Amsterdam has high ambitions in terms of digital mobility management

Interview with **Ruben Polderman,** Smart Mobility project manager

Amsterdam wants to create a more accessible, cleaner and liveable city and is therefore expanding its role as a director of digital mobility management. The challenges are considerable, because public space is scarce, and in some densely populated parts of the city the available mobility network is diminishing. However, the up-and-coming digitisation of mobility does offer new opportunities to steer dynamically, according to Ruben Polderman, Smart Mobility project manager of the city of Amsterdam, when asked about the possibilities of digital mobility management for the city and the region. "We want to make full use of all the new possibilities, but we also want the mobility concepts to be in line with the values that Amsterdam upholds."

In this context, we will include some striking examples of smart-mobility applications from other metropolises in this article.

Isabel Moll-Kranenburg
is a partner in the Data & Analytics unit of KPMG Advisory N.V.
moll.isabel@kpmg.nl

Stijn de Groen MSc
is associate director at the KPMG Global Strategy Group.
degroen.stijn@kpmg.nl

Smart new mobility concepts, enabled by digitisation, offer individual citizens a wide variety of transport solutions. Some may come too soon and others just do not strike the right chord with the public. But every now and then some innovations suddenly break through. Then what? Travellers are happy because they have the fast, comfortable or affordable transport they desire. The provider is also happy because it generates turnover. But what is happening on a larger scale, what is the impact on public space?

"In the public space, we are dealing with more interests than those of consumers and providers of mobility alone", Ruben Polderman explains. "For example, the importance of air quality, the importance of safety and the interests of local residents. When it comes to the future of mobility, these public interests must also be taken into account." In fact, there are still little suitable methods for balancing all these – sometimes conflicting – interests qualitatively and quantitatively.

The scarcity of public space in Amsterdam adds an extra dimension to that challenge. The introduction of low-traffic measures, in conjunction with weak canal walls and bridges, still give rise to some questions. Such as how heavier vehicles can be routed and what the policy for taxis should look like. More generally, Amsterdam wants to facilitate shared mobility.

The city of Amsterdam is increasingly developing and deploying new digital technology for the management of the public space and hence in the mobility system. Three fine examples of these smart-mobility projects from Amsterdam ([Adam20a]):

- **MobiLab**: Data collection platform to analyse the mobility flows of pedestrians, cars, public transport, etc. In this way, large amounts of mobility data on various traffic flows from various sources can be analysed, modelled, visualised and published safely, independently and with multiple parties within this platform. Through this platform, for example, parking data can be analysed in terms of occupancy of car parks, bicycle sheds and parking rights in the street. Data from traffic lights is used to calculate how busy it is at major junctions, also to be able to anticipate road works and big events ([Adam20b]).
- **MUVigator**: A three-year EU project involved collaboration with several European cities to develop an app for Mobility Urban Values (MUV) which promotes sustainable and healthy mobility choices among urban residents. The app follows the user's daily route. If the user moves in a sustainable way, they collect points and can win a prize. The rules of the game, digital services and proposals for new mobility solutions are devised and implemented in cooperation with residents, local entrepreneurs and the municipality. This is how MUV connects residents, entrepreneurs and local government. The collected data is available as open data, thereby contributing to the development of new services and policies to effectively improve the quality of life in the city. The MUVigator is available free of charge at https://amsterdam.muv2020.eu/.
- **Practical trial in Amsterdam**: A collaboration between Rijkswaterstaat, the municipality of Amsterdam, the Province of North Holland, the Amsterdam Transport Region and NDW (National Road Traffic Data Portal). In EU project Concorde, Amsterdam is working with other European cities, NXP and FiatChrysler on a solution to link smart cars digitally, bidirectionally and safely to a smart road infrastructure. Data exchange with the road infrastructure refers to data from matrix signs (closed lanes), traffic lights (red light) or cameras (detecting cyclists and pedestrians). This allows (autonomous) cars to better anticipate traffic jams, accidents, so called 'green waves' and closed roads. The parallel Socrates project tests with service providers and road authorities in Amsterdam, Antwerp, Copenhagen and Munich how digital navigation services can be improved. This is a public-private partnership for traffic management, involving BMW, TomTom, Flitsmeister, HERE and others. Data exchange is tested in a direct collaboration and in constellation with an intermediary role. See also www.praktijkproefamsterdam.nl.

