Measuring Mobility for Travel Efficiency & Carbon Intensity: Case Study of Uber

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Uber

Agenda

01 Background

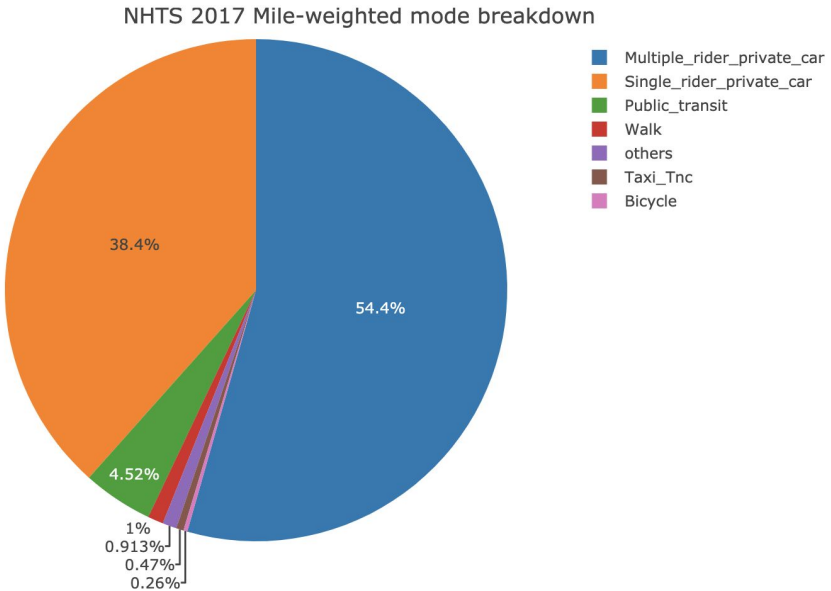
02 Defining Travel Efficiency

03 Defining Carbon Intensity

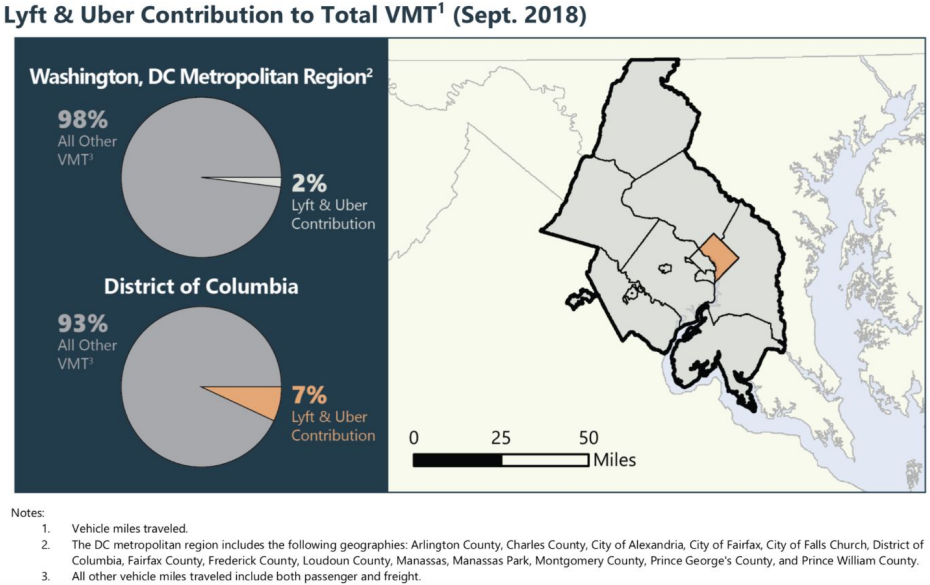
04 Case Studies

TNC is small, but its potential & power may change the status-quo (= private car dominant society)

US overall



Washington D.C.



Power and Potential of Uber's Technology

Rider-driver GPS matching

"Forward dispatch"

Trip swap technology

Pre- & rematch technology

Non-car: MiMo & Transit

UberX Share (Pool)

UberXL

High-capacity Vehicles

Split-fare

Multi-destination trips

Eco-routing

Aggressive driving notifications

Vehicle-to-trip right-sizing

Driver TCO optimization

EV initiatives (clean-air fund, Hertz-Tesla rentals)

FEWER	FULLER	MORE EFFICIENT	BY DESIGN

$$\left(\frac{\text{Rider Trips}}{\text{Vehicle}}\right) \left(\frac{\text{Rider Miles}}{\text{Vehicle Miles}}\right) \left(\frac{\text{Fuel}}{\text{Vehicle Mile}}\right) = \frac{\textbf{impact}}{\textbf{passenger-mile}}$$

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Travel Efficiency

Calculating PMT and VMT on Uber

Passenger distance

Occupancy x trip distance (miles or km)

