people on the benefits of EVs.

With added government incentive schemes and EV car sales on the rise, we will see a shift towards more public infrastructure and sustainable fleets over the coming years.

The biggest incentive local councils should consider when implementing a public EV charging infrastructure is the On-Street Residential Charge Scheme. There is funding of up to £7500 (C$12,000) per charge point available for Local Councils. The scheme will cover 75 per cent of the capital costs of procuring and installing the charge point and an associated dedicated parking bay.

Plus additional incentives, such as low emission zones and lower parking costs for electric vehicles will also encourage drivers to consider making a change. For example, in 2019, London will implement an 'Ultra Low Emissions Zone' that will be followed by an additional 10 sites throughout the UK by 2021. This is the kind of demonstrable change that will help shift perceptions of the general public and of other local councils. Another great example is North Somerset Council, who have invested in public charging spaces to accommodate for growing demand.

With funding available, it's time for local councils to kick-start building the right infrastructure. Before pulling tenders together, local councils can consult with OLEV on charge point implementation. It is recommended for the local council to appoint an OLEV accredited installer offering smart charge points and a robust portal to monitor charge sessions and kWh usage throughout the network at anytime.

We are on the cusp of a vehicle revolution where local councils have the ability to shape the future of commuter transport and the way. It's more important than ever for local governments to support building the UK's EV infrastructure. Ⓒ

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Something borrowed, something new

Florinda Boschetti introduces the Polis working group on bike-sharing, its members and themes, and delves into the newest topic of free-floating bikes

Polis launched the bike-sharing working group as a membership service in 2014 after the rising demand among Members to establish a platform and encourage dialogue and exchange on bike-sharing systems among local and regional authorities.

Working group members comprise major capital cities and towns in Europe, notably Transport for London, Transport for Greater Manchester, BKK Centre for Budapest Transport, City of Milan and AMAT Milan, Gothenburg, City of Paris and Île-de-France Mobilités, Prague, Stuttgart Region, Berlin, Brussels Capital Region, EMT Madrid, Barcelona, Donostia-San Sebastian, Rotterdam, Dublin and Irish National Transport Authority; Fietsberaad Flanders and City of Leuven; and associate member Bikeplus.

Members meet twice a year and discuss various aspects of bicycle sharing schemes, including business models; bidding procedure, supplier selection and contracting; system and fleet maintenance and management; use of new technologies (e.g. Pedelecs, electronic locks, geo-fencing); measures to tackle security and vandalism; information and campaigns.

The arrival of free-floating bicycles to Europe over the last year has

Brussels' Billy - an electric bike-sharing scheme

raised the curiosity and interest of many cities who see these new business model as a way to deploy a bike-share system without having to make any capital investment, eliminating the burden of planning and building docking stations on public space, and yet offer a mobility solution to people living in those districts where docking stations have not arrived.

The first small trials with a few dozen free-floating bicycles arrived in the UK in Oxford, Cambridge, and Edinburgh in 2016, and rapidly expanded to larger cities. The largest fleet in Europe was first deployed in Manchester in late June with an initial 1,000 bikes, expanding to 2,500 in September, followed by Milan who tendered the service for 12,000 bikes in a multi-operators environment.

In the meantime, news from China and Hong Kong reported the massive number of broken or unserviceable bikes dumped in huge piles on roadsides and in parks, cluttering public space. This raised concerns in European cities where space is a scare resource, also in conjunction with a high rate of bike usage, such as in Amsterdam or Antwerp to name a few. There's no space to allow for more bikes on streets and parking places at cycle racks cannot be taken up by dockless bikes.

In many cases private operators have not consulted with local authorities and introduced bicycles almost overnight on the city streets, such is the case in London and Amsterdam where bicycles were removed. In an attempt to regulate a fast-paced market, Dublin City Council adopted - prior to public consultation - bylaws to manage and control the operation of Stationless Bicycle Hire Operations in the City.

In September Transport for London released a Dockless bike-share code of practice for Operators in London, and some other boroughs are following the example, i.e. Islington's Dockless Cycle Sharing Policy. New cities are announcing the arrival of free-floating bike on their streets on a daily basis, including Florence, Brussels and Paris.

European cities are looking for guidance about how to deal with free-floating bikes, and at the same time safeguarding public space, ensuring that high quality service levels are met and enabling accessibility to all users. The Polis working group will convene in Milan in April 2018 to look at first lessons learned from Milan and Manchester and build on their experience to help cities set up the right policy framework to regulate/guide operations harmoniously within a Sustainable Urban Mobility Plan. ©

FYI
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A step in the right di

In European cities, the vast majority of freight deliveries in urban environments are made by conventional petrol and diesel vehicles, says **Thomas Mourey**, yet as the EU seeks to transition towards low and ultimately emission-free transport, alternatives are needed. That is where FREVUE came in...

After 4.5 years of testing, the technology proved mature and robust enough for electric vans and trucks to be included in commercial vehicle fleets in urban operation

rection

The EU project FREVUE that came to an end this September had as its main objective to discover if and how fully electric vehicles are viable alternatives to conventional diesel ones. Ten urban logistics operators tested over 80 electric vehicles in eight of Europe's largest cities: Oslo and Stockholm in Scandinavia where temperatures below 0°C are not rare; London, Amsterdam and Rotterdam with moderate climates; and Milan, Madrid and Lisbon in southern Europe where vans and trucks could be tested in warm conditions. The vehicles tested ranged from small car-derived vans to 18-tonne trucks. With various cities and operators involved in the project, testing took place in a variety of access restriction policy frameworks and urban landscapes.

ELECTRIC VEHICLES SUITABLE FOR DAILY OPERATIONS

After 4.5 years of testing, the technology proved mature and robust enough for electric vans and trucks to be included in commercial vehicle fleets in urban operation. The multistop and low speed urban environment suits these vehicles very well. Small electric vans, for example, reach peak energy efficiency between 30 and 35km/h, a typical speed range in urban traffic. However, this drops at higher speeds.

Other benefits exist and have major positive impacts on people's lives. For instance, quieter engines lead to less noise pollution both for drivers and people within urban environments. In addition, the environmental benefits of electric vehicles are huge. Zero tailpipe emissions mean that no nitrogen oxides (NOx) and particulate matter (PM) are produced. Both are incredibly detrimental to health and diesel exhaust emissions contain them in abundance.

FREVUE research partners calculated the impact that the wider electric freight vehicle deployment would have in London. Even if "only" 10 per cent of the fleet were electrified by 2021, NOx emissions could be decreased by 402,000 tonnes, PM emissions by 3.8 tonnes, and local CO_2 emissions by 284,000 tonnes. This would amount to a 1 billion annual reduction in health and abatement costs (the cost of reducing 'environmental negatives' such as pollution). Electrifying freight fleets therefore makes a significant public health contribution and requires lower costs to comply with legal air quality obligations.

BARRIERS AND RECOMMENDATIONS

While the associated environmental benefits and general technical suitability of electric freight vehicles are clear, currently many barriers make their large deployment difficult. The biggest obstacle is the purchase price of electric vehicles as they remain more expensive than their diesel counterparts. Through operational cost savings and financial and fiscal incentives, a positive business case can be made for smaller models.

To encourage operators to use zero-emission vehicles, the FREVUE project has published recommendations for local authorities, based on the experience of FREVUE cities. A first set of measures can be taken in the fiscal and economic domains. They can lower the total cost of ownership (TCO) of electric vehicles (compared to conventional ones) as local authorities can exempt electric freight operators to pay parking fees, congestion charge fees and other road pricing taxes e.g. toll bridges, tunnels and so on.

To accompany those measures, non-financial actions can be taken, starting with legal and regulatory measures. They can include the implementation of access regulation policies: installation of pedestrian

Photo: Breytner Transport

> *UPS have now electrified nearly a third of their central London fleet, whilst Heineken run a 19-tonne truck in Rotterdam, alongside one 12-tonne and seven 13-tonne trucks in Amsterdam*

Photos courtesy of Heineken (left) and UPS (below)

zones, low-emission zones and zero emission zones. By way of example, the City of Milan installed a congestion charge area in 2012 in which electric vehicles are allowed to enter for free and where the circulation of non-electric freight vehicles between 08.00 and 10.00 is prohibited. Other examples of measures are timed access privileges, such as permitting access only to electric freight vehicles at peak times; (un)loading permissions: granting permission for electric vans and trucks to use privileged loading areas; or allowing electric freight vehicles to use bus and tram lanes.

Further than that, the installation of charging infrastructure is beneficial for the uptake of electric logistics in cities as it allows opportunity charging and decreases the range anxiety of drivers.

For instance, in the City of Oslo, the number of quick chargers tripled in 2016, reaching a total of 11

Photo: SEUR

TOWARDS A MAJOR UPTAKE

In order to tackle the issue of high purchase prices, FREVUE launched a Declaration of Intent. All stakeholders are invited to sign the declaration to illustrate the market demand and ask for a larger production of electric trucks and vans – at a lower purchase cost. As more and bigger suppliers enter the market and battery prices fall over time, the business case for smaller and especially for larger vehicles (ie, the most expensive vehicles at the moment) should improve.

Many of the industry partners who trialled electric freight vehicles have decided to expand this part of their fleet further. For instance, UPS have now electrified nearly a third of their central London fleet, whilst Heineken run a 19-tonne truck in Rotterdam, alongside one 12-tonne and seven 13-tonne trucks in Amsterdam.

FREVUE has shown that electric freight vehicles work for inner city logistics operations. With their associated environmental benefits and an improving business case, the amount of them quietly delivering goods on our streets is only set to increase. ©

The installation of charging infrastructure is beneficial for the uptake of electric logistics in cities as it allows opportunity charging and decrease the range anxiety of drivers

fast chargers and 22 semi-quick chargers in the three biggest stations of the Norwegian capital. Combined with a pre-booking system, the increase of the number of fast-charging points allows freight operators to minimize waiting time and the uncertainty related to the availability of public chargers. This system proved to be useful in Oslo as one station recorded an average of 400 charging sessions per week during the first months of 2017.

Leading by example – via public procurement – is also a way to encourage the development of electric urban freight as the public sector is responsible for procuring around 575,000 vehicles a year in the EU. Here again, FREVUE cities are at the forefront.

The City of Rotterdam has set a target of 50 per cent EFVs in its municipal fleet by 2018; the City of Stockholm does not use fossil-fuel vehicles anymore and the City of Copenhagen (FREVUE Phase 2 City) wants to reach a target of 100 per cent electric vehicles in its municipal fleet by 2025. Green procurements can also be made by introducing strong environmental requirements for transport services and goods in public tendering processes.

Finally, the different measures detailed above should be accompanied by communication and stakeholder engagement at the local level. This remains the best way to make incentives and regulations successful and effective as freight operators might lack experience and knowledge about the financial and operational opportunities that cities offer.

In London, the LoCITY programme was launched in 2016 with the aim to encourage the uptake of ultralow emission commercial vehicles. The programme gathers 1,000 individuals from over 600 organisations and is regarded as a body delivering impartial information about ultralow emission vehicles, particularly focusing on their environmental and financial benefits.

Through the wind and rain...

"Cycling in good times and in bad" was a small project that lasted from May to October 2017 as part of the Smart Mobility Project in Aarhus powered by the Danish Transport Authority and local innovation funding. The investigated how marital support impacts change and retention of everyday transport behaviour. **Liv Maria Stender** and **Gustav Friis** explain the background of the project and how the project is being used for mobility communication in a local setting

You have just decided to start the month of May with a new and active lifestyle. The running shoes are clean and sitting outside the front door after being released from their dark, winter prison and you have signed up for the "Bike to Work" campaign. You are dreaming about being detoxified and cleansed, staying away from the dark path of alcohol (in controlled amounts), crisps and Danish pastries and substituting it with cabbage, carrots and physical activities. You now find yourself seated at the dinner table in front of a lavish feast of roots, kale and steamed fish. Your spouse is now entering the room with an ice-cold, sparkling fresh Coke in one hand and a chocolate brownie with vanilla ice cream on a plate. What to do?

BREAKING THE HABIT ON TWO WHEELS

Support and fellowship at home is crucial for new habits to settle, whether it is regarding diet or activities and maybe even also when it comes to everyday transport.

In 2015 and 2016, the Smart

> *Sharing new experiences, helping each other and cycling together mean that new cycling habits became a part of everyday life for married couples such as Per and Lene*

Mobility Project in Aarhus implemented the project '365 days on the bike'. Through the project, citizens in two twin towns who normally commuted to work by car got the opportunity to commute by electric bike. It was an easy and affordable way to get experiences with new travel habits in a full year from April 2015 to April 2016. An important driver for two of the participants was the partnership as husband and wife, in that they, as a married couple, decided to do something new together:

"To have something to do together, that's a strength [...] It's fun when you can do things together. We have encouraged each other. It has been important that we could go together – at least on the way to work. We used the time together to discuss some everyday issues".

Sharing new experiences, helping each other and cycling together mean that new cycling habits became a part of everyday life for the married couple Per and Lene, who today are cycling daily using both electric and racing bikes and have participated in more bike races together. Cycling

has become a key component in their life. The Smart Mobility Project wanted to capitalise on the results and wanted to investigate what support from a partner or spouse means for the establishment of new, more active transport habits. Therefore, the project "Cycling in good times and in bad – in tailwind and in rain" was initiated on 1 May 2017. Throughout the project, six married couples from a small town 15km south of Aarhus have blogged about their experiences of creating new routines and travel behaviour together. During the period from May to October 2017, they substituted their daily car journeys with trips on an electric bike that will be their primary means of transport to and from work. The project followed the couples on their habit-breaking journey and got, through their personal narrations, a unique insight in what breaking the habit looks like in real life.

TARGET GROUP AND MOTIVATION

All six married couples were, prior to the project, commuting daily to Aarhus by car and drove between seven and 23 kilometres each way to their workplace. The participants were between 30 and 60 years of age, and five out the six couples have children living at home, where they play an important role in the prioritising of time and activities during the day. The six couples presented themselves on the blog www.medvind.smartmobi-litet.dk at the start of the project.

The most prominent driver to enter the project for the participant was to

save time and the possibility to get an accurate prediction for their commute times. A travel time that could not be influenced by congestion:

"Every day on my way to work, I sit in my car swearing at the traffic. I work in the northern part of the city and have a journey of about 23 kilometres. It takes me normally 50 minutes – each way. I am so tired of just sitting there wasting my time in the car and get more and more frustrated that I am always the last parent to pick up our child at the kindergarten", Sanne, a participant in the project explains on the blog.

Besides being reliable, the electric bike also supports the participants in overcoming some of the physical barriers that the terrain around the city offers the many cyclists in Aarhus. To some of them, the hills that need to be conquered can be the obstacle that makes you leave the bike in the shed and go by car instead:

"We are very much looking forward to starting the electric bikes – after all it gets much easier on the many moraine hills in the southern part of the city", wrote Charlotte and Jesper on the blog.

Another couple stressed the wish to incorporate more exercise and fresh air into a busy daily life. It was a central driver for them to start using the electric bike as their primary means of transportation:

"For us, the project will be the 'go' to get cycling into our everyday life and leave the car back in the driveway. Exercise, fresh air and the environmental impacts of the car,

The most prominent driver to enter the project for the participant was to save time and the possibility to get an accurate prediction for their commute times

all influence our decision on changing travel behaviour", say Lisbeth and Olav, who also participated in the project.

The quotes above reflect the initial drivers for participating in the project, and with these descriptions in the backpack, the six couples started their journey towards a more active lifestyle on the electric bikes. When the project concluded, the objectives were for most of the participants fulfilled, and they obtained what they sought by joining the project.

RESULTS AND COMMUNICATION GO HAND IN HAND

Smart mobility gathered through the blog (see **www.medvind.smartmobilitet.dk**) combined knowledge and everyday experiences with new habits.

The blog became a diary, and during the project the six couples (who during the project period became five couples) posted 94 posts on the blog. To ensure good communication, the participants have posted 175 photos and 15 videos. The project communicated the stories on Facebook as well as through local media. A total of five radio features have been broadcasted on the local branch of the national radio broadcaster DR during the six months of the project.

In parallel the Smart Mobility Project has analysed the societal benefits of a project of this kind. Applying the Health Economic Assessment Tool[1], HEAT, on the project "365 days on the bike", indicates that for each kilometre cycled on an electric bike, the society has a benefit of

approximately 0.9, whereas the costs of running the project was apprfoximately 0.5 per kilometre in the first year. The costs covered project management, depreciation of the bikes, maintenance, campaign activities, health measurements, and tracking devices. "Cycling in good times and in bad" has been slightly cheaper to run, and hence provides an even better result of the investment.

By the end of the project, seven out of the remaining 10 participants chose to buy the bike they had used from the project. In "365 days on the bike" 18 out of 30 chose to buy theirs. Most evident in the "365 days on the bike" was the decrease in the use of the bike, primarily after the Christmas break – the same thing was not noticed in the present project.

NOTES
[1] www.heatwalkingcycling.org/#homepage

This could very well be due to the marital support amongst the couples, but also be because they have yet to cycle during the winter period. However, based on the participants' farewell blog posts, it looks like they will keep cycling when it is feasible – and keep telling the positive stories about cycling to their peers.

In October 2017, an increase in the sales of electric bikes of 193 per cent over the last year was reported. Although more and more people are using an electric bike, the potential is still huge.

Analyses from 2013 show that amongst people with less than 5 km journeys to work, 65 per cent are using active transport modes. A big decrease in the number happens at 6 km where only 36 per cent use active modes of transportation and amongst people with between 8 and 11 kilometre daily commutes, 20 per cent use active modes. Therefore, the potential for more electric bikes is also prominent in the smaller communities outside Aarhus – and projects like "Cycling in good times and in bad" can facilitate the change and point in the right direction. ⓒ

Mobility, Multimodality and Traffic Efficiency

The section on Mobility, Multimodality and Traffic Efficiency addresses issues related to network management, network efficiency and innovative services, with a particular focus on Intelligent Transport Systems

Marco Amadori, Giuseppe Liguori and **Chris Bristow** tell the story of a project with its roots in gamification that's designed to change the transport behaviour habits of the residents of Bologna

Over the last decade the spread of smartphones has led to a big change in many aspects of our daily lives, in particular the possibility of being connected with the rest of the world at any time and from every place. But there are many other roads, perhaps less obvious but no less important, which have been made accessible by smartphones.

Gaming is one of the aspects on which smartphones has had a disruptive effect. Apps like PokémonGo, Candy Crush and Ruzzle are some of the most downloaded apps on app stores.

The stereotype of the square-eyed, pimply teenager who spends all night in his room in front of a powerful computer, is no longer true.

An official recent statistic of Italian video-gamers ("video-gamers" are both console players and smartphone players) shows that there is a shift of gamers' average age to the 35-44 range, and an even balance between men and women.

Gamers no longer need to shut themselves in a video-gaming room, because today everybody can play everywhere: in the main square or in the pub, during the lunch break or while traveling to work by bus or by train.

Game of Phones

> **EMPOWER's main objective was to tackle urban mobility through a new approach: it sets aside traffic blocks, traffic restrictions and other actions aimed at limiting traffic, preferring positive and soft actions**

HOW IT WORKED

From 1 April to 30 September 2017, people living and travelling across the metropolitan area of Bologna could track their sustainable journeys – made by foot, bicycle, bus, train, carpooling and car sharing – through the free BetterPoints app. Each qualifying journey was rewarded with some "Mobility Points", which allowed the participant to have access to discounts and vouchers offered by the commercial partner network supporting the initiative.

A very simple and basic scheme, to which gamification techniques have been applied to make it more appealing and interesting over time.

From a technical point of view, the BetterPoints app provided everything required: from the tracking system through the smartphone GPS, to the validation system calibrated on each mode of transport to avoid misuse of tracking and cheating, to the management of the Mobility Points and vouchers.

