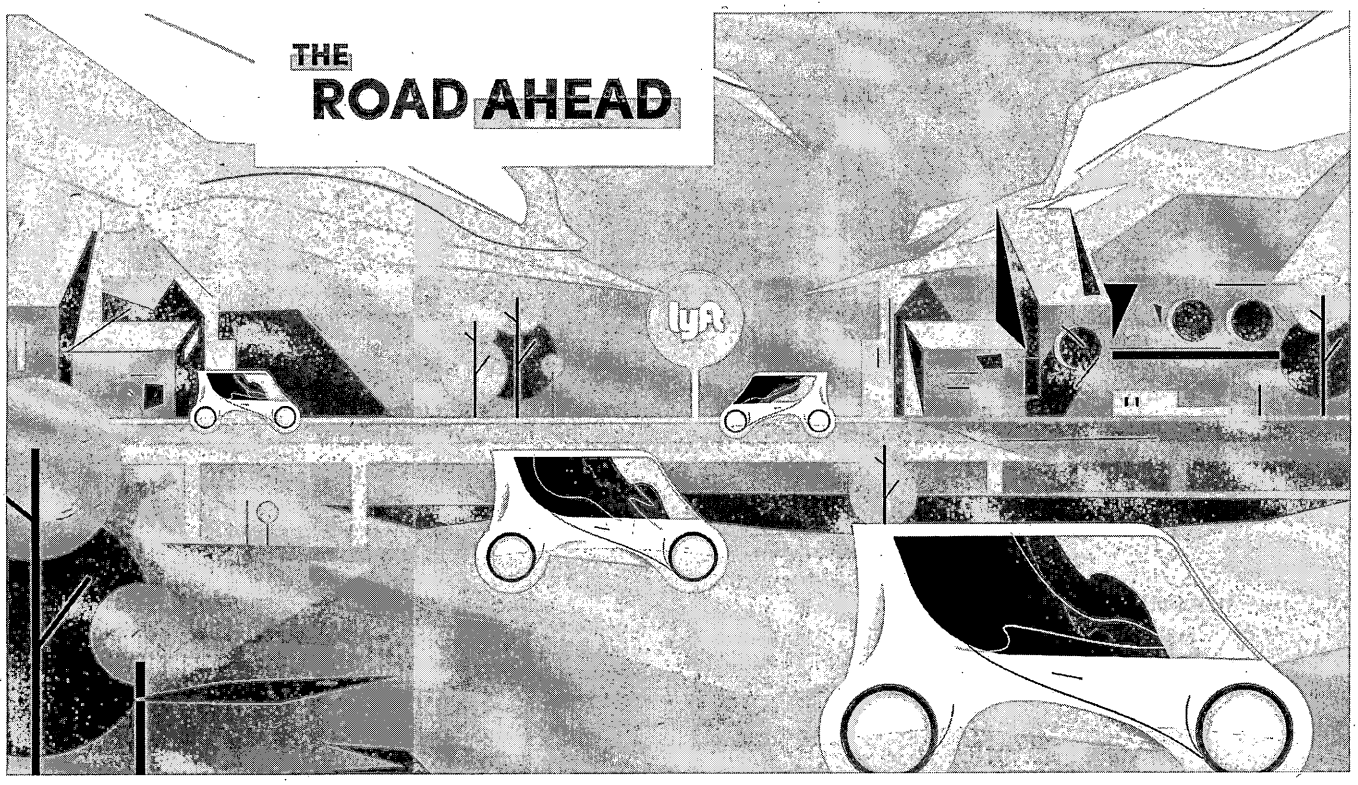
John Zimmer Follow
@Lyft Co-Founder. Life is better when you share the ride.
yesterday · 17 min read



The Third Transportation Revolution

Lyft's Vision for the Next Ten Years and Beyond

Introduction: A Country Built for Cars

I remember when I first fell in love with cars. It started small with Hot Wheels when I was three and Micromachines when I was six. Everything about them was fast and exciting—even the commercials were narrated by the World's Fastest Talker. I loved them.

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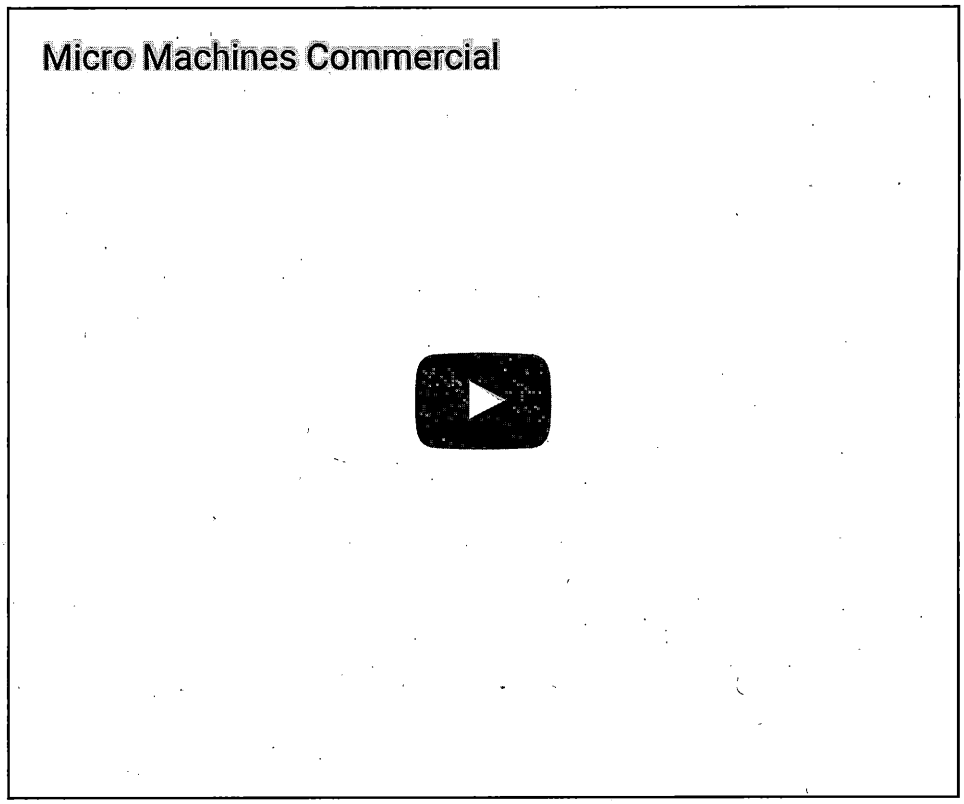
Item 10



Then, when I turned 12, my dad and I began taking annual trips to see the real thing at the New York International Auto Show. I looked forward to going every year, because even at that young age, I felt a connection to cars and the freedom they represented.

I think, in some ways, it was my love of cars that largely influenced how I saw the world. But it wasn't until I took a life-changing city planning course in college that I had an epiphany: Cars weren't just shaping my worldview; they were shaping the world, itself.

In the class, we learned about the history of cities and the massive impact transportation had on their evolution—both on how they were built and how people lived in them. From then on, I couldn't help thinking about the inextricable link between transportation and the design of the cities I was living in. And I started noticing a very basic problem everywhere, hiding in front of our eyes.

> *Next time you walk outside, pay really close attention to the space around you.*

Next time you walk outside, pay really close attention to the space around you. Look at how much land is devoted to cars—and nothing else. How much space parked cars take up lining both sides of the street, and how much of our cities go unused covered by parking lots.

It becomes obvious, we've built our communities entirely around cars. And for the most part, we've built them for cars that aren't even moving. The average vehicle is used only 4% of the time and parked the other 96%.

