

An aerial night view of a city with a network overlay. The city lights are visible, and a network of white lines connects various points across the image, suggesting a digital or urban infrastructure theme.

# **Future of Urban Mobility**

## Insights shared by IKEA®





# About this report

**This report compiles insights on how the mobility of people, goods and retailing could change within cities.**

The focus of the project is urban mobility – the movement of people and goods within cities and their immediate metropolitan areas.

The input for this report comes from a group of experts in urban mobility who came together in the IKEA Future of Urban Mobility Advisory Community (IFMAC).

The geographic scope is Western Europe, the United States, China and India.

Some of the views expressed in this report may not be endorsed by all the members of the IFMAC.

Why IKEA created this report? Because we see cities all over the world are changing rapidly when it comes to mobility.

IKEA seeks to understand the effect of these changes. By exploring the global change in urban mobility, we have created a point of view for IKEA. We are happy to share these insights, so you can create yours.

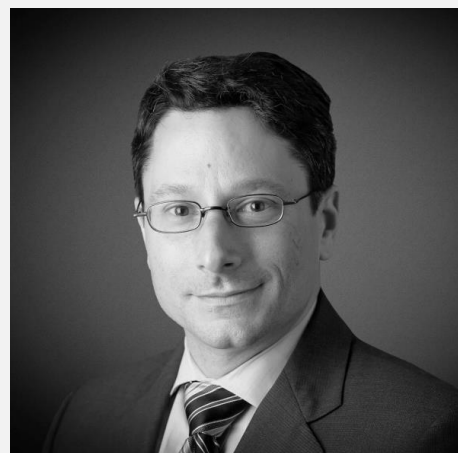




# The IKEA Future of Mobility Advisory Community (IFMAC)

## Why a community?

- Urban Mobility is an important topic for IKEA today and in the future. For that reason, we are interested in creating relationship with expert networks in this area. Creating IFMAC gave the members an opportunity to connect and learn from each other while IKEA benefits from the knowledge, interaction with the experts and creating long-term relations.
- The IFMAC gave IKEA a chance to capture the diversity of views among multiple dimensions of urban mobility – from urban logistics to consumers/behavior to data/platforms
- The IFMAC was a platform to expose divergent views, tensions and uncertainties, as well as points of agreement



**John Moavenzadeh, IFMAC Chair**

The IFMAC was facilitated by John Moavenzadeh, Founder and Managing Partner of Mobility Nexus LLC and Executive Director of MIT Mobility Initiative, Formerly Head of Mobility, World Economic Forum

Europe



Planning/Cities, Policy

**Michael Hurwitz**  
Partner Energy, Mobility & Innovation, PA Consulting



Planning/Cities, Micromobility

**Marco Te Brömmelstroet**  
Prof in Urban Mobility Futures, Uni of Amsterdam



Business Strategy, Sustainability

**Sophie Punte**  
Managing Director Policy, We Mean Business Coalition

USA



Data Platforms, Policy

**Tiffany Chu**  
Chief of Staff to the Mayor of Boston



Planning/Cities, Consumers/Behavior

**Jinhua Zhao**  
Faculty Director, MIT Mobility Initiative



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**Robin Chase**  
Founder, Zipcar; Founder, NUMO



Technology, Urban Logistics

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Autonomy Systems Engineer, Nuro



Consumers/Behavior, Business Strategy

**Sheryl Connelly**  
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Data/Platforms, Urban Logistics

**Mattias Winkenbach**  
Director, MIT Megacity Logistics Lab

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Sustainability

**Daizong Liu**  
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Consumers/Behavior

**Michael Dunne**  
Founder and CEO, ZoZo Go



Technology, Sustainability

**Chetan Maini**  
Co-Founder & Vice Chair, Sun Mobility

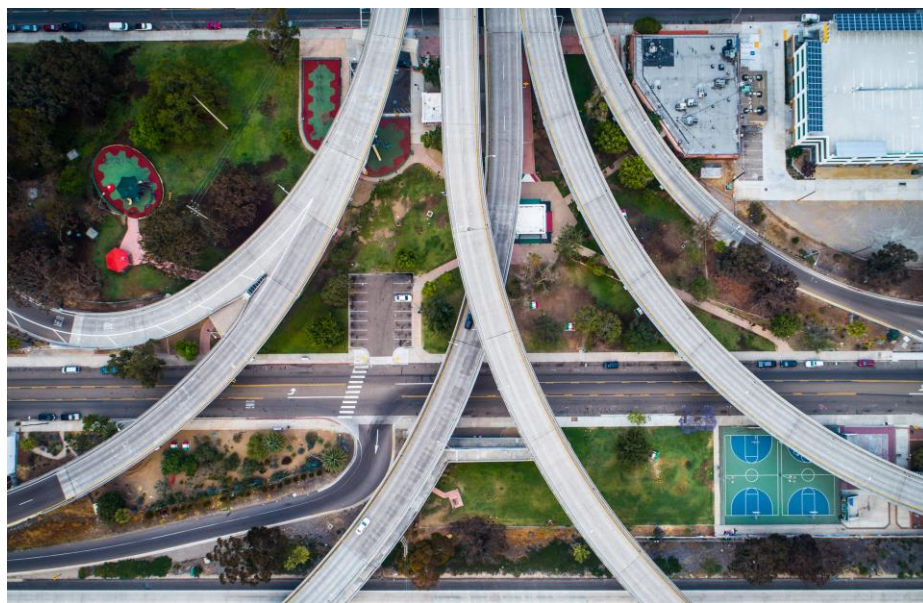
8 ESSENTIAL URBAN MOBILITY CONCEPTS

# **What do we need to understand about the mobility system?**



# The IFMAC explored eight essential urban mobility concepts

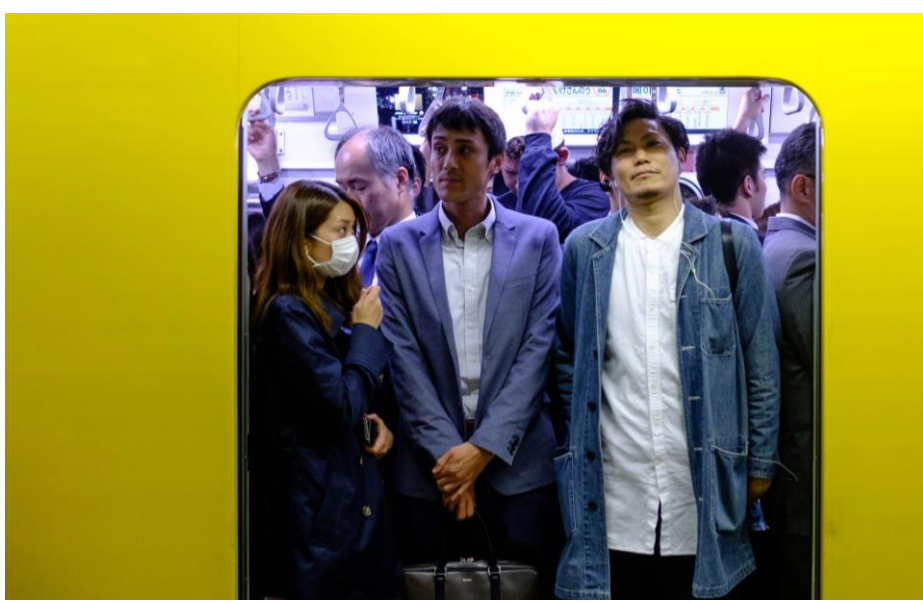
01  
Mobility is a system.



02  
Infrastructure shapes mobility.



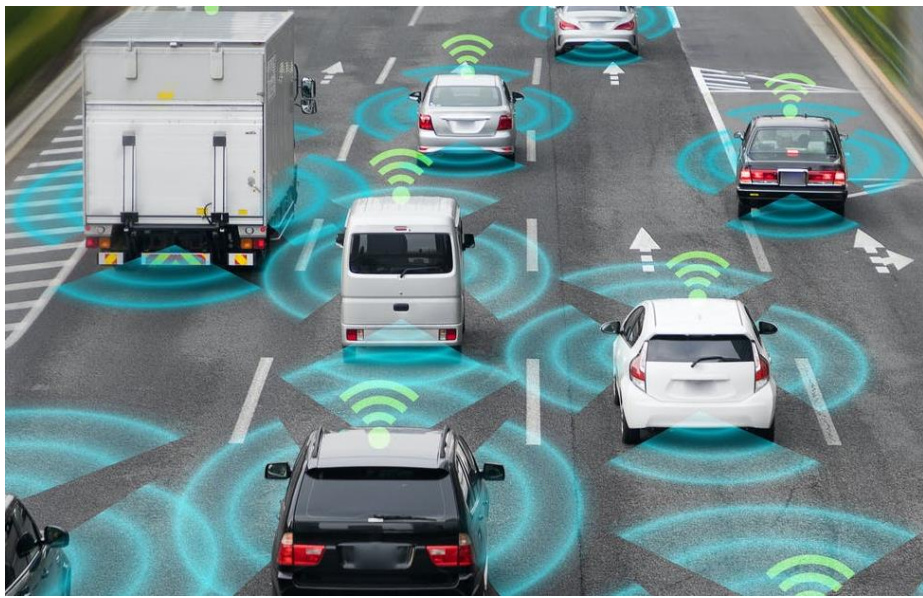
03  
Behavior and norms are critical.



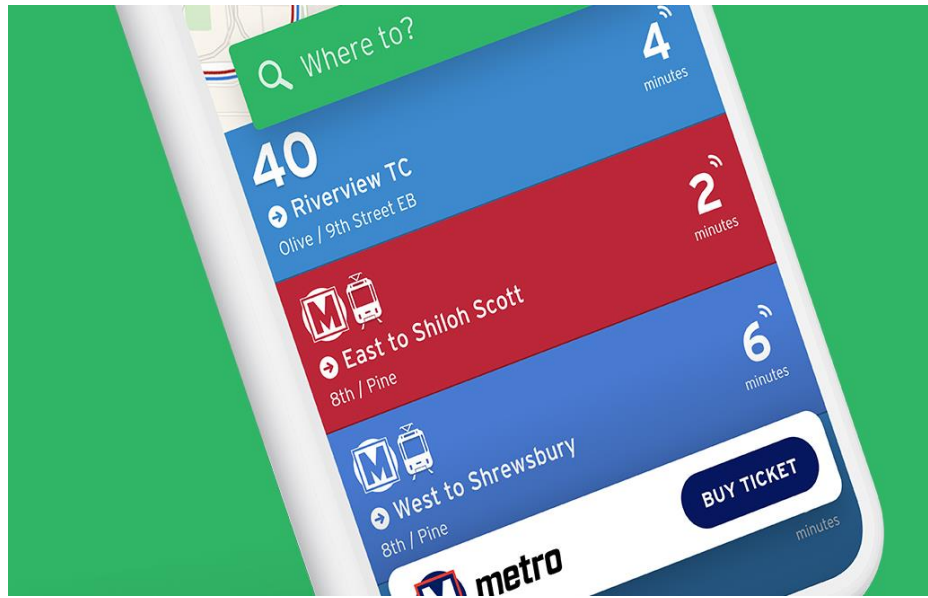
04  
Mobility is expensive.



05  
Technology is not a panacea.



06  
Integration is the holy grail.



07  
Beware of induced demand.



08  
Cities are shaping their own future.

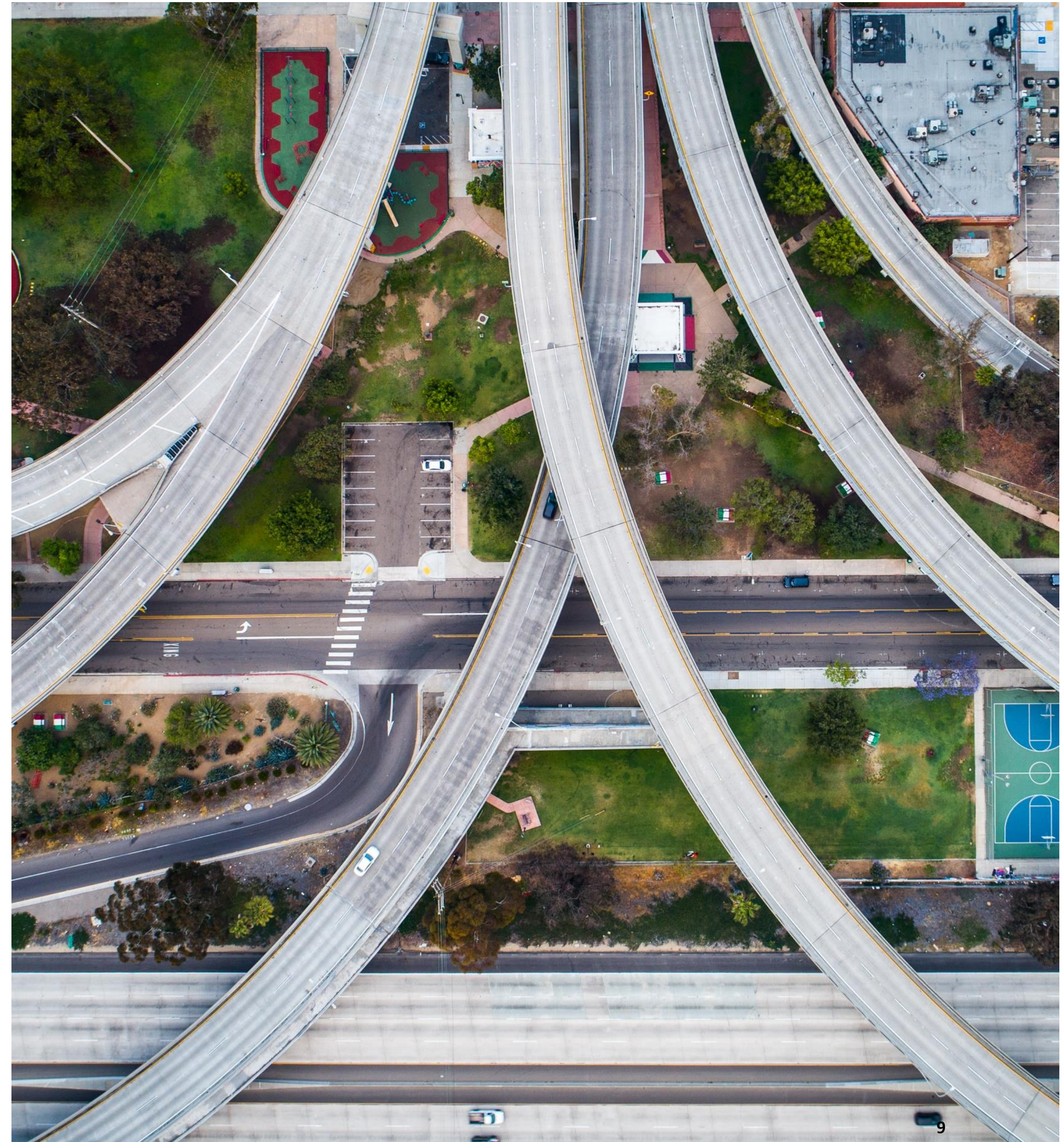




## Concept 01

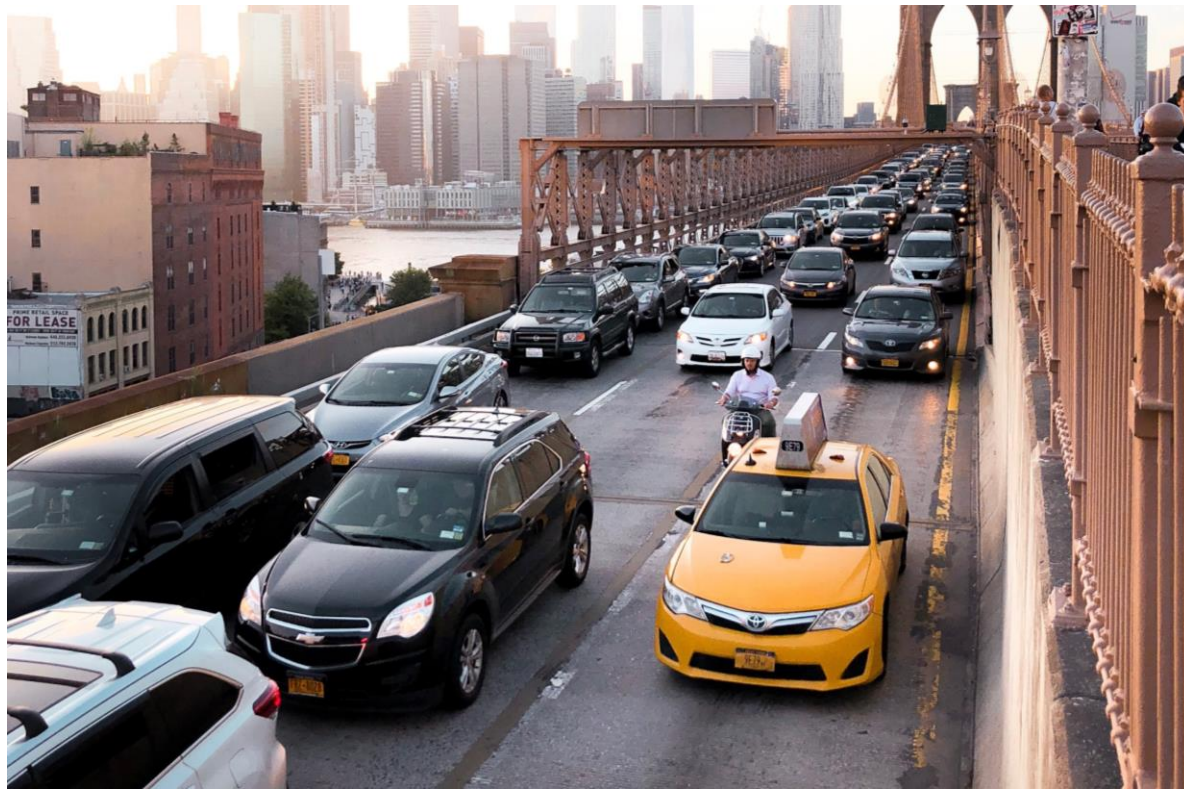
# Mobility is a system.

Mobility is delivered by many stakeholders – citizens, governments, businesses – operating with different and often competing incentives. The mobility system is interconnected with other complex systems, such as energy, infrastructure, health, etc. As we look to the future, we should collectively aim to build a mobility system that is safe, clean and inclusive.



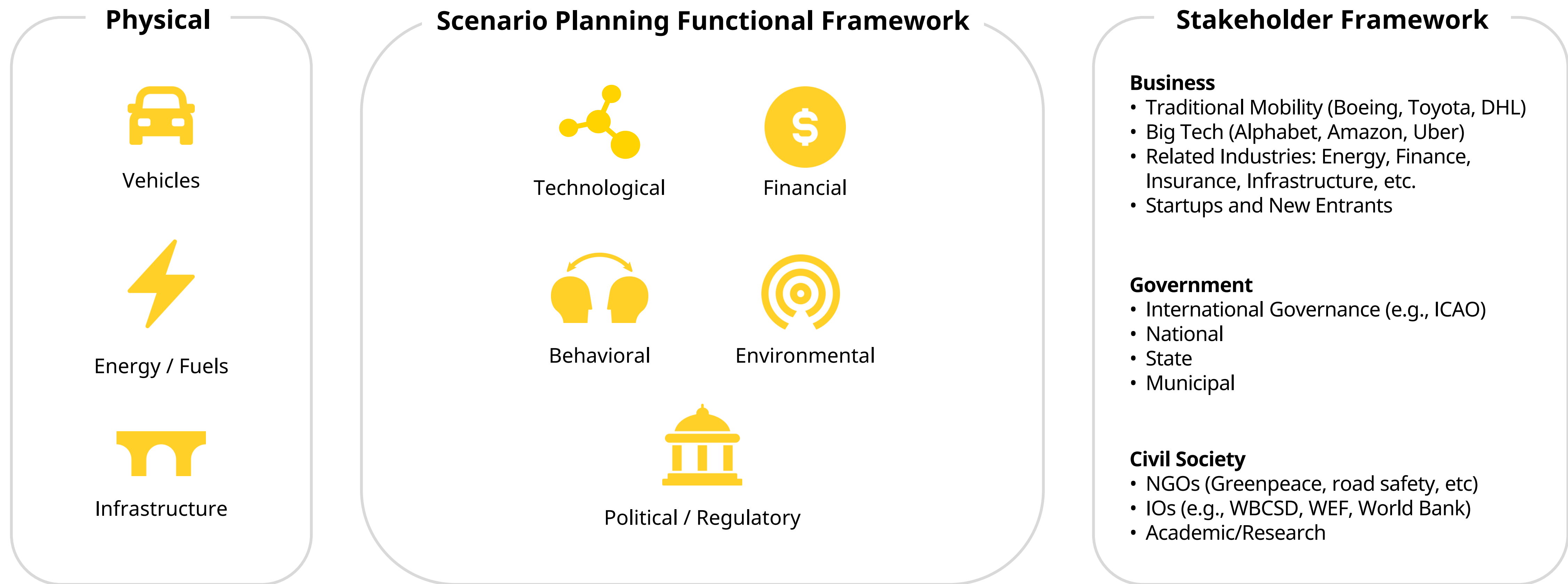


# Mobility - the movement of people and goods - is a complex and diverse system



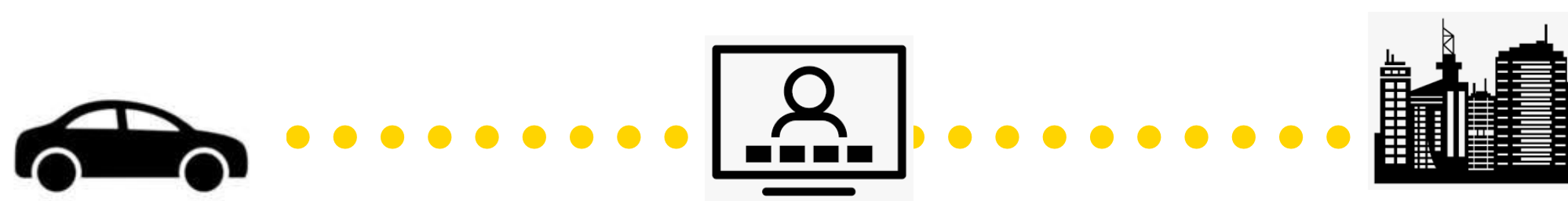


# The mobility system can be defined through different perspectives





# Varied perspectives on why the mobility system is important – but access is at the core

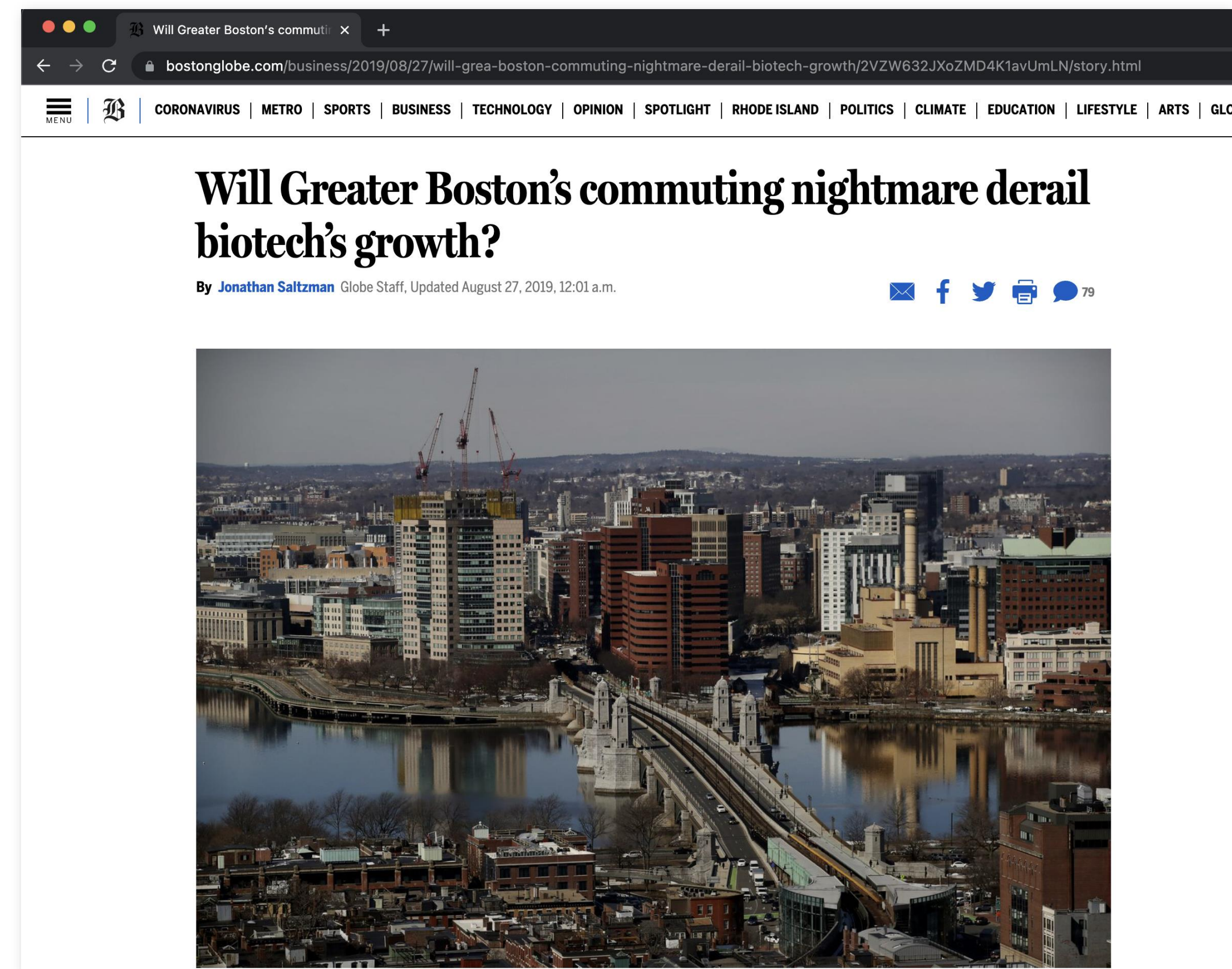


**Access = mobility and/or connectivity and/or proximity**

Mobility provides access ... to people, ideas, products, and employment opportunities. Better mobility in an urban area translates to a more efficient and productive labor market. Some argue mobility doesn't matter at all – it's only access that matters.

