



Mpact Podcast
Episode 68, June 2023
Micromobility and Access
With Hussein Mahfouz, Transport for Cairo, and
Adham Kalila, Streetlight Data

www.mpactmobility.org/podcast

Unedited Transcript

Tamar Shapiro (0s): Welcome to the Mpact podcast. This is Tamar Shapiro, CEO of Mpact, formerly known as Rail~volution. We are excited to have recently announced both our new name and tagline, Mpact: Mobility, Community, Possibility. We're a national organization working at the intersection of transit, related mobility options and community development. The podcast is a chance to hear from a range of voices as we go deeper into how to leverage transit to make communities better for people.

Jeff Wood (42s): Hey there, I'm Jeff Wood, principal of The Overhead Wire and your host. This month on the Mpact Podcast we're joined by Hussein Mahfouz of Transport for Cairo and Adam Kalila of Streetlight Data to talk about their new report, created for NUMO, *All Possible Commutes: How Micro-mobility and Realistic Car Travel Times Impact Accessibility Analyses*. Stay with us.

Well Hussein Mahfouz and Adam Kalila, welcome to the podcast.

Hussein Mahfouz (1m 16s): Hi. Hi Jeff. Thank you. Great to be here.

Jeff Wood (1m 18s): Yeah, thanks for being here. Well, so before we get started, can we tell us a little bit about yourselves and we'll start with Hussein and then we'll get to Adham next.

Hussein Mahfouz (1m 25s): Hi. Well a little bit about me. I'm currently a PhD student at the Institute for Transport Studies at the University of Leeds. I got into transportation shortly after I did an undergrad in civil engineering and eventually shifted away towards transportation and worked in transport for Cairo, an Egyptian consultancy that focuses on like initially transport in Cairo but now like it's more transport in very different places across the world.

And that's where I got to learn about accessibility and multimodal transport and transport data analysis and all of that. And that's how the journey I've taken has been very much rooted in that experience. So that's me.

Adham Kalila (2m 11s) I can tell you a bit about myself. I started also in civil engineering and then I moved back to Cairo and I had a general interest in urban planning and transportation, but then it really coalesced when I met a bunch of guys who wanted to map the bus network in Cairo because there was such a lack of data and that's how Transport for Cairo was founded.

And then shortly after that I went to do a master's degree in transportation engineering and urban planning at MIT and then now I'm actually at Streetlight Data doing custom projects.

Jeff Wood (2m 41s): Awesome. And then how did each of you get into transportation? Like what was your earliest kind of introduction to it? Were you always drawn to it or was it something that came on maybe later in life?

Hussein Mafouz (2m 50s): I think transportation for me, like many people in Cairo is something you have to suffer I suppose on a daily basis if you're not living like within walking distance of where you need to go. So it was always something I was interested in transport and the built environment, but I didn't know it was a career path you could take and eventually like shifting away from civil engineering I found Transport for Cairo. And we started working on a study like I was hired as a researcher to work on a study on like multi-modal transport in greater Cairo, this big World Bank study.

And I was a young researcher so it was like a lot of exposure to what is like the state of the practice in transport planning and also working in a data scarce environment, data collection, processing and so on.

So that's what how, how I got into transportation and I think the way transport is very closely tied to things like life paths and social inclusion and equity and so on, I think kept me hooked.

Adham Kalila (3m 56s) I also grew up in Cairo and had to suffer through a lot of traffic jams going to school every day. And I remember wanting to choose a career path and sitting down with the guidance counselor and saying, I want to be a mechanical engineer so I can build Egypt's first car. And he looked at me, his name was Mr. Neil, he was American and he said, "Egypt doesn't need more cars, you need trains." And you convinced me to maybe look into trains. I also did civil engineering and for some reason I didn't specialize in transportation when I was doing my undergrad, I did structural engineering in geotechnical engineering.

But then four years later when I was applying to grad school and I had actually lived in Cairo as an adult, I immediately wanted to do transportation. It was the one thing that in civil engineering was something that I could still be interested in, wanna work in every day. So I, I applied to a transportation engineering degree and I got in.

Jeff Wood (4m 50s): You both mentioned suffering. I want to know a little bit more about, before we get into talking about the report, I wanna know a little bit more about Cairo and the transportation system or lack thereof there. I heard the word suffer, it kind of made me want to hear more about what that means, what the system's like, what folks have to go through when they're trying to go about their day in city or even the region. I'm curious about that from your perspectives.

Adham Kalila (5m 12s): All right, so Cairo's a very, very quickly growing city. So if you had looked at it a hundred years ago, it was kind of very close to the Nile and then it started expanding in the earliest like suburbs and back then they, they had cared to connect it with rail, like I remember Heliopolis though it

was built about a hundred and something years ago and it was connected by tram immediately to the, to the downtown. But then around the eighties when they started creating new communities out in the desert, there was maybe a plan to have a rail connection within the new urban communities out in the desert like the fifth settlement to the 6th of October City.

