Getting beyond gridlock in cities

With more than half the world’s population living in cities, congestion and pollution are worsening. Technology may hold the solution—but only if city governments and companies collaborate.
In this episode of the McKinsey Podcast, Simon London speaks with McKinsey senior partner Stefan Knupfer and associate partner Swarna Ramanathan about what seamless mobility in cities really means, what it will take to get there, and the massive benefit it could bring to people, government, and business alike.

Podcast transcript

Simon London: Hello, and welcome to this episode of the McKinsey Podcast with me, Simon London. If you listen to this podcast, you probably live or work in a city. And if you live or work in a city, you know that getting from A to B is often difficult and time consuming. Extra point if you’re listening to this episode while stuck in traffic. But it doesn’t have to be this way. As we’ll hear, a number of technologies are converging in a way that could make getting around in cities a whole lot easier. Autonomous vehicles, electric vehicles, ridesharing, smart traffic systems, predictive maintenance. Each of these is interesting in its own right, but put them all together in the right way and we could end up with cities that are a lot cleaner, more efficient, and more livable. To discuss the issues, I spoke with McKinsey senior partner Stefan Knupfer and associate partner Swarna Ramanathan. You can read more about their research in the article, “The road to seamless urban mobility.” Stefan and Swarna, welcome to the podcast.

Stefan Knupfer: Simon, delighted to be here.

Swarna Ramanathan: Thank you, very happy to be here, Simon.

Simon London: Stefan, we’re going to be talking about urban mobility, moving around in cities. At the risk of a terrible pun, that, in some ways, sounds like a very pedestrian topic. Why should we be talking about this now? Why does this matter as a topic?

Stefan Knupfer: Because cities have more than 50 percent of the population worldwide, and that figure will grow to 60 percent by 2030. Cities are seeing a significant increase in congestion, so it’s more and more difficult for people to move around in cities. For example, we have increased congestion in London, Paris, New York, and if you think about New York and LA, I think the congestion increased over the past six years by approximately 30 percent. This is significant.

Then cities need to be healthier, however it will get more congested, it will get more polluted, and I think that’s a significant issue. So far, we have not found a solution. It just takes you longer to get around, it’s getting more expensive, and it’s more unhealthy to live in cities.

Simon London: So things are getting worse, not better? More people are living in cities, there’s more congestion, more pollution, and yet, we think there is hope in sight. Swarna, why should we be optimistic and hopeful?

Swarna Ramanathan: We can be optimistic and hopeful because there are lots of technologies in place. If we think about autonomous vehicles, it’s not just self-driving cars, but also self-driving trains, buses, shuttles [Exhibit 1]. For example, in December 2018, Waymo announced the launch of a commercial autonomous-vehicle taxi service in Phoenix, Arizona.

Connectivity is another one. Again, it’s not just connected cars, but looking at connected intersections, traffic signals, crosswalks, using the Internet of Things, et cetera. How do you get a cohesive ecosystem of connected technologies help you relieve traffic and hence relieve pollution and make people go from point A to point B in a more seamless way?

Another one is electrification. Most OEMs have announced launches of electric vehicles in the next couple of years. It’s not just cars again. It’s buses, bikes, scooters, commercial vehicles as well. We shouldn’t underestimate the congestion and pollution costs by commercial vehicles in the cities. So electric vehicles in all those arenas and spaces.

Stefan Knupfer: One addition to what Swarna just said: The interesting thing is, why cities? Because
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Simon London: So it’s not just electric vehicles on their own. It’s not just autonomous vehicles on their own, or connected cars, or traffic systems, or ridesharing, it’s not any of those individually, it’s the confluence of all of that. If you put it all together, then potentially, you’ve got something revolutionary, is that the gist?

Stefan Knupfer: I think that’s exactly the gist. And I think you’re also describing it in a perfect way. Simon, because all of this needs to come together. That’s exactly why we call it seamless mobility.

Simon London: Bring that to life for us a little bit. If I’m an urban dweller, trying to get around within a city, what is the seamless-mobility future like for me?

Stefan Knupfer: It is interesting, because you will actually use very similar means of transportation that you are used to. The difference is only today, all of them are not connected, they are pretty much independent systems, they do not communicate with each other. The moment you make it seamless, you’re using all those different modes of transportation in a seamless way. Which means the moment I say, in a city I want to go from a point A to a point B, I go online and I will know exactly what’s the safest, what’s the most affordable, what’s the fastest way to go from a point A to B. If I’m by myself, if I need to transport something, if I will have friends with me, it will offer me different ways of doing this.