Mobility affects quality of life – for better and for worse. Streets should be places where people want to be. We have a human need to travel, to experience, to explore.

Mobility matters because the negative externalities matter. Mobility is the top greenhouse gas emitter in many countries, the top cause of death for young people, a poverty trap.





# The core challenge is that the current mobility system is not sustainable

Global demand for mobility is growing, but today's mobility system cannot accommodate tomorrow's mobility demand. Some new technologies could make the problem worse, not better.

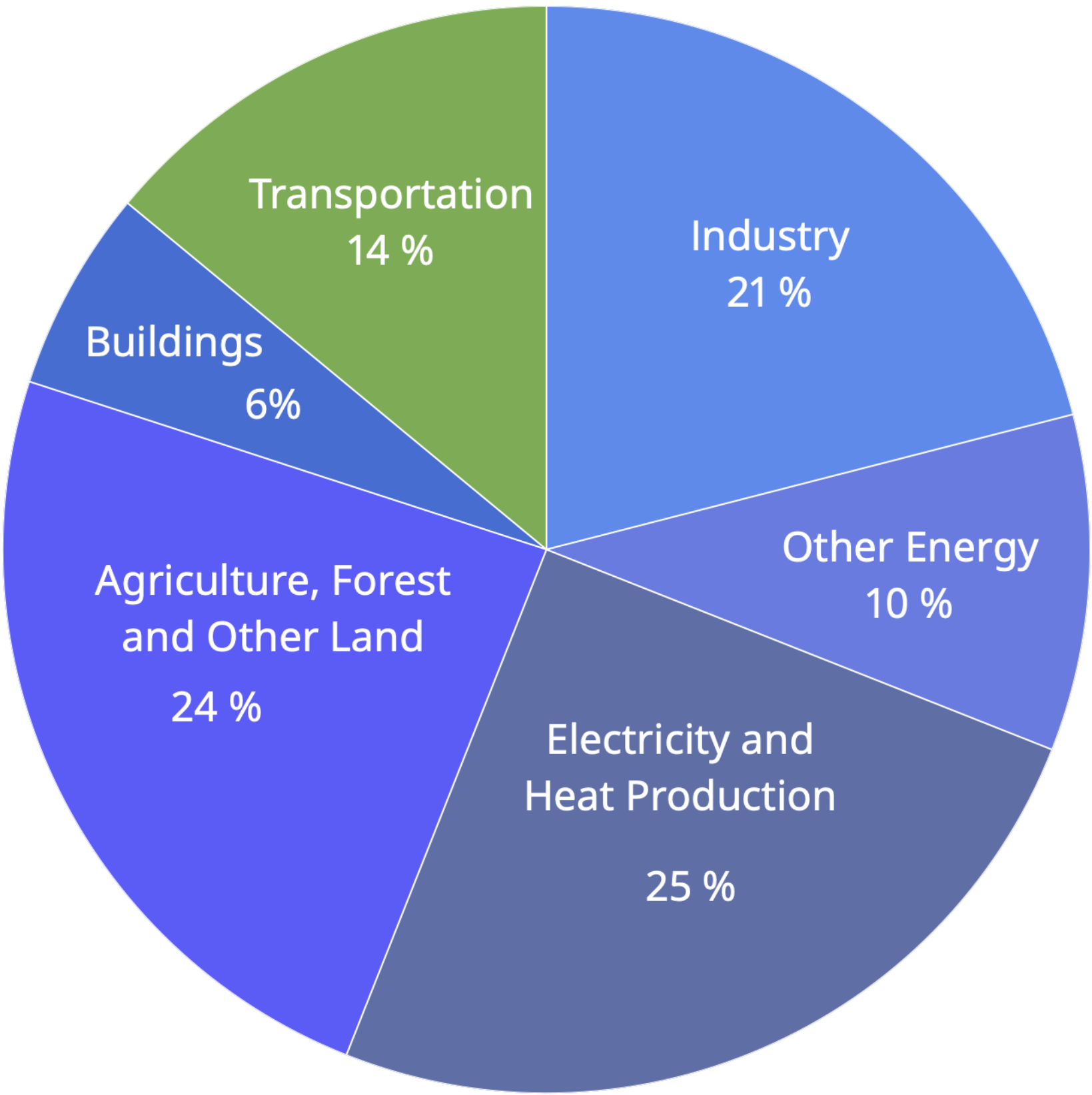




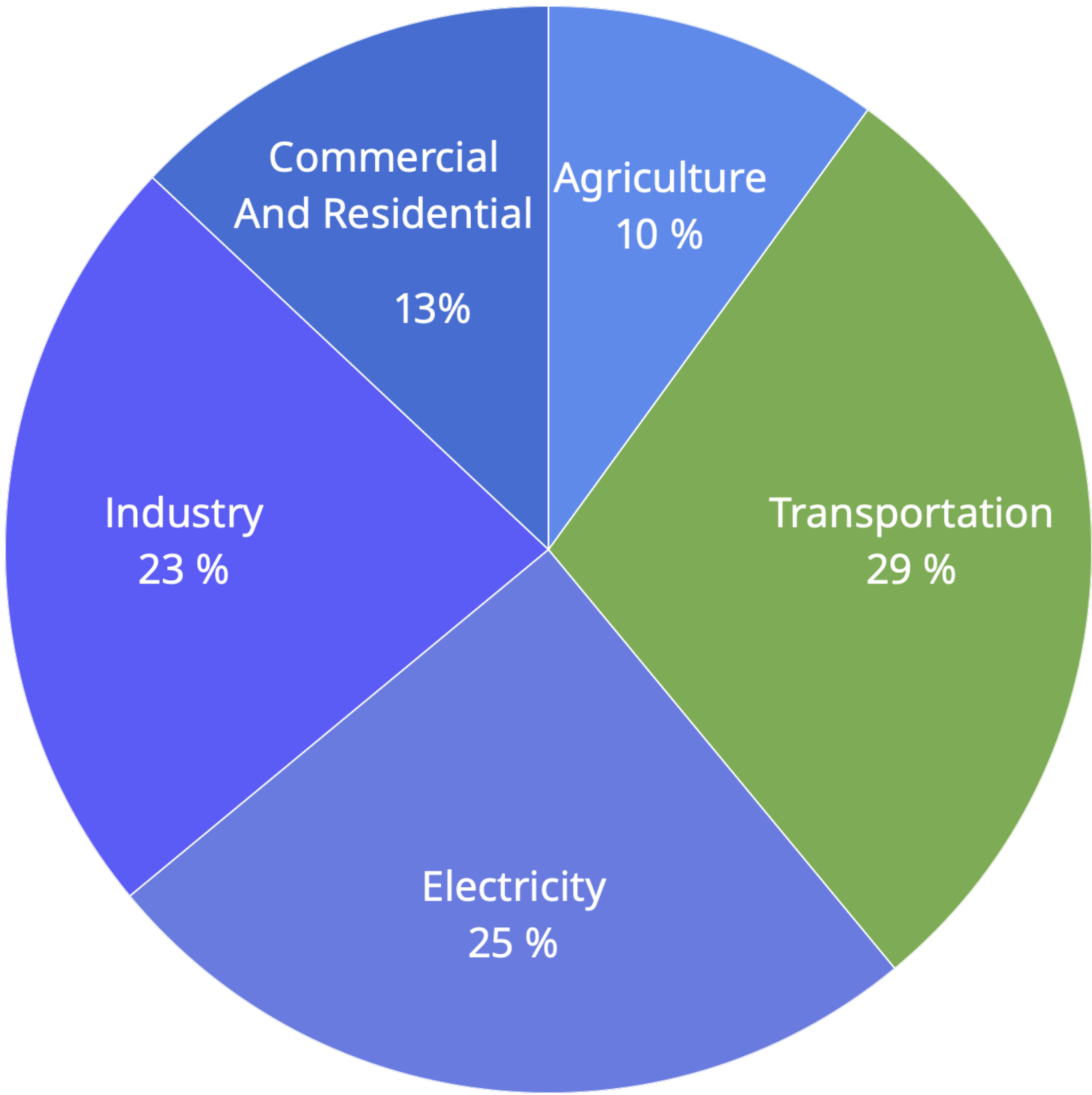
# Clean Mobility

Climate Change, Polluting Emissions, Noise, Ballast Water Contamination, Materials Consumption and End-of-Life

2010 global GHG emissions by sector



2019 US GHG emissions by sector

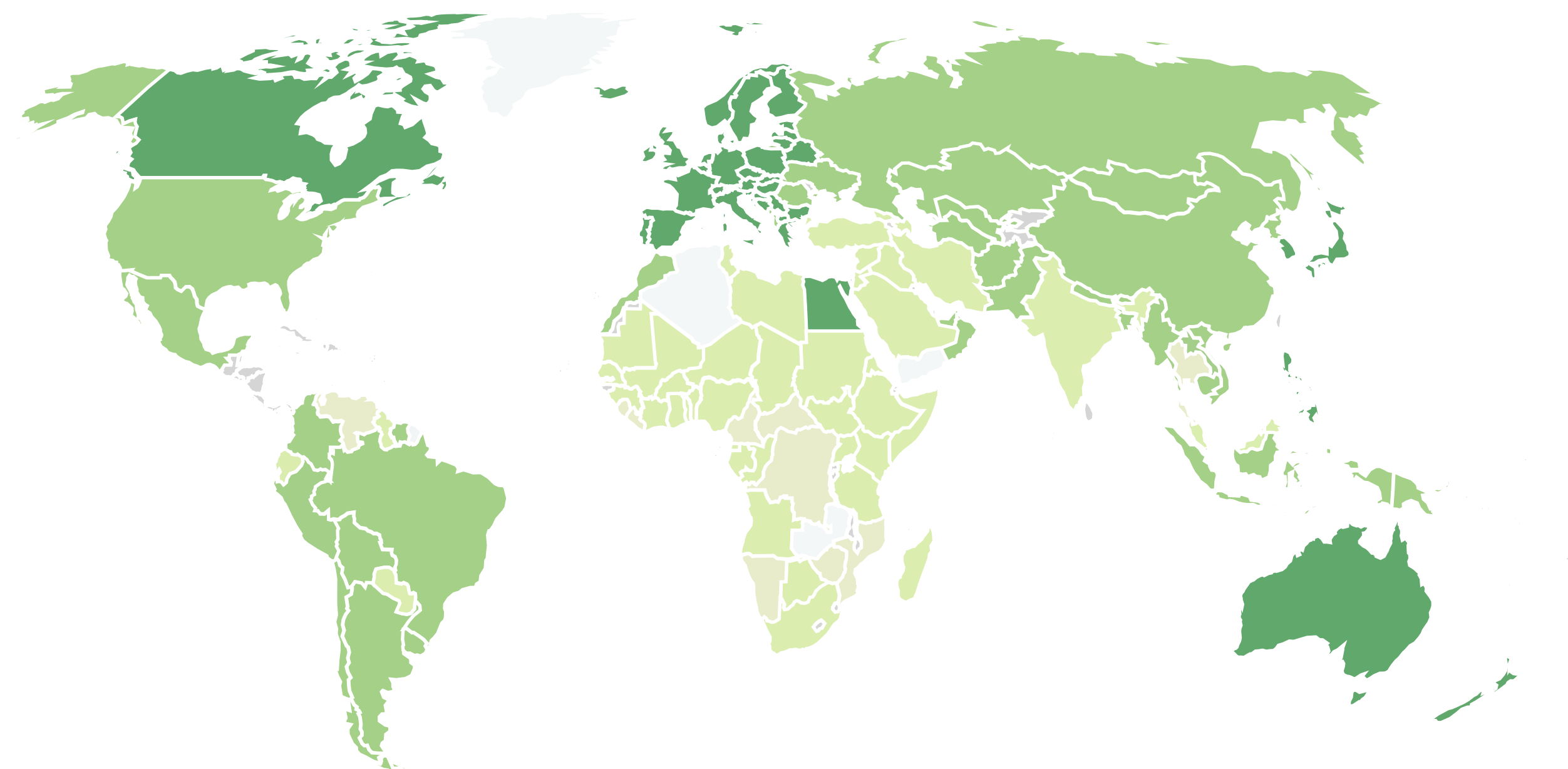


Source: [IPCC](#)



# Safe Mobility

Vehicle Fatalities and Injuries due to Collisions/Accidents, Security/Terrorism and Cyberhacking



**Death Rate**

- <10.0
- 10.1 - 20.0
- 20.1 - 30.0
- >30.0
- Not applicable
- No data

**2016 Estimate Road Traffic Death Rate (deaths/100,000) by Country**

- Approximately 1.35 million people die each year as a result of road traffic crashes.
- 93% of the world's fatalities on the roads occur in low- and middle-income countries, even though these countries have approximately 60% of the world's vehicles.
- Road traffic injuries are the leading cause of death for children and young adults aged 5-29 years.



# Inclusive Mobility

Affordable (both money and time), Reliable / Predictable, Equitable.



- **Harvard study:** Transportation emerges as largest factor in odds of escaping poverty.
- **NYU study:** NY areas with some but insufficient access to public transportation had highest unemployment and lowest income
- **Berkeley study:** More than half of respondents significantly reduced their use of public transportation due to unreliable service



## Concept 02

# Infrastructure shapes mobility.

The role of the built environment in cities is critical. Infrastructure is the starting point for our expectations and norms on mobility. A paved sprawling city is a more car-dependent city. A dense concentrated city enables a more efficient public transportation system and other forms of shared mobility.





# How we build on a given amount of land matters

Village: Sienna, Italy - Population: 30,000



Highway Interchange: Houston, USA - Population: 0



Same area



# Automotive infrastructure consumes a significant percentage of urban area

Roads, parking (surface, on-street, structures), petrol stations, etc. consume a lot of land.

- Parking area in Los Angeles is greater than the entire surface area of Manhattan
- In addition to the 2,450 acres of roadway in Manhattan, nearly 1,000 more acres — an area about the size of Central Park — is occupied by parking garages, gas stations, carwashes, car dealerships and auto repair shops.
- There is no decisive inventory of parking in the United States. Estimated between 105 million and 2 billion parking spots in the United States (for 250 million cars). The reality is probably at the midpoint around 1 billion.
- Surface parking lots are estimated at 5% of urban area in the US.
- Des Moines, Iowa, has more than nine times as many parking spaces per acre as households per acre.



“Parisian public space is rare, precious, and very useful. It belongs to everyone and it can’t be captured by one unique usage, which is the automobile. Today, still, 50 percent of public space in Paris is consecrated to the car, whether it’s on the road or parked. That represents just 10 percent of trips.”

**David Belliard, Adjunct Mayor for Transportation and Public Space, Paris, Sept 2021**





# Urban streets are public spaces

The automobile has profoundly shaped the design and the feel of those public spaces.

**Park Avenue, New York circa 1910**



**Park Avenue, New York Today**





# Private-use cars are generally an inefficient use of precious street space

200 People in Cars



200 People in Cars



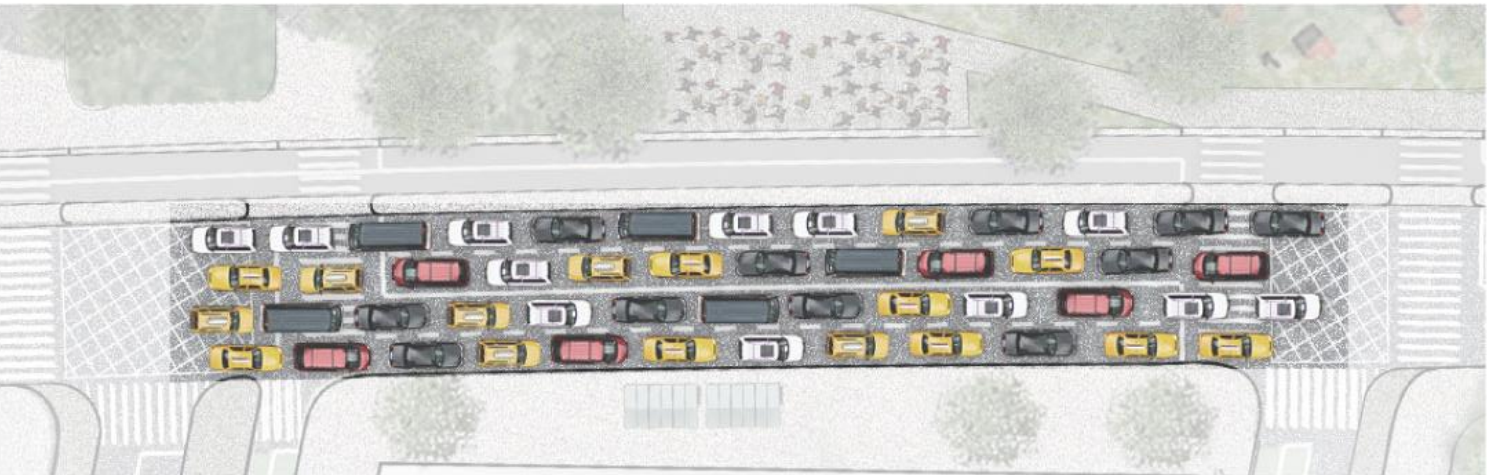
200 People on a Bus



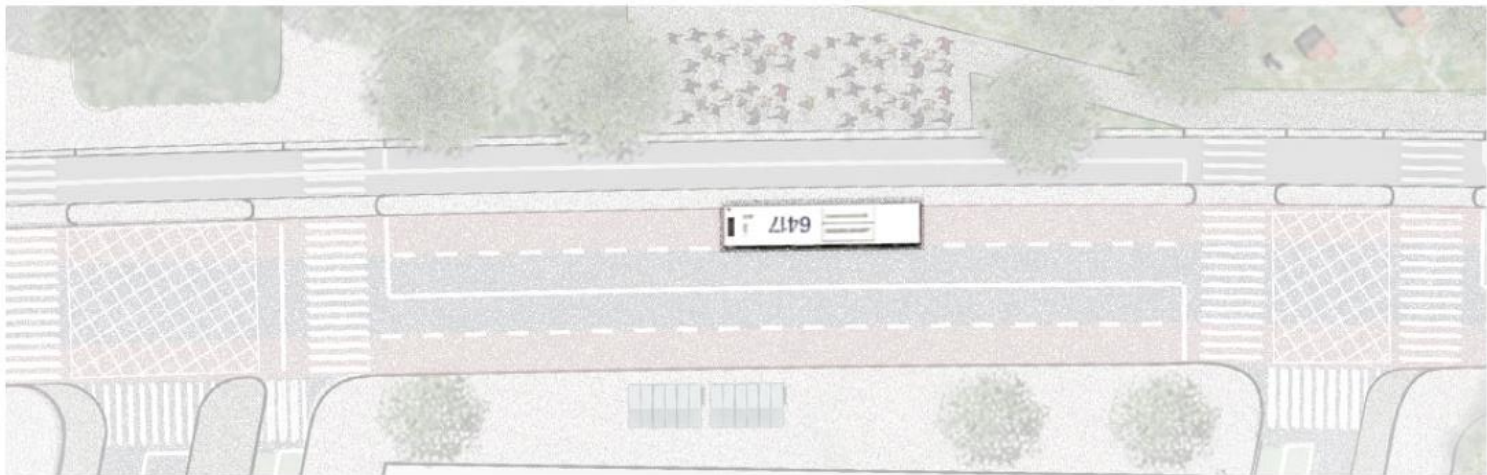
200 People on a Tram



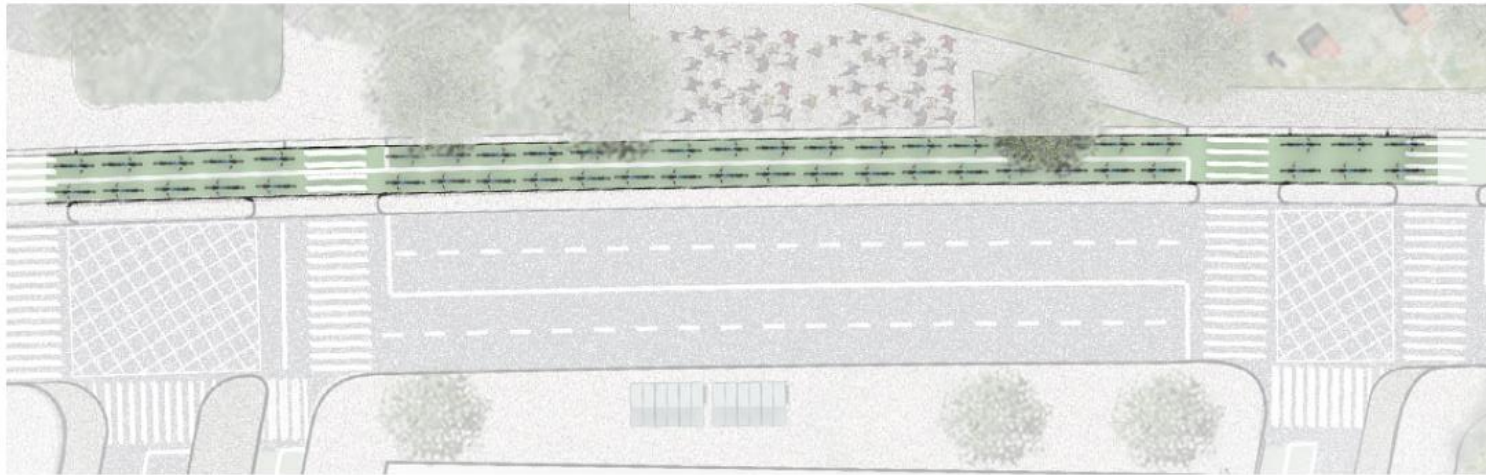
50 Cars - 55 sq. ft. / person



1 Bus - 9 sq. ft. / person



50 Bicycles - 15 sq. ft. / person





### Concept 03

## Behavior and norms are critical.

Our behaviors are shaped by norms that we have learned to accept. Taking the subway is perfectly acceptable for wealthy people in most European cities and in some American cities, but few wealthy Mexicans use the Mexico City metro system. Our belief structure is that time in travel is wasted time. We seemingly want our packages instantaneously and we want to teleport. We accept that it's ok for 3000 people a day to be killed on the world's roads, yet we would be outraged and horrified if a small fraction of those were killed just one day in our aviation system.





