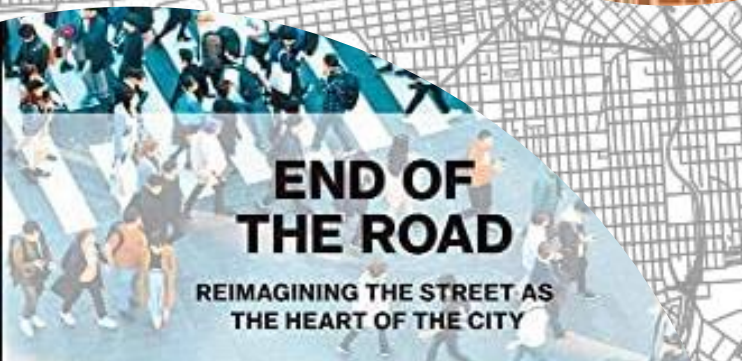
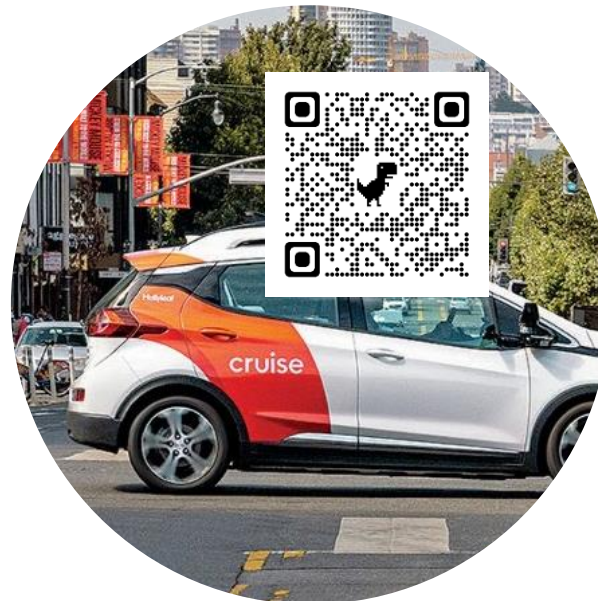


