

Data and the State

PUBPOL 2130 / INFO 3130



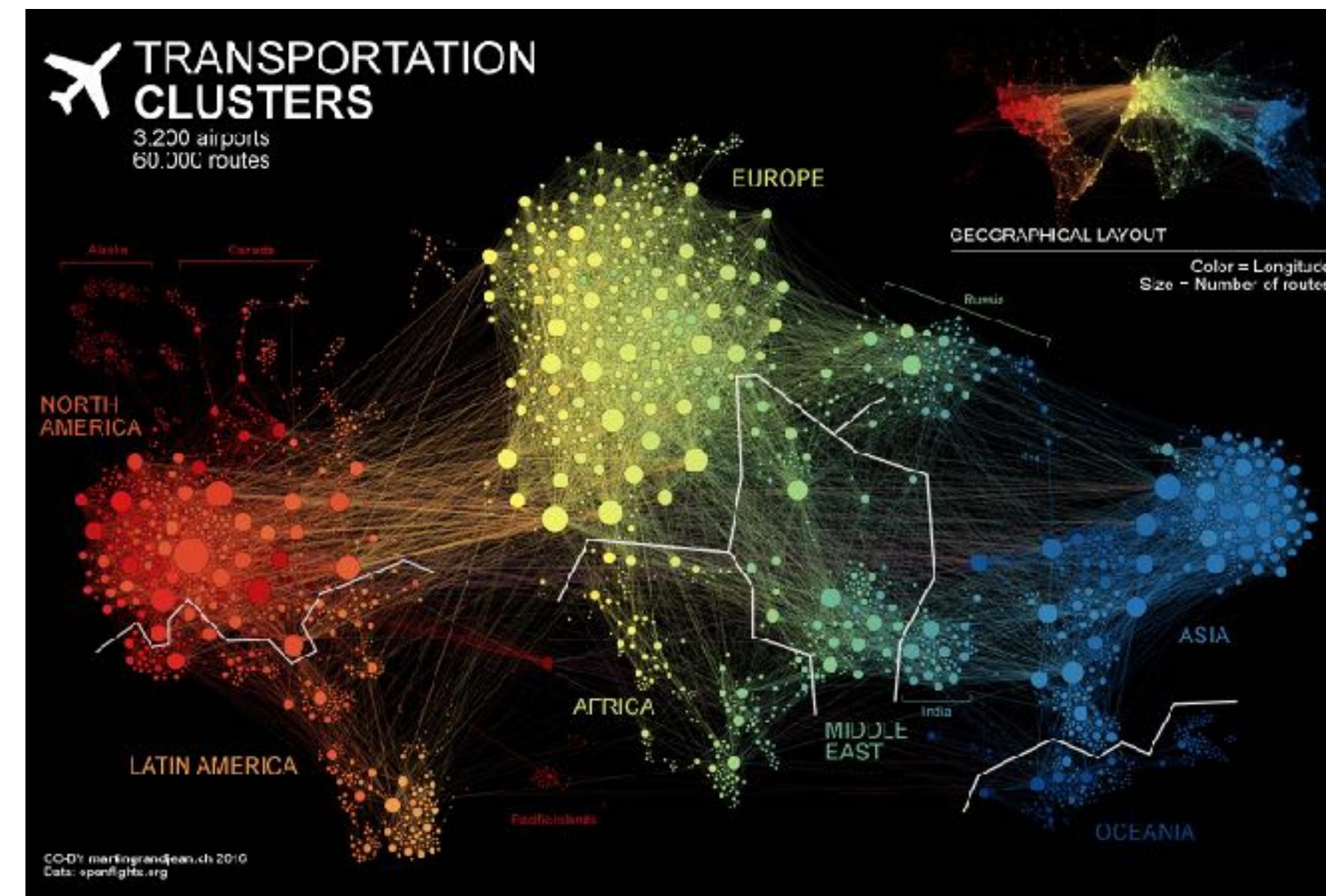
Transit and Networks

Lecture 16, Thursday Mar 20

Announcements

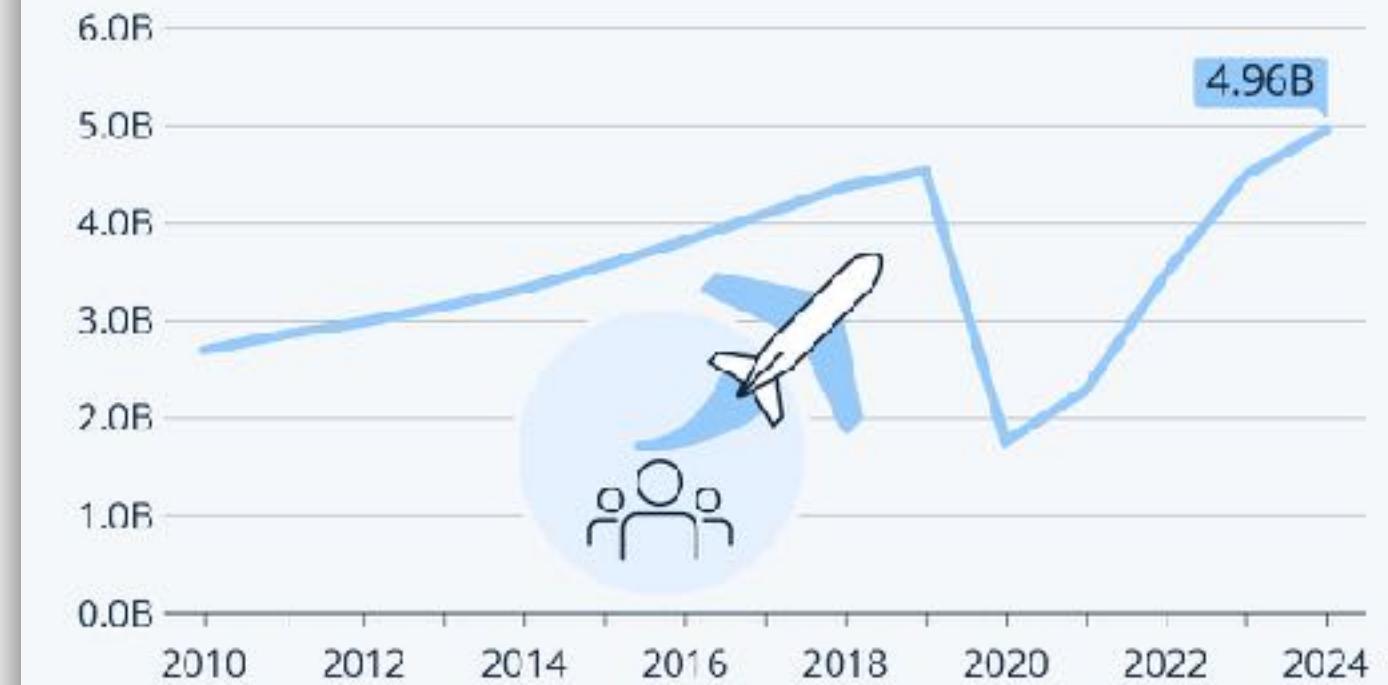
- Guest speaker **Nick Klein** (City and regional planning) today
- In-class exam Tuesday, same format as Exam 1. Practice problems on github.
 - Weapons (SIPRI papers, graphs, flows, commensurating units)
 - Elections (Rodden, precincts, spatial data transfer/MAUP)
 - Migration (Moretti, ACS and PUMS, drivers of migration, microdata)
 - Organs (Healy, STAR/OPTN, out-of-sequence allocation, integer programs)
 - Transit (Shoup, isochrones, tragedy of the commons, infrastructure, OSMnx, networks)
- How to study? Review notes and slides, review readings (on paper?), review notebooks and make sure you see how some of the key code blocks work
- **Review session today 6:30-7:30pm, Malott 406** and also Saturday 2-3pm

Travel flows



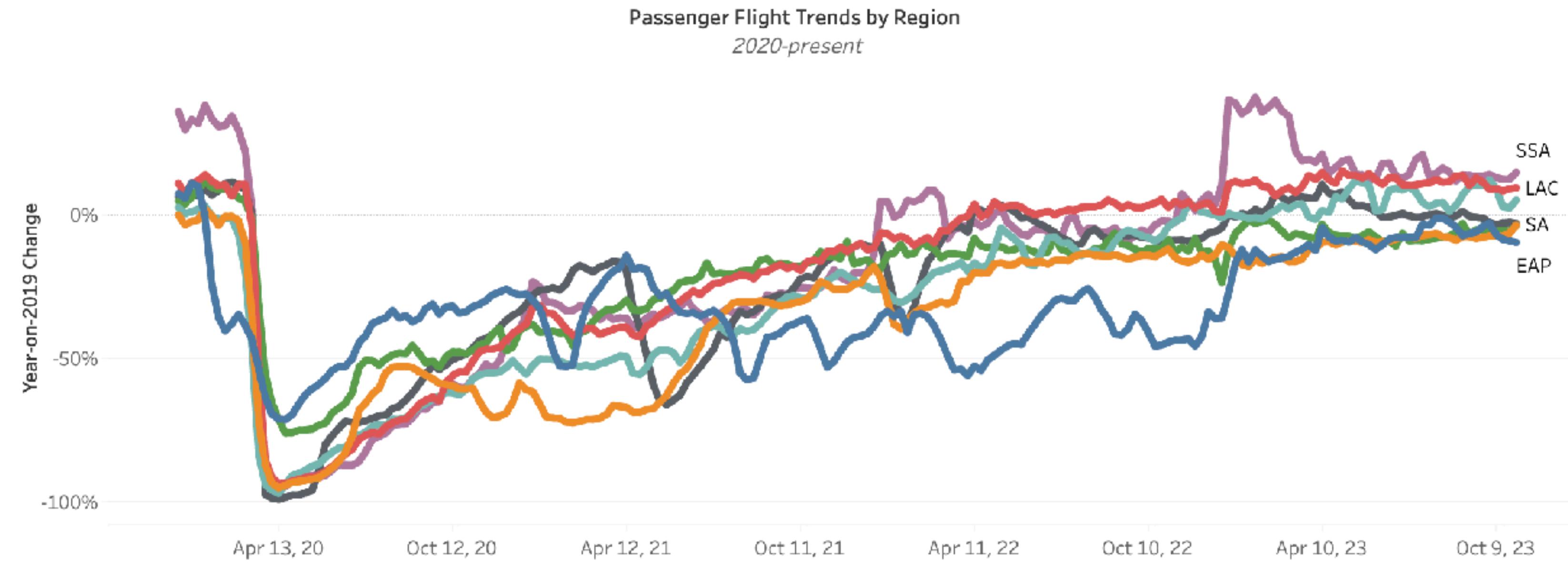
Airline Industry Aims for New Passenger Record in 2024

Number of scheduled passengers of the global airline industry*



* 2023 figure is a preliminary estimate. 2024 figure is a forecast as of June 2024.
Source: International Air Transport Association

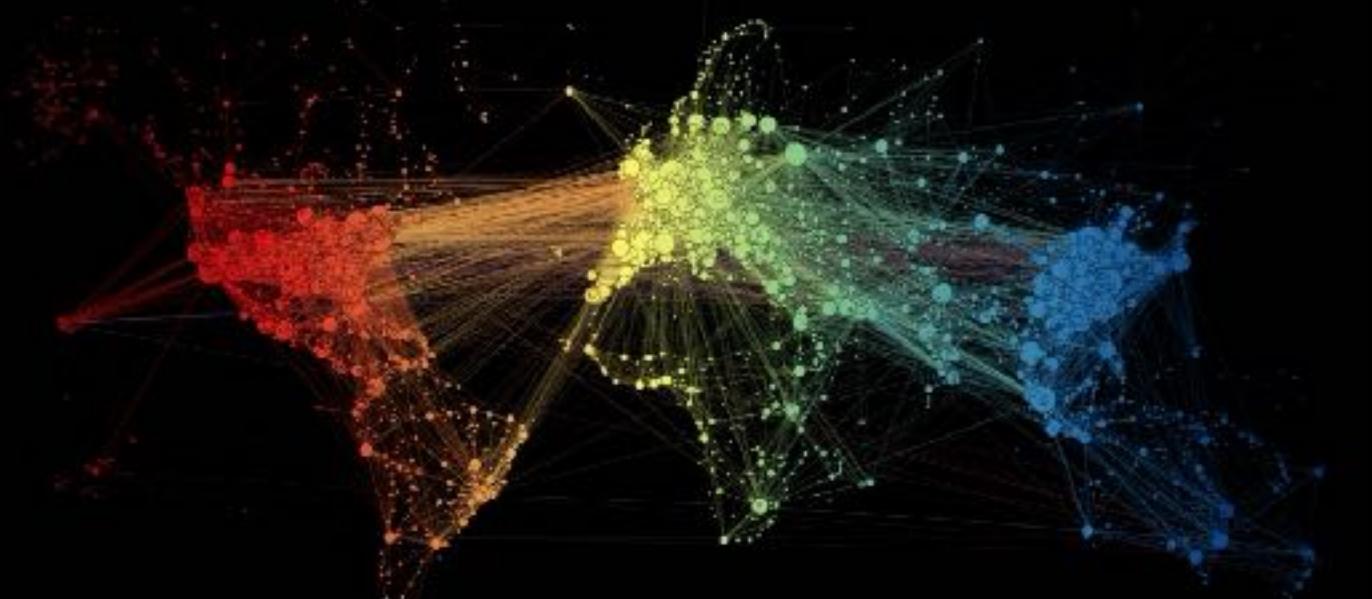
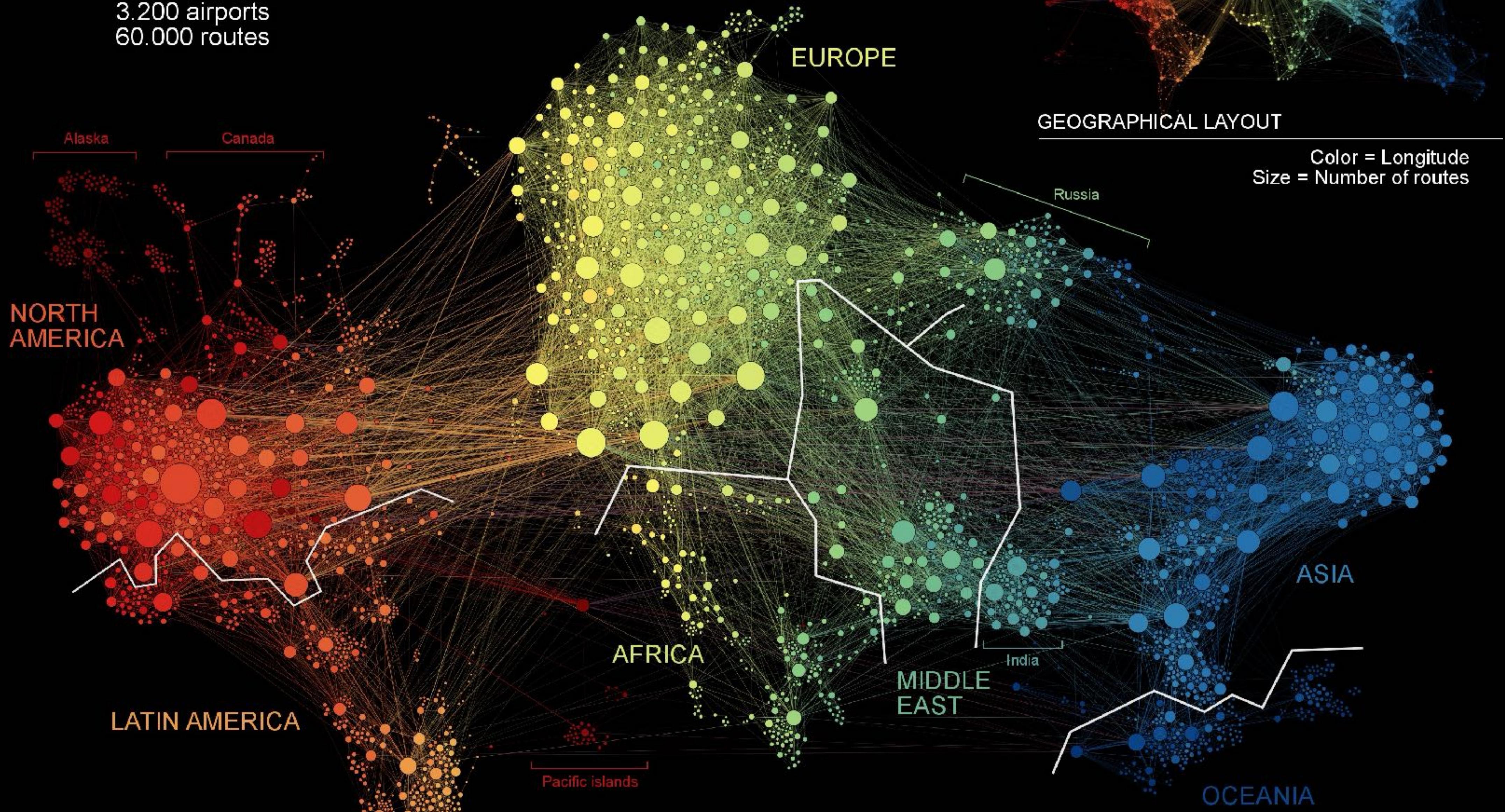
statista



