

There seems to be a kind of hype around the advent of automated and maybe even driverless vehicles. It is quite obvious that fast progress is made in this field. But will further automation hamper or support transitions toward more sustainable transport? When Moshe Givoni visited the Institute for Technology Assessment and Systems Analysis at Karlsruhe Institute of Technology, he discussed this question with Torsten Fleischer and Jens Schippl, the editors of the special topic in this TATuP issue.

**Jens:** Let's start with a geographical perspective on future visions or expectations toward automated driving. We know that you, Moshe, are quite familiar with a couple of different countries, among them Israel, Finland, the UK, and maybe others as well. Torsten and I bring the German perspective. Against this backdrop, we first want to touch upon the questions whether the same "story" about the future of automated driving is told all over the world, or if different stories are told in different countries or regions?

**Moshe:** I'm currently on sabbatical in Finland, and I've been to South Korea about a year and a half ago and to Hong Kong a few months ago, and wherever I go, for me it's the same story. You change the languages, the story is the same story. I think it's very much the business as usual in the sense that we basically are going to reinforce the way of our current mobility, which is centered around a private car, which might be autonomous.

I don't see at the moment the technology making any big change in the way we organize our mobility. And even more than that, as someone who's supposedly an expert on transport, my best guesstimate is that everything is going to be just more intensified in terms of the problems. It probably means more reliance on private mobility. You don't have the issue of wasting time while driving because you can do whatever you want to do, and I think it also means that this very posi-

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*“Self-driving cars are completely the wrong tool for me!”*

Moshe Givoni, Torsten Fleischer and Jens Schippl discuss automated road vehicles, their contributions to sustainable mobility, and why one shouldn't use a hammer to carry water.

tive movement toward walking and cycling is at great risk. Maybe not in countries where they have already established some kind of culture of cycling and walking, but if I look at Israeli cities, which are just starting to realize that maybe it's important to have cycling as a mode of transport, I think all this will not move forward, and instead we will just get more car-oriented cities.

I think automation of vehicles is a great technology, there's lots of potential. I would like to see it basically employed as a form of public transport. So hopefully it will go more toward public transport, the desired pathway, but I don't see it happening at the moment. I think the commercial interest is the one that is

leading the development, that is continuously selling us cars.

**Torsten:** Talking about interests, as you did. I see two or perhaps even three different competing sets of interests, or even mobility paradigms, when it comes to the future of automated vehicles. One is the one that you already mentioned, an extension of the classical car-centered mobility paradigm, and you see that also in automated driving. Of course, car companies try to integrate automation into their conventional business model, which is selling cars. Then there's another one, of which I'm not so sure how to read it, whether this is a real opportunity for change. It is built around the sharing economy, driven by platform providers and by the Ubers and Lyfts of this world, which try to implement a new set of ride sharing, or car sharing, or whatever mobility service options system which tries to, at least temporarily, disjoin parts of the urban population from car ownership and car usage. I would say, this is currently the central configuration of technological competition, but perhaps also of business competition. And there is a third group of players built around cities and public transport service companies, of which I don't know how dedicated they are to the topic. They try to use autonomous driving as an additional set of technologies for certain transportation situations in urban areas, either for night traffic, for traffic in sparsely populated areas of the city, for local circulators, anything like that, because these are usually parts of the transportation chain where you have low ridership, where you usually don't need larger buses, where small buses are really expensive to run, and where automated driving could offer completely new options as long as it doesn't start to cannibalize public transportation as such.

I see these three different sets of interests, grouped around different institutions, and I'm not really sure who at the end of the day would succeed in shaping the entire structure. Perhaps all three in different ways, perhaps just one of them, I don't know. So, I wouldn't say it's a prob-

lem in itself, there are some options for automated driving to develop itself into something that might be helpful for new ways of sustainable transportation, but at the same time there are other developments which might become damaging to the overall idea of sustainable transportation.

other operating cost. If you offer this kind of service, most likely at the end you will very much shift toward private car sharing, to the point that it will be only a small step away from owning a car, maybe even buying that car from the same company that provides you this package of “travel as much as you would like”.

tween your workplace and home, where you feel safe and comfortable and so on, you can kind of “cocoon” in a fantastic area. On the other hand, visions are told about robot taxis, and there are corresponding products being tested and maybe commercialized, for example, illustrated by Volkswagen with the concept car called Sedic. Industry works on products that go into this “sharing” direction as well. So, two rather different, maybe even contradictory visions are told. Both symbolize and would materialize different ways of mobility. Highly personalized private car ownership on the one hand, on the other hand what is called mobility as a service, or mobility on demand.