Participants had several opportunities to get Mobility Points. Firstly, the basic loop "track a trip → earn points → redeem vouchers" was available

Things become interesting when playing a game can produce positive results not only for the amusement of the player but also for society: these elements are the basis of gamification, the application of game-design techniques and game principles in non-game contexts. So why not try to play with our daily journeys to make them as fun as a game?

This idea became a pilot project in Bologna, thanks to EMPOWER's funding. The EMPOWER project's main objective was to tackle urban mobility through a new approach: it sets aside traffic blocks, traffic restrictions and other actions aimed at limiting traffic, preferring positive and soft actions. Behavior change was encouraged and promoted by awarding prizes for virtuous behaviors, instead of punishments for bad (and polluting) behaviors.

The "Bella Mossa" campaign in Bologna, Italy, was designed as a behaviour-change campaign based on a gamification scheme, incentivising modal shift and rewarding "green" commuters.

The technical collaboration with the BetterPoints® web platform and mobile app filled the technical needs, while the funding received as a "TakeUp City" in the EMPOWER project solved the financial issues.

The Bella Mossa experiment took place in the metropolitan area of Bologna, a 3,700 km^2 area where around 1 million people live and move daily.

Bella Mossa's basic loop

Track your trip → Earn points → Get discounts

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The basic loop

Track your trip → Earn points → Get discounts

Extended loops

USE IT AT LEAST 5 DAYS/WEEK → Earn extra-points → Get more discounts → USE IT AT LEAST 5 DAYS/WEEK → Earn extra-points
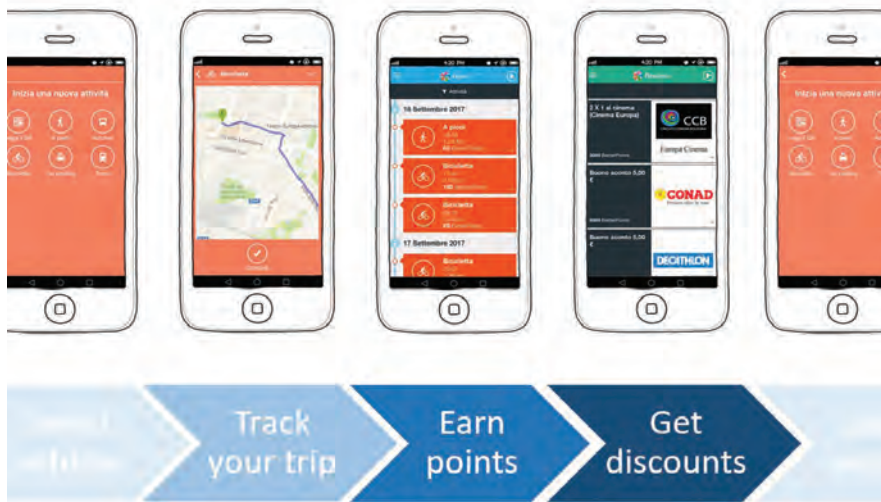
JOIN SPECIAL EVENTS → Earn extra-points → Get more discounts → JOIN SPECIAL EVENTS → Earn extra-points
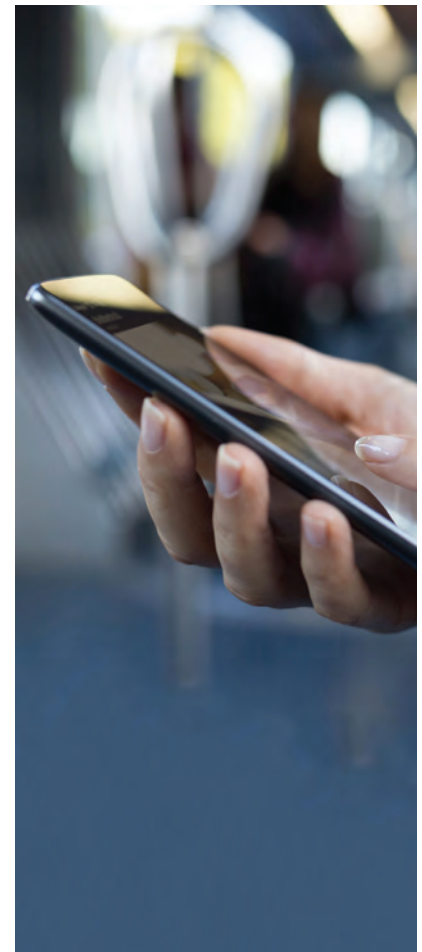
to participants for all six months, allowing them to earn a daily number of Mobility Points for every sustainable trip, and thus providing them with a quick feedback on their positive behaviour.

At the same time, participants could earn extra points for achieving specific goals, such as: a minimum number of sustainable travel days per week, meeting recommended weekly physical activity levels (by cycling or walking), the first sustainable trip of the day, or the participation in special events located throughout the metropolitan area and by getting there in a sustainable manner.

These goals, achievable with a series of sustainable trips and positive behaviors during a longer period, offered a mid-term goal to participants, thus maintaining participants' ˝retention˝ during the campaign.

Alongside the gamification and technological aspects, a strong and wide ˝public-private partnership˝ between SRM - representing the public body of the city - and many private businesses was established, becoming a crucial element for the successful outcome of the campaign: 85 businesses joined the project, from large distributors and major retailers to small local stores.

Various types of discounts were available for participants: 5 for shopping, a free beer, a 2-for-1 ticket for the cinema, a discount for the hairdresser, a free entrance to the spa, and many more.

The wide variety of available discounts satisfied the many needs and preferences of participants, expanding the potential target audience.

The 'Bella Mossa' campaign in Bologna, Italy, was designed as a behaviour-change campaign based on a gamification scheme, incentivising modal shift and rewarding 'green' commuters

Awarded campaign

The "Bella Mossa" campaign won the CIVITAS Award 2017, in the category "bold measure". The prize rewards cities for their efforts to achieve clean urban transport and was presented to Bologna's Deputy Mayor Irene Priolo at the CIVITAS Forum 2017 in Torres Vedras.

THE COMPANY CHALLENGE

Employees generate most of the daily trips through their commuting. In the metropolitan area of Bologna 88 per cent of people make at least one trip per day, of which 50 per cent are a home-work/home-school trip.

A big part of the promotion of Bella Mossa was targeted at Mobility Managers of Bologna companies, who in turn promoted the campaign to their employees. To encourage employees' participation, Mobility Managers were provided with a promotional tool, based once again on a gamification approach: a Company Leaderboard Challenge was implemented as part of the BetterPoints system.

The experience gained by SRM during the six editions of the European Cycling Challenge showed that many people have an innate competitive streak, which is a strong driver and can be used effectively to boost participation in this kind of initiative.

Basically, each company had to recruit its employees, encourage them to use sustainable modes of transport for their trips to earn as many Mobility Points as possible, both at a personal level and at the company level. Employees could then compare their company's results and ranking position with other participating companies of a similar size. Employees could also compete internally against each other in the "challenge within the challenge", which some companies used to reward employees with final internal awarding ceremonies, with prizes for their most sustainable employees.

RESULTS

During the six-month period of the Bella Mossa campaign, 15,000 citizens actively participated, tracking 3.7 million km of sustainable modes of transport – which are equal to 93 times around the world – and potentially saving over 700 tonnes of CO_2 emissions.

The most used travel mode was "walk" with 350,000 journeys, while the highest number of km – around 1.3 million – was covered by train.

Sixty per cent of participants were women, and the age distribution saw the largest number of

Bella Mossa 2017

- **15,000** active participants
- **85** commercial partners
- **16,000** rewards redeemed
- **3,700,000** km of sustainable travel
- **900,000** sustainable journeys
- **93** times around the globe

Bella Mossa by the numbers

piediamoci da fare	bologna è una ciclabile	bologna sosseggia	diventa trenabile	insieme si carpoolla
520,000 km recorded	1,022,000 km recorded	830,000 km recorded	1,300,000 km recorded	45,000 km recorded
350,000 walks	290,000 cycle rides	196,000 bus rides	57,000 train trips	2,150 car shares
31,000,000 calories burned	48,000,000 calories burned	7,400 passengers	3,600 passengers	4,500 people
126 t CO₂ saved*	246 t CO₂ saved	107 t CO₂ saved	240 t CO₂ saved	9 t CO₂ saved

*Source: 2013 Government GHG Conversion Factors for Company Reporting Methodology Paper for Emission Factors

who participated

gender · age · background

when they moved

a typical week · a typical day (work) · a typical day (weekend)

what did they think of Bella Mossa?

Would you participate in another Bella Mossa edition?
84% YES

What is your rating of Bella Mossa?
3.5/5

Did participation in Bella Mossa reduce your car use?
73% YES

Did participation in Bella Mossa improve your opinion of public transport?
64% YES

Did participation in Bella Mossa increase your walking?
77% YES

the corporate challenge

1,800 employees participated

1,000,000 km recorded

39 businesses registered

190 t CO_2 saved

Corporate Challenge participants earned double the amount of **BetterPoints** compared to the average

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participants in the 35-44 year-old group, with 33 per cent of students and 59 per cent of employees, reflecting almost exactly the Italian picture of "video gamers".

Results show that most of the trips were made during weekdays, demonstrating that commuting trips were accurately targeted, which was one of the project's goals.

The Company Challenge results are significant and encouraging: the number of participants who joined one of the 39 participating company teams accounted for 12 per cent of the total participants, but they covered 27 per cent of the total km. This percentage increase in distance might just reflect the nature of the recorded trips, i.e. daily commutes, which are typically longer than social trips to the school or store. However it does show that the challenge itself drove a more frequent use of the app and, on average, a more sustainable behavior. This could be due to the competitive desire to be in front of colleagues or to win one of the prizes.

It must be underlined that the project "Bella Mossa" was, first of all, one of behavioural change with the goal of promoting sustainable mobility.

An analysis of the April-July data shows how a positive trend

> *The experience gained by SRM during the six editions of the European Cycling Challenge showed that many people have an innate competitive streak, which is a strong driver and can be used effectively to boost participation in this kind of initiative*

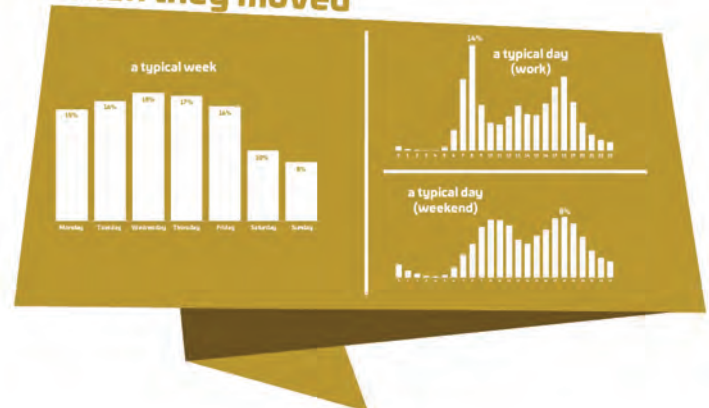Numer of trips per vehicle per active user
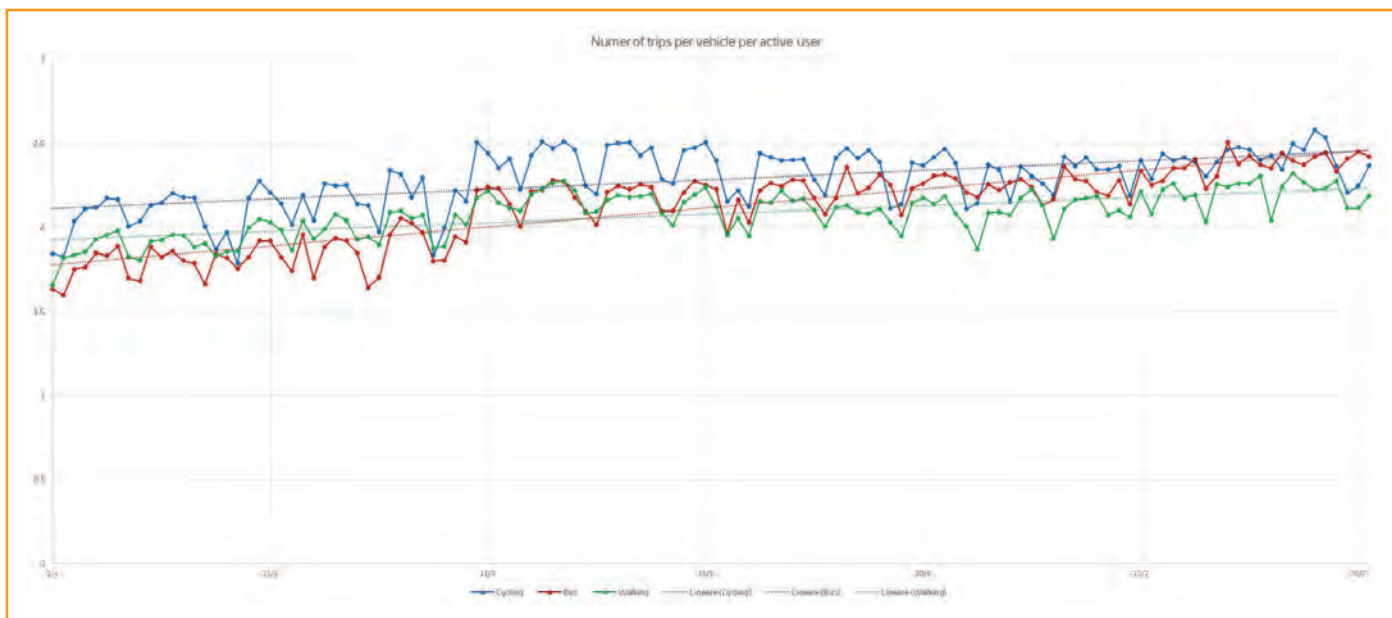
in the use of sustainable modes was achieved: "track a trip → earn points → redeem vouchers" is a virtuous circle which encourages participants to improve their sustainable habits over time.

Furthermore, participants were asked at the end of some trips, on a random basis, if they used that travel mode as an alternative to the car, and 77 per cent of trips were declared as alternatives to using the car.

GPS DATA

Last but not least, during the six months of the campaign a huge amount of data on real travel behavior have been collected. All trips were tracked with GPS and then characterized by a very detailed information set: from the basic latitude-longitude, time, day and speed to a personal information set like age, gender, job, etc. It should be noted that the privacy of participants' data was always a top priority.

Bologna is now designing its first SUMP, and all this data will be one of the main inputs for planning that campaign.

Car-free, care-free

In 2017 more cities than ever participated at EUROPEANMOBILITYWEEK (EMW): 2,526 towns and cities from across the globe organised local activities during the week. EMW promotes sustainable urban mobility locally and this was been the 15th time that 16-22 September were dedicated to sustainable mobility, as **Dagmar Köhler** reports

Although EMW is all about local engagement, the week is actually a top-down initiative. While the European Institutions regularly refer to the principle of subsidiarity with regards to urban mobility and European Mobility Week has been initiated by the European Commission 15 years ago to help sustainability appear on local transport agendas. An impressive network of national coordinators has been set up bringing together representatives from, in the best case, national ministries in charge of mobility. Clever minds defined the week to take place from 16-22 September, no matter what days that week falls on each year. This is unusual, yet very predictable. And there is more about it: European Mobility Week activities should conclude with a Car-Free Day. This gives every willing city the backbone to organise car-free days on any day, not only on Sundays. This year's Car-Free Day on 22 September fell on a Friday, though it was not mandatory to hold the Car-Free Day activities on this date.

In 2017, Car-Free Day participation increased significantly, with 1,352 towns and cities closing their street(s) to traffic – 399 more than in 2016. During Brussels' car-free Sunday on 17 September this year, social media nearly exploded with enthusiastic Bruxellois who, freed from most vehicle fumes but with free public transport and engaged in hundreds of events in Brussels' all-too-often vehicle-clogged roads, didn't hesitate to declare Car-Free Day their
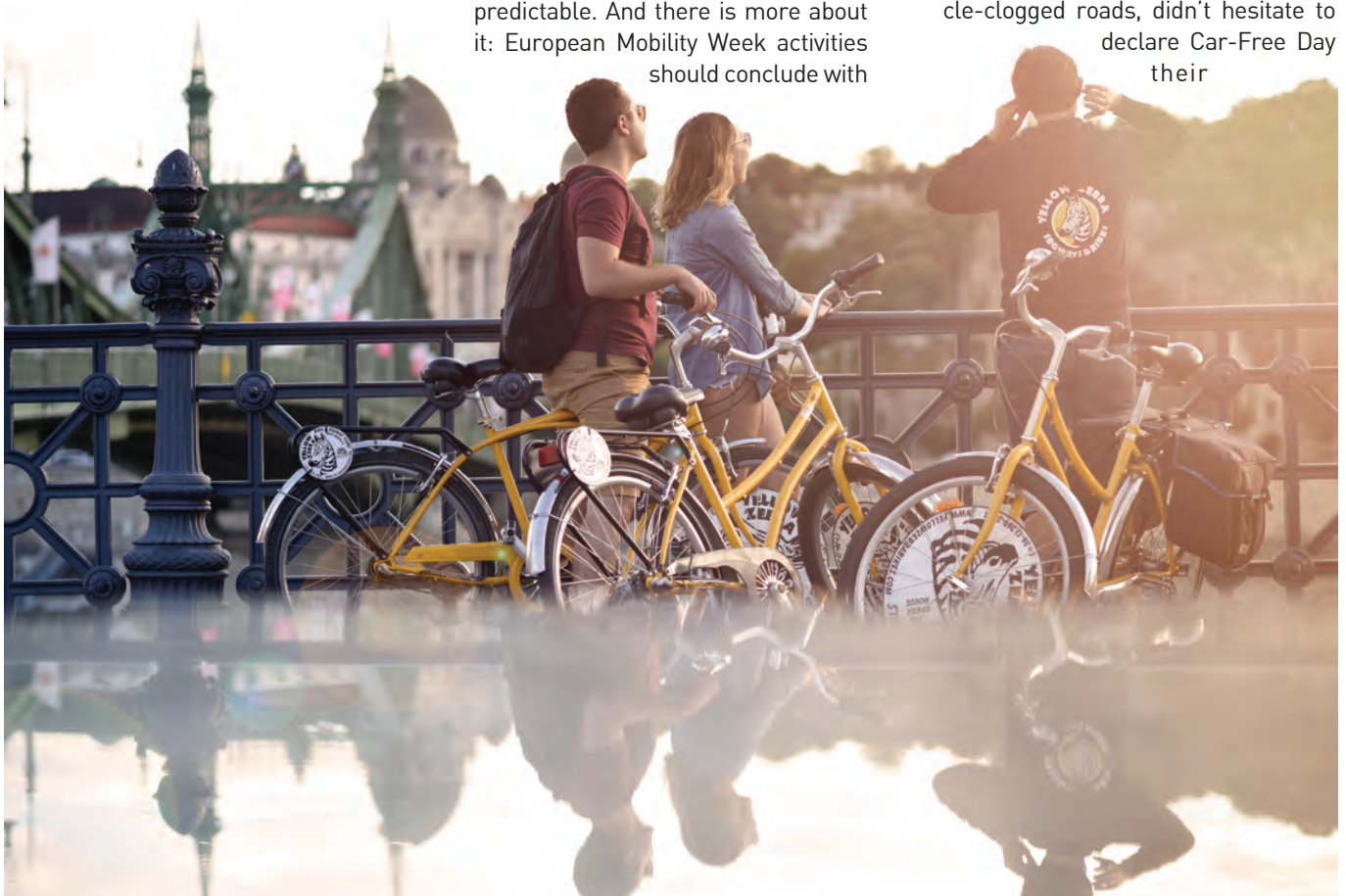
Photo : Hungarian Ministry of National Development

> *The emphasis is on using goods rather than owning them. Over the past years, sharing has become a relevant piece of the urban mobility puzzle*

favourite of the year. Brussels' transport minister Pascal Smet took note and suggested the region's Parliament organise several car-free Sundays throughout the year.

