OUR PUBLIC TRANSPORT

PEOPLE'S PUBLIC TRANSPORT POLICY

WORKER CONTROL OF TECHNOLOGY: THE SMART CITY

This chapter was co-written by Peter Bihr at The Waving Cat and Victor Figueroa, ITF future of work policy advisor to inform policy proposals on addressing worker control of technology for the People's Public Transport Policy [www.OPTpolicy.org]. The ITF would like to thank Peter and Victor for their contribution.

Each chapter in the People's Public Transport Policy focuses on different policy issues related to public transport. The chapters include case studies, as well as campaign materials and educational resources.

The ITF's Our Public Transport (OPT) programme promotes a social model of public transport. A social model includes organisational and employment rights for workers and requires that any expansion of public transport guarantees decent jobs.

OPT:

- works in target cities to strengthen the voices of workers in the development of new urban transport modes, including bus rapid transit (BRT), and in negotiating the transition from informal to formal work

- campaigns to improve working conditions for all public transport workers – informal transport workers in particular – through increasing their industrial power. This includes building union networks in public transport multinational corporations, developing alliances with passengers, communities and other organisations and promoting women's employment in public transport

- works to develop an alternative public transport policy – one that is built on public ownership, public financing, decent jobs and union rights for workers

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1. Executive Summary

There are smart city initiatives across the world. Smart cities promise efficiency and better urban management; they promise innovation and better delivery of government services. However, we find that these promises – made mostly by the companies that sell smart city technologies – are incomplete at best.

While the concept of smart cities does hold tremendous potential for issues such as energy savings and data-driven urban management, it also bears potential for tremendous problems: privacy and digital rights are at risk through invasive tracking and surveillance, and human rights and workers' rights might be at risk where opaque algorithms make decisions that impact people's lives.

The imbalance in the speed and marketing power of global technology vendors on one side and often much smaller, less well-funded city administrations on the other also leads to an unhealthy power imbalance at the expense of the city and its citizens.

Meanwhile, the impacts of smart cities upon workers are often overlooked. This is what this report aims to help remedy.

This report offers a look at different types of smart cities around the world by exploring the marketing narrative that so strongly shapes the debate around them, by discussing the role of private enterprises in the city and the financial and data subsidies that cities offer companies. It also discusses the role of data and data-driven decision-making as far as workers are concerned, and it takes a big picture look at the smart city from a citizen and democracy standpoint.

There is much to criticise in the current debate of smart cities from a worker perspective. However, the report is also intended to help workers to understand the status quo, the forces that influence the ongoing debate, and where trends are headed, in order to help shape this development to a positive, desirable future for workers, citizens and cities alike.

This chapter is written as a starting point to support organisations in this space on their journey. Depending on your context, some parts will be more immediately useful than others, but we hope that all parts help build the internal knowledge base to help navigate this space well. Only then it can serve as a basis for organising.

We have developed recommendations across all chapters (and summarised them at the end of the document). These recommendations can neither claim to be comprehensive nor that every recommendation will fit every labour organisation. They are instead intended to be used as starting points for organisations to develop their own policy on smart cities.

By bringing the worker perspective more strongly into focus, we hope to make a worthwhile contribution to the smart city debate.

2. SMART CITIES — WHAT ARE THEY?

> **It's too broad and vague to win; it's a huge, looming infrastructural phenomenon."**
>
> Bruce Sterling (2014)

> **Let's be clear: none of our instincts will guide us in our approach to the next normal."**
>
> Adam Greenfield (2017)

Cities around the world are introducing so-called 'smart city' projects. The term is rather loosely defined, but it generally implies the increasing use of digital data gathered from sources like sensors and mobile phones to improve services, sustainability and safety. In many cities this also includes apps and websites dedicated to communicating with local government ('government digital services'). It is therefore in many ways an application of the 'Internet of Things' (IoT), and frequently follows the same logic as the platform economy.

IoT is the concept where everything in the world can communicate with everything else – for example by sensing and reacting in real time to changing conditions. It pictures a world in which sensors are implanted into infrastructure, vehicles, tools and products – all of which can communicate with each other or be coordinated through digital means. The collected data can then be analysed through IT systems and used in combination with criteria inputted by people (bus spacing and energy use, for example) to produce certain outcomes, such as increasing efficiency.

Smart city can therefore refer to either infrastructure (such as sensors and cell phone towers) or goods and services which are produced or provided based on data collected from people through their mobile phones (for example, to measure how they move as a mass through the city over time). While most big cities are using data in some way (as they always have), those being called smart cities today have developed, or purchased, an integrated plan for the ways in which they want to use digital technology, and especially data collected around the city.

Smart city is a broad term, and initiatives in this space can take many shapes. Typical domains for smart city initiatives include:

- mobility & transport - often known as Mobility as a Service (MaaS)
- energy and sustainability
- administration and government digital services
- safety, security and policing

We see smart cities as a mega trend that will shape urban life as citizens and workers for decades to come. The concept comes with promises of significant benefits to administrations and is a potentially huge market for technology vendors.

But more than many other fields, the smart city is a concept fraught with potential negative impacts as well. So trade-offs must be made and rights (worker rights, citizens' rights, human rights and digital rights) must be defended vigorously.

Even where citizens are highlighted as the main beneficiaries of smart city projects (for example, through better government service delivery), workers have rarely been explicitly part of the vision. This is despite the fact that workers could be seen as one of the leading 'early exposed' groups, especially where public transport is concerned. Workers

bear the brunt of poorly-executed changes or the creation of faulty systems and low-quality data sets. Workers are among those that understand the day-to-day operations of areas such as administration and transport best, so it's essential that workers are part of shaping what a smart city should look like and what it should do.

It is important to note that the empirical evidence of any impact of smart city strategies is still pretty thin in most areas. So many of the debated impacts, both positive and negative, remain mostly hypothetical for now (Lim et al 2019).

That said, public transport and mobility more broadly is one of the areas which is at the forefront of smart city technology deployment. It is an area in which technology vendors offer a wide range of products and services. Which is to say: public transport is one of the sectors that are affected first and heaviest by the smart city. That is why we argue that workers affected (possibly as side effects) through aspects of the smart city such as Mobility as a Service (MaaS) and on-demand platform economy services (like Uber) can be seen as de-facto canaries in the coal mine.
Workers experience first-hand some of the powerful effects of the school of smart city thinking that prioritises efficiency over participation, and data-driven management over values-driven management. Consider a cab driver who has to work as an Uber driver for worse conditions and with less job security or the bus driver in a pilot project for autonomous buses.

But smart city projects don't have to be as futuristic as a self-driving bus. In many instances, the work of transport workers will simply be closely overseen day-in, day-out, or otherwise be conditioned by digital infrastructure. This already happens in some ways through the use of scheduling technologies which track if buses are running on time and what the spacing is between them. The result on bus drivers is less flexibility at route ends, forcing them often to miss toilet breaks. Another impact is the focus on speed and regularity, forcing drivers to cut back on social aspects of public transport. These examples show that there are no simple answers in this space and trade-offs between different stakeholder groups need to be well considered.

Smart cities are a convergence of technologies and policies rather than being one specific technology or policy. Specifically, smart cities are in practice largely inseparable from the Internet of Things (IoT) and artificial intelligence (AI) or algorithmic decision making (ADM).

Therefore, it is important to remember that many of the issues debated today using the term artificial intelligence equally apply to the smart city arena as well, and many policy recommendations might be applicable for both areas. For example, when it comes to monitoring/surveillance of citizens or workers at scale, the pure mass of data that can be captured across the smart city means human-only analysis would be impossible. Instead, monitoring and surveillance is being built on a backbone of ADM systems. The rise of surveillance and the rise of AI are closely coupled, as Whittaker, Crawford et al (2018) warn below. It is safe to assume that this will increasingly apply to workers as well, if it is not stopped in time.