- SSA – Sub-Saharan Africa
- LAC – Latin America and the Caribbean
- SA – South Asia
- EAP – East Asia and the Pacific
- ECA – Europe and Central Asia
- MENA – Middle East and North Africa
- NAC – North America

TRANSPORTATION CLUSTERS

3.200 airports
60.000 routes



GEOGRAPHICAL LAYOUT

Color = Longitude
Size = Number of routes

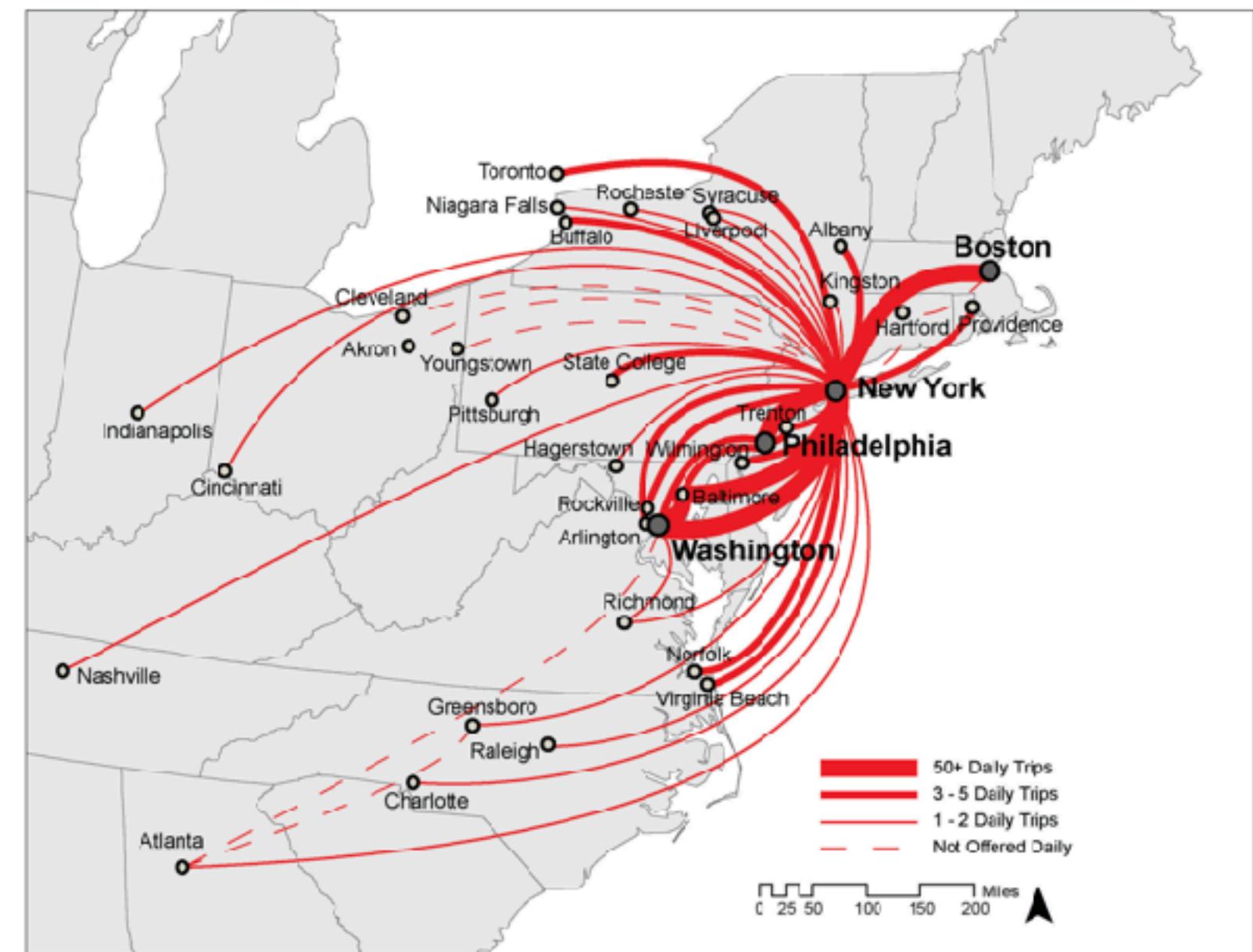
Guest: Nick Klein

- Associate Professor of City and Regional Planning at Cornell
- Specialist in transportation planning with a focus on marginalized populations
- BS in operations research, MS in urban spatial analytics, PhD in planning and public policy
- topics of some papers:
 - cars and employment, "Vehicles for Change" project
 - location affordability
 - millennials and car ownership
 - the Chinatown bus
 - scooter parking



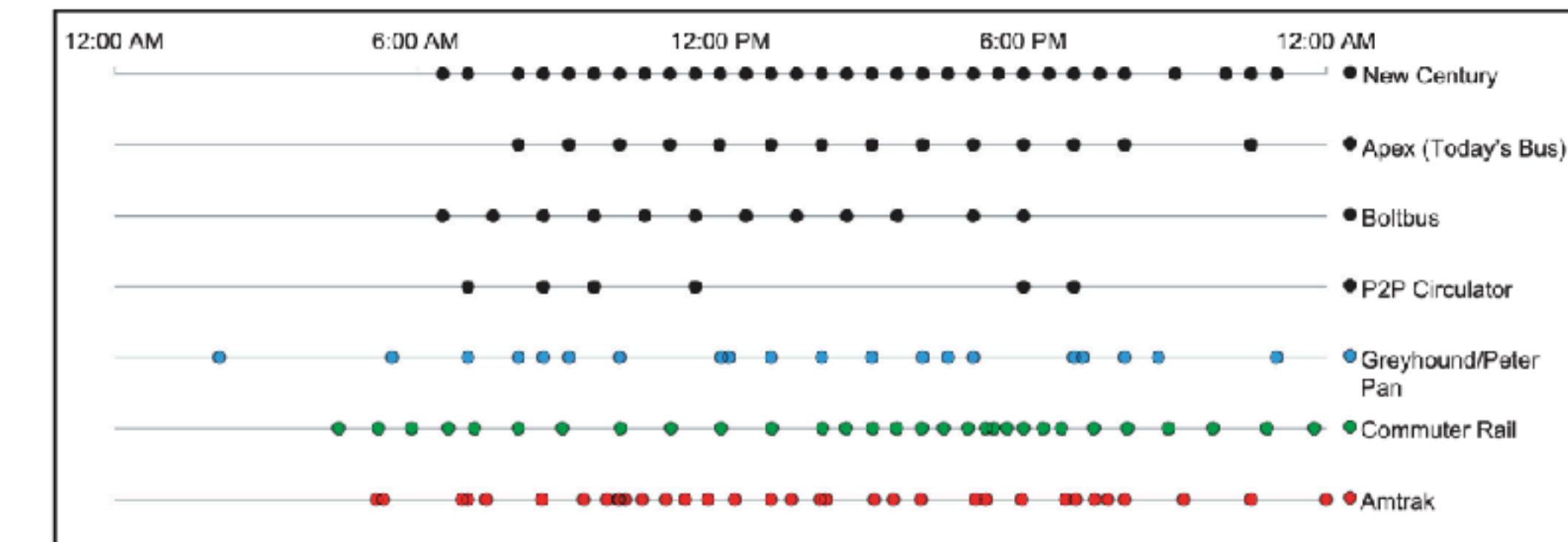
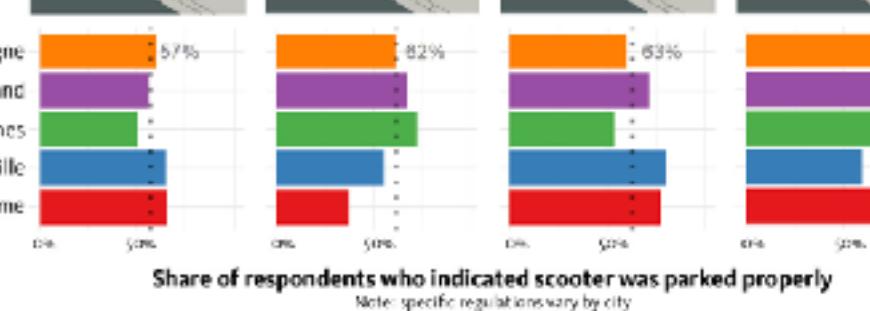
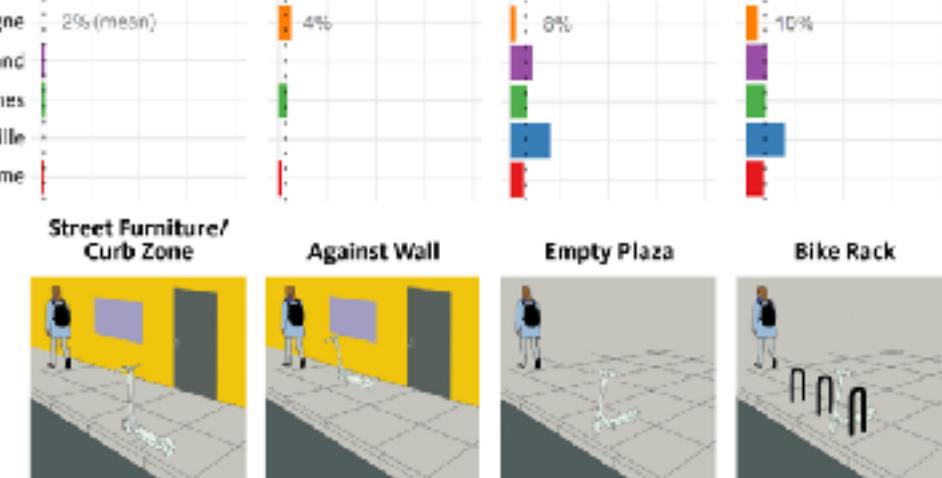
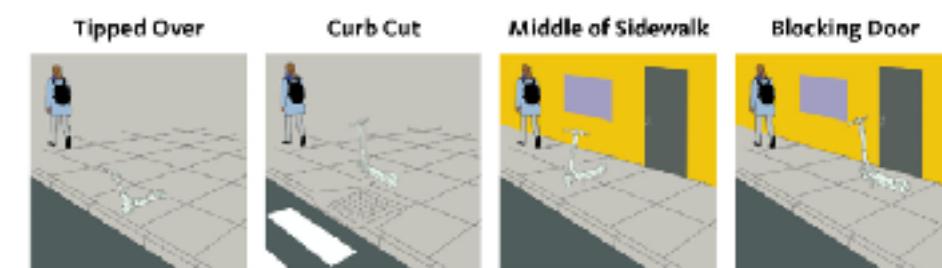


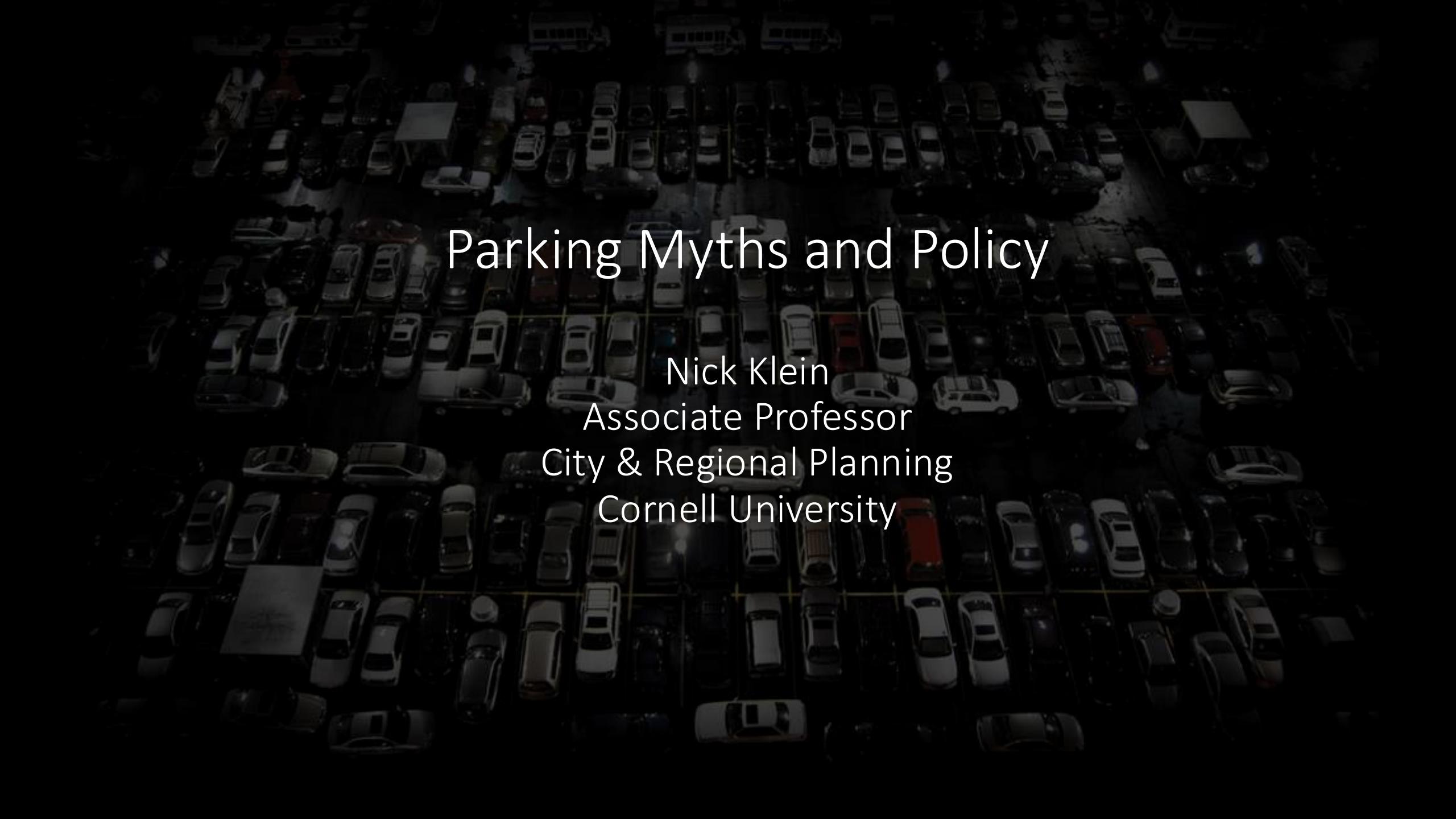
Figure 2-2. Various Designated Parking Areas (left) and Study Areas (right) in Tel Aviv



Can you park your scooter there?

