Center for Strategic and International Studies

TRANSCRIPT

CSIS Online Event

"Decarbonizing Global Transport"
Climate Solutions Series, Session #3

RECORDING DATE

Wednesday, May 27, 2020

FEATURING

Dan Sperling,

Distinguished Professor and Founding Director, Institute of Transportation Studies, UC Davis

Anand Shah,

Co-Founder, Ola Electric Mobility

Dan McGrath,

Head of Corporate Communications and Responsibility Team - Americas, Deutsche Post DHL

Shoshanna Saxe,

Assistant Professor, Department of Civil & Mineral Engineering, University of Toronto

CSIS EXPERT

Nikos Tsafos,

Senior Fellow, Energy Security and Climate Change Program, CSIS

Transcript by www.superiortranscriptions.coM

NIKOS TSAFOS: Good morning, everyone. My name is Nikos Tsafos and I'm a Senior Fellow with the Energy Security and Climate Change Program here at CSIS, and I want to welcome you to today's conversation on decarbonizing the global transportation sector.

This is the third event in our Climate Solutions Series, which explores pathways to net-zero greenhouse gas emissions across the economy. Our first event was looking at economy wide pathways. We have the second event on the power sector. This is transportation, and we're going to follow up with one on industry, one on buildings, and one on carbon removal.

Transportation, obviously, is not one thing. It's many things. We have passenger transportation. We have freight. We have aviation. We have marine. And so we're going t o try to grapple with the different aspects of transportation.

And as some of you know, transportation is the second largest source of CO2 emissions from the energy sector worldwide. It's been growing by about 40 percent over the last 20 years. Split, the largest chunk, obviously, is passenger transportation on roads, followed by freight, followed by shipping and aviation, which are, roughly, equal.

And it's also a sector where the United States stands out for its relatively poor performance relative to China, for instance. China has a much bigger CO2 footprint overall in the energy sector, but in transportation the United States is still on top. The U.S. is also one place where transportation emissions are not falling, and one of the reasons why the U.S. record in recent years on CO2 emissions hasn't been as good as before is because of the lack of progress in the transportation sector. So there's lots to talk about and I'm really looking forward to the panel that we have assembled.

So a few housekeeping notes. First, if you have a question for the audience, you can go to the CSIS website where you signed up for this event and you can submit that question, and my colleagues are going to get that to me.

So we're going to do this – we have about 75 minutes and we're going to do this in two parts. First, we have asked Dan Sperling, who's a professor at UC Davis, to start us off with an overview of where we are in terms of decarbonizing the global transportation sector. So he and I are going to chat for about half an hour, and if you have questions for Dan, that first half hour would be the time to send those questions to us.

So we'll do that for about half an hour, and then after that half an hour we're going to thank Dan and then we're going to move on to a panel conversation where we have Anand Shah from Ola Electric, we have Dan McGrath from DHL, and we have Shoshanna Saxe from the University of Toronto, and they're going to bring sort of different perspectives in terms of mobility and logistics, urban planning, and infrastructure. So it's going to be a really fun conversation, and then, once again, I'm going to start with a few questions

and some conversation, and then we're going to come up to your questions from the audience.

So with those logistics set, let's get started. So, Dan, I'm going to ask a very simple broad question. Where are we in terms of decarbonizing the transportation sector versus where we need to be?

DAN SPERLING: Well, thanks, Nikos. It's a real pleasure to be here. I really appreciate the invitation, you know, being here at CSIS, which is one of the top think tanks in the world, especially in the energy area. So this is really a great opportunity.

So I do want to add a little bit to my bio, just to get people a little engaged, and that is I'm an academic but I'm also a regulator and policymaker. So I'm a board member for the California Air Resources Board, and in that position I oversee all the zero-emission vehicle rules, low-carbon fuels, VMT reduction that we're doing and, as many of you know, we're pushing the envelope in California. So I'll be happy to speak to all of that. So let me try to weave together both the academic perspective and the policy perspective here.

So, and to add just a little bit of background to what Nikos said, you know, as he said, transportation is the second largest sector – greenhouse gas sector – in the world, but it's the largest sector in the U.S. It moved ahead of electricity a few years ago. And also, just to add a few numbers to what he said, is that light-duty vehicles – cars and light trucks, SUVs – are about 60 percent of all the transportation emissions. Heavy-duty trucks are about 20 percent, aviation about 10 (percent), and the rest are much smaller.

And for those people, just to keep in perspective, urban transit is about 1 percent of the greenhouse gas emissions in the U.S., and as Anand will point out, in India and many other countries that percentage is much higher. But in the U.S. it's very low. And also, what we've seen in the transportation sector is slow improvements in the efficiency of the technology and in the carbon footprint of the technology in buses, trucks, cars, jet planes.

But the amount of use of all of those has been going up in recent years, and so that's why we come up with the net effect that we're not making hardly any progress in transportation. And if we think about we're going to try to get a massive reduction in emissions – so in California we have a target of net zero by 2045 and we're adopting all the policies to go with that – that's a dramatic break from where we are now and many countries in the world are adopting, with the exception of the U.S., many countries around the world are adopting targets of zero net emissions by 2050 or so.

So here we are, making no progress, and what are we going to do? So I think, Nikos, it's probably good also to, since we're in the middle of the COVID pandemic, to say what's happening right now and is there anything out of that that provides us either hope or despair, as we go forward, and there's some of both.

So the hope, the good news, from a climate perspective is people are telecommuting more. They're using telecommunications for health, for medicine, for shopping, and so there's three things I've identified as kind of good things that are happening. So more telecommunications, more walking and biking, and less air travel.

The bad, from a climate perspective and in a broader public interest perspective, is transit has fallen off the table. It's, like, 90 percent reduction or even more than that in many places. The pooling services of the ride hailing have been abandoned. So now it's all single-passenger service, and even that has fallen off. And then shared scooters and bikes have also, largely, disappeared in most places.

So those are the bad – the transit, the pooling, the shared use – and there's a lot of uncertainty about what's happening, what trends. There's electric vehicle purchases, and the car travel actually is an interesting one because it fell off, but it's coming back very quickly and we're starting to think that it's probably going to rebound back to where it was, if not higher, because now people don't want to share.

And that's one of my big themes is if we're concerned about sustainability we need to re-embrace or to embrace sharing and that means in transit. That means with the micro mobility services of bikes and scooters. That means in the pooling services of the ride-hailing companies. And we've got to do that and right now there's, really, even a fear of all of that.

So the question is – you know, so one of the big questions here is will this behavior persist, this anti-sharing or reluctance to share. All my travel behavior expert friends say they think it's going to disappear. Two or three years we're going to be back to doing things pretty much like we were. Maybe a little bit more telecommuting, a little less air travel, but pretty much back. So that's an open question.