I mean, there’s a danger, but also an opportunity coming with it. There is a danger that we will have even more traffic and that there are self-reinforcing mechanisms if you have more people cocooning in private cars and less people using private transport, providing public transport may become more expensive and less frequent, which makes the cars even more attractive, and so on. Such developments may in particular have large impacts on small and medium-sized cities, where public transport and car-sharing services are not as well developed as in larger cities. Free-floating car-sharing services so far only exist in some larger German cities. One should consider that in Germany less than one third of the population lives in cities with more than 100,000 inhabitants. Smaller and medium-sized cities matter when it comes to a transition of the mobility sector toward more sustainability.

But still, I think both pathways, and of course numerous mixed forms of them, are possible. Automated cars could just strengthen the existing regime, on the other hand, I think, there are indicators at least that point to chances of breaking somewhat with this trajectory. We have growth rates in the car-sharing domain, we observe a certain decrease in interest in cars, there seems to be a reduced interest in car ownership amongst younger adults in larger urban areas, and there seems to be an increase in acceptance of harder measures that restrict car traffic.

*Automation of vehicles is a great technology with lots of potential as a form of public transport, but the commercial interest of continuously selling cars is leading the development.*

**Moshe:** Looking at your three pathways or scenarios, the first one is similar to mine, the one which I would say is the undesirable. Your third one I think is similar to my desirable one, and obviously there is a big potential if you look at the system. Your second option, this idea of mobility as a service, which I feel very uncomfortable with, it’s for me similar to smart mobility. What is not smart mobility, and what is smart mobility? I don’t know. This idea of mobility as a service could go both ways at the moment. It should go toward the third option: that it has a very specific role from a public service perspective where the demand is very low, in the rural areas, but actually it looks like it is going more toward the first one. When looking at car sharing in London, for example, you could see this mismatch, in the sense that transport for London would like it to be the way you suggested, but obviously the operators, and this is a commercially driven new innovation, they just want to operate in the middle of London, and they cannibalize public transport. And in Israel and in New York, for example, we see the very same development. Uber in New York is an example, and I think at the end of the day, this idea, these new companies of mobility service, would just be assimilated into the business as usual model, in the sense that they will sell you some kind of a service that includes the car and maybe some

**Jens:** Basically, I think what you can observe at the moment in Germany is that in the field of autonomous driving, in particular when car companies present their products and their ideas, you can really see both visions. There’s this idea of the autonomous car which is a convenient and highly personalized *third place* be-



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So, I think it is very much up to the cities, to governmental actors in general, to think about potentials for change, and to try to take influence on these developments. It's really important that cities clarify what they want, in which directions they want to go; they should take up this issue of automated driving, incorporate it in transport development plans, and watch out for policy options that could give a push in a desired direction.

**Moshe:** But what is this technology about? It probably only means that I don't need to drive. Okay. If you look today, the driver is not the main problem. No. It's that we're driving too much, we're going too far maybe, and vehicles are not efficient, but it's not the driver. Yes, we have an issue of safety, which the autonomous technology might solve, but in a long term after all the cars will be autonomous and that's quite a long time from now. So one thing is to talk about "Okay, here we solved the issue of safety," but this is not a debate that we usually focus on. The fact that we have autonomous vehicles that take the driver away doesn't solve anything, except the safety problem.

**Torsten:** In most urban city centers, parked cars are a real pain, for the user as well as for the city inhabitants. If you are able to develop strategies to reduce car parking in city centers, for instance,

carry water from one place to another. You have a problem of space in the city centers because of too much parking, okay. Convert the city spaces to car-free zones, one option. Limit parking spaces and provide more access by public transport, another option. I don't see why the autonomous vehicle is in the set of solutions that you think we need to resolve the problem, and that's the issue. The autonomous vehicle has nothing to do with it, and most likely you will only intensify the problem, and what I'm worried about is exactly that, because we already see very positive trends in city centers where cars go out. If you go down the route of developing autonomous vehicles, most likely you will bring the cars back in the city centers. For me it's a high risk, and again, for no good reason. If you have a problem of congestion in the city center, take the cars out. Don't change their engine and don't take the driver out of the car, because that wouldn't solve the problem of parking.

**Jens:** I see your point, but I still think that the link between sustainable urban transport and automated vehicles can be "new" business models related to sharing and public transport. If you want to restrict car usage, if you want to restrict parking places in urban areas, you need acceptance to a certain extent. You need a political will, and you will only get politi-

I think they can be an enabler for many ideas about the quality of life and sustainable development in urban areas.

**Moshe:** I agree to some extent, but again, we took a problem, and we brought the wrong solutions. It's a huge thing to develop the autonomous vehicle just for assisting a change away from car ownership, and it's not really the direct reason to develop autonomous vehicles. You want to reduce car ownership? Perfect. I think this is the trend we see in a lot of cities, and it's welcome. It's not really directly related to autonomous vehicles, and it's a big question whether autonomous vehicles will push us toward it, or actually pull us away from it. And we're not talking about "Okay, let's manufacture more bicycles", which is a tiny thing. We're talking about huge operations which demand a lot of money and, important but often overlooked, effort. The money and effort go into these autonomous vehicles for all the wrong reasons, because still in this discussion I did not hear one good reason why we should have autonomous vehicles. All the reasons are secondary, "to support this, to support that", but it's not a direct answer to any of our problems in the transport system.