Rider requests trip

Passenger count depends on product

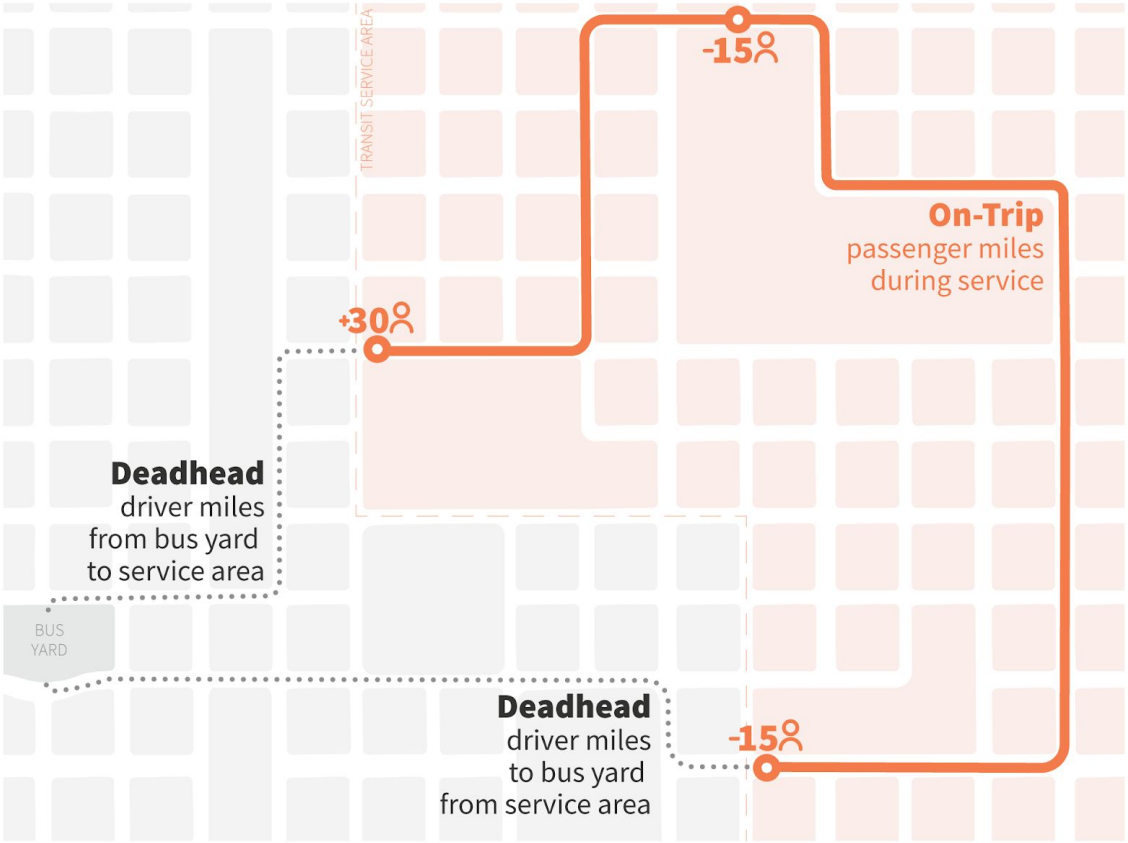
Gets in vehicle

Trip starts

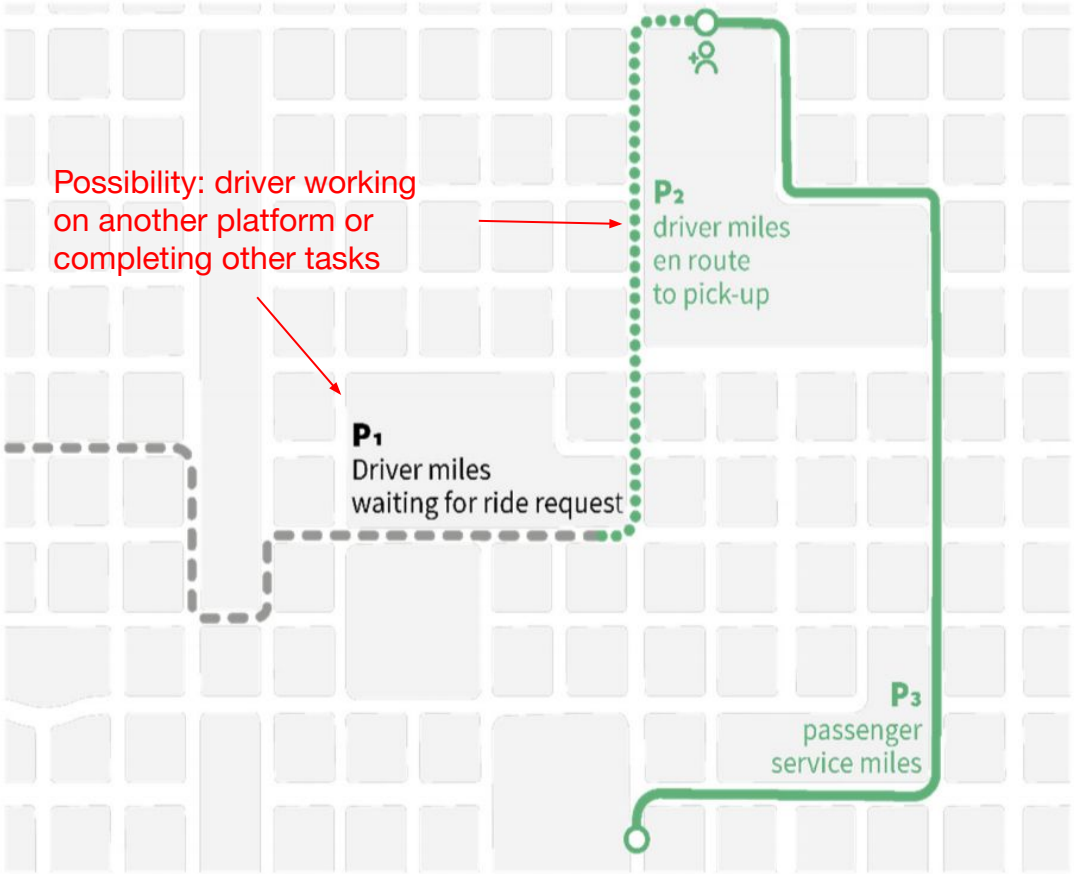
Gets out

Trip ends

Extensions


TRANSIT SERVICE AREA
-15
On-Trip
passenger miles
during service
+30
Deadhead
driver miles
from bus yard
to service area
BUS
YARD
Deadhead
driver miles
to bus yard
from service area
-15

Limitations



1. Double counting vehicle distances traveled across platforms.
2. Difficulty in estimating driver off-trip mileage purpose.
3. Real-time occupancy data = not available
4. Adjusting for “wobble” in shared trip modes.

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Carbon Intensity

Carbon intensity: emissions per unit passenger distance

Vehicle emissions

grams CO_2

1. Drive

"Online"

2. Accepts request

"En route"

3. Pick up rider

"On trip"

4. Drop off

Driver back to "online"

Divided by

Passenger distance

Occupancy x trip distance (miles or km)