DISRUPTIVE TRANSPORT

DRIVERLESS CARS, TRANSPORT INNOVATION AND THE SUSTAINABLE CITY OF TOMORROW



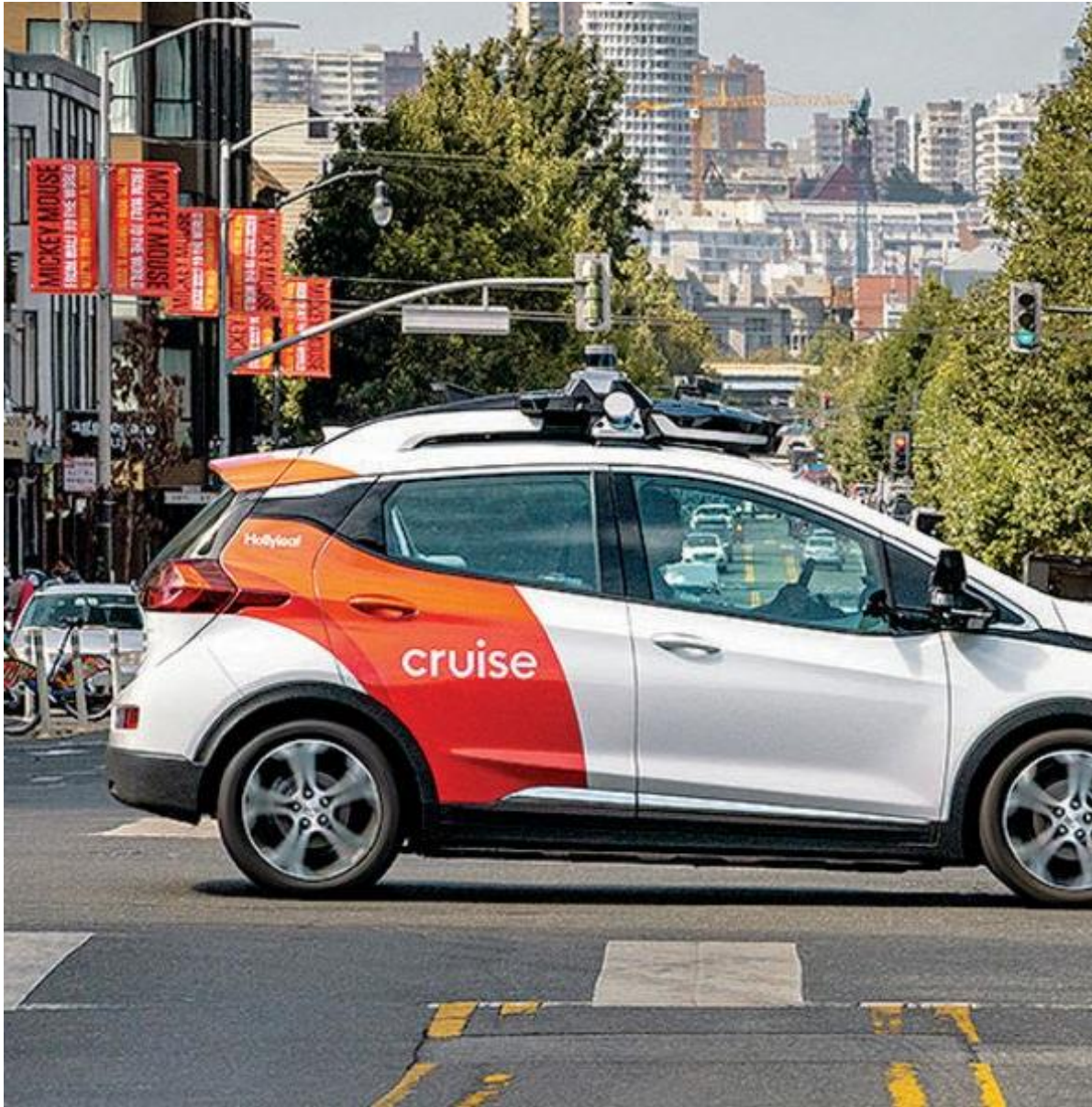
INTN.CITY SF



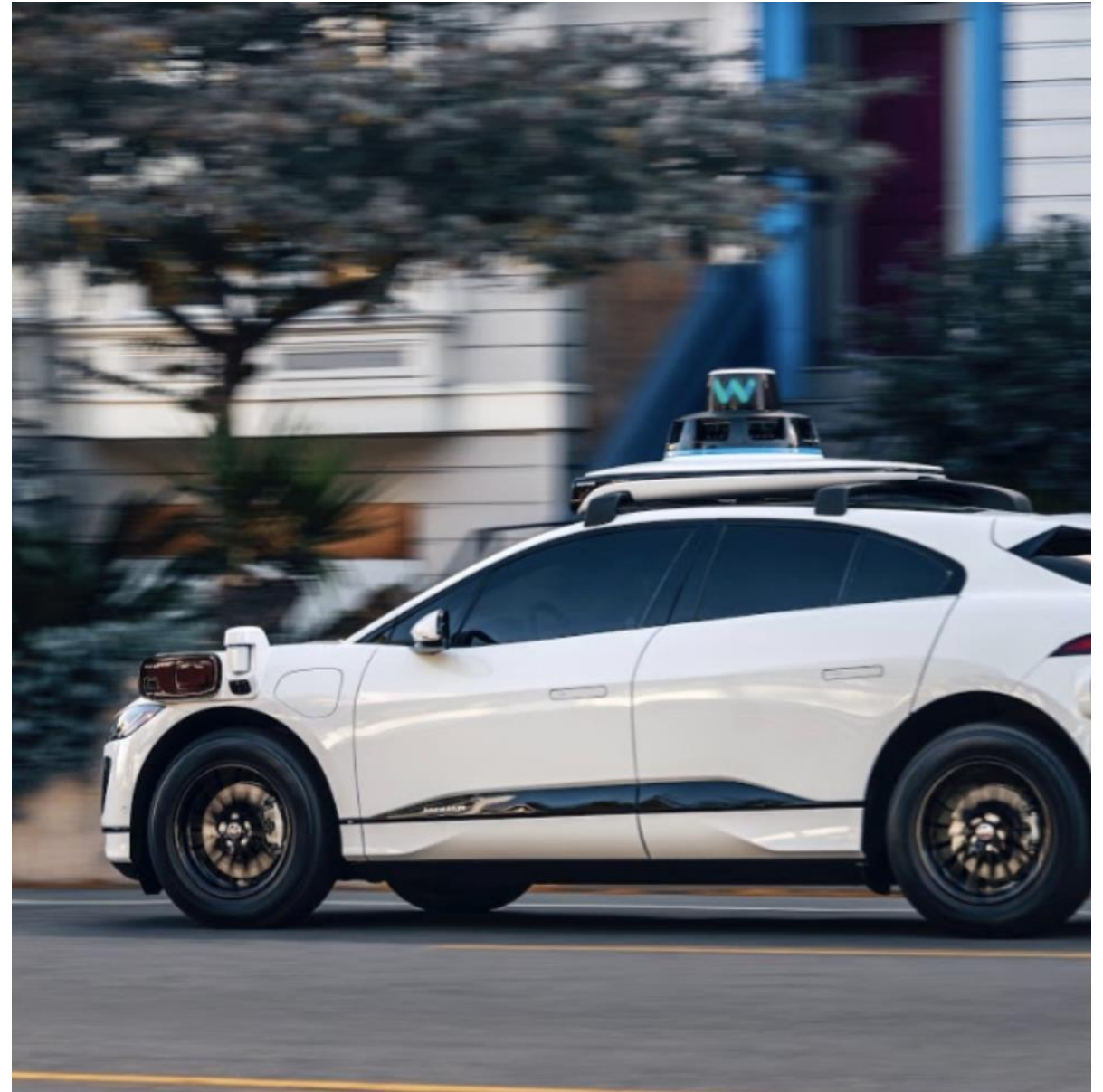
William (Billy) Riggs

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2023



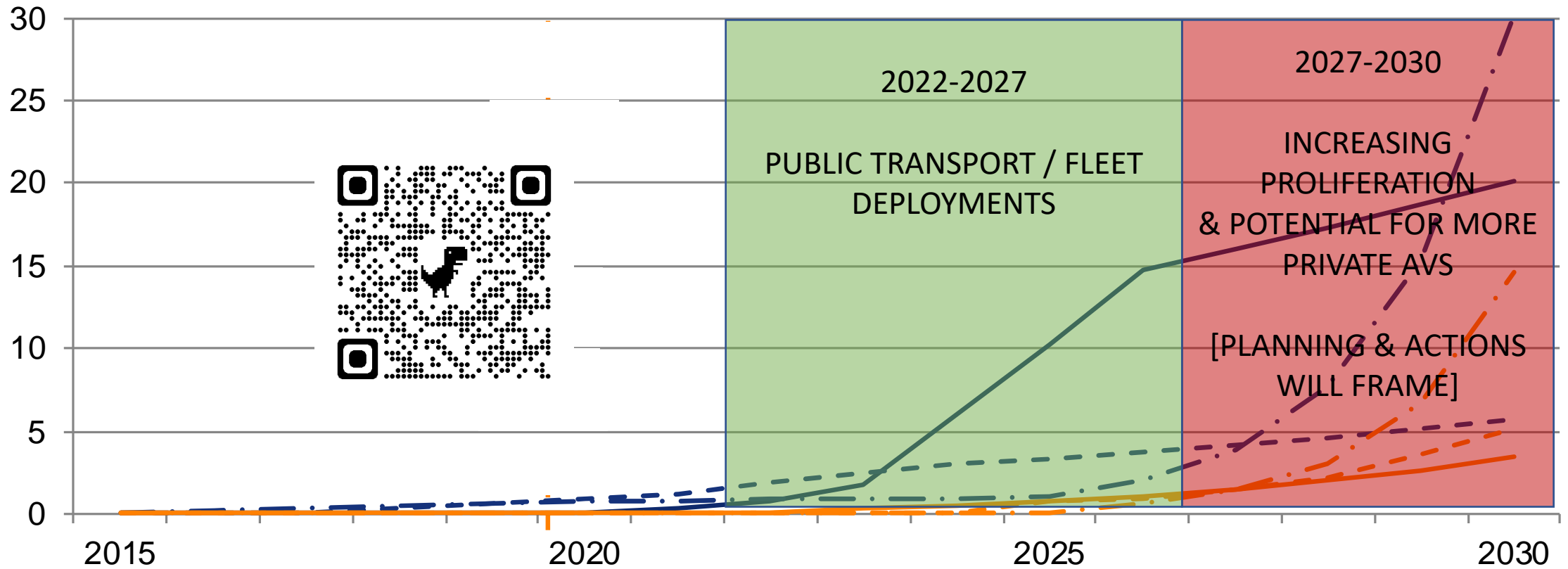
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2

Projections for autonomous vehicle¹ new sales share as published by different analysts

Percent

— U.S. — Global



¹ autonomous (SAE L4-5)



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The background image shows the interior of a vehicle, likely a taxi or ride-sharing car. Two passengers are seated in the back. The passenger on the left is a woman with dark curly hair, wearing a grey jacket and a light blue surgical mask, looking down at a smartphone. The passenger on the right is a woman with long dark hair, wearing a maroon jacket and a light blue surgical mask, looking towards the camera. The car's interior is modern, with grey seats and a digital display hanging from the ceiling. The windows show a city street with buildings.