However, cities do more than closing roads during EMW. They run week-long campaigns, engage citizens in discussions, games, street parties and demonstrations and they also implement permanent measures to support sustainable urban mobility. The most popular permanent changes were undertaken, such as lowering and enlarging pavements, developing urban mobility plans, mobility management and awareness-raising campaigns, new or improved bicycle networks and bicycle stands, as well as speed reduction programmes near schools.

SHARING GETS YOU FURTHER

In 2017 European Mobility Week was held under the theme of clean, shared and intelligent mobility, as encapsulated by the slogan 'Sharing gets you further'. The emphasis is on using goods rather than owning them. Over the past years, sharing has become a relevant piece of the urban mobility puzzle. Shared mobility prioritises the importance of reaching a destination, often at a smaller individual and societal cost than by using a private vehicle.

EMW's European coordination issues thematic guidelines, which discusses the topic of the year: Is public transport shared mobility? Does shared mobility describe individual mobility, or does it include collective transport services, like riding a taxi, bus, or car by multiple persons at the same time? Continue reading the article on the following pages, My Bike Is Your Bus, about the reality of shared mobility in Europe's cities.

WHAT'S HAPPENING LOCALLY?

Many local activities during EMW focused on the annual theme 'Clean, shared and intelligent mobility', some other were more general. Here are some examples from 2017:

● **Florence** presented the annual theme of the campaign in a conference celebrating the 20 years of electromobility in the Italian

city. Currently Florence has 179 EV charging stations, which is the largest network of charging stations in the country. Plans are to increase travels made by foot, bike and electric vehicles, thanks to the combined use of shared vehicles and public transport. The electric car-sharing fleet was shown at the venue. In addition, the city set up an info point during Car-Free Day where people found out about the existing shared mobility solutions.

● **Essen**, European Green Capital 2017, planned over 60 activities including an inter-modal tour, an e-mobility exhibition, a conference in digital mobility solutions and a thanksgiving activity to cyclists. 18,000 people took part in the city's Car-Free Day (pictured opposite, far right).

● **Budapest** organised a car free weekend. With free concerts, electromobility shows, 50 exhibiting companies, and lot of family programmes, about 250.000 visitors were encouraged to develop their own innovations in the field of transport. The Budapest Transport Centre also created a board game about the ecological footprint, which was played in some schools during European Mobility Week – in one school together with European Commissioner for Transport, Violeta Bulc. A children's drawing competition was organised by the Ministry of National Development on the EDWARD day on 21 September, to highlight road safety and sustainable transport.

● The city of **Luxembourg** organised its main event in the spirit of Car-Free Day, closing a central area of 6.4 km to road traffic and organising activities instead. The event was conceived for the official inauguration of a new "passerelle" for bikes under an iconic bridge. Several other activities like workshops and a food market took place at the same time.

● In **Terrassa**, Spain 500 people made a huge, live human bike to promote the use of this clean mode of transport. After the iconic activity, they ride 8 km through the city. The mayor and vice-mayor participated also in the event, showing the political support such an awareness-raising campaign requires.

> *Project EDWARD encourages all road users to think about the risks they face, the risks they may pose to others and how they can go about reducing those risks. The results after its second 2017 edition reads like a miracle: according to TISPOL's statistics, 16 countries recorded zero fatalities on 21 September!*

In 2018, European Mobility Week's thematic focus will be on multimodality, which is also next year's focus for the work programme of the European Commission's Directorate General for Mobility and Transport (DG MOVE). It addresses that the individual vehicle remains the most convenient all-rounder when choosing transport for people or goods. However, combining different modes creates the seamless transport needed to beat congestion and avoid dependency on cars.

GLOBAL OUTREACH

Austria, Spain and Hungary are the countries with traditionally the highest

Photo : Hungarian Ministry of National Development

European Commissioner for Transport, Violeta Bulc, took part in an ecological board game with Hungarian children during European Mobility Week 2017

number of participating towns and cities, Austria alone recording 577 municipalities in 2017. Significant increases were noted in central and eastern Europe, precisely in Poland, Belarus, Bulgaria, Lithuania, Latvia and Romania. Cities from about 50 countries take part in the campaign. This includes cities far beyond the European continent, for example Washington, DC (USA), São Paulo (Brazil), Puebla (Mexico), Buenos Aires (Argentina), Volgograd (Russia), Almaty (Kazachstan), Osaka (Japan) or Seoul (South Korea) to just name a few.

To imagine that a certain share of each participating town's population receives messages on sustainable urban mobility, and a couple of hundred may engage in activities, the overall outreach to citizens is enormous. Its various layers of multipliers manage to overcome the communication difficulties the European level faces with the local level. And European Mobility Week has been noted in the sector: The European Week of Sports from 23 to 30 September promotes physical activity. Project EDWARD stands for "European Day Without a Road Death" and aims at making 21 September a day free of traffic fatalities.

The European Traffic Police Network TISPOL launched the campaign that has received wide support by the European Commission. Project EDWARD seeks synergy effects given that awareness to think about transport is increased during European Mobility Week. The initiative of course advocates to reduce risk and improve road safety not only on 21 September.

When the EU's efforts to reduce road fatalities disappointingly stagnated for the 2nd year in a row in 2016, TISPOL decided to speed up efforts with a campaign targeting road user behaviour. "We believe the European Day Without A Road Death, Project EDWARD in short, can make a big difference. After all, driver behaviour remains the most important barrier to progress as we approach 2020 and its reduction targets", says TISPOL General Secretary Ruth Purdie.

Project EDWARD encourages all road users to think – even for a few short minutes – about the risks they face, the risks they may pose to others and how they can go about reducing those risks. The results after its second 2017 edition reads like a miracle: according to TISPOL's statistics, 16 countries indeed recorded zero fatalities on 21 September! Across 31 countries there were 43 road deaths across, just as in 2016, when Project EDWARD was launched.

This compares with 70 fatalities on the same day in 2015. To achieve this, Project EDWARD engaged stakeholders to sign their pledge, record a video, organise an event and assist with spreading the Project EDWARD message.

Project EDWARD made a great impact on social media with a Twitter reach of more than 25 million over a 48 hours period and with more than 8 813 posts. This is phenomenal for any topic, and even more for a road safety event. #ProjectEDWARD trended number one on Twitter in Ireland, number four in the UK and number five in Germany. ⓒ

My bike is your bus

2017 European Mobility Week voiced the message that 'Sharing gets you further'! Sharing mobility modes is an opportunity to meet new people in real life and the social and fun sides of shared mobility contribute to the success of initiatives such as carpooling or pedibuses. There is, however, a lot more behind the aim of promoting clean, shared and intelligent mobility. **Dagmar Köhler** and **Thomas Mourey** investigated

Photo: BKK Centre for Budapest Transport

What is new about 'shared mobility'? Haven't we been using public transport for decades? The difference is an intermediate platform that brings the service and the user together: when this exists we speak about 'shared mobility'.

This platform is most often a website or an app, which allows registered users to book and pay for the use of a vehicle, book a carpool ride, or use a shared taxi or on-demand minibus service. This is a key difference between shared mobility and conventional public transport services or traditional car rentals. Shared mobility describes sharing bikes, powered two-wheelers, or cars, taxi booking platforms and ride sharing (also known as carpooling).

SHARING MY TRIP MAKES IT CLEAN AND INTELLIGENT?

Shared mobility services can make it easier for people to choose cycling, public transport, shared shuttles, or a combination of these modes over driving. They also have the potential to reduce the number of vehicles on the road: According to a study

conducted by the Transportation Research Board, each shared car takes about 15 private cars off the road, and car-sharing members drive on average 40 per cent fewer kilometres after joining a car-sharing programme. A vehicle fleet, such as a car sharing fleet, is also more likely to consist of electric, natural gas, or hydrogen vehicles than privately owned cars.

Two "intelligent mobility" applications are currently receiving particular attention: vehicle automation and the concept of 'Mobility as a Service' (MaaS). Automation is key to the emergence of driverless vehicles. The MaaS concept combines services from public and private transport providers through a unified gateway that creates and manages the trip, which users can pay for with a single account. This, of course, implies the use of shared vehicles.

What's the reality in Europe's cities?

Shared mobility has been facilitated in many cities. We take a look at examples, each with at least one intelligent or clean mobility component. This non-exhaustive overview of good

practices includes solutions mainly from European cities, developed by public or private actors.

BIKE SHARING SCHEMES: ALLIANCE OF SHARING AND ACTIVE TRAVEL

Users of bike sharing services can pick up a bicycle for a low fee at a docking station or on free-floating schemes with no fixed pick up/drop off stations. Bike sharing is an alliance of three key aspects of sustainable urban mobility: it is clean, intelligent, and shared.

Bring bicycles to the cities that need them

A Bike Share Map, created by researchers at University College London (UCL), maps bike sharing schemes all over the world. It features more than 600 cities and other places with such systems in place, of which more than 130 are in Europe. Countries like France, Spain, or Italy have the largest number of such schemes, which are all but absent in 'cycling countries', such as the Netherlands or Denmark. Bike sharing schemes therefore seem to be

CityMobil2 proposed a campus shuttle service at EPFL in Lausanne, Switzerland

most relevant where bicycle ownership is not (yet) peaking.

Vélib' in Paris is Europe's largest bike sharing scheme, with 20,000 bicycles and 1,800 stations. BikeMi in Milan operates a fleet that includes traditional and electric bicycles, while BiciMAD in Madrid is a pedelec sharing scheme. These forerunners make cycling possible for new target groups, including those who have not cycled before due to health reasons or to the hilly terrain in their city.

The city of Ghent launched Europe's "first public cargo bike sharing scheme in May 2012 in cooperation with car sharing provider Cambio.

Copenhagen's latest bike sharing scheme takes bike sharing one step further: all bicycles are equipped with a touchscreen tablet mounted on the handle bar. The tablet informs users about docking stations, and also provides GPS-based navigation assistance, facilitates payment, and helps to locate sites of interest in the Danish capital. In Brussels, real-time information about the availability of bikes at the nearest stations is given on 'cyclodispos' - street signs that also direct people to the nearest *Villo* stations.

Cycling critical MaaS

More and more multimodal journey planners encourage the use of bike sharing. *Métropole de Lyon* has developed an online tool called ONLYMOOV. It shows users the quickest route to their destination, the availability of shared bicycles, and the best cycling paths. It also considers other modes of transport and offers traffic updates, gives information about the availability of car and bicycle parking slots, and provides real-time data on local metro and tramway arrival times and on car sharing opportunities. The Whim app in Helsinki goes one step further as it combines travel planning, routing and ticketing for a variety of transport modes on a single app.

In some cities, a single card gives access to shared bikes, public transport, and other mobility services. This puts cycling at the core of a chain of urban mobility modes, and embeds cycle sharing in the concept of 'Mobility as a Service' (MaaS) in urban areas. In Toulouse, for example, people use the

Autolib' have been active in Paris since 2011

Pastel card, which gives access to the public transport network, as well as to the city's bicycle and car-sharing systems.

CAR SHARING: THE BEGINNINGS

In 1947, Zurich was the first city in Europe to set up a car-sharing scheme. Since the 1980s, the market has developed further, and today Switzerland and Germany are front-runner countries in this field. In several cities, car-sharing operators originally offered vehicles for use for brief periods only. This was the case for the first two Swiss operators, who started in 1987 and have subsequently merged (this entity is now called Mobility Switzerland). In Germany, StattAuto Berlin was founded one year later, in 1988. Today, over 500 German cities have at least one car-sharing scheme.

Cleaner car sharing schemes

Car sharing schemes quickly evolved to incorporate new clean and/or intelligent components. In 1999, the city of La Rochelle introduced an electric car-sharing scheme called Liselec. Fifty shared electric cars were introduced by the local authority with the aim of reducing pollutant emissions. By now, several cities have introduced electric car sharing services, including Autolib' in Paris. Autolib' was launched in 2011, and in 2016 it boasted an impressive 130,000 registered clients and a fleet of nearly 4,000 electric cars. The car-sharing scheme Sunrise operates in several Swedish cities and uses vehicles running on different fuels, including compressed natural gas (CNG).

...and smarter car sharing schemes

In addition to the improvements in vehicle emissions, new ICT tools have also appeared in this market. This has allowed the introduction of free-floating car sharing systems, which operate without dedicated pick up and drop off stations. Free-floating systems are more flexible and allow drivers to leave the cars at their final destination. Thanks to the immense uptake of smart phones and the development of dedicated apps, registered clients can easily locate the closest car of the fleet and then leave it at their final destination. These ITS tools also facilitate payment and access to information. Such free-floating car sharing schemes operate in Amsterdam, Rome, Madrid, Vienna, and Berlin, among others. In Osnabrück, parallel systems provide station-based car sharing services (stat→k) and free-floating ones (flow→k).

...beyond cars

YUGO is the free-floating electric scooter-sharing scheme in Barcelona. The French region Ile-de-France, together with the city of Paris, launched, in November 2016, the *VULE partagés* pilot project, which enables sharing of light commercial vehicles amongst Parisian artisans and traders.

The YUGO shared scooter initiative in Barcelona

Another approach to urban freight movements is crowd-sourced delivery. This is a peer-to-peer system that brings people and drivers (of any freight vehicle) together. The driver then offers his services to a number of clients with similar needs. An example of this system is the company Hitch, which can operate in any city where supply and demand meet.

ALTERNATIVE USE OF PRIVATE CARS: SHARED TAXIS AND SHUTTLES – TOWARDS AUTOMATION?

Taxi services that can be booked via a dedicated platform are new to the game. Uber is perhaps the best-known example, but there are several other shared taxi services that aim to bring people with over-lapping routes together. The wider uptake of smartphones, Geographic Information Systems (GIS) and Global Positioning Systems (GPS) makes it possible to match drivers and passengers. This concept is also called ride sourcing: users book their trips via a platform and pay their fees via a facilitated gateway.

Minibus or shuttle services are also susceptible of accommodating shared mobility elements. The use of automation and C-ITS has led to the emergence of new approaches and services, such as 'robot taxis' or automated shuttles. In the city of Capelle aan den Ijssel near Rotterdam, the company 2getthere operates electric automated shuttles in the business park Rivium. The shuttles operated by this on-demand service transport 500 passengers per hour and per direction from and to fixed stops.

The European CityMobil2 project proposed a similar on-demand service at the university campus of EPFL in Lausanne via a dedicated mobile app.

RIDE SHARING: WHEN MOBILITY RHYMES WITH SOCIABILITY

Ride sharing, also known as car-pooling, means that passengers share vehicles to reduce costs. The success of Blablacar indicates that ride sharing has become a popular type of inter-city travel. In Craiova, for instance, a poll of 10,850 commuters revealed that carpooling promotion and implementation of measures had reduced the number of kilometres travelled by almost 65,000 per year, resulting in the reduction of CO_2 emissions by 11 tonnes per year.

THE COMPLEMENTARY SCHEME: PARK SHARING

While the fact of sharing a vehicle is spreading in many cities, the fact of sharing parking places is emerging as a complement to the 'traditional' shared mobility options, in particular for vehicle owners. This type of services makes the liaison between vehicle owners and parking place(s) owners. Both actors can subscribe to a service and download a mobile app that indicates to the drivers the location of the closest free parking places. The payment is done directly via the online tool. In Florence, the municipality encourages the use of this type of apps (e.g. Sparky) that have a positive impact on congestion reduction, pollution reduction and land use.

HOT OR NOT?

To really make urban mobility cleaner, the total amount of kilometres covered by motor vehicles needs to be reduced. However, if municipalities develop the right policies and incentives, technological innovation can bring real benefits. A good public transport system is a necessary complement to the development of shared mobility as it remains the best option for the rapid transport of numerous people. If they are an integrated part of a city's mobility strategy, sharing services and enabling technologies can fill gaps and provide a real alternative, thereby contributing to sustainable urban mobility.

Taking the strain

Jeff Butler considers the core capabilities of managing public transport infrastructure in a smart city

Despite cities around the world having different cultures, sights, cuisines and atmosphere, many are experiencing similar challenges in relation to increased urbanisation, congestion and complexity. In fact, according to the United Nations, more than half the world lives in urban areas – a number projected to surpass six billion by 2045.

Therefore, it's inevitable cities around the world will experience greater strain on their transport systems, increasing traffic congestion and transport-borne pollution, adversely affecting the quality of life of citizens.

It's in this context that the smart city model is seen as the future of urban development. Providing one of the most intriguing and innovative applications for the Internet of
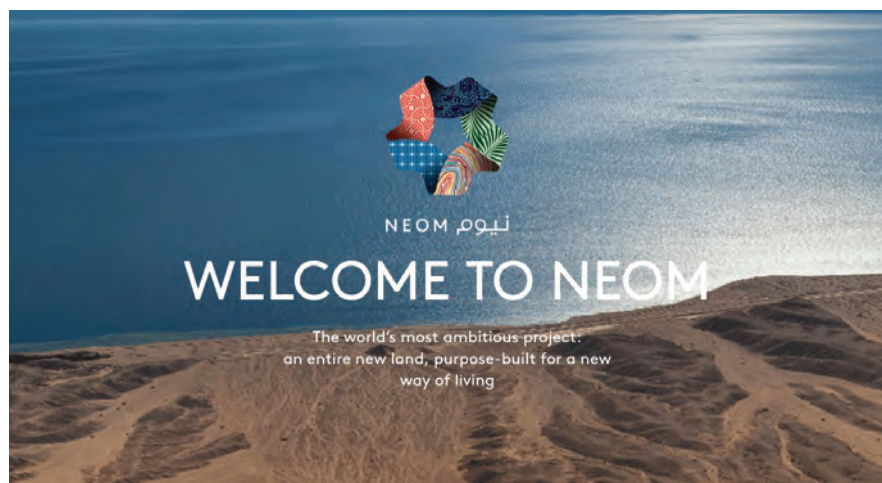
Saudi Arabia recently announced NEOM, an ambitious US$500 billion project which will see a new smart city economic zone developed over 26,500km
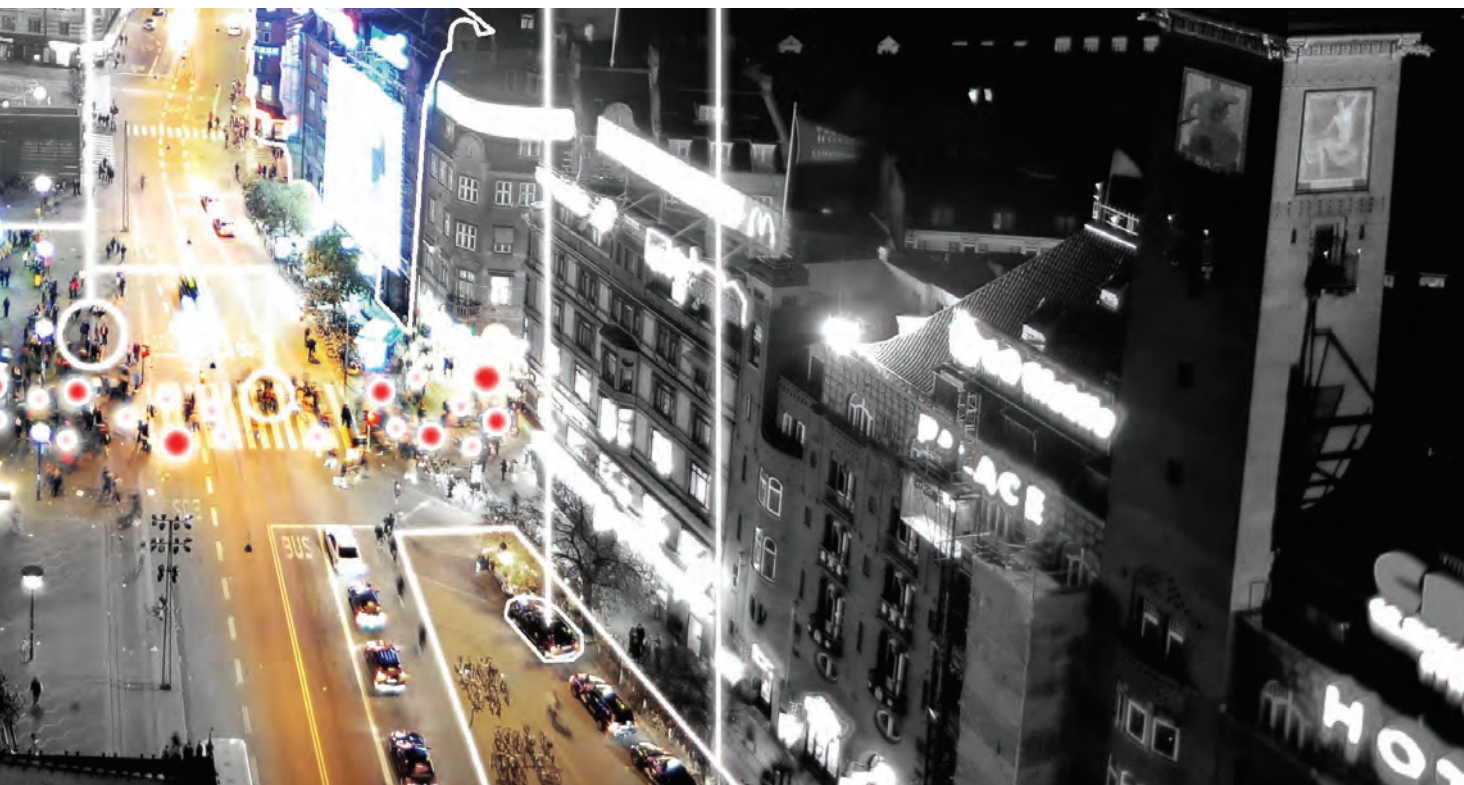
Things (IoT) technology, smart cities offer a myriad of benefits for governments and citizens around service provision, quality of life, security and sustainability in an increasingly complex world.