# Mobility decisions are not driven purely by functional or utility considerations – social norms and behavioral biases are significant ...



**Social Norms:** Rules or expectations based on shared beliefs of a specific cultural or social group, such as:

- Drivers License as a Right of Passage
- Buying First Car as Sign of Financial Independence
- Car Pride: Social status and self-image are linked to automotive ownership



**Behavioral Biases:** Systematic ways the human mind deviates from rational choice theory. Each of the following biases work toward personal vehicle ownership and away from other mobility options:

- **Confirmation Bias:** Focus on information that supports one's preconceptions
- **Status Quo Bias:** Finding it more comfortable to keep things as they are
- **Halo Effect:** Positive attributes are exaggerated, and negative attributes are ignored
- **Ambiguity Effect:** Preferring known risks to unknown risks



# ...yet there is empirical evidence that owning is inherently valuable beyond the usage of the car

**MIT researchers estimated the value of private car ownership and use in four US metro areas (Chicago, Dallas, Seattle and Washington DC) using online discrete choice experiments. Key findings:**

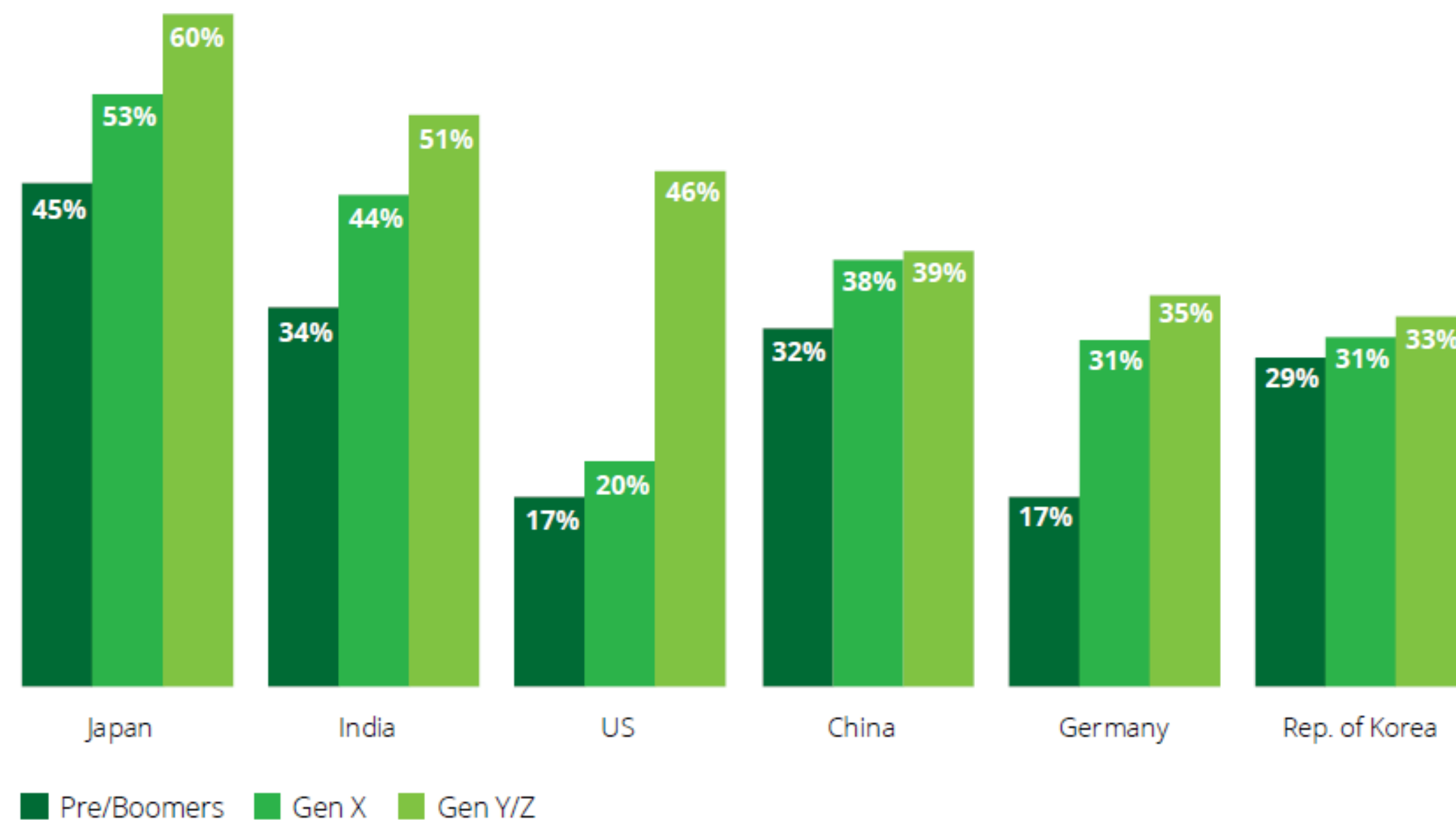
- On average, people would need to be paid \$11,197 to give up access to their privately owned vehicle for one year, which is at least as much as estimates of the average total private cost of vehicle ownership (~\$9,000).
- More than half of this value is non-use value – such as the option to travel whenever or wherever needed at a moment's notice and the status that comes from owning one's own vehicle – beyond the use value of getting from A to B.
- This non-use value was over three times higher during the Covid-19 pandemic
- These findings emphasize the need to provide value and convenience if alternative mobility solutions are to be widely adopted.



# Younger consumers are less interested in vehicle ownership

(long-term, probably yes, but Covid has impacted opinions)

Percentage of ride-hail users that question whether they need to own a vehicle going forward (by generation)



On a global basis, 28% agree that children will not need to learn how to drive. Fairly linear by age cohort – younger people agree more, older people agree less. Across countries: 25% overall in China. 22% in USA. 26% in UK. 17% in Germany. Sheryl Connelly, IFMAC Member

**But:**

- Car ownership remains strong among younger generations
- Carsharing services like Car2Go, ReachNow and Maven have retreated from cities
- Covid certainly drove interest in car ownership up across multiple geographies

**Percentage of consumers intending to acquire a vehicle to avoid public transportation during Covid:**

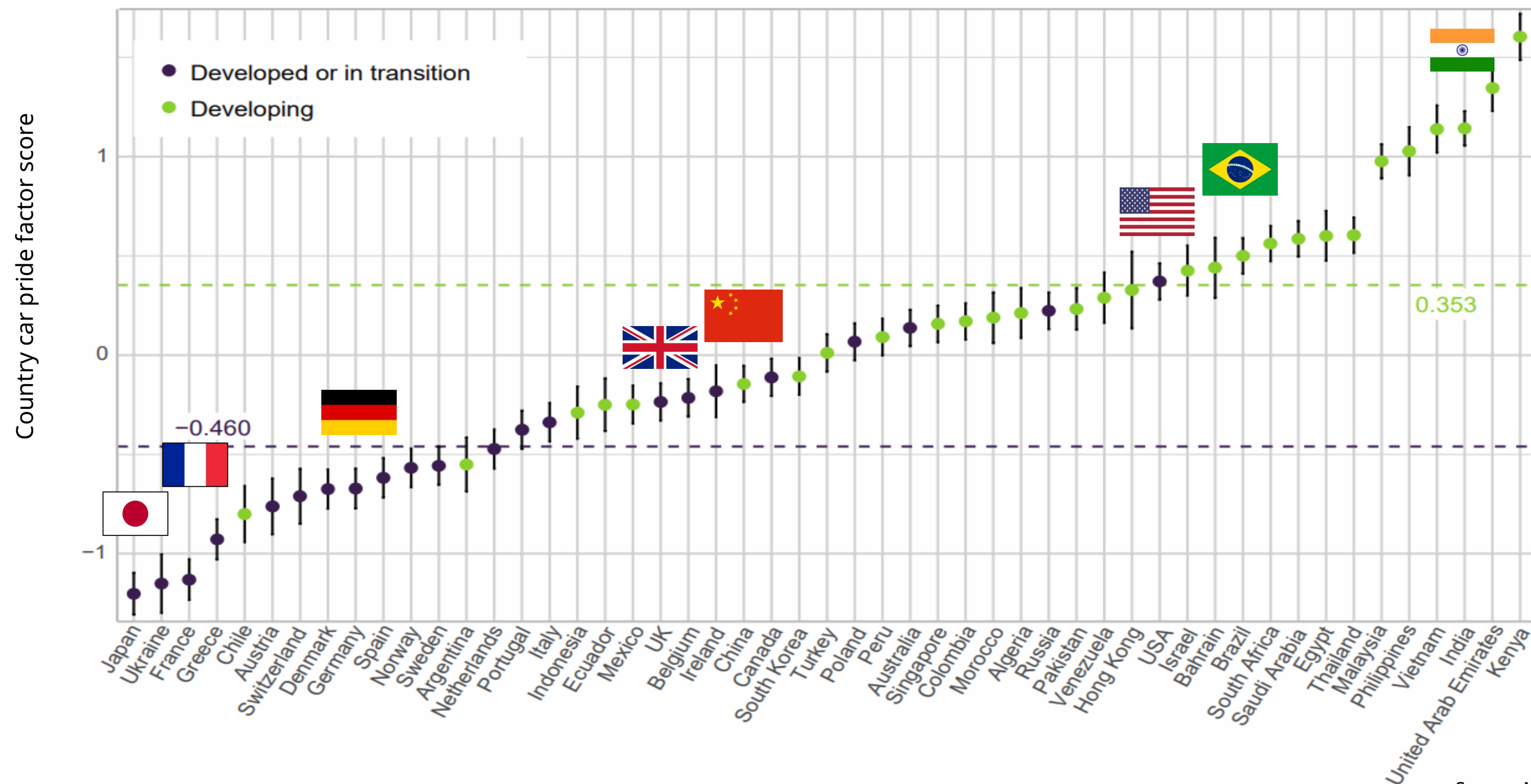
Germany: 11%, Japan: 10%, US: 14%, Rep. of Korea: 13%, China: 23%, Southeast Asia: 31%, India: 45%

**2021 Study from Center for Automotive eMobility Innovation at Ca' Foscari University of Venice:**

- 61.7% of under 30-year-olds would give up car ownership if efficient public transport was available
- One person out of 5 ( 20%) is not interested in owning a car



# With the exception of the United States, most developed nations have lower Car Pride than developing nations



Source: MIT Mobility of the Future Report Mobility of the Future | MIT Energy Initiative, Moody, Joanna C., and Jinhua Zhao. 2019. "Car Pride and Its Bidirectional Relations with Car Ownership: Case Studies in New York City and Houston." Transportation Research Part A: Policy and Practice 124 (June): 334–353.



# “Car Pride” = How People Attribute Their Social Status and Personal Image to Owning and Using a Car

Data based on an international survey of nearly 42,000 respondents across 51 countries completed in January 2017

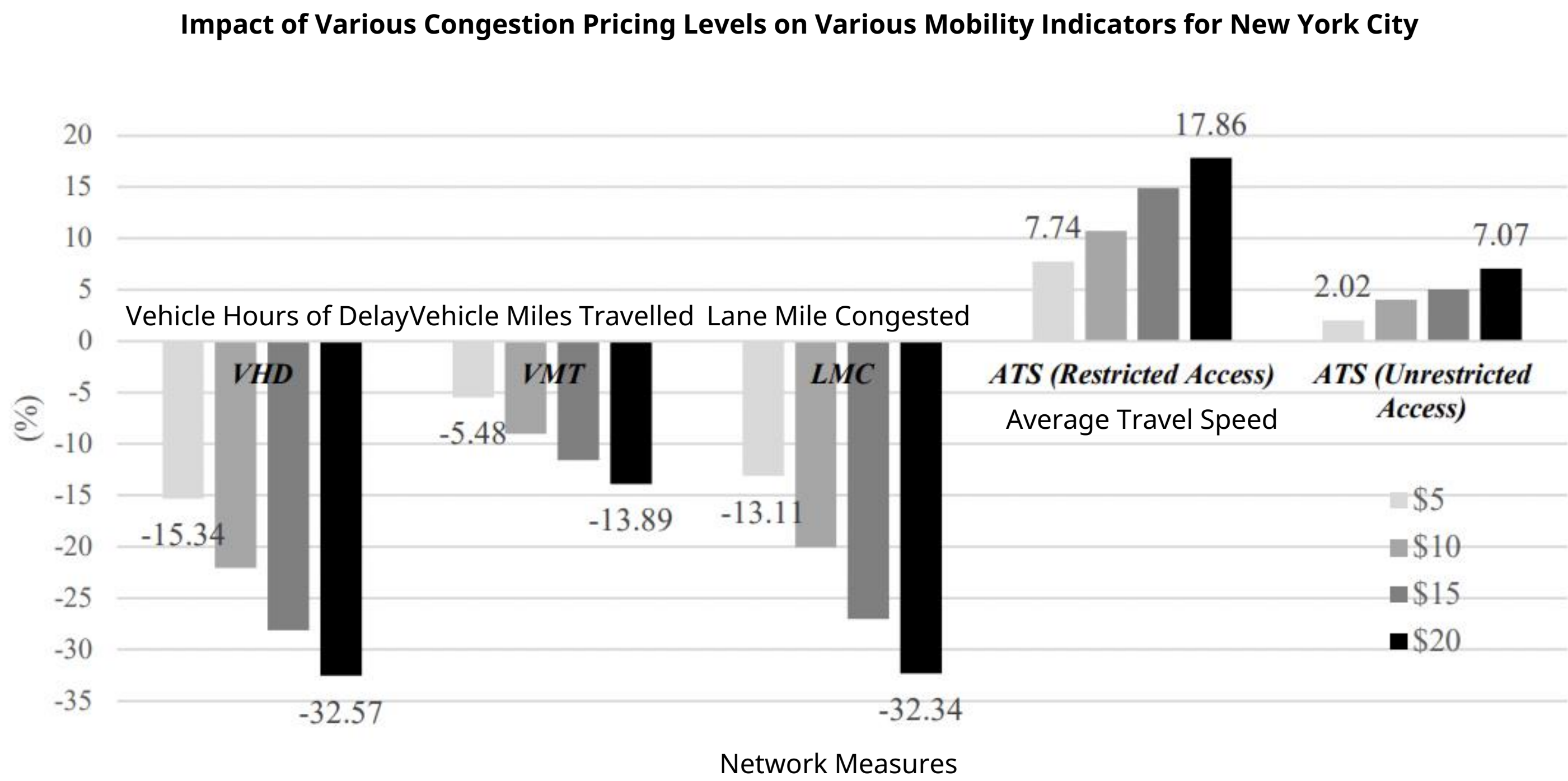
- Respondents used a 7-point scale from strongly agree to strongly disagree to statements such as “Driving a Car Makes Me Feel Superior to Those Who Don’t” and “Driving a Car Positively Affects My Perception of Myself”
- Multilevel confirmatory factor analysis was applied to establish the reliability and validity of the binary car pride measure
- **MIT Researchers:** “We find that **car pride is positively and significantly predictive of household car ownership**. In fact, we find that an individual’s car pride (attitude) is a stronger predictor of household car ownership (behavior) than the individual and household socio-demographic characteristics captured in our survey, including income.”

Source: MIT Mobility of the Future Report Mobility of the Future | MIT Energy Initiative, Moody, Joanna C., and Jinhua Zhao. 2019. “Car Pride and Its Bidirectional Relations with Car Ownership: Case Studies in New York City and Houston.” Transportation Research Part A: Policy and Practice 124 (June): 334–353.



# Values and norms shape our behavior, but pricing is also a powerful lever

Cities such as London, Singapore, Stockholm and New York have implemented “congestion pricing” schemes where drivers pay for access to parts of the city at certain times. Pricing schemes do impact mobility behavior.





## Concept 04

# Mobility is expensive.

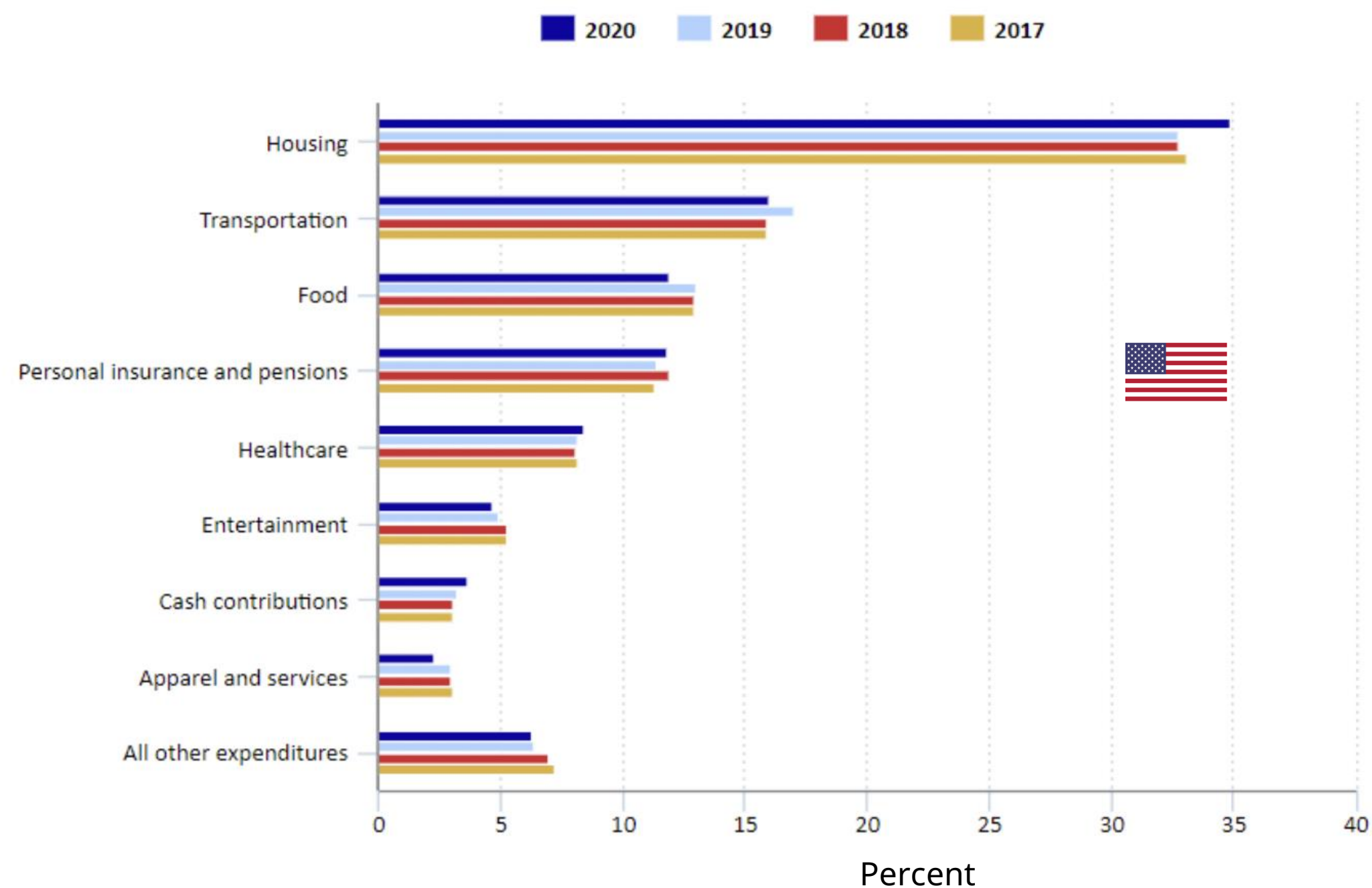
Mobility is often the second most expensive item for consumers (after housing), and even more expensive for society. Furthermore, consumers consistently underestimate the true cost of car ownership. In the United States, the lowest 20% by income pay 35% of annual income for transportation. Options that lower the cost for people and society are likely to succeed in the long-term, but entrenched models and behaviors act to preserve the status quo. The high social costs embedded in passenger mobility are reflected in goods mobility: buying 10 items on-line and returning 9 of them is very expensive for the planet.





