

Paper

Liveable city Forward together with TNO

Top three challenges
for Dutch cities



TNO innovation
for life

Liveable city

Forward together with TNO

As a result of population growth, urbanisation and increasing prosperity, the demand for mobility is on the rise - with all the associated risks to accessibility and liveability in Dutch cities. An appreciable portion of the scarce public space is designed for car traffic, while cars spend 95% of the time parked, motionless.

At the same time, as the dominant choice of transport, the car has a negative impact on the environment, safety and liveability. The way in which people live, work, play and travel seems quite changeable. Examples are the large-scale adoption of work-from-home during the COVID crisis, the flygskam ('flight shame') phenomenon and the shift towards online shopping. Our mobility is also in transition as a result of electrification, automation and the offer of various sharing concepts and delivery services. With all these developments, how can we ensure an accessible, resilient and liveable city without emissions, mobility poverty or unequal opportunities now and in the future?

In this paper TNO describes three challenging urban mobility themes and possible solutions. Bringing about a liveable city is a systemic challenge, a matter of format, in which mobility is a dominant factor.

TNO helps policymakers to set up the innovation process and provides the necessary insights for making the right choices. With over 90 years of experience in orchestrating innovation, TNO has the right approach and unique knowledge, methods and tools offering solutions for tomorrow's problems.

A city in equilibrium: accessible, safe, inclusive and oriented to overall well-being.

Do you have any questions arising from this paper, or would you like to work with us to build your liveable city? Contact us without obligation to discuss the options for a workshop.

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Mobility in terms of square metres:

How do you assign the optimal space to each urban ambition?

The housing crisis, tough climate ambitions, further ageing of the population and urbanisation place mobility in our cities under more pressure than ever. How do you make the best use of the area that is already scarce, and above all how do you make the right decisions today for tomorrow?

Cities are becoming ever more crowded. Different urban functions - residential, working, manufacturing and recreation are in competition for the limited space. The great challenges facing cities require far-reaching measures, political courage and vision. The climate crisis demands a sharp reduction in CO₂ emissions, greener city centres and electric transport with the associated charging infrastructure. The over-stretched housing market requires tens of thousands of homes to be built. Cities are still far from ready for the phenomenally fast rise of the platform economy. At the same time there is also an opportu-

nity, for example using shared transport as pre- and post-transport to promote public transport. How can we best apply technology in the general interest? And more broadly: how do we manage the rapid changes in the field of mobility? Space is not only limited above ground. Invisible infrastructures, particularly for power, are coming up against capacity limitations. In North Brabant and Limburg hardly any more industrial sites can be built because the electricity grid is at full capacity. And at the same time electricity consumption is becoming ever more difficult to predict. Fluctuations in demand

are traditionally absorbed by conventional gas power plants, but that option has no place in a sustainable future. How can we intelligently match supply and demand so that the housing shortage and the energy transition don't run into problems?

Inner-city densification is necessary in order to make the most efficient possible use of space that is scarce. But our cities are becoming ever more complex and the rapid, sometimes unpredictable changes mean that timely reactions and effective policy making are challenging.

Furthermore all these challenges require public-private cooperation and coordination with local, regional, national and sometimes even international authorities. How can policymakers deal with all these spatial challenges so as to keep their cities liveable? How do you go about something like this? Geiske Bouma, Senior Consultant with TNO, and Bart Vuijk, Senior Business Developer with TNO, make five practical recommendations based on their experience.

1. Mobility shift means mind shift

"Previously you designed a district on the basis of fixed planning values: so many homes, so many parking places, paths, bike paths and so on," Bart Vuijk explains. "That approach doesn't work anymore.

If only because from the spatial point of view, cars are particularly inefficient, whether stationary or driving. In TNO's conversations about the housing shortage with the Ministries of Industry and Water Management (I&W) and of the Interior (BZK), we challenge ourselves to look at mobility and accessibility in a different way. For example by using a notion such as 'proximity' as the starting point. How can we organise districts so that the inhabitants have all the important facilities close at hand?"