Stockholm, for example, is using smart technology and connectivity to improve the lives of residents, visitors and businesses through a range of projects aimed at areas such as elderly care and energy efficiency. Similarly, Saudi Arabia recently announced NEOM, an ambitious US$500 billion project which will see a new smart city economic zone developed over 26,500km.

Off all the smart city components, transport infrastructure is arguably one of the most critical and will ultimately define success in the eyes of citizens. As cities grow in size, smart city planning will be able to address the associated issues, such as increased traffic congestion, transport delays as well as air and noise pollution.

To address such issues, and to capitalize on associated opportunities, authorities need to find effective ways of integrating all available assets and resources, giving them full operational visibility of transport networks.

What's more, by leveraging artificial intelligence and real-time data inputs across the various modes of transportation, cities can sustainably manage increasing populations while balancing economic growth. As a starting point, there are five core capabilities needed to achieving this end-goal.

OPEN OPPORTUNITY THROUGH OPTIMISATION

Planning and solving problems within a smart city's public transportation operations requires sorting through an overwhelming amount of information, while being constrained by a web of options, rules and conflicting business goals. One of the keys to managing this chaos is optimisation.

Whether it's data flowing from the public, between government departments or any number of IoT devices on vehicles, road and track side, optimisation slices through complexity to present the best solution from an infinite number of permutations - all in a matter of seconds. This is especially critical when managing transport disruption, where optimisation can account for both crews and vehicles, incorporate all required rules and constraints, and ultimately help planners quickly identify the best resolution to keep the city moving.

In a smart city, data will not be limited to just the public transport network. It's vital to also include insights drawn from external sources including neighbouring cities, local events, the weather and any number of other other factors that can impact public transport performance. Authorities can then respond in real-time, proposing new solutions which can be assessed and further optimised

> *In a smart city, data will not be limited to just the public transport network. It's vital to also include insights drawn from external sources including neighbouring cities, local events, the weather and any number of other other factors that can impact public transport performance*

with the soft knowledge and experience of the most experienced planners. It is critical that planners can easily interact with the system and make changes to any plan at any time, based on their knowledge of the issues and infrastructure.

A FOUNDATION BUILT ON INTEGRATION

By nature, cities are big. Therefore, it comes as no surprise the supporting infrastructure, services, departments and number of civil servants are equally large, which tends to lead to a rigid separation and lack of information flow between different departments and services – ultimately creating data silos.

Data silos occur when the various endpoints within a city produce data, which is then stored on separate platforms, isolated and not necessarily interoperable with other city data. So while gaining the right data from various end-points is important, filtering it through a centralised and single platform is what will translate it into real-time and actionable insight. The core to any smart city is interconnectedness – something that can only truly be achieved by connected data sets allowing for fully integrated planning and operations.

Having an integrated planning and scheduling platform improves end-to-end visibility, as well as drives efficiencies and functionality, especially when it comes to applications associated with servicing and scheduling. In Australia, for example, Queensland Rail uses

such a system to bring all of its rail management departments under one roof. Completed in 2016, the new Queensland Rail Management Centre features a 24 metre-long screen projecting the entire city network, making it the largest LG control screen monitoring a transport network in the world. The system ensures consistency among data sources and business rules, supporting Electronic Train Graphs, delivering dynamic time-tabling as well as fleet allocation capabilities to better optimise the State's train operations.

This kind of integrated platform is the key to breaking down data silos and enabling effective communication between different departments, planning teams and employees. And real-time intregration provides the fuel for continuous optimisation – it is the foundation of any smart city.

ANALYSIS FINDS THE DEVIL IN THE DETAIL

Many transit agencies capture data about their passengers, equipment and infrastructure. However, they struggle with making the vast quantity of data useful when trying to improve operations. Big data alone is of little value unless it's harnessed for actionable insights that support decision-making.

By creating feedback loops, information can be gathered and the impact of decisions can be seen immediately, used to review success and inform further refinements. One example of this might

be using current data and analysing historical records of time spent stationary at scheduled stops to optimise service schedules or further improve maintenance window durations.

Advanced analytics also enables richer insights into historical performance over a longer time-frame. Self-learning analytics can feed intelligent data segments back to the planning teams for review, allowing them to update the most critical parts of their planning data to improve the process. For example, by looking at the effects of factors such as crowding and special events on passenger behaviour, planners can connect data with passenger wait times and trip satisfaction, and improve plans for the next time.

PREPARED TO PERFORM THROUGH PREDICTION

The prediction capabilities of advanced analytics can play an important role in simulating changes to a network and assets, and evaluate the effect of those changes in real time. In a truly smart city, data from across internal and external sources can be used to see how transport infrastructure demand may change in the future. Using sources, such as census data to understand how a population is changing, or hospital records to get an aggregated view of the future demands on assisted emergency transport services, can make the difference between success or failure in the eyes of a city's inhabitants.

In European cities like Berlin the public transport sector is typically the largest employer

At a strategic level, comparing 'what-if' scenarios is critical to understanding the long-term effects of investments or changes to public transport operations. It also supports planning teams by presenting clear options for contingency planning. Public sector employees can be more efficient and more responsive to citizen needs in the context of limited government resources by using predictive analytics to harness the massive volume of available data.

Ultimately, data-driven and IoT powered predictions will not only improve government responsiveness and results, but also create conditions more conducive to innovation by reducing risks associated with future changes to infrastructure.

MOBILISING THE MODERN WORKFORCE

Globally, the public transport sector employs approximately 13 million people, and in European cities like Berlin, Madrid or Paris, these organisations are typically the largest employers. With such a large and disparate workforce, it's critical public transport providers empower employees through mobile technologies, allowing drivers, maintenance staff and other staff to instantly access the information they need while also becoming more accessible to citizens.

Like citizens who rely on having instant access to scheduling and delay updates, mobile solutions are becoming an indispensable tool for employees of all industries worldwide. Correctly implemented, mobile applications can be a window onto the whole transport infrastructure, regardless of the device being used, saving time and money for those that keep it running or rely upon it. Few applications should be tied to a desktop computer in a smart city.

MOVING TOWARDS A SMART CITY

The public transportation of the future will be built around commuters who expect little-to-no waiting time, smart ticketing, real-time information, travel comfort and personal security.

Cities like Helsinki in Finland are working to make this a reality by transforming their existing public transport network into a comprehensive, point-to-point 'mobility on demand' system by 2025 – hoping to make car ownership a thing of the past.

Similarly, Transport for London is making its 12,500-strong workforce more multi-functional through optimising its rostering; meaning staff are no longer restricted by their role when it comes to addressing commuters needs.

While these examples are well underway, these five steps provide the footing for starting a smart city 'journey' – a word that's important, as becoming a smart city is never truly a destination.

There's no denying that transforming into a smart city will be challenging. Of all the smart city initiatives, transport infrastructure will prove to be one of the real measures of success, impacting the environmental, economical and personal lives of every citizen. By carefully planning, establishing these capabilities, and leveraging IoT and big data to optimise infrastructure and services – cities around the world can start to deliver benefits for their citizens much sooner than they might expect. ©

LINKS

1. World's population increasingly urban with more than half living in urban areas (United Nations Department of Economic and Social Affairs)
2. http://www.un.org/en/development/desa/news/population/world-urbanization-prospects-2014.html
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4. Observatory of employment in public transport 2011 (UITP)

FYI
Jeff Butler is Logistics, Products & Solutions Manager at Quintiq

From theory to practice

Suzanne Hoadley discusses the many and varied interpretations of Mobility as a Service and what they can mean for cities and regions

Next year will see the transport work programme of the European Commission focus on multimodality, the way in which different forms of transport can match up for users, so it is important that we discuss now what the outcome of this work could be. We should focus on the ideas that are currently shaping multimodality and how these could have an impact on the European Commission's work on transport in the year ahead. One concept that is currently gaining traction is Mobility as Service (Maas), but its definition remains somewhat elusive.

In short, we cannot say for sure what MaaS is, the concept remains in the moulding stage of the popular imagination, and different people and industries have their own visions of how the idea will take its commonly-accepted form. For instance, the vehicle manufacturing-related industry views MaaS as the move from vehicle ownership to vehicle use and therein the promotion of shared mobility (through car sharing clubs). Whereas technology companies are most interested in building the technical platform that will enable the planning, booking and payment of the trip. At

the centre of this concept therefore is the idea of several modes of transport being joined together through the same payment and booking system.

A SUSTAINABLE FUTURE

Polis, the network of European cities and regions working together to promote innovation in transport for sustainable mobility, has drafted a discussion paper on Mobility as a Service (MaaS), precisely because we feel that cities and regions are a key stakeholder in the MaaS ecosystem, yet their involvement has been rather limited until now. Polis

believes that the future of transport should not only be shaped by the emergence of new technology and services, but also by the way in which they can meet sustainable transport goals and improve the liveability of our cities.

Developments within the MaaS domain have so far has been principally driven by technology and business priorities, and with a focus on personal transport modes, such as taxis and car sharing schemes. Indeed, the extension of trip planning, booking and payment schemes to personal transport modes is one of the main novelties of the MaaS approach. While many cities and regions already offer multi-modal journey planning and integrated payment platforms (whether Smartcard, mobile or contactless bankcard), these do not typically extend to taxis and car sharing schemes although there are always exceptions as is the case of La Rochelle and Paris. These modes are certainly a key part of the transportation system, especially in view of city goals to reduce car use and ownership. However, they should always be complementary to the more sustainable transport modes of walking, cycling and public transport. These latter modes seem to have been lost

in European level discourse on MaaS. As the backbone of urban mobility, public transport should be central to any MaaS offering. Public transport authorities and operators are therefore key stakeholders that should be around the MaaS table. Their relative lack of engagement in MaaS may explain why third party MaaS operators are finding it difficult to secure commercial agreements with them.

PARTY POLITICS

Another important innovation put forward by the MaaS community is the role of third parties in delivering booking and payment services for customers. This is a very big step for mobility providers, especially public transport operators and authorities which do not have a tradition of selling tickets through third parties. This requires much discussion on sensitive issues such as revenue distribution and pricing.

Dialogue is therefore very important. There is also concern that customers may ultimately end up paying more for their public transport service through a third party MaaS operator or that the public transport operator will be required to sell tickets cheaper. After all, the operator has to earn some money from offering the

platform of services. Polis does not believe that the third party approach is the only MaaS model. For instance, some cities are taking advantage of the MaaS momentum in order to improve the integration of their existing services. Indeed, where there are already well integrated transport platforms in cities, a third party approach may be difficult to find a foothold in the market.

This does not imply that local authorities should run the whole show. They acknowledge that certain services can be run better privately, such as information services, notably through Smartphone-based travel apps which have proliferated in some cities, mainly through the growth of open data. One area of MaaS that local authorities are especially hopeful about is the potential for greatly improved transport for people who currently are not able to access traditional public transport, such as the elderly and disabled and people living in suburban and rural areas, where low and dispersed demand makes it very expensive to provide conventional public transport. More personalised mobility with the involvement of private sector providers could aid social inclusion in this way.

Another positive societal impact that MaaS has the potential to bring is a switch to more active and environmentally friendly modes of transport, such as cycling and walking. With the ready knowledge that your journey time will be shorter or the trip cheaper on a bicycle from a nearby bike-share stand, you are more likely to opt for this choice.

Even if your journey cannot be easily completed on foot or by bike, with an integrated transport system it will become more convenient to cycle to a train station and complete your journey by rail, for example. With this increased efficiency, it may tip the balance between choosing to drive and choosing a more environmentally friendly alternative.

STRIKING THE RIGHT BALANCE

There are risks, however, that with a primarily business-driven approach to MaaS, inequality could be exacerbated by MaaS innovation. For example, premium services like priority boarding or superior seats could be offered to customers who pay more, and service quality for poorer users could deteriorate.

With the input of a local authority, this risk could be diminished through proper representation of the general public in MaaS developments. Policy has to be designed in a way that will not stifle the growth of transport options, but the changes to transport must be considered from a wider perspective. If one service increases congestion, makes transport less accessible to certain groups, or is in any way detrimental to the interests of the public, there needs to be a way of redressing the problem.

To answer the question of what role a public authority should play is complex. We cannot say that MaaS is a rigid, uncompromising concept that must manifest itself in the same way in every city. European cities are diverse in many respects, so the transport on offer must reflect local needs. This is an advantage of MaaS, the motivation behind the transition to MaaS is based on a will to make transport more efficient and flexible. It could be said that at present a major deficiency of public transport is its rigidity – buses and trams may be designed with one city in mind, but not another. MaaS has the potential to adapt transport in a way that makes it more suited to its city, reducing journey times and filling in gaps in service that currently make people choose to travel by car.

Rather than being inflexible about what Maas should be, and what role cities and local authorities should have in the development of MaaS, Polis understands that these roles will be different depending on the context of the city. What is important, however, is that the city should have some role, whether it be as an enabler, a leader, or a supervisor. To exclude local authorities from the development of MaaS would be problematic, especially in cities where there is already a high degree of transport integration. In many local authorities in Europe, it is already possible to use the same ticket for buses, trams, metro, and even rail, as well as choosing different levels of transport subscription so that bike or car sharing is included.

These subscriptions can already often be paid for online on a website or app where transport users can also look up routes and receive real time travel information. To try to establish a MaaS system parallel to this, rather than integrated with it, may be inefficient and impractical.

The way in which transport is provided is evolving, due to new technologies and societal pressures, and this change will be good if it increases transport efficiency and safety, as well as promoting greater social inclusion.

With cities and regions working in collaboration with private companies, we have the potential to ensure that transport users continue to benefit from these improvements, and that fewer people are socially excluded due to lack of transport options. Now is the time to turn theory into practice. ©

> *Another positive societal impact that MaaS has the potential to bring is a switch to more active and environmentally friendly modes of transport, such as cycling and walking*

Favouring integration

To reach true added value, authorities need a comprehensive policy approach towards Mobility-as-a-Service. **Michel Arnd** and **Marko Lovric** investigate Manchester's Transport Strategy 2040

When the fourth generation of bike sharing emerged in the last decade, it fuelled hopes that bike sharing could help to increase the modal share of cycling substantially. Cities all around the world invested in bike sharing schemes, often in public-private partnership. Recently, some city authorities experienced that new private operators compete with their schemes. The London Borough of Fulham and Hammersmith even had to ask the Singapore-based operator Obike to remove their bicycles as they caused obstructions and cluttered pavements. To resolve the challenges, Feryal Demirci, a cabinet member in North London's Hackney council suggested a policy dialogue with the bike sharing companies. She proposed agreements with bike share schemes, similar the regulation of car clubs to avoid uncoordinated distribution of bikes.

With their Transport Strategy 2040, that comprehensively addresses new mobility under a Mobility- as-a-Service (MaaS) umbrella, Manchester's transport authority Transport for Greater Manchester (TfGM) lead the way and established a code of working with the Chinese bike sharing operator Mobike.

In contrast to the capital, where Transport for London has long-since regulated transport, Manchester has experienced decades of open competition after public transport services were deregulated in 1986. However, high levels of congestion and poor

> *Drawing on past experience of free competition, Manchester opted for a policy-led approach of coordination in its MaaS activities*

air quality eventually led to a reversing trend in Britain. Beginning in 2011, new authorities like TfGM were set-up to develop competitive public transport network, particularly addressing the lack of integration. Before, passengers were required to buy different tickets at different tariffs for every transport mode; and while multiple operators competed on the same route, they left other areas without service.

However, Manchester's 2040 Transport Strategy does not stop at public transport integration. Instead, it aims to integrate other modes including bike sharing and car clubs, aiming at a comprehensive MaaS system.

Eventually, it will include ticketing and route planning of different modes and services in a single interface, such as an app. Rafael Cuesta, TfGM's Head of Innovation points out: "It's all about choice. We're looking at how to provide people with information about the full range of travel options for their journey so they can make up their own minds".

MAAS BENEFITS

Drawing on past experience of free competition, Manchester opted for a policy-led approach of coordination in its MaaS activities. It entails a consistent approach to transport information, pricing and payment through MaaS. Similar to the Mobike agreement, TfGM aims to work with all transport operators to fully embed their modes in the MaaS system.

To evaluate MaaS technology and policy, Manchester joined the MaaS4EU project, which develops a platform that integrates planning, settlement and ticketing functionalities across mobility services.

The new system will be evaluated by 400 passengers will evaluate the new system in a four-month pilot phase allowing a thorough evaluation and understanding of travel behaviour and customer experience. Cuesta is convinced of the benefits of MaaS. He believes in its potential to transform the way people move and to make Manchester's roads less congested and polluting. Ⓒ

FYI

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Find out more about the 2040 Transport Strategy at **www.tfgm.com/2040**

A whole new path

How the Middle East is aiming to take the lead on global urban mobility development, by **Ralf Baron, Thomas Kuruvilla, Morsi Berguiga, Michael Zintel, Joseph Salem** and **Mario Kerbage**

Between 2006 and 2014 the number of cars registered in Dubai doubled

In the Middle East, population and urbanization have been growing rapidly, and some of its countries could drive major development and growth initiatives and become top global economic performers in record time. However, to do so, these countries must catch up with standard urban development issues extremely quickly. A full set of urban-growth challenges stands in the way, including traffic congestion, transportation safety and security, the cost of public transportation, high usage of private vehicles, and environmental considerations.

As another indication, Arthur D. Little's Urban Mobility Index 2.0 report, which analyzes the maturity and performance of urban mobility systems around the world, revealed that Africa and the Middle East were the lowest-performing regions, with respective average point totals of 37.1 and 34.1 out of a possible 60. This may be compared with leading cities in Asia and Western Europe, which scored well above 50.