# In both Europe and the US, transportation is the second largest category of consumer spending

Percent of Household Spending by Category, United States



Transport accounted for about 16% of Household Spending in the US in 2020, more than 90% of that spending was automotive-related

Percent of Household Spending on Transport, EU Countries (2018)

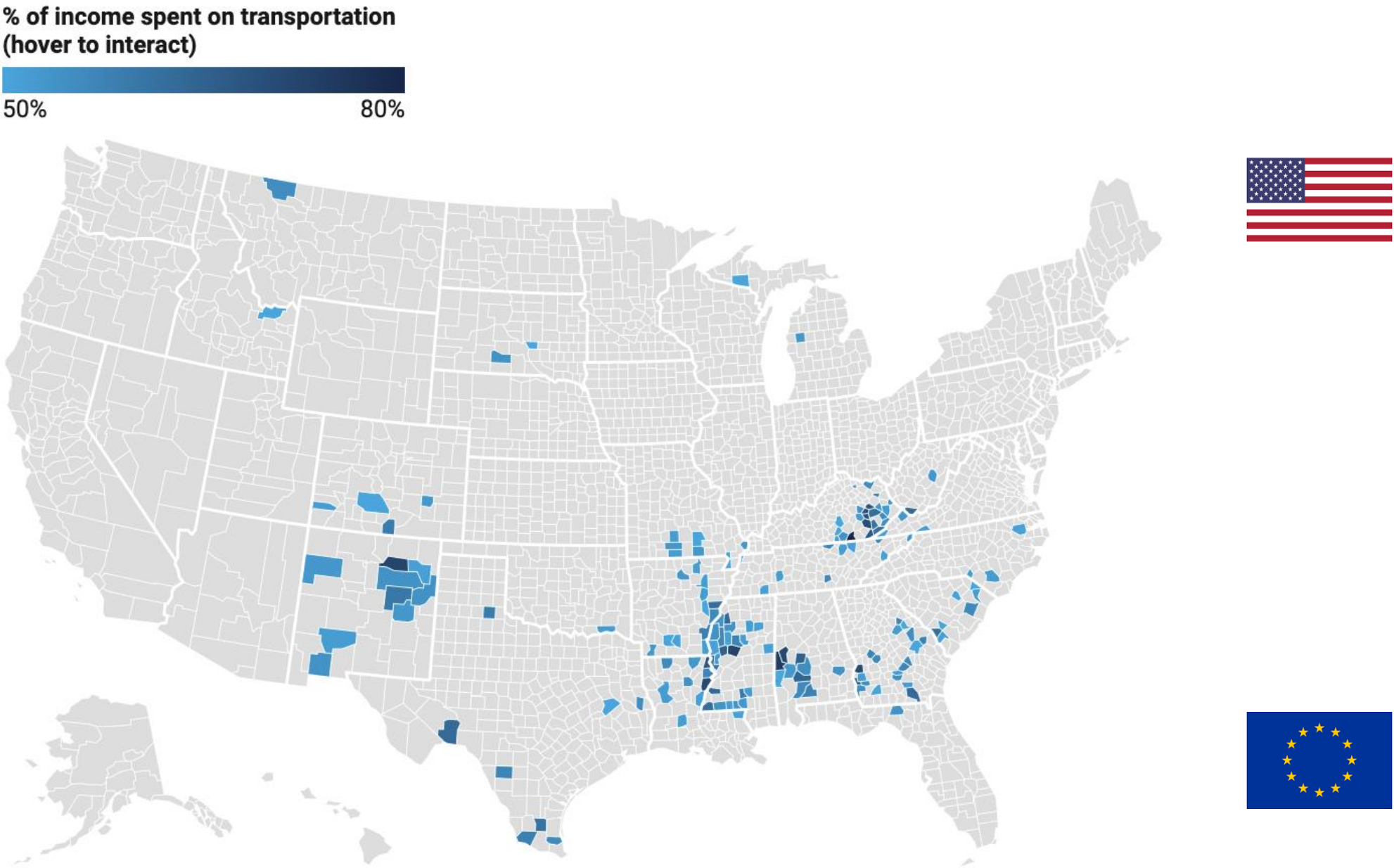


Transport accounted for about 13% of Household Spending in Europe in 2018

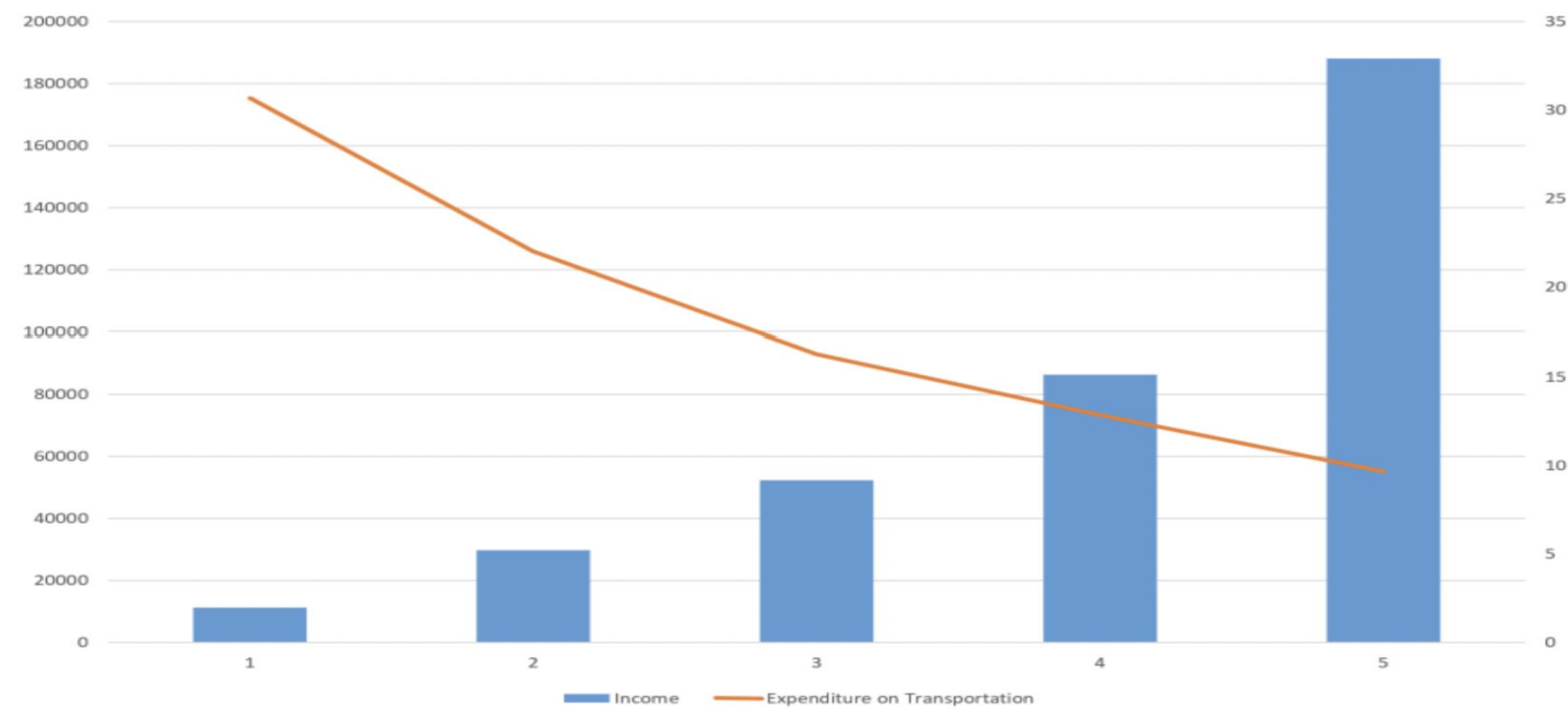


# The financial burden of transport is greater for lower-income households in the United States

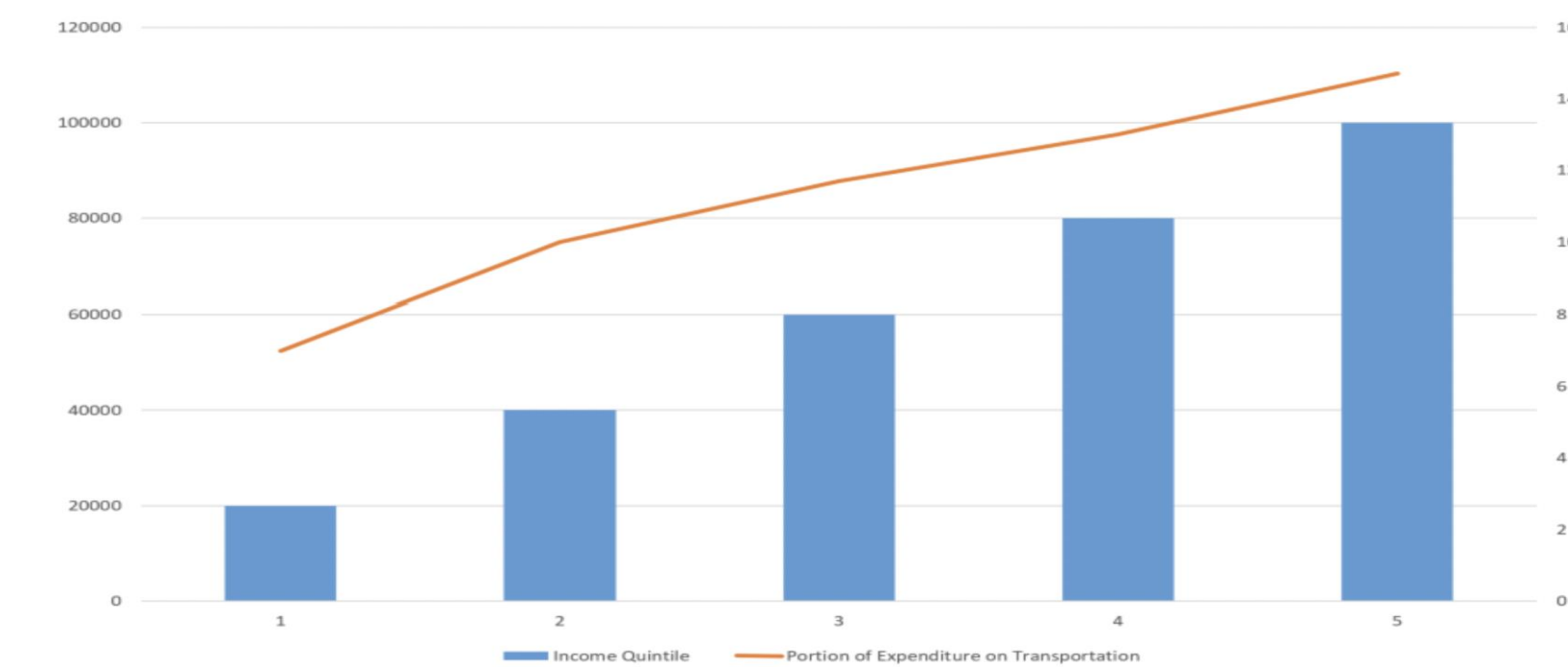
Counties where residents spend over 50% of their income on transportation



Transportation Spending Relative to Income: United States



Transportation Spending Relative to Income: Europe



Source: <https://www.bls.gov/opub/reports/consumer-expenditures/2020/pdf/home.pdf>,  
<https://ec.europa.eu/eurostat/web/products-eurostat-news/-/ddn-20200108-1>



# Is the personal-use automobile the best solution for urban mobility?



- **Heavy therefore energy thirsty:** The typical passenger car weighs 10-20 times the weight of the passengers it is designed to move



- **Designed for extreme use cases therefore expensive:** Vehicle purchase decisions are biased to rare use-cases



- **Inefficient Asset Utilization:** The typical passenger car is the second largest household expenditure yet sits idle (parked) 95% of the time

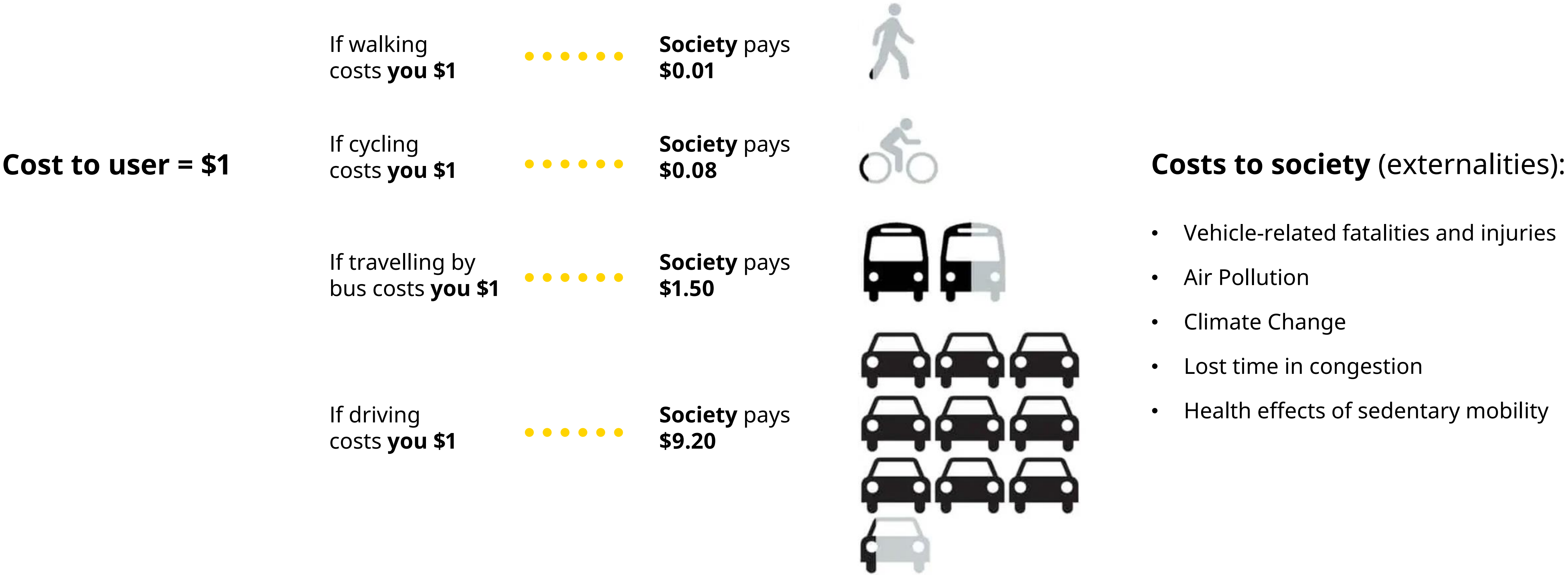


- **Large footprint:** the typical passenger car consumes far more street space than its occupants

**Automakers are shifting from “how can we make better cars?” to “how can we be part of the solution for better cities?”**



# The full cost of automotive mobility (with externalities) greatly exceeds the cost to the user

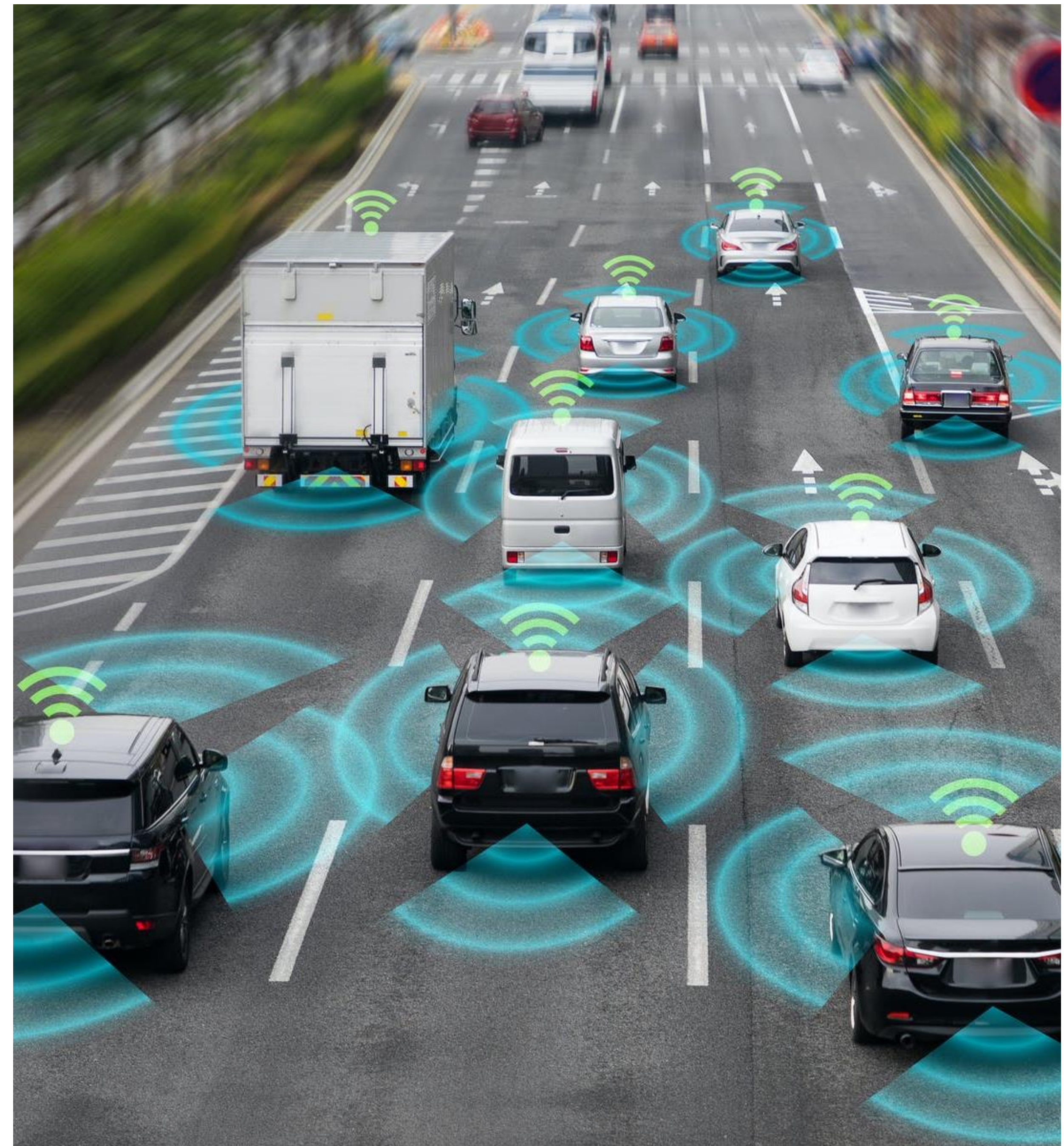




## Concept 05

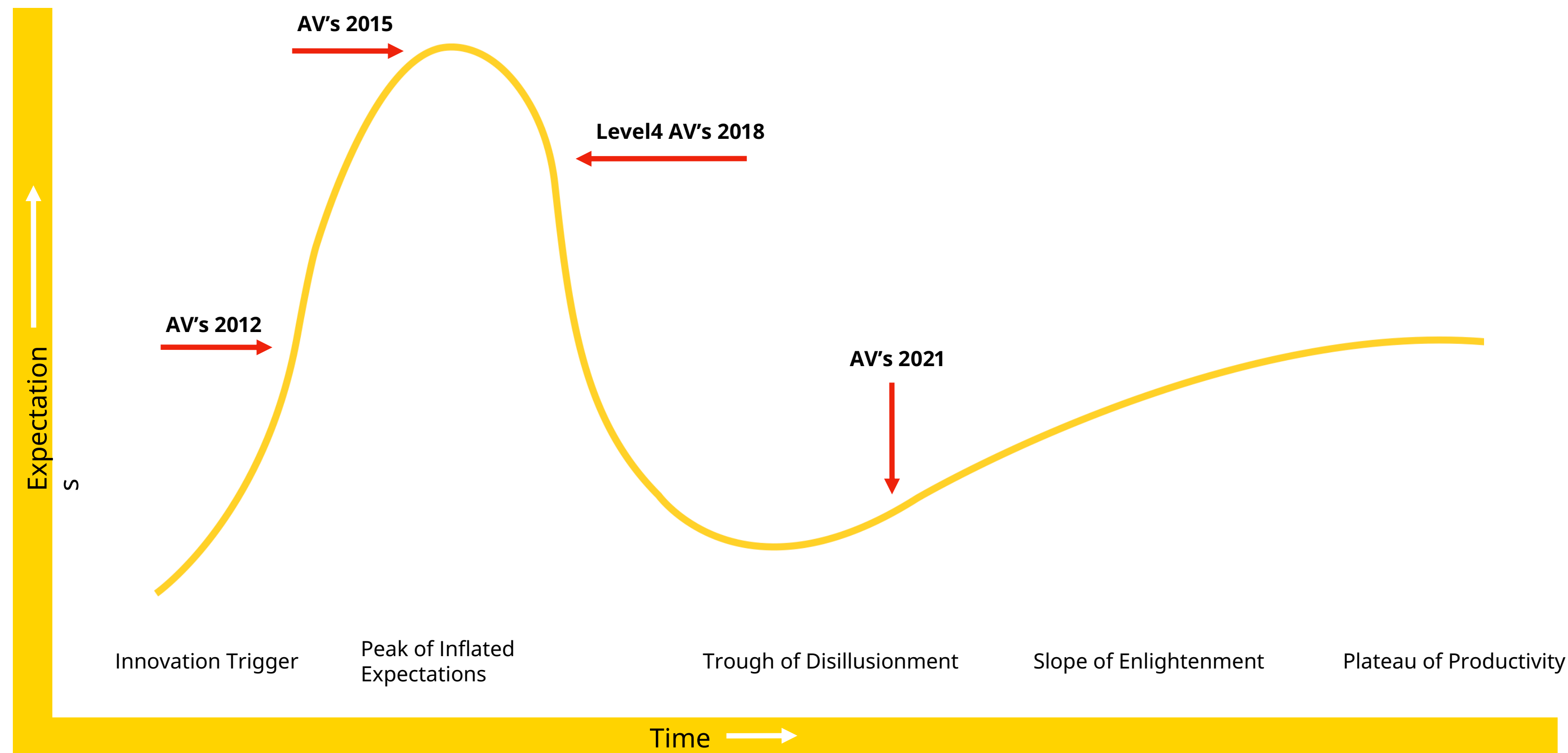
# Technology is not a panacea.

Our expectations for new mobility technology are often overestimated in the short-run and underestimated in the long run. Autonomous vehicles are a good example: after much hype in the early 2010s, the reality of challenging edge cases has delayed the timeline for deployment. Autonomous mobility will eventually be deployed at scale, but depending on the choices we make, it could make congestion in cities better or worse.



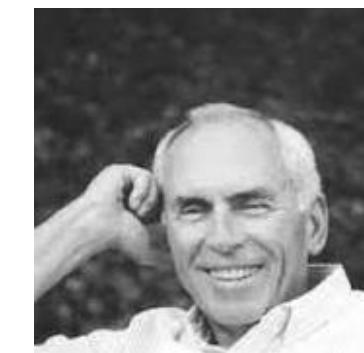


# Autonomous vehicles – and many mobility technologies – have passed through the Gartner Hype Cycle



"We tend to overestimate the effect of a technology in the short run and underestimate the effect in the long run."

**Roy Amara, former President of the Institute for the Future**





# Autonomous vehicles span a variety of use cases and business models

**Autonomous Urban Shuttle**



**Autonomous Long Haul Truck**



**Autonomous Personal Use Car**



**Autonomous Mining Vehicle**



**Unmanned Aerial Systems**



**Autonomous Delivery Robot**



# The use case and business model are particularly important in the urban context

Personal-Owned Low-Occupancy AV



GM CEO Mary Barra announces GM will sell personal-use AVs “by the middle of the decade” at CES 2022

Fleet-Owned Low-Occupancy Robotaxi



Deployments in China, US cities – including without a test operator

Fleet-Owned High-Occupancy AV Shuttle

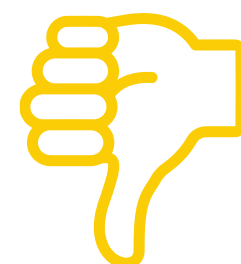


Covid has lowered interest in shared mobility AV Shuttle



## Autonomous vehicles – in a best case scenario:

- Safer mobility (reduced human-related errors)
- Better mobility performance (lower congestion)
- Mobility access for the blind, disabled, elderly



## Autonomous vehicles – in a worst case scenario:

- Streets clogged with empty personal-owned AVs
- Greater social isolation
- Increased disparity of access between rich and poor



# Many companies are pushing the urban robo-taxi shuttle vision

Zoox Robotaxi (Amazon) (4 seated passengers)



Cruise Origin (4 seated passengers)



ZF Shuttle (8 seated + 14 standing)