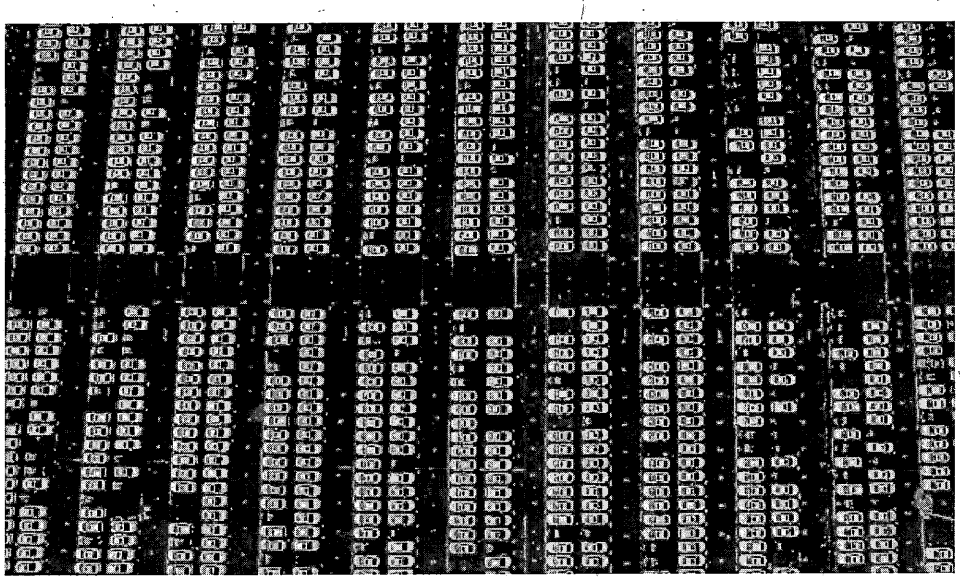


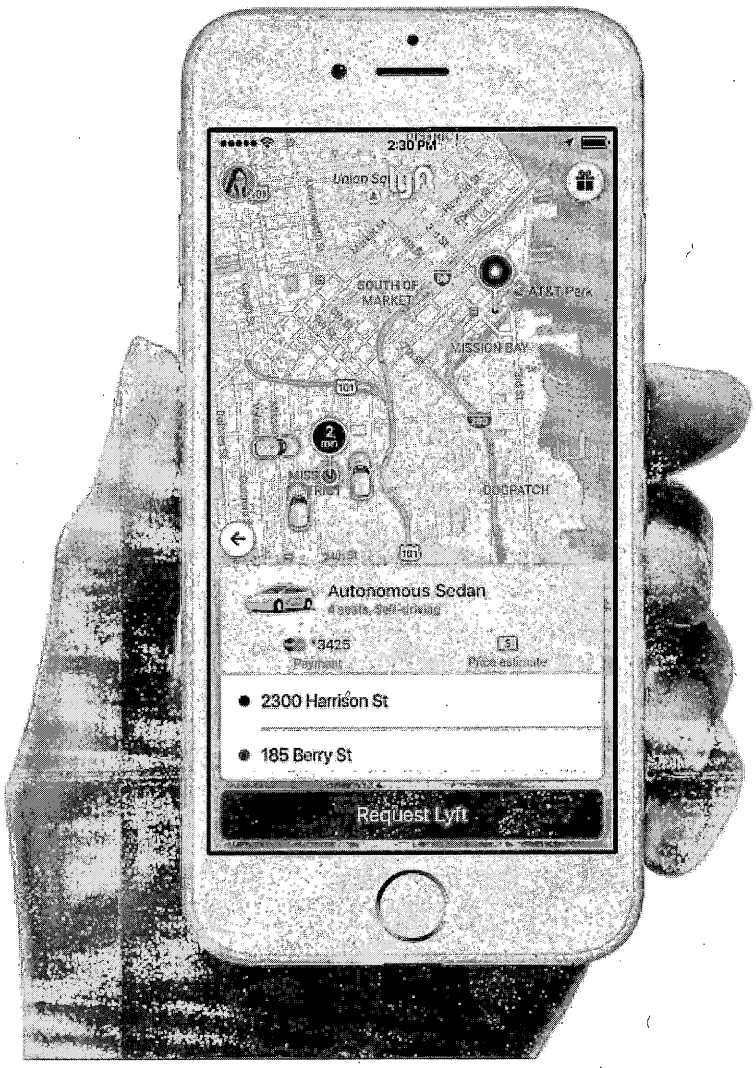
Photo Credit: Sheng Li, Reuters

Most of us have grown up in cities built around the automobile, but imagine for a minute, what our world could look like if we found a way to take most of these cars off the road. It would be a world with less traffic and less pollution. A world where we need less parking—where streets can be narrowed and sidewalks widened. It's a world where we can construct new housing and small businesses on parking lots across the country—or turn them into green spaces and parks. That's a world built around people, not cars.

All of this is possible. In fact, as we continue into our new century, I believe we're on the cusp of nothing short of a transportation revolution—one that will shape the future of our communities. And it is within our collective responsibility to ensure this is done in a way that improves quality of life for everyone. The coming revolution will be defined by three key shifts:

1. Autonomous vehicle fleets will quickly become widespread and will account for the majority of Lyft rides within 5 years.

Last January, Lyft announced a partnership with General Motors to launch an on-demand network of autonomous vehicles. If you live in San Francisco or Phoenix, you may have seen these cars on the road, and within five years a fully autonomous fleet of cars will provide the majority of Lyft rides across the country.



Tesla CEO Elon Musk believes the transition to autonomous vehicles will happen through a network of autonomous car owners renting their vehicles to others. Elon is right that a network of vehicles is critical, but the transition to an autonomous future will *not* occur primarily through individually owned

cars. It will be both more practical and appealing to access autonomous vehicles when they are part of Lyft's networked fleet.

Why? For starters, our fleet will provide significantly more consistency and availability than a patchwork of privately owned cars. That kind of program will have a hard time scaling because individual car owners won't want to rent their cars to strangers. And most importantly, passengers expect clean and well-maintained vehicles, which can be best achieved through Lyft's fleet operations. Today, our business is dependent on being experts at maximizing utilization and managing peak hours, which allow us to provide the most affordable rides. This core competency translates when we move to an autonomous network. In other words, Lyft will provide a better value and a superior experience to customers.

I'll have more to say on how the autonomous network will work a bit later in this piece.

2. By 2025, private car ownership will all-but end in major U.S. cities.

As a country, we've long celebrated cars as symbols of freedom and identity. But for many people—especially millennials—this doesn't ring true. We see car ownership as a burden that is costing the average American $9,000 every year. The car has actually become more like a $9,000 ball and chain that gets dragged through our daily life. Owning a car means monthly car payments, searching for parking, buying fuel, and dealing with repairs.

Ridesharing has already begun to empower many people to live without owning a car. The age of young people with driver's licenses has been steadily decreasing ever since right around when I was born. In 1983, 92% of 20 to 24-year-olds had driver's licenses. In 2014 it was just 77%. In 1983, 46% of 16-year-olds had licenses. Today it's just 24%. All told, a millennial today is 30% less likely to buy a car than someone from the previous generation.

Every year, more and more people are concluding that it is simpler and more affordable to live without a car. And when networked autonomous vehicles come onto the scene, below the cost of car ownership, most city-dwellers will stop using a personal car altogether.

3. As a result, cities' physical environment will change more than we've ever experienced in our lifetimes.

So why should you care about changes in transportation? Even if you don't care about cars—even if you never step into a Lyft or an autonomous vehicle

—these changes are going to transform your life. Because transportation doesn't just impact how we get from place to place. It shapes what those places look like, and the lives of the people who live there.

> *Transportation doesn't just impact how we get from place to place. It shapes what those places look like, and the lives of the people who live there.*

The end of private car ownership means we'll have far fewer cars sitting parked and empty. And that means we'll have the chance to redesign our entire urban fabric. Cities of the future must be built around people, not vehicles. They should be defined by communities and connections, not pavement and parking spots. They need common spaces where culture can thrive—and where new ideas can be shared in the very places where cars previously stood parked and empty.