Polderman is contemplating the question of how best to organise new innovative mobility solutions. How much control is required in view of these issues? "We're developing more and more tools, the possibilities are practically endless. However, we do keep in mind that the government is also there to set a good example when it comes to handling of data. As far as that's concerned, there are of course limits."

Amsterdam's mobility ambitions are articulated in the Smart Mobility 2019-2025 programme. Polderman: "This is the second programme. The first ran from 2016 to 2018 and focused mainly on experimenting with different concepts. This second programme has a different approach: scaling up the impactful experiments and learning further in different iterations. It is clear that our infrastructure is not suitable for all types and unlimited amounts of mobility. That is why we want to focus specifically on solutions that make smart, efficient and manageable use of the existing infrastructure. After all, together we want to create a more accessible, cleaner and liveable city."

To this end, Amsterdam is expanding its coordinating role in this area. As such, the focus is not only on technical and infrastructure issues, but also on the social aspects of the development of – digital – mobility concepts. After all, the digitisation of mobility offers plenty of new opportunities, but also new threats. "Such as the risk that platform parties will eventually determine the price of and access to the city", says Polderman. "Or that local entrepreneurs are sidelined by the market power of the big technology companies. The city also has an eye for the working conditions of the platform workers. Moreover, we must prevent data surveillance and trade in data from violating the privacy of the Amsterdam community."

The threats are balanced by opportunities: in particular, the more efficient distribution of public space and traffic infrastructure mentioned above, making the city more liveable and creating more space for play and recreation. The reliability of the networks will increase, thereby improving safety. In addition, the city will have new and better – data-driven – instruments at its disposal to manage busy traffic and sustainability.

NO BLUEPRINT

How will Amsterdam ensure that these opportunities are actually seized and that the threats can be averted? There is no blueprint, Polderman admits: "This is exactly the question that underlies the whole programme. The ambitions are high, but we still have a lot of work to do to achieve them. You have to map out the legal instru-

Singapore

According to the IMD Smart Cities Index 2020 survey ([IMD20]) conducted by business school IMD, Singapore has once again been classified as the world's smartest city. The survey examines the extent to which cities use digital techniques to improve the lives of their inhabitants and reduce the shortcomings of urbanisation. Amsterdam has risen to 9th place on this list; Rotterdam is 29th on the list of 109 metropolises.

An important reason for Singapore's leading position is that it is smarter than other cities in dealing with mobility as a shared community experience. Transport largely determines the quality of life for the inhabitants of a smart city. An example is the expansion of the pilot area for autonomous vehicles (AVs) to the whole of Western Singapore.

The city council has realised that in order to obtain a resilient working and civil population, (public) transport concepts must be designed in such a way that not only the finely-meshed transport for the last leg of the journey is provided, but also that everyone can participate in what the city has to offer. In Singapore, the Land Transport Authority (LTA) is developing a transport infrastructure in which the daily commute can be integrated with more active forms of mobility, such as walking and cycling, and with public transport modes, such as bus and metro. A number of car lanes on a number of through roads will be converted into cycling and walking zones (the 'Walk Cycle Ride' initiative, as started in Bencoolen Street, [Sing20]).

In some respects Singapore goes further than cities in Europe would consider. The city has a taxi management system that enables extensive monitoring of taxis. Sensors have been installed on the dashboards of the taxis to even monitor the driver's heartbeat.

Our Smart Mobility programme is especially designed to show how positive digitisation of mobility solutions can be

ments, for example. But we also have to take big steps in building ecosystems: in the Netherlands, mobility is still organised by mode of transport, whereas the new, smart solutions transcend transport mode. How do you shape the collaboration that should lead to the robust networks we are aiming for?"