CHOOSING THE BEST APPROACH
Government and public authorities in the Middle East have generally followed one of two models when looking for solutions to address these major transportation challenges.
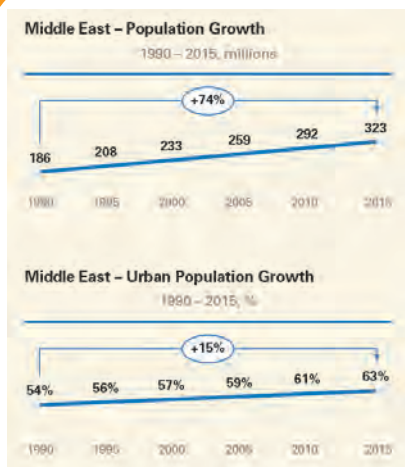
TRANSITION MODEL
The initial approach decision-makers followed was to invest heavily in roads and public transport infrastructure, raising the transportation network's capacity to absorb the greater demand. This "transition model" is inspired by the evolution of transportation networks in the Western world, where it took more than a century to build, develop and maintain advanced public transport networks. Cities in the Middle East have tried to follow these models and strengthen transport-mode offers in short time frames, often focusing on roads and rail networks.

Governance methods are reinforced in parallel through the launch of transport supervision authorities, which have mixed roles covering planning, investments and regulation (for instance: RTA in Dubai, ADA in Riyadh, PART in Kuwait).

While this approach solves short-term urgent issues, such as congestion, it also faces the risk of not being sustainable enough to address long-term difficulties. Addressing the challenge of congestion solely from the supply angle, through investments in traditional transport infrastructure, will not solve the long-term problems for two main reasons.

Firstly, given the very high (and continually increasing) growth rates on the demand side, expansion in infrastructure capacity will not be enough. For example, road capacity in Dubai increased by 36 per cent between 2006 and 2014, yet the number of registered cars in the country doubled in the same period – without including the large inflows of non-Dubai-registered cars entering and exiting the Emirate every day. The city has started to think about new "out-of-the-box" ideas to address the problem differently.

Secondly, this traditional approach ignores current trends in urban transportation, particularly around major technological and behavioral changes. Today, we can see clearly that the dominance of the private car as the main means of transportation is coming to an end. The "sharing economy" means services such as e-hailing and car sharing and the rise of digitally enabled transport modes are booming all over the world. Given the young, connected population in the Middle East, this is creating a greater shift in transport habits than in other geographies. For example, in Saudi Arabia, 50 per cent of the population is below 25, and 77 per cent owns a smartphone, driving a

Middle East – Population Growth
1990 – 2015, millions

+74%

186 208 233 259 292 323

1990 1995 2000 2005 2010 2015

Middle East – Urban Population Growth
1990 – 2015, %

+15%

54% 56% 57% 59% 61% 63%

1990 1995 2000 2005 2010 2015

Graphs: short-term measures are not sustainable in the long term

■ Lane-Km
■ CL-Km

+4%

8.715 9.198 10.808 11.468 11.454
3.077 3.263 3.498 3.639 3.940

2005 2007 2009 2011 2014

sharp increase in e-hailing usage – the local Uber service announced a month-to-month increase of 50 per cent in the number of trips taken in 2016.
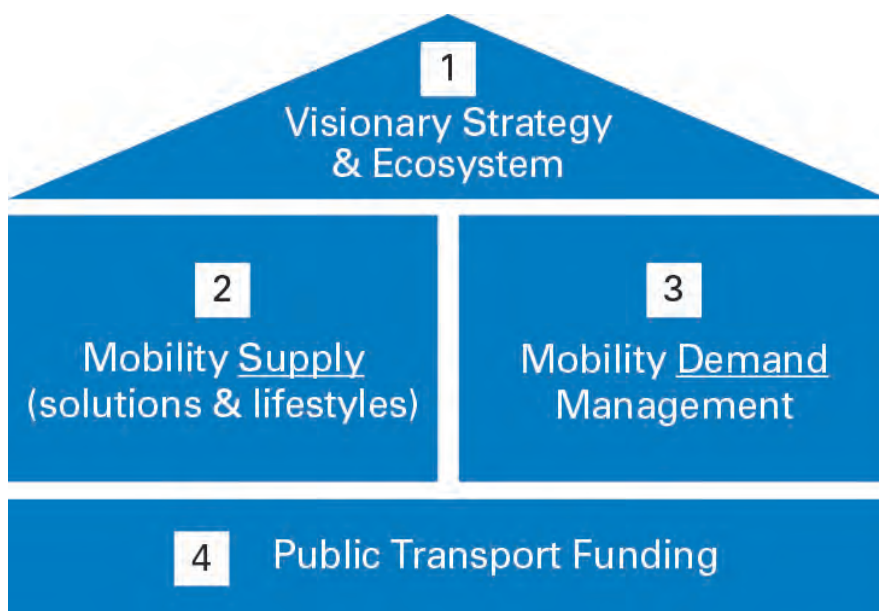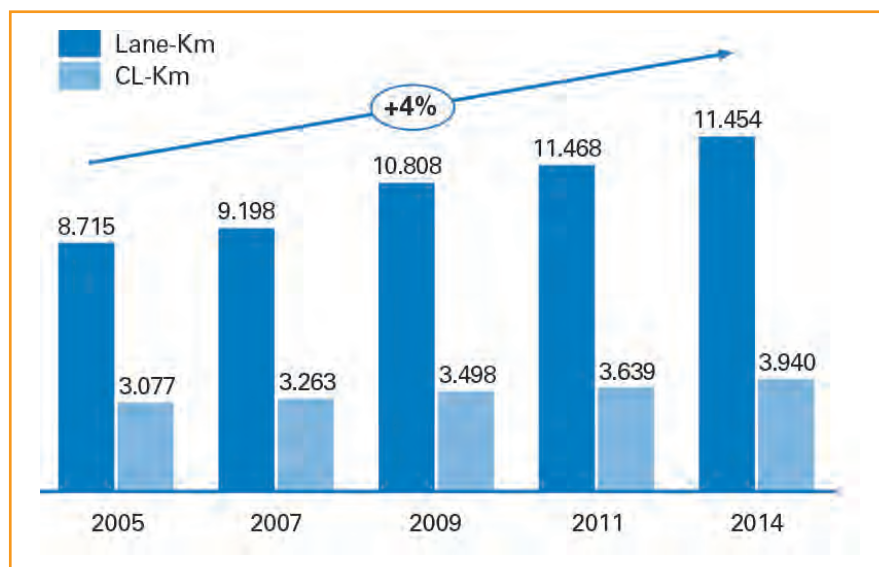
ECOSYSTEM MODEL

A few advanced cities have taken different paths, trying new approaches to reinvent their transportation networks in order to respond to challenges. The key principles of these new approaches are to:

- Develop a holistic view of the mobility model ex ante
- Integrate all available mobility modes seamlessly and holistically
- Consider both supply and demand levers to reshape urban transportation
- Effectively leverage innovative, new mobility modes (such as shared or autonomous transport)

Middle Eastern cities provide a favorable environment for this new mode for multiple reasons.

- They do not have heavy legacy transport infrastructure to manage.

1 Visionary Strategy & Ecosystem

2 Mobility Supply (solutions & lifestyles)

3 Mobility Demand Management

4 Public Transport Funding

- Infrastructure rollouts are faster and easier given the short decision-making process.
- Most of these cities are undergoing ambitious transformation plans with the aim of increasing their attractiveness: an innovative urban transportation experience is seen as a strong lever for differentiation.

At this moment, we can see that the Ecosystem approach – usually implemented in a broader ˝smart-city context˝ – is a true game

changer leading to progressive urban development opportunities. The model opens the door to create true impact in a city:

- Push public transport modes via integrated offerings, hence reducing congestion and carbon emissions.
- Provide a seamless customer experience – search, book, pay – integrating mobility and other sectors.
- Promote complementarity between transport modes, rather than competition.

Dubai Water Canal

● Prepare the city to accommodate the future mobility modes.

DRAWING FROM THE EXPERIENCE OF THE MIDDLE EAST

Set solid foundations on the supply side: This includes infrastructure investments as well as investments in new mobility modes. On the infrastructure side, Dubai is a role model in rapid decision-making, planning and deployment of big infrastructure initiatives. The recently opened Dubai Water Canal, which runs through the heart of the city, took only three years to move from the start of the planning process to opening.

Set awareness for the necessary shift in mobility demand: Public transport's share of journeys is only 14.4 percent in Dubai. This is very low compared to other major cities in Asia, Europe and the US (where it reaches 35–55 per cent). One explanation for this might be climate related, but the major reason is the mindset of users. Historically, individual transport was the only possibility users had. Now Dubai is aiming to jump directly from an individual-centered mobility system to an integrated one.

Think of mobility as an integrated ecosystem: The set-up and optimization of single mobility modes and infrastructure components is important. But Dubai understood at an early stage that the entire system could only be successful if single modes were networked and integrated in a system that solved a mobility "challenge" for the user: to go from A to B. A trip on the metro from station to station is worthless if the user does not know how to proceed from there, especially with a hot climate and (still) underdeveloped walking and cycling options. The solution is to integrate on the supply side as well as on the demand side – infrastructure and mobility modes have to be interlinked like a well-oiled machine in order to provide a seamless mobility experience.

Be at the forefront of new mobility technologies: Dubai is continually searching for the latest new technologies. Innovation labs, international experts, panel discussions, fairs and visiting trips are all used to identify technologies that might move the mobility system forward. When potentially successful "pearls" are identified, decision-making and pilot programs are rapid. In this process, Dubai essentially works like a start-up company: if an opportunity is spotted, it is tested.

CONCLUSION

The dramatic growth of urbanization is a global trend. It puts tremendous stress on one of the core functions of an urban area – the mobility system. It is therefore worthwhile for any and every urban developer, technology provider and traveler to study how the new ecosystem approach is being applied.

When it comes to mobility, we may see learning becoming truly bidirectional. Middle Eastern centers have followed the traditional European and American development path for quite some time. Now they are setting their own priorities. Cities in other parts of the world should observe and learn from their experiences. ⓒ

> *A few advanced cities have taken different paths, trying new approaches to reinvent their transportation networks in order to respond to challenges*

FYI
The authors all work for Arthur D Little in various locations in North America and Europe

It's not about the journey

Transport Malta's **Alexandra Ellul** charts the progress of CIVITAS DESTINATIONS, a six-island project designed to tackle the challenges of tourism

Malta is one of six demonstration sites participating in the CIVITAS DESTINATIONS project. The four-year project is funded by the Horizon 2020 Programme and targets mobility in areas most hit by tourist seasonality, particularly islands on the periphery of Europe. The project builds up an integrated approach to address mobility and tourism, testing balanced strategies to face the rising challenges of these two growing sectors and to achieve sustainable development and a better quality of life in Funchal (Madeira), Limassol (Cyprus), Rethymno (Crete), Elba (Italy), Las Palmas de Gran Canaria (Spain) and Valletta (Malta).

As part of the project, Malta and the other five sites, will be piloting several innovative (for the local context) solutions that in the end will form part of the Sustainable Urban Mobility Action Plan (SUMP) - the European Commission has promoted SUMPs extensively in recent years. The concept includes the compilation of an integrated plan for sustainable urban development comprising interlinked actions that seek to bring about a lasting improvement in the economic, physical, social and environmental conditions of a region, a city, or an area within the city.

For Malta, the SUMP focuses on the entire region of Valletta, consisting of the Northern and Southern Harbour Districts. The Valletta region is the highest urbanised node of the island and generates the highest concentrated demand for transport. This stems from the fact that the area houses almost 50 per cent of the resident population, the major employment nodes and all international passenger gateways, including the Malta International Airport, the Valletta Cruise Port and the Malta-Sicily ferry terminal. Moreover, of the 1,988,447 tourists who visited Malta in 2016, 90 per cent visited Valletta during their stay. This is consistent with the trend by which the city of Valletta hosts 10 times the number of residents in daily visitors, thus intensifying the demand for mobility on the already saturated transport infrastructure.

The need for the compilation of a SUMP focusing on the Valletta Region was highlighted in the National Transport Strategy 2050 published in the third quarter of 2016 by Transport Malta, the Regulating Authority for transport in Malta. The

Above: Funchal; Clockwise from top: Valletta, Rethymno, Gran Canaria, Elba, Limassol

> *The city of Valletta hosts 10 times the number of residents in daily visitors, thus intensifying the demand for mobility on the already saturated transport infrastructure*

integrated Strategy consists of a vision outlining where Malta wants to be in the long term, the strategic goals, the strategic direction on how to get there and the indicators necessary to measure the progress of this strategy. Accompanying the Strategy, Transport Malta also published the National Transport Masterplan, a document that sets out the framework and the overall priorities that will guide transport investment in air, sea and land transport sectors over the next 10 years. The priorities and planned projects set within the Masterplan are aimed for implementation at national level. However, through CIVITAS DESTINATIONS, Transport Malta, and its project partners, the University of Malta, the Ministry for Tourism and the Valletta Local Council, will be piloting these measures on a smaller scale in a bid to study the measures in detail, assess their feasibility, adapt them to the local context and use what is learned to upscale their implementation on the regional, and where applicable, the national level.

This step was considered crucial when considering the innovative

aspect of the measures in question and the fact that, so far, these measures have as yet been untested locally. Pilots to be tested include the deployment of a smart parking management system for the city of Valletta; the introduction of a shuttle service to and from the inner-harbour ferry landing sites to urban road transport nodes, thus further integrating the scheduled ferry services within the overall public transport network; and piloting the concept of last mile delivery of goods to the city of Valletta.

Lessons learned from these pilots will be built on and further designed for wide-scale implementation. These, together with other solutions discussed with the key stakeholders involved in the SUMP process, will form part of the Action Plan that shall be compiled as part of the final SUMP, endorsed at government level and eventually implemented between 2020 and 2040.

THINKING LOGISTICALLY

The SUMP shall also include a Sustainable Urban Logistics Plan (SULP) for the city of Valletta. This is another deliverable of the CIVITAS DESTINATIONS project. All six demonstration islands are working in parallel to develop a SULP for their sites.

The SULP methodology is related to that of a Sustainable Urban Mobility Plan, but instead of studying mobility needs in their entirety, the SULP focuses on the elements of city logistics. Like in a SUMP, the process of developing a SULP adopts a bottom-up approach, starting from users' needs, operators'/associations' requirements and towns' objectives. Through stakeholder consultation and political involvement a plan of action is agreed on and implemented during the set deployment period.

As part of DESTINATIONS, Transport Malta will assist the Local Council of Valletta to develop a SULP

The project builds up an integrated approach to address mobility and tourism, testing balanced strategies to face the rising challenges of these two growing sectors and to achieve sustainable development and a better quality of life in Funchal, Limassol, Rethymno, Elba, Las Palmas de Gran Canaria and Valletta.

for the City. Due to its historical aspect, Valletta was built for the sole purpose of defence, its accessibility to modern day transport is very limited. Entertainment, employment and retail outlets far outnumber the per capita average when compared to other cities in Malta, therefore planning the logistics for such a city is highly challenging. In this regard, DESTINATIONS brings about an indispensible added value. Through expertise available in the consortium, past experiences from other project partners and the sharing of best practices between partners, the sites have all the assistance they require to develop a high-value plan. This is the case for all measures being implemented as part of the DESTINATIONS project.

KNOWLEDGE TRANSFER

Apart from the development of both a SUMP and SULP that each of the six demonstration islands will be developing in parallel for their site, several actions following the same theme shall be implemented throughout the six partner sites.

This creates a very good opportunity for the islands to learn from each other, highlight common problems and work together towards finding a solution which can be adapted to the local context. For instance, for both Malta and Limassol one of the

innovative actions to be deployed will be the implementation of a Green Label and Award for hotels within the study area. While in theory the measures are very similar, it will be very interesting to see how the parallel measures develop in the separate locations; how these will be adapted to the local context and how they will be received by the various stakeholders.

Other measures implemented by the different sites but falling under the same themes include the improvement of public transport for tourists and residents living in tourist-centric areas, the introduction and/or promotion of electromobility, promotion and uptake of shared mobility, promotion of soft modes and infrastructure as well as testing freight logistics solutions. In this regard, the DESTINATIONS project is offering the demonstration sites the perfect opportunity to learn from each partner's experiences and develop innovative solutions that would otherwise have been impossible to test outside the context of this project.

The DESTINATIONS project is being carried out by CIVITAS 2020, a network of cities dedicated to cleaner, better transport in Europe and beyond. Since it was launched by the European Commission in 2002, the CIVITAS Initiative has tested and implemented over 800 measures and urban transport solutions as part of demonstration projects in more than 80 Living Lab cities Europe-wide. ©

FYI
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civitas.eu/about-us-page
civitas.eu/destinations

Social and Economic Challenges

This section focuses on mobility for urban economic development and social policy. This includes accessibility of transport for the mobility impaired and accessibility to basic services for everyone; the financing of public transport and transport projects generally; and regulation, planning and governance

SUMP evaluation: a design for life?

A recent study describes a method for the evaluation of Dutch municipal mobility plans, regarding the extent to which they already meet the five primary performance objectives of Sustainable Urban Mobility Plans. **Niels Barten** presents a short overview of the methodology that is being used, followed by a brief example of evaluation outcomes for the analyzed municipal mobility plans

By adopting the White Paper 2011, the attempts at meeting European standards on urban mobility planning by European cities are becoming numerous. This new series of European guidelines provides performance objectives to be implemented in urban mobility planning policies, transforming traditional policies into Sustainable Urban Mobility Plans, abbreviated to SUMPs.

Following the official definition of the European Local Transport Information Service' (Eltis); a Sustainable Urban Mobility Plan is to be described as a strategic plan, designed to satisfy the mobility needs of people and businesses in cities and their surroundings for a better quality of life."

Building forward on current mobility planning policies, SUMPs connect the mobility domain with other fields such as spatial planning, economic affairs and social affairs. The adoption of SUMP guidelines in urban mobility planning should therefore enforce a shift away from traditional policies, towards an integrated planning

SUMP performance objectives, even though these have not been from a particular influence in the set up of these policy documents. Doing this allows it to draw recommendations on the current content of the GVVPs, in order to further stimulate the development of 'SUMP-proof' local mobility policy plans.

METHODS: TRANSLATING THE PERFORMANCE OBJECTIVES OF A SUSTAINABLE URBAN MOBILITY PLAN

The five essential performance objectives of a SUMP are described by Eltis as:

1. Ensure all citizens are offered transport options that enable access to key destinations and services;
2. Improve safety and security;
3. Reduce air and noise pollution, greenhouse gas emissions and energy consumption;
4. Improve the efficiency and cost-effectiveness of the transportation of persons and goods;
5. Contribute to enhancing the attractiveness and quality of the urban environment and urban design for the benefits of citizens, the economy and society as a whole.

The first step to be taken in the evaluation of Dutch GVVPs is an explanation of the key elements of the five primary performance objectives of SUMP guidelines. This allows lines to be drawn between current GVVP content and the essence of the SUMP objectives, to identify at least the similarities and missing components. Table 1 presents a brief overview of the key elements within the SUMP performance objectives.

One difficulty in accurately defining the extent of meeting the requirements of the performance objectives is the fact that there are some mutual aspects to be identified within the

Key essential elements of SUMO performance objectives		
SUMP OBJECTIVE	**KEY ESSENTIALS**	**BRIEF**
1	Operating a mobility system that assures at least the possibility to reach essential locations and services for every person	Social Equity
2	Attention to both objective (qualitative) as subjective (quantitative) safety in mobility planning policies	Safety
3	Direct attention to a mobility policy system that reduces air and noise pollution, greenhouse gas emissions and energy consumption, regarding European and National legislation	Environment
4	Drawing a consideration of costs and effects of the mobility policy, focusing on the total integrated decision field	Effectiveness
5	Balanced mobility decisions, with regard towards the essential aspects of existing urban planning.	Liveability

approach that embodies a strategic, sustainable and integral mobility system as a catalyst for a healthy and liveable environment.