Taken together, this urban reimagination has the opportunity to deliver one of the most significant infrastructure shifts we have ever undertaken as a nation. And the good news is that we have to make these investments anyway. The American Society of Civil Engineers recently gave U.S. infrastructure a D+, estimating that our country requires $3.6 trillion in infrastructure investment by 2020. If we have to rebuild and revitalize our roads and cities anyway, let's do it in a way that puts people, not cars, at the center of our future.

Before we continue looking forward, I want to take a moment to look back at how we got here. Because there's something I haven't mentioned yet. This won't just be *a* transportation revolution: It will be America's *third* transportation revolution.

How We Got Here: America's First Two Transportation Revolutions

America looked very different in the early days. At the turn of the nineteenth century, the U.S. was made up of loosely connected, largely agricultural communities. If you wanted to travel over long distances, the covered wagon was pretty much your best option. The United States, in other words, were still pretty divided.

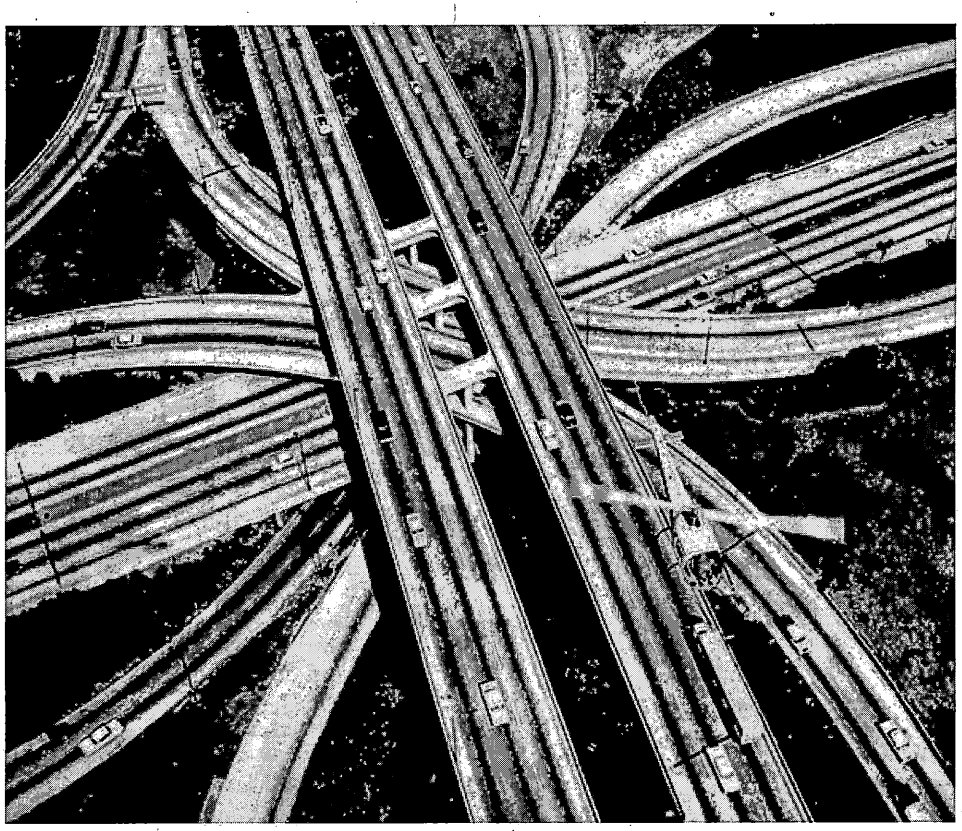
That all changed over the next several decades, as America constructed a massive transportation network of canals and railroads. By 1860, the first revolution was in full swing as more than 30,000 miles of railroad track

spread out across the U.S.—and as tracks linked together, so did communities, economies, and people. Wherever these transportation networks went, small outposts were transformed into thriving cities. Chicago, Baltimore, and Los Angeles exist as they do today because of transportation innovations that helped spark their growth.

Now fast-forward into the next century, when the assembly line automobile came onto the scene. For individuals, this brought almost unprecedented freedom. But for our cities, car ownership started a vicious cycle: as more cars filled the streets, more roads had to be built to accommodate them. This second transportation revolution caused communities to spread farther and farther apart, which made having constant access to a car increasingly necessary—resulting in even more cars that needed even more space. In the process, our cities were dramatically reshaped to favor cars over communities.

Across the country, city planners wanted to make it as easy as possible for drivers to access metropolitan areas. That often meant building highways straight through the centers of our most vibrant cities. Neighborhoods were literally split in half, and many never recovered.

In some cases, neighborhoods were demolished to make room for cars. In Los Angeles, for instance, engineers built structures like the Four Level Interchange, which connects the 101 with the 110 and hosts 425,000 cars a day. The builders made room for it by knocking down 4,000 houses and apartment buildings that were there before.



Credit: California Historical Society Collection, USC Libraries

In addition to widespread demolition, there was also a more subtle way that cars began to reshape our cities. Streets themselves used to look very different than they do today. Most were more narrow, leaving room for sidewalks, front yards, and places where people could come together outside.

Back then, people used city streets as public spaces. Streets were where children could play. A place for shopping, where you could stop at a cart on the way home to pick up everything from dinner ingredients to shoes for your family. People spent a lot of time outside on the street, making friends, seeing neighbors, and living their lives within a true community.

But when streets began to be redesigned for more and more cars, all of these other benefits suffered. As time went on, streets became a place solely for cars. They encroached closer to homes. Yards disappeared. People were left with narrower sidewalks—or no sidewalks at all. That meant less foot traffic, which made it harder for small businesses, shops, and restaurants to flourish. Development patterns changed dramatically and the strip mall was born. And with fewer people outside, neighborhoods also became less safe because we lost the benefit of having "eyes on the street" most hours of the day. For the first time in history, cities were no longer centered on human social interaction.

All of this made it harder for a community to thrive. And as changes like this played out across the country, the face of America's cities was transformed for generations.

The Problem with Cars

At this point we should probably take another step back to answer a simple question: Why is a company built around cars complaining about cars? The answer is that vehicles themselves aren't the problem. The problem is how we use them—and just as importantly, how we don't.

I studied hospitality in college, so sometimes I can't help looking at the world through the lens of a hotel. What's the occupancy? Are you getting great service? And it's actually interesting to think this way about transportation—to imagine that our ground transportation is being run like a hotel.

To measure the health of our transportation hotel, let's start by looking into how much money we spend on car ownership and how often we actually use our cars. It may shock you, but Americans spend more than $2 trillion every year on car ownership—more money than we spend on food. What's even more staggering is that for all the money we spend on them, the 250 million cars in America are only occupied 4% of the time. That's the equivalent of 240 million of the 250 million cars being parked at all times. For the most part, your car isn't actually a driving machine at all. It's a parking machine.

Can you imagine a hotel where almost every room is empty? A hotel that spends an enormous amount of money maintaining those empty rooms, no matter how little they're used? It would go out of business tomorrow. And if you think about occupancy of cars the same way, the observation is simple: America is running a failing transportation business.

America is running a failing transportation business.

Plus, think about where all those unused cars sit while they're idle. In 2011, researchers estimated that there are at least 700 million parking spaces in the U.S. That means our country has more than 6,000 square miles of parking—bigger than my home state of Connecticut.

We can't be this inefficient anymore, because we're about to hit an inflection point that will strain our cities' resources like never before. The U.S. already has ten cities with more than a million people. And our urban population is

growing fast. By 2050, almost 100 million more people will move to American cities.

We don't have enough space, housing, or public transit to accommodate this population influx, especially while keeping cities livable and desirable places to be. And while fixing transportation won't solve all these problems, it certainly doesn't help to continue devoting so much of our space to unoccupied cars.

The Third Transportation Revolution

The good news is we don't have to keep building our country around car ownership. Technology has redefined entire industries around a simple reality: you no longer need to own a product to enjoy its benefits. With Netflix and streaming services, DVD ownership became obsolete. Spotify has made it unnecessary to own CDs and MP3s. Eventually, we'll look at owning a car in much the same way.