Scooter riders' assessments of parking compliance for eight scenarios in 5 cities:
Cologne (n=80), Auckland (n=46), Milton Keynes (n=67), Nashville (n=20), and Rome (n=78)





Parking Myths and Policy

Nick Klein
Associate Professor
City & Regional Planning
Cornell University



Nicholas J. Klein



Nicholas J. Klein

Associate Professor; Director
of Undergraduate Studies (on
sabbatical)

[Curriculum Vitae \(CV\)](#)

Department

City and Regional Planning

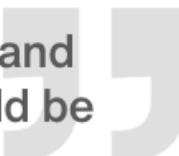
Contact

214 W. Sibley Hall
(607) 255-8772
njk8@cornell.edu

Nicholas J. Klein's research contributes to two central areas of transportation planning: understanding the factors that influence how people travel on a daily basis and how these changes play out over the course of their lives. His work focuses on marginalized populations and neighborhoods that use transit, walk, and bike at high rates. By studying factors that influence how people in these communities travel on a daily basis and how their travel evolves over many years, his work offers new perspectives for planners, policymakers, and researchers on issues of equity and sustainability in transportation.

He received his Ph.D. from the Edward J. Bloustein School of Planning and Public Policy at Rutgers University, a master's degree in urban spatial analytics from the University of Pennsylvania, and a bachelor's degree in operations research and industrial engineering from Cornell University. Klein previously taught at Columbia University, Temple University, and Pratt Institute.

"I teach students how to look at cities, neighborhoods, and streets to provide ways of thinking about how they could be changed and rebuilt to mitigate so many of the daily transportation challenges and barriers people face."



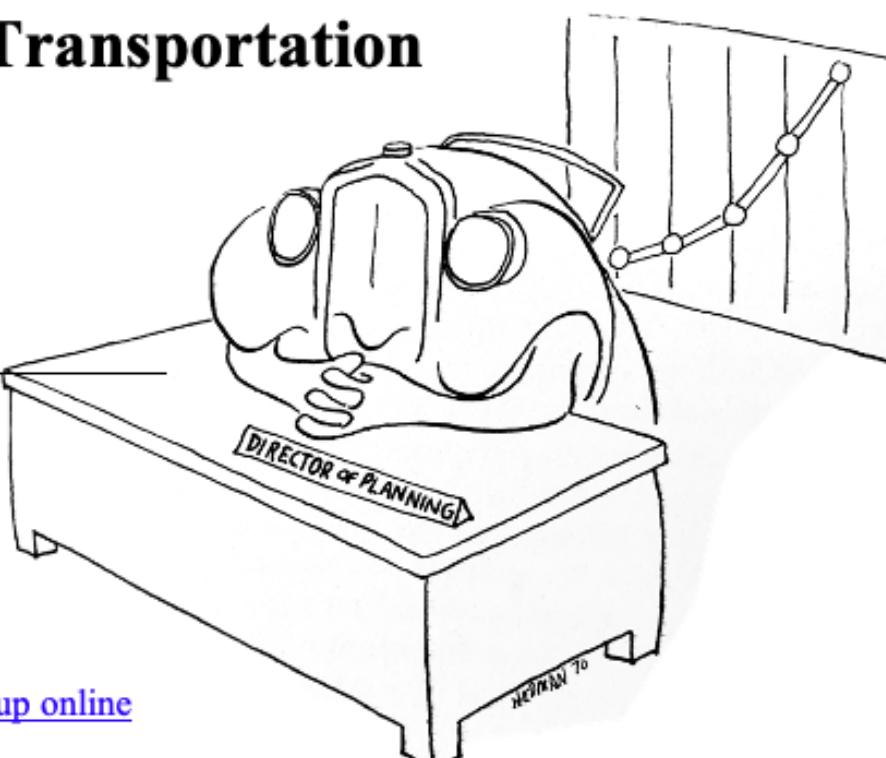
Planning for Sustainable Transportation

CRP 3860/6860

Fall 2025

MW 11:40 – 12:55

Sibley Hall 101



Instructor: Nicholas J. Klein,
Assistant Professor
214 W. Sibley Hall
njk8@cornell.edu

Office Hours: Weds. 2-4pm
In-person or on Zoom [Sign-up online](#)

Grading: 3 credits, graded

Rationale:

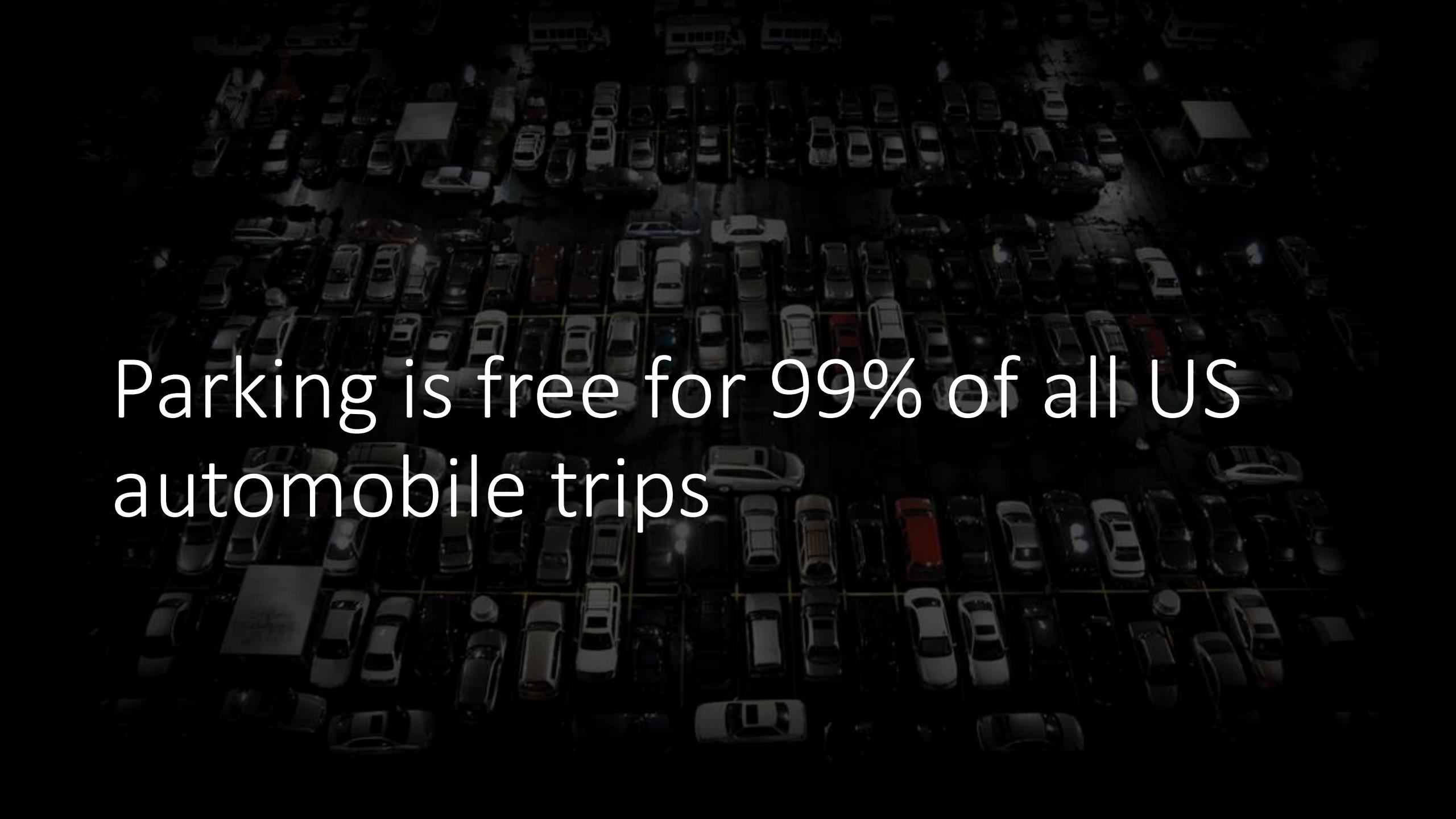
The current transportation systems and travel patterns in the United States are not sustainable. Transportation is now the largest source of greenhouse gas emissions in the United States. Low-income families and minorities face more onerous travel and have fewer transportation options. Infrastructure investment needs are increasing while funding streams to pay for them are drying up.

Course Aims and Outcomes:

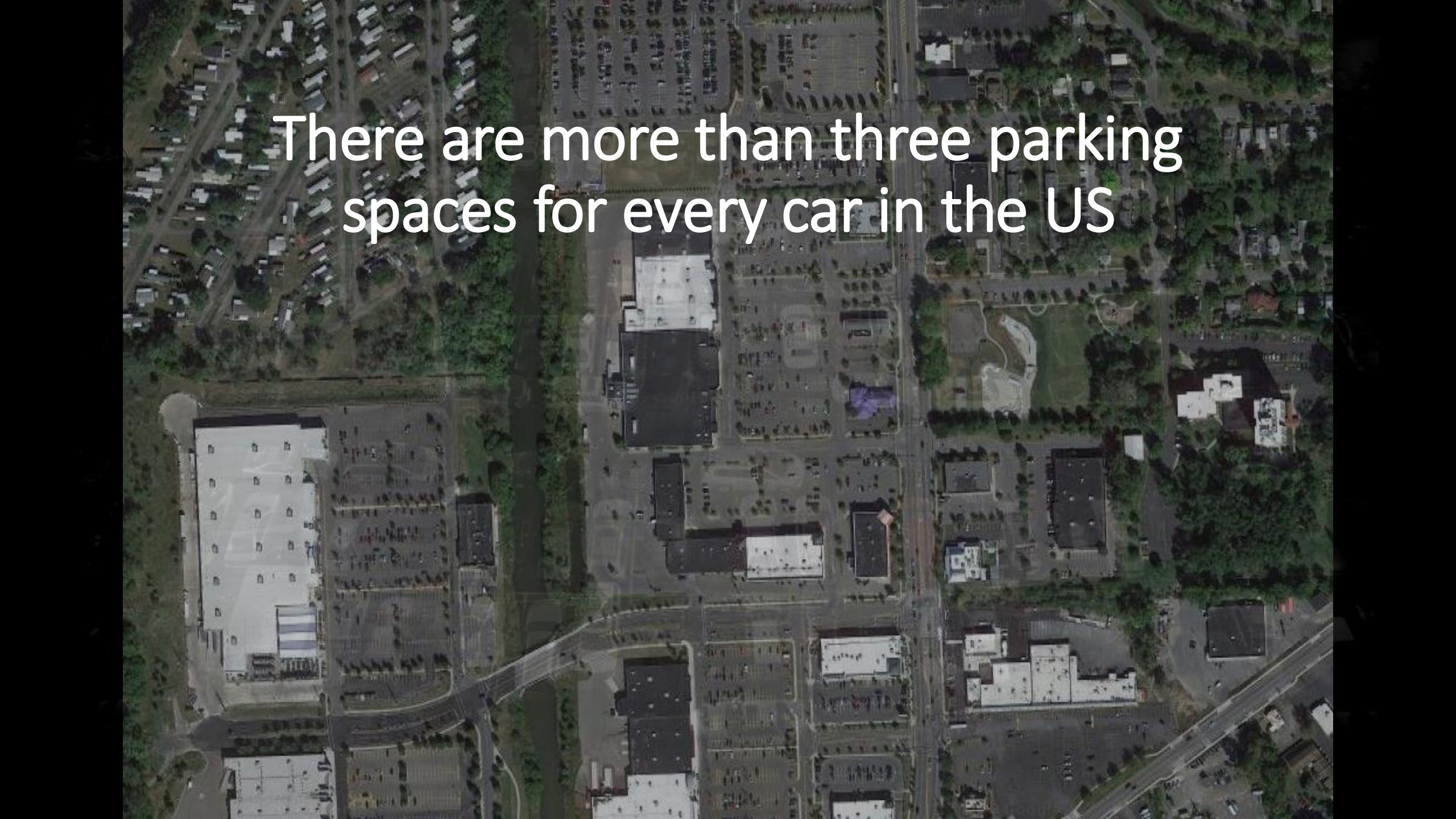
This course is designed to introduce students to the challenges and opportunities for sustainable transportation planning. We will learn about the interconnected relationship between transportation and urban form, the relationship between where we live and how we travel, the history and current state of transportation policies, planning strategies for automobile, transit, biking and walking.

Cars spend 95% of their time parked



The background of the image is a dark, grainy aerial photograph of a parking lot. The parking lot is filled with rows of cars, mostly sedans, parked in a grid-like pattern. The lighting is low, creating deep shadows and highlights that emphasize the density of the vehicles.