OK. So to set up the – so what you're really asking and to set up this discussion here, I think – what are the strategies for decarbonization, and, certainly, for the U.S. and probably for most other places in the world, the number-one strategy, the number-two strategy, and the number-three strategy is electrification, and that's where we're going to get the massive reductions.

That's where we have – in every sense, it's the easiest thing to do. Not to say it's easy, but from a technological sense, from an economic sense, from a behavioral sense, because, basically, we're just doing a technical fix. We're not asking people to dramatically change their behavior. The car companies are all geared up to do it. And I should point out, you know, maybe we can get into this a little bit, is it's now – because the cost of batteries has come down so much, it's now becoming very plausible, even desirable, to electrify trucks.

So in California next month, my California Air Resources Board we're going to adopt – we're almost certainly going to adopt a regulation that requires a path for electrification of most trucks. So the rule is probably going to say 50 percent reduction of – or, excuse me, a 50 percent market share for electric trucks for all but the long-haul and the big pickups, and even those we're talking about a 15 percent market share for the long-hauls and the big pickups. Everything else getting up to 50 percent electric by 2030.

So that really signals to the industry, to the consumers, to the shippers, that this is possible, this is doable, and it's in the public interest. So that's the number-one strategy, and the number-two strategy, which is quite a bit behind but still very important, is how do we reduce what we call VMT – vehicle miles traveled – vehicle use, and that's both light-duty – it's mostly light-duty but it's also trucks and, to some extent, it's planes as well.

So I think that's kind of where we are and, you know, I'm actually preparing a decarbonization plan with my colleagues for the state of California and it's going to reflect what I was just saying.

MR. TSAFOS: Perfect. Thank you, Dan.

Let me – you put a lot of things on the table. Let me sort of take on a few. Let's start with electrification because that was kind of your number-one imperative. Talk to us a little bit about the policy toolkit. I mean, one thing, obviously, has been just signaling effect, this thing that says by some date this is what we want the world to look like. But, obviously, in California but also elsewhere we have a relatively sort of diverse and complex toolkit that we try to use to incentivize electrification.

Talk to us a little bit about that toolkit and, you know, to what extent do you think that electric vehicles are becoming cheaper, automakers sort of making plans for that. Does that lessen the need for that policy toolkit? Does it create a bigger need? How are you thinking about how to nudge this process along?

MR. SPERLING: Yeah. This is all about policy. If you leave this to the market, if you leave this to the companies, if you leave it even to the consumers, it's going to be a very slow transition path. And so your question is exactly right on is what are the policy instruments we have to do it, and I think that, you know, certainly, the economists will say just raise the price of fuel or have a carbon tax.

But the reality is in the transportation sector, it's such a complicated sector. You got conservative consumer behavior. You got the – you know, the structure of the auto industry. You got the recharging infrastructure you have to put in place. There's so many barriers and so many – you could call them market shortcomings, market failures, that are part of this.

So the number-one strategy, I think, is very aggressive performance standards for vehicles and that means CO2 or greenhouse gas performance

standards. So Europe is actually showing the way on that, and their CO2 standards are so aggressive that the car industry just says, the only way to meet this is electrifying our fleet, making – selling more electric vehicles. And so they don't even have a ZEV, a zero-emission vehicle mandate, and I think that their strategy will be effective.

In the United States – well, let's say in California, we have a zero-emission vehicle mandate as well as greenhouse gas standards. I mean, part of it's a political call because if we really thought the federal government would adopt really aggressive performance standards, then we'd say OK, we don't need a ZEV mandate. But that's – you know, that's not likely. Maybe in a Biden administration it would happen. But even then, questionable.

So even though politicians love to say that their policy is banning ICE – you know, internal combustion engines and mandating EVs – the reality is that's probably not the policy instrument that most are going to use. So that, by far, is the most important. And then – but then, you know, you can't sell cars that consumers don't want.

So then there's the economic side of it and you need to create, at least in the beginning, incentives, and somehow – there's a lot of ways of providing incentives to consumers to buy electric vehicles and there's different ways of doing it. Some are expensive to the taxpayer but some are no cost to the taxpayer like – I'll give you my favorite – my other favorite policy and that is feebates, and that's the idea if you buy a gas guzzler you pay a high fee. If you buy a really clean car or electric car, you get a rebate.

And so then that's just an exchange between people buying the big guzzlers with people buying the more efficient, and it's kind of a – it meets the equity consideration because equity is important here. Everything we do we've got to make sure that we don't exacerbate the divide between, you know, the haves and have nots. In fact, we should be shrinking it. So the feebate idea I love it, and a few countries have done it. France did it. Sweden has a version of it. I would love to see the U.S. and California do it.

MR. TSAFOS: Thank you. Let me take you back to reducing VMT because you kind of threw it out there as a target and we all kind of know that we need to do it. But at least economy wide we had a little bit of a lull in VMT and then it kind of went up again. Obviously, with COVID, it's come down.

What are you seeing in terms of successful strategies of really reducing VMT and thinking about what is working out there? Because that's a really – it's a really tough one to crack.

MR. SPERLING: That is a really tough one. (Laughter.)

You know, when VMT per capita started going down around 2005 for almost 10 years, you know, we all clapped, you know, ourselves on the back and said, wow, we've done a great job. Well, turns out it was mostly due to the recession, and it came roaring back. And so the question is what to do.

So Shoshanna is going to talk later, I know, about land use and what we do about land use, and I think that's part of the mix.

But it's a really slow long-term strategy to change land use. There are some simple land use things that can be done. You know, you can require higher density around transit stations. We try it – even in California, though, we can't pull that off. It's been one of the most contentious laws, bills, in the state and it's been defeated every time because the mayors and the cities don't want to give up authority. And so land use is a tough one, certainly in the U.S.

The other thing is to create, and I think the best approach is create incentives for pooling and carpooling and for the ride-sharing services to use – to have pooling. And so what that means is we make it expensive and difficult to drive your own car by yourself, but if you're in a car with multiple people, then we make it easy and we even provide incentives, and that can be everything, like going to the airport.

So if you drive your own car you've got to park far away or if you go in a Lyft with one where you're the only passenger they make you park far away and take a shuttle. If you're in a pooled vehicle, you go right up to the curb and you get right out. And then we can charge fees for the ride hailing for regular cars with congestion pricing. So congestion pricing is a good one where we link that to pooling as well.

So, you know, those are some ideas. I think telecommunications, you know, for employers to provide incentives to their workers to telecommute is another good option as well.

MR. TSAFOS: Thank you, and I'm starting to get a stream of questions from the audience. I'll try to sort of group some of those in, and let me ask – one person asked about hydrogen. Talk to us a little bit about how you think about hydrogen.