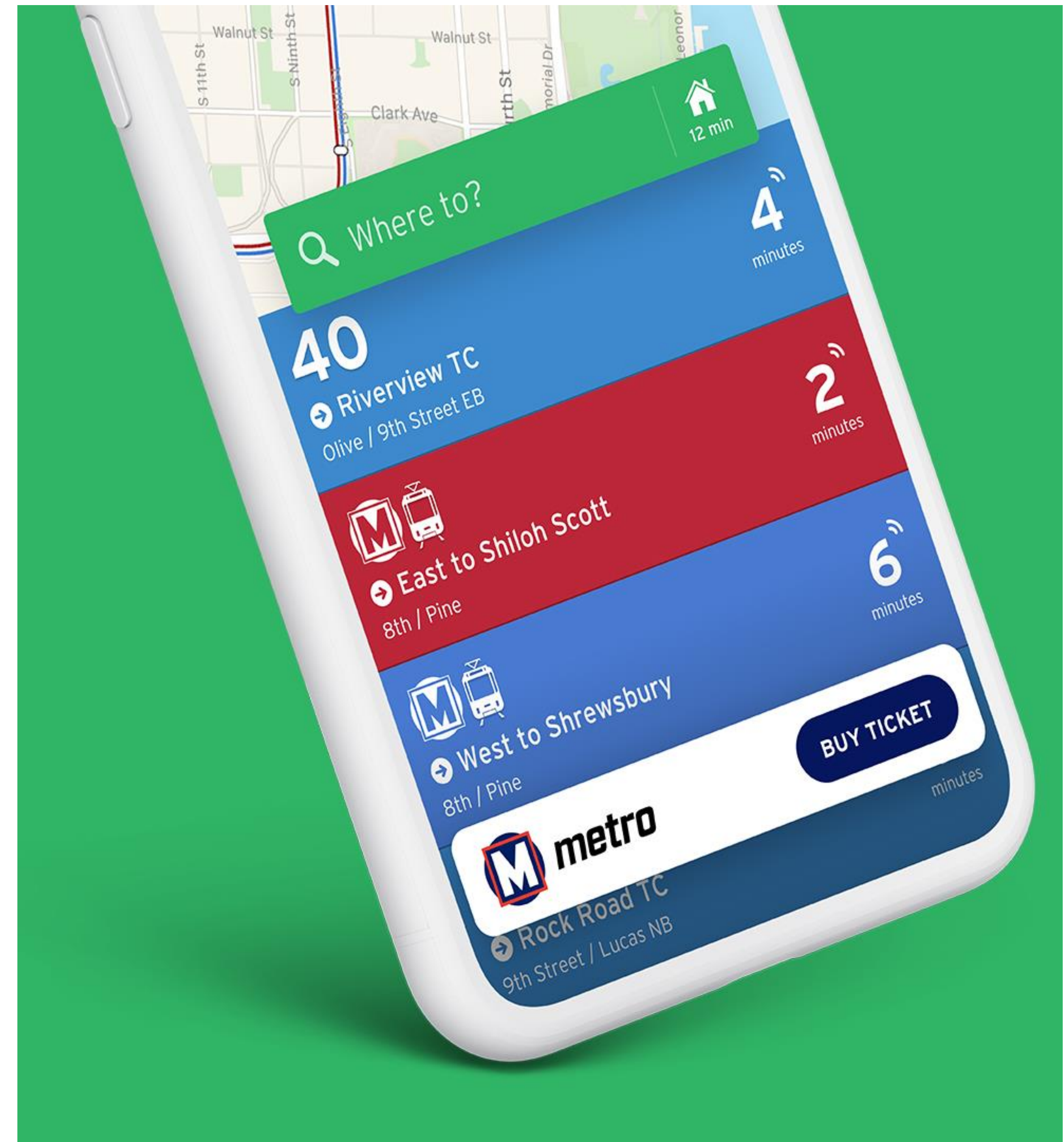




## Concept 06

# Integration is the holy grail.

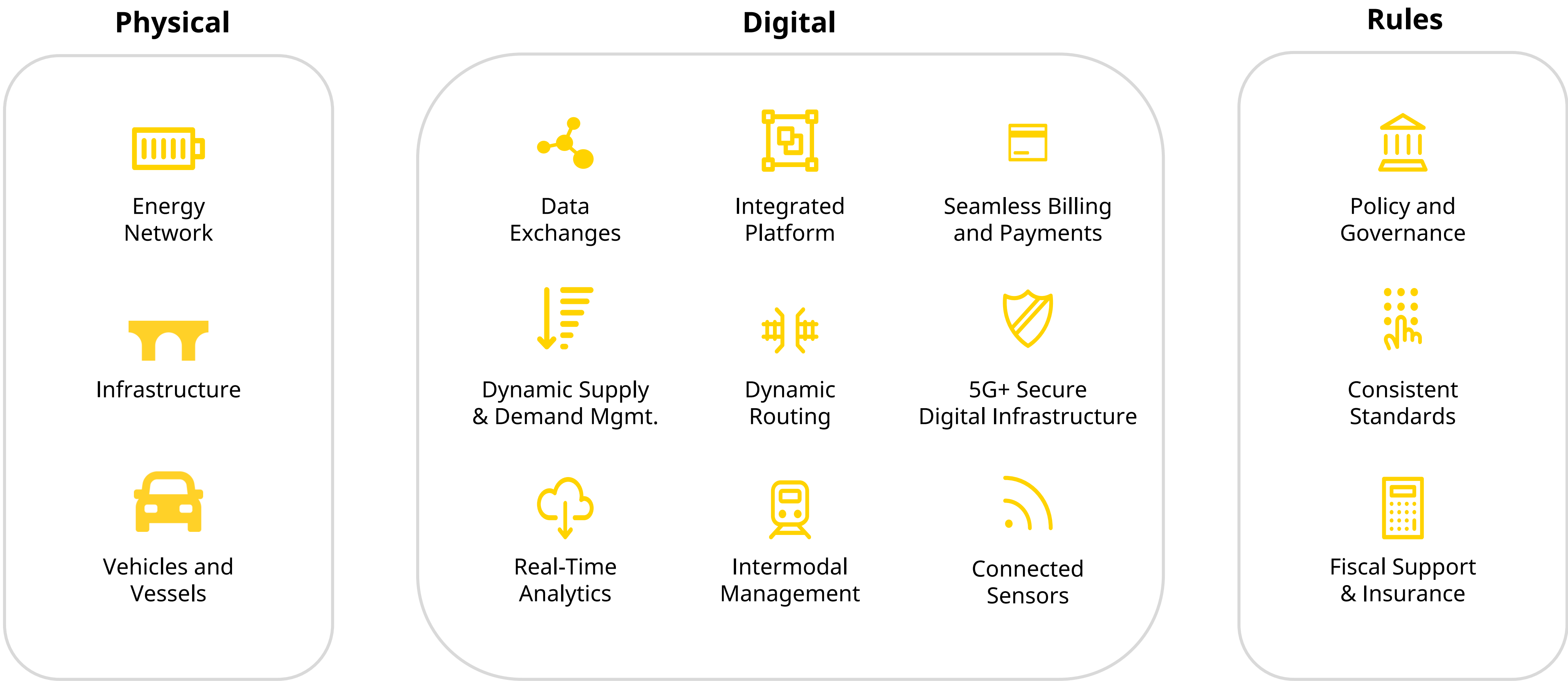
The concept of Mobility-as-a-Service, offering consumers a simple multimodal platform for trip planning, seamless connections among different transport modes and easy single payment, remains an important but elusive goal. Achieving integration requires physical integration (of vehicles and the built environment), digital integration (of data platforms, APIs, payment systems) and institutional integration (of government agencies, public transport operators, etc).





# Integration is the "Holy Grail of Mobility"

Connecting physical, digital and institutional systems in a seamless solution would create value





# Visualizing modal integration

Airbus Urban Mobility Concept 2017





# Visualizing modal integration

Mercedes – Matternet Delivery Van 2016





# Visualizing mobility-infrastructure integration

Volvo Electric Bus in the library 2017





# Visualizing mobility-infrastructure integration

Uber Elevate Architect's Renderings of Skyport 2019





# Visualizing mobility integration

Hyundai Vision for Urban Pods CES 2022

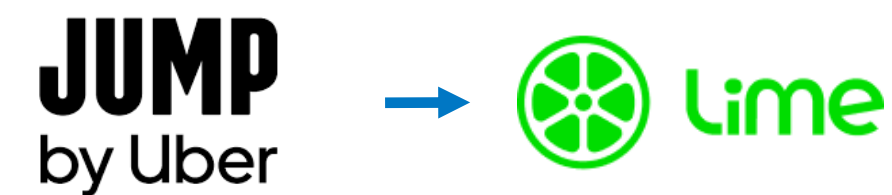




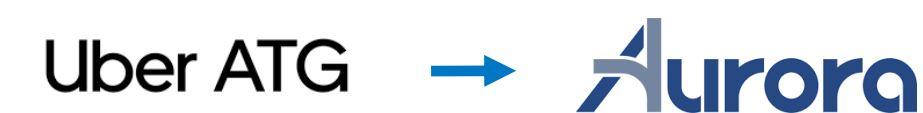
# Achieving mobility integration is not easy

## Uber unwinds its platform vision in 2020

**May 7, 2020:** Micromobility provider Lime acquires Uber's Jump business. (Uber acquired Lime in April 2018.) Lime services will be integrated with Uber's platform.



**Dec 7, 2020:** Uber sells Advanced Technology Group (autonomous tech) to Aurora Technologies for \$4B valuation. Uber retains 26% ownership stake.



**Dec 8, 2020:** Joby Aviation acquires Uber Elevate assets. Joby services will be integrated with Uber's platform.



The challenge is how to integrate things. AVs should be integrated with the new infrastructure, like streets with sensors. EVs are totally different – EV batteries can be used for storage and Vehicle-to-Grid applications. DiDi pursued a Mobility as a Service (MaaS) pilot in Guangzhou, but it failed. We need political will – it's always the case in China, you need top-down support from government. The Government promoted a MaaS solution but it also failed. We need an in-between solution, where both government and private sector promote a MaaS.

**Daizong Liu, IFMAC Member**



## Concept 07

# Beware of induced demand.

As with any complex system, mobility is governed by the law of unintended consequences. We cannot build our way out of congestion: adding a lane to a congested road eventually attracts more drivers to that road and brings renewed congestion. Similarly, adding inexpensive autonomous vehicles to our roads would encourage more people to take trips with those inexpensive autonomous vehicles.





# Lowering the price of a good increases its consumption

How about lunch in Paris tomorrow?



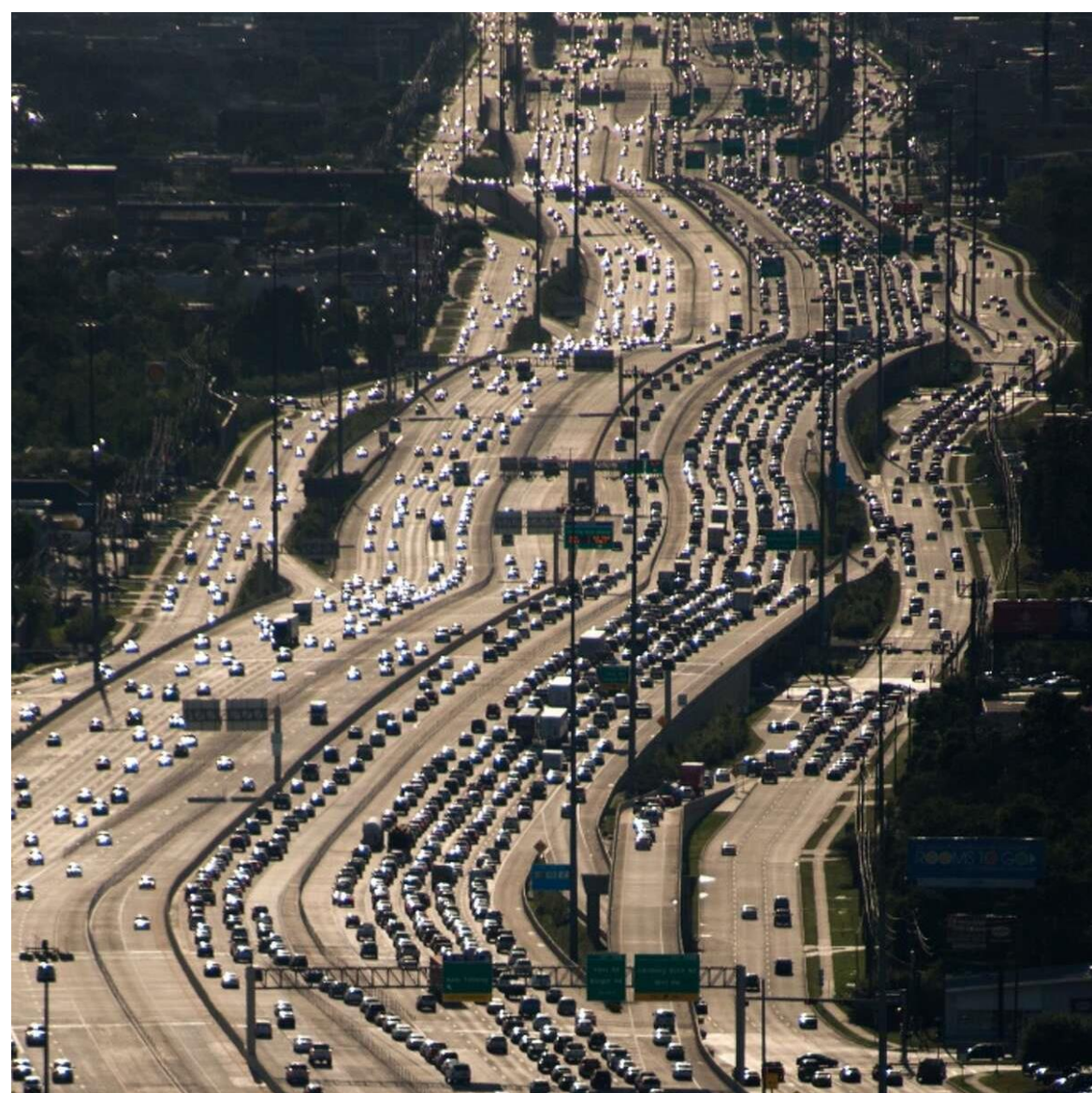
How about watching a movie or doing your banking on your mobile phone?



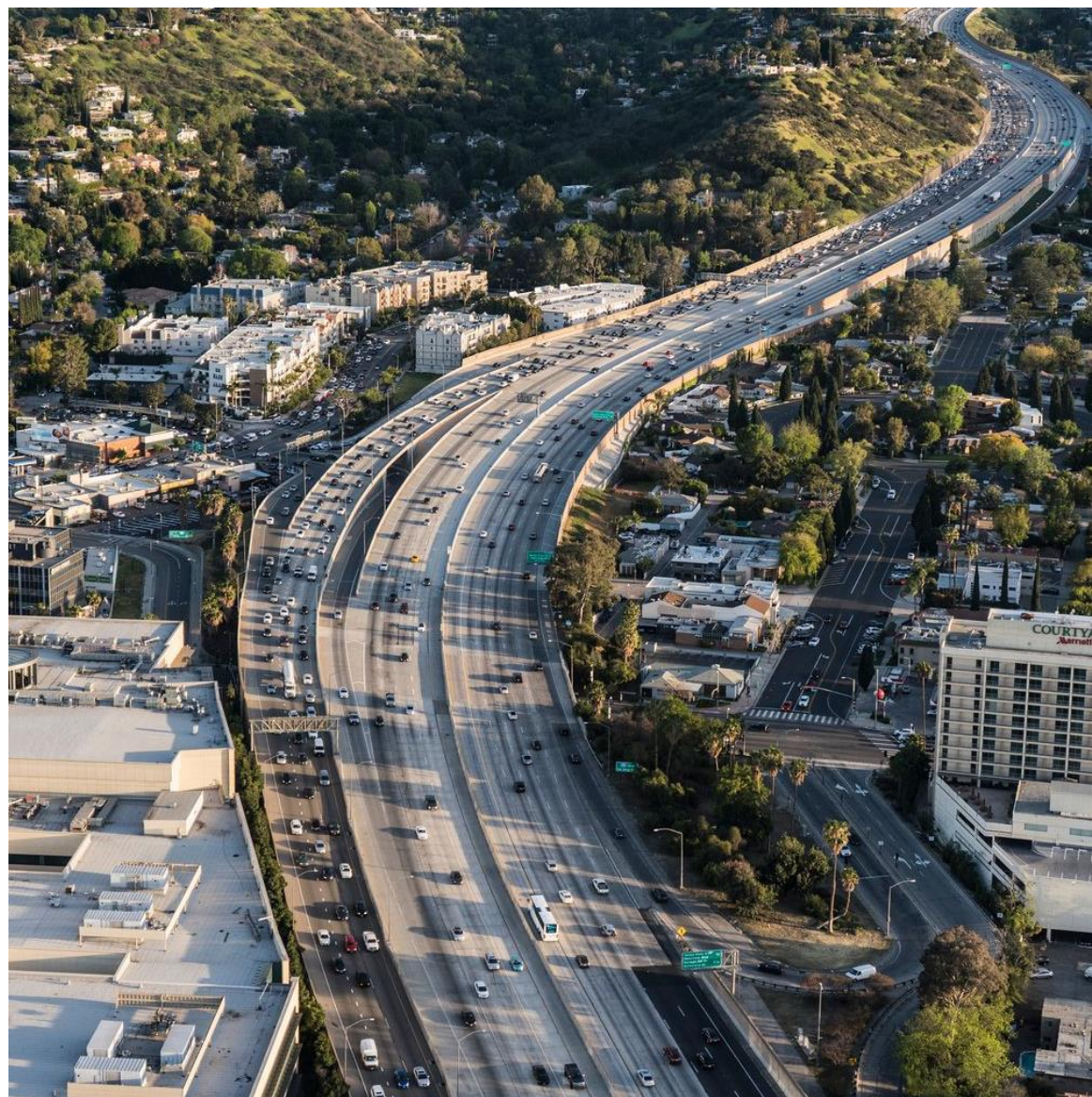


# Induced demand: the law of unintended consequences

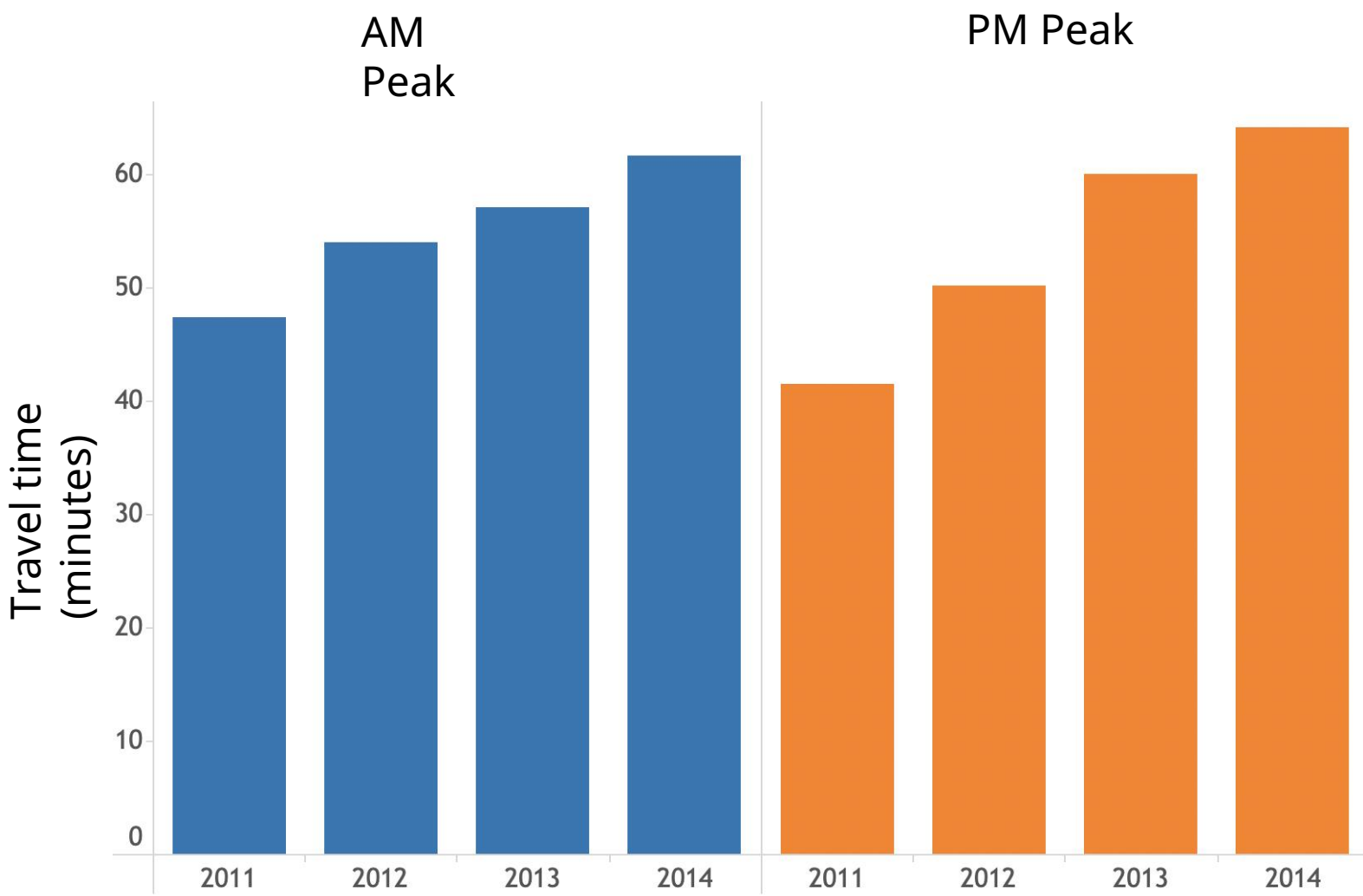
Katy Freeway in Houston expanded (to 26 lanes at the widest point) in 2008-2011 at a cost of \$2.8 billion. Traffic got worse.



Houston



Los Angeles



**Traffic on 405 Fwy Is Worse 5 Years After \$1 Billion Widening Project in Sepulveda Pass: Study**



## Concept 08

# Cities are more actively shaping their own mobility future.

City leaders and policymakers have been increasingly active in requiring mobility providers to share data in exchange for the privilege of serving the citizens. Cities are also increasingly active in imposing (private-owned) car bans or restrictions and considering congestion pricing options to deter travel in core urban areas.





# Cities are increasingly active in shaping their mobility systems



**Dec 2014:** Shenzhen becomes 8th City in China to Impose Car Purchase Restriction Policies



**July 2016:** Paris bans pre-1997 vehicles from roads during weekday daylight hours



**Dec 2016:** Mayors of Paris, Mexico City, Madrid and Athens vow to ban diesel vehicles from their cities by 2025



**April 2017:** London Mayor Sadiq Khan announces London will have world's first ULEV Zone by 2019, a year ahead of schedule



# Cities are increasingly active in shaping their mobility systems (cont'd)



**Jan 2018:** Brussels imposed Low Emission Zone in city center. By Jan 2022, fines were being imposed of 350 Euro for older diesel vehicles (Euro 4 or less) entering the LEV. In June 2021, the city announced plans to ban all diesel cars by 2030 and all gas cars by 2035.



**Jan 2019:** Oslo restricts access for private cars from city center and eliminates 700 parking spots



**Oct 2018:** Frankfurt and Berlin issued court orders to remove older diesel vehicles



**Jan 2019:** Milan imposes weekday ban on diesel vehicles, later extending the ban to all diesel cars. Milan plans to impose a series of private car bans and become diesel-free by 2030.