Outside the Netherlands too, in cities such as Paris and Barcelona, 'proximity' and 'walkability' have become important criteria in spatial planning. In the '15-minute-city' all facilities can be reached within

a quarter of an hour on foot or by bicycle. This development also ties in with the increasing ageing of the population, since older people prefer to live in places with sufficient local facilities.

Geiske Bouma agrees that a ‘mind shift’ is necessary for the ‘mobility shift’. “New districts such as Havenstad in Amsterdam and Merwede in Utrecht have been developed on an almost car-free basis with very limited parking. This requires a different way of living and working and a new architectural approach and system. And also clear communication to inhabitants so that they too can adapt their behaviour. For this reason, TNO also takes account of behavioural changes in its simulations and modelling.”

2. Make your city adaptive

Along with a different way of looking at mobility, another much-heard term whenever the city of the future is described, is adaptivity. Bouma: “In the World Cities Report, the UN says the better your ability to adapt, the better you’ll be able to react to major shifts such as climate change or pandemics. You do this by not fixing every aspect of your policy in advance but by

leaving room for new developments to be incorporated in an agile way. The challenge remains of course: how do you make a physical environment adaptive? We saw that it was possible during the COVID crisis when motorways were used as bike paths and footpaths were widened.”

3. Set clear objectives

Due to the volume of cases requiring their immediate attention, it is quite a challenge for policymakers to look forward to tomorrow, let alone beyond. “But to build a future-resistant city, you need a clear vision from a broad scope,” says Bart Vuijk. “It’s essential for the public party to know what it wants, what role it wants to play, and what goals it wants to pursue. Private parties will also want clarity before undertaking investments in shared mobility or charging infrastructure for example. TNO helps governments to formulate those goals. It does so with know-how and instruments that provide insight into the dependencies in their city. For example, our Urban Strategy platform very clearly reflects the interconnections and impact of policy choices. These models, combined with our expertise, help you to convert a strategic vision into a concrete policy.”



4. Experiment in order to accelerate

With so many developments and dynamics it makes no sense for municipalities to work with rigid multi-year plans or blueprints. Geiske Bouma: “These times call for experimentation. Together with policymakers, TNO looks at what measures would be suitable in a given area. Examples might include introducing a small-scale car sharing project to reduce pressure on parking. Then we help municipalities set up pilot schemes, at which stage we also involve the inhabitants. By properly monitoring the results and evaluating them, you can refine the solution further until the desired result is attained. TNO has acquired extensive experience with these kinds of processes over the years and policymakers have often been pleasantly surprised by the results. Because many cities are faced with the same problems, we can often apply what we’ve learnt from earlier pilot schemes to new situations, which leads to faster results.”

5. Look at the mobility system as a whole

“Not travelling is also an option,” says Geiske Bouma. “By that I mean it’s important for cities to look at the big picture when it comes to mobility. Granted, a refined public transport network is of course a good basis for any city, but you also need to take a good look at the alternatives. And at whether these work for all target groups. What are you offering to people in low income groups that are dependent on their car? How much precious space are you sacrificing to charging stations that are used only by a small group of well-heeled citizens? And what will the impact of new digital technologies be? To what extent can you limit congestion by means of hybrid working, or by meeting more often in the metaverse - as may soon be possible? These are all considerations that TNO can take account of in its simulations and models, enabling cities to make thoroughly thought-through choices for a future-resistant city.”

This time calls for experimentation together with policymakers from the three layers of authorities.