"The role of AI in widespread surveillance has expanded immensely in the U.S., China, and many other countries worldwide. This is seen in the growing use of sensor networks, social media tracking, facial recognition, and affect recognition. These expansions not only threaten individual privacy, but accelerate the automation of surveillance, and thus its reach and pervasiveness. This presents new dangers and magnifies many longstanding concerns. The use of affect recognition, based on debunked pseudoscience, is also on the rise. Affect recognition attempts to read inner emotions by a close analysis of the face and is connected to spurious claims about people's mood, mental health, level of engagement, and guilt or innocence. This technology is already being used for discriminatory and unethical purposes, often without people's knowledge. Facial recognition technology poses its own dangers, reinforcing skewed and potentially discriminatory practices, from criminal justice to education to employment, and presents risks to human rights and civil liberties in multiple countries."

Most smart city initiatives are built around tracking and data analysis. Specifically, real-time tracking and so-called Big Data analytics are key drivers for the smart city. Concretely, this means real-time tracking of, for example, vehicles through the city by means of sensors or GPS signals or other sources of data, and finding patterns in that data to optimise traffic. Tracking worker activity is no exception. Drivers can be tracked in real time as they move through the city, including stops or detours. Drivers can increasingly be rated and ranked by managers and/or customers. In some contexts, video surveillance is becoming the norm.

These are just some obvious examples. It is safe to assume that, unless there are legal protections in place, more surveillance and tracking at the workplace is to be expected. It could be said that tracking and surveillance are part of the smart city toolkit.

The data produced can then be manipulated or used for specific purposes, like for example seeing available drivers (such as Uber, Lyft and taxis) or rental vehicles (such as e-scooters, cars and bikes) parked conveniently nearby. By exposing this information through consumer phone apps (which in turn share data about that user's location and offer payment capability), new or updated services can be offered.

Often, these new services are essentially just new combinations of existing offerings. For example, calling a taxi combined with metro schedules and paying the fare for both from within a smart phone app takes data from existing services and bundles them into a Mobility as a Service offering. For users, this can mean a significantly more convenient or consistent user experience, so it is no wonder that this model has been advanced most heavily by consumer technology companies. But it is not exactly ground-breaking.

However, organisationally this can also require a new mental model. For workers it has significant implications, as this level of integration creates a tendency to constrict the autonomy of the component parts and also introduces aspects like driver ratings, not just by passengers but possibly also by employers. Therefore, it also significantly contributes to the adoption of practices current in the gig economy model.

Going forward, these applications of technology might be combined with artificial intelligence/machine learning to analyse and control worker performance with minimal human intervention. Think algorithmic analysis of the facial expressions and emotions of a driver, or security personnel in a bus station. Increasingly, algorithms might be employed more and more ubiquitously to optimise the efficient output of workers in public transport at the cost of the worker's agency and ability to respond meaningfully to the situation on the ground.

The actors that have driven this development over the last decade largely come from

consumer tech companies and startups rather than the public sector or public transport backgrounds, so they function according to different incentives – including, frequently, the aggressive growth requirements of venture capital investments. They are not accustomed to thinking of health and safety, or worker input into tech deployments. They do not think as employers and this in itself creates challenges for the way they understand the impact of their actions.

Smart cities are big business. Smart cities are a significant industry already and are predicted to keep growing fast over the coming years. The exact predictions vary from source to source but there is little doubt that for technology vendors, smart cities are a big business opportunity. As Townsend (2013) points out, "building-in smart added only 2.0 percent to the project's construction budget. Scale that share planet-wide, and global spending on smart infrastructure is on the order of $100 billion over the next decade alone". With that much budget on the line, companies are keen on capturing market share sooner rather than later, and few exercise restraint with regard to their promises.

Critics point out how much of the current smart city discourse is essentially a marketing and sales narrative. Söderström et al (2014) refer to smart cities as "corporate storytelling", stating that IBM's smart city pitch "mobilizes and recycles two long-standing tropes: the city conceived as a system of systems, and a utopian discourse exposing urban pathologies and their cure". Smart city vendors try to position their offerings as indispensable in a city's journey towards digital transformation.

> **This story is to a large extent propelled by attempts to create an 'obligatory passage point' (...) in the transformation of cities into 'smart' ones. In other words, it is conceived to channel urban development strategies through the technological solutions of IT companies." (ibidem)**

They go on to argue that:

> **"This discourse promotes a conception of urban management that is a technocratic fiction (...) where data and software seem to suffice and where, as a consequence, knowledge, interpretation and specific thematic expertise appear as superfluous" and that "this discourse prioritizes public investments in IT over other domains of spending and thereby introduces a new 'economy of worth' (...) which is particularly problematic in resource-scarce cities."**

To put this differently, from a perspective of a city government that feels pressure to appear innovative, "looking smart, perhaps even more than actually being smart, is crucial to competing in today's global economy" (Townsend 2013).

The worker has little place in this picture, which is dominated by perceived technological innovation.

RECOMMENDATIONS:

- Unions should ensure that city authorities are aware that the smart city has impacts on people as workers, as well as citizens.
- Unions and city authorities should ensure that the monitoring and surveillance of transport workers is minimised, and that the impacts of these technologies on occupational safety and health and gender are properly assessed.
- Unions must campaign to reject the framing that technology-driven smart city projects are inherently more innovative, useful or desirable, and demand that workers and citizens all have a voice in debating the future of cities.

3.
SMART CITY MODELS AROUND THE WORLD

"It's a utopian vision of technological determinism. If we've learned anything from a generation's marriage to the internet, we should know that that's not how things work out in real life."

Bruce Sterling (2014)

Smart city projects come in various sizes and with various functions, but there are local flavours and approaches that can be discerned in the way the smart city is being developed. These approaches can help us to roughly categorise various approaches to the smart city in different regions of the world. The following descriptions are not exhaustive, but they highlight what the main features of the smart city are and help tease out commonalities and distinctions across the world.

Fundamentally there are two possible approaches to the smart city: those that engage citizens in discussions around the issue in some way, and those that present citizens with a fait accompli, often after closed discussions between municipal authorities and tech companies where the democratic element is assumed to be assured by the elected nature of municipal representatives.

But who is driving the smart city forward is just as important. It is possible for the initiatives to be led by the private sector, public sector or even government. Each of these actors has the potential to be authoritarian in effect, in the sense of removing accountability and transparency from citizens and shifting it towards unelected or unaccountable actors, whether private sector or state. And whether in China or the US, big tech companies tend to have close relations with the national security institutions of their home country, which carries implications for those that dissent from government policy. Technological systems run by private companies can also come to play the role of de facto government, so the threat to democratic participation and oversight could just as well come from a private enterprise. So authoritarian, for the purposes of this typology, refers to the focus on top-down control, no matter who exerts that control.

Unfortunately, as Kempin Reuter (2020) has recently noted, smart city initiatives are usually top-down. She highlights six main problems with the way smart cities are currently developed:

1. An over-emphasis on technological solutions, which are seen as 'objective, neutral and politically benign'.
2. Usually top-down in implementation and dominated by an alliance between corporations and local government.
3. They often hand public functions over to private actors who then pursue profits over the greater good.
4. They reinforce divides and inequalities because they cater to elites and prioritise vested interests.
5. They rely on surveillance and other forms of data collection which erode privacy, enable predictive profiling and foster social categorisation.
6. They create urban systems vulnerable to hacking and cyber attacks. (See Kempin-Reuter, 2020.)

We would add that they ignore the citizen as worker and therefore focus on service delivery, not on the implications for working people in the city.