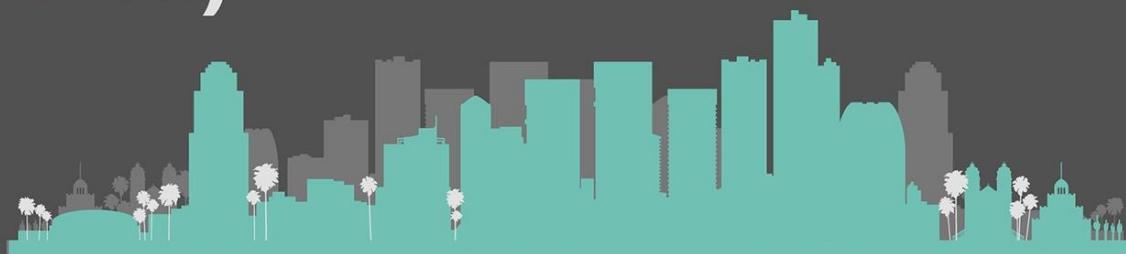
Parking is free for 99% of all US
automobile trips

An aerial photograph of a suburban landscape. It features a dense network of streets, several large parking lots associated with commercial buildings, and clusters of houses. The image captures the urban sprawl and the prevalence of vehicle parking spaces.

There are more than three parking
spaces for every car in the US

Phoenix example

In 2017, Metro Phoenix had:
4.04 million inhabitants,
2.86 million cars, &
1.84 million jobs.



Total parking spaces:

3.67 

million off-street residential spaces

+

3.60 

million off-street non-residential spaces

+

4.93 

million on-street spaces

12.2 million total
parking spaces

Spaces per ___:



6.6

spaces
per job

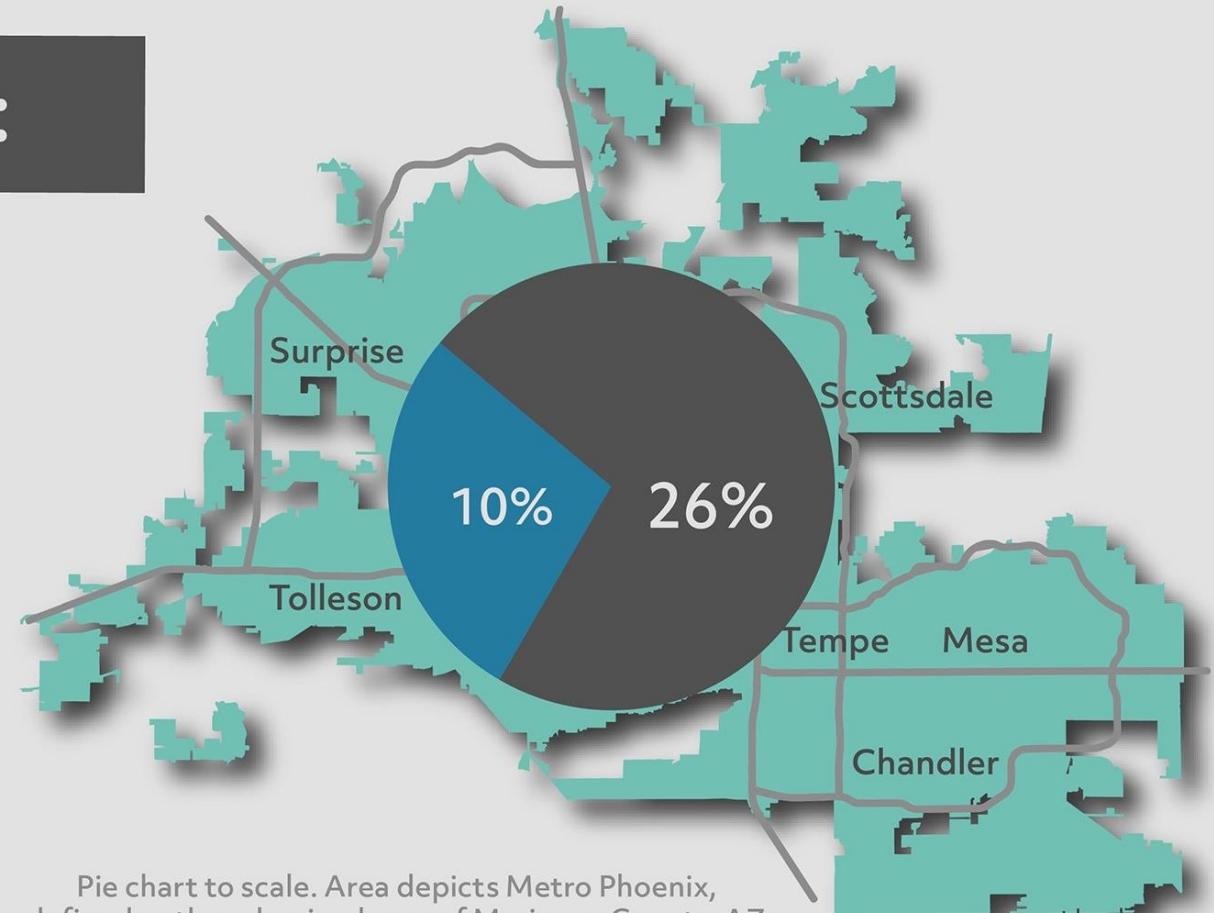


spaces per car

Phoenix example

Total coverage area:

approximately
36%
of urban area a
is covered by
parking & roads





City	New York	Philadelphia	Seattle	Des Moines	Jackson, WY
Total Parking Spaces	1.85M	2.2M	1.6M	1.6M	100,119
Parking density per acre	10.1	25.3	29.7	28.4	53.8
Parking spaces per household	0.6	3.7	5.2	19.4	27



How does parking shape urban centers?



Donate



Buffalo, NY

Parking: 30% of central city

Parking score: 64

Parking reform: implemented

City type: core city

Population: 278,349

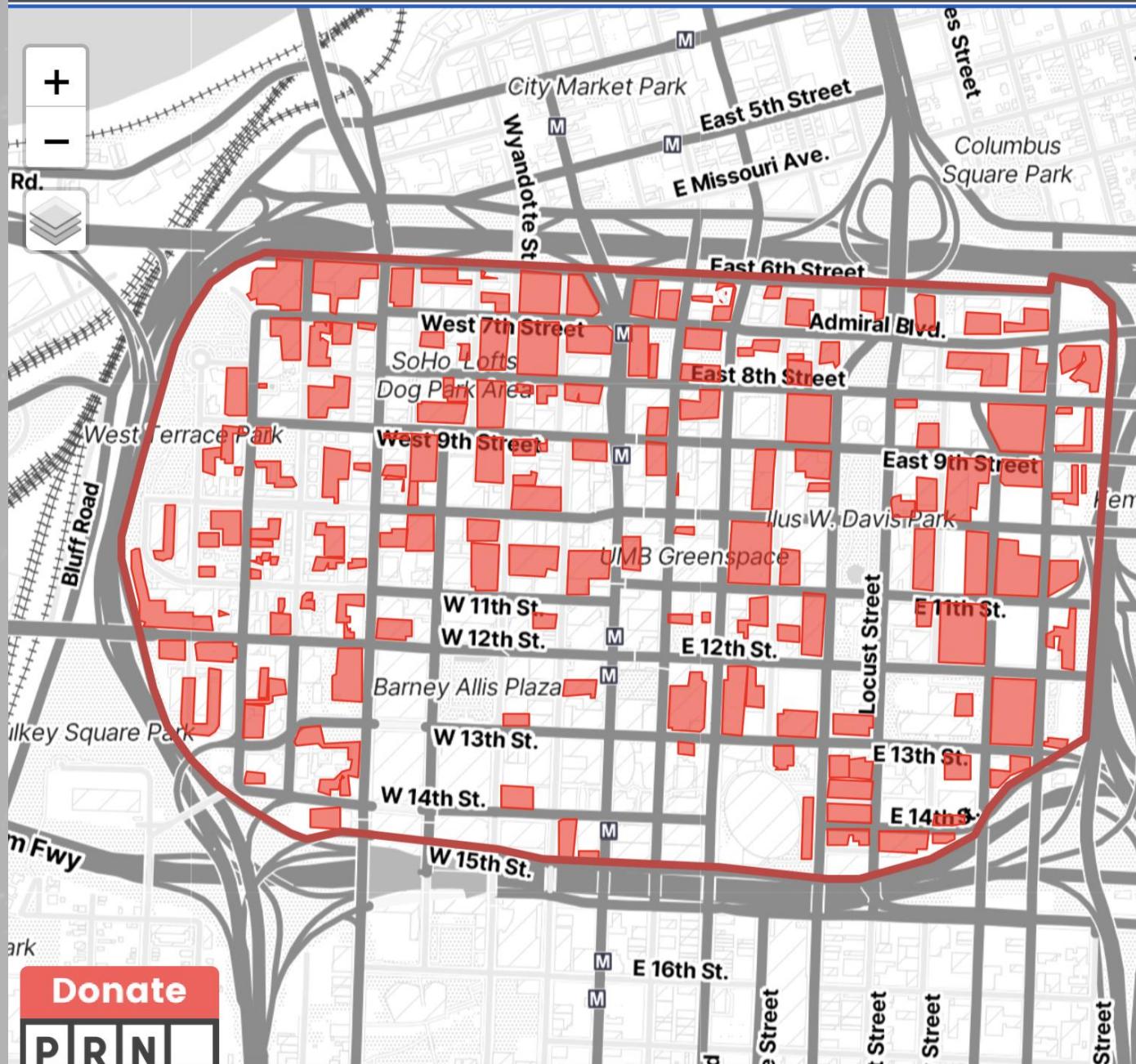
Urbanized area population: 948,864

[View more about reforms](#)

Parking Lot Map

Select a city:

Kansas City, MO



Kansas City, MO

Parking: 29% of central city

Parking score: 64

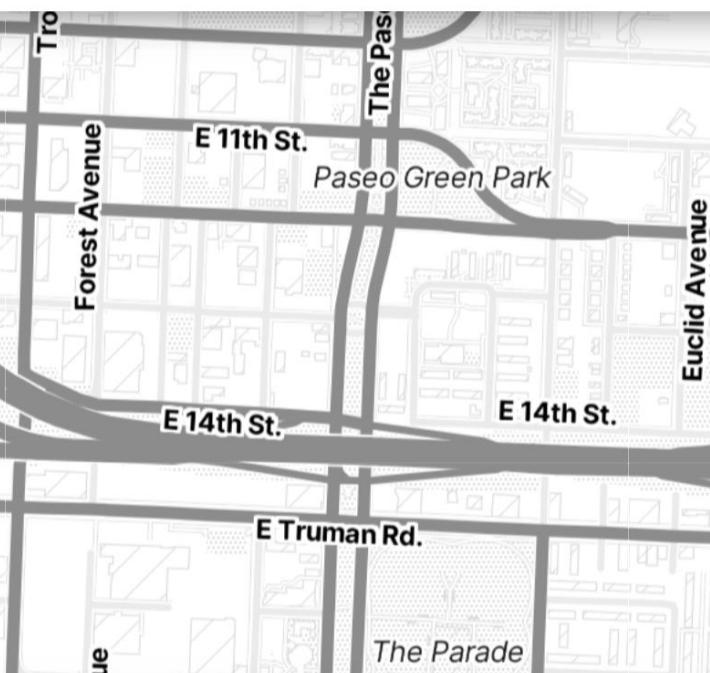
Parking reform: implemented

City type: core city

Population: 507,969

Urbanized area population: 1,674,218

[View more about reforms](#)



Donate

P R I N

Donald Shoup

- The center of parking knowledge
- Wrote about parking since the late 1970s.

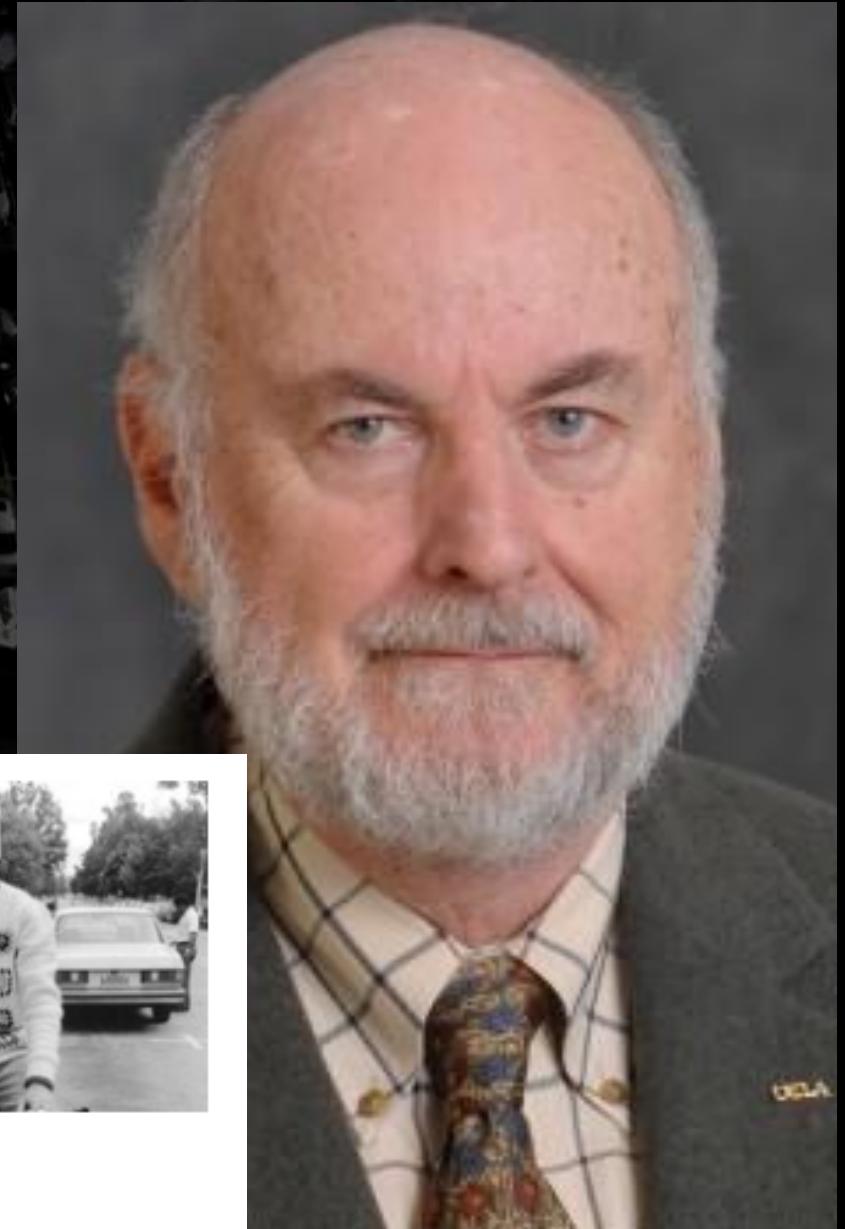
BOOKS

Donald Shoup, 86, Dies; Scholar Saw the Social Costs of Free Parking

He took a dry topic and made it entertaining, capturing the attention of policymakers and influencing the way cities are built.