Case study: City of Amsterdam Insight into the impact of policy choices thanks to Urban Strategy

By combining data and simulations in the Urban Strategy platform, TNO provides digital and visual support for complex decision-making. Bart Vuijk, Senior Business Developer with TNO: “We have a long-standing collaborative arrangement with the City of Amsterdam in which we look at the interdependency of a number of policy areas: accessibility, noise pollution, air quality and the impact on liveability in the city. Urban Strategy plays an important role in this, by producing a ‘predictive digital twin’. We use this digital replica of the city to tackle major strategic and tactical infrastructure issues and to make the impact of policy choices directly visible. What is the impact of a new tunnel or road on air quality for example? If we introduce paid parking, how will this affect a district’s accessibility?”

Tijs Roelofs, Head of Innovation with the City of Amsterdam, on MaaS: “With innovation, the trick is to let your own thoughts roam free in order to arrive at new insights together. That’s precisely what our collaboration with TNO has brought us in these past few years. Also, the ongoing joint development of Urban Strategy means that you’re constantly getting new insights. The model is not the holy Grail, but it is one of the perspectives that you always have in mind when reflecting or when conversing with policy colleagues, because it provides direct insight into the consequences of interventions. Urban Strategy also illustrates the potential for a different kind of dialogue with citizens. We’re really still just at the beginning.”



A mobility hub for every city?

Transit points on the edge of the city, often combined with all kinds of shared mobility, much of it electric, used with smart MaaS apps. A district hub offering sustainable alternatives from where you live.

Mobility hubs reduce the need for one's own means of transport and contribute to lower emissions and less pressure on parking, all good reasons making them popular with regional developers. But these kinds of solutions mostly consider only the transport of people. Geiske Bouma: "E-commerce has really taken off, boosted by the pandemic. As a result we see that city logistics are becoming more and more important. Here too the lack of space is a factor. The risk is that you set up wonderful mobility hubs but the urban logistics are gridlocked. Which is why we work with our Urban Strategy platform on linking the transport of persons with that of goods." For both forms of transport, hubs are being developed as part of a major European project called Move21, in which TNO is also involved. "We deliver instruments with which to make the impact of these hubs on the accessibility of cities visible. So with the help of an Urban Strategy model we look at what kind of 'modal shift' is to be expected in people's choice of transport. How will people travel? What is the impact on the city, movements in the city and the environs? We see huge demand for this."

Platform economy

How do you get the platform economy to work for your city?

Shared electric scooters, taxis, bicycles and rapid delivery operators are flooding our cities and having a disruptive effect on accessibility and safety. Without proper management, the negative social consequences may be considerable. How do you keep control as a city and ensure that innovative platform services work for your city and all its citizens?

Uber took a giant slice out of the taxi market in no time at all. ViaVan buses operate with fares below the public transport level and take you from door to door, so why wait for the tram or metro? Instead of walking or cycling, young people tend rather to take a share scooter from Check, Felyx or GO. And probably in the future an electric kick scooter. Rapid delivery riders from Gorillas and Getir fly through the city at great risk to their own and others' lives, and all for a packet of crisps. The platform

economy is taking over our cities, with disruptive consequences for the mobility system. Sharing platforms and other 'Mobility-as-a-Service' (in short, MaaS) initiatives are not new. But their impact on cities is not yet known. According to Maaïke Snelder, Principal Scientist with TNO, this is because the limits of the current mobility system have been reached. "There's hardly any spare capacity, so even the smallest disturbances can have major consequences.

It's no longer possible to give unlimited space to private cars. New mobility services are needed to supplement the traditional modes of transport. Authorities know how they have to manage infrastructure, such as by planning new roads and public transport lines. But they are all too often still being ambushed by new mobility platforms. This is a problem because, without proper control, cities are bound to be gridlocked," warns Snelder. But how do you tackle this as a policymaker?