Bearing these issues in mind is a useful analytical tool with which to approach the smart city concept. Each of the following approaches is the result of different assumptions and different social structures, which are themselves conditioned by the availability of capital, the diffusion of technological know-how and the extent of popular accountability. They share many features, and the technology itself, and its basis in tracking and surveillance, means that all of them bear potentially negative implications for democracy and for workers' rights. Moreover, the private sector plays a big role in all of them, as most technology in this area is developed by private companies, mostly by global tech enterprises.

CHINA AND EAST ASIA

The Chinese model of smart city is the most important in the world, with as many as half of the world's smart city projects being developed in China. As employed in Shenzhen, Shanghai and other Chinese urban centres, the smart city is exemplified by the close cooperation between tech companies and the Chinese state: resulting in a system with a strong focus on trust building, and efficiency and control, which is collectively known as the Chinese Social Credit system. In this system, the government has the power to see the data collected by companies and it can ensure that the data is used in ways that reflect its priorities. This has been notoriously known to be used to shame jaywalking pedestrians by showing them on big urban screens, for example. While this sounds menacing, its supporters argue that its main function is actually to build trust. The centralised surveillance and control structures aim to monitor citizens in order

to condition their social behaviour and encourage actions that are understood to improve social cohesion and quality of life. As part of this they also aim to encourage good corporate behaviour and counter corruption and bureaucratism (Xin Dai, 2018). The extent to which good corporate behaviour is seen to encompass workers' issues, such as pay and conditions, including occupational safety and health, is not clear. Nevertheless, the idea of increasing incentives for responsible corporate behaviour is interesting, as long as it is accompanied by a well-developed set of regulations and follows a widescale public discussion among the citizens concerned.

The social credit system is not deployed equally across China and reflects more of an emerging patchwork of systems with a weak regulatory framework. Critics point to the lack of legal protections against government surveillance and argue that these systems undermine the ability of citizens to oppose the government. On the other hand, surveys from China reflect a high level of trust among the Chinese public towards government and employers (Edelman Trust Barometer, 2019), and some academic studies reveal similar levels of trust in smart cities and new technology (Xinyuan Wang, 2019). This trust reduces the perception of potential problems with the application of technology. These smart city projects tend to be cutting edge technologically, involve tech actors from across the world and make heavy use of advanced artificial intelligence, but without western forms of democratic accountability or oversight.

Despite the stated intentions of the Chinese Social Credit System and the high level of public trust in government and in technology, there is obvious potential for these technologies to be used to enable the repression of dissent, as has recently been proved by the use of facial recognition to target protestors in the US.

This further underlines the need for democratic discussion and oversight of the uses of these technologies in cities and workplaces.

Singapore's approach to the smart city (also known as smart nation), contains some of the same approaches as the Chinese model. In Singapore, the smart city includes all digital transformation activities, taking a broader perspective than many other municipalities with the inclusion of telemedicine. The focus is on fostering (neoliberal) economic opportunity to citizens and private enterprise, government service delivery and improving living standards. Nevertheless, the Singaporean model also includes potential for social incentives to become social control.

In South Korea, the development of smart cities is part of national economic policy. Several cities are engaged in developing smart city responses, including Busan, Anyang, Bundang, Namyangji and Sejong. The best-known project, in Songdo, has run into problems, with completion being delayed from 2015 to 2018 and now to 2022. Residents have complained of high living costs, a lack of culture and poor public transport as well as poor urban design. As in most countries in South Korea, smart city projects are being sold as solutions to congestion, public security and safety, waste treatment, and as reducing energy costs. In Busan, Cisco and KT have established 'community centres' intended to improve urban services such as access to healthcare, information and education, particularly for the elderly. In Sejong, AI is being used in homes to help predict illness. In order to sidestep potential issues, many of these projects are taking place in 'regulatory sandboxes' which suspend existing legislation and allow the use of intrusive technologies and data collection. In Sejong, the sandbox suspends regulations that would otherwise be an obstacle to car sharing, for example.

WESTERN AND SOUTHERN ASIA

India's many smart city projects display a wide range of characteristics ostensibly focusing primarily on governance and urban planning to enable governments to 'do more with less'. One hundred cities are scheduled to become smart cities by 2022, each to be developed in cooperation with the private sector. Each city aims to develop an integrated command and control centre to make use of the data produced. India's smart cities target public security, the provision of clean water, effective sewerage systems and efficient urban transport. It is a model that heavily relies on international tech firms and mixed funding. However, the shared 'data infrastructure' of the Aadhaar biometric identity database and its centralised, top-down infrastructure, along with the failure to incorporate privacy protection in its conception, make for a problematic set up, particularly in the light of recent changes to Indian citizenship laws which target Muslim Indians. Moreover, critics allege that the concept is in reality intended to service wealthier inhabitants while leaving the bulk of India's urban dwellers in need of the most basic services (for more detail see the Housing and Land Rights Network 2017 report, India's smart cities mission: smart for whom? Cities for whom?).

In the Emirates, a number of high profile (mostly first-generation) smart city projects have been launched over the years. Most notably, Masdar City Abu Dhabi was a lighthouse smart city project that drew attention from across the globe. At the time it was intended as a planned city, built from scratch around connected, smart infrastructure. For the most part it remained a ghost town. Workers' rights, unsurprisingly, played no part in the project.

NORTH AMERICA

Within North America, we see a range of approaches to the smart city, all well within the framework of a neoliberal market economy but with distinct local expressions. In the United States the Department of Transport (DOT) in 2015 began funding smart city transport initiatives in mid-sized US cities. These came up with ideas such as dynamic routing and zoning, as well as car sharing. The federal government has also invested in funding for cities to develop the infrastructure to enable the Internet of Things. Kansas City has been a leader in building affordable, powerful broadband and technical infrastructure innovation in partnership with Google and Cisco, and has recently decided to offer public transport for free, joining other cities like Estonia's capital, Tallinn. It also has hundreds of video cameras and a gunshot detection system. In Seattle, a similar surveillance system has been dismantled after concerns over privacy. The Kansas system has been criticised for the modest size of improvements and for a lack of clarity around the way in which private companies are using the data they collect in the city.

San Francisco is the heart of Silicon Valley and therefore a natural test bed for new smart city interventions from technology companies and startups. It has been fast to respond to potential disruptions like autonomous delivery robots that clog up sidewalks.

Toronto was likely to be the test bed for a new greenfield development of a new neighbourhood built from the ground up as a largely privatised smart city neighbourhood by Sidewalk Labs, an Alphabet subsidiary and Google's sister company. This was a worrying example of the privatisation of municipal services in

practice which threatened the democratic rights of citizens. At best it threatened the creation of some sort of technologically-enabled gated community living under rules set by Google where democratically elected authorities have little say.

New York City is a noteworthy exception on this list. Here, the city administration takes a broad view of the concept of smart cities and includes not just government service delivery and digital transformation in its approach, but also a defence of its citizens and workers against potential threats from the federal government and private sector corporations, especially when it comes to questions regarding privacy and surveillance.

EUROPE

Within Europe, we see a broad mix of smart city projects, coming under the Europe-wide framework of the European innovation partnership on smart cities and communities (EIP-SCC). The stated goal helps to 'improve urban life through more sustainable integrated solutions and addresses city-specific challenges from different policy areas such as energy, mobility and transport, and ICT'.

Vienna is often highlighted as a leading example of the smart city, one built on collaboration that is intended to use the city's 'collective intelligence' to respond to the challenges the city faces. The city uses an integrator to connect various public transport and mobility options, and enables bike, e-scooter and car sharing. The city is also experimenting with ticketing options that cover all its transport modes. Like other European smart city initiatives, Wien is heavily tilted towards sustainability and quality of life but it has not considered workers in the development of its projects. This means that potential negatives are not even considered as part of the city's smart city strategy.