Rider requests trip

Passenger count depends on product

Gets in vehicle

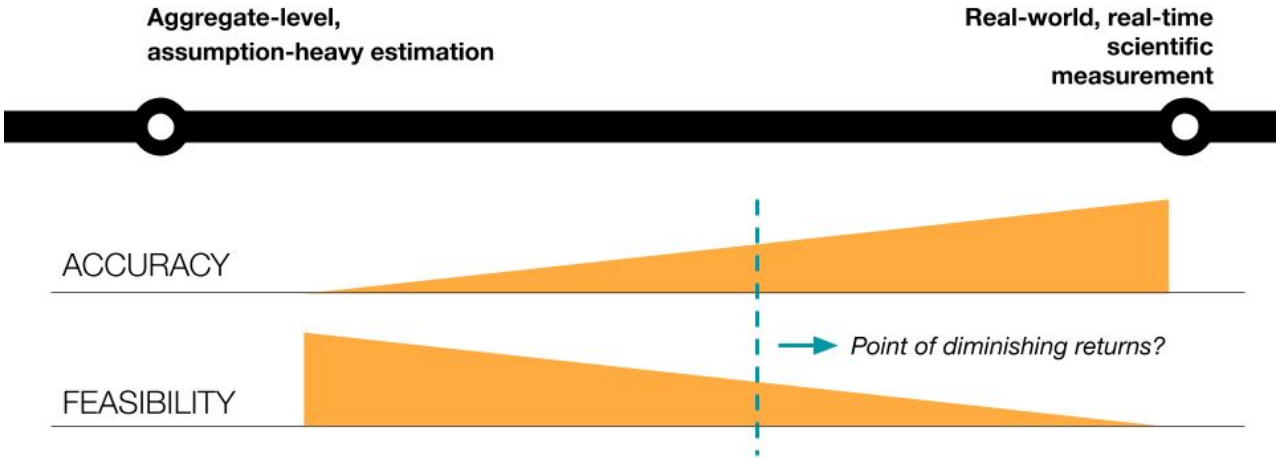
Trip starts

Gets out

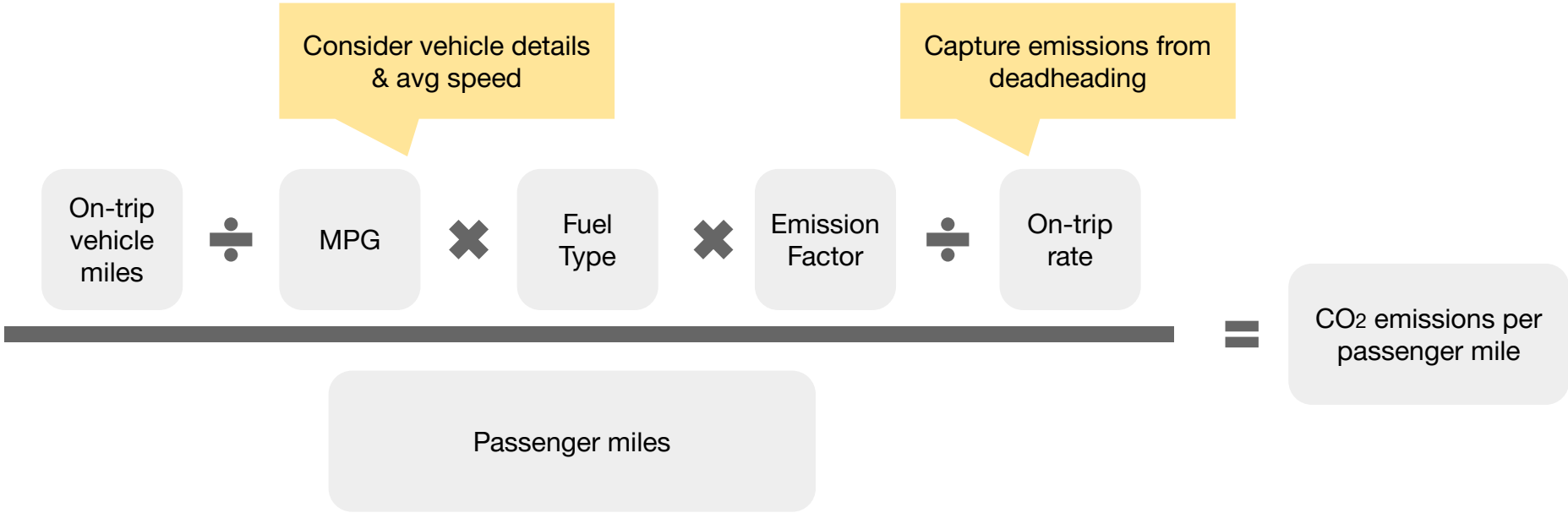
Trip ends

Emission calculation details

- Balance between accuracy and calculation feasibility
- Uber's approach:
  - When available, use third-party vendors to VIN-match vehicles to fuel/engine type
  - Coverage varies by geography - in the US/CAN coverage is very high, in the EU/UK coverage is lower.