Getting a grip on MaaS

Gridlocked inner cities, poor air quality, streets full of parked metal: MaaS initiatives can make a positive contribution to all these problems. Car drivers, but also users of public transport, walkers and cyclists are tempted by cheap, easily accessible and fast transport alternatives. Everything found, booked and paid for with a few clicks in the app. Their success is determined by the ease of use. But the commercial objectives of the providers are by no means

always in line with the public interest. Also new platforms often take no account of the local context and existing policy. And they accept no responsibility at all for the social consequences. For example, many MaaS concepts produce zero or very low emissions, thus contributing to the objective of a clean city. That's all well and good, but they also lead to increased movements. Whether they replace trips that are also sustainable and in many cases healthier and less space-intensive, such as public transport, walking or cycling. The risk is the emergence of a gap between the solution aimed at by policymakers and the reality. The platform economy is still in its infancy, and governments the world over are wrestling with different governance models for MaaS. What have we learnt so far about the do's and don'ts of implementing MaaS?

Guidance on public-private models

On behalf of I&W, TNO has researched the policy on MaaS in Paris, Los Angeles and

Singapore. There are some sharp differences. In Los Angeles, for example, a ‘mobility data specification’ is used: conditions with which new providers must comply. These conditions include: sharing all data with the authorities and providing reduced rate services in districts threatened by mobility poverty.

“The most important result of the survey is that countries are shifting more and more towards a public-private model in order to maintain control of progress towards the social objectives,” says researcher Geiske Bouma from TNO.

Close involvement of the government is relevant in all cases. Monitoring and learning are also important here, so that, as in the Netherlands with a knowledge and learning environment, MaaS does not become an end in itself but rather a means for raising the level of liveable cities and sustainable mobility. “That kind of learning environment and the possibility of adjusting course or scaling up are still missing in many cases,” notes Bouma. She also observes that there is still little monitoring of the promise of MaaS and the extent to which it really contributes to social objectives.



Challenge the market

Policy makers can certainly establish frameworks within which markets may innovate. Indeed, by establishing clear goals and pursuing innovative purchasing policies that send clear signals – making use of governments’ purchasing power – you can challenge the market to develop new solutions and business cases that contribute to your objectives. Maaikje Snelder: “At TNO we help policy makers to obtain clarity as to what their policy goals are, and subsequently what the ideal picture should look like. This tells you how much shared mobility is desirable and where. So you can make the corresponding agreements with the market operators. And it also tells you what side policies are needed as regards parking spaces and charges for example, or pedestrian and environmental zones, etc. With this approach, you remove part of policy makers’ uncertainties, making them less fearful of making choices the impact of which will not be seen for perhaps five or ten years. For example, if you plan now a bicycle parking facility for 2027, you already know that by then mobility will look quite different. And thus that you also need to take account of future developments, such as shared electric kick scooters. With

different scenarios, TNO gives governments insight into the potential impact of such a new development, but also that of its own measures,” says Snelder.

The threat of uncontrolled proliferation

There’s one more important point we need to talk about: apps and services that have been developed for a platform work only on that specific platform. The threat of ‘vendor lock-in’ looms if building blocks are not accessible or interchangeable with other parties. For example Dutch Railways has integrated various different means of pre- and post-train transport. As a result it is very easy to pay for a public transport bicycle with the public transport chip card, to connect with a bus, tram or metro or to rent a shared car or scooter. In Singapore the government has actually made it obligatory for all MaaS platforms to serve public transport.

Without the condition of interoperability, there is a risk of uncontrolled proliferation of platforms and apps. They do not reinforce one another, which is what you want in an integrated mobility system. Also, one might well ask whether they can attain

enough critical size to be able to have any real impact. So the first step that governments can take is to impose interoperability as a condition for new MaaS providers. And oblige them to make at least some of their user data available. Furthermore, as a government, you want to work with the market on establishing a level playing field, for example by means of transparent pricing for the use of infrastructure.