Helsinki is another city that is often at the top of smart city rankings. Its smart city offering also includes a strong participatory element, with citizens contributing to improving public spaces, waste collection and the development of new forms of community housing. The urban mobility system uses MaaS Global to integrate data from various sources into an app where users can pay in one place and use various transport modes. The bedrock of the system is free open data from Helsinki Region Transport. Like other smart cities, Helsinki has also been experimenting with autonomous shuttles. Despite the laudable results in many areas, consideration of workers does not appear to have been a major part of the city's adoption of new technologies.

Amsterdam is another leading European smart city that prides itself on using a bottom-up methodology and open data. As with other European examples, the city seeks to develop cooperation between government, business, research centres and universities and citizens. An online platform enables startups and tech companies to develop responses to the challenges set out. The city has become a leader in combining artificial intelligence with privacy in the smart city, for example through (prototype) systems that would use cameras in public spaces to analyse where there is rubbish on the street, while filtering out any personally identifiable information like faces or number plates right at the source. As with other examples, Amsterdam uses 'ambient data' from social media to indirectly collect data on how citizens experience the city. Again, workers have not been considered separately from citizens.

Barcelona has developed an approach that is now widely known as the Barcelona Model of smart cities. The city has sought to re-align all of its administration and government around digital governance and participation, and its smart city thinking is central to this approach. Through a digital-first participation platform (Decidim), bottom-up initiatives and government digital services are tied closely with the smart city policy. Barcelona has therefore tried to engage citizens in making decisions about the city.

But especially noteworthy is Barcelona's focus on open source (non-proprietary and often free software) and open data (that can be used for free for non-commercial purposes and licensed for a fee to commercial actors), as well as capacity building. Barcelona intentionally built up technical and analytical capacity within the municipality rather than outsourcing these tasks to commercial actors. This puts the city in control of its own technological fate rather than lock it into dependencies on multinational corporations. The tools it builds for the city can be used by other municipalities, too, and everything is aligned towards digital rights, participation and technological sovereignty.

However, Barcelona has faced problems keeping the digital capacity it has sought to build, as private sector actors have simply hired entire teams previously working for the municipality. Furthermore, workers in the city administration complain that the digital systems are not properly connected and that their workloads have often increased as a result of digital systems.

Moscow is another leading European city with a well-developed smart city project. It is distinguished from other projects by the greater range of public services still directly run by the city, which enables a more integrated approach. The digital services include the city's public healthcare system, which now distributes appointments across the city; a portal for e-government that allows citizens to apply for permits, upload documents and pay bills; and an education portal for students, teachers and parents.

Like other cities, Moscow also seeks to engage local citizens through an 'active citizen' portal that polls citizens at city and district level on a variety of issues. Participation is rewarded with points that can be redeemed across the city. Following complaints, the portal now includes the possibility to vote on issues that citizens nominate themselves. All of this is accessed with a single sign-in. The city introduced an intelligent transport system to reduce congestion but it also bought thousands of new metro trains, buses, trolleybuses and trams. In addition, it brought new light rail and metro lines into operation, regulated the taxi industry and introduced bus lanes and integrated ticketing. The result has been increased use of public transport in the city. The city also has thousands of cameras and a pilot facial recognition system aimed at reducing crime and improving passenger flow. The city states that any citizen can access video data within five days, after which it is deleted. Nevertheless, more robust regulation of its use is necessary.

Moscow is a kind of hybrid smart city model, incorporating some of the elements found in western smart cities (e-government and citizen participation, for example) and the incentives used in Chinese smart cities. But Moscow is unique in enjoying the advantages of a centralised urban system that has not been privatised as is common elsewhere. Nevertheless, in some areas the city has partnered with private companies, for example to provide public wi-fi. Potential issues with privacy appear to be minimised by the fact that most of the benefits have

been realised by the effective digitalisation of existing municipal datasets. Therefore, it seems that Moscow's efforts to digitise all its data and procedures and train thousands of city administrators before launching any services have minimised negative impacts on workers in the city administration, although there has been no consultation with workers on other aspects of the smart city, such as public transport.

BRAZIL

Rio de Janeiro illustrates some of the problems inherent in smart cities. Rio was for a long time a highly visible showcase for a smart city built around the notion of a real-time, data-driven urban management dashboard. After a horrific flood in 2010 that killed hundreds and left thousands homeless, and around the time the city was elected to host the 2016 Summer Olympic Games, the government started a collaboration with IBM to build a sophisticated weather forecasting system. However, this system – built around extremely powerful cameras and computer visioning – quickly morphed into a highly criticised surveillance system (Townsend 2013): "What began as a tool to predict rain and manage flood response morphed into a high-precision control panel for the entire city. As [Mayor] Paes boasts, 'the operations centre allows us to have people looking into every corner of the city, 24 hours a day, 7 days a week'." The long-term impacts of this initiative aren't yet fully clear, but it is safe to say that workers' rights are of little importance within this framework.

Most importantly, the Rio example highlights how even a system intended to protect citizens can rapidly morph into a high-surveillance system used for other ends. It is also worth noting that even in non-Chinese smart cities some observers note that "the focus is on social control, in which behaviour of citizens is monitored and explicitly or implicitly steered or nudged, resulting in a quantified community with numerous overlapping calculative regimes designed to produce a certain type of social and moral arrangement." (Kempin Reuters, 2020).

Furthermore, while several smart city initiatives include some form of citizen consultation or participation, it is usually on a small scale and done in a relatively low-intensity way through online consultations and so on. Not including workers' organisations in the discussion means that citizens are only considered to be citizens in their leisure (or non-working) time. Yet in cities across the world many people work in public services (or in privatised public services) which are in some way affected or conditioned by the smart city – education workers, medical workers, transport and logistics workers, waste and other urban service workers, public administration workers, delivery and postal workers. This approach ensures that problems are only seen from the perspective of the user as resident or businessperson, but never from the perspective of the citizen-worker.

For example, an urban community may decide that it wants its bus services to run every two minutes, 24 hours a day. But it is bus drivers who have to deliver that service, and who will find their working lives determined by this parameter, which can be encoded in their shift-patterns, electronic schedules and monitored every second of the day at the expense of their working conditions and health. A properly consultative decision would have to include workers' representatives so that a balanced allocation of costs and benefits across the citizen community can be achieved.

4. PRIVATE ENTERPRISE AND SMART CITIES

> **Surveillance capitalism operates through unprecedented asymmetries in knowledge and the power that accrues to knowledge."**
>
> Shoshana Zuboff (2019)

By and large, smart city projects tend to either take the shape of private public partnerships (PPP) or of city municipalities contracting private companies to deliver a service. In either way, we see a tendency to shift responsibilities for service delivery from public to private sector – and a lack of oversight and accountability tends to follow from this shift.

This is relevant because it means that public space and government service deliveries are turned into privatised or (often) de facto privately governed space, and what used to be government service delivery to citizens is turned into a private sector offering. Almost by necessity, the dynamics of power and governance change, with citizens and workers coming out worse when profit becomes the main incentive.

The smart city sits at the intersection of public policy, finance and data. As cities are where the majority of the world's population lives, the type of smart city that develops is going to fundamentally affect the lives of most of the world's workers, particularly in public transport. From a labour perspective, a key issue with the dominant concept of the smart city today is that it is essentially a neoliberal concept. A city run on public subsidies to private companies and often private delivery of services implicitly threatens to undermine existing working conditions because the private sector is driven by the need for profit, no matter what the costs incurred by others.