Network Efficiency and Reduction of Wasted Travel (VKT)

Incentive to Reduce Wasted Travel (aka “Deadheading” or “Ghost Miles”) and Maximize People Kilometers Traveled. Keep vehicles in circulation with with maximal occupancy to increase economic viability and decrease economic / environmental costs associated with wasted / inefficient Vehicle Kilometers Traveled.

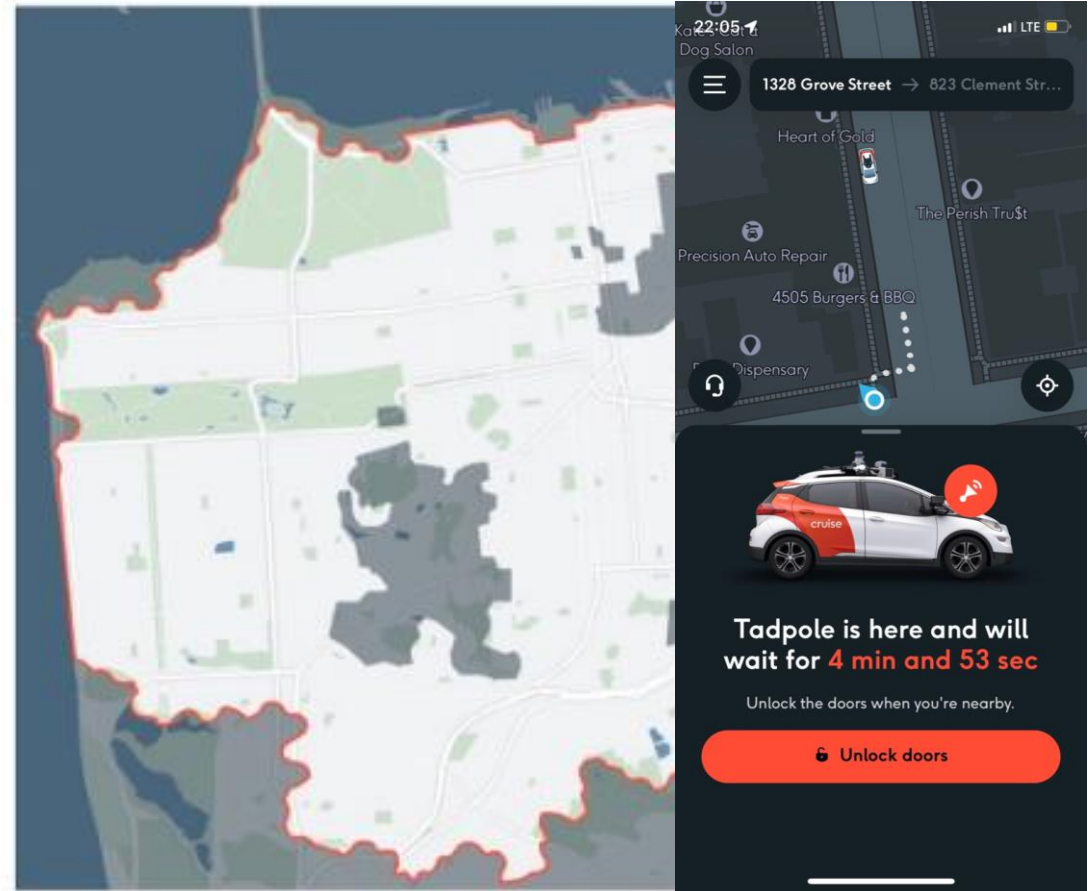
Evaluating Street Grid Networks for Surplus Travel

- Simulate total daily vehicle trips for each model ($n = 1,133,333$) using Dijkstra's shortest-path algorithm
- Two OD matrices of San Francisco street network (no freeways) using OpenStreetMap and OSMnx: "survey-derived" between homes and workplaces (CHTS); random "survey-derived to cover more of the city"
 - Real World Directionality (G1) real real-world "status-quo" one-way directionality
 - Bidirectional Two-Way Network (G2)
- Tests for weighting of trip length; Shortest path between the origin and destinations and free-flow travel w/out queuing model.
- **Over 20M annual surplus VKT on non-optimized network both real world and random trips (2 extra blocks traversed every trip)**