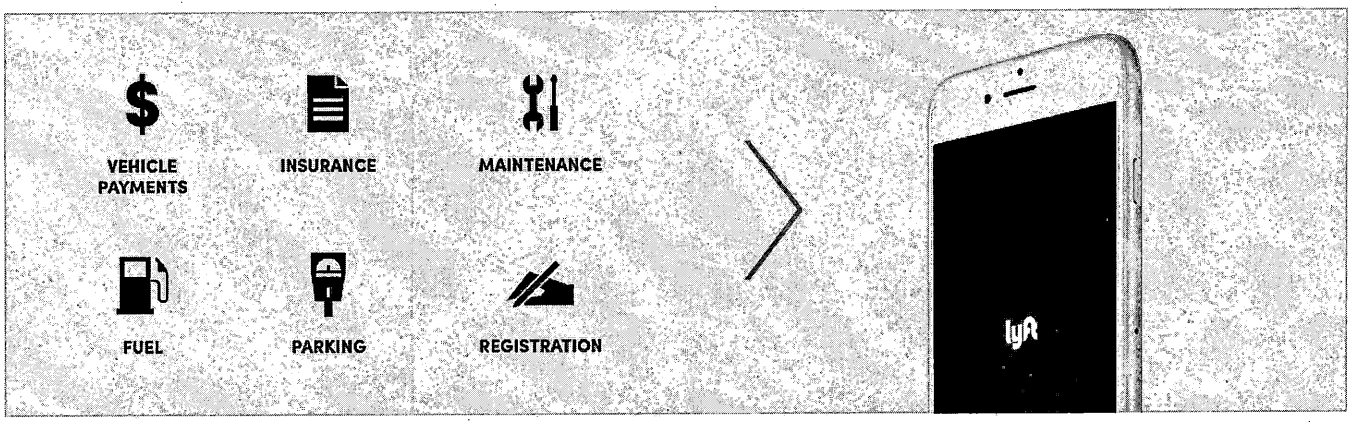
A full shift to "Transportation as a Service" is finally possible, because for the first time in human history, we have the tools to create a perfectly efficient transportation network. We saw this potential in 2012 when Lyft became the first company to establish peer-to-peer, on-demand ridesharing, which is now what the world knows simply as ridesharing. What began as a way to unlock unused cars, create economic opportunities and reduce the cost of transportation, has today become the way millions of Americans get around.

> *Ridesharing is just the first phase of the movement to end car ownership and reclaim our cities.*

Ridesharing is just the first phase of the movement to end car ownership and reclaim our cities. As I mentioned before, the shift to autonomous cars will expand dramatically over the next ten years, transforming transportation into the ultimate subscription service.

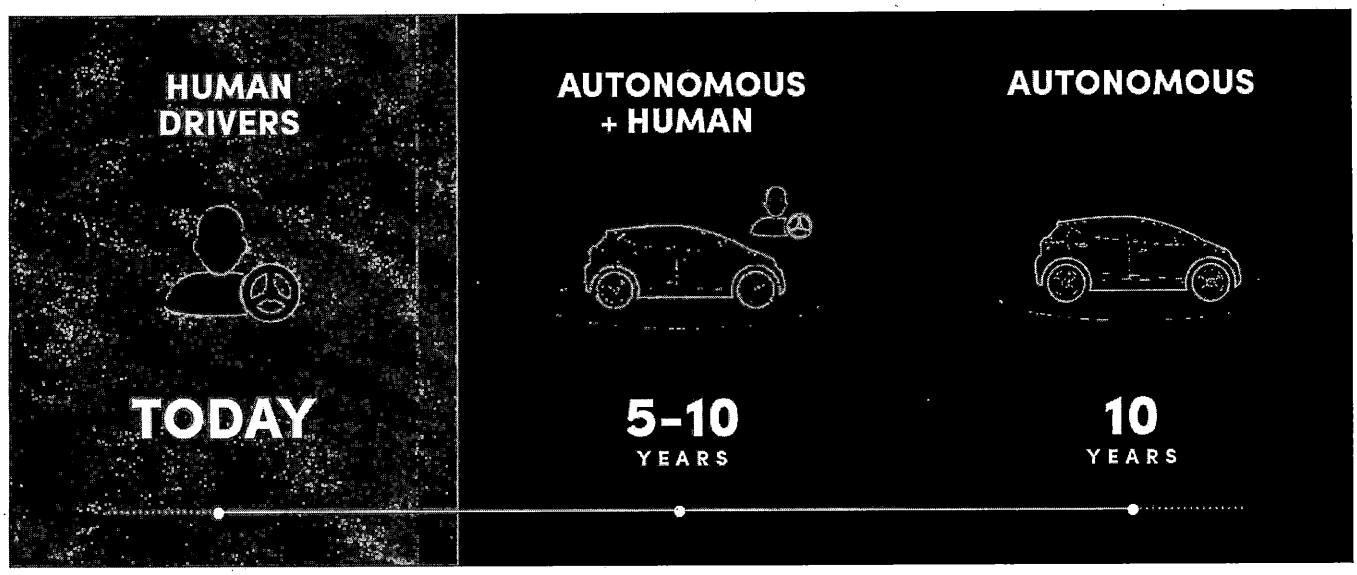
This service will be more flexible than owning a car, giving you *access* to all the transportation you need. Don't drive very often? Use a pay-as-you-go plan for a few cents every mile you ride. Take a road trip every weekend? Buy the unlimited mileage plan. Going out every Saturday? Get the premium package with upgraded vehicles. The point is, you won't be stuck with one car and limited options. Through a fleet of autonomous cars, you'll have better transportation choices than ever before with a plan that works for you.

Using the Lyft network will also save you money. Here's why: We don't often think about it, but owning a car and making monthly payments also means paying retail prices for every aspect of getting where you need to go—fuel, maintenance, parking, and insurance. In a future subscription model, the network will cover all of these costs across a large network of cars, passing the savings onto you. We cut the hassle and you get the one thing you really want: the true freedom to ride.



Credit: Lyft

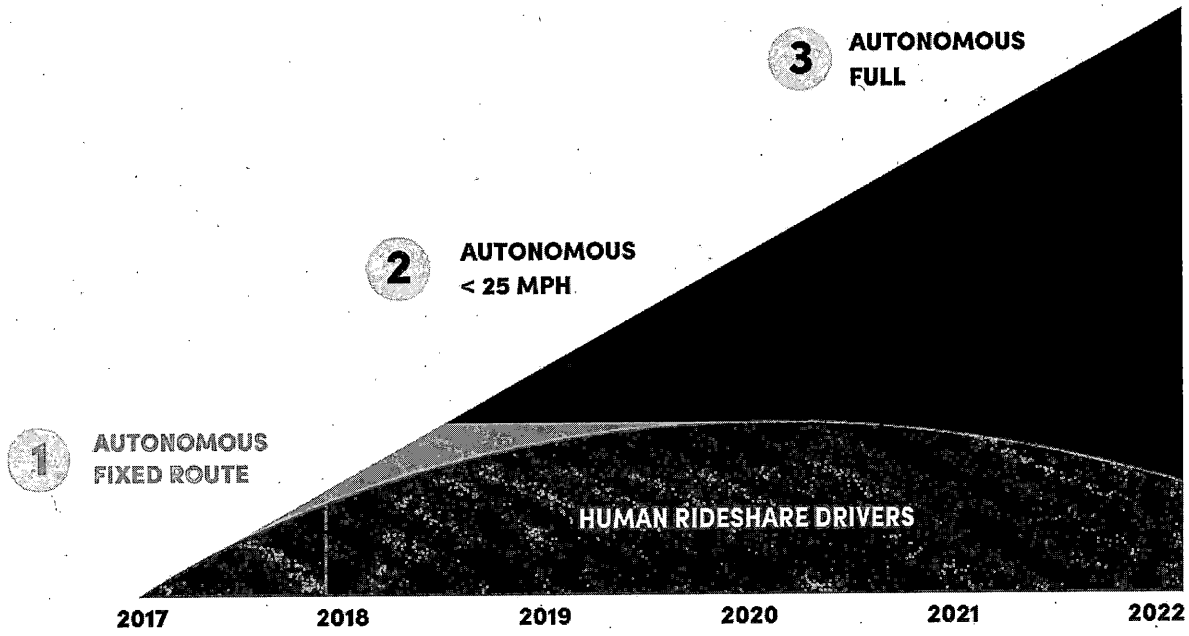
Once this happens—once autonomous networks provide better service at a lower cost—our country will pass a tipping point. And by 2025, owning a car will go the way of the DVD. Until then, over the next five to 10 years there will be both driver and driverless cars on the road, which we call a *hybrid network*.