What's more, where infrastructure is concerned the government gives up key resources and reduces its own agency over the future. Privatising infrastructure and outsourcing the management of data-driven systems means giving up the power to actively shape the future in the interest of citizens, and introduces or reinforces dependencies on those providing the technologies. Furthermore, outsourcing or privatising key infrastructure reduces the city government's bargaining power for the future.

As an example, look at broadband internet infrastructure.

> **Community-owned broadband is one of the best investments a smart city can make. It creates a vital infrastructure for information-intensive industries (...) More importantly, it puts the city in control of its own nervous system, giving it tremendous bargaining power over any private company that wants to sell smart services to the city government or its business and residents."** (Townsend 2013)

The same holds true for other infrastructure, especially where data-driven systems are involved, most of the smart city.

What role should private companies play in developing and running what are otherwise considered public spaces? An inherent risk of having private companies install a complex system is that they will "also do the next steps – thereby further privatising the work" (Saskia Sassen). Related to this debate is also the lack of public oversight over data that might be collected and/or processed by private entities.

On a strategic level it is worth noting that many smart city projects start out as pilot projects. Given their roots in the realm of technology

and IT systems, this would not be unusual except that in this case, where we discuss projects with potentially huge impact on both the infrastructure level and the citizen/worker/privacy level, it is a critical aspect. All too often, pilot projects (especially when heavily subsidised by the technology vendor) will take place with significantly more lax oversight by municipalities. In many jurisdictions, these pilots sidestep the formal public procurement process and therefore avoid meaningful oversight. This is highly problematic – smart city pilot schemes should be structured in such a way that guarantees that:

a. they have a clear end point;
b. that the end of the project is the default – it won't just keep going unless there is a formal public procurement process; and
c. that there are clearly defined goals and metrics that the pilot is evaluated against.

Without the latter, a pilot project cannot offer any institutional learning or insight and would simply be a sidestepping of the procurement process.

Smart city projects should at no point reduce the public's and the public administration's agency or weaken their governance mechanisms.

Over the last few months, we have seen a number of alternative approaches to safeguarding the balance between public and private. The Cities Coalition for Digital Rights (2018) is a network of progressive city chief technology officers (CTO) that coordinate to better protect digital rights of their citizens. The Vision of a Shared Digital Europe (Bloemen, Keller, Tarkowski 2018) proposes to replace the European Union's Digital Single Market framing by instead focusing on four foundational principles (empower public institutions; enable self-determination; decentralise infrastructure; cultivate the commons). Both these approaches can help guide the search for better approaches to the smart city from a worker and citizen perspective.

5. THE SMART CITY AS A SUBSIDY TO THE PRIVATE SECTOR

"The notion of the smart city in its full contemporary form appears to have originated within (...) businesses, rather than with any party, group or individual, recognized for their contributions to the theory or practice of urban planning. That is, the enterprises enumerated here are to a surprisingly great degree responsible for producing both the technical systems on which the smart city is founded and the rhetoric that binds them together in a conceptual whole."

Greenfield and Kim (2013)

In many ways, the smart city and especially the data captured and generated there equals a subsidy to the private sector.

Since governments and cities lack trained staff and experience in developing and using technology, across many smart cities the technology is owned by private providers who are given free access to municipal data. These companies create digital tools that improve service provision, governance and safety in the city. The justification is that data sharing creates (often vaguely defined) value for all – like improved services or higher returns on investment. Working conditions are not part of this equation. In essence, this is the private appropriation of socially produced data and can lead to a situation where governments supply publicly funded data that companies use to compete with the government over service delivery.

This is clearly visible in the way so-called smart transport is delivered. In cities such as London and Madrid, data from municipal transport is being provided free of charge to for-profit companies seeking to connect different transport modes (such as Citymapper or Uber). These private service providers then use this data as part of their digital products to generate value for their customers but without necessarily contributing back to the public data commons. This makes public data a public subsidy for these private companies, and it reduces the amount of publicly available data the cities can work with in the future. These partnerships clearly capture more value than they create, or at least more value than they create for the public: the value is captured first and foremost by the companies' investors.

Furthermore, public data and the infrastructures required to use and or deliver it are usually managed by private corporations and are at best only overseen by municipalities. This begins with the conceptual framing and the narrative that accompanies the technologies themselves (as quoted at the beginning of this section).

Some cities, such as Barcelona, have made a point of attempting to develop their own IT capacity and data storage, but even here the bulk of its digital services are contracted. This leads to risks for longer-term operations, which Barcelona experienced first-hand when a startup it worked closely with was acquired by Facebook and ceased operations.

However, it's worth noting that IT capacity is only one of the building blocks towards digital and data autonomy in the smart city. Others include a smart data licensing regime, in which public data can be made available for free for research and community projects but offered for a fee for commercial use; and

strategic procurement guidelines, for example to include accountability, governance and maintenance considerations as part of public procurement. These procurement guidelines can also demand that data needs to be shared back with the public data commons and that technological safeguards must be put in place that enable interoperability and data portability to reduce dependencies. These measures and others will all be required to establish that the private sector works for the public rather than vice versa.

In some contexts, notably in China, the sharing of data goes both ways and yet without much participation from citizens and workers. There, the government gives a large degree of freedom in implementing and monetising data about citizens but in exchange gets nearly full access to said data. This data, for example, goes into social credit schemes. The data collection and analysis informs a system that rewards 'good' behaviour with preferential access to loans and other financial benefits but also various preferential treatments similar to those used by credit or loyalty cards. Negative behaviours are disincentivised with denial of access to these benefits and in some cases, social shaming.

While there are questions around the privacy and other implications of this technology, it should be noted that the same data is often collected elsewhere, but without any real government oversight. Furthermore, recent proposals from big US tech companies such as Amazon, Google and Microsoft for helping to deal with Coronavirus also have severe privacy and digital rights implications.

LEADING TECHNOLOGY COMPANIES

Smart city technologies are mostly developed by private companies, and to a surprisingly large degree as a set of one-size-fits-all solutions that are just then adapted to any given city's requirements. In this they follow the logic of other big IT systems.

The range of companies in this space is very broad, with some of the biggest global corporations (IBM, Cisco, Microsoft, SAP, Siemens, Huawei, Amazon, Palantir, Alphabet subsidiary Sidewalk Labs and many others all have extensive offerings in this space) and many smaller, more local companies and startups. Many companies in this space are new entrants to the transport sector and bring with them their own distinct business practices and cultures. This diversity makes it impossible and not very useful to give a comprehensive list of companies. Instead, consider these exemplary profiles of the types of companies in this space, as they tend to impose the logics of their original industries onto public space and the public sector:

- networking and telecoms companies build their offerings around connectivity, and to a degree, the tracking of people and goods through space
- industrial IoT and global supply chain companies treat urban space like a factory that requires (predictive) maintenance, where the movement of goods and people is a top priority, and where public life can be optimized for efficiency
- data analytics companies focus on capturing, analysing, and inferring data and insights to optimize decision-making
- startups and other technology companies aim to fill perceived service-delivery gaps by bringing the superior user experience known from consumer products to government services

Please note that this typology by necessity uses a broad brush, and there are other companies that fall outside these categories. That said, it's helpful to look at the organisational DNA that shapes its outputs and its products.

Vendors imply that data-driven management means neutral, objective management. However, data is never neutral but encodes power dynamics. The framing of 'neutral data' and of the market as key priority is a political

statement that the market is the highest good, before other societal functions (including democracy, equality, public infrastructure thinking and workers' rights). We believe that this framing is myopic and dangerous and recommend rejecting it. Efficiency is not a city's most important characteristic.

While the idea of a smart city holds much potential, it is important to note that the currently predominant model of the smart city is mostly corporate storytelling (Söderström, Paasche, Klauser 2014) – in other words, marketing: "On the surface, the dominant smart cities' storyline is about efficient and sustainable cities, but underneath it is primarily a strategic tool for gaining a dominant position in a huge market."