Recent research by Royal HaskoningDHV attempts to evaluate the performance of SUMP guidelines in current Dutch mobility planning policies. Therefore a set of Municipal Mobility Plans (Gemeentelijke Verkeer-en Vervoersplannen or GVVPs) has been analyzed in an attempt to measure the extent to which these policies already meet the requirements of the

explanation of each objective and they are sensible to a rather personal or subjective appreciation.

Finding suitable criteria that are applicable to the different planning systems and mobility issues in European cities is not an easy task. That might also be the reason that there is no actual assessment framework for urban mobility policies on a European level. Therefore the subsidiarity principle allows local governments to assess their policy plans to the SUMP guidelines. This research aims to be a starting point in this possibility of self-assessment.

SMART CRITERIA AS ASSESSMENT TOOL

To be able to describe 'the extent to which a policy plan meets the requirements of a SUMP objective', SMART criteria have been applied as a measurement tool. The relation between SMART criteria and SUMPs is drawn in chapter 5.2 of the official SUMP guidelines, which mentions the use of SMART criteria in formulating policy objectives. The idea is that the extent of a SMART formulation of GVVP content that links to a certain SUMP objective, reflects the extent of fulfilling the essential aspect of this objective. This creates a possibility to observe the strength of the connection between GVVP content and its connection to a SUMP objective.

CONNECTING GVVP CONTENT TO SUMP OBJECTIVES

In evaluating Dutch GVVPs within the perspective of SUMP guidelines, the first conclusion is that there is a need to actually shift away from the traditional planning paradigm in order to get closer to what SUMP objectives are designed for; an integrated approach to urban mobility planning.

Not surprisingly, the two traditional mobility planning aspects 'road safety' and 'economic accessibility' are strongly represented in the GVVPs. As good as all content focuses on good and efficient traffic flow in and throughout the city and the surrounding area. Thereby much attention is paid to eliminate black spots and potential dangers in conflicting traffic flows of roads and cycling. In that sense, the second and fourth SUMP objectives, focusing on Safety and Effectiveness, are represented to a larger extent.

The third and fifth SUMP objectives, focusing on Environment and Liveability, are mentioned for a large part within the GVVP content, but they seem to be a derivative spin-off from the main traditional planning goals of safety and economic accessibility. That means that environmental care and elements such as noise, greenhouse gas emissions and energy consumption are not specific GVVP policy goals, but that they derive from the way that the mobility system is designed.

In order to meet the SUMP requirement, clear and evident attention needs to go out more to the way the urban mobility affects these specific domains.

The main conclusion that can be drawn from the research is the fact that in order to effectively fulfil the SUMP objectives, the attention to the first SUMP goal is lacking completely; the social aspect of mobility is a topic that is ignored in the studied GVVPs. That means that there are no specific clues regarding the ambition to create a mobility system that assures at least the possibility to reach essential locations and services for every person. It is possible to derive the intention of municipalities regarding the subject,

by for example looking at road widths, safe crossings for disabled people and servicing public transport. But it still forms a part of the traditional way of planning urban mobility, instead of social equity as a specific part of the GVVP content.

In this sense it can be concluded that Dutch mobility planning policies are focusing mainly on the traditional planning issues and that they mention key SUMP elements, but that this is not transformed into plain and clear parts of the policy. The traditional perspective only has a derived effect on these elements.

MAIN CONSIDERATIONS

A couple of main considerations have to be addressed in evaluating this research.

First, the research was carried out for a small number of GVVPs, as time was limited and it took comprehensive study to make up conclusions. This allows it to only draw explorational conclusions of the Dutch mobility planning policies, whereby it is not intended to give a generalized view on the content of all Dutch municipal mobility plans.

Effective social mobility planning focusing on equity is difficult and expensive, as it requires a detailed and tailor-made approach. Therefore it is important to notice that a large part of the projected first SUMP objective that was barely mentioned in the analyzed GVVPs can be still be found in other local policies, for example in housing policies or they might derive from provincial or national mobility planning policies. ©

FYI
Niels Barten is a researcher at Royal Haskoning DHV

The freight of the West

The University of Washington's Supply Chain Transportation and Logistics Center has launched Urban Freight Lab to address Urban Delivery Challenges, as **Dr. Anne Goodchild, Barbara Ivanov, Jose Machado, Gabriela Giron** and **Haena Kim** report

More than 80 per cent of Americans have purchased goods online[1] and in 2016 over 8 per cent of all retail sales in the US took place online[2, 3]. The growth of e-commerce is putting increasing pressure on local governments to rethink how they manage street curb parking and alley operations for trucks and other delivery vehicles. It is also forcing building developers and managers to plan for the influx of online goods.

To develop practical solutions to these problems, in 2016 the Supply Chain Transportation and Logistics (SCTL) Center at the University of Washington launched the Urban Freight Lab (UFL), a partnership between private and public industry stakeholders. The UFL provides a place for companies and public agencies to work together to develop and ground test low-cost, promising solutions to deliver these goods while maintaining livability and economic vitality.

As part of this research effort, a three-year strategic research partnership with the City of Seattle Department of Transportation (SDOT) has been established to advance understanding of urban goods movement in support of the City's goals for safe, predictable and efficient goods movement and economic vibrancy. By entering into a long-term strategic partnership with the university and industry, SDOT demonstrated its interest in developing innovative

Researchers found that 87 per cent of buildings in Seattle's dense urban centers are completely reliant on nearby public commercial vehicle load zones (CVLZs) and alley truck load/unload spaces to receive goods deliveries

A cargo van at an on-street commercial vehicle loading zone in downtown Seattle

solutions to achieve their policy goals. The city's willingness to pilot test and potentially adopt solutions that provided both public and private good was essential in attracting private sector firms to engage fully in the work.

THE URBAN FREIGHT LAB

In 2016, the SCTL Center recruited founding industry members from Charlie's Produce, Costco Wholesale, Nordstrom, UPS, and the United States Postal Service (USPS) to develop solutions to improve the way goods are delivered in the urban environment.

Private sector members of the Urban Freight Lab at the University of Washington, in partnership with SDOT, are using a systems engineering approach to solve delivery problems that overlap the spheres of control of the city and business sector.

The Lab has created a multi-year strategic research plan with principles and innovative approaches to produce evidence-based improvement strategies.

The role of the Urban Freight Lab is to be a living laboratory where potential solutions are generated, evaluated, and then pilot-tested on real city streets. Members provide clear and open input as to whether proposed solutions are sustainable in their and other firms' business models.

THE FINAL FIFTY FEET PROJECT

Researchers at the SCTL Center, SCTL and Urban Freight members have defined and focused on the Final 50 Feet; the urban supply chain segment that begins where delivery vehicles park at the curb, alley or in a building's freight parking space. It tracks the delivery process inside buildings and ends at the receipt of goods by the receiver. The Final 50' concept represents the first time that researchers have identified the importance of analyzing deliveries moving along the street grid and in cities' vertical space (office, hotel, retail and residential towers) as a unified goods delivery system.

Development of the Final 50' concept is the necessary first step in defining rigorous, goal-oriented improvement teams that can take coordinated action to reduce truck trips, delivery delays, cost, emissions, and improve delivery service to tenants and consumers. It provides them with the ability to analyze and improve the process flows meaningfully from the beginning-to-end of the last piece of the urban goods system.

The Urban Freight Lab members and SDOT have identified two priority goals, with both public and private benefits, for the 2017-2020 research partnership:

1. Reduce the number of failed first delivery attempts.

The failed first delivery can be as high as 15 per cent. Benefits of reducing failed first deliveries include:
- Improve urban online shoppers' experiences and protect retailers' brands;
- Cut business costs for the retail sector and logistics firms;

Photo: Barb Ivanov, University of Washington

A reduction in delivery vehicle dwell time is crucial to reducing traffic congestion in Seattle

Private freight parking infrastructure found in five urban centers in the Seattle area

Urban Freight Lab is working on a number of initiatives to maximise on- an off-street delivery options

● Lower traffic congestion in cities, as delivery trucks could make up to 15 per cent fewer trips while still completing the same number of deliveries.
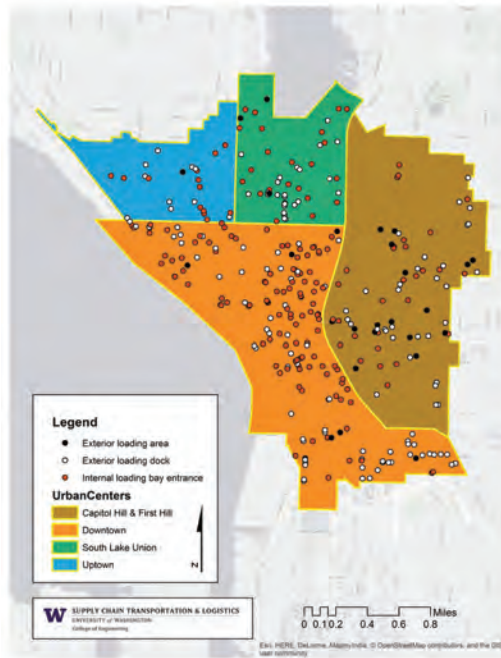
2. Reduce dwell time

The time a truck is parked in a load/unload space. There are both public and private benefits to reaching this goal, including:

● Lower costs for delivery firms, and therefore potentially lower costs for their customers;
● Better utilization of public and private truck load/unload spaces;
● Less congestion, as spaces turn over more quickly.

OVERVIEW OF THE INNOVATIVE APPROACHES

> *By applying systems engineering and evidence-based planning, we can make receiving online goods as efficient as ordering them – without clogging city streets and curb space*

TAKEN TO IDENTIFY AND QUANTITATIVELY ASSESS THE FINAL 50' OF THE URBAN GOODS DELIVERY SYSTEM

Building the first comprehensive database of urban off-street infrastructure for delivery and pick-up operations

The urban goods delivery system includes both public and private facilities. While on-street parking facilities are well documented in Seattle's databases, facilities out of the public right of way (i.e. privately held) are not. SCTL research assistants, developed a ground-truthed data collection method to build a comprehensive database inventory, capturing geospatial locations and documenting the visible features of all private freight parking infrastructure in five urban centers in the Seattle area (see graphic, right).

For this task, the team collaborated with one of the private carrier members of the Urban Freight Lab to further improve the accuracy of the data collection method. Carrier drivers with deep knowledge of city routes and infrastructure, review the closed door locations.

This review allowed the Lab to rule out 98 per cent (206) of the locations behind closed doors, reducing uncertainty in the final database from 38 per cent to less than 1 per cent.

Researchers found that 87 per cent of buildings in the City's dense urban centers are completely reliant on nearby public commercial vehicle load zones (CVLZs) and alley truck load/unload spaces to receive goods deliveries. These buildings do not have underground or adjacent freight bays on their property.

Building a delivery process flow for delivery inside the building environment

Photo: Anna Bovbjerg, University of Washington

The SCTL researchers created detailed process flow maps of the Final 50' in and around five prototype city buildings in Seattle, Washington. The team collected original data by following delivery persons from the buildings' freight bays or nearby commercial vehicle zones (CVLZs) into each of the buildings, until delivery was completed or the return to the truck when there was a failed delivery. SCTL researchers designed and built an application for collectors to enter the precise time that the delivery people began and ended each process step.

The team then collected data for up to a week in peak delivery periods for each building. They analyzed the range and average of delay in the process steps to understand where improvement strategies will have the most significant ability to achieve project goals (13). Based on this analysis, the researchers found that the greatest opportunities to reduce the number of failed first deliveries and dwell time in truck load/unload spaces are inside buildings when delivery persons:

a. Interact with security personnel; and
b. Attempt to locate tenants.

In the next phase of the Final 50' project, the Urban Freight Lab and SDOT will pilot test promising improvement strategies in and on the streets around the Seattle Municipal Tower over four weeks.

BENEFITS

The Final 50' project findings will be used to provide decision support to city officials and private-sector firms managing scarce resources. By applying systems engineering and evidence-based planning, we can make receiving online goods as efficient as ordering them – without clogging city streets and curb space.

We have received requests from many other cities, including Washington, DC, to share results and lessons learned during the Freight Master Plan development process and early actions coming out of this three-year program. Seattle is committed to being a leader in urban goods policy and problem-solving and keeping our economy thriving.

According to City of Seattle officials Mr. Christopher Eaves and Ms. Jude Willcher, "Seattle is one fastest growing cities in the country. The Seattle Department of Transportation is committed meeting the urban goods delivery challenges facing most big cities in the U.S. We know that issuing parking tickets to companies who are simply trying to meet the daily delivery needs of residents and businesses isn't the right solution. So, our goal is to identify and implement scalable strategies that improve deliveries at existing building, as well as initiate strategic research to mine new data to improve and inform new construction designs that support freight and delivery in the city. And we are incredibly grateful to have found a strong and innovative partner in the UW Freight Lab and SCTL". ©

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Cape crusaders

Devin de Vries introduces the need, the context and the work being carried out to significantly increase the efficiency of Cape Town's public transport system

London is a sea of public transport options, buzzing with double-decker buses, underground tubes, driverless trains, and rental bikes. Without the information to navigate these, it would be a more time and economically costly journey from home to the office every day. The city's mobility systems are easily navigable thanks largely to a move Transport for London (TfL) made 10 years ago: it centralised public transport data and made it accessible for organisations to use in their software or services. Since then, it's been easier than ever for commuters to get information and for businesses to provide innovative services based on public transport data. TfL estimates that access to this data adds £130m a year to the city's economy[1].

The daily commute looks a little bit different in my home city of Cape Town, where the city's transport authority doesn't have reign over all the different modes. Take South Africa's ubiquitous white minibus taxi for example - a mode used by around two-thirds of commuters and privately run by roughly 152 different associations. Established during apartheid to address the demand for travel from areas designated for non-whites to employment centres, the ownership and operation of each minibus taxi can differ, with taxi associations representing the interests of operators on a local and national level[2].

Moreover, unlike the scheduled systems that Londoners are familiar with, minibus taxi services are demand-based, meaning that routes, timetables and stops are adjusted based on passenger demand or the needs of the driver. This characteristic means they fall into the category of informally run public transport - systems that are semi-regulated and with a flexible operating model. Across the world's emerging cities, informally run systems have different names but one thing in common - they're the primary mode for commuters.

Both the fragmentation of operations and word of mouth communications of services mean that comprehensive information on the total network is not easily accessible, raising many issues. How do commuters keep informed on routes and timetables? How do public transport information services operate? How

> *Unlike the scheduled systems that Londoners are familiar with, minibus taxi services are demand-based, meaning that routes, timetables and stops are adjusted based on passenger demand or the needs of the driver*

15 per cent of all public transport trips in Cape Town are made by "informal" minibus taxi

do governmental bodies get an accurate view of mobility in the regions they serve? The short answer is: they don't. Little documentation exists, and when it does, it is typically not of the quality required for journey planning or data analysis. Informally run transport operators and passengers, the regions they operate in, and the companies that operate locally have been excluded from the opportunity of digitalisation.

This missed opportunity is the challenge WhereIsMyTransport is addressing. Based in London and Cape Town, we're a technology company that makes public transport data accessible in African cities - for formal and informally run modes. We've formed partnerships with cities, transport operators and other organisations to provide access to data from formal modes, and when data doesn't exist - as is the case for informally run modes - we collect it ourselves. Data collection is the process of recording routes, frequencies, stops (when relevant),

passenger numbers and fare information, to create the digital information that levels the data playing field between cities like London and Cape Town, and creates opportunities for citizens, cities and business.

Public transport systems have shared characteristics from one city to the next, but there are also differences. After completing data collection projects across all of South Africa's major metropolitan regions in the last year, we've recently expanded our efforts into east Africa. Here are some learnings from our work, including insights from Graeme Leighton - one of our Data Collection Coordinators.

LOCAL INSIGHTS FROM THREE CITIES

Cape Town, South Africa
Informally run public transport is the most popular mode in Cape Town, with 15 per cent of all public transport journeys taken on minibus taxis. However, this is lower than all other South

African cities, making Cape Town the most multi-modal city in the country. This affects the informally run network's operation, regularly acting as a feeder network to major bus depots and train stations. This impacted our approach to data collection as we were able to use major formal transport stops as hubs, working out which routes started and ended at these points, planning our data collection work accordingly[3].

Dar es Salaam, Tanzania
While Cape Town is the most multi-modal city we've collected data from in South Africa, Dar es Salaam introduced the challenge of a wider range of informally run modes. This was the first city where we collected data from a commuter ferry, for example. Though a significantly different mode in some ways, like other modes it operates regularly, has pick up and drop off points, and fares. Dar es Salaam's limited mobile data network

was also challenging, meaning it was critical our technologies were able to function with poor connectivity. We partnered with a local organisation in Dar es Salaam, harnessing their local network knowledge and expertise – including fluency in Swahili.

Kampala, Uganda

Kampala was the first city where we partnered with a local organisation that had previous experience in data collection. As with Dar es Salaam, this brought extensive knowledge of the city's informally run public transport, including how the network is impacted by boda-boda motorbike taxis – private hire yet informally run vehicles which speedily weave through the city's congested streets. The past experience of our partner improved data collection efficiency, reducing training requirements and simplifying on-the-ground project management.

PROS AND CONS OF DATA ACCESS

The opportunity of accessible data on a city's most-used public transport mode is significant. Understanding of how a city truly functions - an accurate understanding that was previously not possible - can enable innovation, which in turn can improve quality of life and local economies. The most obvious use of this information is journey planning services - like the ones I rely heavily on in London, but people in emerging cities largely have to do without. The opportunities go beyond the obvious, however. Access to mobility network data can introduce a deeper understanding of how to better optimise access to spatially dependent services, such as retail or healthcare facilities.

Infrastructure and city planning decisions, or any decisions which benefit from reliable mobility information, are enabled by accurate data on public transport networks. This data can also provide the basis for insights and analysis - computationally or otherwise - that was previously not possible. Particularly in emerging cities where resources are increasingly expended in integrated approaches to transport networks and transit oriented development, a full network view is key to planning, implementing, and managing the future urban mobility systems.

Despite its reliance on minibus taxis, Cape Town is actually South Africa's most multimodal city

Every assumption about the network in Cape Town was challenged. We discovered dozens of previously unknown routes, and many previously-documented routes no longer operated – Graeme Leighton, Data Collection Coordinator at WhereIsMyTransport

> # *"We foresee that by formalising and modernising the minibus-taxi industry, the operators will become our partners in transforming the method and ease of commuting in Cape Town"* –

Councillor Brett Herron - Mayoral Committee Member for Transport and Urban Development

With information, city stakeholders can accurately understand the systems already in place – often for the first time – and manage existing infrastructure and services to meet the needs of the city.

As with any sector, the value of data is not realised by its existence, but by how it is put to use. In the case of informally run public transport networks, there is the risk that this information could be used to attempt to reduce its role in the public transport mix. However, this data could actually be used to legitimise the sector and highlight its importance as a mobility provider, particularly for marginalised communities, as was recently proposed in Cape Town. The City's recently-adopted Integrated Public Transport Network Business Plan aims for integration of the informally run public transport system, taking advantage of its routes and demand-based operation to feed core Bus Rapid Transit routes – a plan which would not be possible without accurate data on the operation of the city's minibus taxi network[4].

Collecting public transport data in emerging cities is an act of disruption - introducing something to a market that previously did not exist. Historically, this level of disruption has generated benefits for individuals, organisations, and cities. The value of accessible public transport data is being realised daily in many cities, and though challenges and risks exist when trying to create the same opportunities in emerging cities, the potential for social and economic impact is too great to ignore. ©

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4. http://maitcid.co.za/wp-content/uploads/2017/08/Media-
Release-Modernised-Minibus-Taxi-Industry.pdf

FYI
Devin de Vries is co-founder and CEO of WhereIsMyTransport

The digital cities business is fragmented. This situation is mainly due to a lack of political and administrative integration but also technical interoperability and standards. The leading open-innovation European organisation, EIT Digital, has therefore decided to support a high impact initiative (CEDUS) that aims to speed-up the digital transformation of urban services in European cities and worldwide.