An Uber Without a Driver

- No Driver in ODD
- Fully Autonomous / No V2X Requirements
- No fixed route within ODD
- On-demand, app-based
- Door-to-door “last mile” service
- User-responsive and personalizable

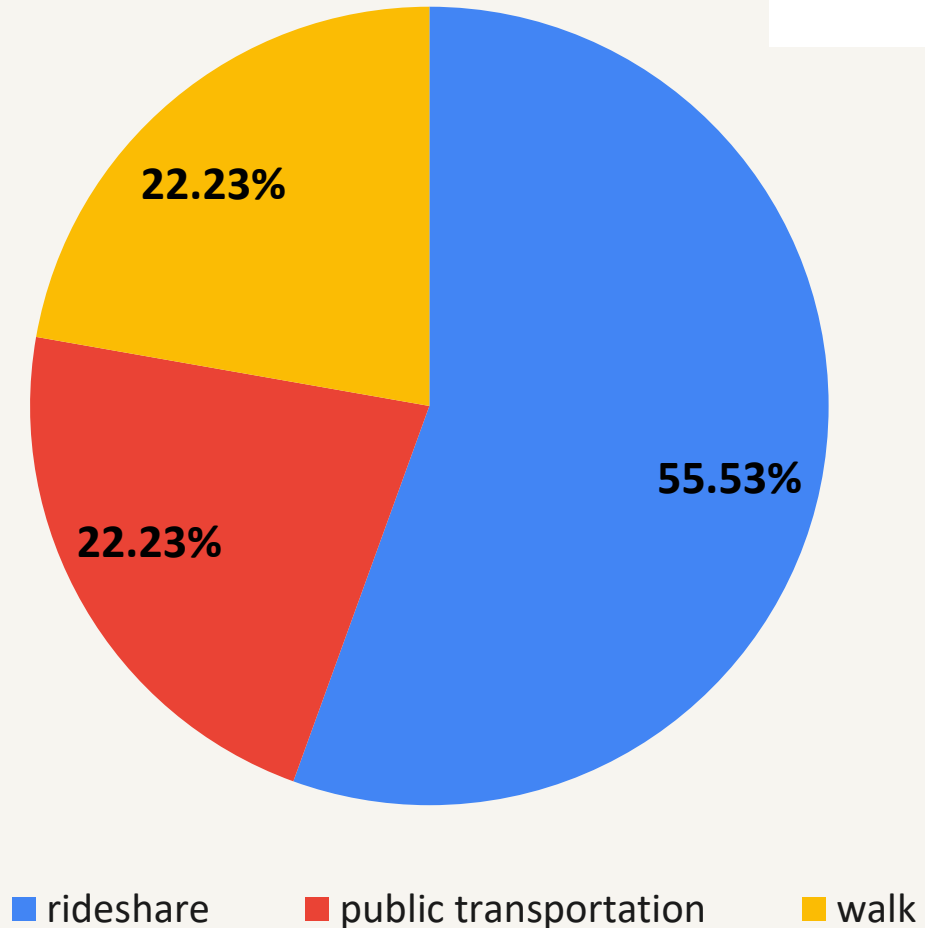


Alternative Travel for AV Riders

56% of riders would have used rideshare. Others would have walked or taken transit.

76% of riders would have made the trip via other means even if an AV were not available; existing trips not induced.

Alternative Travel Mode
(If AV was not available)



The Trip Characteristics of a Pilot
Autonomous Ve...

papers.ssrn.com



The Trip Characteristics of a Pilot
Autonomous Ve...

papers.ssrn.com

“People use my street as a racetrack and AVs have slowed down traffic.”

10

Ongoing evaluation suggests AVs meter (slow down) non-AV traffic leading to slower (and potentially safer) travel.

Importance of Incident Response & Communication

- Incident response (police / fire / ambulance) require that first first responders are trained and abide by that training.
- Need for anticipatory data to update on-board maps: Construction, Emergency Management, Etc.



We'll be back after some routine maintenance

Something happened on your trip

Blueberry is pulling over to a safe stop

- 📞 Cruise Support is calling you to help
- 🚗 Stay buckled up and wait in the car
- 👁️ If you need to, exit on the sidewalk side (check for bikes and cars)



Operational Corner Cases

future tense

Self-Driving Taxis Are Causing All Kinds of Trouble in San Francisco

They've blocked traffic, driven on the sidewalk, sped away from cops —and the city is powerless to stop them.