The power of data sharing

In order to keep a grip on mobility in your city, data are enormously valuable. They enable you to factor in traffic flows and monitor the use of mobility. And by combining data, invaluable insights are obtained. New sharing or other mobility initiatives are all well and good, but how many users of public transport do they lose you? The exchange of personal and user data is sensitive, especially for governments. However, some good technologies are now available for securely exchanging sensitive data. At TNO the ICT department is working hard on innovations such as [Multi-Party Computation](#) and [Federated Learning](#) whereby datasets of large groups of people or organisations can be securely combined.

Seven tips for success with MaaS

- Governments have an important role to play in implementing and managing MaaS
- MaaS demands customised public strategies
- Experiment with models and pilot schemes to obtain insight into how MaaS can work for your city
- MaaS strategies must be directed at users’ motivations and barriers
- Designing the entire MaaS ecosystem requires effort, long-term dedication and patience
- Policy makers must invest in MaaS know-how
- Public-private cooperation is the key to success

New mobility, including MaaS, can potentially offer all citizens a flawless and affordable journey.

With MaaS platforms it is often unclear just how the security and privacy of data is assured. The digital motorway still does not have many traffic rules. Each provider has its own code of conduct, often depending on the country of origin. What data are kept, how are they stored and for what purpose?

For this reason, TNO ICT helps governments with questions on platform data, for example in the case of outsourcing. What requirements must the data meet and what conditions can governments lay down for their use?

Finally:

How do you make sure platform mobility contributes to a future-resistant mobility system for one and all? That is the challenge facing cities. How do we bring about a playing field on which we make use of all the latest technological innovations but for each other's benefit, so that they really contribute to an inclusive and liveable city? Not only accessible to every inhabitant of and visitor to a city or region, MaaS must also be present in districts that are not so busy. It must be just as much a part of life in deprived or peripheral neighbourhoods as it is in the city centre.

Case study: City of The Hague: **How do you create a successful public-private MaaS collaboration?**

In The Hague, TNO works with the municipality in the SUMMALab (Smart Urban Mobility Meta Lab) on innovative, sustainable transport solutions. SUMMALab gives professional, substantiated and practice-oriented advice on setting up and evaluating experiments. Because several cities are involved, they benefit from earlier learning experiences and there are economies of scale. One of the experiments is the use of shared scooters at the beach in Scheveningen. To combat the proliferation of scooters on the street, the municipality has reached agreements with providers on parking policy. Some car parking spaces are now reserved for shared scooters. This shows that market operators are prepared to adapt their offering in order to reinforce positive local effects.



Case study: City of Rotterdam: **Does shared mobility help you attain your CO₂ objective?**

More than half the cars in the city do fewer than 10,000 km per year. Precisely for this group of car owners a combination of public transport and car sharing is attractive. The City of Rotterdam asked TNO how shared mobility (specifically shared electric cars) can contribute to the attainment of its 2030 climate ambitions. How do you implement car sharing, and what additional policies are needed to make it happen? Marjolein Heezen, Medior Consultant Urban Mobility and Innovation with TNO: “One of the most striking conclusions of the study is that if you make car sharing more attractive, the use of cars in your city will very probably increase. This is because the introduction of car sharing makes for fewer trips by public transport and bicycle, and more trips by car (private and shared cars together). The biggest impact as regards CO₂ reduction is achieved by encouraging car sharing in combination with measures to make private car use less attractive. Ways of doing this include increasing parking charges and reducing the availability of parking spaces. Finally it is also important for shared cars to be properly integrated spatially and socially. Shared cars can be spread around the city, for example with one shared car in each street, clustered in hubs at strategic locations or a combination of both. This case is a good illustration of the fact that all traffic measures and modes are interconnected, and that it is not simply a matter of making a number of shared cars available but that a whole package of measures is needed in order to achieve the desired effect.”