**Dec 2018:** Madrid bans older cars from city center. (Gas-powered vehicles made prior to 2000 and diesel-powered prior to 2006)

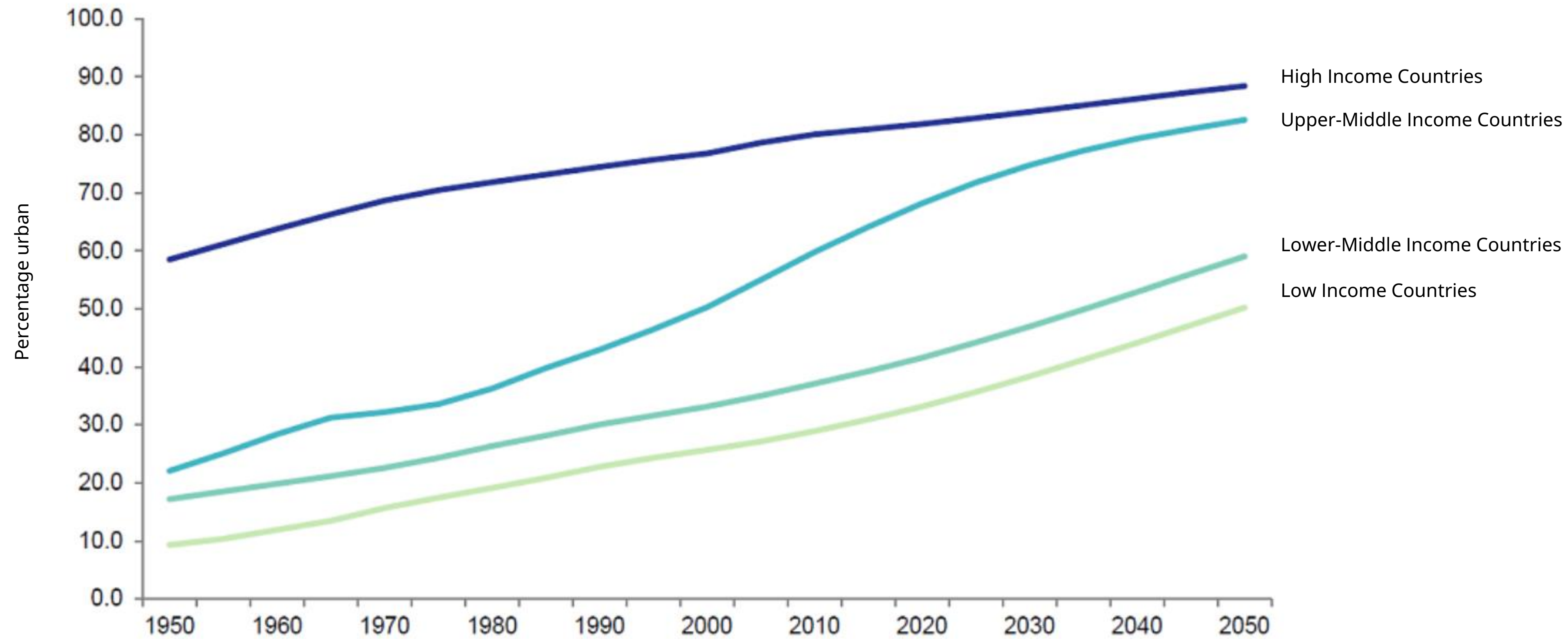


DRIVERS OF CHANGE

# **What are the factors driving change in urban mobility?**



# Urbanization itself is a powerful driver of change

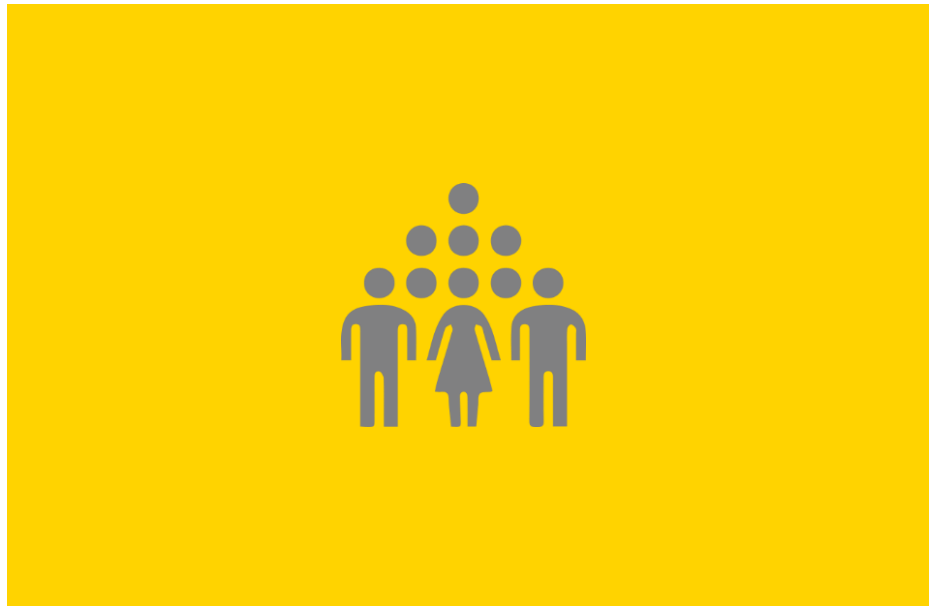


Source: [UN World Urbanization Prospects](#)

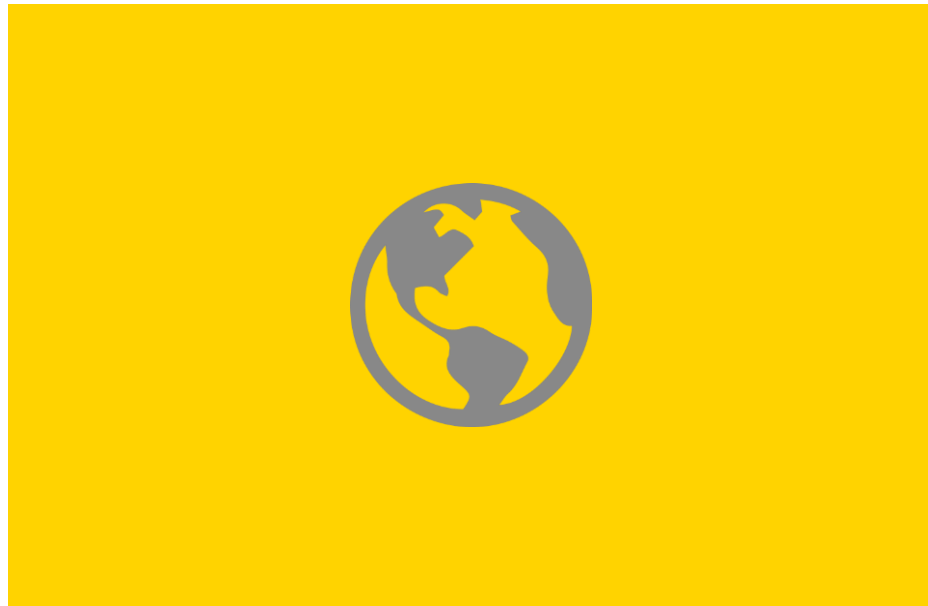


# The IFMAC explored the drivers of change for mobility across these five different dimensions

01  
Values / Behavior / Social.



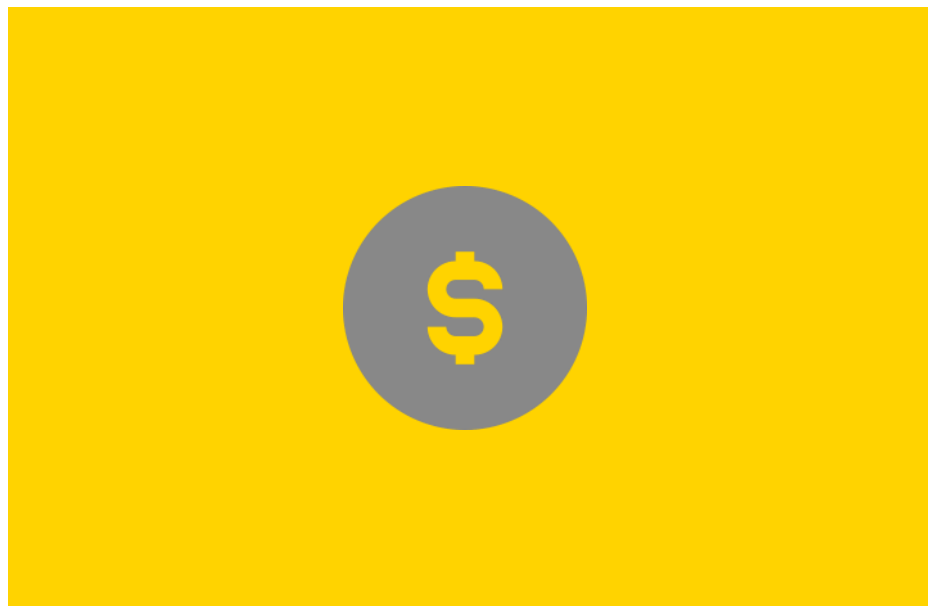
02  
Environmental.



03  
Economic / Business.



04  
Technology.



05  
Political / Regulatory / Policy.





# Drivers of change in urban mobility

01: Values / Behavior / Social.



- **Vision Zero programs:** cities are actively promoting programs with the goal of eliminating vehicle-related fatalities



- **Cities are rethinking the value of the street:** Beyond safety, aesthetics, modal mix (auto vs non-auto), see NACTO



- **Focus on equity and inclusion:** Mobility and social justice



- Values shifting toward sustainability
- The epidemic of loneliness and the social dimension of mobility



- **Travel time = wasted time?**



- Technophilia versus technoskepticism: Do people trust tech companies?



- E-commerce instant gratification



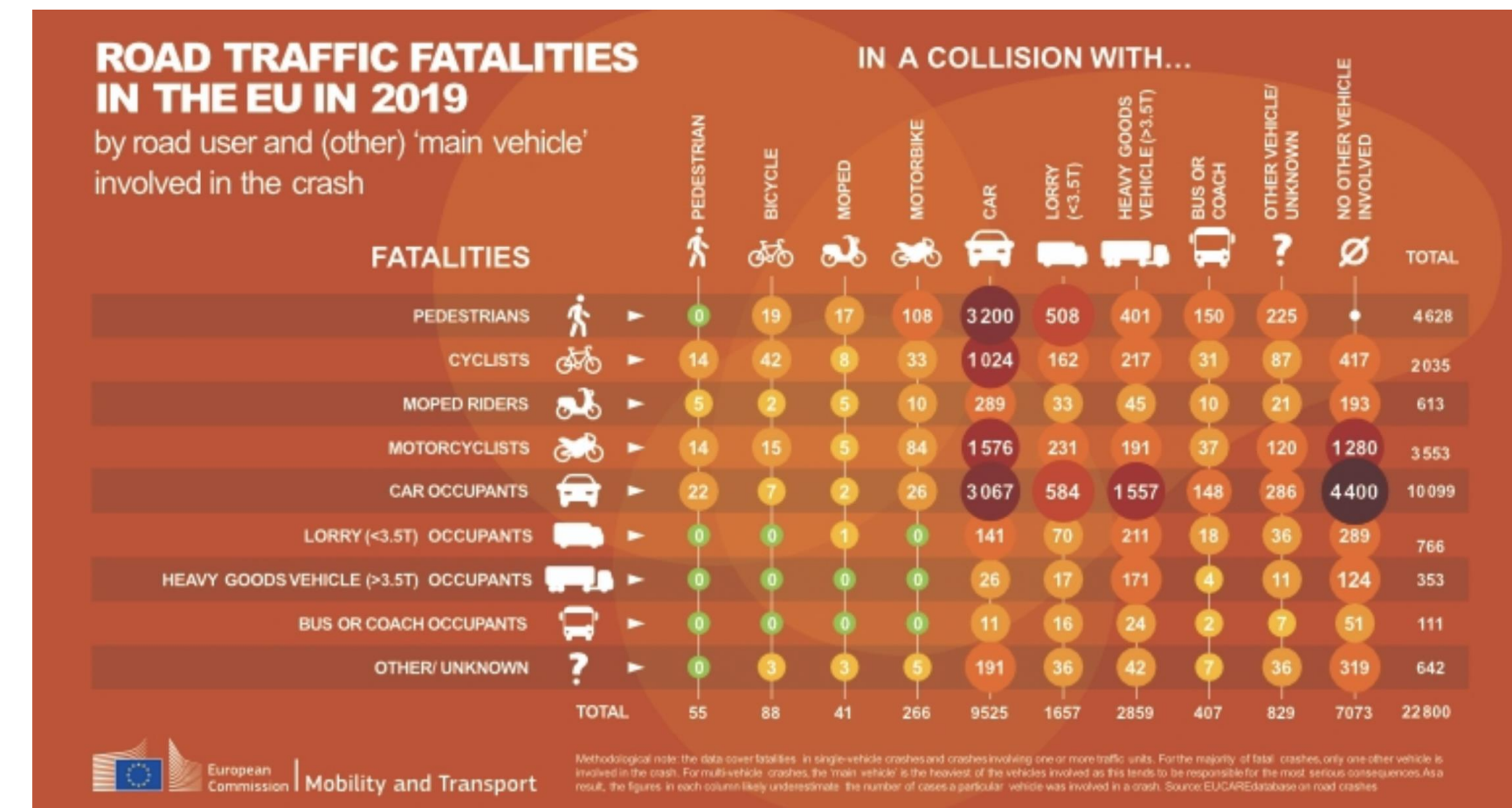
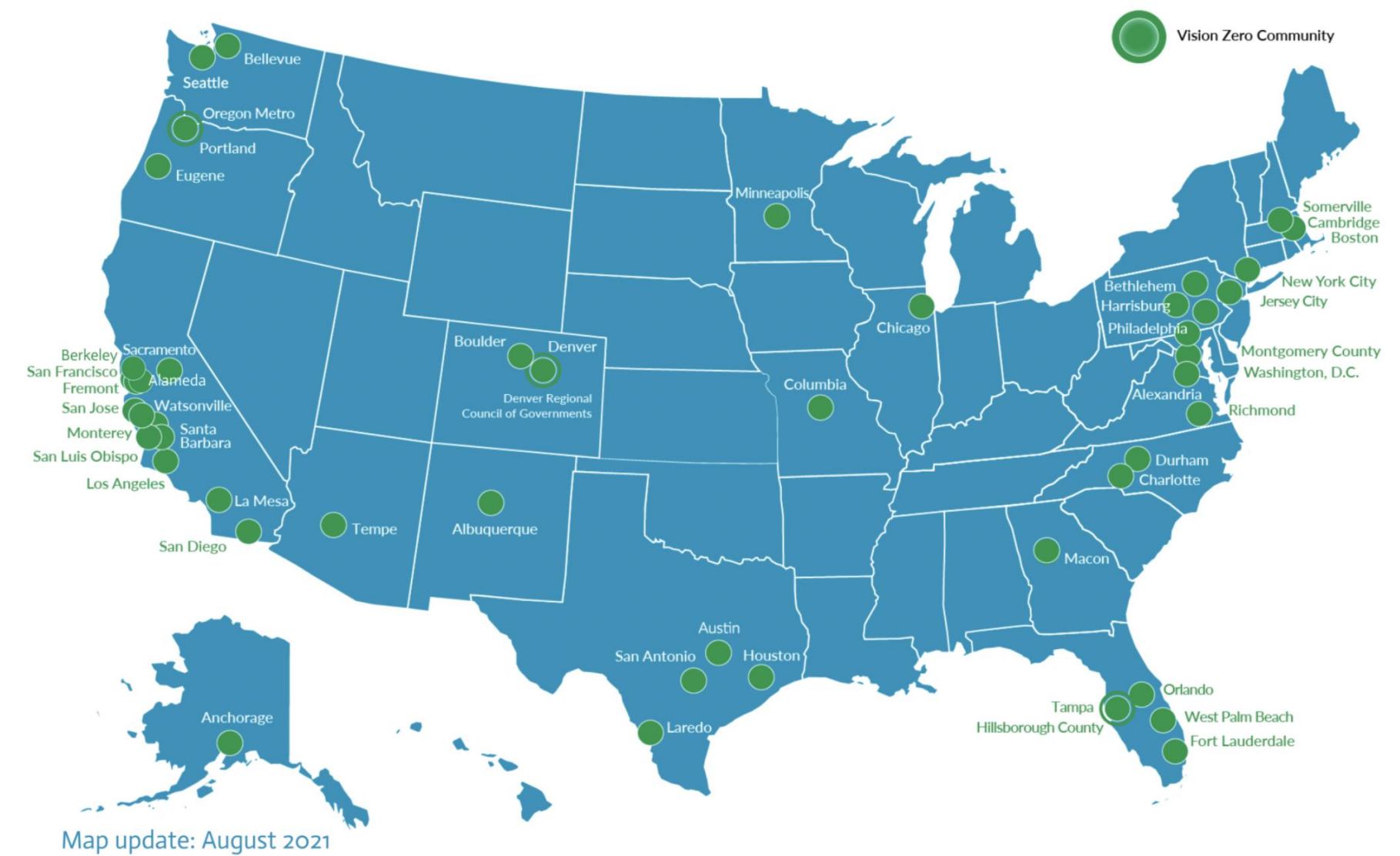
- Covid rethink: Remote work is work
- Political and social polarization: Are we moving to be with like minded people?



# The Vision Zero movement is creating safer streets in cities around the world

Vision Zero is an international movement rooted in collaboration across sectors to eliminate traffic-related deaths and severe injuries, and to ensure safe, equitable mobility for everybody. Sometimes referred to as the Safe System approach, the idea is to accept that human errors are inevitable, but that vehicle-related fatalities and injuries should not be.

The Safe System approach was pioneered in the 1990s, through programs such as Vision Zero in Sweden and Sustainable Safety in the Netherlands. Australia and New Zealand, and a handful of US cities such as New York and San Francisco, adopted similar policies over the following decades.





# Streets are increasingly redesigned for shared vehicles, micromobility, and for people over cars.



I want to promote bicycles. People think bicycles are old and outdated. Everyone is thinking the car is the future. My commute by bike is 45 minutes and by car it is 90 minutes. More Chinese cities are starting to plan for bicycle routes.

**Daizong Liu, IFMAC Member**



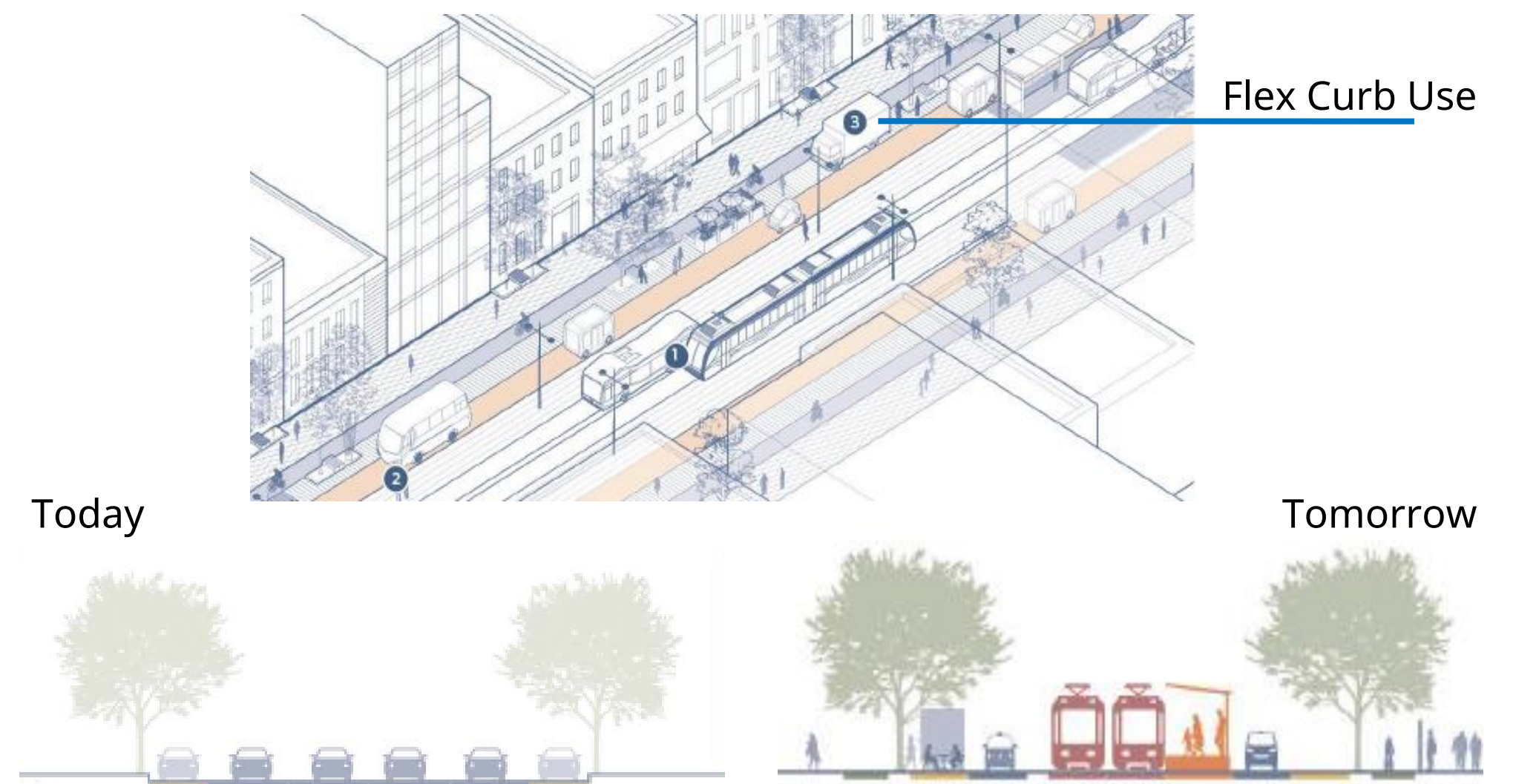
Sept-Oct 2020: New York City Mayor and City Council Make the Covid-era Outdoor Dining Program Permanent

Source: [The Impacts of Neighborhoods on Intergenerational Mobility](#); [Mobility, Economic Opportunity and New York City Neighborhoods](#); [Berkeley: https://www.governing.com/blogs/view/gov-reasons-riders-abandon-public-transit.html](#), [New York Times](#); [City of New York](#)



# Reimagining city streets with the flexible-use curb

The curb – the space between the edge of the sidewalk and active traffic lanes – is an asset generally owned by cities but not clearly understood or well managed. Several startups, such as Coord, Populus, Curbflow and Automotus, have been building technology solutions for cities to create digital inventories of their curbs and enable a “flexible curb” to accommodate different use cases (on-street metered parking, delivery vehicle pickup/dropoff, bike lanes, parklets, micromobility stations, etc.). Better curb management facilitates curb usage for users (e.g., parcel delivery companies) and increases revenue for cities.





# Technophilia versus technoskepticism – attitudes will shape mobility

I want to live in a safe city. I don't need urban air mobility. I want time to spend with my family. I think more and more Chinese people agree with me. They want clean air. They want biodiversity. Water and land use needs to be improved. Cities should be affordable. I don't want to live in a high-tech city like in the Matrix movie.

**Daizong Liu, IFMAC Member**



## Alphabet's Sidewalk Labs cancels Toronto 'smart city' project

By Moira Warburton

3 MIN READ



TORONTO (Reuters) - Alphabet's [GOOGL.O](#) Sidewalk Labs has pulled the plug on its Toronto "smart city" project, citing "unprecedented economic uncertainty" in a setback for the city's long-planned waterfront revitalization.





# Building a brand around values

A few months ago, the government in India launched the Shoonya movement, which intends to make 100% of deliveries carried out with electric vehicles. 30-40 companies have signed on and they are all following the same brand of Shoonya – actually building a brand based on values beyond one single company and shaping consumer preferences along the way.

**Chetan Maini, IFMAC Member**





# The epidemic of loneliness and the social dimension of mobility

The concept of social mobility – that mobility has an inherent social dimension – is gradually gaining currency. As society battles an epidemic of loneliness, we should be conscience of the social dimension of our our urban trips. Similarly, mobility can be highly sedentary (and therefore unhealthy) or highly active (and therefore healthy).



Mobility is multi-dimensional. We want to go as fast as possible. But we also want to have interaction with other people. We want potential exposure to diversity. The feeling that you are outside and that you have exposure to other people creates social value in itself.

**Marco Te Brömmelstroet, IFMAC Member**



Covid accelerated the epidemic of loneliness.