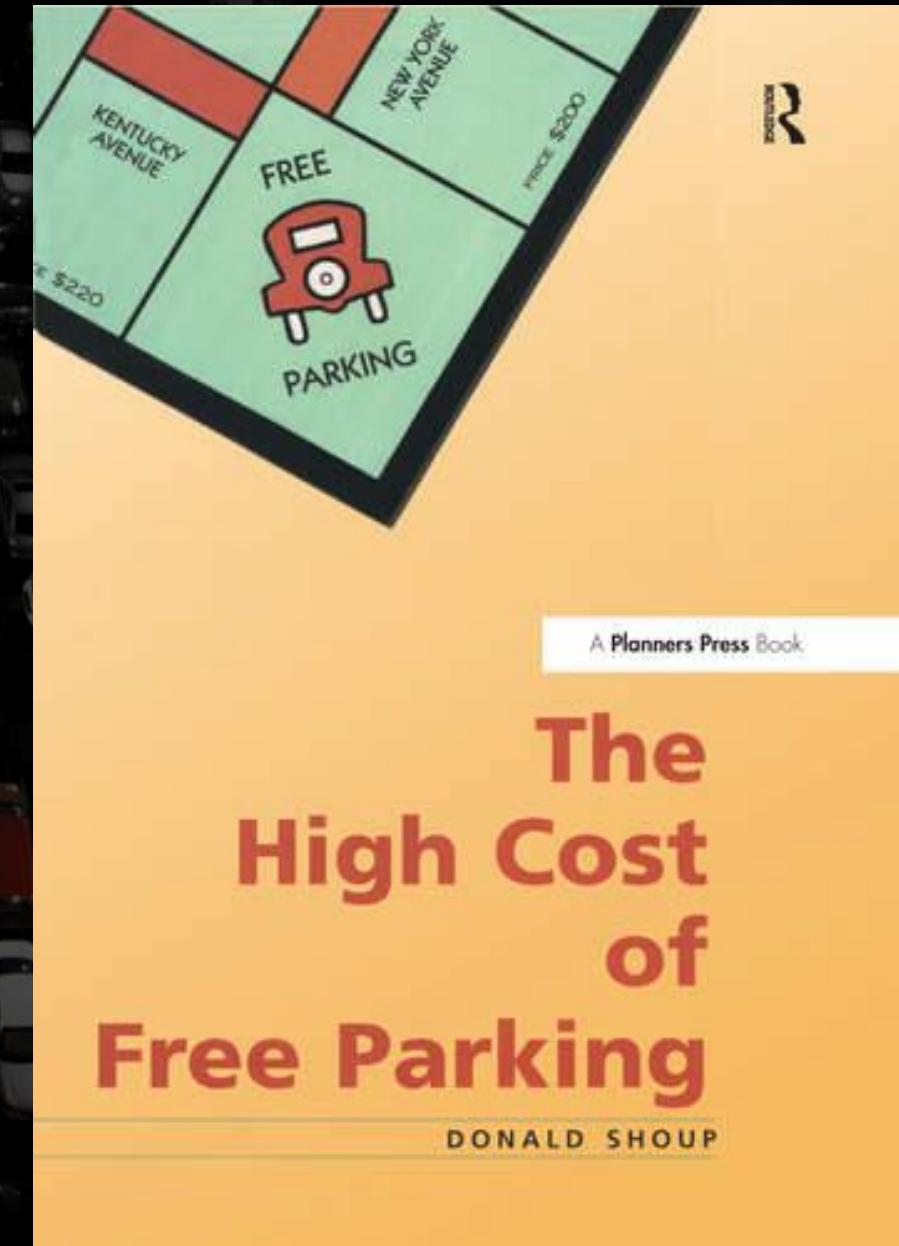
By Michael S. Rosenwald

PRINT EDITION Donald Shoup, 86, Professor Who Realized The Toll of Free
Parking | February 23, 2025, Page A25



Donald Shoup

- He literally wrote the book on parking



PAVED PARADISE

HOW PARKING
EXPLAINS
THE WORLD
HENRY GRABAR



← A more accessible and shorter book
on parking





Parking Myth #1
Parking regulations (minimums)
are based on science

Before cars, horses and carriages were (freely) tethered out front





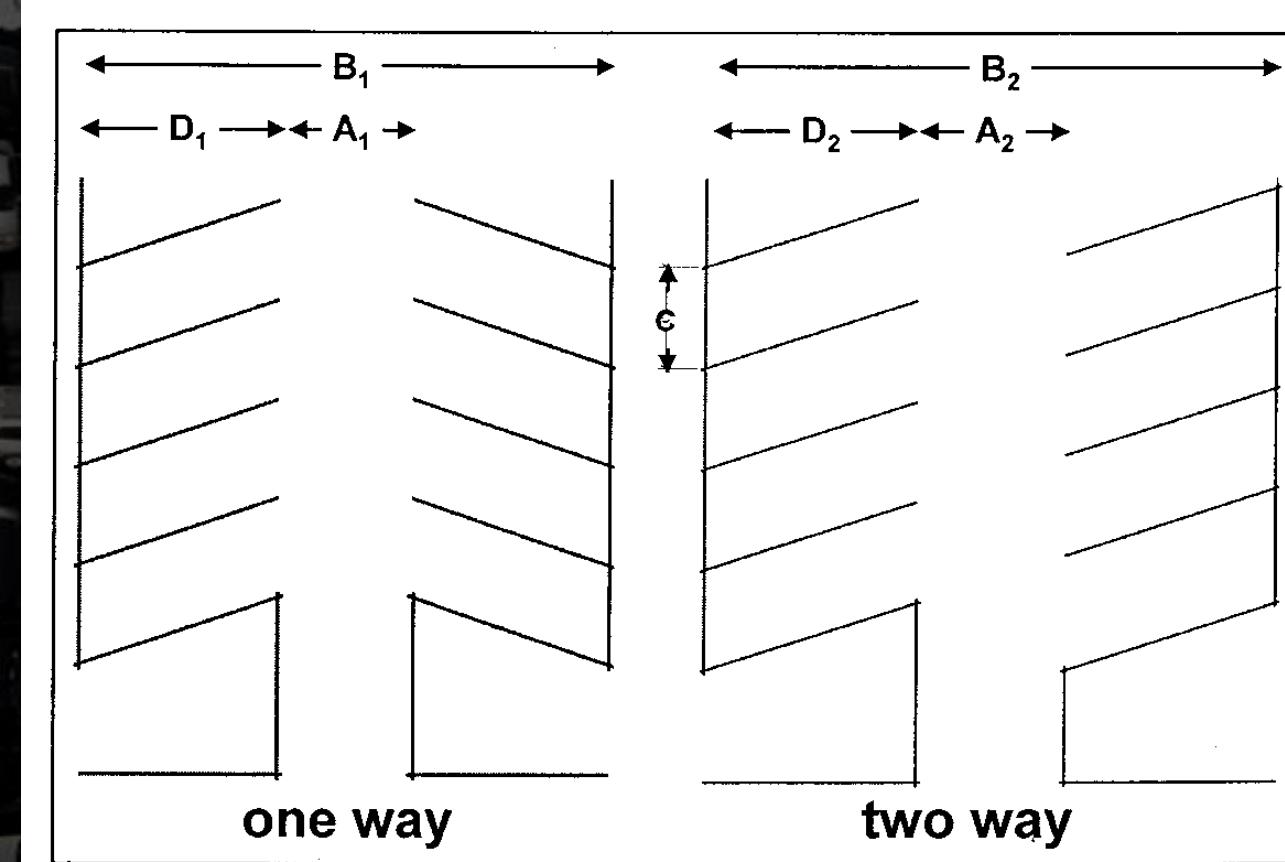
The “parking problem” emerged in the 1920s with the rapid growth in car ownership



- One solution to address this problem was the parking meter
- First installed in Oklahoma City in 1935
- Quickly spread to other cities

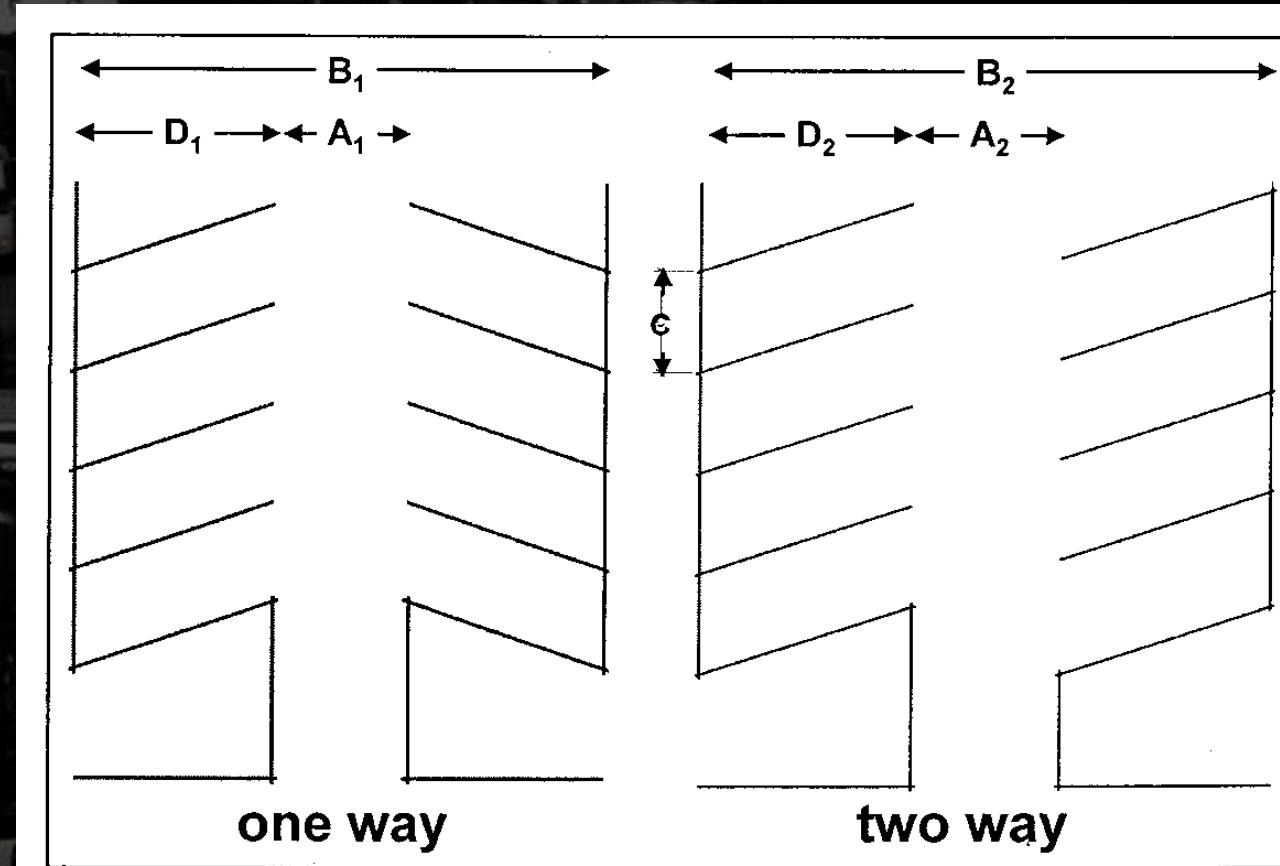


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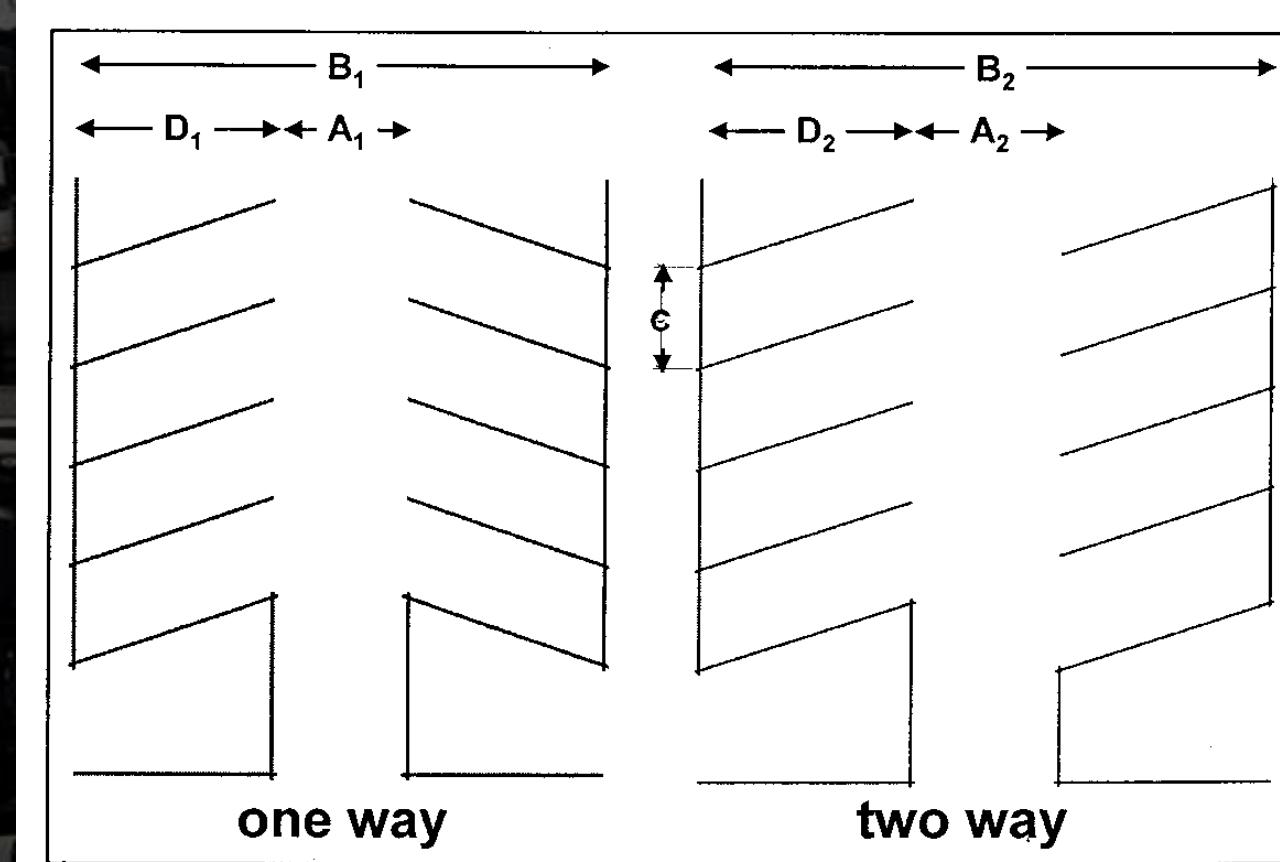
In 1950, ~20% of cities over 10,000 included parking requirements.