BY DAVID ZIPPER

DEC 08, 2022 • 11:45 AM



MANY OPERATIONAL CHALLENGES CAN RELATE TO DEFINITIONS IN ODD (STREET GRID, WEATHER, ETC.) AND CURB / PARKING POLICIES

LEGALITY OF COMMERCIAL VEHICLES TO BLOCK TRAFFIC FOR SAFE DROP OFF (CURB CUT IS ILLEGAL!)

*"...journeys were mostly smooth, though one car summoned stopped **alongside a construction site**, forcing to walk through traffic to get into the car.*

ROUTING CHALLENGES BASED ON ODD

*"...driverless taxi went... **blocks farther than necessary**, roughly half a mile, apparently to avoid the most crowded roads...."*

An aerial, isometric view of a city street scene. The street is paved with asphalt and has yellow double lines. A brown-paved area on the right side of the street is labeled "DROP OFF LANE" in white text. Buildings with brick and stone facades line the street. A white diagonal line runs across the scene from the top right to the bottom left. A white-bordered box is overlaid on the left side of the image, containing text.

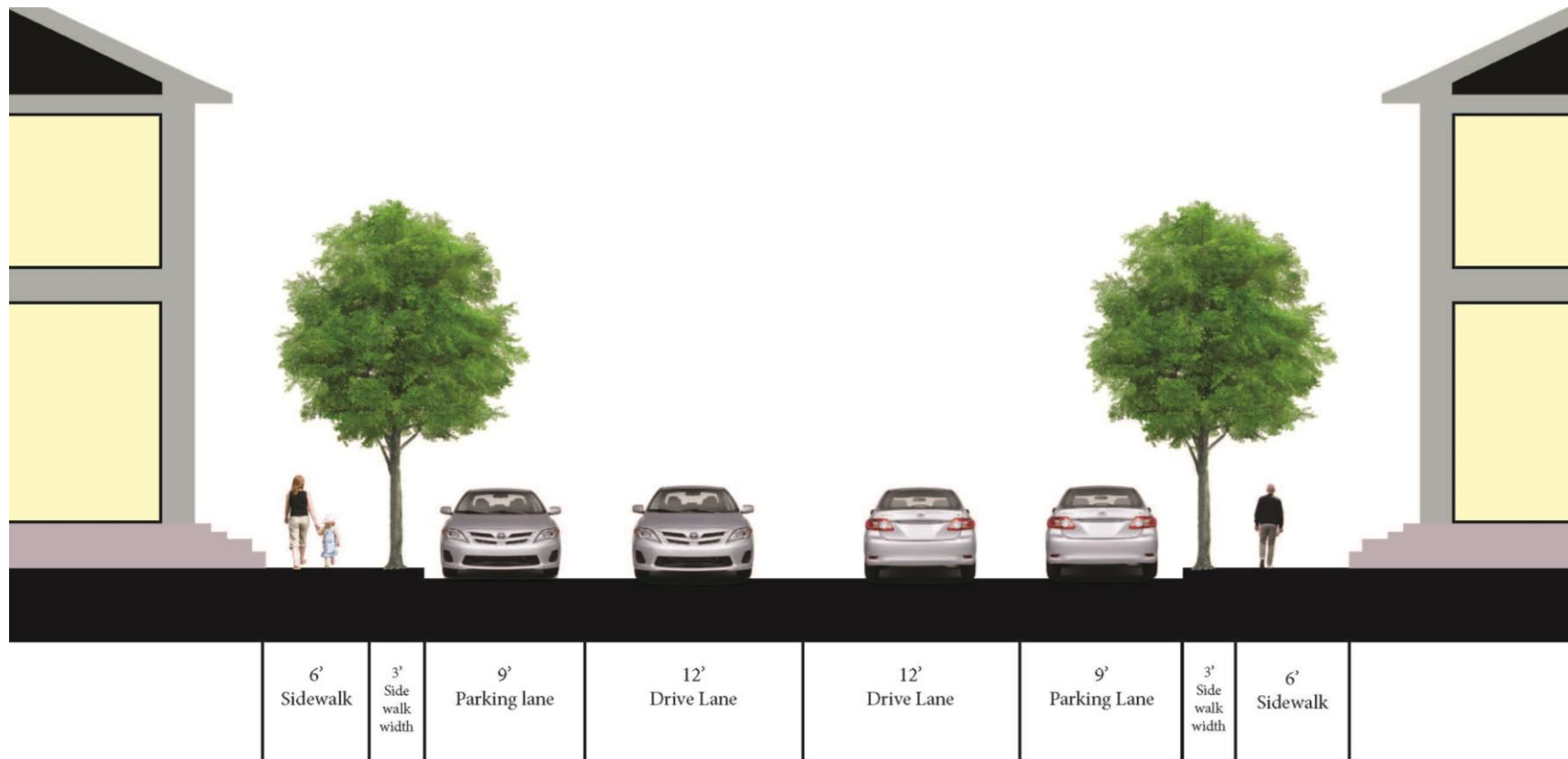
Curb Tension

Underutilization
Lack of Sharing
Infra Opportunities
Real Estate Opportunities
Move to Curb Maximization