But then that quickly gave way to a new ideology that centered around cars. And so the farther you get from the city, the worse the public transportation connectivity becomes and the more reliant on private cars the city becomes. Nonetheless, if you wanted to, you can still live in the downtown. There are like parts with varying prices for all kinds of society members to live in downtown.

And, and we do have some very well-planned public transport.

Like we have three subway lines and they're expanding and we have a network of formal city buses that's also buttressed by a huge network of concession style buses like 28 seater, 14 seater, seven seater, like micro buses we call them. And then once you get into the very smaller parts of town where the government doesn't really try and control too much, you get the the rickshaws and auto rickshaws. So there's a wealth and variety of different public transportation options, but if you can afford it, everyone automatically defaults to a car because that's kind of what the planning has been signaling for the last couple of decades, especially in the last five years.

The road infrastructure is improving tremendously and everything else is just kind of staying the same. The subway improvement is slow, it's not everywhere but it is happening. So you kind of get mixed signals, but the main signal you get from officials is that cars will get you everywhere the fastest.

Hussein Mahfouz (7m 26s) I think it's good to compare Cairo with other cities just to get some perspective. You have Cairo or Greater Cairo as a city with over 20 million people and we have like Adham said, three underground lines or the third is just like towards completion.

Now compare that to other like major cities like London I think is nine, 9 million, 9 million people and they have over 10 underground lines and an overground network and very good rail access outside of the city and lots of similar like Tokyo, New York, so on.

So the underground cannot absorb all of these people. So there's lots of like surface public transport and you have the Cairo Transport Authority which operates all of like the big 50 Caesar buses, but there isn't a lot of investment in it. So the buses are old and they break down and they, they don't really get you everywhere and there's no right of way bus lanes and so on. So they can be very slow, especially in peak hours and so on. So you get the micro buses which have developed a network in parallel that is sort of what you would call like more direct services, more direct services get you from one side of the city to another and so on. They're a bit more expensive, but there it is like 14 seater micro buses, they operate everywhere. In some places they are competing with the formal transport network and in some places they're offering a service where a service isn't provided, especially in some informally planned areas where maybe the roads aren't wide enough for public transport.

So there are a range of options but there is a lot of, I suppose room for improvement in terms of like public transport right of way and integration between the different modes to make public transport a good alternative to private vehicles.

Adham Kalila (9m 15s) I wanted to go back to your question on suffering. There's also a bit of chaos in this street. That was always an aspect that of Cairo that I didn't see in a lot of different places, at least not in like Europe and, and the US.

It's loud, like everyone's honking all the time. It's polluted. Small comes out of all the exhaust of all the buses. People don't respect lanes. So it's also kind of like a bumper car situation and intersections are like kind of a game of chicken where you kind of approach quickly and you see who's gonna stop first. So in terms of suffering, it's, it's kind of hard on the senses to drive around Cairo even to walk because the sidewalks are not continuous and you have to, you have to navigate all these trees and like garages and then sidewalk stores and just cars. So it is, it is hard on the sense that's what I meant by suffering.

Jeff Wood (10m 4s): I see. That makes sense. Yeah,

Hussein Mahfouz (10m 6s): I was gonna say even passenger information isn't truly available. If you think of like planning your day, planning your journey using public transport, when is my bus gonna come, is gonna come, when is the microbus gonna come and so on. None of that is really available. Real-time information. You're sort of going on like your knowledge from your day-to-day routine, but passenger information doesn't really exist. You say like it might exist on the metro, on the underground for example, but not on a systemwide level.

And that's part of what Transport for Cairo, part of like the initial efforts of Transport for Cairo was to create this data and put it out there so people can use course. There's a long way to go in terms of like improving it and making it real time and so on. But it does get in the way of music, public transport.

Jeff Wood (10m 55s): You have to start somewhere and and hopefully all of your work gets internalized and can help push that forward. Well let's chat about the report because I think that's actually a really good push into what you all are talking about in this report. *All possible commutes, how micro mobility and realistic car travel times impact accessibility analyses*. We'd love to talk about access on the show. We talked about access extensively on, on episode 18 of the Rail~Volution, now Mpact podcast, where we talked about accessibility as a metric with folks from the University of Minnesota. But we should ask this question again. Why do you all think access is important and important to measure?

Hussein Mahfouz (11m 27s): Well the literature on access or accessibility, there's quite a lot of it now and I think maybe more recently it's gaining in importance.

There are lots of benefits to improving accessibility for people. There are economic benefits, it's considered essential like a good public transport. Accessibility is considered essential to economic prosperity of cities and therefore individuals, so like productivity and so on. There's like on the social and individual level there is the idea of like for accessibility, restricting life paths and limiting employment opportunities and limiting networking capital for example, a higher accessibility is linked with social inclusion, it's also linked with psychological wellbeing and you get from like a transport planning perspective, you have better public transport accessibility, highly correlated with public transport mode share.

So the effects of that have to do with like reducing congestion and air pollution and health externalities and so on. So you can look at it in many ways.

