

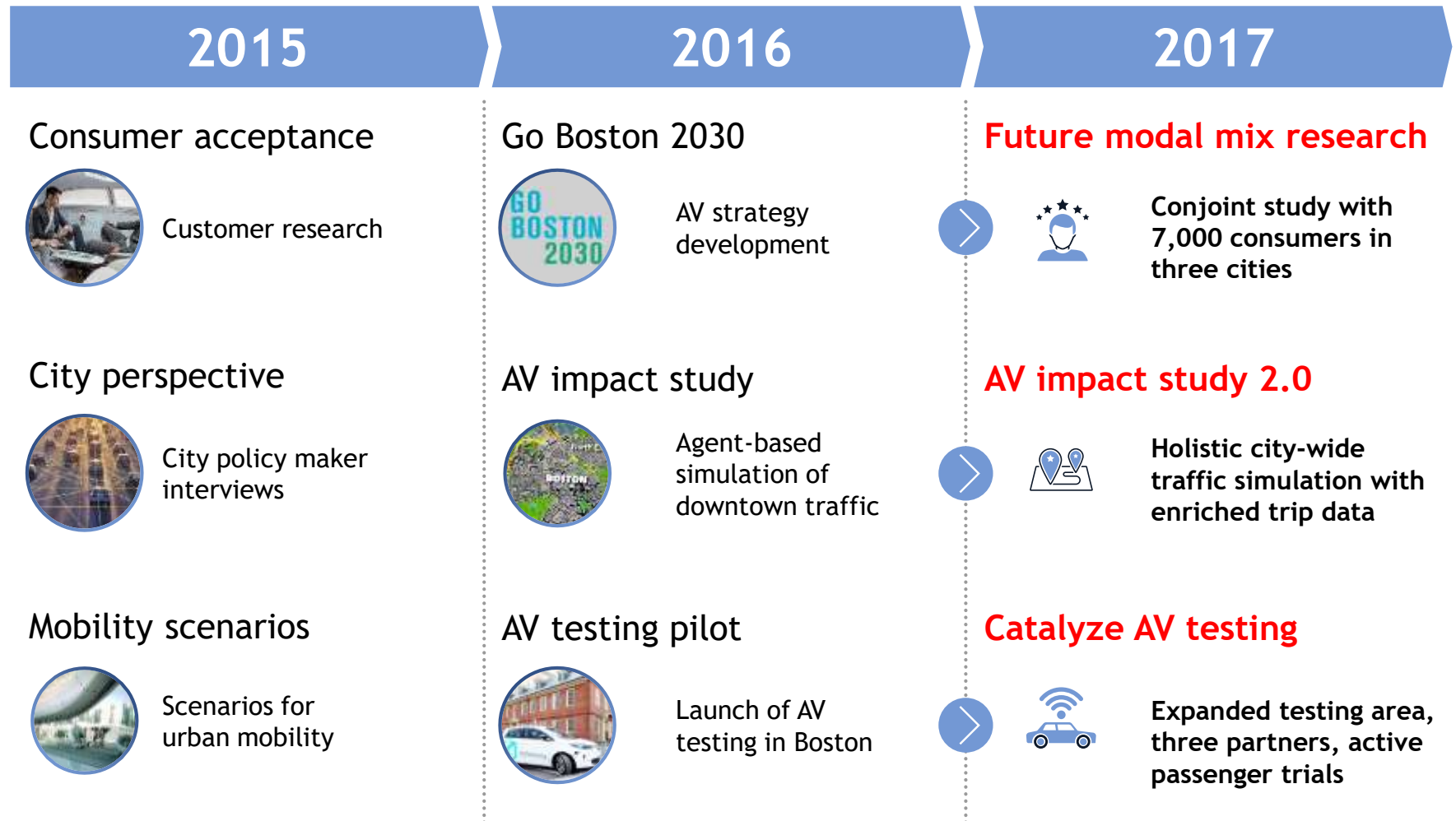
# Autonomous Urban Mobility

## Key Lessons from the City of Boston