Maximized Curbs Are ROW Opportunities

Thin Lanes | Remove Parking | Think Shared

Help cities “End the Road” and rethink what our streets are and can be.



Lessons / Opportunities for OEMs, PTOs, & Cities



Rider Data Consideration / Still Potential for Sharing

Off-peak trips may not increase total travel / VMT; capture latent travel



Infrastructure Opportunities

Signs, lines and potholes; lane / roadway prioritization (create network / operational efficiency)

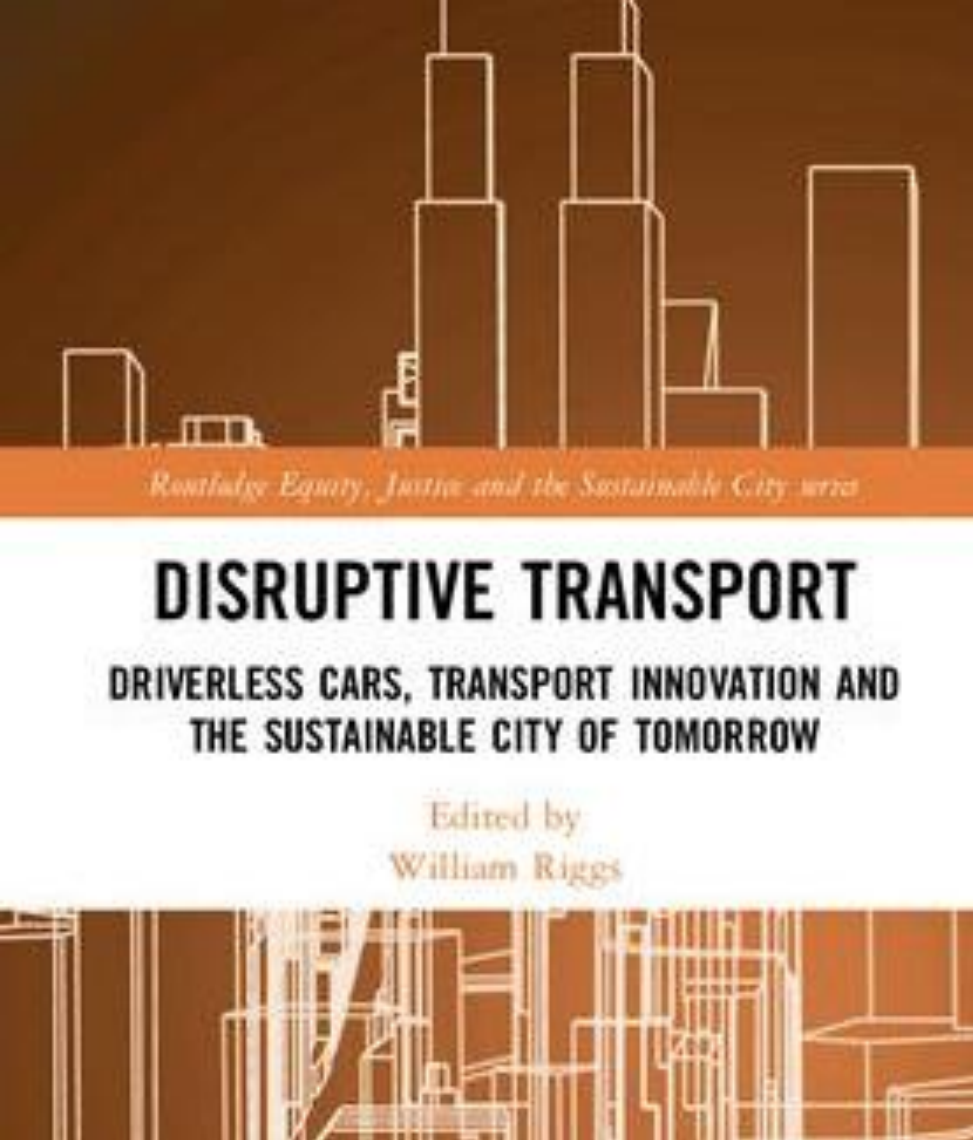
Pick and drop off / curb availability / potential use of transit stops