Adham Kalila (12m 36s) Yeah, that's perfect. We defined accessibility as how easily people can reach destinations and activities and some of it's very self evident like work or educational opportunities, healthcare or grocery stores. So it, it's kind of a no-brainer that we should increase people's accessibility, it helps them kind of live life more fully

Jeff Wood (12m 53s): And the report takes a new approach, a different approach to modeling access by different modes including cars, which has been modeled a certain way forever. And I'm wondering, you know, why do you need a fresh outlook on this discussion about accessibility for transportation modes?

Adham Kalila (13m 8s): So accessibility's been measured in numerous ways with different like limitations throughout the academic literature. What we've found is that most of the time it's very hard for researchers to get realistic information, especially speeds for cars. So that's one thing we did to get a more accurate representation of access in the city is how fast are cars driving on every road and not just the average or the free flow or the theoretical speed on every road.

But we didn't stop there. We also tried to model realistic conditions for every mode that we modeled. So for public transport we use G T F S that takes into account the schedule differences in rush hours for example versus non rush hour times. For bicycles, we made sure to route on specific roads that had level of traffic stress, which is a measure of how dangerous driving on a road can be to ones that were easy and moderate so that we can model a bigger part of society and not just like the most avid bike riders.

And then for micro mobility we also modeled risk constraints, constraints in finding a bicycle and also how it kind of combined with other modes like when you leave your house you can make a realistic choice of do I want to take a shared bicycle or do I wanna just walk to the station? Which one improves my overall trip.

Hussein Mahfouz (14m 30s) Just to add to that, maybe on like a more high level or to zoom out a bit and perhaps it's good to make a distinction between how we see access and accessibility I'll mention a few measures.

So, so basically you have like access can be seen as a lot of the time when people say access they mean like proximity to a transit stop, whether it's a bus or a metro stop. And that can be a measure in itself like how many bus stops are within a 500 meter distance or a 1 minute walk. If you want to get more nuanced you say but actually how many bus buses pass through these stops? That's still access's a measure like where you can walk, what public transport do you have access to?

And then accessibility can be seen as more of where can they take these buses or this metro, where can it take, so not just what bus can I access but where can this bus take? So accessibility is more of a measure of what opportunities do I have access to given the public transport network. And this measure of accessibility has been further like extended to look at temporal variations in accessibility. So how many opportunities do I have access to at different times of day, how many hospitals do I have access to at different times of day because the transit schedule changes throughout the day.

So in that sense, this is all quite well established in in the literature. So what we did was to build on that by including micro mobility. Because a lot of the research on accessibility does not include micro mobility as part of like a multimodal trip. And a lot of the literature focusing on micro mobility itself focuses on its own. So again you can have access measures, how many dock stations do I have access to and so on. But

we didn't really find literature that mixes or combines the two when calculating accessibility to opportunities.

So that was like one of our likes besides what Adham said, that was like one of our main contributions.

Jeff Wood (16m 32s): I think that's really important thinking about the trip chain that people actually take versus the one that you know is supposed models often show you.

And I think the other important kind of thing that I took from this paper and I think you all highlighted really well was kind of how we measure car trips. You know, the idea that a car trip isn't just one point to another point on a map, it's actually everything else that has to do with that car trip. Whether that's traffic or looking for parking or any other kind of boundary that or barrier that we, we don't necessarily build into the models, we just assume that the trip is very clean and and very easy versus all these other messy trips that have a trip chain associated with them. Like you were mentioning the micro mobility trips.

Hussein Mahfouz (17m 11s): Yeah, in terms of walking trips, again it's important to see like the breakdown a car trip in terms of its components because when you think about accessibility by car, you normally choose, say this is the origin, this is destination, this is like the car travel time that's shown by like Google Maps or whatever routing engineer you're gonna look at.

But there is more to a car trip. You have the access and egress so how long does it take to walk to my car or how long does it take to walk to where I park my car to where I want to go? And there is also how long does it take to actually find the parking spot And that varies a lot depending on residential employment density of the area and parking restrictions in the area.

So all of these together make car travel time longer than what it would be if you just considered the actual driving component of the trip. And it's important to include them all because when you're comparing to public transport, because with public transport you are looking at the access part, walking to the bus stop, you are looking at walking from where you are light to your destination.

So that's included and there is no parking time involved. That's one of the nice things about taking public transport. So that's what we try to model.

Another thing we tried to add was to add realistic speeds. So normally like this work is done through routing, like open source routing engines. We use R five which is a routing engine that calculates travel time by mode. But normally these routing engines use default speeds, so they'll use the speed limit on whatever road, the speed limits on the road to calculate travel time.

Unless you give it an alternative. You say no, the actual speeds at this time of day on each of these road segments is actually X. So then it'll use X when it's calculating the travel time. And that's what we brought in. Travel time, realistic travel times are hard to get your hands on, they are not freely available for lots of cities, lots of places around the world. That is a limitation. We used openly available uber movement data for San Francisco to data that Uber had created from 2018 to 2020. But I think Uber has stopped providing this service or stopped updating their Uber movement speeds data.