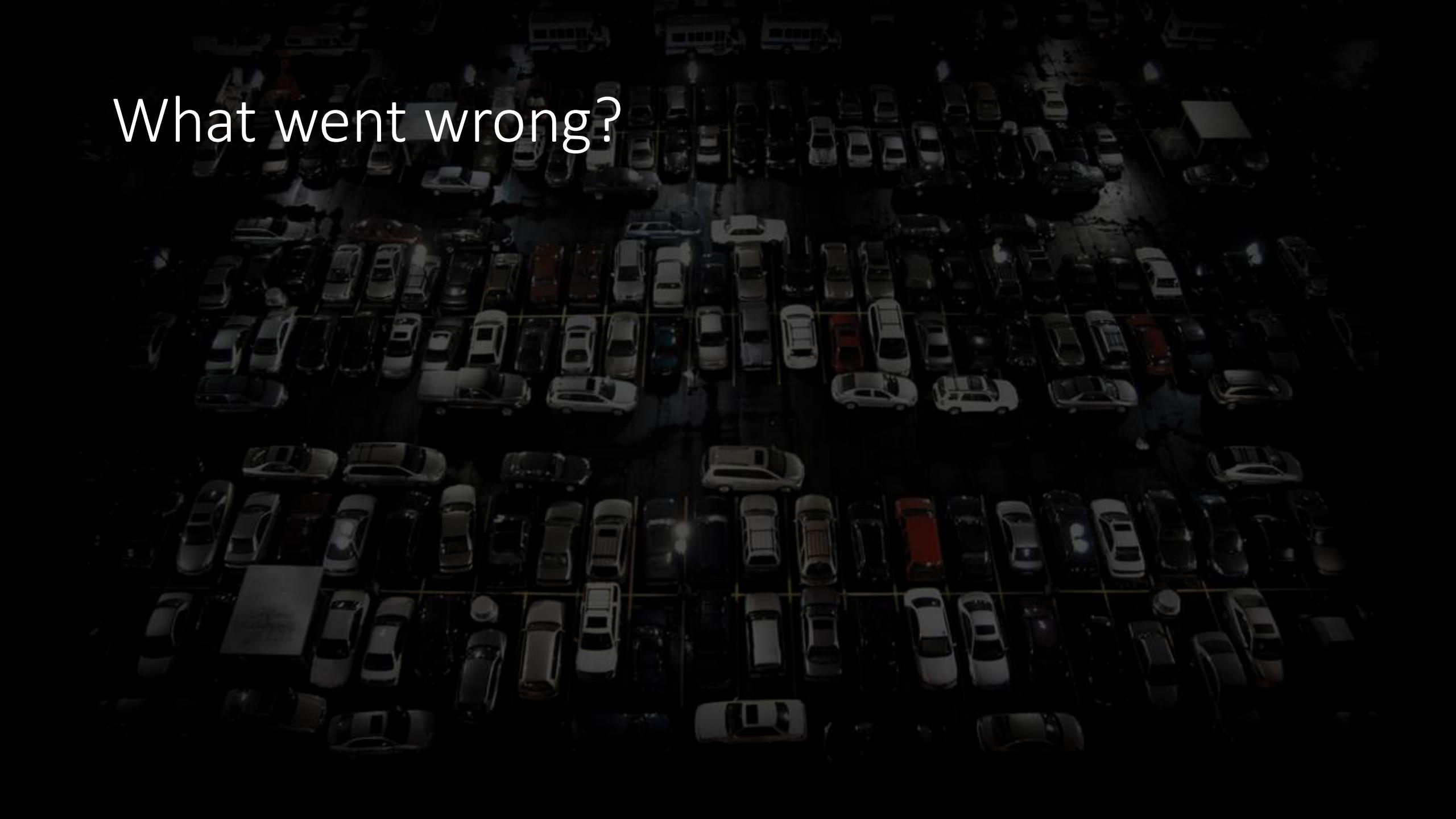


The second idea was to include in the zoning ordinance a provision that new developments include ample off-street parking for their visitors

In 1950, ~20% of cities over 10,000 included parking requirements.

By 1970s, 95% of cities over 25,000 zoned for parking





What went wrong?

	Restricted Business			General Business			Service Business		Central Business
	B-1			B-2 ³			B-4	B-5	CBD
	B-1A	B-1B	B-2A	B-2B	B-2C	B-2D ²			
Minimum Parking Requirement (# spaces)									
Residential									
First three bed or sleeping rooms per dwelling unit	-	-	1 space per dwelling unit				-	-	-
4-5 bed or sleeping rooms per dwelling unit	-	-	2 spaces per dwelling unit				-	-	-
Each additional bed or sleeping room	-	-	+ 1 space per room	1 space per 3 persons housed in building			-	-	-
Home occupation	-	-	1				-	-	-
Multiple family dwelling	-	-	1 space per dwelling unit				-	-	-
Dormitory	-	-	1 space per 4 persons housed				-	-	-
Nonresidential									
Neighborhood commercial facility	-	-	1 space per 500 gross sf of floor area				1 space per 500 gross sf of floor area	-	-
Bed and breakfast home or inn	-	-	1 space per bedroom				1 space per bedroom	-	-
Hospital, nursing home, or similar use	-	-	1 space per 5 beds				1 space per 5 beds	-	-
Funeral home	-	-	1 space per 10 seats				1 space per 10 seats	-	-
Business or professional office	-	-	1 space per 250 sf of office floor	See §325-20 ¹			1 space per 250 sf of office floor	-	-
Retail store	-	-	1 space per 500 gross sf of floor area				1 space per 500 gross sf of floor area	-	-
Auditorium, theater	-	-	1 space per 5 seats				1 space per 5 seats	-	-
Bar, tavern, restaurant	-	-	1 space per 50 sf net floor area in assembly place				1 space per 50 sf net floor area in assembly place	-	-
Hotel, motel	-	-	1 space per guest room				1 space per guest room	-	-
Other Uses	-	-	See §325-20				See §325-20	-	-

**TABLE 1. SELECT PARKING REQUIREMENTS FOR
“ENTERTAINMENT AND RECREATION” USES IN SAN JOSE, CALIFORNIA**

Use	Vehicle Parking Required
Arcade, amusement game	1 per 200 sq. ft. of floor area
Batting cages	1 per station, plus 1 per employee
Bowling establishment	7 per lane
Driving range	1 per tee, plus 1 per employee
Golf course	8 per golf hole, plus 1 per employee
Health club, gymnasium	1 per 80 sq. ft. recreational space
Miniature golf	1.25 per tee, plus 1 per employee
Performing arts rehearsal space	1 per 250 sq. ft. of floor area
Poolroom/billiards establishment	1 per 200 sq. ft. of floor area
Private club or lodge	1 per 4 fixed seats on the premises, or 1 per 6 linear feet of seating, plus 1 per 200 square feet of area without seating but designed for meeting or assembly by guests, plus 1 per 500 sq. ft. of outdoor area developed for recreational purposes
Recreation, commercial (indoor)	1 per 80 sq. ft. of recreational area
Recreation, commercial (outdoor)	20 per acre of site
Skating rink	1 per 50 sq. ft. of floor area
Swim and tennis club	1 per 500 sq. ft. of recreation area



Where do these come from?

Many, *though not all*, cities rely on the
Inst. of Transportation Engineers *Parking
Generation* handbook.

4th Edition

Parking Generation



Institute of Transportation Engineers



Where do these come from?

Many, *though not all*, cities rely on the Inst. of Transportation Engineers *Parking Generation* handbook.

This guide describes parking generation rates for numerous different land-uses.

4th Edition

Parking Generation



Institute of Transportation Engineers

Deeply flawed

The observations are all done at peak demand time in a “suburban developments with little or no significant transit ridership” – the ITE wants places where all parking and all visitors can be counted easily.

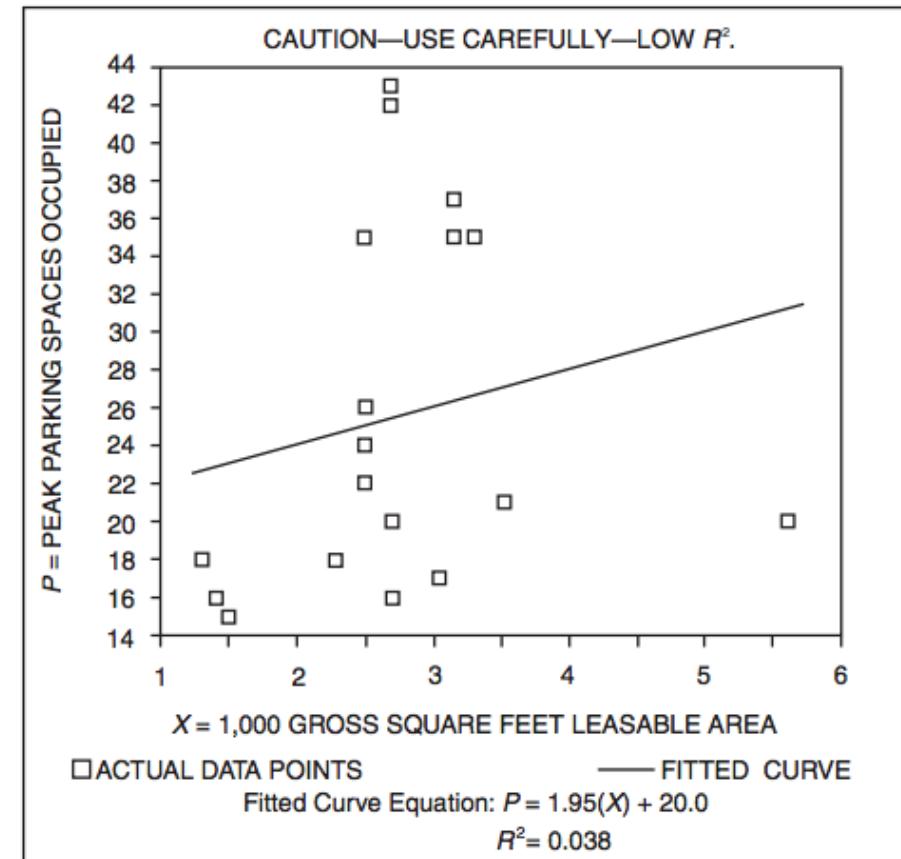
**FIGURE 2 Fast Food Restaurant with Drive-In Window
(Land Use 836)**

Peak Parking Spaces Occupied vs:
1,000 Gross Square Feet Leasable Area
On a: weekday

PARKING GENERATION RATES

Average Rate	Range of Rates	Standard Deviation	Number of Studies	Average 1,000 GSF Leasable Area
9.95	3.55–15.92	3.41	18	3

DATA PLOT AND EQUATION



Fast food example

And planners often set standards
higher than ITE precisely suggests

FIGURE 2 Fast Food Restaurant with Drive-In Window

(Land Use 836)

Peak Parking Spaces Occupied vs:

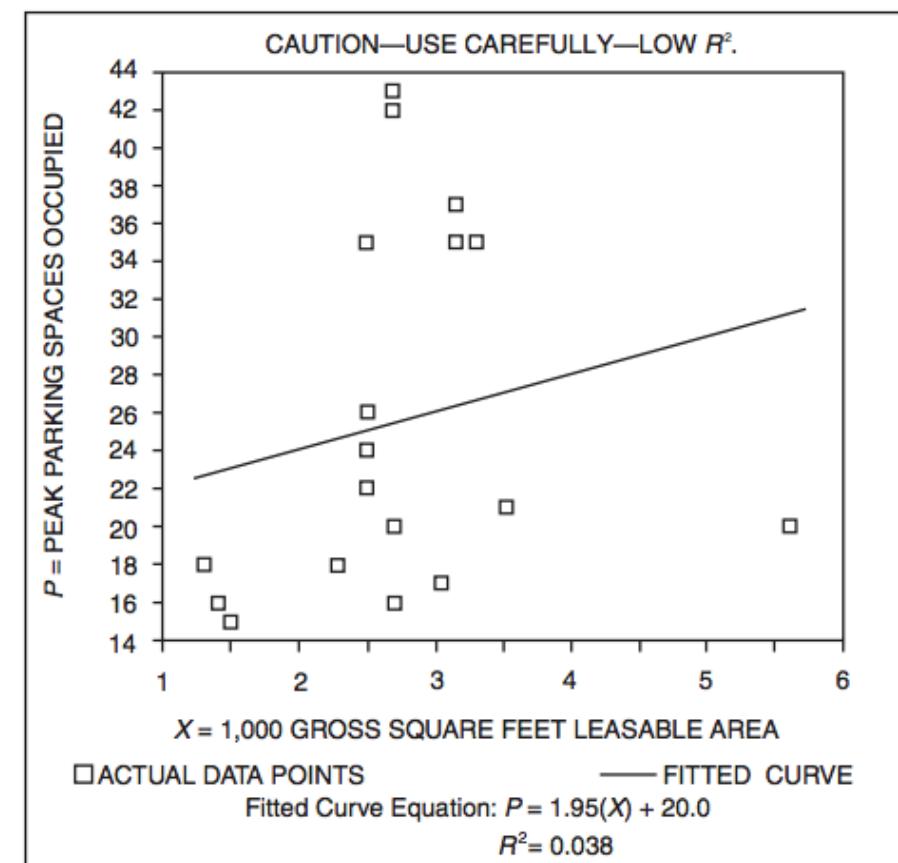
1,000 Gross Square Feet Leasable Area

On a: weekday

PARKING GENERATION RATES

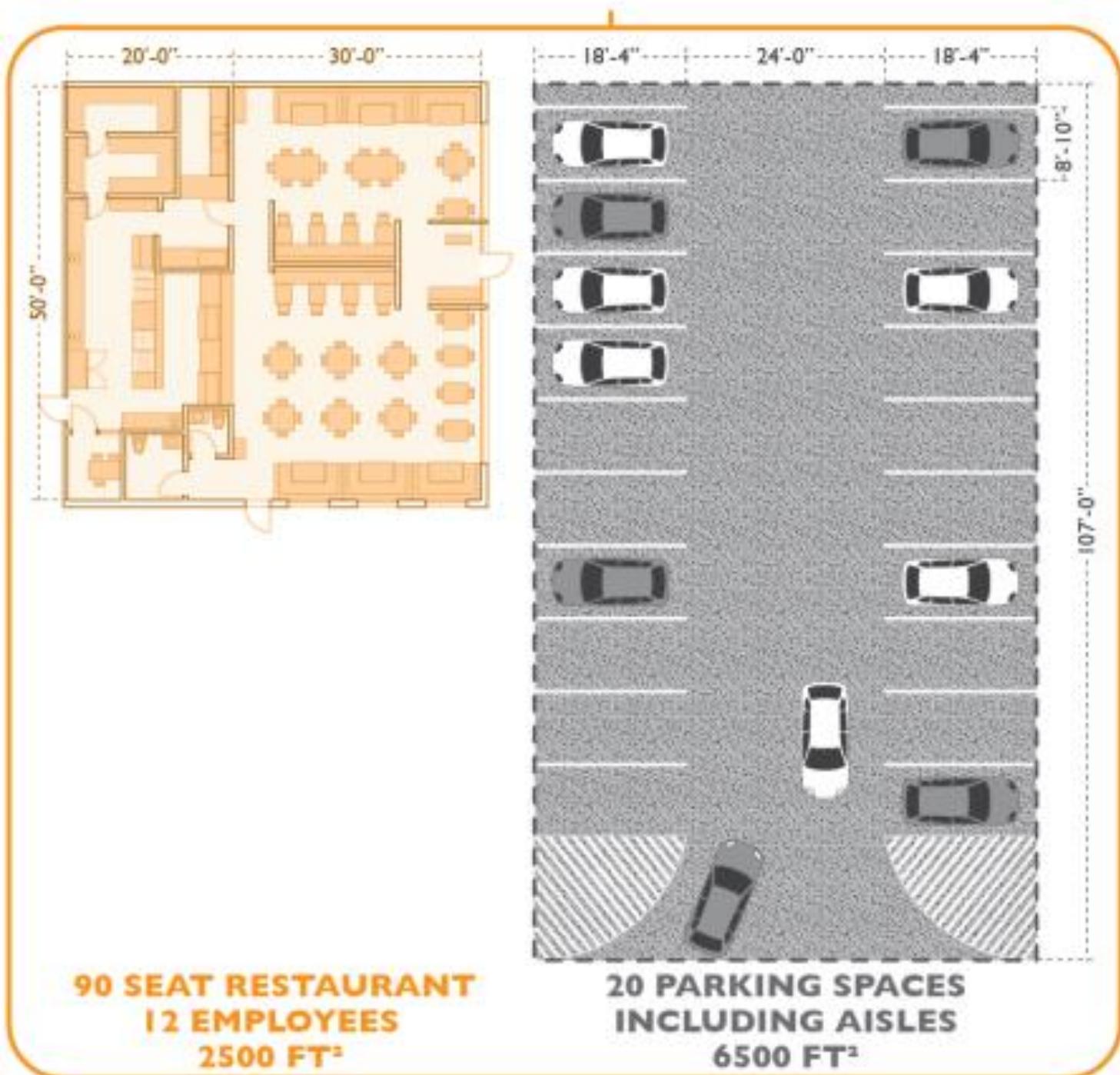
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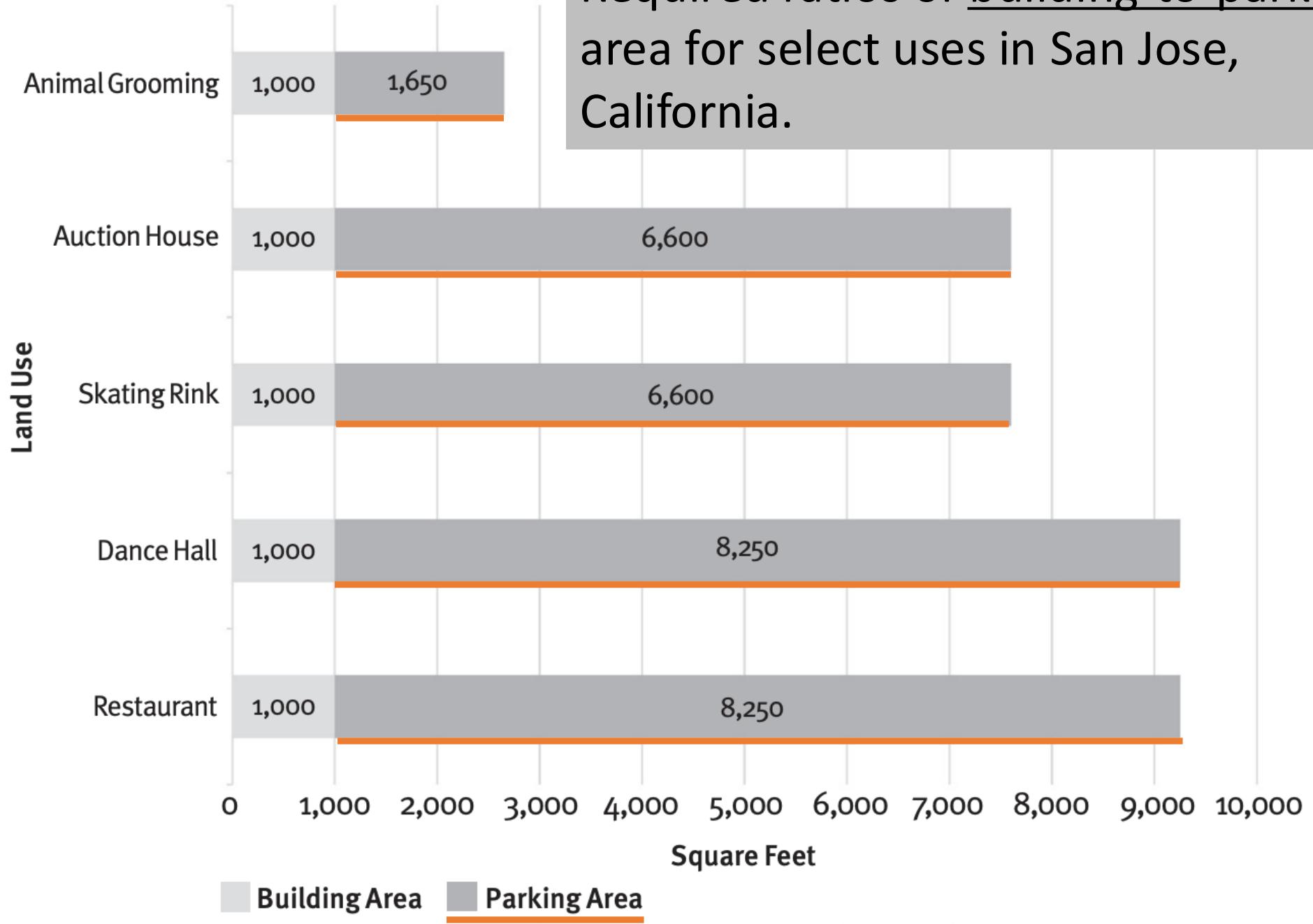
DATA PLOT AND EQUATION





The result is a built environment that is spread out – often with more space devoted to parking than buildings.

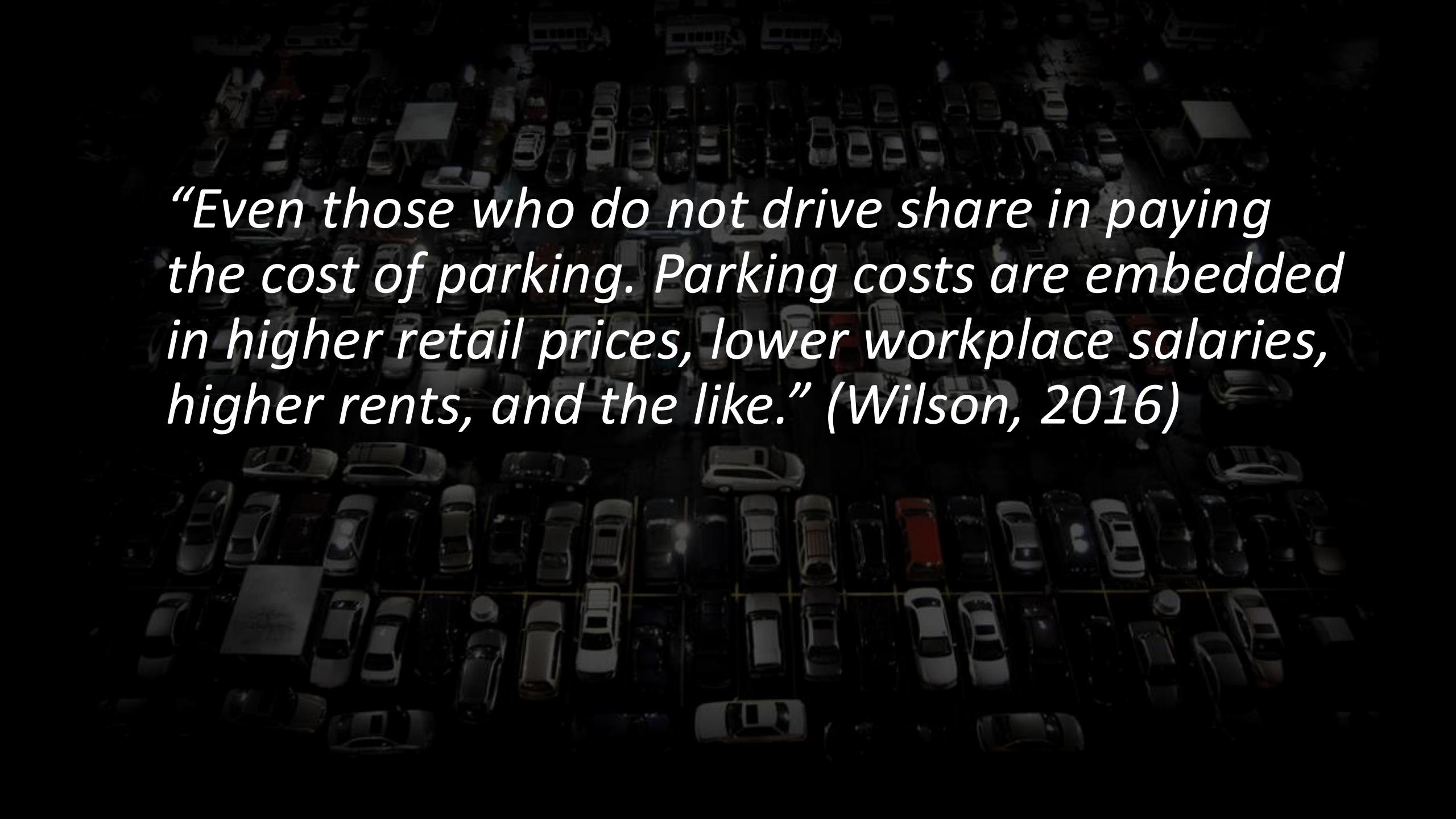




Required ratios of building-to-parking area for select uses in San Jose, California.



Parking Myth #2
Free parking is free



“Even those who do not drive share in paying the cost of parking. Parking costs are embedded in higher retail prices, lower workplace salaries, higher rents, and the like.” (Wilson, 2016)

Parking is expensive even when it is free

- The costs of parking are passed on to everyone. In the case of apartments, renters pay more for the parking they may or may not use.

Parking is expensive even when it is free

- The costs of parking are passed on to everyone. In the case of apartments, renters pay more for the parking they may or may not use.
- On average, a parking garage increases the rent by ~17%
 - ~\$1,700 per year (\$142 per month)

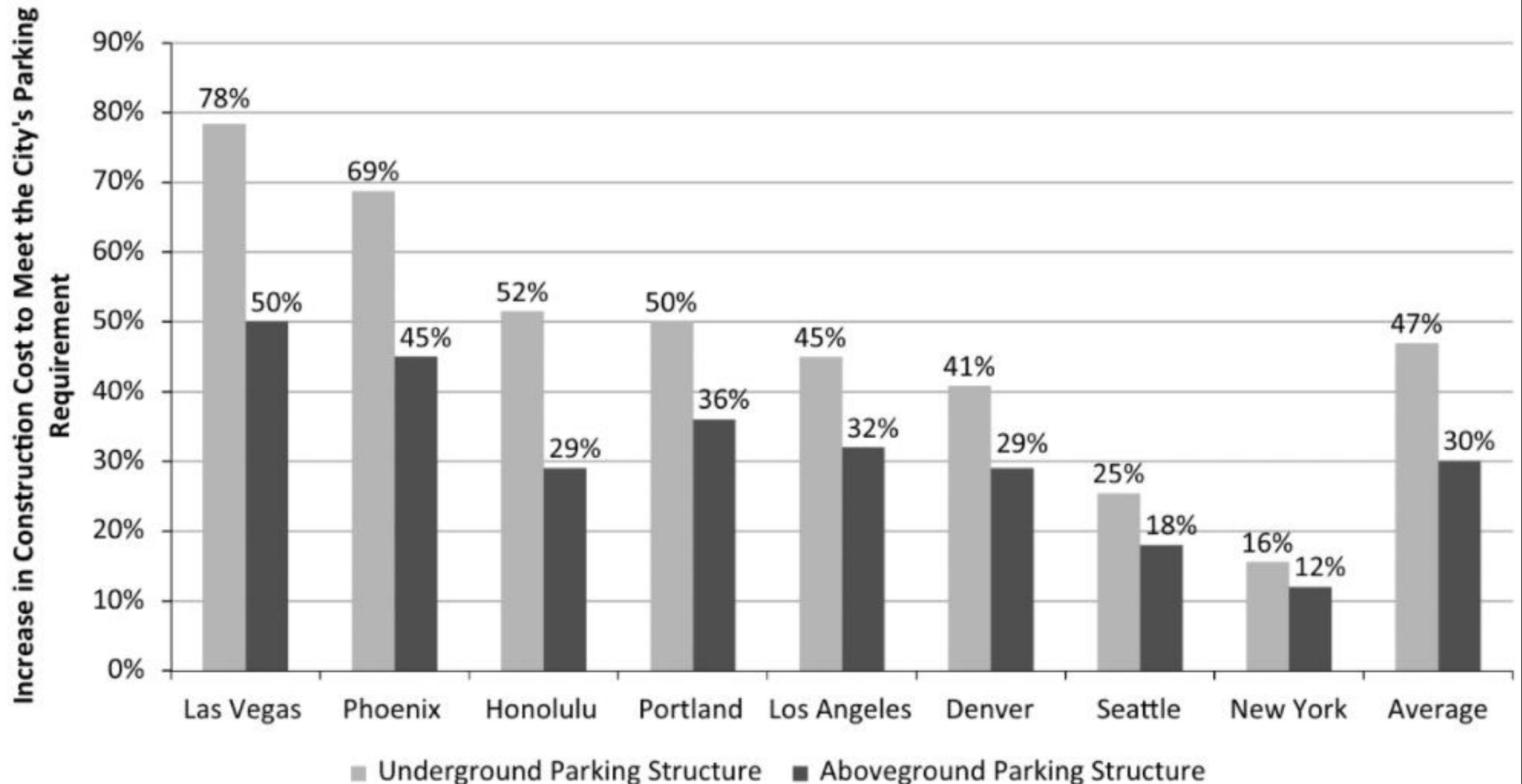


Figure 3-1 How parking requirements increase the cost of constructing office buildings