Exhibit 1

By 2030, in the seamless-mobility scenario, private cars will be used less, and autonomous shuttles could account for a quarter of passenger-kilometers.

**Passenger-kilometers traveled per year, index: current demand = 100**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Baseline (2016)</th>
<th>Business-as-usual urbanization</th>
<th>Unconstrained autonomy</th>
<th>Seamless mobility</th>
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<td>125</td>
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<td>Autonomous shuttle</td>
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Swarna Ramanathan: For example, you might share an autonomous shuttle to get to the railway station, and then take a train into the city center. And then maybe use an electric scooter or robobtaxi, to go on to your destination from the city-center train station. So that makes your transit more seamless, and point to point. It’s door to door using multiple modes of transport. That’s what the consumers would see, but behind the scenes, they expect connectivity, and intelligent traffic systems, advanced train signaling, and predictive maintenance that would keep these trains and the remainder of the connected transportation systems running more smoothly with fewer delays and breakdowns, as compared to today.

Stefan Knupfer: The combination is very often, I think, the most difficult part when you are trying to use public transportation to get to the station. If you can find a way that you get to the station, again, in a safe way, in a convenient way, the usage of public transportation becomes much more convenient. But again, that means that every transportation means needs to be connected, and therefore needs to do so online. That is the only way that you can connect it.

Simon London: We are not imagining a future state in which, for example, trains go away, and we’re all buzzing around the city in autonomous flying whatever. Our future with seamless mobility certainly has a big component of things that we are all familiar with.

Stefan Knupfer: I must admit, Simon, I don’t want to forecast how cities are going to look in 50 years. Because if you’d asked me 15, 20 years ago, if what we’re talking about right now is even close to reality, I would have said no. Because the technology development is so significant. That’s also why we’re talking about 2030, 2040. I recently served a client who is in the area of flying around. They had significantly more advanced ideas that I would not even imagine, so I'd be very, very careful. We might fly around in cities much faster than we believe.

Simon London: What do we think, if we could get to a world of seamless mobility, what’s the upside?

Stefan Knupfer: If you succeed, and also based on modeling, if the seamless mobility in the city actually works, we will have an increased transportation capacity of about 30 percent. That means about 30 percent more passenger miles that we can travel. We’re doing this by cutting down on travel times by about 30 percent.

The cost will also go down significantly. So therefore, every time the costs go down, demand goes up, more people want to go. But the nice thing is we have the opportunity that more people can move around. And we still move them around in significantly shorter time.

The most important piece is that the greenhouse-gas emissions will go down significantly. We have numbers that are significant because we talk about emissions going down by 80 percent. That obviously requires that we are fully electrified in the vehicles. So as long as you have combustion engines in the cities, it’s not going to happen. But the moment you have electrical vehicles, even if the energy generation is not perfectly clean, at least you keep it outside of the city.

Simon London: Presumably, there are also big societal benefits here, as well. So just talk a little bit beyond the economics and beyond the sort of saved minutes and more miles.

Stefan Knupfer: So we already talked about greenhouse gas. The autonomous is primarily going to be safer. Because if you think about it, 95 percent of deadly accidents are driving errors. Out of this, 30 percent is actually drunk driving. About 30 percent is that people are just not being aware of what’s going on on the street. A machine doesn’t do this. If I make a driving mistake, I hopefully learn from it. Hopefully. The machine, actually the entire system is going to learn from it. So therefore, the system learning in this case is going to be—just from a probability standpoint—it will be safer.
People actually like autonomous driving, even today. Not when it’s in the city, because in the city, there is no fun driving. You have stop and go all the time. The only thing is, you’re busy driving, and you can’t do anything else.

There’s a lot of people who like their cars, and like the driving experience, and the [turning]. This is something you still can do in the countryside. So as long as you have a steering wheel in your car, you can actually do both. You can do autonomous and you can do your own thing. The last point that I’d like to raise here, as a benefit, is also it has an economic benefit. And I think that’s important in our report, that everything that we propose makes economic sense. Just to give you an example, those new transportation services could be about 40 percent of transportation revenue in 2030.

That means for a city like London, our beautiful city, about $10 billion of additional revenue on the transportation side. And if you multiply this by all big cities in the world, you realize how big this industry will be.

Simon London: And that’s things like ridesharing, robo-taxis, bike-sharing schemes. If you add all those up, we think 40 percent of the transportation-related revenues, could be this new stuff?