But for other cities such as Cairo, Mexico City, we, we had to get data through Mapbox and they agreed to give it to us for free, which is very kind of them. But again, because we were doing this project with

NuMo and because NuMo have connections with them. So there is a barrier to getting this data. So there is an argument here to be made for making traffic data more accessible to research. And it doesn't just apply to cars but it also applies to public transport and cycling and so on.

Especially for public transport. A lot of the data we use for routing public transport like data is based on GTFS which is basically timetable to show you where the bus is supposed to be at each point in time. But that data sometimes doesn't reflect reality. Sometimes actually the buses that run on the day and their speeds is quite different to the schedule.

So it's important to like not be heavily biased towards like public transport as well and like look at what the actual public transport service provision is and then you can start to look at choke points, start to look at places where there should be right of way for public transport, start to look at how and where the service is not operating according to a schedule.

Adham Kalila (20m 48x) Yeah but at least in Google Maps or Apple Maps or any other routing app, they always include the walk to the bus stop or the train stop and then the walk from to your destination. They don't do that with parking time or walking to that parking spot or leaving that parking spot or even finding the parking spot or even the parking cost. It's almost like the car is free and then there's this like \$3 fee for the public transit. So in the mind of the person making the decision on the spot, sometimes cars are, they get an unfair advantage for that trip.

Hussein Mahfouz (21m 19s) Just to build on that, this is something we didn't really have time to explore but it's becoming, well I've, I've seen examples of this where accessibility with cost thresholds. So you see like this is accessibility given certain like time threshold accessibility of 15, 30, 45, 60 minutes. But what if you also add the cost threshold? So this is the cost of this trip using public transport, using car, using cars, using whatever mode you want. And then you start to see like it's not just about time, it's about how how much does this cost And for public transport maybe that's not so difficult to do cuz you know the price of bus tickets and so on.

But for cars it's again more complicated cuz you have to add fuel costs, you have to add parking costs, it's different depending on how long you're gonna park for and depending on where you're parking and so on. But it is important

Adham Kalila (22m 11s) Not to mention micro mobility costs and how these different like service providers can have very different costs or if you're on like a yearly annual subscription, it's a different cost entirely. So very hard to model for sure. Which we didn't try and do.

Jeff Wood (22m 24s): Well that was one of the things is like it was important to you all that you made it that it was replicable, that somebody could take what you did and replicate it even if the data's hard to get, you can try to get it and replicate it so that people can use this as a way to look at access in their cities around the country and around the world.

Adham Kalila (22m 41s): Yeah, definitely part of the plan, we have a GitHub repository with all of the scripts that we developed as well as a bunch of diagrams that help you kind of navigate like which script to use when and telling you the inputs and the outputs of each of the scripts.

It doesn't run kind of automatically. You still have to be very involved in changing the parameters of those scripts and kind of bringing in data because it's all open source. You have to go get the, let's say

the O S M open street map road network you're gonna use, you have to go get the Uber movement car speeds or the map up car speeds. You have to pull census areas. US it's easy but everywhere else if you want information on jobs and information on demographics, if you're gonna do an equity analysis.

So it is complicated but it's definitely reproducible and we try to be as transparent as we can. Because we do see the benefit in public agencies and service providers seeing the transportation or let's say the urban issues that they want to solve through an accessibility lens. Like it's not just, oh look Cairo has like three metro lines and two upcoming, you know, monorail lines. It's also this group of people in this neighborhood used to not be able to access anything and now they can access 30% more jobs. We don't have that conversation and we'd love to see it happen and, and we know that most of these public agencies are very constrained on time and even engineering effort. So we tried to make it as easy as possible.

Jeff Wood (24m 8s): It's really important because there was research out of Georgia recently and I can't remember exactly who it was that was doing the research, but it showed that, you know, they had a time when the bus line ended, they took away the service and they found that, you know, increased poverty, increased reduced access to employment. And so I, I think that that's an important like kind of, you know, little piece of what you all are doing is looking at the ways that access can actually improve people's connections to the things that they need to get to. And I, we talk about access on the show all the time, but I can't help like reiterate this important point that people wanna get to where they wanna go and making things accessible is helpful and beneficial to all the things that Hussein said at the beginning of the episode. Right. It's just such an important thing to make sure that we understand how everything is connected or not connected for that matter. Because sometimes that's the problem as things aren't as connected.

So y'all established comparable data across modes, it's really cool to see all the graphs and the maps and things in the report. I think those are like as a map person myself, I really love those to look at the different modes and the different travel times.

But what is the big takeaway for you all from putting all this information together? What, what was something that you think can be shared with everybody else in terms of what you found and how that impacts different cities around the world?

Adham Kalila (25m 20s): So what I found as a value that I didn't know was going to be a value going into this project was that there wasn't just one like way that micro mobility can be useful to people in the city.