Leveraged digital / 3D mapping; challenge for some deployments



Business Model Partnerships

Refinement and partnership likely needed for sustainable business model alongside an emphasis on last mile / shared mobility services

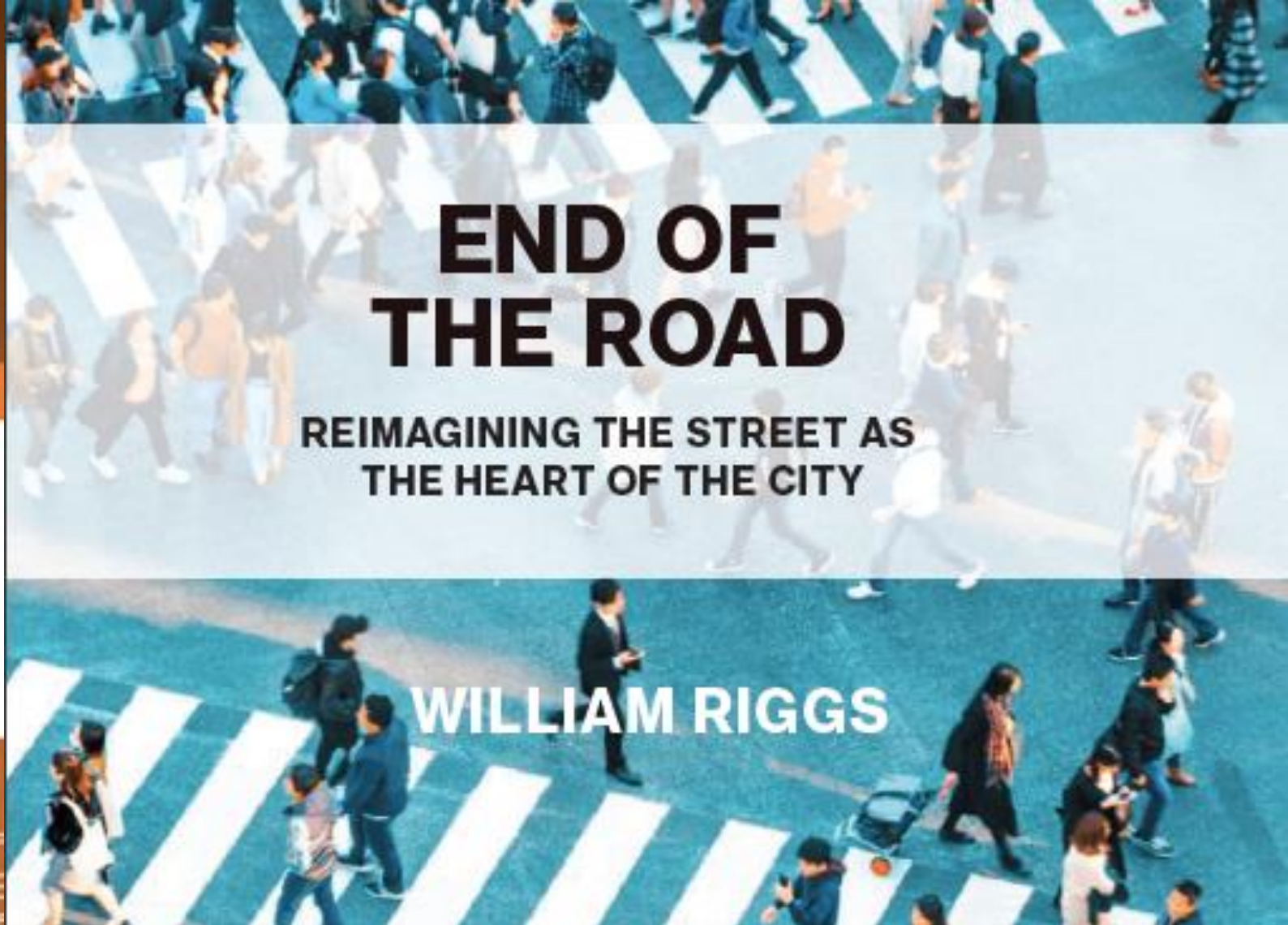


Routledge Equity, Justice and the Sustainable City series

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REIMAGINING THE STREET AS
THE HEART OF THE CITY

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