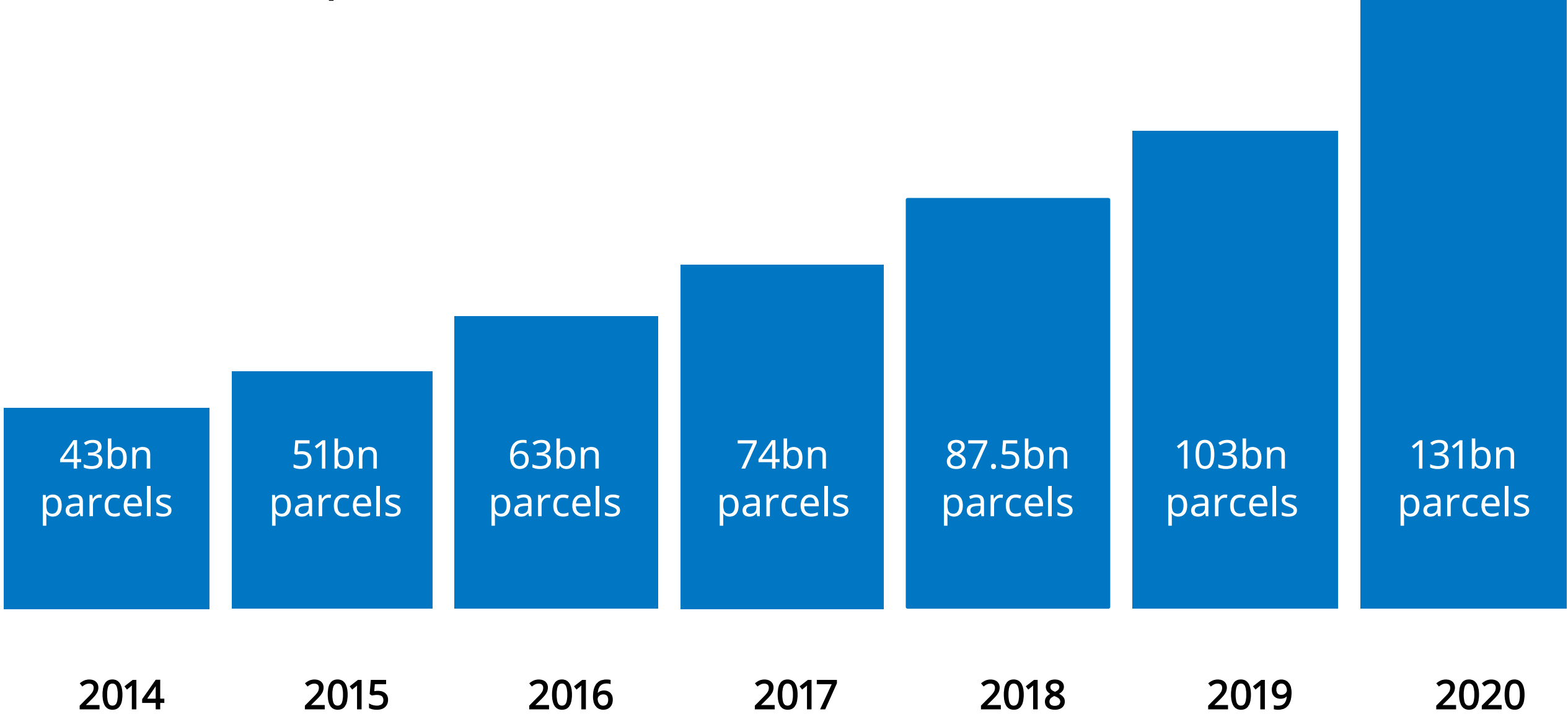
**Sheryl Connely, IFMAC Member**





# The rise of e-commerce is straining urban mobility systems...

Global Parcel Shipments: 2014 - 2020



In 2020:



Every second  
**4160**  
Parcels are shipped globally



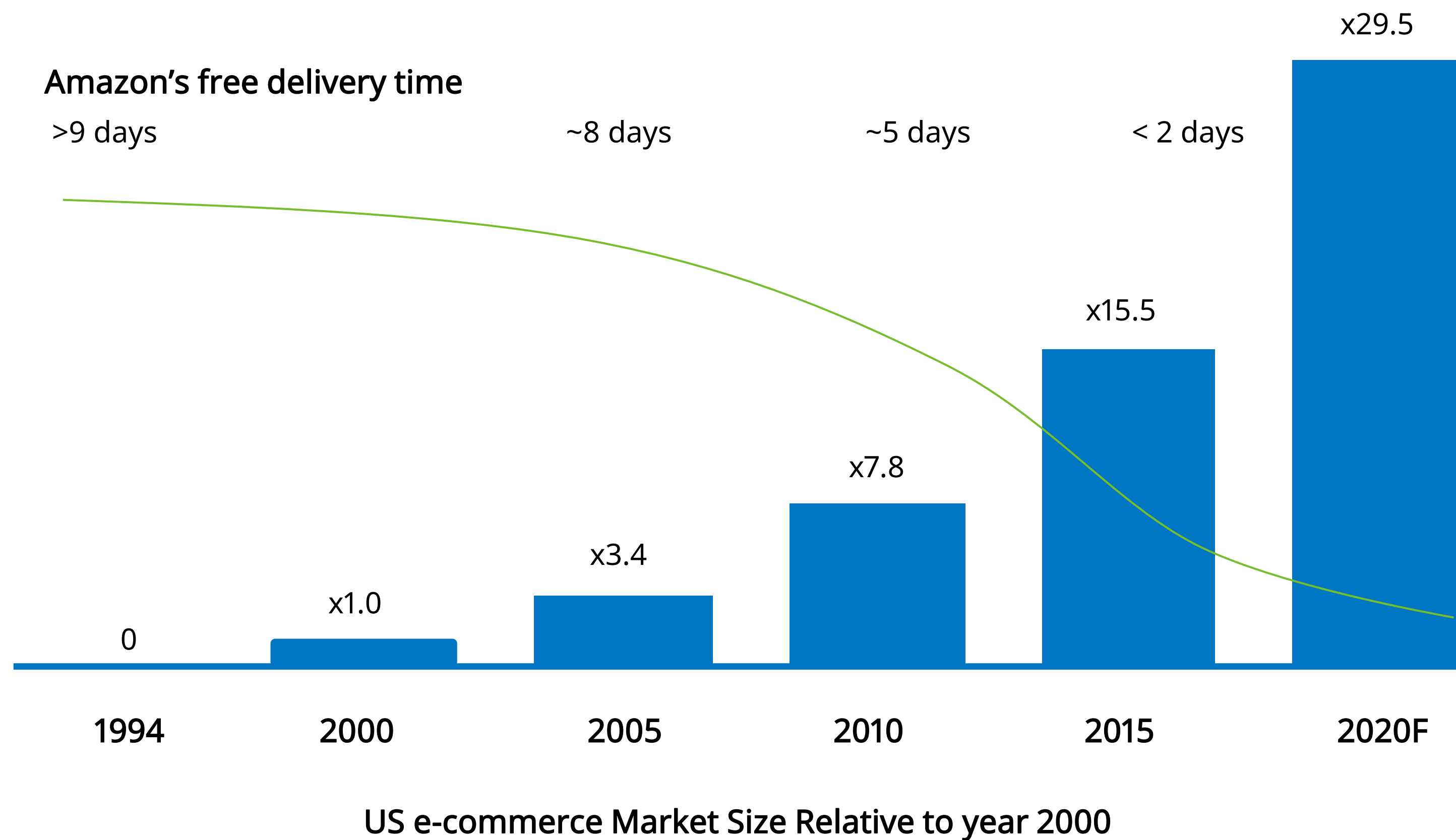
Parcel volume is up  
**27%**



Global parcel shipping revenue increased to  
**\$430bn**

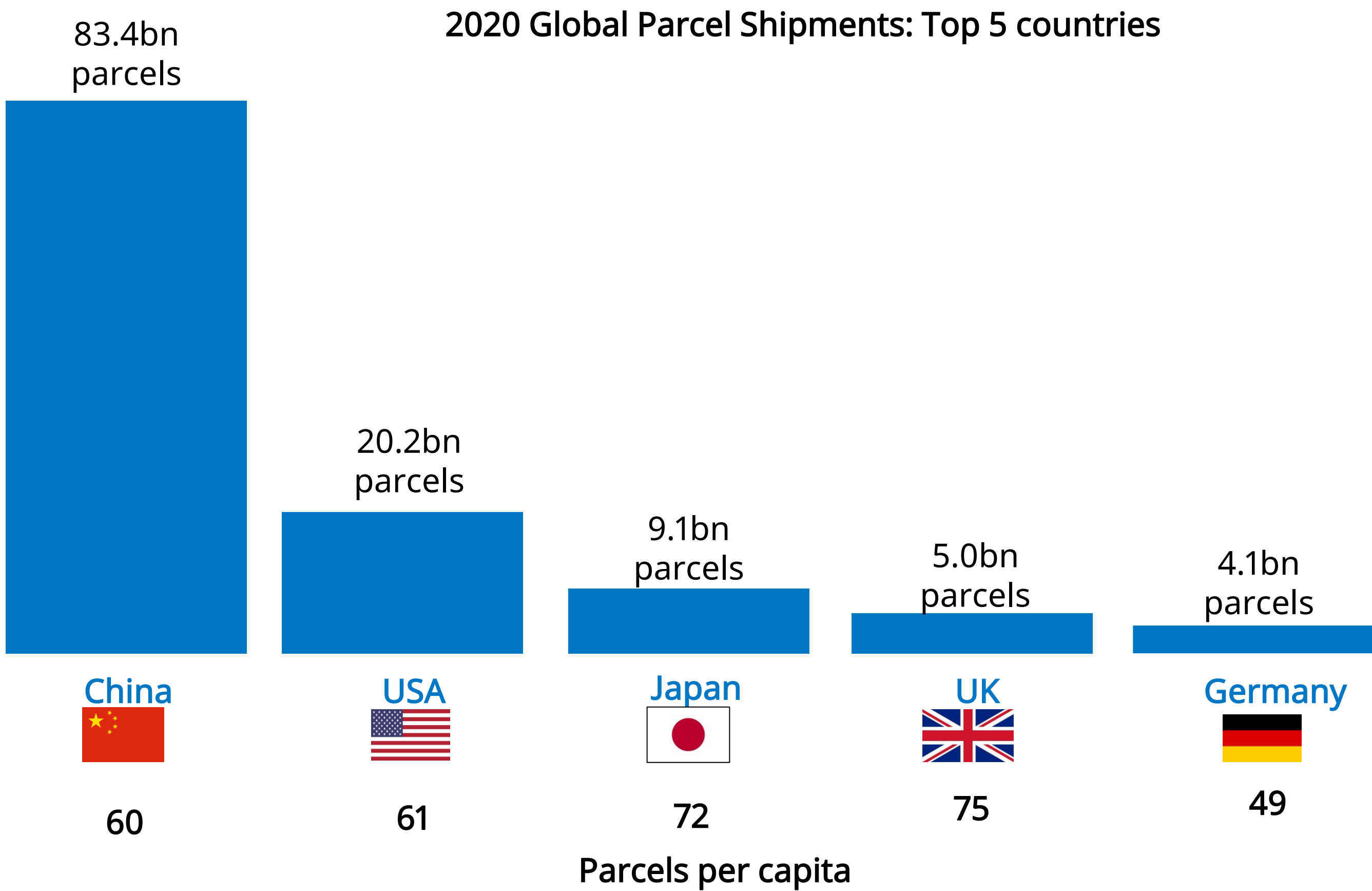


# ...and consumers expect instant gratification with deliveries





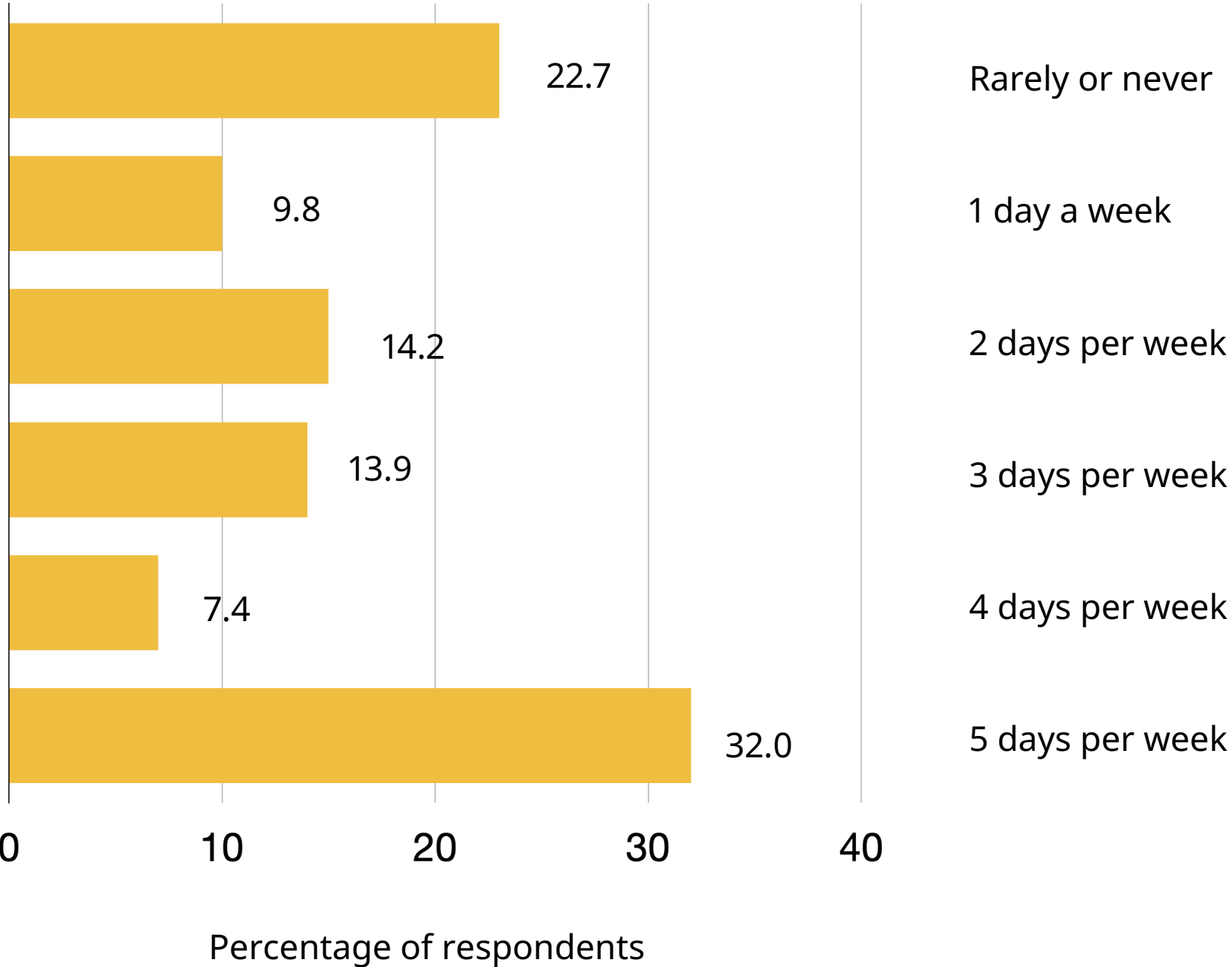
# E-commerce intensity has spread to many countries





# The required 5-day work week at the office is an endangered norm

How often would you like to have paid work-days at home post-COVID?





# Drivers of change in urban mobility

## 02: Environmental.



- **Climate Change**



- **Air pollution**



- **End of life / recycling**



- **Noise**



- **Materials supply for batteries**



# Three ESG questions to consider with electric vehicles



**Minerals Supply:** Where will the lithium, graphite, nickel, cobalt and other battery materials come from and what are the broader environmental impacts of mining these materials?

- Lithium ion battery production is water intensive and sulfur oxides intensive
- 70% of the world's cobalt is mined in the Democratic Republic of Congo
- Security of supply is an issue: China controls 100% of the global spherical graphite supply and 56% of graphite raw supply



**Impact on Labor:** What will be the impact on jobs with the transition from the internal combustion engine to electric powertrains?

- Fewer parts in an EV and parts are more easily produced with automated production (less complex assembly)
- But battery production adds labor and some studies show no net difference in labor intensity



**Battery Recycling:** How to mitigate the environmental impact of used batteries through recycling and materials recovery?

- Business opportunity to build a Lithium Ion battery recycling industry through companies such as Redwood Materials in the USA and GEM in China

Source: [Congressional Research Service](#),

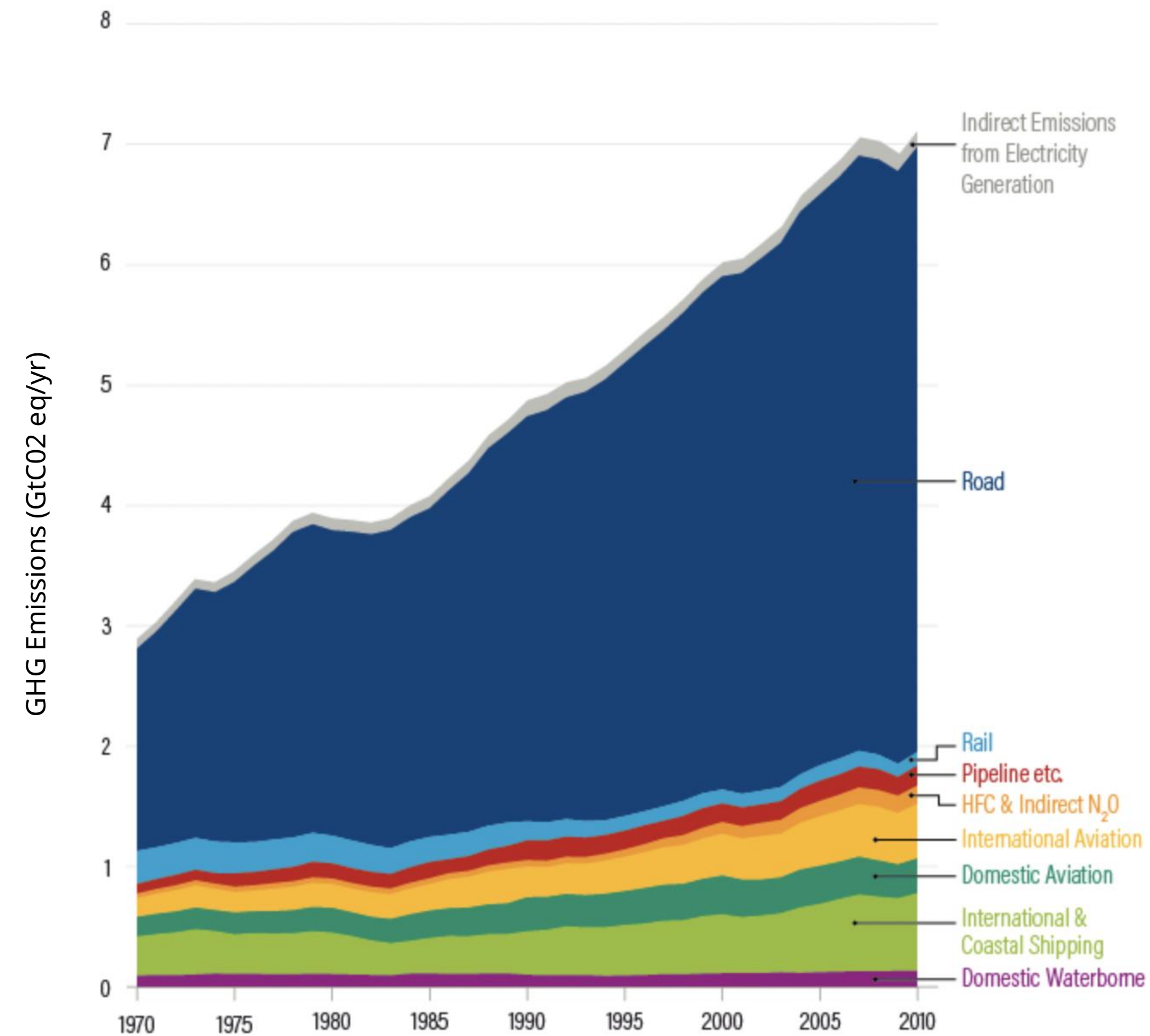
Graphite Pricing & Forecasting | Benchmark Mineral Intelligence ([benchmarkminerals.com](#)), Millions of electric cars are coming. What happens to all the dead batteries? | Science | AAAS ([sciencemag.org](#)), Profiling the world's largest cobalt-producing countries ([nsenergybusiness.com](#))



# Drivers of change in urban mobility

## GHG Emissions from Transport

Greenhouse gas emissions from transportation are the fastest growing sector

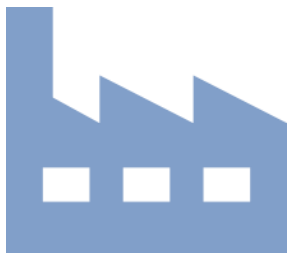




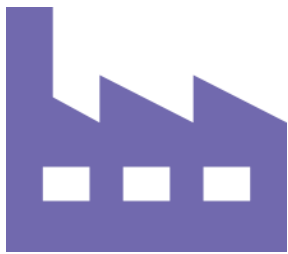
# China dominates lithium ion battery production

## 200 Battery Megafactories Across the World

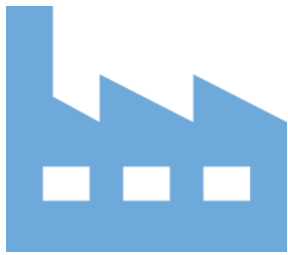
- 122 Operational
- 78 Planned



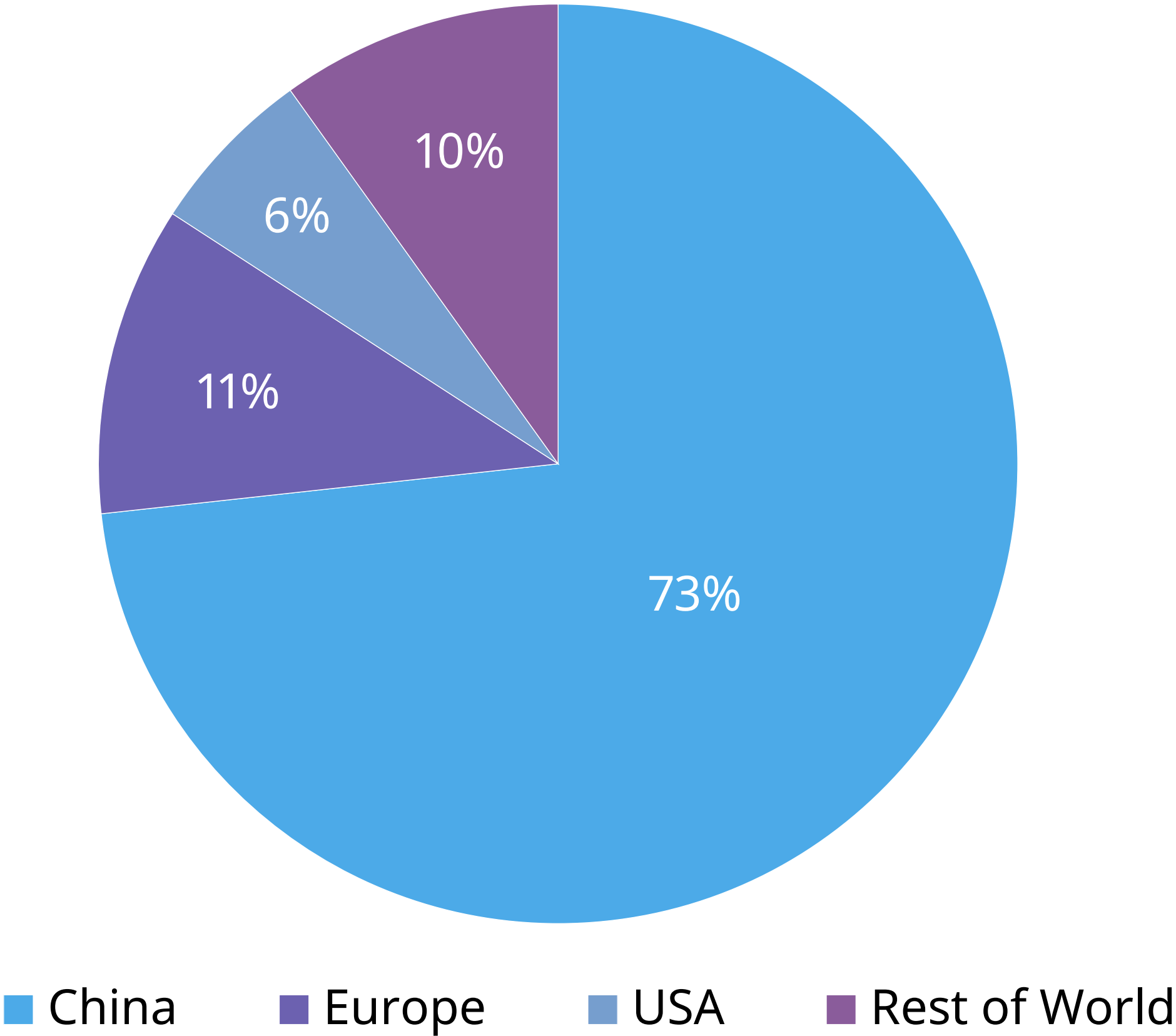
**USA: 11 Factories**



**Europe: 21 Factories**



**China: 148 Factories**



Lithium Ion Battery Megafactories Planned and Built) as of March 31 2021



# Drivers of change in urban mobility

03: Economic / Business.