I remember we were first trying to kind of ideate or develop the scope of the project and we wanted to choose a specific time threshold for the accessibility analysis cuz we used a a cumulative opportunities measure, which is counting the number of jobs one can get to within a time threshold. And then one of the support partners at I T D P, he said why don't you do like a sensitivity analysis, do 15 minutes, 30 minutes, 45 and then 60 minutes.

And then when we did it, we started seeing mixed results. Like in 15 minutes and 30 minutes. In some cities you can see that micro mobility was comparable to car but then when you get up to 45 and 60 minutes it kind of plateaus and then car goes ahead and, and it's much more, you get a lot more access with car.

So what we ended up finding was that a nice way to summarize it, but there were two scenarios in which micro mobility most improved job access. One is for shorter trips, especially in cities with congested urban cores. So we're thinking 15 minutes in most cities but up to 30 minutes in places like San Francisco, with a very good micro mobility network and a pretty difficult parking landscape. And those usually happen in the service areas of the micro mobility. So where micro mobility is available.

And then the second scenario where we saw some improved job access was in longer trips. So over 30 minutes we kind of get into the value of public transport and we start seeing that micro mobility can help outlying areas connect to the public transport system and get people much better access than they would have if they had to walk from the station to their house or the other way around from the station to their job.

Those were two big things that kind of shown when when we did the analysis and the modeling.

Jeff Wood (27m 16s): That's an interesting break, though, you know, the lower end and then kind of at the higher end you have two kind of similar results is, is that a function of you know, the way that systems are laid out or is it a geographic issue? What, what do you think if you could kind of expand upon that a little bit more?

Adham Kalila (27m 31s): So the thing we identified the most was that if the city itself, if the public transit let's say wasn't frequent and you would have to wait a while to get to a bus, then it's faster to just take the e-bike or the shared bike and do your 10 minute trip without having to wait for that scheduled bus to help you out.

Whereas when it gets longer then you have the opportunity in those 60 minutes to wait for the bus. And so getting to that one scheduled bus might be feasible within the time threshold that we took.

So the one thing that I noticed was that a robust public transit network made it so that you can get way more access out of micro mobility in the longer periods. And then for the shorter periods it's just a matter of, I wouldn't say geography, I would say it's more of like a, if it's a congested urban core, like if you had to worry about parking, then just taking that micro mobility trip in a, in a quick way avoided all the extra parts of the trip that we added for parking.

So access egress and looking for parking.

Hussein Mahfouz (28m 32s) I think what I would add is for longer trips the areas or the origin destinations where micro mobility had an effect were areas where you could, there were docking stations around public transport stops and that has to be either at the origin or at the destination or at both. And you see the effect that that has on accessibility and on micro mobility being useful as part of a public transport trip.

So I think like one of the takeaways for us was the need to plan for that, plan for the integration of micro mobility and public transport. Like, be intentional with the placement of like docking stations to make this transfer as seamless as possible.

And again, it's like Adham said, if the bus doesn't come often then like takes away the potential use of micro mobility for these longer trips. But it's part of a wider process of providing micro stations where high frequency bus lines are.

Jeff Wood (29m 38s): I know you didn't address this in report necessarily, but there's public access kind of imperative and then there's like these private companies that run these micro mobility services. I'm curious if that changes the calculus at all in your minds. I, I don't think that you looked at it specifically. But you know there's a private kind of interest and a profit interest for some of these companies and so you know, does that change if the micro mobility actually becomes public transportation. Like in Austin I think that capital metro took over the bike share system for example and then they can place you know, the system wherever they would like to place it. And so is there kind of a back and forth between that and the goals of accessibility and the goals of profitability?

Adham Kalila (30m 16s): Yeah, they definitely do. So I know from friends that when they decide where to expand the Citibike infrastructure in New York, it's a whole model that they developed and a big function of it is where can people afford to use the service and where can they kind of casually use it on a daily basis.

But that's not the lens that we're advocating for. We wanna see where relatively low cost of infrastructure for micro mobility will have the highest effect on improving someone's accessibility.

That, coupled with helping people pay for it or making it subsidized for those who need it might have a very tangible effect on people who would otherwise be left out of the economic system, left out of job opportunities.

Hussein Mahfouz (31m 01s) I'd say it's the same problem you can have with public transport. If you have a deregulated public transport system where operators have much more of a say on where they can run their lines, then you find lots of operators running on the same route which are profitable.

And I see that here in Leeds where public transport service isn't very good and public buses don't come often and they all take you to the city center but not really to other places.

And you can compare that to a system where you have franchising where the local authority or the planning authority, for example Transport for London and so on actually decides where the route should run and operators bid to run these routes. But the route are decided by planning authority and there's definitely an argument to be made that the same should apply to micro mobility. Where like if it's going to be part of an integrated public transport network or integrated network for a city, then like service areas for micro mobility and docking station locations should, there should be a big input by local planning authority. Of course in terms of if you look at fleet rebalancing and micro mobility vehicle supply and so on, that's where perhaps the micro mobility service provider can have more of a say.