  - When a vehicle isn't contained in the third-party data, efficiency metrics are imputed by comparing to other vehicles with the same Make/Model/Year in the same geographic area
  - Average trip speed is used to assign city and highway fuel efficiency



Uber’s Carbon Intensity



2021 Climate Assessment and Performance Report

Travel efficiency in US/CAN

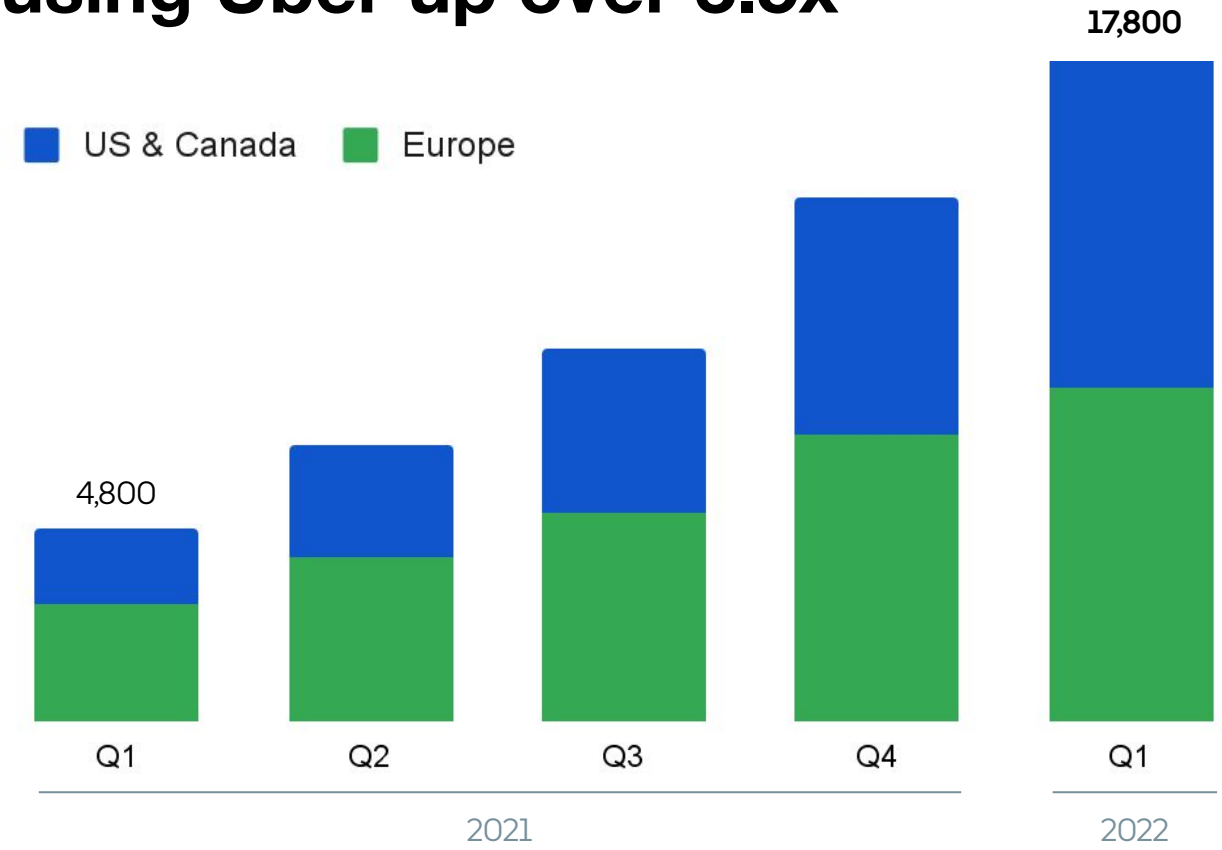
Estimated passenger miles per vehicle mile traveled