Credit: Lyft

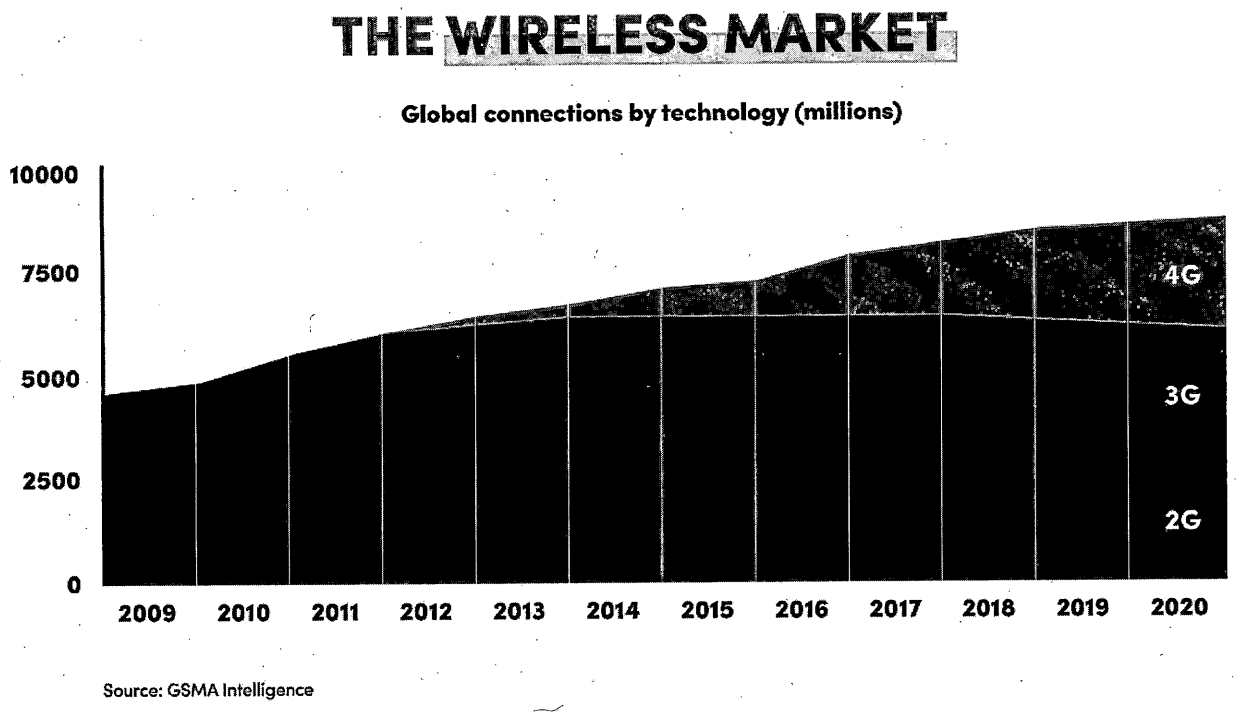
We are currently in the first of three phases, and will be until vehicles can be operated without any human intervention. That said, we don't have to wait until autonomous cars are capable of handling *all kinds of rides* without human intervention. The second, or hybrid, period will be defined by a mix of limited capability autonomous vehicles operating alongside human-driven ones. At first, fully autonomous cars will have a long list of restrictions. They will only travel at low speeds, they will avoid certain weather conditions, and there will be specific intersections and roads that they will need to navigate around. As technology improves, these cars will be able to drive themselves in more and more situations. Hypothetically, Lyft could initially have a fleet of autonomous cars that completes rides under 25 miles per hour on flat, dry roads. Then, we could upgrade the fleet to handle rides under those same conditions, but at 35 miles per hour. And so on and so on, until every kind of trip can be completed by an autonomous car.

Some people assume that the introduction of autonomous vehicles will mean human drivers are no longer needed. We believe that in the first five or more years following the introduction of autonomous vehicles, the need for human drivers will actually *increase*, not *decrease*. How is that possible? Rides in autonomous vehicles will be less expensive than any options today and will lead to more people using Lyft for more and more of their transportation needs. As people rely on Lyft for more of their transportation, they are more likely to live car-free. And as more people trade their keys for Lyft, the overall market will grow dramatically. When autonomous cars can only solve a portion of those trips, more Lyft drivers will be needed to provide service to the growing market of former car owners.



Credit: Lyft

Remember when cell phone coverage transitioned from 3G to 4G? The 4G networks were slowly rolled out, first covering only the largest cities and eventually growing to cover larger and larger portions of suburban areas. This ensures that people are always covered, one way or another. If you spend most of your time in a place that's only covered by 3G or even 2G, you still have a network to rely on. But as soon as you step into a spot with 4G coverage, you automatically get to try it. Just wait for the upcoming launch of 5G. Future 5G networks won't be introduced to the world by new companies, they will be rolled out on top of the largest existing networks around the world.



Credit: Lyft

The introduction of autonomous vehicles will follow the same pattern, and will be the only way passengers are always covered. Safety is paramount, so any condition which remotely adds risk can be serviced through a hybrid network while the technology improves. If it's snowing or raining we can turn off autonomous mode—and still pick you up. But all of this happens behind the scenes. For the passenger, autonomous will just be another mode of transportation. And no matter where you want to go, you'll be able to enjoy safe and reliable service from Lyft.

Cars defined our cities. Now it's time for us to redefine them.

There are many concepts for what the inside of self-driving cars will ultimately look like. Will they have couches and TV screens? Will happy hour take place with friends on the ride back from work? When our children say, "Are we there yet?" will the car respond? But when it comes to autonomous vehicles, the most important question is not what they will be like on the inside. It's what changes they will enable in the world around them. Since autonomous networks will be much more efficient than individual ownership, a large number of cars will come off the road—freeing up an enormous amount of space to devote to anything but cars. Eventually, we'll be able to turn parking lots back into parks. We'll be able to shrink streets,

expand sidewalks, and make room for more pedestrians. That means more local shops and small businesses, more shared spaces, and more vibrant communities. This translates to better cities—and better lives—for people all over the world.