Jeff Wood (32m 23s): Your model also includes the ability to look at the impacts of access for particular groups, which you're mentioning by race, ethnicity or income. What kind of takeaways did you find from that approach?

Adham Kalila (32m 33s): So first we were only able to apply this equity analysis in the US because of how easy it was to get information about race, ethnicity and income groups. So we weren't able to apply it to Cairo or Mexico City. We did apply it in San Francisco and Minneapolis St Paul.

And the first takeaway that was a little surprising is that it's surprisingly equitable. And the main thing that I could possibly point to explain that is that a lot of American cities have the downtown as a concentration of both the jobs as well as some minority racial groups and low income groups.

So for example, in San Francisco there's two job centers when we look at the city. One is in San Francisco proper and then one is downtown Oakland and those two areas have a surprising amount of black and Hispanic populations. So when we look at the improvements, when we looked at the weighted average accessibility improvements of all the groups, it looked like black and Hispanic residents had accessibility levels that were on par with or higher than white residents and definitely higher than the total average population.

So in some of these cities it's not the usual narrative of racial minorities have lower access, it's actually they actually are able to benefit from micro mobility, not just in the first mile but also in the last mile because they live near where the service is located. That's compared to people who live on the outskirts where they might be able to access it once they get into the downtown and they need maybe a last mile connection but near where they live there isn't likely to be service of micro mobility.

Like an interesting finding was that only the poorest segments of society and the richest parts of society. So people making less than 35,000 or people making more than 200,000 US dollars in San Francisco had high access. Everyone in the middle like section from \$35 all the way to \$200 had lower accessibility than the average. And that's because everyone in San Francisco probably lives outside of the downtown areas.

Jeff Wood (34m 45s): That makes sense in terms of where the highest frequency bus lines are and the system services is best and where micro mobility is, I feel like a lot of the docked bike stations kind of are in the, you know, close proximity to downtown San Francisco. Now the calculus might change now because of some of the impacts of the pandemic and the work from home stuff. But it's interesting to think about it from that perspective if things kind of, I don't wanna say go back to normal, but just like if things kind of retrace their steps to previous kind of norms that were existing, I do wonder what the pandemic has done to this discussion or you know, the work from home movement has done to this discussion. You all didn't talk about it in the report, but it's such a big topic these days that it's kind of sitting on everybody's shoulder and and talking to them in some way.

Adham Kalila (35m 32s): I would say that the pandemic has changed a lot of commutes in terms of frequency but not in terms of geography. Like if you still needed to commute, you would still need to commute to more or less the same places where the offices are, but you do it two or three times a week, maybe once or not at all if you, if you can avoid it.

But I like to think of this accessibility analysis as a proxy, especially in most of the cities that we looked at. So in Cairo, Mexico City and even New York, where the jobs are is also where all the points of interest are. So as someone who wants to engage with the city, you're likely to want the same level of access that we've looked at when we looked at job locations.

It can be different for different cities, especially places that are very like geographically segregated. And I don't think it applies very well to Minneapolis St. Paul. But I do stand by my argument that the job accessibility that we did is a good proxy to how people can move around the city regardless of if they work from home but also need to see their friends or or maybe work once a week out of the house.

Jeff Wood (36m 32s): There was an interesting piece this morning by Paul Krugman as a writer at the New York Times, also an economist, who's, you know, basically saying something similar is saying that you know, the invention of the telephone and the internet actually didn't reduce the need for people to see each other. They actually increased the need to see each other because you actually made more acquaintances, you made more, you know, colleagues, friends, those types of things when you had access to more people and more things. I mean you know, we're talking to each other over Zoom right now and at some point, you know, if y'all ever come to San Francisco I'd love to you know, have a beer with you.

So we've made an acquaintance, we've made a friendship and so you know, you make those and then you have more of a reason to travel to places you have more of a reason to access cities. And so I think that that's a kind of an interesting point that he made as well in thinking about these technologies. They may and work from home specifically, it may allow you to live in a place that you want to live where you have access to more things but you just might not go to work every day in the same office in the same space. It just, you know, changes your habits a little bit but maybe doesn't change the fact that people are humans and they wanna be around other humans to a certain extent.

Hussein Mahfouz (37m 37s): Yeah, yeah definitely. I think it's also tied to, well I think maybe post pandemic the idea of like livable neighborhoods or the 15 minute city, I'm not sure if that's there are conversations about that in America and so on, but it is gaining more prominence the idea of having like everything you need or most of the things you need close to you and that's where cycling and micro mobility could again like have increased prominence in terms of like access to leisure facilities nearby or even like healthcare facilities or schools and so on like cycle streets for schools and so on. So basically create this like, or help create the cycling culture.