Carbon intensity in US/CAN

Estimated grams CO_2 per passenger mile traveled

*"Top 10 metro markets" in USC: Atlanta, Boston, Chicago, Los Angeles, Miami, New Jersey, New York City, San Francisco, Toronto, and Washington, DC

Active monthly zero emission vehicle (ZEV) drivers using Uber up over 3.5x



NOTE -- European countries included:

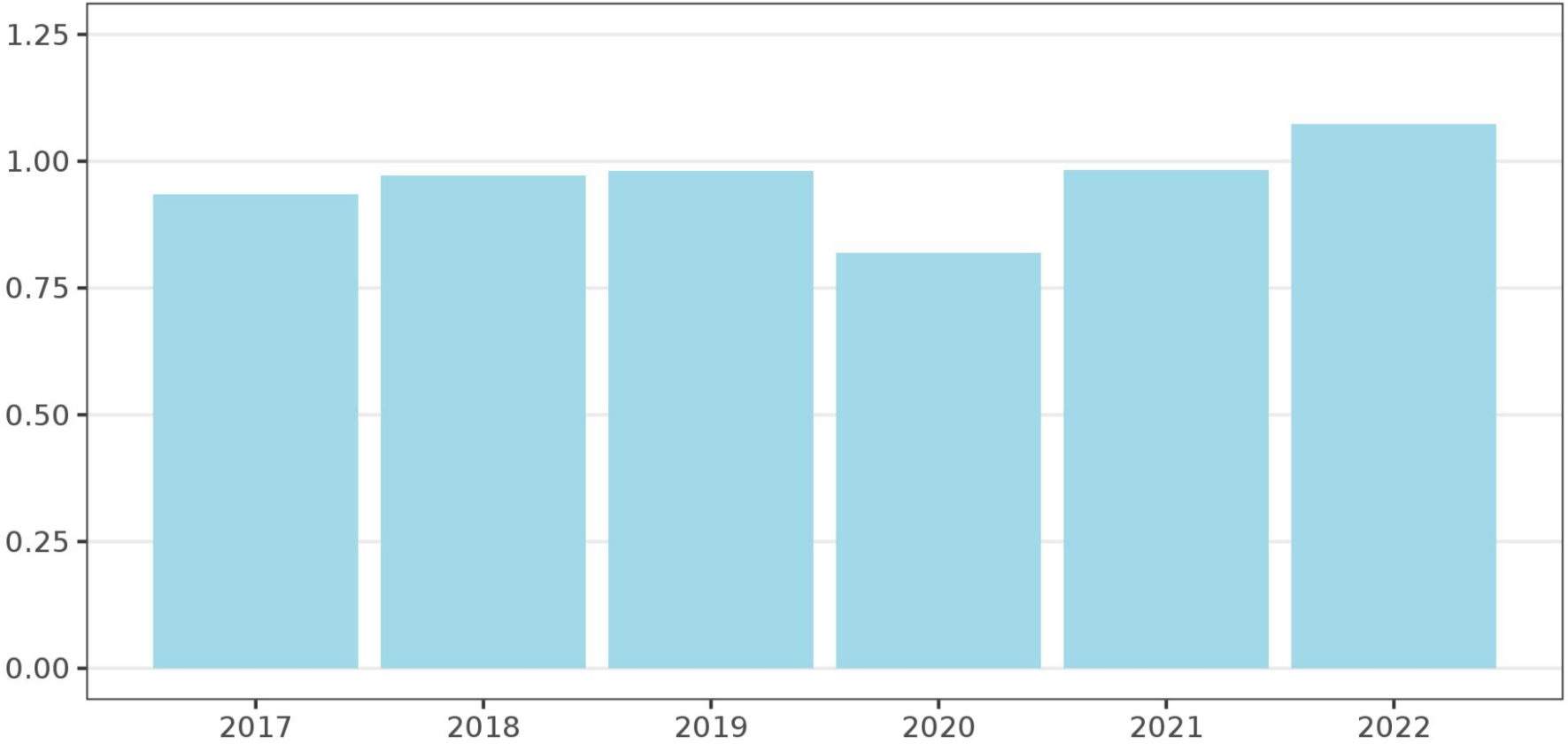
- Belgium
- France
- Germany
- Portugal
- Spain
- The Netherlands
- United Kingdom