MR. SPERLING: Well, I've driven a hydrogen car for the last three years. I gave it up, and I have to say my favorite zero-emission vehicle now is my bicycle. But hydrogen, I think, is important. You know, for what we need to do with hydrogen is shift it more toward heavy-duty vehicles. The focus so far has been for cars. But I think battery costs have come down so much and so fast, and there's so much inertia, that for most cars, battery electrics are going to work.

For the bigger cars, such as big SUVs, big pickups, hydrogen might start making a lot of sense and for the trucks definitely makes sense and definitely for the really long-haul big trucks. There's just batteries – no matter how cheap they get, they're still fairly costl,y and they still weigh a lot and they take up a lot of space. So hydrogen, I think, has a future.

But, you know, we should be thinking about it in a broader way, too, because hydrogen shouldn't be just a transportation strategy. When I talk to my electric grid people and especially here in California where we're well

on our way to using renewables, wind and solar, you know, they all worry that, you know, what happens with – you know, when the wind goes down and the sun goes down. You know, you generate all this excessive – you know, what is really excess electricity when the sun is shining and the wind's blowing, and then what do you do the other time? And so hydrogen is a great way of storage.

So the electricity people say their most desperate need is storage as we move to renewables, and so hydrogen can play that storage where you convert electricity into hydrogen and then you can use it for transportation, for industry, and other sources. So yes, I think we need to come up with a good hydrogen strategy. Policy needs to embrace it.

MR. TSAFOS: Let me take a few more from the audience, and then I want to sort of take us out of passenger to sort of higher sort of larger vehicles. So you talked about trucking a little bit and especially both sort of long-haul but as well as short-haul. But I wanted to also talk about, you know, electric buses and how you think, especially when you look at the electric – the bus fleet has changed dramatically the last sort of 10, 15 years in the U.S. and there's a lot of desire to see electricity being used more. Obviously, China is a leader there and that provides an opportunity with COVID.

So talk to us a little bit more about the outside of passenger sort of road vehicles.

MR. SPERLING: Yeah. You know, in a way it's a similar story about batteries. So batteries have gotten – are getting so cheap that it starts looking attractive for buses. Even though they're big vehicles, it actually works well because they have fixed routes, and they have a mix of routes. So it takes a little – you know, batteries are still, you know, expensive and you don't want to use more batteries than you want – than you need because it is expensive.

But if you can manage your fleet in a way that you have the shorter routes be electric to start with and then you can have little charge stations on your longer routes where you do fast charges at the end of the route, or where you even have inductive charging where you just pick up electricity from the pavement, you can actually just have these certain locations where they can inductively charge.

So I think that, you know, my one – so in California we do have a law, a regulation – we, CARB, just adopted it last year – that requires all new buses to be electric, all urban buses, by about 2029, and in less than 10 years. And so that shows that – and the bus companies are more – bus operators are more or less going along with it.

My one misgiving on that is our transit agencies are in such huge financial trouble. Even before the pandemic in the U.S. they were all – almost every one of them was losing ridership, and now, you know, they've just been devastated and a lot of the strategies for helping them is, you know, having

people not sit next to each other and cleaning the buses. All of that adds costs and makes it more difficult.

So I'm a little concerned about putting new burdens, new challenges. Even though it might make sense economically, you know, the transit operators have so little capacity. They've been atrophying for so long and they don't just – they don't even have the personnel to be able to manage this very well from all but the few largest ones. So I worry about that. But from an economic perspective and a technology perspective and environmental, it's pretty much becoming a no-brainer now.

MR. TSAFOS: One of the audience members asked a question about electric bikes, and since you said that your favorite zero-emission vehicle now is your bike, I was wondering if we could talk about electric bikes. But maybe give us your sense of, you know, micro mobility more broadly and, in particular, what do you think, you know, cities and regulators should be doing to incentivize that and maybe how should we be thinking about micromobility.

I mean, one of the big conversations when it came to ride hailing was, you know, were these services taking away from transit, what was it replacing. It seems for micromobility there is a greater synergy with transit. But, you know, how are you thinking about micromobility. So I want to make sure that we cover the electric bikes question which was there, but, perhaps in answering that, give us a slightly broader sense as well.

MR. SPERLING: Yeah, I will give you a broader sense because I'm a huge enthusiast for the ride-hailing services, for the scooters, for the electric bikes, and the reason is, and this is a little bit more of a U.S.-centric perspective, but it's relevant to many, is that we've become so car-centric and that all the other modes have atrophied to almost nothing.

You know, mass transit in the U.S. accounts for about 2 percent of passenger miles and even less than 2 percent of passenger miles, and cars have just dominated. And so we need to do everything we can to support and encourage any – from my perspective, any mode that reduces the role of cars because it's not until we get a suite of mobility options that people will be willing to give up the car.

You know, there's a few people – so I gave up a car for a year because it really worked for me to have a – use a bicycle and then use Lyft and Uber for other trips and the train for some trips. But for most people, that won't work yet. But if you have the scooters, you know, you have the electric bikes, you've got the – you know, you've got some transit available to you and you've got telecommuting available to you, then it becomes much more plausible, easier, to get rid of a car. And so I'm just a champion of all of these, and we need to figure out how these do.

Now, we want to make sure that it's done in a safe way, an efficient way. But, to me, those are second order questions. So I get really annoyed with mayors when I meet with mayors and they just say – you know, I say Uber

and they say congestion, pollution. I say scooter. They say clutter, danger. You don't get it. You don't get it. We've got to be reducing dependence on cars if we're going to create a sustainable transportation system.

So all of these – all the policies that support those, you know, back to the pooling ideas I had before, supporting, you know, with the scooters and the bikes I think we do need to get better to make sure they don't get abandoned everywhere and become too much of a clutter.

But, you know, mostly that's not a problem. A lot of it is stories that – you know, reporters always have to come up with a story about something sensational and it's easy to write stories about new things, and if you say they're good, that's not much of a story. But so that's a message to the politicians and to the media.

MR. TSAFOS: Well, thank you for that. One of the things that really struck me, I was looking recently at the American Public Transit Association's kind of fact book and a hundred years ago, there were more people actually taking public transit in the states than there are today. In fact, a lot more. So we've had this huge shift away from transit, and so I appreciate what you said.

There are two questions that are sort of related so I want to group them, and that's the last one for you and then we'll go to the panel, and it's talking, essentially, about electrification relative to how we generate the electricity.

So one is more factual, where are we now in terms of emissions based on what the grid is giving you, and the second one was thinking about how that might evolve if you have autonomous vehicles. And, essentially, I think, if I'm sort of paraphrasing the question, is, you know, could you have such a big VMT increase that you lose some of the benefits from electrification.

So maybe talk to us a little bit about how the electricity gets generated and how we think about that in terms of the emissions footprint.