Adham Kalila (38m 22s) It's funny that you mentioned new technology changing the way we live. We have this whole, I think we've been speaking for about 50 minutes now and we haven't mentioned the metaverse once, but Apple just unveiled a new technology just now actually my brother and cousins are outside watching the worldwide developer conference and they, there's releasing these new goggles that are supposed to like immerse you even more into some virtual reality. And I don't think, as you're saying, it's going to take away the need for us to actually take off the goggles and then go hug someone or meet someone or shake a hand. Because unless they start, you know, putting things into our nervous system that actually makes us physically feel what we're seeing virtually, I don't know if we can avoid needing, you know, social interactions in the real world. But that's not just for social interactions. I think even work, like right now I work from home a lot of the time and I'm, and I'm working while I'm in Cairo, but the company still likes to get us all together for all hands that are in person. They, they want us to develop relationships and have meetings face to face even if it's less frequent than every day, maybe once a month, maybe once a quarter. But it still happens.

Jeff Wood (39m 29s): It is important the human interaction and meeting other people and getting together. You know there's been hundreds of thousands of years of evolution that have led us to this place in the, you know, 15 to 20 years of the internet.

Adham Kalila (39m 43s): It's not gonna change that

Jeff Wood (39m 45s): The internet, it's not necessarily gonna change that too quickly. It's a, it's a process maybe in a hundred thousand years in the future that that'll have changed but I don't see it happening in the next 10. So how do you think your all's findings might change how you plan transportation systems?

Adham Kalila (39m 59s): That's a good one and I don't know that we can say anything that's not already been said. A lot of the decisions that need to be made when it comes to things like accessibility and equity, they're more political decisions and I think we kind of know the answer but we as researchers try and develop models and mathematical examples to kind of support a claim that we already have. Sometimes we're surprised by the results but very often we set up the question knowing that like, yes, more accessibility is better and yes people will get to jobs in like nicer ways if they have options like micro mobility and public transport.

But one thing that I would say was an interesting find or some change of perspective is seeing micro mobility not just as like a, a game or a toy or something like the quirky nerds in San Francisco like to play with, but also as something integral to improving people's quality of life, improving their access to jobs, improving their like financial resources eventually.

So it's, it's good to have numbers to back the fact that micro mobility when combined with a strong public transport system really does have an effect on society, really does improve the experience of the city.

Hussein Mahfouz (41m 21 s) Yeah and it's important to, to this reiterate that all our work was showing was the potential for micro mobility. Like if used to its maximum potential as part of a multimodal trip, this is the improvements in accessibility that you could get. But to actually realize that potential does take intentional planning. Yeah, does take intentional planning and part of that could be things like integrated ticketing between micro mobility and public transport to make it a seamless trip. It could be again, where to locate docking stations and so on.

So again, to make transfers seamless cuz a lot of the increased access that results from micro mobility is for these longer trips depends on these transfers and these transfers being seamless. And we have lots of research showing that how value of time associated with waiting versus that associated with like actually being on your trip. And people don't like to wait, people don't really like transfers. So how to plan for minimizing the inconvenience associated with multimodal trips. Again like integrated ticketing doesn't just make it more seamless but you can make it cheaper. You don't have to pay a separate ticket for each mode and then you know, so pricing schemes and so on.

One other thing I would like to mention was like we alluded to this at different parts was how our study was limited by data availability in some parts. So some parts of the study were only conducted in certain cities because of data availability. I think it's very important to highlight open data and what it does to like fostering research culture.

So updated, open, high quality data is very important for proper planning and research. We found this is much easier in North American cities as all data is publicly available online. Not all data, like a lot of data is publicly available and open online. Like I think our studies, we relied on some R packages created by Kyle Walker like TI Census and Tigris R packages to get like demographic and spatial data from the US Census Bureau.

And this really makes our lives easier. We don't have to worry about finding the data, cleaning the data and processing it or making assumptions to fill data gaps and so on. So if you have this seamless data pipeline, it makes research much easier, much less like time consuming and you can create an evidence

space to have a dialogue about public transport wherever you are. And a lack of data just hinders that and you see the difference in research coming out of like areas with open data and areas without. And I think again we said like how transport for Cairo was very focused on creating some of these data sets on public transport availability, G TFS feeds and so on. And we make them openly available but it shouldn't really be on us to do or on a private company to do.

Jeff Wood (44m 28s): I'm wondering also kind of why cities have a hard time seeing what you all found in terms of, you know, comparing auto centricity versus you know, the benefits of transit, micro mobility, walking, active transportation, those types of things. Feels like, as you mentioned even in Cairo the, the car has been supreme for quite a while and so it's hard for cities to change tact. I wonder if there's a way to, you know, take this work and, and make it so that people understand the bigger picture.

Adham Kalila (45m 3s): I don't want to get too deep into politics, but I do think that at the end of the day saying, "Oh look I've made the road, now it's on you to get the car and get yourself there" shifts the entire burden of transportation onto the user. And it's just, did you work hard enough to get a good car? Does your car, you know, work well? Can you afford gas? That's all on the user. And so you could just kind of build the road which is just a flat asphalt layer and then kind of step back.