Data is the average monthly drivers as of the last month of each quarter shown

Case Study: Bay Area Network Efficiency

Travel efficiency in the Bay Area

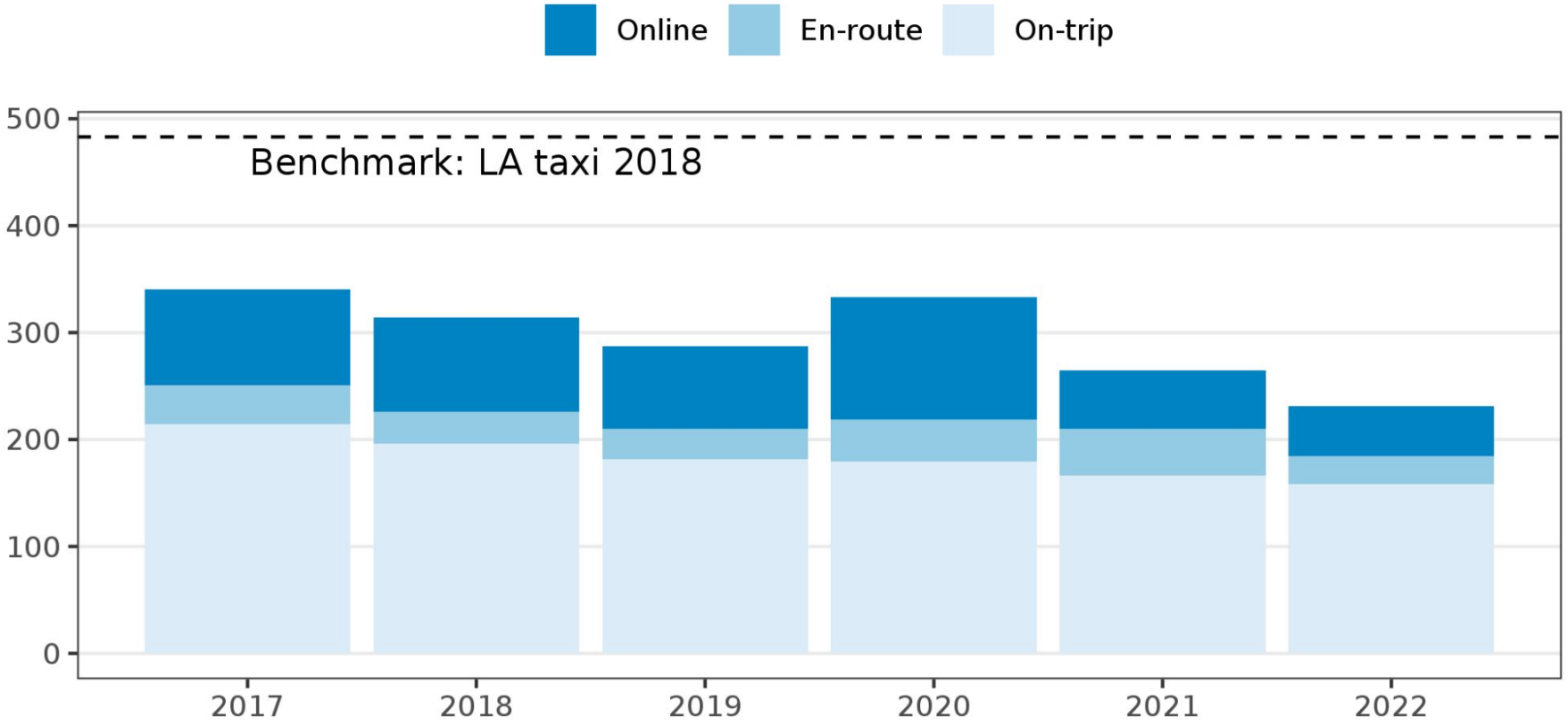
Estimated passenger miles per vehicle mile traveled