MR. SPERLING: So, you know, I work mostly in the transportation sector and most of my regulatory and research is in that area. But it, obviously, connects to the electricity sector just for the reason you said, Nikos. I think that this is – you know, we always say we don't want to silo, you know, our initiatives and our activities. But this is a case where we need a little bit of siloing, and that is because if we're going to decarbonize our economy we've got to greatly increase renewable energy on electricity side and we've got to have much more – many more electric vehicles.

So we've got to push both of them, and so in some places where you still have a lot of coal, you know, these analyses are done that says, well, an electric vehicle is no better than a gasoline vehicle. Actually, that's not entirely correct. It's still a little bit better but it's not a lot better. But the point is that coal-based system is eventually going to become decarbonized or at least lower carbon.

So we need to – all these changes take a long time. So from a policy perspective or from a strategic perspective, we need to just push ahead with electric vehicles regardless of what the state of the grid is at this moment in time because it will decarbonize. If it doesn't, we're in big, big trouble. So that's kind of the, you know, the electricity generation question.

The autonomous vehicles, and I always call them automated vehicles because they're not going to be autonomous. You know, that's kind of mashing up the English language. These vehicles are going to be connected to each other, to infrastructure. They won't be autonomous. That was a Google expression that stuck.

But the issue with autonomous vehicles – so I wrote a book on it, on "The Three Revolutions" – sharing, electric, and automated vehicles. And there's really one simple issue with the automated vehicles and that is are they going to be personally owned and driven, or are they going to be owned by mobility service companies? Because if they're personally owned, the VMT is going to go dramatically higher.

Research we've done at UC Davis and a number of other universities suggest it's going to be – it could be – the VMT will probably double, and if you just think about it, I've got my automated car. I can sleep in it. I can read. I can use it my office (sic). I can live, you know, three hours away. No big deal. And so there will – I mean, intuitively we know it and research wise we know it's going to lead to a lot more VMT if they're personally owned. So the goal here has to be pooling.

So I said that, basically, there's two strategies for decarbonization. The big one is electrification. The other one is what I'll call pooling, and that's for pooling in all senses of the word. Pooling and sharing. And so we need to make sure that these – the Lyfts and the Ubers and the Waymos and the Olas, all of these companies, as they expand that they use these automated vehicles and we make incentives for them to have multiple passengers.

And I'll just put out one, you know, endorsement. General Motors, just a few months ago, came out with a prototype vehicle they unveiled that they said they're going into production with, and it holds six or seven people. It's automated, electric, and it's pooled, and I think, you know, that's what we need to be thinking about and that's what Lyft – you know, Lyft and Uber, I'll have to say this, both of them would love to have automated cars and both of them would love to go electric.

So, you know, we're not swimming upstream with that one. It's more like how long is it going to take for the automated technology to become acceptable, safe enough for us, that we'll accept it for – you know, for everyday use.

MR. TSAFOS: Well, Dan, thank you. If we were in the building I would ask everyone to do sort of a virtual round of applause for Dan. That was a fantastic opening. So really appreciate your insights.

MR. SPERLING: Thank you. Thank you very much.

MR. TSAFOS: So now we're going to turn to the panel part of the conversation. We have Anand, Dan, and Shoshanna.

So let's start with Anand from Ola Electric, and I guess there was a few things. First of all, maybe tell us a little bit about Ola Electric. But I was hoping you would bring us a little bit more into an emerging economy perspective focused on India, and there was lots of different questions that, obviously, swirl around in my head when I think about this. One is, you know, in the U.S. we, obviously, think a lot about cars and, as Dan said, it's become a very car-centric society. Not the same picture in India. A lot more sort of two- or three-wheelers. But also, I think, there's been this enduring debate in the transportation world around, you know, what does vehicle ownership look like in a place like India; does it sort of follow the trajectory of the United States or does it look different?

So let's start off with kind of how the world looks like from your side of the world.

ANAND SHAH: Sure. Thank you. Thanks to CSIS for putting this together, and it was great to hear from Dan.

So just quickly, Ola Electric is a spinout from Ola, which Dan mentioned, but Ola is a ride-hailing business in India. It is Uber's competitor local. It's grown internationally. It's also present in Australia and New Zealand and the U.K. It has a fleet business. We're the largest car owner in India outside of the government. We have a financial services business that was really driven to help insured drivers to pay for their vehicles, and we're able to manage cash flow.

And we looked at electric a number of years ago, largely, because we deliver a lot of kilometers every day. I mean, in the case of India, it's VKM or VKT, and we deliver a lot of kilometers every day moving people on predictable paths for the most part, and being able to convert that to electric seems like something that we are better positioned to do than others, given the nature of our business.

We did a pilot in 2017 and '18, and soon after decided that electric has a lot of promise. In the case of an emerging market like India where, literally, all of the oil is imported, car ownership is still very, very low. But the aspiration continues to be one that's been driven by the global set of aspirations including what we see in China, which is that upward mobility involves an ownership of a vehicle at some point. We think that it's early enough in India to change that idea in some form.

India is very space constrained, especially in urban areas. So issues around parking are increasingly becoming very heated in the post-COVID environment. This sort of stark difference in air quality pre-COVID and during COVID as the lockdown, really, I think, is making people scratch their heads about what the future can look like and whether, you know, I should be waking up to spend three hours, you know, going one direction on the road to breathe bad air to get to work that I can now do from my home.

So I think there are a lot of questions that are being raised. But, in short, we've been focusing specifically on lightweight high-utility vehicles. So, for example, the two-wheeler and the three-wheeler are highly dominant in India. By definition, both of them actually tend to do quite a large number of kilometers. Electrifying them seems to be simpler. Infrastructure is a challenge, so we focus currently on battery swapping, not for large vehicles but sort of ones that you can carry as a human being and pick up. Therefore, you can make the vehicle even cheaper, and as batteries get cheaper, we can sell the vehicle without a battery and you pick up a battery that you pay for for the power that you use it. But, in a nutshell, that's where we are. We've made a public statement to put a million vehicles on the road in the course of the next two years or so, and in electric and, you know, we hope to get there.

MR. TSAFOS: Thank you. I'll come back to you to talk a little bit about that 1 million vehicles, and I'm particularly interested in, you know, what are you thinking of the barriers or what might be things that help you or hinder you from getting there. But I'll come back to you on that.

Dan McGrath from DHL, I want to bring you into the conversation. And, obviously, you've put out some very ambitious targets in terms of where DHL wants to go in the long term in terms of your GHG footprint. Tell us a little bit about how the world looks like from your end and what are the things that you guys are grappling with.

DAN MCGRATH: Thanks, Nikos. Yeah, and good morning, everybody, and thanks as well to Dan and Anand for the prior words.