Stefan Knupfer: That’s exactly right.

Simon London: So this all sounds fantastic. We’ve got a cleaner, safer, more efficient transportation system within cities, a world of seamless mobility. What’s the catch?

Swarna Ramanathan: The catch is that seamless mobility will not happen without a close public and private cooperation. This will not be solved by either of them alone. For example, cities should be encouraging the use of shared autonomous vehicles but also controlling the number of autonomous vehicles that come onto the street.

You really need innovation from the private sector, but also a little bit of controlling force from the public sector and the policies. Our research shows that if robo-taxis and autonomous shuttles become widely available in an unconstrained way, congestion would only get worse and not better. While there could be many benefits—more point-to-point trips, potential lower greenhouse-gas emissions—like Stefan was mentioning, you’re going to open up travel to a completely new segment of people who are not traveling today. But we wouldn’t be maximizing the potential of technology if there’s no good private and public partnership.

Stefan Knupfer: Building on Swarna’s point, if you do it in an unconstrained way, and you’re not using all the technologies that we mentioned in a seamless interaction, you might get some disadvantages, at least in the short term.

For example, in New York, the more Uber cars you have, and the more people like them and use them, what you get is people using less public transportation. We strongly believe that you need to have public transportation, and you need to expand capacities there. So it’s the combination of it; it shouldn’t take away. The second is if you have more driving on the street, and you do this combustion engine, you obviously make the pollution worse, you make the congestion worse.

The congestion obviously leads to more pollution, all those different things.

Therefore, in the transition, it’s not going to be easy, and that’s exactly why you have to have a strategy and know where you want to get to. And then to Swarna’s point, you have to be very organized between public and private. If we just let it go, it’s going to take us probably ten years longer and much more hardship and much more money.

And the cities can’t wait, because the point is that you have those congestion-pollution problems today, and what cities do at this point right now, they ban vehicles, they ban cars out of the city. Which is nice to walk, but on the other side, it takes you significantly longer.
Simon London: You’ve mentioned the word robo-taxis, and we’ve talked about autonomous vehicles, even autonomous shuttles as something that was probably part of the solution set [see Exhibit 2 for details on the opportunities for autonomous vehicles in the United States]. Realistically, when do we think some of those things are going to be hitting the streets, at any kind of scale?

Swarna Ramanathan: It really depends on which part of the world you’re talking about. You already see Waymo is doing different pilots and trying to bring it to a commercial sense in Arizona. But it might not be the same case if you think about India or China as an example.

There are different models in terms of infrastructure and regulation. There needs to be careful coordination and synchronization. It’s not a straightforward answer to say, yes, robo-taxis are going to come in 2020.

Stefan Knupfer: If you’re in a more Western, developed city, and you live in a safer city, it’s easier to go to autonomous. So therefore, you see the modern Western cities, and then a lot of the smaller European cities, leading. So Helsinki, Oslo. They’re smaller cities in Europe, but obviously, they’re very modern cities. So they’re actually well organized, so they go very quickly in those things.

On the other side, I believe cities that will be kind of newly built, a lot of the Chinese cities, have all the opportunities to leapfrog.

Then you have cities like Mumbai or Mexico City. They’re big cities, but the infrastructure’s not necessarily there. They have absolutely the need from congestion and pollution standpoints to do
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something significant. On the other side, their starting point is relatively difficult in some of those areas. You will see some of them advancing significantly. But they’re not necessarily the ones that are going to lead us in the next ten years. I think the other thing is, I think when you talk about timing, I think you have to understand what kind of autonomy.

For example, I don’t want to get too technical, but as described from a level of one to a level of five, level five means everywhere, anywhere in the world, driving is autonomous, nobody has a steering wheel anymore.

Now think about driving through the desert in Arizona, or you drive through the jungles somewhere in Africa, or something like this. There are a lot of roads out there that are probably better suited to autonomous driving.

So, level four, where you have something organized, and you can actually have a relatively simple infrastructure. Think about highways, think about New York City, you’re driving east or west, you’re driving north and south, and you’re driving from traffic to traffic. It’s relatively organized, and it’s relatively simple to build an infrastructure that allows you to coordinate there. That’s what you call level four.

It’s a little bit restrained. If you go there, people talk about they can do this within the next ten years very easily. The technology is there, and therefore people talk about being able to do it within the next three to five years.

Simon London: So we would argue that—it’s a big generalization—but a lot of infrastructure spend should really be on the smart infrastructure at this point. It’s the connectivity, and the intelligence, and existing infrastructure that probably will get you more bang for your buck.