Note: 2022 data is preliminary (only includes January - May)

Carbon intensity in the Bay Area

Estimated grams CO_2 per passenger mile traveled



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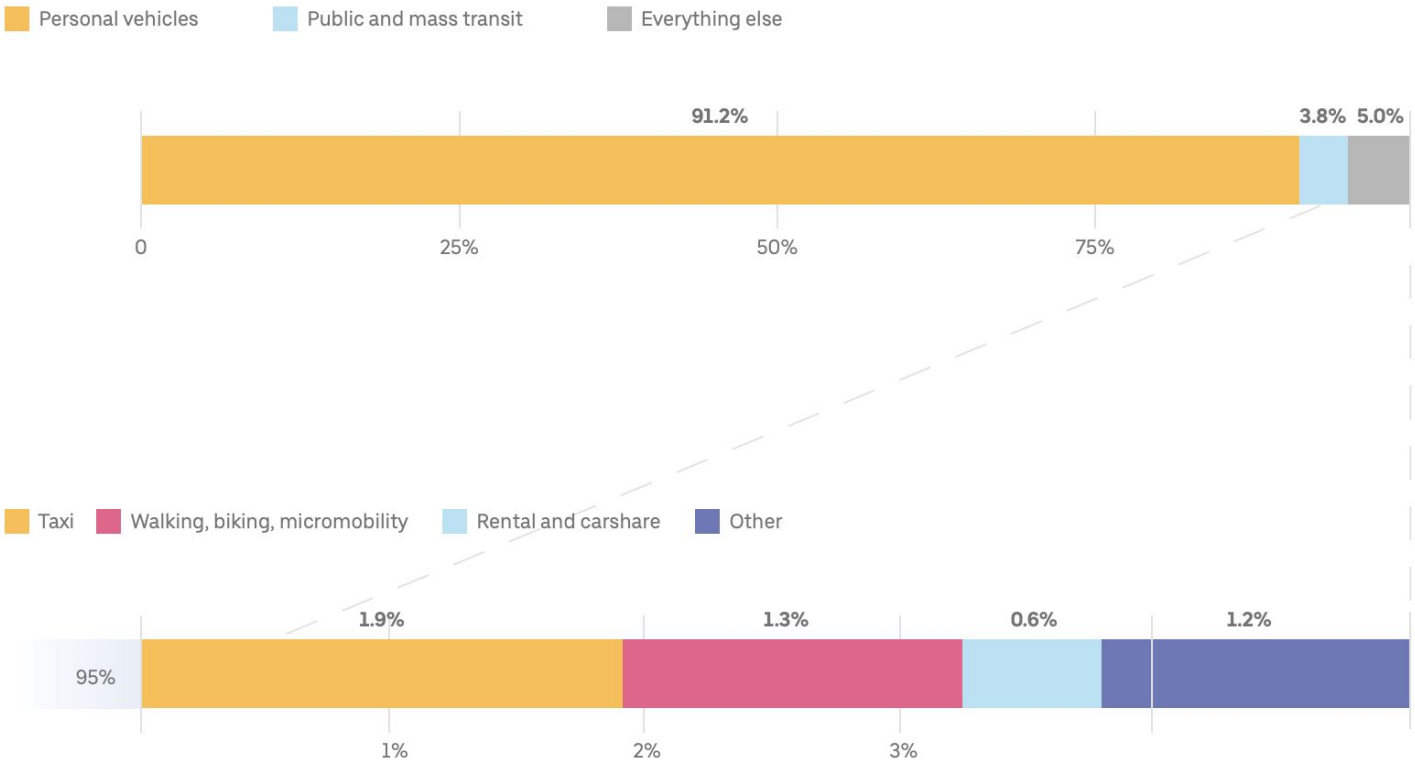
Case Study: Comparing Travel Modes in Los Angeles