This framing "promotes an informational and technocratic conception of urban management where data and software seem to suffice and where, as a consequence, knowledge, interpretation and specific thematic expertise appear as superfluous. This is a rather dangerous fiction" that "promotes a mentality where urban affairs are framed as an apolitical matter". In other words, this language is used to sell something, and as a side effect it also devalues human expertise as inferior to algorithms. It's important to be aware of the existence of this marketing language that it is used to sell products and services, and to treat it as such.

Nowhere is this more obvious than in the strong focus on efficiency as determined by measuring mostly physical aspects (movement, air quality), consumption (energy consumption, retail) and worker output. Rather than just efficiency, governance questions should also be among the top priorities. Optimising towards incomplete or wrong goals can be just as bad as going in the wrong direction altogether. Many if not most characteristics that are relevant to urban life (fairness, opportunity, quality of life, serendipity and economic opportunity) can by definition not be measured with sensors, so they would not be managed. Just because they are harder to measure doesn't make them less important.

RECOMMENDATIONS:

- Unions should demand reform of public procurement guidelines to include provisions that limit the potential negative effects of pilot projects on governance and oversight.
- Unions should demand that public data be used for the public good – including ensuring accountability and public oversight over what types of data are collected in the context of smart city initiatives, and who gets to use data for what purpose.
- Unions should demand public procurement contracts to include conditions protecting workers rights.
- Cities should develop in-house expertise regarding IT and smart city technology and ensure social and environmental impact assessments of technology.
- Cities should reduce implicit data subsidies to the private sector. They should require that value generated is also captured by the public and the public sector, through sharing back data as well as through licensing fees.
- Unions should engage with city authorities to discuss the way that smart city initiatives are framed in the larger context, and how to ensure that technology companies are accountable for delivering what they promise.
- Unions should work with city governments to set up strong participatory governance models for smart city initiatives to make sure citizens and workers are well represented in all deliberations.

6.
Smart cities and the challenges for workers

The impact of connected systems – especially complex connected systems like the smart city – is best considered through the lens of unintended consequences and marginalised groups affected by externalised costs. "Unintended consequences affect familiar people in unknown ways, while externalities happen to people we've ignored. In other words, we overlook unintended consequences by not looking deeply enough, but we miss externalities because we were looking in the wrong places." (Bowles 2018)

In other words, failing to look at the full potential impact of a technological system as well as (consciously) choosing not to care about externalising costs will happen at the expense of vulnerable groups.

Workers are not always the most marginalised group. The most marginalised include those who for various reasons cannot find employment, structurally disadvantaged minorities in some cases and those who live in the overlaps of marginalisation and discrimination (intersectionality): jobless, homeless, undocumented and unbanked people. And among workers, some groups are more vulnerable than others, such as informal sector, migrant and gig economy workers, and women workers.

Workers can easily be one of the first groups most exposed to the impacts of technology and therefore also affected by unintended consequences very easily and significantly. Often, the effects set out above arise out of combinations of developments that individually might not be problematic but become so in combination. So we see workers as an especially relevant group to discuss the impacts of smart cities.

As we have stated, workers are mostly notably absent from the discussion around smart cities. This may not seem like a big problem at a time when the smart city is limited to certain areas of administration or energy management. But increasingly, the logic of the digital age is considered that of surveillance capitalism, "a rogue force driven by novel economic imperatives that disregard social norms and nullify the elemental rights associated with individual autonomy that are essential to the very possibility of a democratic society" (Zuboff 2019).

Despite this, the smart city is usually advertised as serving the interests of people as citizens (e-governance and digital administration) or users (of Mobility as a Service) as customers (of municipal services, transport) and as businesses (new infrastructure and markets for digital products). Even in the most progressive cities, political concerns today are largely limited to the uses of data, the protection of (individual) data and the security of data.

It might be uniquely complicated for workers to coordinate a response to this set of challenges because they face a series of often overlapping challenges. Workers in a smart city face a peculiar combination of challenges:

- workplaces can potentially be massively impacted by technologies that make workers extremely transparent to management and/or customers. Some tasks are increasingly being automated and workers being forced to work alongside highly automated machines
- the speed at which smart city projects are discussed and implemented and changed is very high, which is a challenge for accountability and for organising
- the technology actors involved are not the traditional actors that labour groups had to grapple with before, and are often large companies with very little history of constructively engaging with workers' groups

As Greenfield (2017) explains regarding the latter point from a citizen's perspective, "the most basic tasks we undertake in life now involve the participation of a fundamentally different set of actors than they did even ten years ago". This is also and especially true for workers in the smart city as tech vendors are pushing in to reshape urban mobility and transportation under the cognitive model of Mobility as a Service.

DIGITALISATION AND WORKPLACE SURVEILLANCE

As Townsend argues (2013), "smart cities may also amplify a more commonplace kind of violence – that inflicted by poverty – by worsening gaps between haves and have-nots. This may happen by design, when sensors and surveillance are used to harden borders and wall off the poor from private gated communities. Or it may simply be an unintended consequence of poorly thought-through interventions". In addition to economic inequality, there is reason to believe that the equivalent will also hold true for basic privacy and data protection at the workplace: those in privileged roles would be largely free of surveillance and its implicit threats, and those in less privileged roles would be disproportionately surveilled.

Digital tools like apps, cameras and sensors have increased the surveillance of the workplace. This can improve safety and it also makes the work process much more transparent to managers, and sometimes customers, through things like rating systems. The technology is not necessarily used for disciplinary purposes but it can guide managers towards areas where they can find issues that are then used for disciplinary purposes. In extreme cases, customer ratings can even lead to terminations: in the case of Uber, reportedly, an average driver rating of 4.6 (out of 5) or below would be reason enough for the company to fire the driver.

Technology is increasingly being used to track workers themselves. Often the justification is reducing accidents but the technology can be used to 'geo-fence' – to limit areas a worker can access on a site – and to track toilet breaks or other activities.

For workers in transport, urban administration and other functions, the digitalisation envisaged in the smart city threatens to increase the areas of work open to such optimisation, with the attendant reduction in directly employed staff numbers and increasing workloads for remaining workers. It also threatens to de-skill jobs by allowing some functions to be reassigned or automated. The introduction of digital technology in administration can also lead to services shifting towards digital platforms and the outsourcing of tasks, leading to loss of formal jobs and increasing the number of precarious jobs that remain.

A particularly problematic use of artificial intelligence in the context of employment is so-called affect recognition, a specialisation of facial recognition. Affect recognition claims to detect the emotional state of an individual through video or audio feeds. Increasingly,

this is used in work situations, for example to identify certain characteristics in candidates during job interviews, or worker performance on the job.

Affect recognition is highly problematic for multiple reasons, as Crawford, Dobbe, Dryer et al (2019) clearly lay out. It is a highly invasive type of surveillance. It's been demonstrated to be a highly unreliable type of facial recognition that fails in ways that are systemically discriminating and biased, for example assigning "black [NBA] players more negative emotional scores on average, no matter how much they smiled" (ibidem, p. 50-51). Most importantly, there is "little to no evidence that these new affect-recognition products have any scientific validity" (ibidem). In other words, affect recognition doesn't work, it is discriminatory and it is highly invasive.

When all of this is taken together, a picture emerges where employers "may utilize algorithmic control using six main mechanisms, (...) the '6 Rs'—they may use algorithms to direct workers by restricting and recommending, evaluate workers by recording and rating, and discipline workers by replacing and rewarding" (Kellogg, Valentine, Christin 2020, p. 396).