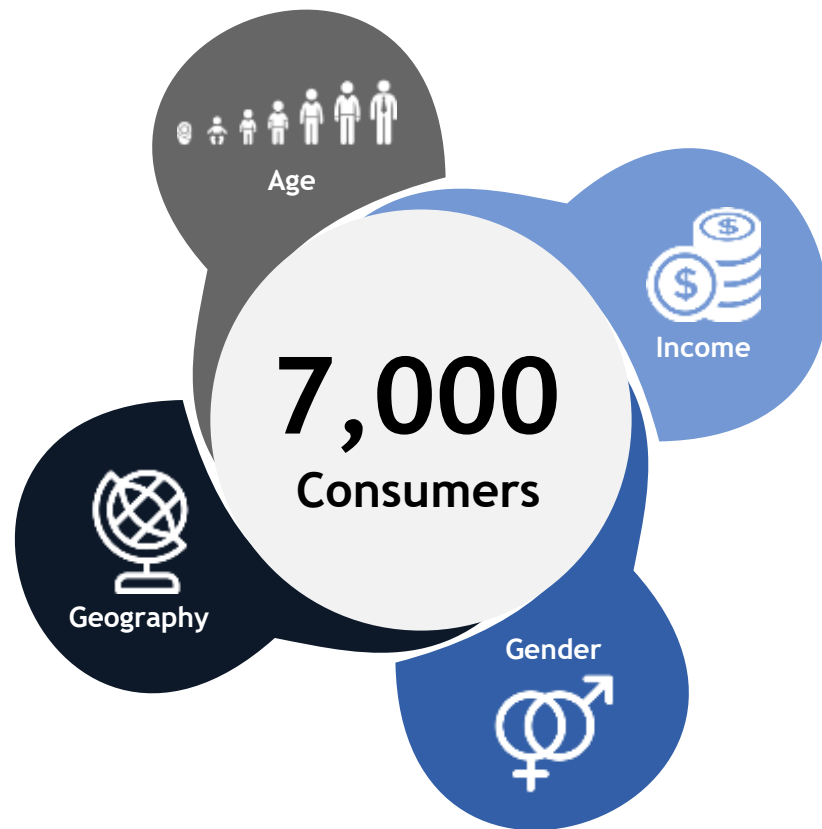
John Moavenzadeh  
MassTLC Robotics/IoT Community Meeting  
September 18, 2018, Boston