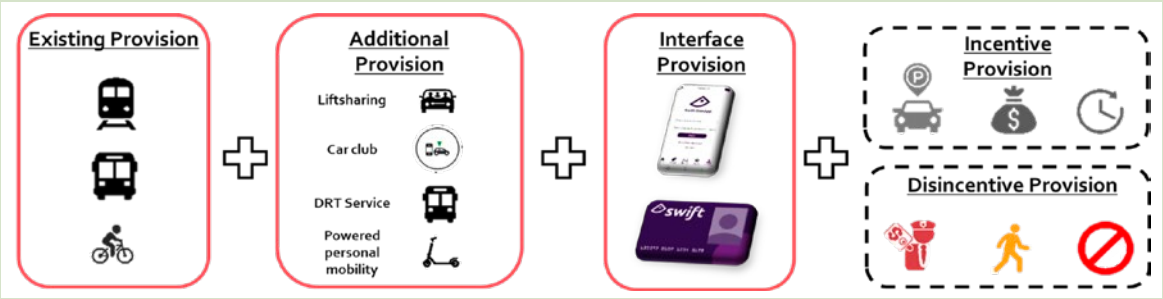
In search of answers, Amsterdam regularly looks at experiences gained in other cities and metropolises. This often concerns the question of how the exchange of information between government and industry can be shaped, both legally and economically. "Data is central, of course", says Polderman. "Who collects and who uses what data? It's a tricky question." (See also the boxes with examples of smart mobility in New York and Barcelona, where contractual arrangements have been made with mobility platforms about making their location data available.)

ETHICS PANEL

Technically it seems that – almost – anything is possible by now. But what is desirable? Close attention is being paid to this issue in the context of the Smart Mobility programme. Meanwhile, the Amsterdam coalition agreement has established the so-called Tada principles (see Table 1 and tada.city), a number of values that the municipality of Amsterdam applies in working towards a responsible digital city.

Birmingham

In the West Midlands region that Birmingham forms the heart of, experiments are being conducted with 'mobility credits' to encourage residents to leave their car at home and choose alternative transport options, such as public transport. The reason was the introduction of an environmental zone, which the government enforced because of the poor air quality. Drivers of polluting cars had to pay a fee for their traffic movements. The mobility credits can be earned through the use of electric cars, through LPG installation in petrol/diesel cars, subsidies on EV leasing and the like.



The regional government has also set up the Future Mobility Testbed to test innovative and automatic vehicle tests, as well as initiating the Convex project to create an open data platform for the commercial exchange of data to improve and accelerate the development of new mobility products and services.

Table 1. Key principles of Tada Manifesto.

Principle	Explanation
01 – Inclusive	Our digital city is inclusive. We take into account the differences between individuals and groups, without losing sight of equivalence.
02 – Control	Data and technology should contribute to the freedom of residents. Data is useful. To shape life according to your own judgement, to collect information yourself, to develop knowledge, to find space to organise yourself.
03 – Human factor	Data and algorithms are not all-decisive, humanity always comes first. We leave room for unpredictability. People have the right to be forgotten digitally, always leaving room for a new, clean start.
04 - Legitimate & verified	Residents and users have a say in the design of our digital city. The government, civil society organisations and companies facilitate this. They monitor the development and the social consequences.
05 – Open & transparent	What data is collected? What for? And with what outcomes and results? We are always transparent about that.
06 – From everyone – for everyone	Data that governments, companies and other organisations generate and collect about the city is common property. Anyone can use it. Anyone can benefit from it. We decide on this together.

The Amsterdam-based Innovation Centre for Digital Mobility (IDM), which is headed by Polderman, has appointed an ethics panel for this purpose – a group of scientists who audit the activities of the centre and advise the policymakers with regard to ethical aspects. "This has led, for example, to Privacy by Design, the early inclusion of privacy principles in the design and development of new concepts."