Stefan Knupfer: There’s a big budget in every city and state, and probably also the federal government, for building additional roads. Now, building additional roads is, in my understanding, a complete waste. Because if this happens ten years from now, we generate significantly more free capacity.

Just think about autonomous vehicles, they’re not doing stop and go. They all have the same distance, because they don’t have a reaction time, they can drive much faster, they can drive much closer.

All of a sudden, you’re using significantly more of the road capacity. Right now, we’re using an average of about 10 percent of road capacity that we built. Now, building more roads is probably that more people will drive, but it’s not going to solve our problem. And therefore, changing budgets, and that’s a little bit difficult, I believe, because if somebody has money allocated to a specific area, it’s very difficult to say, Do you know what? I’ll take a radical cut here and move it completely to the other side.

Usually, we do some small cuts. But small cuts don’t lead to revolutions. I think the quality of the roads needs to improve, but I don’t think we need to see significantly more roads.

Simon London: Put yourselves in the shoes for a minute of a mayor or a city planner. How do I approach this? I understand that there’s a lot of change coming, and there’s potentially a big role for me to coordinate and bring parties together, to get to rational solutions here. Where do I begin?

Stefan Knupfer: That’s a terrific question. And to be quite honest, we are in the very fortunate situation that we are allowed to talk to a lot of mayors at this point. Interestingly enough, not only about mobility but also about smart cities. We work with an organization called C40 that connects about I think 93 or 96 large major cities right now. More than 25 percent of world GDP, 500 million to 600 million people. Therefore, through this, we have the opportunity to talk to mayors. We know this is a positive development.

On the other side, it can be pretty messy on the way there, so therefore, we recommend pretty much to every mayor, you have to develop a
mobility strategy that is ten, 15, 20 years out for your city. But it gives you a very clear indication not only for the people who live in your city, and vote for you, and need to understand why you’re spending all the money, but also to the private sector—that the private sector is ready to invest, but if you don’t know if you’re allowed to invest, or even if it makes sense in a city, you’re sitting there and saying, The city has to do something. Now, the city doesn’t have the experience, the city doesn’t necessarily have the money. The money and new technologies are in the private sector. They both actually have to come together in a significantly better way. I do believe the starting point needs to be a city saying, I’m willing to take this on.

The second thing is, we talked on the mobility side about 40 ideas, 40 major things that you can come up with. Again, we don’t think that every city needs 40 of them. Because a lot of them are already in place. So you could get it down to ten or 15, that’s a number that you can manage. That’s very, very important. Don’t try to follow every lead, don’t try to follow every technology. Try to be very clear what you want to do, and then lay out exactly those ten, 15 things that you need to do. The moment you have ten, 15, you can also put the money next to it, you can put the management attention next to it.

This focus, that you understand what is important in the short term, what are the next steps, what are the technologies I can implement right now—I think that’s important, but you have to have the big picture, because otherwise, as I said before, you start banning vehicles out of a city. That’s a solution, but honestly, that doesn’t make you move around faster, it doesn’t help you with your delivery. You have to find better ways that those vehicles move around. I think that’s the better solution.

Simon London: You’ve mentioned that there are 40 or so levers or tools that are at the disposal of cities and city governments. Just explain those a little bit, without going through all 40, what are some of the tools that I’ve got?

Swarna Ramanathan: At the highest level, there are three ways for cities to get to a seamless mobility according to our research. One is optimizing supply. Another one is optimizing the demand for transport. And the third one is improving sustainability.

If I had to pick a couple of them, very tactically, intelligent traffic systems, which include lights that send traffic and communicate with each other, to minimize the times that you and I would spend in traffic jams and really maximize movement. They all would also allow for dynamic lane allocation, which shifts lanes to the direction with more traffic. Smart parking is a technology that connects vehicles to infrastructure, or even vehicles to vehicles, to inform you where parking is available. They both are proven technologies.

Intelligent traffic systems have reduced commuting time in Buenos Aires by about 20 percent. Smart parking has reduced searching time for parking by about five minutes on average, in Johannesburg and in San Francisco.

These have significant impact on normal commuters’ lives by saving time. But they are also pretty simple solutions that any city could think of, because they’re existing technologies, available in most cities.

Stefan Knupfer: I like a lot where Swarna is going, because I think there are a few no-regret moves. There are one or two that I would like to add. Night delivery. Why do we deliver during the day? The only reason is because if a vehicle is not autonomous, it makes noise. Noise is primarily the trucks that obviously are diesel trucks, and they go backwards and make noise, and all of this is not going to happen in the future. You have electrical vehicles, you don’t need to make noise, because you know your surroundings.