- **City budget shortfalls**



- **Share mobility business models**



- **Mobility partnerships**



- **Economic growth as KPI**



- **Building new mobility infrastructure**

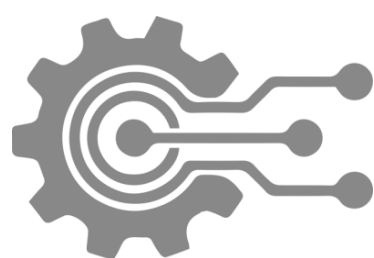


- **Platform economics of mobility**



# Drivers of change in urban mobility

## 04: Technology.



- **Electrification**



- Autonomous



- Connected



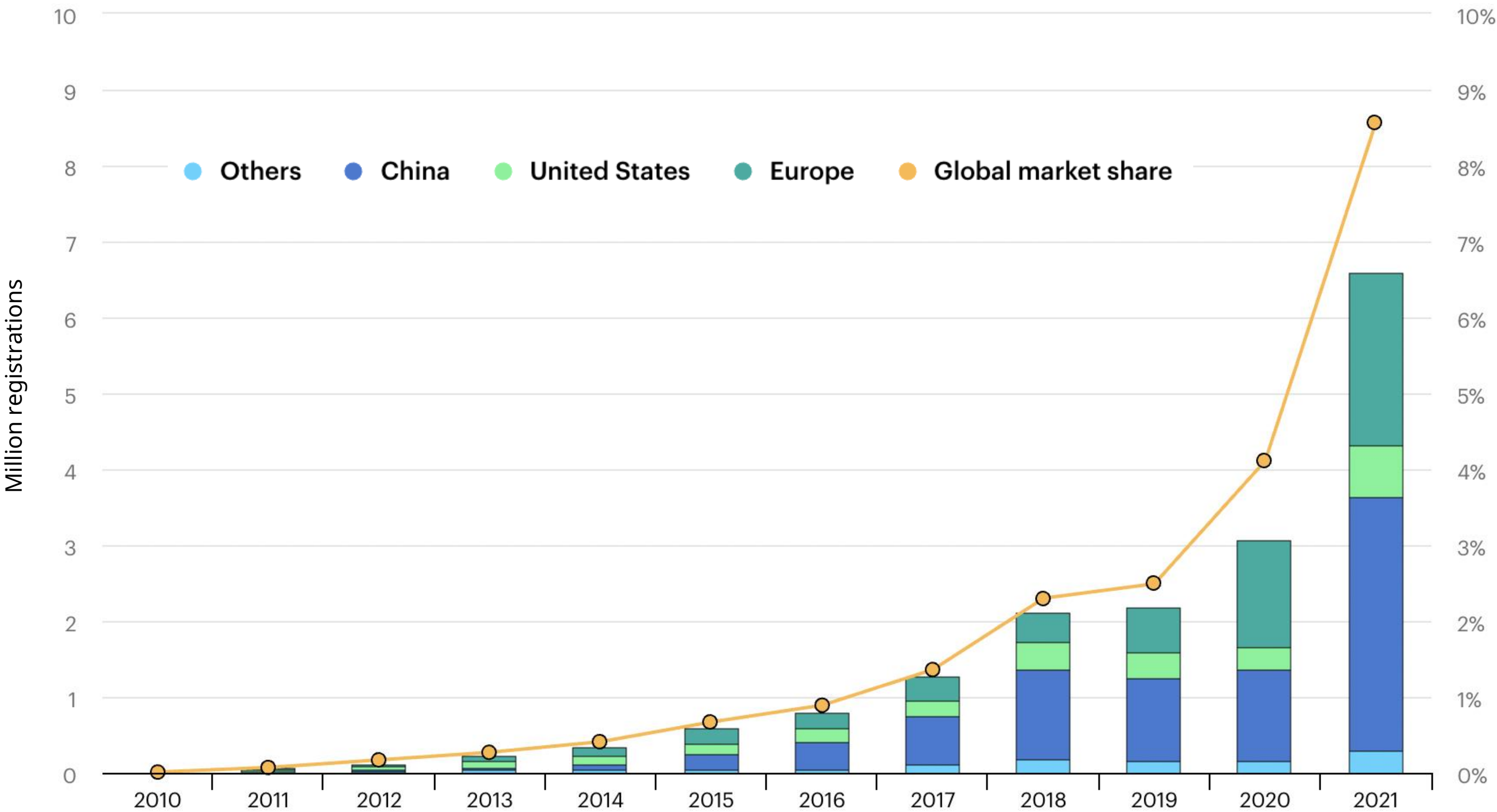
- Machine learning and AI



- New form factor vehicles

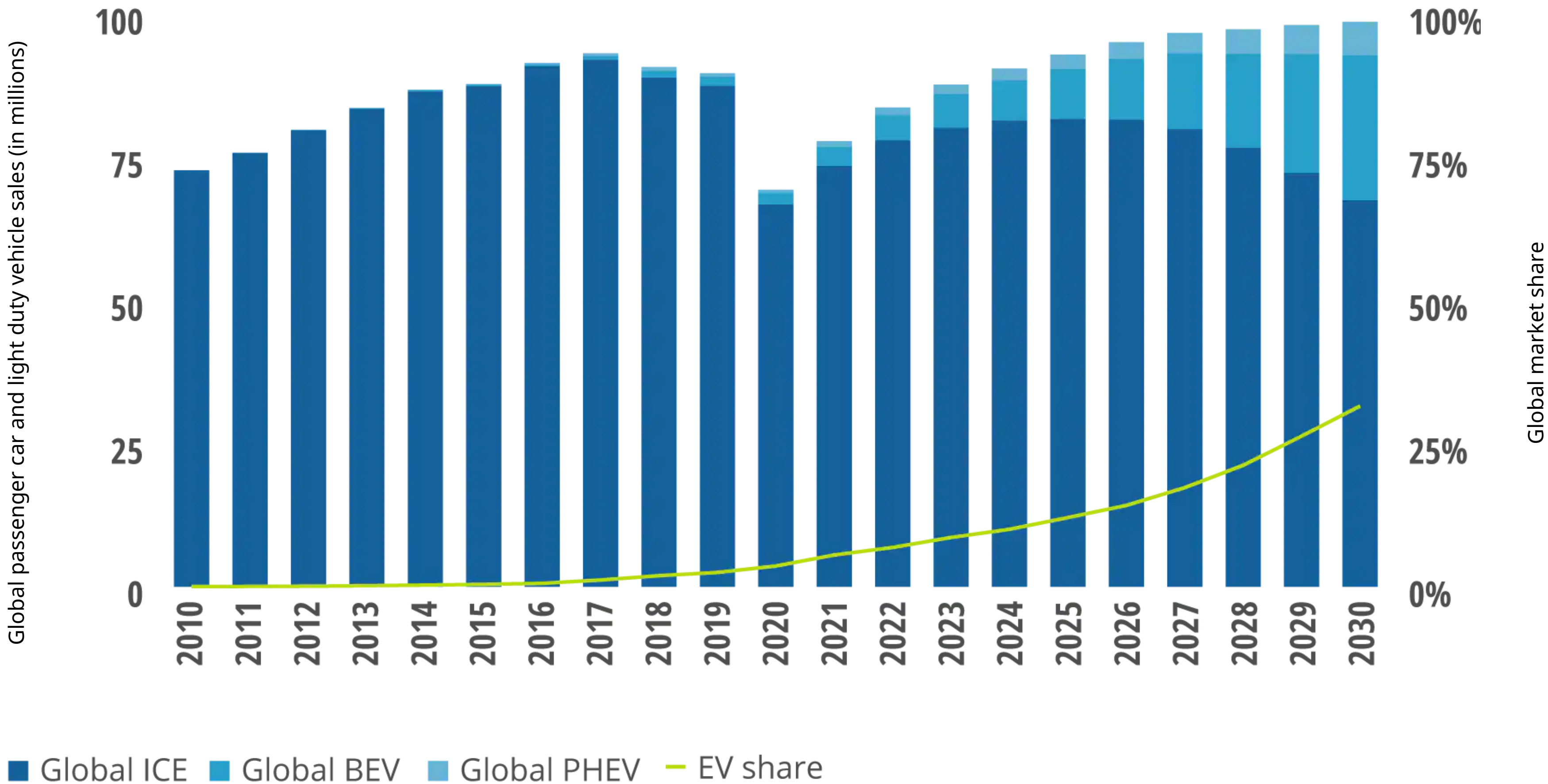


# Electric vehicle registrations have exploded – despite Covid





# ... and EV sales are forecasted to continue to grow





# Drivers of change in urban mobility

05: Political / Regulatory / Policy.



- **Zoning the 15-minute city**



- **Car bans/restrictions/pricing**



- **Cities as champions of inclusion**



- **Cities asserting data sharing**



- **China policy**



# Cities are becoming champions of inclusion, asserting data sharing, and imposing car restrictions, bans and/or pricing policies

Cities have increasingly focused their mobility policies to serve the needs of disadvantaged populations. Additionally, cities have become more organized and more assertive to push for mobility data platforms where mobility providers, in exchange for operating in a city, must provide the city to access to mobility data sets that the city can in turn use to improve its overall mobility system performance. Cities are also reacting to the aggressive go-to-market tactics of early mobility tech players. Finally, many cities continue to actively push private-use automobile restrictions.



Paris Mayor Anne Hidalgo announced that by 2024 she wants all Parisian streets to be cycle friendly, including removing 72% of on-street parking spaces in an effort to create room for cyclists.



A citizens initiative in Berlin has proposed that the entire city center – an area greater than Manhattan – is made car-free.



More and more it's the city as the champion of inclusion. Transport for London is a highways authority guided by the a clear mandate: "It's the duty of the highway authority to assert the rights of the public for the use and enjoyment of the highways". Doesn't matter what your background is – rich, poor, etc. – the mandate is to improve road usage for all Londoners.

**Michael Hurwitz, IFMAC Member**



The scooter companies should have reached out to city officials first before blanketing city streets with scooters. How you deploy matters.

**Sarah Thornton, IFMAC Member**



LA has deployed the Mobility Data Specification (MDS). If you want to do business in our city, you need to share your data so we can better plan our city. I think we will see more of that trend – cities asserting to private companies that you must share your data to operate here.

**Michael Hurwitz, IFMAC Member**



# China national policy has had a profound impact on mobility

Since 2010, China has been the largest automotive market in the world, and more recently China has emerged as a leading innovator in mobility systems. Two important government policies are worth noting. The Made in China 2025 policy announced in 2015 aimed to make China a leader in electric vehicles ("New Energy Vehicles"), robotics/advanced manufacturing, IT/artificial intelligence and other areas relevant to mobility. The Common Prosperity policy announced in 2021 seeks to reduce income and wealth inequality and share the benefits of prosperity more equitably across the Chinese population.



China has some very strong players in autonomous vehicles. AVs are found in 12 cities, led by Beijing, Shanghai, Shenzhen, Chongqing, Guangzhou. Typically vans or passenger cars transporting people more or less along fixed routes with the blessing of the government. Baidu is a front runner -- they will have 3000 robotaxis deployed in 30 cities within a few years. Pony.ai, Momenta, WeRide and AutoX are all pushing autonomous urban mobility. My view is that both autonomous and electric mobility will happen faster in China. Local officials stand to gain by being first. Local officials in the US stand to lose if something goes wrong.

**Mike Dunne, IFMAC Member**



China is different from other countries. Lots of change is driven from the government top-down. The overall economy is shifting from export-driven to consumption-driven.

**Daizong Liu, IFMAC Member**



PLAUSIBLE SHIFTS IN URBAN MOBILITY

# **What could urban mobility look like in ten years?**



# What could urban mobility look like in ten years?

**Different street design**

**Different vehicles**

**Shift away from personal-owned automobiles**



**Integration among modes enabled by data platforms**

**Different mobility demand patterns**

Source: Image credit: [NACTO, Bloomberg Philanthropies](#)

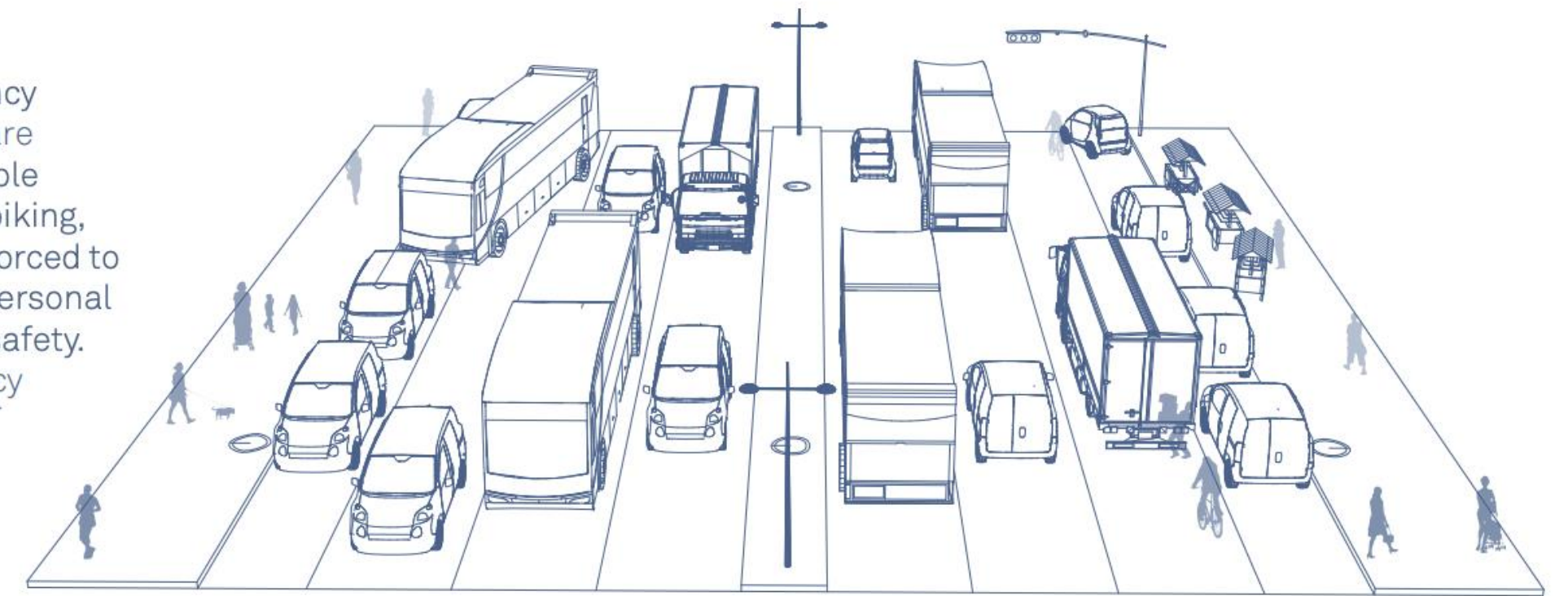


# City streets will look different in the future

- Less lanes for automotive traffic, more lanes for BRT/autonomous shuttles, bike lanes, wider pedestrian zones, outdoor cafes/dining and more pedestrian-only streets
- Flexible and digitized curb management
- Far less on-street parking
- Migration from petrol to EV charging and grid integration
- Sensing and connected infrastructure integration of vehicles and buildings

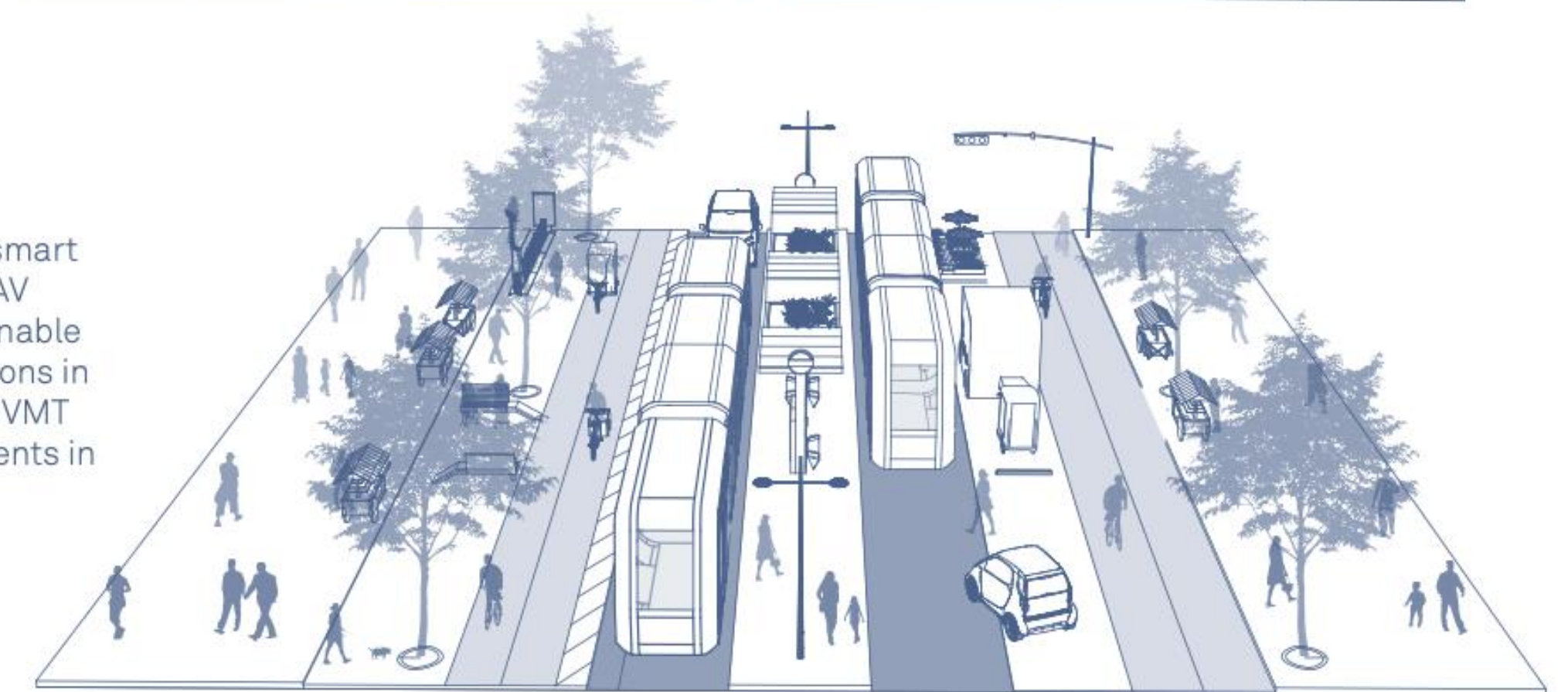
## Today

Single-occupancy vehicles (SOV) are prioritized. People taking transit, biking, or walking are forced to compete with personal cars, reducing safety. Transit efficiency decreases, VMT increases.



## Future

Supported by smart street design, AV technologies enable further reductions in emissions and VMT and improvements in safety.





# The vehicles on those streets will look different in the future





# The big shift away from the personal owned automobile as the dominant mode of mobility will accelerate, particularly in denser cities

- More cities will enact use restrictions on private vehicles, reduce on-street parking, and impose congestion pricing charges
- Business and cities will offer new alternatives to trips in personal vehicles and existing alternatives will be improved, ranging from robo-shuttles to micromobility to better public transportation systems
- Denser cities in particular will lead this trend away from personal owned automobiles toward fleets.

London and Paris are taking out private cars. That is the future. Cities need to rationalize how their streets are used. The denser cities will lead this transition.

**Robin Chase, IFMAC Member**



What's changing in mobility? Access over ownership. People don't want to own things that depreciate. We will see a shift to fleets over the personal automobile ownership model. It will be more prevalent in [US] coastal cities. Density is literally a geometry problem. The more people in a small space, the better services you can provide.

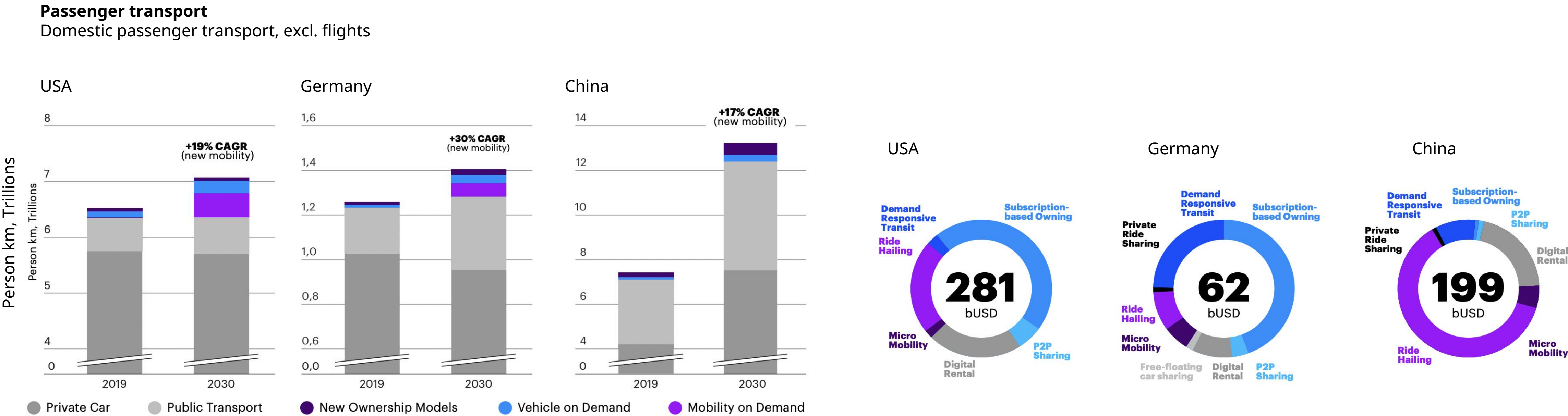
**Tiffany Chu, IFMAC Member**





# City dwellers will have more mobility options – and those options are likely to be better integrated

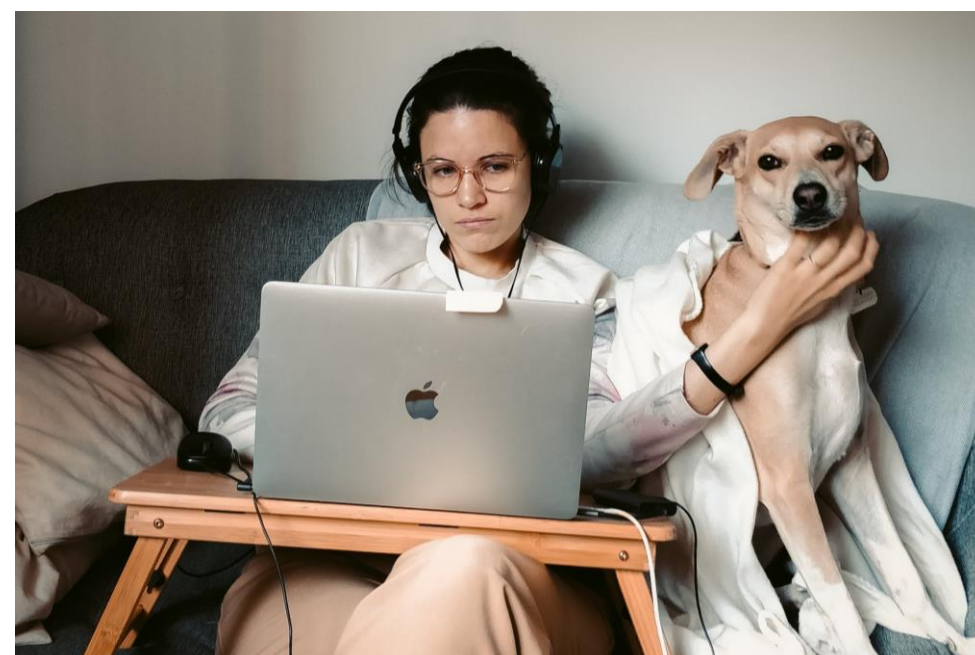
Accenture report suggests significant gains in mobility services in China





# Urban mobility demand patterns will look different –

where we live, where we shop, where we eat



- Zoning movement toward the 15 minute city
- Rise of urban micro stores
- Changes in work and commuting patterns (including structural changes from Covid)
- Changes in where people choose to live – donut trend in the US



**Implementation of new opportunities  
will require partnerships with mobility  
providers, cities, and other organizations  
like global retailers like IKEA.**





The winners of the mobility transformation will be those enterprises with a strong **ability to collaborate** across industrial and technological sectors, engage with governments, and ultimately to engage with the citizens whose lives they seek to improve.

**John Moavenzadeh, IFMAC Chair**





# Tack!

(Tack means Thank you in Swedish)

Inter IKEA Systems B.V.





# IKEA Future of Mobility Advisory Community (IFMAC)

USA



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Data Platforms, Policy

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