Annual average of percentage of passenger miles traveled by mode in Los Angeles



Carbon intensity

Grams CO_2 emitted per passenger mile traveled per mode in Los Angeles, 2018

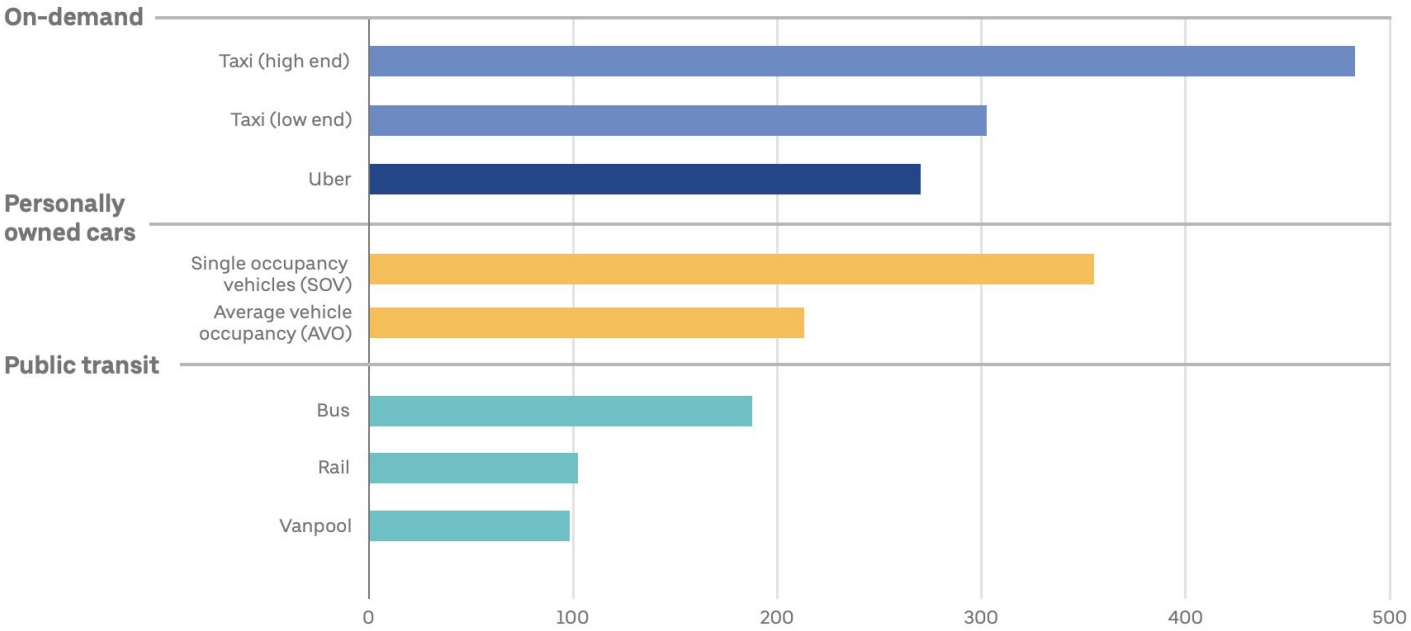
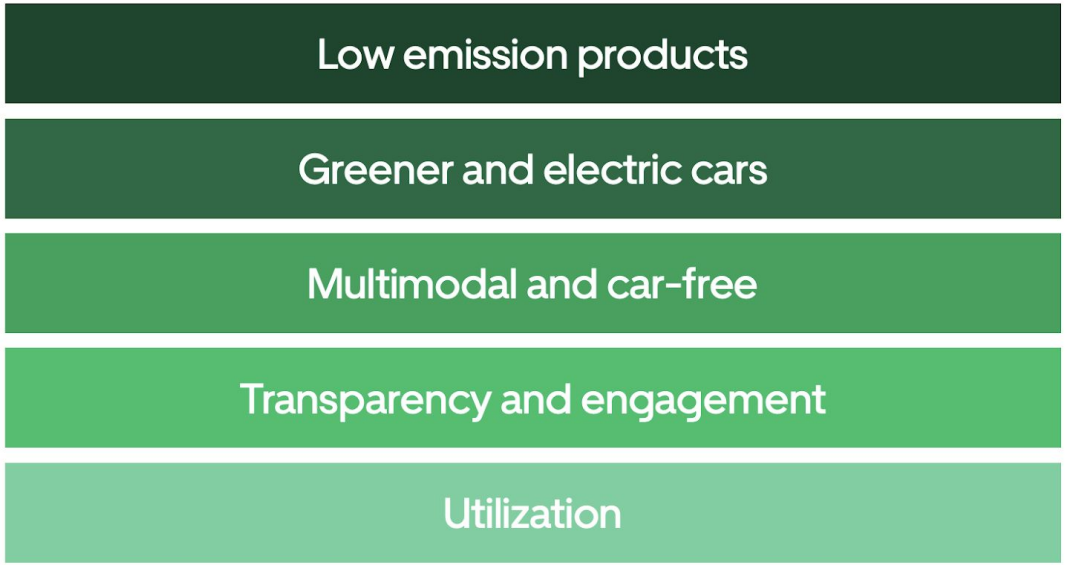


Figure: Carbon intensities for popular transportation modes in the Los Angeles metropolitan area, based on 2018 or most recent data. Chart data compiled by World Resources Institute from: U.S. Department of Transportation; National Transit Database (LA Metro PMT); Los Angeles 2019 Energy and Resources Report (2018 GHG Emissions); Los Angeles Department of Transportation (Fleet Fuel Economy); National Household Travel Survey (Passenger Vehicle Occupancy); California Air Resources Board, EMFAC (Passenger Fuel Economy); National Bureau of Economic Research (Taxi Trip Data); and U.S. Environmental Protection Agency (Mobile Fuel Combustion Factors).

Platform-wide carbon-intensity reduction strategies



Thank You

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