Whereas if the focus is on all the different multimodal ways you can get to places which is you know, walk on the sidewalk, then take micro mobility, use a bike path, get on a bus or get on a train link between one mode and another, then on the other end do the same. It puts a lot of the work on those service providers and they're usually government to get things right in a way that makes the entire trip, you know, proper or works well, functions efficiently with dignity for the user and safety.

So a lot of the times it's just an easier method for resource-strapped communities and places to say well you know, we're just gonna do it for the cars and they're usually the people with money and with power and if they can get to their places quickly then it's okay. Everyone else can kind of be quiet for a bit.

Hussein Mahfouz (45m 24s) Just to add to that, I think it is on researchers to make the research accessible, you have to work on making your findings accessible and presenting them in a way that's easy to digest. I think maybe some critique of researchers is like, the research isn't always easy for, for policy makers to digest.

Another thing is it has to do with, again, how are you planning your transport system? Is it, are you, is it a deregulated market that you're operating in or is it more of a franchise system or is it something in the middle? And I think it's only recently that there is emphasis on like linking transport emissions to climate change to the need to decarbonize our transport networks. That is slowly like that sort of rhetoric is slowly like disseminating through.

But these things take time and societal transitions take time and in some ways people are attached to their cars and in some ways there are, there is lobbying involved and in other ways you find like vicious cycles of local authorities that are strapped for funding. So there are lots of different reasons why public transport and micro mobility are not the default option or are not being planned like cities and aren't being planned around them. But they aren't insurmountable.

Jeff Wood (47m 50s): Well the report is *All possible commutes. How micro mobility and realistic car travel times impact accessibility analyses*. How can folks find a copy if they want to get their hands on one?

Speaker 3 (47m 59s): So the report is available on NUMO website. NUMO is the new Urban Mobility Alliance who funded this research. You'll find the report, you'll find the technical appendix outlining like the exact steps we took in our methodology and how to reproduce them. You'll also find the link to a GitHub repository with all the code and documentation. So all that is available publicly online.

Jeff Wood (48m 23s): Awesome. And how can we find you if we wish to be found?

Hussein Mahfouz (48m 26s): Yeah, so you can find me on Twitter. H_M A H F O U Z

Adham Kalila Yeah same here. My email Adham at transport for chiro.com. So adham at transport.com. I will say that it's very easy to find the report at numo.global/resources and then you'll find it as one of the resources. And then from there you can, you can also find it on ITDP blog. They wrote a blog about us so we're, yeah, we're available in several spots. Please do reach out with any kind of critique or ideas for, for how to move the project forward.

Jeff, there was something I wanted to call some attention to in the methodology of the paper that was kind of novel. So part of the modeling of micro mobility was supply constraints. And we didn't really see this happen anywhere in the literature. So we developed a new way to look at how we can quantify how likely it is for someone to find a vehicle where they're going and where they're coming. We basically got the information from San Francisco's service providers and found how often it was that stations had bikes or, or didn't have bikes.

And the findings were interesting because we mapped accessibility as a potential accessibility. You see that all of San Francisco lights up as improved. But then when you overlay it with actual availability data, you find that only some parts actually have vehicles and they're usually near downtown and the northeast. And then most of the rest of the city is kind of sparse and you don't have a lot of vehicles, at least when we were checking, which was I think the morning time from seven 30 to 9:30 AM. And so even though the whole city has potential to get a lot of improved accessibility, you only find the actual supply constraint, a restricted accessibility kind of in, in the middle and on the southern tip of San Francisco.

Jeff Wood (50m 29s): That's interesting. I wonder how much that has to do with, you all mentioned, you know, the hills and stuff in the report as well. I know that the dock next to my house is really full in the morning and then empty in the afternoon. And I think part of that is cuz everybody takes it to go downhill in the morning and then the dock is empty until they, they restock it. So I wonder how much that has to do with where the, the vehicles are available or not available. Cause I think, I think a lot of people like to ride them downhill and then take the bus back. That changes with e-bikes I think. But it, it's a kind of a funny finding.

Adham Kalila (50m 59s): Yeah, and also you're not gonna force people to do something against their will. You just have to like, this is the easiest path and they're gonna always choose it and it's good to put that into the planning and and the modeling and work around it because they're gonna always choose what's what makes the most sense to their needs.

Hussein Mahfouz: I think one thing we did include was both normal bikes and e-bikes and assumptions about both in terms of travel time or speeds and in terms of like elevation profiles of the roads where

the person is actually going to go up that route or not, depending on elevation and depending on the type of bike, whether it's a normal bike or an e-bike.

Jeff Wood (51m 38s): Yeah, that's super interesting. Y'all did so much work. Well Hussein and Adham, thank you so much for joining us. We really appreciate your time.

Speaker 3 (51m 46s): Thank you very much for having us.

Tamar Shapiro (52m 3s): Thanks for listening. Find out more about our work by visiting our website mpactmobility.org. That's M as in mobility and pact as in agreement dot org. Mpactmobility.org.