Because these algorithms are often 'black boxes' whose inner workings aren't transparent, this means that those actions (the '6 Rs') are based on obscure methodologies, which further tips the balance of power against workers. The researchers also demonstrated that "algorithmic control can be more comprehensive, instantaneous, interactive, and opaque than prior forms of rational control, and that it can allow for further disintermediation of managers" (ibidem), meaning that human oversight and accountability in cases of error or unfair treatment are reduced. They also point to pathways of workers who engage "in four main forms of 'algoactivism' to resist algorithmic control—individual action, collective platform organizing, discursive framing around algorithmic fairness, accountability and transparency, and legal mobilization around employee privacy, discrimination, worker classification, and data ownership" (ibidem), which we recommend studying.

Autonomous vehicles as well as algorithmic decision making (ADM) systems might introduce a new challenge. The obvious, but maybe not most pressing, concern is that autonomous vehicles might displace drivers in public transport. Nevertheless, despite the hype around self-driving cars, and the test runs with autonomous buses in public spaces, we don't expect this to be a major concern in the immediate future because the technology is expensive, insecure and still not as good as a human driver in responding to the local environment. Nor are the necessary productive capacities up and running. So far, experiences with autonomous vehicle testing indicate that while powerful driver assistance systems might become commonplace, drivers will have a place behind the steering wheel for at least the next 10 years.

More problematic, because it is more complex and obscure, is that transport workers might end up being pushed into serving as a 'moral crumple zone' for mistakes committed by algorithms. In other words, human workers would serve as scapegoats for computer errors.

Elish (2019) found that "as debates about the policy and ethical implications of AI systems grow, it will be increasingly important to accurately locate who is responsible when agency is distributed in a system and control over an action is mediated through time and space". The concept of a moral crumple zone describes "how responsibility for an action may be misattributed to a human actor who had limited control over the behaviour of an automated or autonomous system".

Just as the crumple zone in a car is designed to absorb the force of impact in a crash, the

worker in a highly complex and automated system may come to bear the brunt of the moral and legal responsibilities when the overall system malfunctions. While the crumple zone in a car is meant to protect the human driver, the moral crumple zone protects the integrity of the technological system, at the expense of the nearest human operator.

In this scenario, the human worker would quite literally absorb the legal liability of a system outside their own control in order to protect the organisation (in this case, the transit authority, the company that made the vehicle or some third party that integrates all the various parts that make up that particular system). This, obviously, must not come to pass.

The point is that the smart city, as a digitalisation of administration, mobility (including public transport) and other municipal services and systems, makes workers and citizens increasingly transparent to tech companies, and allows these companies access to levels and forms of data that increasingly limit the democratic purview of city authorities. The negative impacts on workers will increasingly be mirrored by impacts on citizens of the privatised and unaccountable smart city.

THE SMART CITY AND TRANSPORT WORKERS: DIGITALISATION, MAAS AND BRT

Smart city concepts are growing in relevance at the same time as Mobility as a Service (MaaS) and Bus Rapid Transport (BRT). These transport concepts are therefore set to be the context in which public transport workers will experience the smart city.

The shift towards MaaS – the connection of all transport services through a digital platform that allows users to combine transport modes as they wish – is a key part of the smart city concept. It might well be the most visible aspect of the smart city.

Mobility as a Service relies on an existing public transport system, but the integrator (the entity providing the platform) uses data from this system, with data from taxis, ride sharing, bike sharing, carpooling, e-scooter and other providers. The bedrock of the system is data produced by the public which is collected (often) by a public transport operator. The public data is combined with data from private providers to provide the user with an integrated picture of transport options and their cost to the user. The integrators can sell tickets or not, depending on the model.

There are challenges for workers in the MaaS model. These include the increasing privatisation of public transport and the potential combination of formal-informal workers in an app that can rank options by their cost to the user without considering other factors.

1. This can create cost competition between a public transport system and private sector transport and push people from public to individual transport.
2. MaaS could even combine paid transport services with those run by volunteers, pitting paid labour against unpaid labour.
3. MaaS could combine data from the formal transport network and the informal transport network.

MaaS therefore threatens to create an incentive towards a more precarious public transport.

The 'datafication' of public transport in the MaaS concept is a growing reality for transport workers, who are already having their work governed by externally set requirements – for example the spacing of buses – that they experience as a form of digital management.

MaaS exacerbates the impact of digitalisation in an environment of neoliberal competition, with its emphasis on cost-defined productivity, multi-tasking (the increasing number of tasks assigned to remaining jobs) and the organisation of labour processes to reduce costs and the strength of labour.

Bus Rapid Transport, as a type of public transport system, is also impacted by digitalisation. It usually transfers the operation of transport from the hands of small and medium, often informal, operators into those of large national or transnational operators.

It is precisely these wealthier operators that have the capital and incentive to introduce cost saving technology, such as automated ticketing machines, and which also make heavy use of outsourcing in order to make savings to labour costs across their operations. They can also potentially become integrators of the new digitalised public transportation system.

In some cases (such as Mexico City), digitalisation is allowing the measurement of real transport flows across the city. This can create maps of both the formal transport network and the informal one, which could then be used to formalise these informal networks, either by bringing them into the public system, or by replacing the small and medium operators with large national or transnational operators. In the current socio-economic context, most cities are seeing the replacement of small operators by national or transnational ones.

RECOMMENDATIONS:

- Unions must ensure that workers at all levels are protected from intrusive workplace surveillance. The power of algorithms over workers should be restricted to legitimate and fair use cases negotiated and agreed with unions.
- Unions should call for a complete ban of affect recognition in work contexts.
- Unions should study the 'algoactivism' pathways to workers' resistance to algorithmic control analysed in Algorithms at work (Kellogg, Valentine, Christin 2000).
- Unions and cities should seek to prevent transport and other workers from becoming the moral crumple zone for errors committed by automated and algorithmic decision making (ADM) systems by demanding corporate responsibility for software or AI applications in the workplace, rather than placing that legal burden on the workers.
- Unions should demand a comprehensive register of ADM systems that affect workers' rights.

OTHER POTENTIAL IMPACTS OF THE SMART CITY

The potential effects of the smart city on employment still isn't fully understood – far from it. However, we can make inferences from adjacent fields, notably around impacts of the gig economy, as well as the impacts of automation and artificial intelligence.

Odell (2019) points out that the transformation to digital work, and especially so-called gig work, brings with it a structural, dystopian burden. Concretely, she warns of the risk of a possible disassociation of workers from their work: "In the global digital network, labour is transformed into small parcels of nervous energy picked up by the recombining machine" (Odell 2019). This disconnection is to be avoided. However, algorithmically coordinated gig economy, task-based types of work promote exactly that kind of disconnection.

Smart city tech can bring a structural burden and do so from previously unexpected angles. This is something that is just beginning to come into focus. If a technology company like Amazon tracks not just its own delivery trucks but also builds and sells the infrastructure to track delivery at the household level (through Ring, its connected doorbell and camera package), then we see the lines between public and private space blur ever more, and at the clear expense of workers (in this case, delivery workers).

Looking at the role of algorithms, things get even less transparent. Currently, the role of ADM systems in the smart city is poorly documented, even where public space or government services are concerned. It is currently largely unclear "how to fully assess the short and long term impacts of these systems, whose interests they serve", and if they are sophisticated enough to "contend with complex social and historical contexts and if they are sufficiently sophisticated to contend with complex social and historical contexts" (Reisman et al, 2018). In short, we don't know which algorithms are used how in public space, nor do we understand how they work and what impacts they might have.

This aspect – whose interests these smart city systems serve, who the smart city in its end-state is optimised for – is a key question in the smart city debate.