Yeah, I mean, many of you will be familiar with DHL as a company I'm sure and our brand. But just by way of a quick introduction, I think we have – here in the U.S., we have a number of different business units. So the express one, which I think most of you are familiar with, is our international package delivery business and that's quite asset intensive with primarily aviation and road transport assets.

But we also have some what I would call lesser known, at least to the people not in the industry, operating units. So one is the freight forwarding unit, DHL Global Forwarding. That is the number-one air freight provider and number-two ocean freight provider in the world, and that – it's asset light as a business model. So we work with lots of carriers. And we also have what's called DHL Supply Chain, which is a contract logistics company which works with companies as a third-party logistics company providing

warehousing and transportation. That's also an asset-light business, relatively speaking, but they do invest in their own assets as dedicated transportation assets for customers. So we have a whole mixture of different models and different challenges across those business units.

And back in 2008, we, I think, moved very early within our industry to announce some carbon efficiency targets, which was to reduce our emissions by 30 percent by 2020 over a 2007 baseline. By 2016, we had already actually achieved that. But what we found was that, you know, the industry had moved on as well and public sentiment had moved on and the awareness of this topic had moved on as well.

So we decided to set a significantly more ambitious target, which was quite aspirational in nature. It was to achieve zero-net emissions by 2050, and I think, you know, you'll hear now quite a few companies have embraced that and, obviously, we'll have to achieve that target in California five years ahead of time, judging by Dan's remarks.

So we've set up that aspiration and but just to lay out some of the challenges of, you know, what we're working through, around 80 percent of our emissions are Scope 3, so they're not generated in-house, and a lot of that will come through aviation suppliers, although we do operate our own aviation, and through ground transport.

But we also, as I mentioned, have a lot of assets of our own. So we – you know, I think around 86 (percent) or 88 percent of our total emissions currently are generated by air and road. So that's a combination of Scope 3 and, obviously, Scope 1. On the Scope 2 front, we do try to source 100 percent green electricity. So I think we're at around 94 to 96 percent, a hundred percent in the U.S. I think we're performing relatively well there.

But in terms of the challenges we have across the short-haul market, what we'd call the last mile, I think this is the area where we've probably had the biggest increase in efficiency and the best performance, and a lot of that has been thanks to electric and alternative fuel vehicles.

We have around 11,000 globally, many of them in Germany, but also here in the U.S., I'd say about 13 (percent) to 15 percent of our fleet is alternative fuel electricity but also propane and hybrid. In Manhattan, for example, we have a fully natural – well, a fully green fleet. And we've recently launched, as another example, cargo bike projects in New York and down here, near where I am, in Miami.

So we're making progress across the last mile. But there's still some way to go, and I think the challenge we have in that area illustrates the broader challenge for the industry and I think Dan alluded to that, which is that the technology – we still need the technology and by that I mean the transportation assets to improve or at least the supply and the performance of those assets to progress.

We're doing our part by setting out broader ambitions and also by investing in these technologies and deploying them. But what you have here in the U.S., for example, would be that the – you know, the OEMs, the major OEMs, don't yet manufacture a viable, even on the short haul, a cargo van that fully meets our needs. So we've tended to work with startups or startup-type ventures, which brings its own issues. You know, we very much welcome that but, at the same time, they might – you know, there's a high risk of them going out of business, facing cash flow problems. Their supply chains perhaps might not yet be mature enough to serve a company of our scale.

So, you know, we have to work with them and at the same time hope that the major OEMs who have the production capacity and the supply chains will advance their own electrification agenda. So but at the same time then that gets exacerbated when you move to longer-haul vehicles where we do feel there's a gap in market right now, and I'm very much hoping that we – our supply chain division made a commitment to purchase 10 Tesla semis and once they enter the market, and you know, we're committed to working in that area and we have to to meet our own goals. But at the same time, we do think, you know, there's still challenges to be overcome in the areas of battery performance and range.

And then beyond that, just finally – because I don't want to talk for too long – I think, you know, when you go longer-haul still, I think that then illustrates the more effective approach we can take right now, which is in the area of efficiency.

So we have the technology is one thing. Our philosophy is to burn clean and to burn less. So burning clean is all about alternative fuels and using alternative sources. Burning less, I think, comes through efficiencies we generated by technology where we can plan our routes and achieve higher unit – well, lower emissions per unit of production through better efficiencies by filling the planes sort of flying around while they're still generating emissions, but at the same time utilizing our capacity more effectively and working with our suppliers and our customers then to make their emissions more visible and to devise strategies to reduce them. So, obviously, a very broad and challenging domain across many fronts.

But I think, first of all, we're making the investments that we need to and trying to move the market forward, and at the same time we're issuing a call to action to the market with a target of zero emissions by 2050 even where we don't see the exact pathway we're going to take across certain modes of transport.

MR. TSAFOS: Thank you for that, Dan. I really appreciate of you explaining, if I can put some words in your mouth, that you're not really a technology taker as much as you are both a taker as well as kind of like an enabler; that you're not sort of a passive recipient of what the world is doing out there but you're trying actively to create some of these opportunities.

There's a few things you didn't talk about that I'll come back to you when we do our second round. One is on regulation and talking a little bit about how you see the regulatory environment either inhibiting or facilitating that transition, and the second thing is you talked about it towards the end there. You talked about your customers, and I think it's very interesting how you think about is this – is the customer asking for this, is this DHL sort of pushing for net-zero GHG. You know, is the customer willing to pay anything extra or is the customer kind of waiting for the cost to come down before they come onboard. So regulation and sort of the cost and the discussions with the customer, I want to come back to those conversations when we come back to you.

But I want to bring Shoshanna in for a second here, and I think, you know, part of what – part of the reason we wanted to have you on this panel, Shoshanna, is I think you bring a very different sort of perspective, which is how we think about our cities. And so one of the things that I remember you wrote – maybe it was last year or so – kind of like a general skepticism towards smart cities.

So I was wondering if you could tell us a little bit how you think about those kind of challenges.

SHOSHANNA SAXE: Thanks, Nikos, and thank you, everyone, who's spoken already.

So the criticism of smart cities and a tech-first approach came from the fact that it's very unlikely to work. The types of questions we're talking about now need solutions that last for the long term and that incentivize and reward behavior that's in the interest not only of ourselves but society at the same time, and a lot of the tech-first solutions are things that are likely to break and also follow on a history of technologies that have been proven over and over again to fail.

So since we're talking about transportation, let's talk about cars. We've got almost a century of history of being car-dominated and we've seen all the ways in which that fails. It creates a lot of pollution. But one of the main failures of cars is that they can be great if not that many people own them. But the more people buy a car, the more useless they are to everyone else who already owns a car.