# June 2018: The World Economic Forum and Boston Consulting Group complete a 3-year collaboration



# Conducted large-scale conjoint study in three cities

## Representative sample



Boston



Berlin



Shanghai



# Respondents were given specific situations and use cases ...

## Situations along four criteria

1 | Trip reason



2 | Group context



3 | Weather



4 | Time of day



## Use case examples

Commute to work alone



Family trip to the zoo



Night out with friends





# ... and asked to chose from 8 transport modes

## Mass Transit

Bus/  
subway



Commuter  
rail



## Personal car

Personal  
car



Autonomous  
personal car



## Mobility on demand

Taxi/  
ride sharing



Autonomous  
shared taxi



Autonomous  
taxi



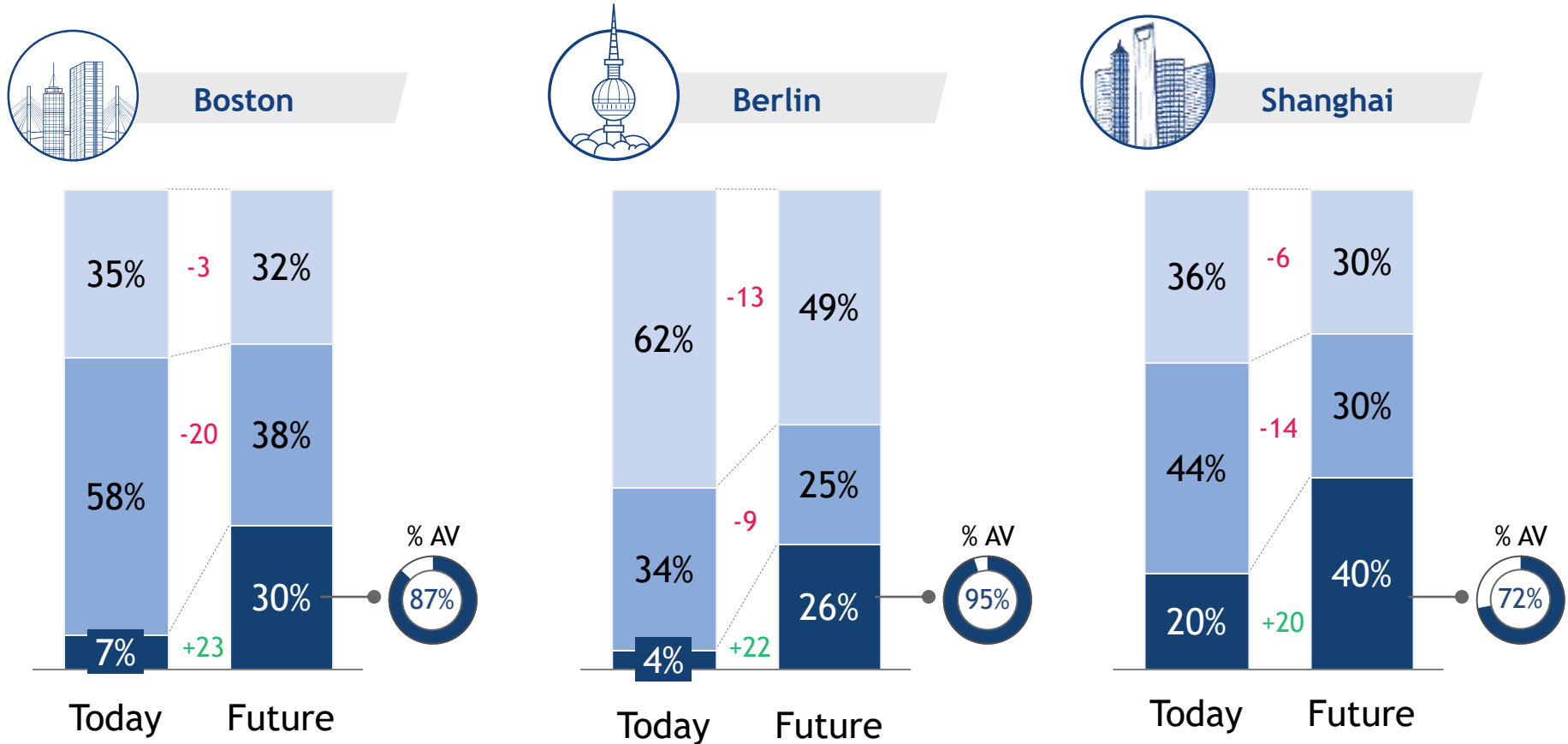
Autonomous  
minibus



# Top 5 findings from our conjoint study

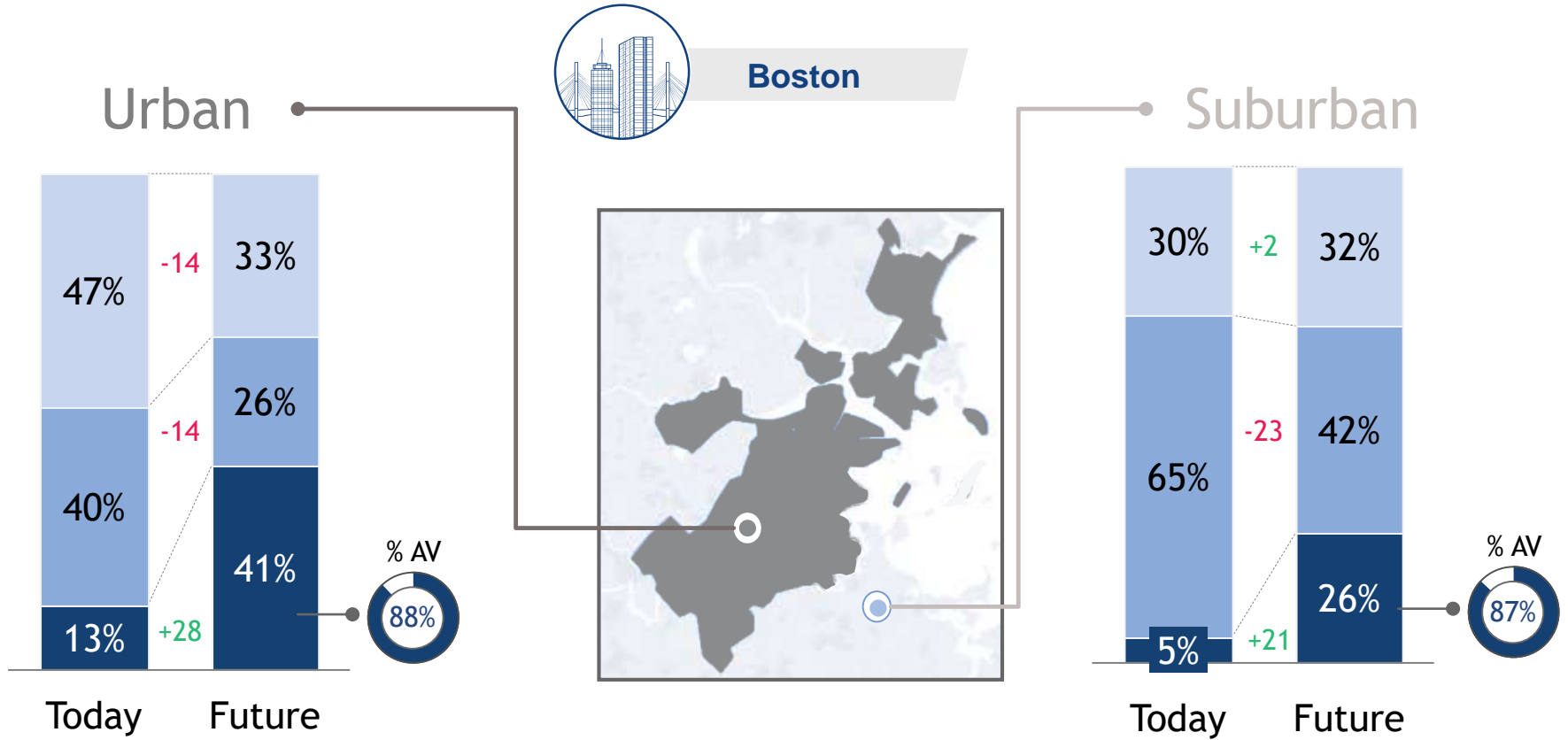
- ① Cities globally move to **30-40% mobility on demand**
- ② Mass **transit ridership drops** in urban areas