The City Enabler, developed within CEDUS, allows crawling, collecting, integrating and rendering scattered and heterogeneous urban data (e.g. open, sensor, legacy data) om a number of city providers. Data is managed and visualised in order to support the city manager in decision-making processes, opening up new business models for all the stakeholders and making new ventures possible thanks to innovative map-based urban services.

City Enabler makes access to city knowledge easy, adding value and revenues for the urban ecosystem, avoiding vendor lock-in for customers and also avoiding city lock-in (i.e. easy re-usage of apps among different cities).

Through a collaboration with Engineering, Telefonica and Atos, EIT Digital expects this innovative software solution to become the major de facto standard in the digital cities area. Therefore, City Enabler is open to other platforms through standard APIs and is compliant with the OASC (Open & Agile Smart Cities) principles.

THE OPEN-PLATFORM FOR DIGITAL CITIES

Cities are facing ever-more complex challenges to meet objectives regarding socio-economic development and quality of life. Indeed, cities need more and more open and stakeholder-driven innovation practices to effectively deploy Future Internet-enabled services in operational environments.

In the era of the Digital Transformation, several indicators have been tailored and used to perform comparisons among different cities of different sizes. In particular, several Key Performance Indicators (KPIs) and Key Impact Indicators (KIIs) can be found in literature in order to adopt a common framework for benchmarking the level of innovation, stakeholder

City Enabler: the ultimate open platform to scale up digital cities' services in European and global markets, by **Stéphane Péan, Lanfranco Marasso** and **Giovanni Aiello**

Ready, willing and enabled

engagement and the impact of deployed technological solutions. Nevertheless, the aforementioned literature is lacking robust methods to boost and benchmark the reusability of such technological solutions (e.g. IoT and city data management platforms) actually adopted in cities or metropolitan areas. Another important aspect to address is the "city data awareness" of stakeholders (e.g. city managers and companies) about the real availability of urban data, which are often managed under multiple separate domains with no real ability to be condensed into one entity. So, city managers have no single place to be aware, in real time, about what is happening in the city.

Moreover, city data providers are used to applying heterogeneous technical solutions to provide data. Indeed, very often the Information systems and data are closed within different silos and therefore it is extremely hard to get access to available urban data in the city. In this context, data visualization on maps is very popular and familiar to any kind of users as it is very comprehensible, easily readable and straightforward. Among companies that are trying to address this problem, we count corporations with generic platforms (Microsoft CityNext, Oracle's City Platform, IBM Intelligent Operations Center for Smarter Cities) or SMEs with specific apps. The main common drawbacks are: a) technology driven solutions; b) vendor lock-in; c) not scalable without putting in considerable effort.

We propose the City Enabler, an innovation powered by FIWARE software co-funded by EIT Digital, that allows for an integrated and geo-spatial urban knowledge base collecting scattered data in the city, stemming from a number of public and private city providers. The City Enabler provides a set of tools to "predict through
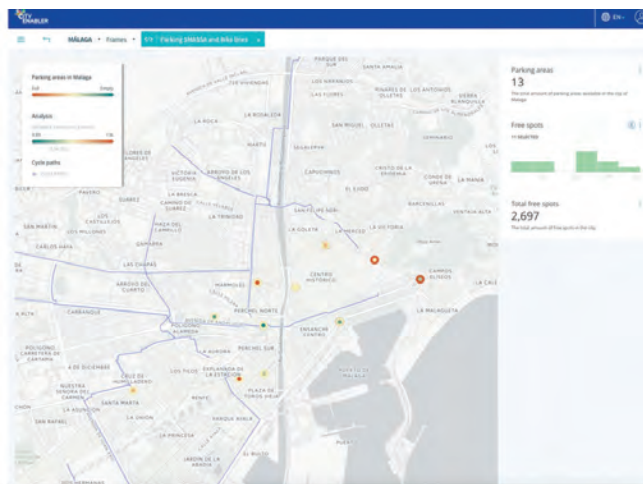
City Front end: exploitation of two different data sources in the same map based urban service (Parking, data of Malaga Municipality)

location" (i.e. support in policy making based on location data) and to easily develop innovative map-based urban services relying on the data collected. The City Enabler focuses on exploiting all the information (data) available (e.g. open data and data coming from existing IoT infrastructures/legacy systems), building on new urban services, active in multiple domains, depending on registered data sources.

The City Enabler intends to overcome several problems with existing solutions available in the market, providing the following advantages: a) Data-driven solution; b) Openness (no vendor lock-in); c) Portability (no city lock-in); d) Focused on data discovery, integration; e) Applies a data economy model.

ENABLING CITIES TO POWER URBAN DATA

The City Enabler is basically a ´powered by FIWARE´ framework of tools with a responsive User Interface for the following purposes:

1) Data collection: performed by the "City Data Workspace" tool. Through this tool it is possible to detect and register data sources scattered in the city, in order to give awareness and access

to the available city knowledge. The detection of data sources is performed by a software module that performs a search of the web and suggests potential data sources, giving the name of the city and optional domain specific parameters as inputs. Moreover, it is possible to plug existing IoT platforms/services/legacy systems through the support of so-called "micro-proxies". Examples of micro-proxies are: a) Open Service that provides anonymised and aggregated data about the frequency of certain pathology in zones in a city, provided by a Health Authority; b) Service already exposed through APIs by a transportation Company (data provider).

2) Devices registration and monitoring: performed by the "IoT Device Manager" tool. Through this tool it is possible to register, in a very simple way, already existing (or new) heterogeneous sensors installed in the city. Here, the heterogeneity is on protocols used by the different vendors. Real-time data collected from registered devices is then optimized and analysed through big data analytics means - historical data is stored in the city data workspace. All the registered devices/sensors can be monitored, through the City Dashboard (see below), within verticals.

3) City Front-End: performed by the "City Dashboard" tool, to monitor all the data available in the city through thematic verticals (urban services), exploit contemporary data coming from different data sources, to speed-up the creation of new innovative urban services. The City Front-End includes also dashboards to visualize on a map the data collected in the City Data Workspace, and to create nice visualizations to support City managers in decision-making. The screenshot above shows the City Front-End used

in a real scenario for the exploitation of aggregated data related to parking provided by the Municipality of Malaga and Open Data, and data coming from parking sensors previously registered through the IoT Device Manager. This tool works with harmonized data formats compliant with NGSI v2 specifications, called FIWARE Data Models. Thanks to the harmonization format used, the City Enabler is able to easily reuse among cities the map based urban services created.

4) Mapping datasets in open standard format: Mapping datasets in open standard format are performed by the "City Data Mashup Editor" tool. Through this tool it is possible to graphically map each kind of data structure into FIWARE Data Models, compliant with NGSI v2 specification, in order to make it exploitable in map-based urban services, and the same services reusable among different cities. This is the tool that actually provides the city enabler with the no city lock-in feature. Indeed, in order to reuse an existing urban service from a City A to a City B, it is enough to graphically map data structures of City B into the harmonized format through the City Data Mashup Editor.

City enabler benefits			
STAKEHOLDER	**ACTION**	**BENEFITS**	**TIME/MONEY**
City manager	Take decisions	Plan actions and policies	Save money and time
Data provider	Share data Take data	New urban services	Earn money and save time
Citizens	Search and consume data/information	New/better services	Save money and time
Developers / Ecosystem	Use City Enabler	New markets	Earn money and save time

5) SDK for fast development of apps: the City Enabler provides citizens and businesses with one software development kit (SDK) for easy creation of mobile apps relying on the city knowledge collected by the City Enabler. In particular, with the City Data Mashup Editor it is also possible to graphically build web and mobile applications in a wizard-based way without having technical skills.

BENEFITS FOR SOCIETY AND BUSINESS

From the economic point of view, the CE supports long-term sustainability of the platform by guaranteeing reuse and portability of urban services, and by defining a systemic and multi-domain approach to urban innovation in which every actor of the community has a clear benefit. Different kinds of benefits are summarized in the following table:

CITIES AND VERTICALS EXPANSION PLAN

The City Enabler is currently being piloted in the province of Trento (Italy), the municipality of Málaga (Spain) and the municipality of Rennes (France).

Other cities will also be involved in 2018 through new pilots but also through commercial contracts. In particular, one commercial contract with Genoa Municipality (Italy) has been closed and recently, a consortium established by Engineering, EIT Digital and ATC International, submitted a proposal for the SELECT for Cities Pre-Commercial Procurement (PCP) issued in March 2017 by the cities of Antwerp (Belgium), Copenhagen (Denmark) and Helsinki (Finland). The common proposal has been shortlisted for the second phase.

As far as verticals are concerned, City Enabler will deal with different domains such as mobility, safety, education, environment, energy and health. ⓒ

Below: wizard –based development of apps for citizens and businesses
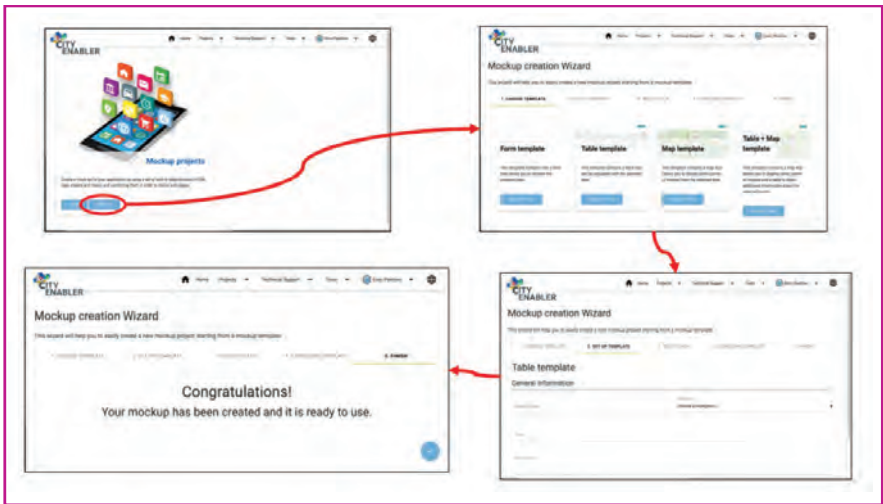
FYI

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Road Safety & Health in Transport

This section addresses road safety and the security of transport systems. It covers road safety policies, addressing all categories of road users and supporting the development of innovative solutions. It also covers technological innovations contributing to the improvement of road safety

- **Safer City Streets** - A global traffic safety network for liveable cities
- **Automation** - Are autonomous vehicles really safer?
- **Manchester** - How to become a healthier city

The road to enlightenment

Safer City Streets is the global traffic safety network for liveable cities. Its goal: to help cities to improve their urban road safety performance by sharing data, experiences and knowledge – by learning from each other. **Alexandre Santacreu** takes up the story

Currently, 44 cities are taking part in Safer City Streets. The network is managed by the International Transport Forum (ITF), which collects and analyses relevant data from cities in a dedicated database. The network is funded by the FIA Road Safety Grant Programme.

Every minute, a person dies in city traffic. Millions are killed or injured every year causing great human suffering and costing around 3 per cent of GDP. Crashes also nurture a feeling of insecurity. Among people killed on city streets, 8 out of 10 are pedestrians, cyclists and other vulnerable road users. Where streets are seen as dangerous, efforts to promote walking and cycling are undermined. Reducing the risks of urban traffic thus not only saves lives. Safer streets encourage sustainable forms of transport and help a city reduce pollution, cut emissions, fight congestion and have healthier citizens – in short, to make a city more liveable.
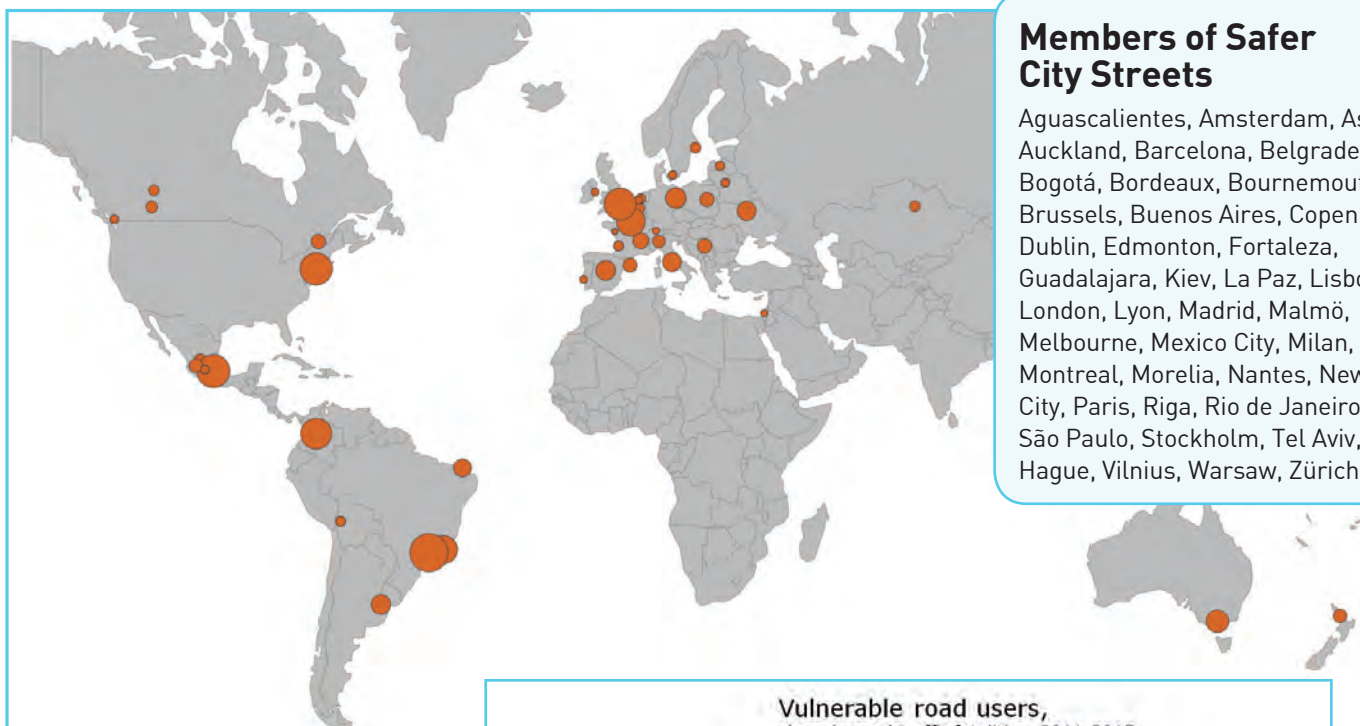
NETWORKING FOR EFFECTIVE URBAN ROAD SAFETY POLICIES

Cities address many challenges by working together and learning from each other. The Safer City Streets network links cities that want to make their citizens safer in traffic. It provides city officials with high-value information for better decision making. Member cities have access to policy-relevant data, a network of experts and targeted analyses.

Safer City Streets supports global networking and creates targeted learning opportunities for officials. It can also carry out research on topics of common interest.

Safer City Streets is modelled on the global road safety network of countries hosted by the ITF (known as the International Traffic Safety Data and Analysis Group, or IRTAD), that has run for more than 25 years. The IRTAD Group has been hailed by the World Health Organization as "a model of a multi-country effort" and

> *Cities address many challenges by working together and learning from each other. Safer City Streets links cities that want to make their citizens safer in traffic*

Members of Safer City Streets

Aguascalientes, Amsterdam, Astana, Auckland, Barcelona, Belgrade, Berlin, Bogotá, Bordeaux, Bournemouth, Brussels, Buenos Aires, Copenhagen, Dublin, Edmonton, Fortaleza, Guadalajara, Kiev, La Paz, Lisbon, London, Lyon, Madrid, Malmö, Melbourne, Mexico City, Milan, Montreal, Morelia, Nantes, New York City, Paris, Riga, Rio de Janeiro, Rome, São Paulo, Stockholm, Tel Aviv, The Hague, Vilnius, Warsaw, Zürich

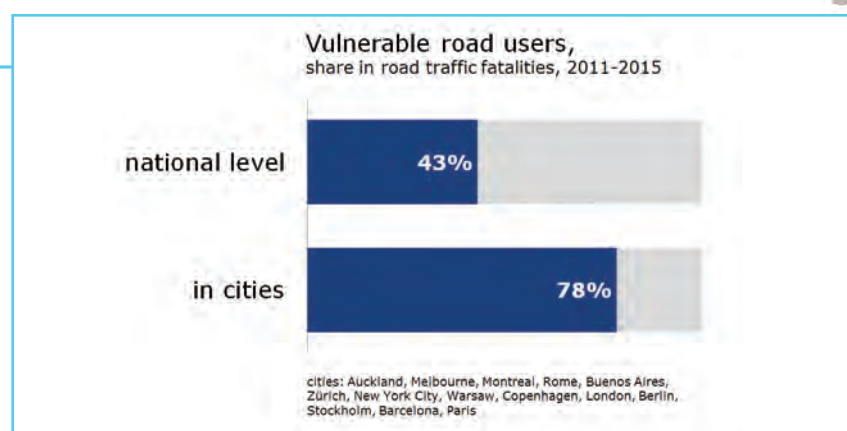its crash data as "simply the best in the world" by Global NCAP, the car assessment programme.

LINKING UP WITH POLIS
Members of the network met for the first time on 20-21 April 2017 in Paris. This meeting provided a global platform for over 50 road safety experts working within or with cities.

POLIS was involved in this first meeting and co-organised a workshop on road safety data in European cities, with a special focus on serious injuries and the MAIS3+ standard.

The second meeting takes place in Brussels on 7 and 8 December 2017. This time, the entire meeting is organised jointly by the ITF and the POLIS road safety working group.

Joining forces helps a greater number of cities meet and share their experiences. In joint meetings,

Vulnerable road users,
share in road traffic fatalities, 2011-2015

national level — 43%

in cities — 78%

cities: Auckland, Melbourne, Montreal, Rome, Buenos Aires, Zürich, New York City, Warsaw, Copenhagen, London, Berlin, Stockholm, Barcelona, Paris

expert conversations take place not only about road safety policy development but also on data collection and analysis by the ITF. The goal is to best monitor progress and benchmark performance using a range of most relevant indicators.

NEW CITIES ARE WELCOME.
New cities, as well as relevant stakeholders are welcome to join the network. All are invited to contact

the author at the ITF secretariat or Dagmar Köhler at the POLIS road safety working group.

DATABASE AND ANALYSIS
Data collection and analysis is key to developing road safety policies in cities. The improvement of data collection methods will be at the heart of Safer City Streets.

The International Transport Forum has created a database to collect and

Project milestones
• October 2016 – official launch of the project at the UN conference Habitat III
• April 2017 – 1st meeting in Paris
• Dec 2017 – 2nd meeting in Brussels
• April 2018 – 3rd meeting in Rome
• May 2018 – Safer City Streets is one of the highlights of the International Transport Forum's Summit which brings together Ministers from ITF member countries and many business leaders

In joint meetings, expert conversations take place not only about road safety policy development but also on data collection and analysis by the ITF

disseminate road safety data from cities. To make figures comparable between cities of various sizes, data on population, mobility and traffic are collected. This information is hosted by the OECD and made available through the OECD statistical portal to the cities which take part in Safer City Streets. Database contents include:
• number of road deaths and serious injuries (by mode of travel)
• seat-belt wearing rate
• helmet wearing rate

• population (by gender and age)
• daytime population, defined as the sum of the resident population and the net influx of commuters
• vehicle-kilometres (by vehicle type)
• trips (by mode of travel)
• passenger-kilometres (by mode of travel)
• vehicle fleet (by vehicle type)

Cities are encouraged to produce estimates for the entire range of

casualty, mobility and traffic data. However, cities with missing data are welcome to join and provide as much as they can.