What is optimal is a subjective and political issue. Currently, the majority of optimisation is economic in nature: reducing costs (energy, water and removal of inefficiencies), reducing outputs (such as energy and traffic levels) and increasing revenue (for example, digital taxes and frictionless revenue collection). Environmental (reduction in consumption of fossil fuels or energy use) and social (such as less crime and better transport) improvements are almost a by-product of the reduction of costs (although they are heavily used for marketing material). Inversely, if the same companies that offer software for optimising the workplace towards employee productivity also provide the software backbone of the smart city, it is hard to imagine that anyone but the corporation would benefit. And potentially that benefit comes at the expense of workers.

Without a clear understanding of whose interests are being served and the larger issues outlined above, though, neither meaningful political debate nor organising is possible. "These questions are essential, and developing strong answers has been hampered in part by a lack of information and access to the systems under deliberation. Many such systems operate as 'black boxes' – opaque software tools working outside the scope of meaningful scrutiny and accountability. This is concerning, since an informed policy debate is impossible." (Reisman et al, 2018) If we don't understand it, we can't discuss it. What is more, it is frequently not even clear when ADM systems are used to make decisions, which ones, or how. One demand to counter this lack of access to relevant information – which would allow researchers to investigate better – is to create a comprehensive register of ADM systems (AlgorithmWatch 2019): "Municipalities, federal states and the national government (...) should create a register of all software systems used in their administrations and which documents the degree of automation and its effect on participation and on society."

This idea, while originally aimed at governments and administrations, could also be applied to private enterprises – companies would have to disclose and register all ADM systems that could potentially affect workers' rights.

7.
A WORKERS' RESPONSE

A main challenge the smart city poses to workers derives from the fact that workers themselves are not being considered during the design of these schemes. Generally, nobody is asking workers what they would like from a smart city, even though workers are among those who understand the day-to-day operation of the transport and other systems best.

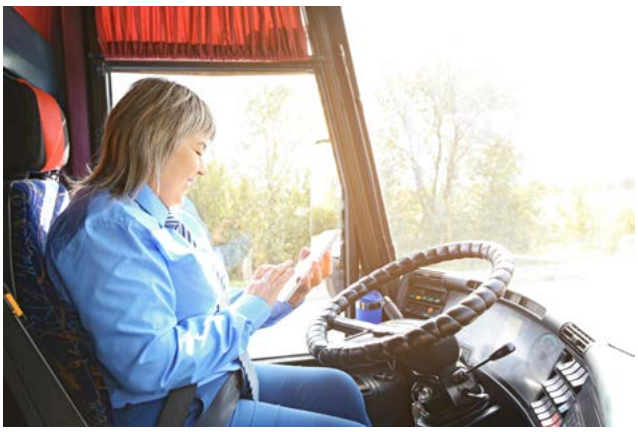
The ITF's People's Public Transport Policy contains recommendations for how worker-friendly transport could be achieved, including their control of technology. Under this vision, the smart city would be democratically planned, with a strong emphasis on participatory processes and especially worker participation. Mobility as a Service would be run by publicly-owned public transport operators acting as integrators. The publicly-produced data would be publicly owned and stored. The integrator's platforms would incentivise decent work and the city would consult workers on technological change. Furthermore, there would be regulations on the uses of employee monitoring technology and AI.

We believe that much in the current debate of smart cities is worthy of criticism. However, we also believe that there is real potential to make cities smart for the benefit of citizens and workers alike.

The key to unlocking this positive vision of the smart city is to make sure that all stakeholders are meaningfully represented in planning the future of cities. The building blocks we need to get to this positive vision are participation, inclusion and diversity; multi-stakeholder governance; accountability and transparency; privacy and data practices; openness; and last but not least, workers' rights.

Only if we get all these building blocks in place can we get to a version of the smart city that doesn't just work for technology vendors or governments, but also for citizens and workers.

We think that to achieve this positive vision unions must engage with city authorities, expert communities, social organisations and other civil society groups in order to raise awareness of the potential problems inherent in the smart city, shape the discourse around the smart city, and ensure a participatory and widely rights-based approach to the concept of the smart city.



8. Recommendations for policy/action

Throughout the report we have developed specific recommendations for policy, action and organising by trade unions. Below, we include an overview of these recommendations, which, although intended for unions, could also be of use to other civil society groups.

We recommend trade unions should develop a smart city agenda based on the ITF's People's Public Transport Policy as well as these recommendations:

POLITICAL AND CAMPAIGNING RECOMMENDATIONS

- Unions should encourage city authorities to reject the framing that technology-driven smart city projects are inherently more innovative, useful or desirable, and demand that workers and citizens all have a voice in debating the future of cities.
- Unions should campaign for city authorities to realise that the optimisation of the city cannot be solely economic and that workers and citizens should be democratically involved.
- Unions should demand accountability and oversight over what types of data are collected in the context of smart city initiatives, and who gets to use them for what type of purpose. Specifically, unions should argue for authorities to respect workers' right to the data they produce at work.
- Trade unions should approach city authorities to find out what smart city initiatives are in the pipeline, particularly with regard to transport and last mile delivery.
- Trade unions in urban transport should engage with cities over the smart city concept since it is one that encompasses transport, particularly through Mobility as a Service (MaaS).
- Unions should demand representation on smart city projects from the earliest planning stages so that workers' interests can be defended from the inception.
- Unions should be consulted on the implementation of new technology, whether at city or workplace level – especially if it is data-driven technology connected to the smart city.
- Unions should engage with cities to discuss the way that smart city initiatives are framed in the larger context, and how to ensure that technology companies are accountable for delivering what they promise.
- Unions should work with city governments to set up strong participatory governance models for smart city initiatives to make sure citizens and workers are well represented in all deliberations.
- Cities should incentivise positive corporate behaviour by ensuring data is collected on issues such as pay rates, taxes and charitable contributions, on occupational safety and health issues, gender based occupational segregation and other measures that affect working conditions and labour rights.
- Unions should demand reform of public procurement guidelines to include provisions that limit potential negative effects of pilot projects on governance and oversight.
- Cities should build in-house expertise regarding IT and smart city technology, and include social and environmental impact assessments.
- Unions should demand that cities build up their IT and smart city capacity in-house (insourcing ICT), including the capacity to do technology and rights impact assessments.
- Cities should reduce implicit subsidies to the private sector through free access to public data. They should require that value generated is also captured by the public and the public sector, through sharing back data as well as through licensing fees.

TECH AND WORKERS' RIGHTS-RELATED RECOMMENDATIONS:

- Unions should campaign to minimise the monitoring and surveillance of transport workers. Unions must demand agreements on the uses for surveillance and monitoring technology in both transport and administrative areas.
- Unions should demand access to municipal data and to the criteria being used to inform algorithms regulating transport and other municipal services.
- Unions should campaign for a complete ban on the use of affect recognition in work contexts.
- Unions should study the algoactivism pathways to workers' resistance to algorithmic control analysed in Algorithms at work (Kellogg, Valentine, Christin 2000).
- Unions must prevent transport and other workers from becoming the 'moral crumple zone' or scapegoat for errors committed by autonomous and algorithmic decision making systems by campaigning to ensure that liability rests with the designers of technology.
- Unions should demand a comprehensive register of automated decision making (ADM) systems that affect workers' rights, and the disclosure by companies of the data technologies they are using.
- Cities should make decent work a precondition for MaaS operators, for example regulating BRT systems and informal or gig economy transport services to ensure workers' rights are properly protected.
- Unions should demand that public procurement contracts include clauses protecting workers' rights.
- Unions should demand workers' access to, and ability to control, the data workers produce while they work.
- Cities should ensure that workers at all levels are protected from overly intrusive workplace surveillance. They should ensure that the power of algorithms over workers is restricted to fair and legitimate use cases negotiated with trade unions.

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