Next generation traffic model

Traffic and transport models play an important role in all major cities and regions in the Netherlands in providing insight and clarity for decision-making on major investments. Many of the current models are not very good at answering questions on new mobility services and MaaS. For this reason, TNO has developed an Urban Strategy transportation mode choice model, the New Mobility Modeller, which can be used to explore the effects of new mobility services. TNO has also used its Urban Tools Next system to investigate various more detailed types of model. The Activity Based Model (ABM) provides insight at the individual level into the use made of these kinds of services, making simulations more reliable. The prototype has been developed together with the University of Hasselt and a large number of authorities.



“It’s happening already, here and now, and we need to act urgently on MaaS. We must invest in intelligence, as governments we must understand it ourselves too. Leadership means we have to get busy accelerating innovation but also with the social impact. On the one hand, it’s a blessing that all kinds of parties come up with innovative solutions, but on the other hand, we need to become smarter, quicker and more pro-active.”

Tijs Roelofs, Head of Innovation, City of Amsterdam, on MaaS

Mobility & social cohesion: In the mobile city of tomorrow, no-one is left behind

Mobility is an instrument that's becoming ever more important for attaining broader social goals in the city. New roads, tunnels or bridges mean not just a literal connection between population groups but, with the right choices, they also contribute to the social cohesion and inclusiveness of your city. TNO helps policymakers make those choices.

A new tunnel under the river and a new metro line are planned in the city. Travellers will take ten minutes less to reach the other side of the river and rush-hour traffic will be reduced by 5 percent. Good results, so let's get building. Or is there more to it than that? Who benefits specifically from this investment? Do we help the dock worker to get to work more sustainably and cheaply? Or older people to reach a care institution more easily? Or only relatively well-heeled commuters to get home a bit faster? You can also ask who is adversely affected by it: does the new metro station in front of your house not lead to extra parking problems or the discontinuation of the local bus? And how do we make sure policy choices do not benefit certain groups only?

Inclusiveness = social cohesion?

Policymakers are increasingly aware of the social impact of mobility choices. They know that scrapping parking spaces or

introducing low-emission zones can have a strong influence on social inclusion in the city. But what exactly do we mean by this notion?

Tanja Vonk, Senior Advisor with TNO: "We use two notions: inclusiveness and social cohesion. Inclusiveness means everyone can take part in social life. Mobility plays a crucial role in this. You could say that in this digital society there is ever less need to move about physically, but there are some groups that are simply not affected, or only slightly affected by this digitisation trend. Examples include the elderly and people with impaired sight. An inclusive city also means that its inhabitants can do whatever they want within reason and be whoever they want to be. If you don't take this into account, you risk excluding population groups. And that's fatal to social cohesion, or the degree of connectedness that population groups in your city feel."

Mobility poverty? In the Netherlands?

How inclusive and socially cohesive is the Netherlands, looking at mobility? For example is mobility poverty a problem here too? Are certain population groups no longer able to play a full part in social life due to their limited transport options? Tanja Vonk: "TNO recently carried out research into mobility poverty in Curaçao. There you see sharp regional differences in the possibilities for travel to work or school. Here in the Netherlands that's less extreme. But if you take a broader definition, there are certainly lots of people here too who are forced to travel in ways they wouldn't choose if more options were available. For example if you have to use the car every day because there is no good public transport. Without good alternatives this group suffers extra effects from the car discouragement policy. New modes of transport such as car or bike sharing are often available only to citizens who already had plenty of choices.



As a policymaker, it's good to be aware of the consequences that choices have and of the blind spot we all have because we give context to our actions from our own viewpoints."

Taking account of overall well-being

Being aware is all well and good, but how can you use your mobility policy to steer notions such as inclusiveness and social cohesion, which are in any case open to widely different interpretations?