A FOCUS ON VULNERABLE ROAD USERS
Data collected so far has revealed a very important difference between the national and urban road safety challenges. Pedestrians, cyclists and motorcyclists – together called vulnerable road users or VRUs – make up 8 out of 10 traffic fatalities in cities. This is far more than in rural areas, where car occupants make up the majority of casualties. This is an important finding, which is already being used to better focus the activities of the network.

FYI
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Would autonomous driving really save lots of lives? **Andreas Kossak** provides the answer to his own searching question

Ideas above our station?

A key issue in the complex discussion on autonomous driving is safety. Representatives of the automobile and IT industries, as well as the more or less self-appointed "Future and Mobility Researcher" assert over and again that the amount of human victims of road-traffic accidents will decrease by 90 per cent in a future world of fully autonomous vehicles (AVs). The supporters of autonomous driving interpret that as an ethical obligation to society to introduce autonomous automobiles as quickly as possible.

However, these respective expectations are not entirely shared or echoed by international renowned, independent experts. Here are some examples:

According to Prof. David Mindell of the Massachusetts Institute of Technology (MIT), one of the world's leading specialists in the field of automation in the transport sector, forcible preconditions for a justifiable general introduction of AVs are that they must "identify all nearby objects correctly, have at any time perfectly updated mapping systems and avoid all software glitches". His conclusion: it is totally unrealistic to expect that.

A report of the Transportation Research Institute of the University of Michigan closes with the statement, that it is not even sure that an autonomous car will ever be safer

> *The Transportation Research Institute of the University of Michigan report closes with the statement that it is not even sure that an autonomous car will ever be safer than a conventional car being handled by an experienced middle-aged, human driver*

as saying: "The ideal scenario saving tens of thousands of lives a year, assumes complete automation with no human engagement whatsoever. I'm not confident that we will ever reach that point...fully autonomous cars are unlikely."

The headline of an article in the October 2015 issue of the MIT Review reads: "Why self-driving cars must be programmed to kill"; the subtitle includes the sentence: "Car makers must solve an impossible ethical dilemma of algorithmic morality".

VULNERABILITY OF DIGITAL SYSTEMS

A key problem of the increasing digitalization of all areas of life is the susceptibility not only to internal malfunctions but in particular external vulnerability. The more the transport system is dominated by and dependant on digital structures the more it is susceptible to cyber-attacks. Digital worlds will in the future (most probably even more) be targets of manipulation by cyber-criminals, terrorists and hackers; particularly vulnerable in this regard would be fully "connected" AVs (see main photo). Other highly problematic complexes are climatic and optical

influences. Snow, sleet, heavy rain and freezing of the sensors as well as optical reflexes could cause malfunctions with catastrophic consequences.

A much more prosaic danger than cyber-attacks or climatic and optical influences are the interactions of AVs with pedestrians and cyclists. AVs will almost surely be programmed to avoid hitting people. The pedestrians and cyclists will understand this. The result will be a new "crosswalk game of chicken".

SAFETY RISK: DRIVER

Of great interest regarding an assessment of the frequently averted high amount of fatalities that would be avoided by the introduction of AVs, is a recently published article headlined: Real-world conditions limit AV safety gains by Alan Thomas. It starts as follows: "The case for AVs is usually made by saying 90 per cent of crashes are caused by driver error, so remove the driver and you avoid 90 per cent of crashes. However, this simplistic approach ignores the real-world causes of collisions..."

The typically cited share of driver errors in context with crashes is based on the "National Motor Vehicle Collision Causation Survey" (NMVCCS) of the US-DOT. Preposition for an adequate judging of the stated figures is a correct interpretation. According to the survey principles about 94 per cent of the "Critical Reasons" for a collision

than a conventional car being handled by an experienced middle-aged, human driver. The researchers are convinced that safety levels could even deteriorate, particularly during the transition phase of mixed traffic.

In the August 2016 issue of the MIT Technology Review, the chairman of the US National Transportation Safety Board, Christopher Hart (pictured right) is quoted
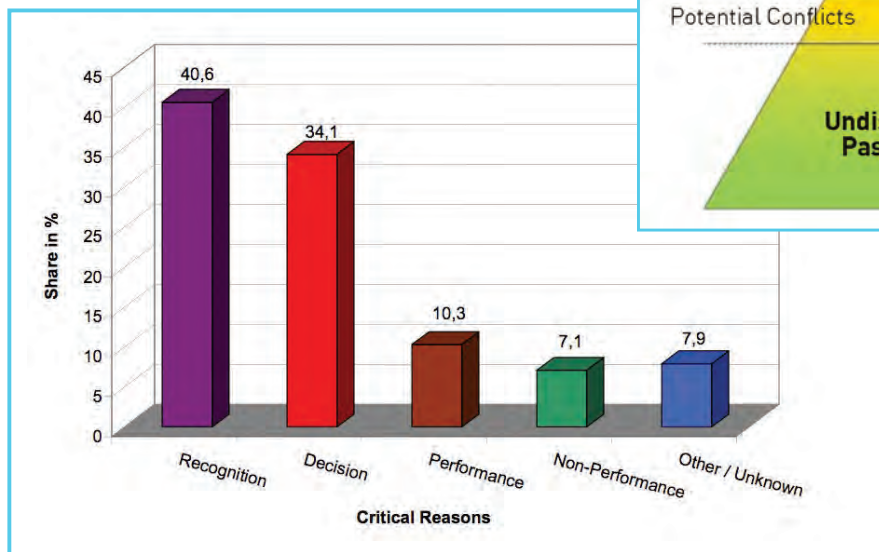
Driver critical reasons for critical pre-crash event

are theoretically attachable to the driver. The Critical Reason is defined as "the immediate reason for critical crash-event – often the last failure in the causal chain"; in other words: "given a situation in which a collision is almost inevitable, the driver has failed to avoid the impact".

The author explicitly mentions that this definition "raises the questions about what led up to the situation when the impact was inevitable. The full NMVCCS Report to Congress highlights that there are almost always multiple factors" - including in particular those related to road, weather and vehicle conditions. In the words of the survey "the driver is solely responsible for less than half of the often stated rate… Looking at details of the Drivers Critical Reasons for the Critical Pre-Crash Events, the largest factor was errors of recognition (40.6 per cent), followed by wrong or no decision (34.1 per cent)" – see graph above. Meanwhile, extensive tests have shown that a substantial share of the driver associated reactions leading

to crashes as a result of wrong or insufficient recognition of danger can not be avoided even by use of the most advanced techniques.

A good impression of the complexity of the interrelations in the respective context is given by Ekman's Traffic Conflict Pyramid and in particular its upper part, the Collision Pyramid (above, right). In the sense of the "Conflict Pyramid" the NMVCCS defines in the green sector "undisturbed passages", numerous factors that could be connected to accidents: an overloaded vehicle, snow/sleet, dark but lit, fatigue, wheel or brake deficiencies and so on.
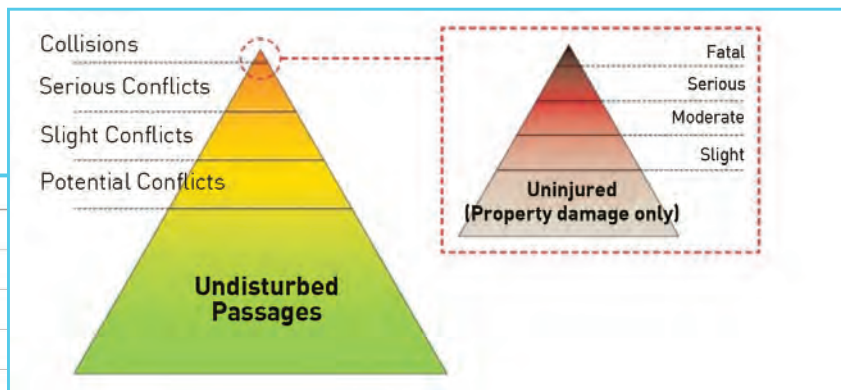
The "potential conflicts" and "slight conflicts" zones (yellow and orange) cover "Motions before the Critical Crash Envelope" including changing lane and avoidance manoeuvres (due to a previous critical event). The red zone includes "Critical Reasons for the Critical Pre-Crash Event": distraction, inattention, misjudgment, over-compensation, panic, sleep, technical deficiencies, road layout and obstructed view (fog, glare).

The variety of different and/or differently formatted traffic signs and signposts can also play havoc with automatic systems' abilities to correctly identify them – in particular, if they are poorly maintained and/or badly arranged (pictured below).

Finally the author states: "Assuming (rashly) that full integrity and reliability can be achieved, it is in principle possible to provide good enough physical infrastructure and I2V to mitigate some of the risks of ADAS and AV systems – but, given today's budgets and the inability

Collision critical factors: a jungle of traffic signs and poor readability

Official Vision Zero initiative logo in Sweden (above) and (right) the Vision Zero program in Canada (featuring exclusively conventional measures)

of authorities to maintain existing standards, this is impossible. Interestingly, many of those measures, particularly the low-cost ones, would also remove or minimize the hazards for human divers."

CONVENTIONAL POTENTIAL

The improvement of traffic safety has been a key subject of efforts in the automobile and road sectors for decades. That includes conventional means of infrastructure configuration, traffic management and traffic regulations as well as driver assistance systems. The aim of all activities in this context is labeled worldwide as "Vision Zero", meaning no fatalities (pictured above).

As a result of these activities the number of fatalities on German roads from 1992-2016, for example, decreased by nearly 70 per cent, the number of injured persons decreased by about 22 per cent, while the miles traveled by motorized vehicles on the roads increased by 30 per cent. That means, the yet
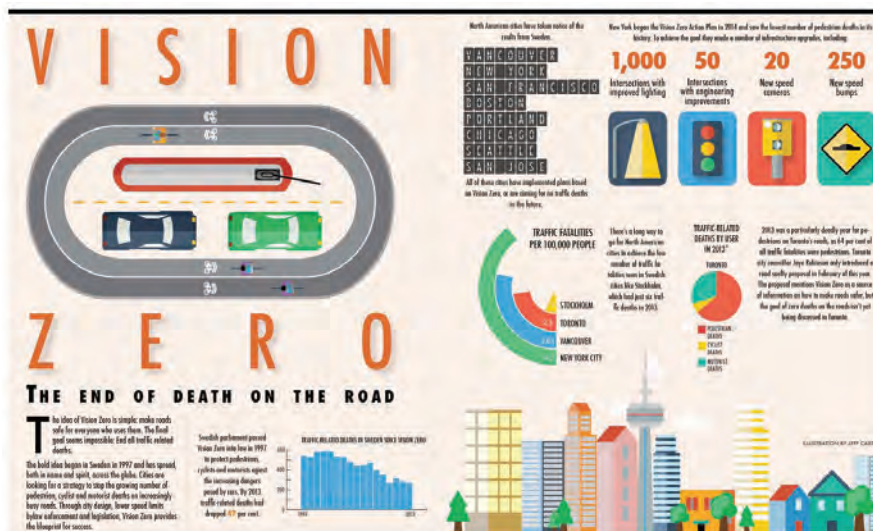
gained success based on conventional measures exceeded by far the effect that could be only theoretically expected in a world of AVs. The full conversion from conventional traffic to AVs would take at least 20 to 30 years. According to simulations of renowned independent institutes the safety of the road traffic would even decrease during that period.

The potential of reducing the number of fatalities and injuries in the road-sector by conventional measures has by no means been fully taken advantage of yet. That includes the improvement and adequate maintenance of the road infrastructure and its technical periphery.

CONCLUSION

By realistically judging the perspectives of the influence of AVs on road traffic safety one comes to the

conclusion that the key argument of supporters is not merely totally exaggerated – in fact, according to highly qualified independent experts it is much more probable that the number of fatalities and injuries would even increase.

Taking this into account, it is not justifiable at all to aim at the conversion of regular road traffic to fully autonomous driving – in particular in urban areas. Instead it should be concentrated on the further improvement/optimization of the safety-relevant driver assistance systems (ADAS) and the vehicle body characteristics. In addition, the activities of politics and road administrations should, with the same intensity, be aimed at improving the design, maintenance and equipment of the conventional road infrastructure. ⓒ

Full integrity and reliability can be achieved - it is in principle possible to provide good enough physical infrastructure and I2V to mitigate some of the risks of ADAS and AV systems – but, given today's budgets it's impossible

FYI
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Hot topic

Transport for Greater Manchester (TfGM) is a member of the Polis working group on Health and Transport. A presentation of Health Economic Assessment Tools (HEAT) model applications in TfGM was delivered at the "Active Travel for Healthy Cities" workshop during Autonomy's Urban Mobility Summit on 19-21 October 2017 in Paris. **Rafael Cuesta** and **Clare Cornes** discuss TfGM's ambition to become a healthier and more liveable city

Greater Manchester, a metropolitan area of 2.7 million residents and comprising 10 authorities working together, sits in the heart of England. This is the UK's first Combined Authority and is home to several centres of innovation, education, industry and culture. Transport for Greater Manchester (TfGM) oversees transport and travel across Greater Manchester – home of the UK's largest city region economy outside London. TfGM

has multi-modal responsibilities in Metrolink, highways, cycling and active travel. Alongside its current modal responsibility, TfGM also has a growing role in relation to buses and rail. The city region is predicted to have another 600,000 trips each day by 2040.

An increase in transport demand will aggravate existing problems and challenges, such as serious health issues caused in part by emissions from transport. These pollutants

contain microscopic solids or liquid droplets that are so small that they can get deep into the lungs and cause serious health problems. Secondly, a limited capacity to expand the current highways network within the dense urban centre. Furthermore, the city already faces significant congestion levels, which, if go unchecked, will eventually inhibit economic growth. Alongside this Greater Manchester is a rapidly growing city region. By 2040, Greater Manchester is predicted to

The aim of Vélocity 2025 is to support the ambition of Manchester being a city fit for the future through the delivery of the highest quality cycling infrastructure

have: 350,000 more jobs; 300,000 more residents.

In response to this TfGM is working to implement a variety of solutions across the transport network. These solutions can be in the form of infrastructure or service delivery mechanisms. Recently improved public transport infrastructure includes: Metrolink expansion with another extension planned; rail electrification and capacity increase; and over 300 electric vehicle charging points are in place across the city region. Increasing levels of walking and cycling is also an integral part of the transport strategy to create a healthy, safe, and sustainable city.

TfGM has recently made significant investment in active travel infrastructure thanks to "Vélocity 2025" a multiannual programme of investment in cycling. The Health economic assessment tool (HEAT) for walking and cycling was used as part of this project and to measure the impact these investment's had on travellers.

TRANSPORT AND PUBLIC HEALTH

For urban transport to achieve health and wellbeing goals, it needs to increase its contribution to physical activity, through active travel and other means. However, there is currently a lack of robust tools or guidelines that provide health benefit valuations for transport project appraisals.

The UK Department for Transport's WebTAG function (part of appraisal tools) considers some health aspects such as road traffic injuries and the impact of some aspects on physical activity, however it does not consider broader wellbeing impacts. To adequately assess the positive impact physical activity can have on health

and wellbeing a complementary tool is needed, to expand on the appraisal and modelling tools that are currently used. As such, the Department for Transport incorporated the Health economic assessment tool (HEAT) for walking and cycling into their WebTAG function.

The Health and Economic Assessment Tool (HEAT) is intended to be part of comprehensive cost–benefit analyses of transport interventions or infrastructure projects. HEAT is a robust economic tool used to evaluate the health benefits for cost-benefit analysis of active transport infrastructure. The tool complements existing tools for economic valuations of transport interventions, for example on emissions or congestion; it can also be used to assess the current situation or past investment; it is based on best available evidence, with parameters that can be adapted to fit specific situations. Default parameters are valid for the European context.

A new version of HEAT was launched on 31 October. The main features and changes comprise:
- combined assessments of walking and cycling;
- calculation of impacts of exposure to air pollution, crash risk and carbon emissions, in addition the benefits from physical activity;
- updated Values of Statistical Life (VSL) with averages and country-specific values (based on a methodology developed by the OECD);
- a new HEAT methodology booklet;
- updated section with HEAT examples;

- revised workflow;
- new user interface.

The new HEAT can be accessed at: **www.heatwalkingcycling.org**.

HEAT AND TRANSPORT FOR GREATER MANCHESTER

On 30 January 2013, the UK Government, announced a £62 million investment in cycling, which would comprise of two elements – an urban element and an element for rural areas covered by a national park. This was followed by a further announcement in August 2013 that committed a total of £148 million, including local contributions, to improving cycling across the country. The Cycle City Ambition Grants would be for infrastructure improvements to give people the confidence to take up cycling.

In the spring of 2013, the Greater Manchester authorities, led by TfGM, made a successful bid to the Department for Transport (DfT) to secure investment to make cycling safer and easier in the city region. The programme is called "Vélocity 2025" and is a 12-year, sustained programme of investment in cycling.

The aim of Vélocity 2025 is to support the ambition of Manchester being a city fit for the future through the delivery of the highest quality cycling infrastructure. More people cycling more often is expected to make the city more healthy, safe and sustainable and will help drive the economic growth of the regional centre and district centres alike.

The programme has been inspired by other major European cities such as Seville, Berlin, Amsterdam and – more further afield – New York City. All of these cities have invested significantly in cycling infrastructure

> *As a devolved city region we're working to break down silos, which will allow us to improve knowledge sharing and funding opportunities with the health sector. TfGM will strive to continue integrating health and transport budgets to fund infrastructure and initiatives that would have a clear positive impact on health of Greater Manchester residents*

TfGM's proposed cycle lanes that will form part of the planned rethink of city's road network

Forecast Impacts of CCAG Phase of Manchester Velocity 2025	
No. of new cyclists (per day)	26,800
% change in cyclist trips on interventions	over 300%
% change in cycle speed	16%
% additional cyclists that would never have gone by car	18%
Car km removed from road per year	1,680,000
CO2 emissions avoided (tonnes) per year	228
Health benefits per year	£7,300,000
Absenteeism benefits per year	£198,000

over a significant period (some more recently than others) and are now reaping the benefit. Vélocity 2025 aims to bring Manchester up to that standard. The programme recognises that there are many examples of good infrastructure in the city, but the overall quality of such infrastructure is limited and it's not well connected. This project aims to address these issues and to double, then double again the number of people cycling by 2025.

The bid was coordinated by TfGM with significant input from Manchester City Council, as the majority of the proposed infrastructure was providing improved connections to the regional centre. Greater Manchester's total bid value was for £30 million of investment in cycling,

which included £10m locally funded contributions.

HEAT was a key function in the preparation of this bid and demonstrated the need for investment and the potential positive outcomes that could be achieved by the city region if the funding was secured. The table above right highlights some of the figures produced using a range of tools, including HEAT.

Health benefits of cycling were estimated for Cycle City Ambition Grant 1 interventions and applied to forecasts of new cycle trips resulting from the intervention (over 300 per cent). Calculation considers estimates of average cycle distances. The value of reduced mortality as a result of increased physical activity accounted for £7,300 per year. Results from

HEAT were added to wider monetised benefits to feed into benefit-cost ratio (BCR) calculation.

Improvements to date include 60km of largely segregated cycle lanes built since 2013. Around 9,000 people have enjoyed free adult bike training sessions. TfGM is working with 11 schools and colleges to promote cycling to pupils and staff. 16 cycle hubs are now available across the city region. ©

PURE MOBILITY

As the automotive world moves toward fully connected and self-driving cars, it's no surprise who's driving the future of the industry. Michigan. Home to the world's first and only real-world testing facility for autonomous vehicles, Michigan leads the country in research, development, innovation and technology. And it all makes up the epicenter of mobility known as PlanetM. Find out why Michigan is the hands-down choice for your business at **michiganbusiness.org/planetm**

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