So if you're sitting in traffic for three hours, it's not because you own a car. It's because everyone else owns a car. But everyone else is sitting in traffic for three hours because you also own a car. And a lot of the technology solutions that we're looking at don't solve that fundamental physics reality that cars are very inefficient, they take up a massive amount of space, they cost a ton of money, and they make a huge amount of pollution.

And whether or not we're talking about autonomous cars, which are likely to be very similar in terms of, like Dan was saying, just incentivize more people to drive a little farther, or if we're talking about electric cars, which are better outside the tailpipe but still have massive implications in terms of

how much infrastructure we have to build for them, which has major environmental implications.

The physical body of the car, the batteries, have major environmental implications, but the – also the type of land use and relationship between space that they continue to incentivize has lots of negative implications.

So take advantage of my virtual background. Many people might be familiar with this famous transportation picture, which just shows how efficient – inefficient it is – I think if I point that way – to carry people in a car versus by bicycle or by bus. But the modern version of that is this. It's people in a car, people in an Uber, or people in an electric car. It's still massively inefficient, even with a lot of our new technologies.

Dan was saying that we really have to be shared and, in theory, that could work. But the research we saw around things like Uber and shared vehicles was it just makes more pollution. It makes people drive more. So it can be very appealing. Like Dan said, if we can have a technological fix it's, in some ways feels, like it would be the easiest thing to do. You know, we don't have to change our behavior. Consumers can just – eventually just go buy a car and everything will feel the same.

But, in reality, it's very unlikely to work and it's also very hard. I think the first time I was promised the future was autonomous was 15 years ago, and they said in five years everything will be autonomous. I think the only reason for me that it was 15 years ago was because of how old I am. I think if I was older, I'd be able to name an earlier time period.

So we've been promised the autonomous future five years away ad nauseam, and it's not coming. The tech isn't working. Whereas, there's lots and lots of existing technologies that work really well that have been proven all around the world and for some reason, we're hesitant to use them.

I mean, I'll speak mostly about North America. We used to be the people, the countries, most ambitious about change, most thinking we can solve all our problems. We can do wild things. And now, especially when we talk about transportation, we talk mostly about we just want the old comfortable things, that we're not really willing to try anything new.

But that gives us a great advantage in that countries all over the world, from Europe to Asia to India to Africa, have done all kinds of things that are already working, and we can copycat them. We don't really need new ideas anymore or new technologies. We know public transit works. We know bikes work. We know land use planning works. We don't need a newfangled piece of technology to solve problems that other people have already solved.

MR. TSAFOS: Thank you, Shoshanna. I want to come back and, essentially, continue where you ended and especially in terms of the land use aspect, but in

terms of how you think about, you know, how do we get – as you say, like, we have a set of tools or policy that we kind of know work and have worked, but we can't really seem to implement them. So I'd love to get some thoughts on some specific things that you think we might do to get greater adoption.

Anand, let me come back to you and take you to that million vehicle question. In particular, talk to me a little bit about the ecosystem that will enable that or the ecosystem that you think inhibits that, and the extent to which or how are you thinking about that vision versus sort of, you know, private ownership.

You kind of said that India is early enough we may avoid the same trajectory. Are there things that are happening that are worrying you in that regard or you still think that that's still sort of the right way to think about it?

MR. SHAH: Yeah. I mean, I think it's a mountain to climb to convince India and Indians to take a different path, and so that worries me, generally speaking, is that everybody's got to want to climb.

But I do think that, you know, for example, you know, this land use question is an important one and pretty much every rule about land and roads and width of roads and buildings you can build anywhere in the world have something to do with cars. They have something to do with, you know, how much parking there is and what you can build on this road in order to avoid that.

And India, weirdly, never really figured that out. So there just isn't any space and there's no place to do anything with private vehicles, and I think people know that. You think of congestion in a place like Bangalore or something along these lines. Our view on this is, OK, well, we're in this situation where no matter what price oil is at, for India it is, you know, always going to be imported and complicated.

India has made major statements and is doing a lot to put renewable energy in play. Renewable energy needs storage in order to be able to counter fossil fuel-based generation and, by the way, the biggest kind of storage you can find en masse where consumers can pay for it, you know, is, potentially, electric vehicles, if the grid gets its act together.

You have people who are upwardly mobile. They want to move more, which, you know, could turn out into a – you know, a consumption of VMT or VKT in your own vehicle, or you provide an alternative that is a bit more interesting. And that's really where we are, is in the third part of this: is if we know that battery prices are going to go down or fuel cells are going to get cheaper and that people want to move more and we don't have infrastructure, how do we actually do whatever it takes to capture that opportunity and define it as a clean way of moving?

Our view on that as the low-hanging fruit is in fleets. They're rational purchasers, whether it's us ourselves. You know, we buy a vehicle based on what's cheapest to maintain, you know, what has the best resale value, where the engine parts are available wherever our vehicles might be. So we would be a buyer of something that is more efficient, cheaper to operate, more reliable, which electric promises it could be. That could be in the four-wheeled sort of car space.

There's also a lot of stuff that already exists. So, for example, you know, a product that people don't talk about, India has this ubiquitous three-wheeler, the auto rickshaw, but it's, literally, a first and last mile movement machine. No one goes 50 miles in it. They go to get to the metro station. They go to get to, you know, the bus stand or they go to get to the grocery sort of space, and you don't need a 2,000-kilogram vehicle with air conditioning to go two kilometers, right?

But we think of it as an obsolete vehicle rather than being something that could be brought into the modern age that is electrified, and it delivers, on average, more kilometers per day, 2X to 3X, of what a car does, right. And it's shared, by definition. That's what it does, right.

The same is true of a two-wheeler, which we're beginning to see everywhere in the world. India, you know, has – is a large two-wheeler culture but, you know, I've been watching stuff online and there seems to be this very interesting emerging electrification of bicycles opportunity that looks a lot like the first time we motorized the bicycle in the early 1900s and put a little motor on a bicycle that happened to be gas. But today, we're doing that all over again, and that may actually solve a whole lot of interesting first- and last-mile problems.

So our view on this is think of this blue sky, right? If you have the raw material that electric is coming and needs to come, in the case of India, no, you're not going to get any space. You're not going to get any oil anytime soon. People want to move more as long as you make it attractive and frictionless for them, which may be to make the other version more – you know, more of high friction and less attractive.

If you do that, there's got to be a product market fit that's also a product society fit that can work. And so we've been focusing on two-wheelers and three-wheelers, and if no one else is going to build the infrastructure, at least for the fleet use case, we'll build it for ourselves.

MR. TSAFOS: Thank you for that.

Dan, let me come back to you. I'd already said that I wanted to talk about regulation. There was also actually one of the questions from the audience has been sort of – I'm sort of paraphrasing – is regulation kind of like helping or hindering? Like, this move that you have, is it kind of like pushing you in one way or is it sort of its absence or what exists there holding you back?