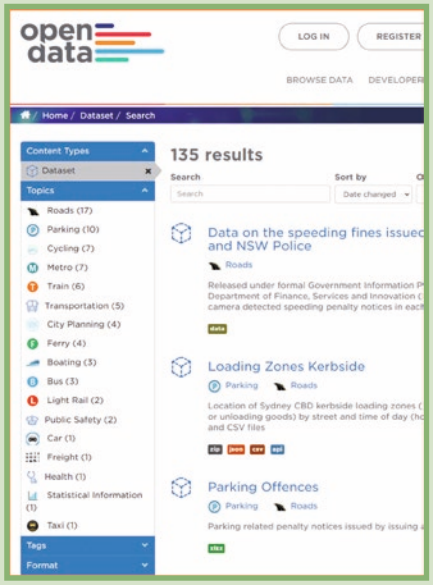
That is also part of the role of governments, according to Polderman. "We are developing more and more tools, but you can never lose sight of what is desired, what the ultimate goal is: a liveable city. The question is: What kind of city does Amsterdam really aspire to be? This also means being very careful with the privacy of residents, visitors or entrepreneurs."

FAIR ALGORITHMS AND WIN-WIN IN COOPERATING WITH MARKET PLAYERS

At the same time, Amsterdam states that the city has a responsibility with regard to what other parties do in this respect, for example when using algorithms. "Are the algorithms as used in the public space used correctly?

Sydney

COVID-19 has severely restricted the use of public transport, partly due to government measures and partly due to fear of contamination by passengers. Sydney has used real-time data to provide insight into the number of people on the road with different transport modes and hence which public transport services are safe to use during COVID-19.



A Mobility-as-a-Service (MaaS) ecosystem has been built not only in Sydney, but throughout New South Wales. To this end, Transport for NSW has developed a standard data specification for easier sharing of planned and real-time information, including capacity information.

New York

Due to the enormous increase in the number of taxis, downtown New York is becoming increasingly congested. They form such a large part of the total mobility system that controlling the taxi market has become a priority of mobility policy. The city's taxi monitoring team alone consists of around six hundred staff. A team of ten people is employed to analyse all the data.

In addition to data collected by the city itself, the city also has data from, for example, Uber and Lyft. As a contractual precondition for issuing a licence to such mobility platforms, the city has stipulated the receipt of detailed data. This concerns data such as date/time, start and stop locations, the taxi licence number, the number of kilometres, the route driven (via the city centre), the fare and how much the driver was paid. This data is then anonymised, used for in-house analyses and made available as open data.

Recently they have focused their data analyses on two policy areas:

1. Driving around empty. Driving around without fare without a destination is in many western cities a logical consequence of the free market and the emergence of mobility platforms such as Uber and Lyft, but it is also a problem due to the impact on the quality of life and accessibility for local residents and the impact on air quality. In New York, the standard is that taxis are allowed to drive around without passengers for a maximum of 30 percent of the time. The city measures compliance at a collective level. For 2021, the city council has lowered the standard by 10 percent, with the obligation to innovate being imposed on the platforms.
2. The remuneration of taxi drivers. On the basis of the data collected, the taxi team was able to establish that some of the drivers of the platforms earn less than the compulsory minimum wage. Subsequently, the city determined that the platforms have to supplement the drivers' pay up to that amount.

In addition, the team also monitors the number of taxis that take wheelchair passengers. It has also linked the location to traffic light data, so that when a taxi drives through a red light, not only the taxi in question but also the offending driver can be identified. On the positive side, a safety gallery is maintained to reward drivers who have not committed any offences in the last four years.

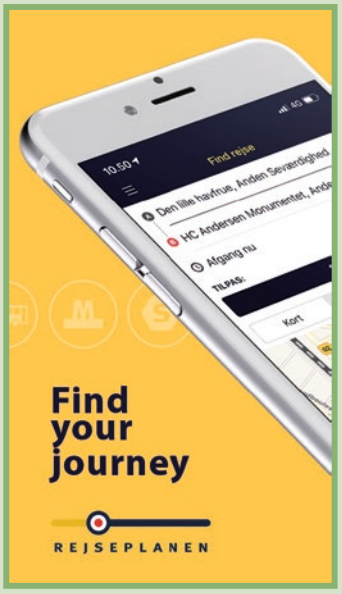
That's what the city also wants to have a grip on", says Polderman. It remains to be seen to what extent this will be possible. Amsterdam, however, has already established a solid position in this respect. Polderman: "Both our legal position and our data position are stronger than sometimes imagined. Especially now that we're bringing it all together."