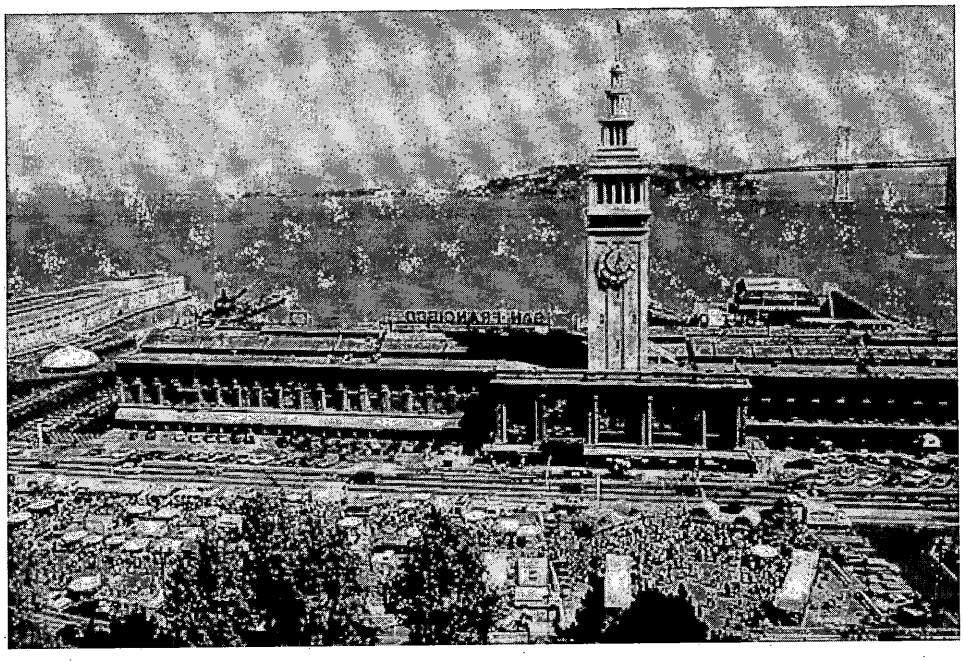
And we don't need to look into some far-off tomorrowland to imagine what it will look like. It's already happening today. It's happening in New York City, which is expecting a million new residents by 2030. Under Mayor Bloomberg, New York embarked on a plan to reclaim 180 acres of roads from vehicles—and turn them into things like bike lanes and public plazas. The parking lot below the Manhattan Bridge, is now a plaza where New Yorkers go to eat lunch and spend time with friends. Just five years after reclaiming this space from cars, retail sales in the surrounding area increased 172% (Sadik-Khan, Janette. *Streetfight: Handbook for an Urban Revolution.* Pg. 254).

Or look at San Francisco, where the historic Ferry Building was blocked for decades by a two-level freeway. Since locals couldn't really get there, it became a rarely-visited office building. But when the road was damaged by an earthquake in 1989, the city saw an opportunity. Instead of rebuilding the space for cars, it tore down the highway and reimagined the area as a place where people could gather. Shops, restaurants, and cafes were built, and before long the Ferry Building became the focal point of the San Francisco waterfront. Every weekend, almost 25,000 people visit its farmers market and support local vendors. As a result, new neighborhoods emerged, and within five years, there was 51% more housing available in the surrounding area.

Before

Credit: Sustainable Cities Collective

After



Credit: CUESA

Look at Washington, DC, where the historic Georgetown district has begun widening sidewalks. Or cities like Phoenix and Portland, which are replacing parking lots with parks, cafes, and meeting spaces They're tearing up pavement and planting trees. Projects like this are happening all over the

world, from Seoul to Barcelona, proving that taking back our cities is a global phenomenon.

This opportunity is not simply about more parks and less parking, though. The design of our cities has tremendous implications on global economics, health, social equality, the environment, and overall quality of life. The problem is, not nearly enough time is spent considering how we can improve our collective home.

Our society is at a fork in the road and whether we take the right path is not inevitable. I don't have all the answers, but what I do know is that decisive action must be taken by all of us—business leaders, policymakers, city planners, and citizens—to realize the full potential of this almost unprecedented moment in history.

Over the next year, to encourage more discussion on what is needed to deliver the right change to our cities, I will partner with experts in relevant fields to share and debate this opportunity through a column called "The Road Ahead." It will examine the future through the lens of transportation, and discuss the steps we need to take today to unlock an era of unbound social progress.

We have a long way to go. But when I look at the world through my 9-month-old baby girl's beautiful eyes, I know what we have to do. We must come together and grab this golden ticket to redesign an even greater home. A home that drives community—not cars—to the center of our everyday life.

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MEMO: ELIMINATION OF MINIMUM PARKING REQUIREMENTS WITHIN TOD AREAS.

Monday, September 19, 2016

Mayor & City Council, City of Pasadena

Minimum Parking Requirements have a direct impact on **the cost of housing**. Pasadena's lack of affordable housing—high rents and the unattainable cost of starter condo units—is partially related to our current parking requirements. There is no such thing as "free parking," and the costs of mandated parking spaces are passed on directly to renters and unit owners.

In the past, parking was necessary, but the changes in transportation technology (shared rides and the impending arrival of autonomous vehicles) and also changes in our city and region (investment in public transit and increased focus on walkability and denser) mean that mandating the development of parking spaces is increasingly wasteful and expensive.

Please find attached an article and study demonstrating parking requirements relation to the cost of housing.

I urge Council to adopt the following parking requirements:

		Sierra Madre Villa TOD Station Area		Allen, Lake, Memorial Park, Del Mar, and Fillmore TOD Station Areas and Central District Transit Oriented Area	
		Existing	Proposed	Existing	Proposed
Residential* (Projects Over 48 Dwelling Units/Acre)	< 650 sq. ft.	1 to 1.25 space/unit	1 space/unit	1 to 1.25 space/unit	***0 to 1*** space/unit
	> 650 sq. ft.	1.5 to 1.75 space/unit	1.5 to 2 space/unit	1.5 to 1.75 space/unit	***0 to 1.75***
Non-Residential	Office (excluding medical offices)	Mandatory 25% reduction from the code	No Change	Mandatory 25% reduction from the code	Mandatory 25% with up to 35% reduction from the code
	All other non-residential uses	Mandatory 10% reduction from the code		Mandatory 10% reduction from the code	Mandatory 10% with up to 20% reduction from the code
*Zoning Code Section 17.46.040 requires 1 parking space for units <650 sq. ft., and 2 parking spaces for units >650 sq. ft. in other multi-family districts					

Sincerely yours,

Jonathan Edewards

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From The Atlantic
CITYLAB

CITYFIXER

The High Cost of Residential Parking

Every time a new building includes space for cars, it passes those costs on to tenants.

ERIC JAFFE | @e_jaffe | May 11, 2015 | 51 Comments

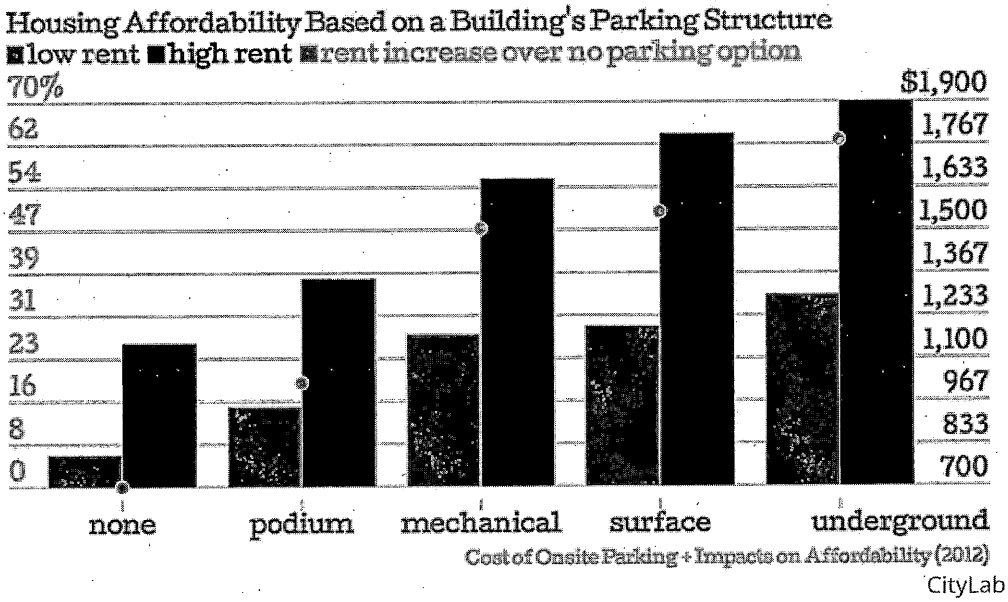
Phil Roeder / Flickr

Seattle's smart new plan to give tenants transit passes instead of parking spaces should help housing stay more affordable down the line. To get a sense just how much money renters might save, the city relied on a 2012 study of how parking impacts affordability from its neighbor in the Pacific Northwest, Portland. That work is striking for both its clarity and its conclusions, so let's took a closer look.