Tanja Vonk: "The CBS (Central Statistics Bureau) uses the notion 'overall well-being'. Every year we look back at developments in well-being in the Netherlands on the basis of a whole series of indicators. Looking back is all very well, but we were looking for instruments to help policymakers examine measures and their effects explicitly from the point of view of the well-being of various groups in their policy options. This as an extra factor, together with the existing aspects that are already taken account of in the policy process. For this, we have chosen four indicators which the Environmental Assessment Agency uses for mobility: the environment, safety, accessibility and health. Next we took a

look at which indicators are used, and there are very many of these. From this large group we selected a number which are already in use and that give a good, broad picture. Examples include environmental burden, NOx and particulate emissions, the quality of the public space and the spatial use of parking places. Our advice is to monitor these and test repeatedly to see whether they help policymakers to consider overall well-being in making their mobility choices."

Interactive design cycle with TNO's Urban Strategy Platform

Another effective instrument that TNO uses to make well-considered policy decisions is the Urban Strategy Platform, particularly for social considerations. Leonard Oirbans, Mobility Consultant with TNO: "We use Urban Strategy to make 'predictive digital twins'. These are digital replicas of the physical urban environment in combination with very fast simulation models. They make it possible to try out different policy variants and mobility scenarios with the help of an interactive design cycle. The effects of policy measures and new forms of mobility can then be explored in terms of mobility, air quality, noise pollution and

other aspects. This can be done for the city as a whole, or for specific districts or target groups. Suppose a city authority wants to limit the use of cars in the inner city. What measures are needed so as not to reduce accessibility? Closing off streets, lowering speed limits and raising parking charges may not be enough if there is no alternative mode of transport such as bus, tram or shared scooter. At the same time, traffic flows may shift to other areas as a result of the measures, to the detriment of the quality of life in those districts. Urban Strategy helps to find the right balance of policy measures by providing insight into the overall effects.”

From citizen participation to co-creation

A ‘predictive digital twin’ may offer opportunities for citizen participation. In order to create traction for a policy at an early stage, policymakers are seeking to involve citizens in planning and decision-making more and more frequently and earlier in the process. Urban Strategy offers inhabitants insight into the consequences and interdependency of measures. Leonard Oirbans: “In collaboration with the municipality of Eindhoven, TNO has for the first

time applied ‘digital twinning’ technology in a participation process. Based on this initial trial the impression was that the use of Urban Strategy can make a positive contribution to the participation process. For both the policymakers concerned and the inhabitants, the digital twin proved an interesting means of gaining a better understanding of the proposed policy plans and promoting co-creation.” How would the world look if all its inhabitants had access to a digital copy of the city in which the overall impact of policy measures could be seen? Or in which inhabitants themselves could explore their own initiatives? Leonard Oirbans: “Technically speaking, much is already possible, but how best to use this technology in a participation process needs to be investigated further. For example, how do you ensure an inclusive process, in which every inhabitant is represented, able to participate and able to understand the generally complex results so as to weigh up all the options in a well-informed way?”

In the future we can expect digital twinning to be used in co-creation of our cities too. With all inhabitants being involved in the development of the ideal city.

Mobility is an important button that you can turn to achieve broader social goals.

What can we do today?

As a policymaker, what can you do now with mobility in order to make your city more inclusive? Leonard Oirbans: “By understanding that in making policy choices, mobility is an important knob that you can turn in order to attain broader social goals.” Tanja Vonk adds: “Mobility is not a goal in itself. Always ask yourself what mobility choices might mean for different groups of people, for their well-being. And we need to make sure we distribute the negative and positive effects fairly.”

Do you want to work with us to build your liveable city? Contact Jeroen Borst.

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This is how TNO helps

TNO works with policymakers on the liveable city in three ways:

1. Development of innovative tools and models. We help untangle complex problems by asking the right questions and providing insights, so that policymakers are in a position to formulate policies effectively.
2. Investigation of future situations or proposed decisions. We carry out impact assessments with the instruments of our Urban Strategy platform. If car sharing is offered, which target groups are reached? What happens with mileage, traffic jams?
3. Monitoring and evaluation. We help with setting up pilot schemes: by monitoring and evaluating results we can refine solutions, pointing them in the direction of the desired result.



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