**Jens:** Maybe it's that of safety.

**Moshe:** Yes, safety is an issue.

*The driver is not the main problem. It's that we're driving too much, we're going too far maybe, and vehicles are not efficient.*

or reduce this fight for parking resources within city centers, and you can do this by a smart automation strategy, this could be attractive. If cars were able to navigate city environments without any human intervention, then of course they might contribute to solving this problem.

**Moshe:** For me it's a perfect example to show that I agree with the problem, but it's completely the wrong tool for me, it's like taking a hammer if you just want to

cal will if a certain societal acceptance can be expected. So, my hypothesis is that political acceptance is much easier to get if you can offer a good alternative to privately owned cars. The more you are able to provide alternatives, the easier you get political acceptance. So, taking out the driver can make a difference if it supports the extension of public transport systems and/or sharing schemes. If automated cars are able to contribute to the attractiveness of non-private car transport,

**Jens:** Beyond this, I think we should try to have an influence on the direction, on the development pathways of automated cars. If they are an enabler to form the niche of sharing schemes and related concepts changing the transport regime, to use the language of transition research, it should be tried to push the development into this direction. Today we have about 17,000 car-sharing vehicles in Germany, this is not more than a niche if you compare it to the over 40 million private cars.

**Moshe:** Now, I'm completely with you. Then it takes us basically to the second level of the discussion. Now the problem is that, because of this mix in what it does and what it doesn't, it should be something that the private industry is developing, working on, putting money in, and testing. The problem is that the main pusher is actually public money, because if we look at the calls for research in all countries, if I don't do research today on autonomous vehicles, what do I have?

If you look at the Ministry of Transport in Israel, all they think about, all

nologies for automation and robotization, but it's basically private money that they put on that. In this country, it's the car manufacturing industry that's driving this development, not least because car manufacturing is a very important part of the national economy of Germany. I'm not sure if they would say that in public in the same way I put it, but I have the impression they feel threatened by a potential shift in gravity of future mobility technologies. This of course has brought research policy and also transportation policy to the table because, as we all know,

traffic safety, we want to offer new mobility options for people who are excluded from existing mobility systems, and so on and so on. And this is of course like trying to square the circle. The missing link is that we don't have good answers at a more operational level. The lack of definitive transportation policy goals and roles for autonomous systems in achieving these goals is the problem. But I would argue this has been a problem of transportation policies in most countries for decades, not just since the advent of automated vehicles.

*Policy makers and planners at all levels of government should have potential developments in automated driving on their radar.*

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they talk about, all they invest in is autonomous vehicles. If the industry wants to develop it, fine, take the risk, put the money. But we're putting the public money to solve a problem that is not there, and we give a lot of excuses for that. Now I think the discussion should somehow go into "there's policy, and there's technology", and the autonomous vehicle is a technology; in terms of policy, actually transport policy, my perspective is that it does not make any change. We need to push for the same policies with and without the autonomous vehicles. In cities, in city centers we need public transport because of the amount of people that comes, we need more walking, we need more cycling because of the health benefits, it's all the same story, with or without the autonomous vehicles. And then the question is, "Why should we, as researchers, as government, invest so much effort, so much time into this technology?"

**Torsten:** The answer, I would say, is different depending on the country you're talking about. Of course there's substantial private investment into development of autonomous cars in some corners of this planet. So, the major investments that are done by the IT companies for automated driving are of course supported by public funding into certain basic tech-

nowhere on this planet transportation technology and transportation policy are disjointed, they are closely intertwined at different levels.

Furthermore, it should not be overlooked that a number of developments that are part of the current technical capabilities of autonomous vehicles are outcomes of a broader robotics automation investment program that would happen anyway even without the push toward autonomous vehicles. So, maybe it's just an application case for broader robotics development.

**Moshe:** Does Germany have a political strategy with respect to autonomous vehicles or ...?

**Torsten:** With respect to automated and connected driving, that's what it's called.

**Moshe:** Which is?

**Torsten:** It's an innovation strategy as well as a transportation policy as well as a problem solving strategy; at least it claims to be that. We want to advance technologically, we want to support the industrial basis of this country, we want to push the technology forward, we want to solve technological problems, transportation problems, we want to improve

**Jens:** I think, policy makers and planners at all levels of government should have potential developments in automated driving on their radar. I sometimes have the impression that they do not. But the world around them is changing, and there are new threats, dangers, and also opportunities coming up. One needs to understand potential developments and to think about entry points for policy options.

**Moshe:** It's a good point. Again, my view is that when they start talking about it, they talk about it in a way that goes "Yes, it will solve this, it will solve that," but again, they only see the positive side of it. "Smart" mobility, which is autonomous vehicles and all this, is becoming an institution in the sense that that's what everybody is seeing – the "smart" side.