Portland's Bureau of Planning and Sustainability modeled what happens to unit prices when a building developer decides to include parking. A few specs if you're into that sort of thing: the sites were 10,000 square feet (so, about 4 stories tall), zoned for mixed-use (so, shops on the ground floor), with units averaging 550 square feet (so, depending on your persona, cozy or cramped).

The report looked at several types of parking, including a surface lot, podium (a partial cut of ground floor) style, mechanical lifts that maximize space, or underground parking. All are compared to a 50-unit development option with no parking at all. The low-end rents assume developers make a 7 percent profit on the project; the high-end assumes 10 percent.

Charting the data on cost, we can see rents climb as the parking options become more complex, and thus expensive for the developer. A low-end rent in a building with no parking comes to $800 a month. Rent in the same unit in a building with the cheapest parking option, surface spots, comes to $1,200—a 50 percent jump. In a building with underground parking, the low-end rent hits $1300, a spike of 62.5 percent.



Of course, more parking in a building doesn't just mean higher unit rents—it means fewer units, period. Below we chart the rental units that are sacrificed to various parking types. Again, in the no-parking scenario, a building can have all 50 possible units. This time the underground lot actually fares best among the parking options, since it preserves all but 3 units. The surface lot removes 20 potential homes—that on top of whatever commercial development space it might lose on the ground floor.

CityLab

So we see how parking (especially surface parking) becomes a scourge on a city. Residential lots and spaces make individual units less and less affordable for tenants. They also result in fewer units as a whole, meaning the supply of housing across the city takes a hit. That too jacks up rents over time, as neighborhoods run out of sites to develop, and families run out of places to live.

For decades, cities have required developers to include parking as part of their building plans, a "minimum" standard that's only now starting to relax in places. That shift in focus does create new challenges: cities must find other places for parking (ideally, shared facilities), or better yet, craft programs that discourage residents from driving in the first place (like Seattle's). But for metros struggling to make housing more affordable, rethinking parking policy is a clear place to start.

About the Author

Eric Jaffe is the former New York bureau chief for CityLab. He is the author of *A Curious Madness* and *The King's Best Highway*.

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Cost of Onsite Parking + Impacts on Affordability

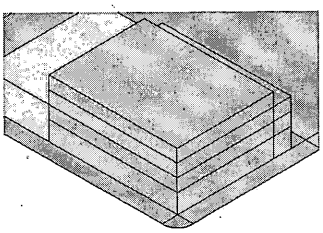
The Bureau of Planning and Sustainability modeled development data to evaluate the cost of providing onsite parking for infill apartments and impacts on affordability. Six different development prototypes were evaluated. A description of methodology used for this evaluation follows.

Methodology

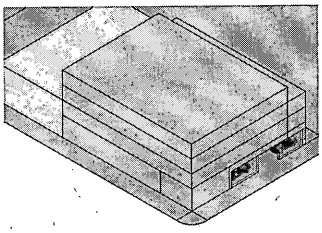
WHAT ARE THE PARKING ALTERNATIVES THAT WERE EVALUATED?

Diagram A. Building Prototype Form

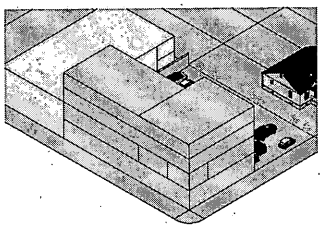
No Parking



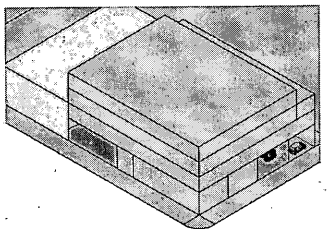
Tuck-Under



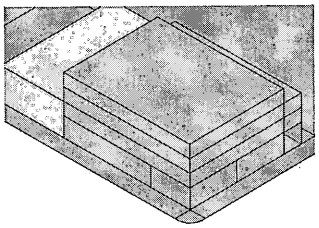
Surface Parking



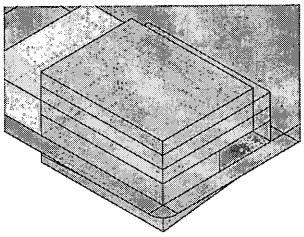
Podium



Mechanical



Underground



Tuck-Under Parking

Tuck-under parking is distinguished by its open configuration. One wall of the parking area is open with no garage door. Most tuck-under areas have living space or commercial space abutting the rear wall of the parking area.

Surface Parking

Surface parking is a parking lot located on street level.

Podium Parking

Podium Parking is similar in design to tuck-under parking though will occupy a larger percentage of the ground floor. Podium parking would likely require two curb cuts (in and out) to allow for circulation of vehicles and may have a negative impact to continuous frontage (street-level activity).

Mechanical Parking

Parking lifts are automated or manual lift systems designed to stack one or more vehicles vertically. Parking lifts may be located indoors or outdoors. Where space to provide parking is limited, parking lifts may be an appropriate method for meeting parking requirements. Parking lifts located outdoors must meet applicable height and screening requirements.

Underground Parking

Underground parking is a below ground parking lot that is accessed by a ramped entry. Due to the limited site size for this building prototype, multi-story parking is not considered as the space required for circulation between floors adds significant cost and limits the number of practical spaces per floor. As a result, one level of underground parking is considered.

HOW WERE THE BUILDING PROTOTYPES MODELED?

Envision Tomorrow

Envision Tomorrow puts powerful tools in planners' hands to design and test land use, site development, and transportation decisions. Envision Tomorrow provides planners with an easy-to-use, analytical decision making tool.

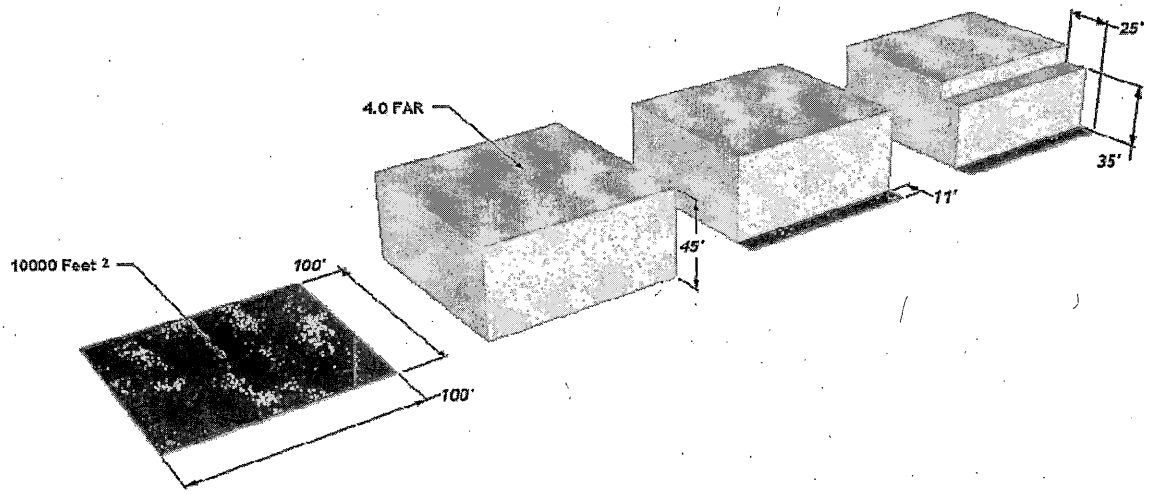
The Envision Tomorrow Prototype Builder & Return on Investment (ROI) Model tests the physical and financial feasibility of development. The tool allows for the examination of land use regulations in relation to the current development market and considers the impact of parking, height requirements, construction costs, rents and subsidies. This tool can be used to evaluate what development assumptions will generate a project profit (reported as 7 to 10 profit on investment in this study). In this study, the model was used to assess how alternative parking scenarios and forms of development, such as tuck-under and podium, might become more financially feasible. Similarly, by keeping a standard return on investment rate, a range of monthly rental rates can be modeled to more accurately depict the impact on affordability.