The city will also invest in this position, he says. "In the meantime, we've seen that a decisive approach works best. We have learned that we can definitely exert influence on market players. For example, we have introduced the Amsterdam conditions. Especially in cases where it is difficult to get market players to cooperate, it is important to act clearly and consistently."

In this way, Amsterdam strives to ensure that the entire city can benefit from the promising mobility initiatives. "Of course there are challenges, but our Smart Mobility programme is especially designed to show how positive digitisation of mobility solutions can be, to show the potential of all those possibilities. In the public interest, we are working on the future of the mobility system and we are doing our utmost to make it a very bright mobile future."

Copenhagen

The RejsePlanen app offers multimodal means of transport, from city bikes and city cars to carpooling and domestic flights. Other travel options can also be found via this app, including water buses and other public transport options. Denmark also has a national data access point that makes travel and traffic data available , with associated APIs.



Helsinki

Helsinki – as the second smartest city after Singapore – is working on a project together with mobility provider Daimler to test the information chain from city to provider. This is a city access pricing experiment. The Finns are at the forefront of this at European level, while other cities experience legal obstacles.

Helsinki is also the city that has a complete 3D model as its counterpart, a so-called 'digital twin'. Actually, these are two 3D models of the city: a semantic information model and a high-quality visual reality mesh model, built using laser scanning and panoramic photogrammetry. The data is made available as open data. See also https://www.hel.fi/helsinki/en/administration/information/general/3d/3d.

Barcelona

In recent years, Barcelona has invested heavily in public transport and smart-mobility projects, among other things by the city's – previous – CTO. Two illustrative examples:

- Metro. The new metro line 9 will be the longest underground connection to be built in Europe, from airport, via university and Nou Camp, to the other side of the city. The line connects to all kinds of other public transport facilities via 52 stations, creating a high-capacity and a large network effect (up to 130 million passengers per year). There are also 300 lifts and escalators with an innovative Smart Control System (SCS), which learns on the basis of AI how many passengers are at what station, at what platform, at what time, or when they are going to arrive and where, and can anticipate this in real time. The lifts weigh their 'load' to fine-tune lift entry and exit from the point of view of logistics and energy consumption.
- Democratising smart city data. Through the Decode project ([Week20]), Barcelona, together with Amsterdam and other cities, has developed a model to collect and share the data of citizens in a safe way. The aim is to develop a joint data provision ('data commons') to combat metropolitan problems, such as traffic congestion and noise pollution, and to improve air quality. The Internet of Things data is collected via all kinds of sensors and equipment, mostly from citizens or non-profit organisations. The city aggregates, analyses, enriches and distributes this data, giving citizens the right to self-determination by being able to give explicit and differentiated permission to share this data. With a data infrastructure surrounded by processes, rules, anonymisation and agreements on data exchange and property rights, a jointly designed data utility can be offered for civil and private public services.

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About the interviewee and authors

Ruben Polderman is Smart Mobility project manager for the Municipality of Amsterdam, as part of the CTO Office Innovation team. In different positions at various consultancy firms, he has previously supervised a wide range of innovation projects.

Isabel Moll-Kranenburg is a partner in the Data & Analytics unit of KPMG Advisory N.V. for the Healthcare & Public Sectors. She supports organisations in these sectors to operate on a data-driven basis with specially developed programs, services and products. Isabel has more than twenty years' experience in the ICT sector, twelve of which at Microsoft in various leadership roles, including Lead Business Group Cloud & Enterprise.

Stijn de Groen MSc is associate director at the KPMG Global Strategy Group and Lead for the Mobility and Automotive advisory practice in the Netherlands. He has more than ten years' experience in the automotive, mobility and leasing sectors, focusing on strategy and deal advisory services, such as strategy development, business modelling, M&A and major transformation projects in the Netherlands and abroad.