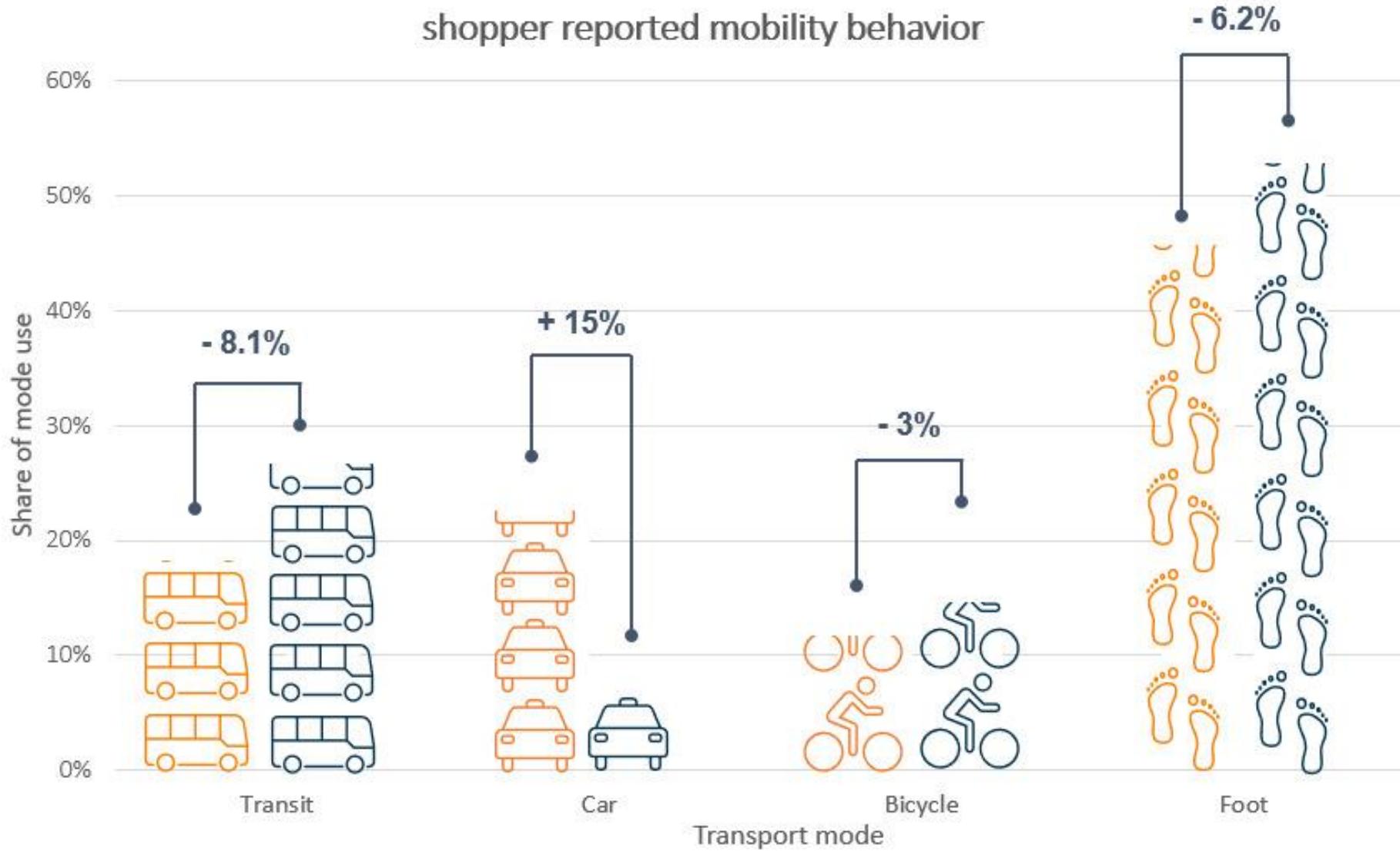


Parking Myth #3
Everyone drives
(and needs parking)

Business owners overestimate how many people drive

- Many business owners worry that reducing parking will hurt their business
- Studies from around the world find that business owners always overestimate the share of customers arriving by car.
- Reducing parking to improve bike, walk, transit access does *not* hurt businesses.

Trader perception of mobility behavior vs. shopper reported mobility behavior



Trader perception of
shopper mode



Shopper reported mode



POLICY RECOMMENDATIONS

Eliminate parking minimums

- Get rid of parking minimums.
- Does not mean no one will build parking – but that they will only do so if they think it's worth it.

Eliminate parking minimums

- Get rid of parking minimums.
- Does not mean no one will build parking – but that they will only do so if they think it's worth it.
- Examples all over the country

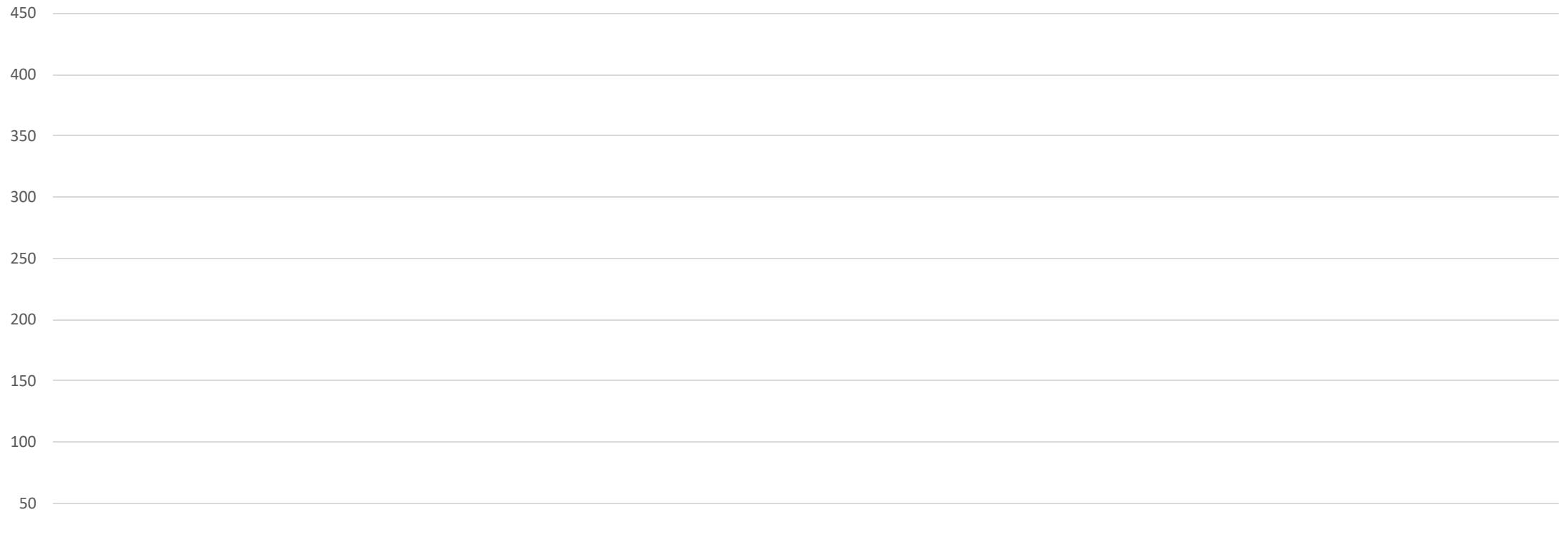


Ithaca examples

- Collegetown and Downtown Ithaca have done away with parking *minimums* in 2014



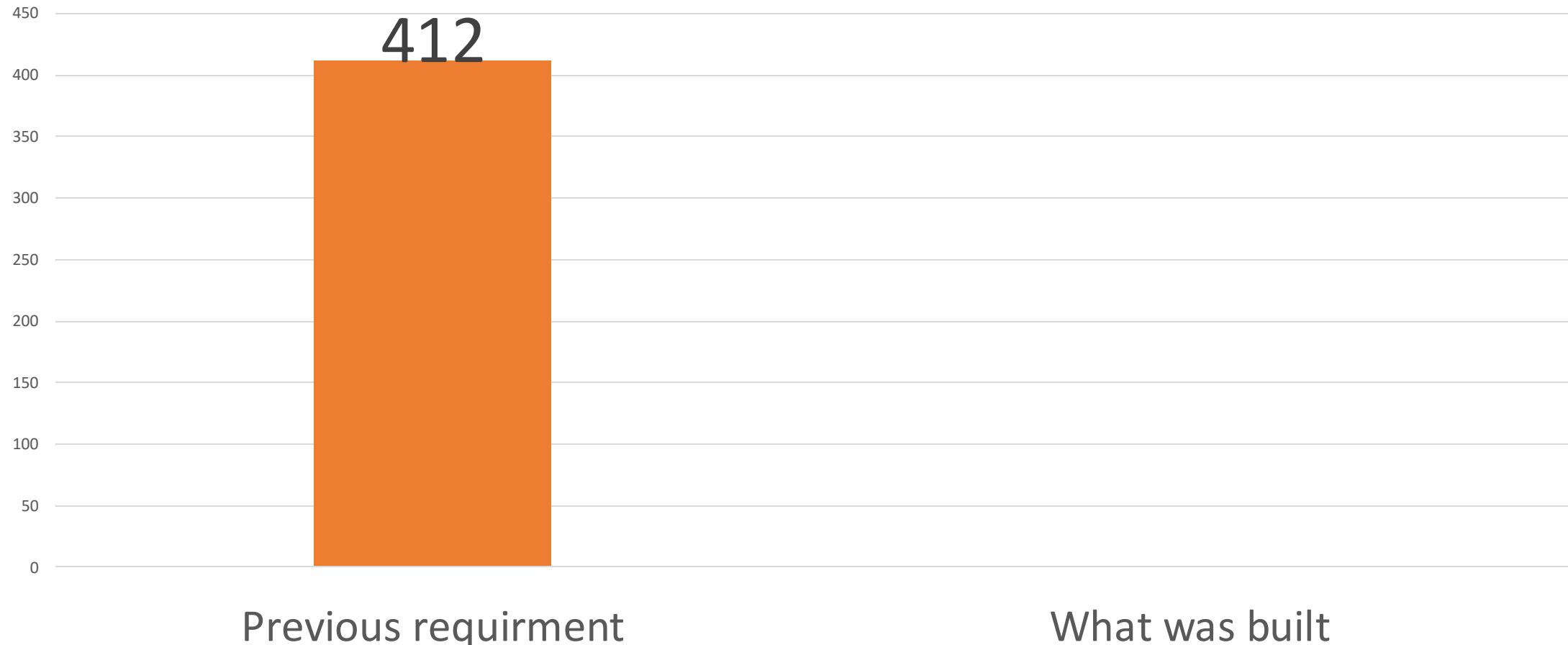
Collegetown example



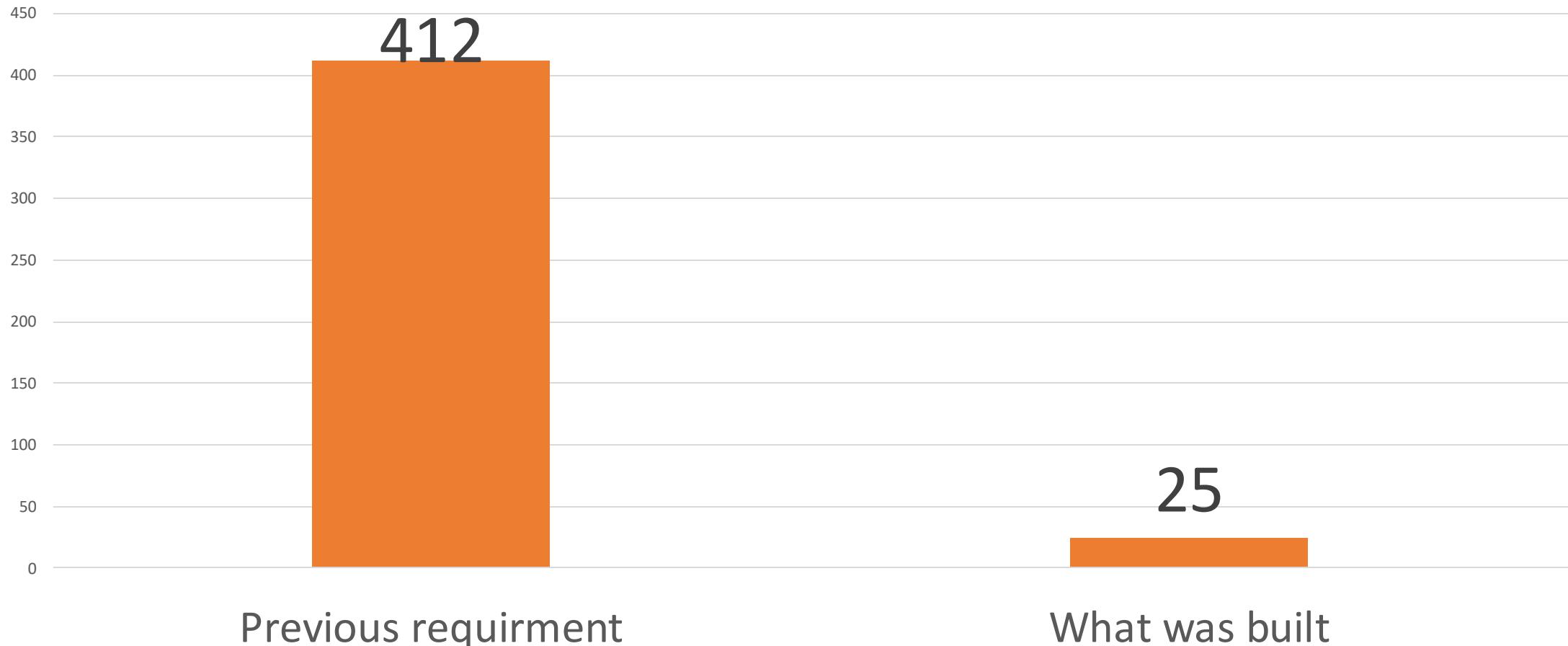
Previous requirement

What was built

Parking that would have been required under the pre-2014 zoning reg.



Parking spaces built 2014-2020



2. Price the curb



2. Price the curb

The right prices will leave one or two open spaces on each block, so there will be no parking shortages. Prices will balance the demand and supply for on-street space.

Revenue can then be used to improve city service.

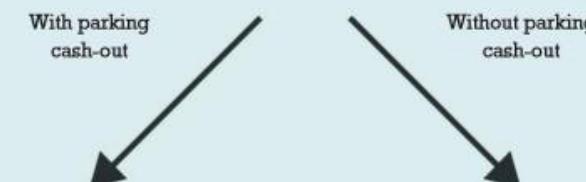


3. Parking cash outs

- Require employers who provide free or subsidized parking to offer \$\$\$ to employees who opt out of parking.



Jamie gets free parking from their employer at their downtown DC office. Jamie is looking into other transit options for their commute. Will parking cash-out help?



Jamie can get \$200/month instead of a free parking spot.



After weighing the cost, Jamie will likely continue to drive to work because parking is free.



Jamie can use that money to commute however they want — transit, biking, walking, or parking when they need their car.

In sum

- Parking minimums are based on bad science
 - Creates unpleasant sprawled out landscapes
 - Discourages non-driving
- Parking makes everything more expensive
- Retailers overestimate driving & parking
- We can fix this
 - Eliminate parking minimums
 - Charge for parking
 - Encourage people to use other modes