WHAT DEVELOPMENT ASSUMPTIONS WERE USED FOR MODELING?

Site Development Assumptions

All development prototypes assume a 10,000 square feet lot size with 100 foot depth, or 0.23 acres. CS (Storefront Commercial) or Mixed Commercial/Residential (CM) zone is assumed. Both zones intend to promote development that combines commercial and housing uses on a single site. This zone allows increased development potential on busier streets without fostering a strip commercial appearance. Development is intended to consist primarily of businesses on the ground floor with housing on upper stories. Development is intended to be pedestrian-oriented with buildings close to and oriented to the sidewalk, especially at corners.

Diagram B. CS/CM Building Envelope Guidelines



Each development prototype assumes 4 stories of development with an 86% utilization rate. This utilization rate accounts for an eleven foot rear building set back and a maximum height reduction to 35 feet for a 25 foot depth, also at the rear of the building (*see Diagram B*). These reductions amount to an approximate loss of 6,000 square feet buildable area.

As part of the modeling, circulation, lobby, and egress spaces internal to the building are discounted from the gross building square footage. The no parking development prototype assumes 50 units, which translates to an average unit size of 550 square feet after circulation spaces. This unit size remains constant throughout each of the alternative building prototypes.

WHAT DEVELOPMENT COST ASSUMPTIONS WERE USED FOR MODELING?

A site acquisition cost of $27.00/sq ft was assumed based on a sampling of land values in CS zones in Inner Portland neighborhoods. For a 10,000 sq foot site this translates to $270,000. Construction costs for residential units were set at $109.00 a square foot. Given an average unit size of 550 sq feet, this translates to approximately $60,000 to produce a residential unit. Standard parking spaces are generally assumed to occupy 260 sq feet (including circulation area). Mechanical parking utilizes half this space on account for stacking spaces. In general two standard parking spaces will replace a residential unit. This is important as the main drivers for unit cost are number of units and overall construction cost. As the cost to produce additional parking spaces becomes greater than the cost of the units not produced, rental rates rise. Similarly, as the number of units decreases within a project, project costs are distributed in greater proportion to renters. For example, in the tuck-under development prototype there is an overall cost savings as the 5 units that are not produced (at a cost of $300,000) come at a greater savings than the cost associated with producing 9 parking spaces (at a cost of $20,000 a space or total cost of $180,000). There is a small decrease in the overall project cost; however, as there are 5 fewer units to generate monthly revenue, a slim rental rate increase is observed. In other development scenarios, as the cost to produce parking increases, there is an increase in project cost and a decrease in the total number of units resulting in larger rental rate increases.

Table A. Cost of Parking

Parking Type	Parking Costs Per Space
Surface	$3,000
Podium/Structured (above ground)	$20,000
Underground	$55,000
Internal (Tuck Under or Sandwich)	$20,000
Mechanical	$45,000

HOW DO THE BUILDING PROTOTYPE ALTERNATIVES PERFORM?

- A building with no parking is able to utilize the full capacity of the development on the site (factoring in assumptions above). In this scenario fifty units and zero parking spaces are constructed. This is the most affordable unit produced amongst the alternatives.
- A building with tuck-under parking is able to utilize nearly all development capacity, with a loss of 5 residential units. In this scenario 45 units and 9 parking spaces are constructed. There is a moderate rental

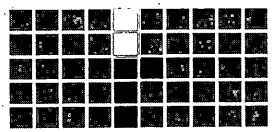
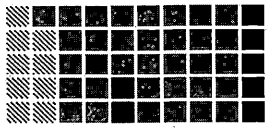
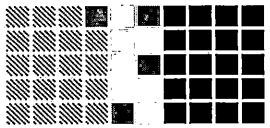
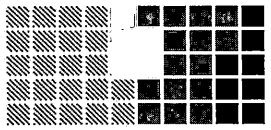
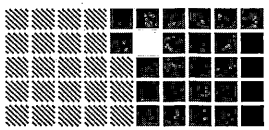
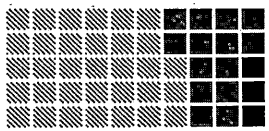
rate increase associated with this scenario to accommodate the cost associated with providing tuck-under spaces and loss of potential residential units.

- A building with surface parking is able to utilize 50 percent of development capacity. In this scenario 30 units and 19 parking spaces are constructed. There is a rental rate increase associated with this scenario to accommodate for the opportunity cost associated with not producing 20 units.
- A building with podium parking utilizes 75% of the ground floor to provide parking. In this scenario 42 units and 22 parking spaces are constructed. There are negative impacts to ground floor activity and street frontage which may have a direct impact on surrounding businesses, pedestrians, and street character due to additional curb cuts and loss of continuous storefront/first floor character.
- A building with mechanical parking utilizes 40% of the ground floor to provide parking. In this scenario 46 units and 23 parking spaces are constructed. Mechanical parking is a space-efficient parking alternative as it stacks parking spaces with the aid of mechanical systems. As a result, more parking spaces can be constructed in a smaller space; however, it adds significant cost, at $45,000 a space.
- A building with underground parking is challenged given the limitations of the 10,000 sq foot lot. The practicality of producing underground parking is challenged given the short bay width (less than 100') and limitations to circulation between levels. In this scenario 44 units and 33 parking spaces are constructed. The rental increase can be attributed directly to the cost of providing underground parking at a cost of $55,000 a space.

Table B. Building Prototype Summary

Building Development Prototype	# of Units	# of Parking Spaces	Parking Spaces per Unit	7% ROI* Monthly Rent	10 % ROI* Monthly Rent
No Parking	50	0	0	$800	$1150
Tuck-Under	45	9	0.25	$850	$1200
Surface	30	19	0.6	$1200	$1800
Podium	42	22	0.5	$950	$1350
Mechanical	46	23	0.5	$1175	$1660
Underground	44	33	0.75	$1300	$1900

**Note: ROI= Return on Investment*

	# of Units	# of Parking Spaces	Parking Spaces per Unit	% of Ground Floor used for parking	Parking Cost as a Percentage of Total Construction Cost	Construction Cost	Potential Monthly Rental Range (550 sq ft apartment)*
	50	0	0	0%	0%	4.3 M	*$800 - $1,150*
			A building with no parking is able to utilize the full capacity of the development on the site (factoring in assump this scenario fifty units and zero parking spaces are constructed.				
	45	9	0.25	33%	4%	4.3 M	*$850 - $1,200*
			A building with tuck-under parking is able to utilize nearly all development capacity, with a loss of 5 residential u parking spaces are constructed. There is a moderate rental rate increase associated with this scenario to accom providing tuck-under spaces and loss of potential residential units.				
	30	19	0.6	47%	2%	2.8 M	*$1,200 - $1,800*
			A building with surface parking is able to utilize 50 percent of development capacity. In this scenario 30 units an constructed. There is a rental rate increase associated with this scenario to accommodate for the opportunity c 20 units.				
	42	22	0.5	66%	10%	4.3 M	*$950 - $1,350*
			A building with podium parking utilizes 75% of the ground floor to provide parking. In this scenario 42 units and There are negative impacts to ground floor activity and street frontage which may have a direct impact on surrc street character due to additional curb cuts and loss of continuous storefront/first floor character.				
	46	23	0.5	40%	22%	5.4 M	*$1,175 - $1,660*
			A building with mechanical parking utilizes 40% of the ground floor to provide parking. In this scenario 46 units constructed. Mechanical parking is a space-efficient parking alternative as it stacks parking spaces with the aid more parking spaces can be constructed in a smaller space; however, it adds significant cost, at $45,000 a space				
	44	33	0.75	20%	28%	6.5 M	*$1,300 - $1,900*
			A building with underground parking is challenged given the limitations of the 10,000 sq foot lot. The practicalit is challenged given the short bay width (less than 100') and limitations to circulation between levels. In this scer are constructed. The rental increase can be attributed directly to the cost of providing underground parking at a				

Housing Unit

- *Based on Results of Envision Tomorro*
- *Developments with a Retu*