So if you can do that, and then if you have some thoughts on the question of the customers and the price point I would love to sort of hear how you guys are thinking about that.

MR. MCGRATH: Sure. So we – I mean, on the regulation point, we, obviously, work around the world in a large number of different regulatory environments, and we try to adhere as much as we can to a standardized operating model the world over.

So, for us, it's a combination of working, you know, above the regulations. That sounds like, you know, the wrong way of putting it. But setting our own ambitions and defining for ourselves the minimum standards, as they were, and we want to place them as high as we can regardless of regulatory environments. And then, obviously, around working with regulators very closely in the markets where we operate to make sure that we're sticking to those standards but also helping to define what will move the industry forward and influence and benefit our customers, and then the overall economy itself.

You know, obviously, any question of regulation is about carrot and stick, and, you know, I know Dan referenced earlier that we perhaps need a bit more of both and, certainly, we need more regulation to move things forward for us. Here in the U.S., for example, we work very closely, particularly, with local administrations.

So to give you one example, you know, we launched the New York cargo bike solution with – you know, in close cooperation with the city, and that wasn't an overnight process and there were things we had to work through. But, obviously, cities are extremely interested, not necessarily from a carbon perspective but mainly due to, you know, fine particulate emissions, reducing them and improving quality of life and, potentially, reducing congestion. But even then, you know, you get questions about will bikes reduce or contribute to congestion.

We're very much in the camp of, obviously, believing they will reduce, particularly if the infrastructure is built for bikes. So, you know, we work with them but, you know, I guess the most urgent or the most important carrot for us would be in terms of accelerating production of EVs and anything that can be done, and the ticket price of an EV right now is significantly above that of a diesel or conventional fuel vehicle.

You could argue that the total lifetime operating cost can be comparable, although, you know, in our experience so far within the U.S., it's still higher. So anything that can be done to create either tax incentives for acquiring those vehicles or incentives to accelerate manufacturing of them would be, obviously, something we would very much welcome.

But we're also realists beyond the carrot. You know, when it comes to sticks we recognize that they can be needed, too, and it's not necessarily a

bad thing for a company like DHL. So, you know, we can realize benefits and even competitive advantages by being ahead of the curve before sticks are introduced.

And, you know, that's a factor in our – we have a 20 – an interim target of having 70 percent of last-mile deliveries performed with green vehicles by 2025, and you could say in many respects that will be, you know, in, hopefully, many markets ahead of the curve in terms of cities imposing their own restrictions on – in a city operations with conventional fuel vehicles. We're seeing already in Germany cases where that has happened.

So, you know, Stuttgart, for example, is, largely, emissions-free in the city center, and we have the advantage of already having deployed emissions-free vehicles in that city. So, again, we recognize that the sticks are out there and they're – you know, that in some cases can be needed. So it's our job to anticipate and be ahead of that and, you know, work around it and work with it.

Then on the customer side, you asked about the willingness to pay. I mean, I will put it down to a few different factors. So the first would be we see it as our job to create a green operating platform in the first place for our customers because that in itself is something that helps us win tenders and win business.

Some markets have more of an appetite. Some customers have more of an appetite. You know, there's a well-known apparel manufacturer or retailer here in the U.S. which we work within our supply chain division, which is pushing us and challenging us to develop more green solutions.

So, you know, it's a mixed bag, I would say. But if you were to ask is a customer willing to pay more for a green solution, being realistic, in most cases the answer is definitively no. They might argue that they would expect it anyway from a company like DHL, which is why the operating platform comes in as part of our value proposition.

The one area, however, where I do think, you know, I'll call it a frustration. I'll call it an aspiration. We have stated as well as an interim goal by 2025 that 50 percent of our sales will incorporate a green solution. And behind that is not just a desire to help people send packaging – you know, packages with offsetting solutions or to use recycling; it's really to share with us the ambition of developing green solutions, using circular-economy philosophies and methodologies, or implementing more aggressive investments in technology to achieve green results. And that's an area where we do hope that some of our forward-thinking customers – who, in turn, are also driven by the end consumer – will work with us and be willing to, you know, share with us or absorb perhaps a little bit more cost, but through that realizing a competitive advantage as well as the sentiment changes.

MR. TSAFOS: Thank you. By the way, we have about 10 more minutes to go and I'm seeing a bunch of questions coming in. So I'm going to plant in your head, Dan, two more questions that pertain to you.

One is about your bike cargo initiative and kind of like what you're learning on that, number one. And number two is – the question is phrased a little bit differently, so I apologize to the person who asked it. I'm going to tweak it a little bit. You know, how you think about the different sort of modes – rail, air, shipping, trucking – in terms of are you – if I can paraphrase a little bit the question, like, are you trying to push logistics to one preferred form when you have that option, because it's more sustainable? So how you think about, essentially, a model choice. So I'll come back to you for those two questions so if you can start thinking about those.

But I want to go back to Shoshanna and I wanted to, you know, since kind of Dan's role was to – Dan Sperling's role was to throw a bunch of things and then we'll put them in the background, but one of the things he said that I thought was very interesting is this, you know, land use can be slow and can be politically challenging, and that's true.

At the same time, we have sort of a land use experiment going on right now in the world around COVID, right, where cities are sort of repurposing public space. They're trying to rethink about, you know, who gets access to streets.

And so I wanted to come back to this question of land use but maybe with a little bit more of a COVID-19 angle and what are the types of things that you're seeing out there that make you hopeful that maybe, you know, the land use paradigm that you described in your previous answer might be kind of sticking a little bit more?

MS. SAXE: OK. Thank you. So I'm going to talk about the things that make me hopeful and also the things that are terrifying me. So the things that make me hopeful have been a real realization in many cities, though not all, that we need space for people to move around and that for people to be able to move around safely and to choose active transport, you have to have the infrastructure involved.

So one of the classic lines about bike lanes is just like you can't tell you need a bridge by where people are swimming across a river, you can't tell you need bike lanes based on where people are biking, and that's been a loophole that many North American cities especially have been stuck in. They say, oh, not that many people bike. We shouldn't make any bike infrastructure.

But just like we know more people drive cars when you make more highways or more lanes, it's been the same thing over and over with bike lanes, which is when you make safe infrastructure people show up en masse. We have seen in many cases in Toronto, where I live, that when you

build a new bike lane, the number of people cycling goes up by a thousand percent. So just the scale of change can be astronomical.

One of the really exciting things about bike lanes is that they're fast and they're really, really cheap. So you can build a city-scale bike network for tens of millions of dollars. That's the cost of one highway interchange. So we tend to think of infrastructure intervention of things that cost hundreds of millions or billions of dollars that take 10 years of planning and 10 years of construction.