So deliver at night, which means that you take the trucks and the delivery away from the day. If you go to a city these days, you see right and left trucks going to retail stores. Everybody is slaloming through the streets. Delivering at night opens up the whole street. And it’s also easier for the
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delivery trucks to deliver at night because during the day, they can’t park.

The other thing is, why is it that every delivery truck that goes long distance ending up in New York needs to go over the George Washington Bridge and then deliver somewhere in Manhattan?

Why aren’t we using urban consolidation centers, which means they go to New Jersey, in an urban consolidation center and they repackage from the big trucks into smaller ones. And the smaller ones are all electrical, and they only go to a specific zip code. All of a sudden, it looks very different in a city.

Simon London: But again, it’s a big coordination issue, isn’t it? Because there are all these private-sector players, and they’re all doing what’s rational for them, and what minimizes the cost for them currently. They’re used to having their trucks coming into the city, but getting to a more rational solution for the city as a whole takes an enormous amount of coordination and a lot of different parties.

Swarna Ramanathan: Yes, it takes a tremendous amount of coordination, but it’s not impossible, Simon. Cities like Barcelona are piloting this night-delivery system that Stefan was just explaining. They have seen very good results. Travel times have been reduced by five minutes during the daytime, because they were able to move a lot of deliveries to be done during the nighttime. So it’s possible, it’s not impossible.

Simon London: And what about the private-sector side? If I’m a CEO here, what are the opportunities for me? Why should I be excited about this?

Stefan Knupfer: You should be excited because there are significant business opportunities in the first place. Where there is new technology and new business opportunities, I hope that would excite CEOs to invest. Now again, as we said, I would only invest if I know that there is a city that I can work with. That’s exactly why we said the public and the private sectors need to interact.

We thought about four layers that you could think through, as a city, but also obviously as a business: infrastructure layer, a rolling-stock layer, a digital-analytics layer, and a user-interface layer. The infrastructure layer is literally the very basic hard assets. For example, roads, rail lines, but also, for example, charging infrastructure for electrical vehicles.

Rolling stock is another one. Very simple, we talk about trains, we talk about buses, but we also talk about robo-taxis, we talk about minibuses and minishuttles. We talk about electrical bicycles and scooters. This is all the different kind of vehicles that are moving around on the surface.

The next one, it becomes pretty clear, because the moment, as we talked about, if you want to go from a point A to B, and you change different modes, you need to understand all the different steps that you go through in your mobility. This means you’re talking about analytical and digital layers, like ticketing, like payments, like mapping, like vehicle vouching, congestion pricing. We talked about the intelligent traffic lights that all need to be connected. Preferred lanes.

Then the most interesting one, and people like to forget about it, but think about it, we all like our smartphones. It’s going to be, probably, the device we’ll use to manage mobility going forward. But on it, you need navigation maps, you need payment integration, you need to find a very simple interface. People actually say, “I want to go from A to B, I want to be safe, I want to be fast, I’m not paying a lot of money, I want to do it with friends, I have luggage that I have to take.”

With this little information, it should give you very simple instruction, and say, Here’s your vehicle, this is what you’re going to do first, second, third. And then very hopefully, very simply, you’re going to get from A to B, and you’re going to enjoy it.

Simon London: It reminds me a little bit of the way information-technology people like to talk about the stack. And it sounds like there’s a mobility stack here, all the way from the hard infrastructure
at bottom, right up through to a user-interface layer at the very top. And the trick for a CEO is to think about, well, Where do we want to play? Where do we play there, on which of the bits of that stack that we want to be in?

Stefan Knupfer: I think that’s exactly right. Also you have to understand the interfaces. Even if you play in one, you need to find a way that you actually add value to the entire system. That’s exactly, I believe, why we need a strategy, and we need to have the different players coming together.

What you see right now, most of the players, at this point, they offer a product or a service, but they’re not offering solutions. We need them working together to offer solutions. That’s the way to get to seamless mobility.

Simon London: OK. So I think that’s all we have time for. But Swarna and Stefan, thanks so much for joining.

Stefan Knupfer: Simon, thank you so much. It was a lot of fun.

Swarna Ramanathan: Thank you.

Simon London: And thanks as always to you, our listeners, for tuning in. To read more about our research and work on the future of mobility, please visit McKinsey.com.

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