But for active transport interventions, which you can do to make the lives better of a lot of people all at once, you can do them on the scale of a year for really not that much money. And so it's been exciting to see cities like Paris, like Milan – in Canada, Montreal has been a leader – saying, we're going to do this and we're going to do this now, and then once people experience it, they tend to like it a lot, and whereas it's hard to imagine in advance, once you've lived it, it can be pretty great. So that, I think, is one potential benefit that we could maintain from COVID in the long term is this massive increase in biking.

Some of the things that are really scaring me about the way we're talking about cities and land use around COVID is that there's been a false belief that COVID is driven by density and a false belief that COVID is driven by public transport, and the reason I say those are false is because all of the data shows that they're false. COVID has not been correlated with density. Many of the most dense cities have had much more success than other cities, and even in the cities with a lot of COVID, it tends to be more determined by poverty than by density.

And so what we're looking is – are crowding disadvantages. It drives determinants of health, just like – we knew that before. But this belief has taken off that it's density. And so people – and, similarly, with metros people are – say, you know, are assuming that travel by transport will be really dangerous. But we're starting to see data out of places that are still using their transport networks heavily, like in Japan, that there's very little transmission going on, especially if people wear masks and don't yell.

So I'm worried about the increasing acceptance of things that are not true. So where does that leave us when it comes to land use, going forward? One of the big things about transport is that we tend, as we've mostly done in this conversation, to focus on what's coming out of the end of the car.

We focus on the tailpipe emissions when we're talking about environment, and that's the symptom but it's not the disease. And we struggle and would benefit from stepping back to talk about what is really driving all of this pollution in the first place, and it's the need to move. And mobility is a good thing. We want to be able to meet our needs. We want to be able to get where we go.

But movement in itself is silly, right? If we were just promoting movement all the time we would all be running around and driving as much as possible and never getting anything done, and we know that that's not our goal. Our goal is for people to have a good quality of life. You want to be able to get to work. You want to take your kids to school. You want to be able to shop. You want to go somewhere to have recreation.

And that's accessibility. It's not about mobility. It's about where can you get from where you live, and many of the best places you don't have to go very far to do that, in part because things are nicely organized, or we have a nice mix of the way things are built, and a lot of the places where we're seeing more and more pollution from transport are because we've used our land in really nonsensical ways, and there's often really strong rules that people don't know that much about.

So parking minimums are famous in the transportation sector but not something that gets discussed that much by the general populace, which means you have to dedicate a lot of space to parking, which means things have to be really far apart. We talk a lot about the rights of homeowners, but in many cases it's totally illegal for people to build a second unit in their home to make money, which would also increase density.

It's often illegal to run a business out of your home. It's often illegal to grow food in your home. So all of these things are regulatory based, and we just don't talk about why do we, especially in North America, have to travel so far in the first place? Why don't we have things nearby? Why aren't we taking better advantage of the forest and farmland we're turning into built-up areas to make nice places where lots of people can live?

MR. TSAFOS: Thank you for that, Shoshanna. I am mindful of the time and I'm mindful of the time versus the questions that are coming in. So I will apologize to the people that have asked a question online that I'm not able to ask. We only have about, you know, three or four minutes to go and, Dan, I've already sort of put a couple questions to you so I want to give you a chance to tackle those, and then if we have time we'll do one final question. But I wanted to give you a chance to respond.

MR. MCGRATH: OK. I'll give you a very condensed answer, Nikos, to those two questions. I mean, in terms of learnings on cargo bikes, we'd already had the benefit of having deployed cargo bikes in Europe and seen where they can be beneficial, albeit with a slightly different infrastructure and operating environment.

But we're very much committed to deploying cargo bikes as in when they can – as in when we can, rather. I think the major challenge in that or the major consideration is that we can only deploy cargo bikes in high-density environments. So where we have a lot of deliveries to be made, you know, of smaller packages, which tends to be downtown urban environments. So we're doing that on a targeted basis.

But they're more productive than vehicles and they also have to work in a modular – you know, we tend to deploy modular bikes that can carry containers, for example, that can be integrated into our overall operation and then carried by van over the long haul, which, again, raises the question of it only really works end to end if we have electric vans operating in that environment, which is, again, a factor behind that.

There's no silver bullet. We need a combination of all of them. But we're very much committed to rolling out cargo bikes wherever we can and wherever the regulatory environment allows for that.

And in terms of modes, yeah, I think that was a great question because it touched a little bit on a point – (inaudible) – the first one. In terms of our Scope 3 emissions, I think last year, in 2019, we reduced our overall emissions globally by half a million tons. And the bulk of that, despite the fact we had increasing volumes – we were flying more – came through ocean. And a big part of that is what our forwarding division is doing in terms of providing modular – intramodal or intermodal solutions that combine, for example, air and sea, because the issue you have, in the end it's all about inventory management and the customer strategy around that.

So if they want the just-in-time model. They want a minimum amount of inventory, which requires, generally, quicker modes of transport. So it's our job to help them through that while – and combine the modes while still enabling the use of lower modes of – slower modes of transport where possible.

I think what you see now with COVID-19, for example, a lot of people speculating that companies will want more inventory to mitigate for any potential risks or shortfalls or supply spikes – sort of demand spikes. So, again, you know, we're encouraging customers to become more efficient in the way they forecast, develop the technologies, and they manage their volumes.

But we do try to migrate to slower modes where that fits the customer's model and, therein, customer's demand. But faster doesn't always mean that it's necessarily, you know, worse for the environment if it can also contribute to slower – lower levels of inventory within a customer's supply chain, which means lower overall aggregate vehicle miles travelled. So, you know, it's also a tradeoff about enabling that.

But we do, again, particularly in our forwarding division and our supply chain divisions, work very closely with customers to try and optimize their supply chains to use the slowest mode that is acceptable to their supply chain because rail, sea, road, they generate significantly lower emissions than air – obviously, significantly lower – and there's a benefit where their supply chains can accommodate that and that, you know, it allows them to carry enough inventory to meet their customers' needs.

MR. TSAFOS: Well, Dan, that was great. Thank you. I don't know about you, but I thought this was a fantastic conversation, and we've run out of time. But I just want to say I really appreciated, you know, Dan Sperling for kicking us off and then Anand, Dan, and Shoshanna for the panel discussion.

We covered so much ground and I think, if anything, we highlighted just how many different aspects of transportation we have to think about as we consider sort of the long-term net-zero sort of decarbonization of the sector.

So I really want to thank our speakers. I want to thank you for listening. I want to thank you for sending in your questions, and I apologize if I wasn't be able – if I wasn't able to get to them. But thank you, again, for tuning in and please be on the lookout for the remaining chapters of this conversation.

Thank you.

(END)