- ③ **AV adoption varies** across city—correlated to **income levels**
- ④ The **shorter the trip**, the **higher the AV adoption**
- ⑤ **20-25%** will use a **personal car no matter what**

# ① Cities globally move to 30-40% mobility on demand



Mass transit = Bus / subway + Commuter rail  
 Personal car = Personal car + Autonomous personal car  
 Mobility on demand = Taxi / ride sharing + Autonomous taxi + Autonomous shared taxi + Autonomous minibus

## ② Mass transit ridership drops in urban areas



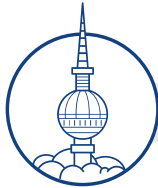
Mass transit = Bus / subway + Commuter rail  
 Personal car = Personal car + Autonomous personal car  
 Mobility on demand = Taxi / ride sharing + Autonomous taxi + Autonomous shared taxi + Autonomous minibus



# ③ AV adoption varies across city – correlated to income



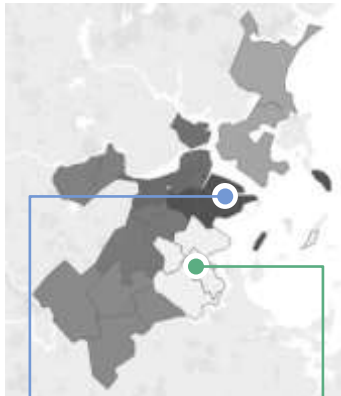
**Boston**



**Berlin**



**Shanghai**



% AV adoption

53

26

Median income

\$100-\$149K

\$50-\$74K

Seaport and South Boston

Dorchester



36

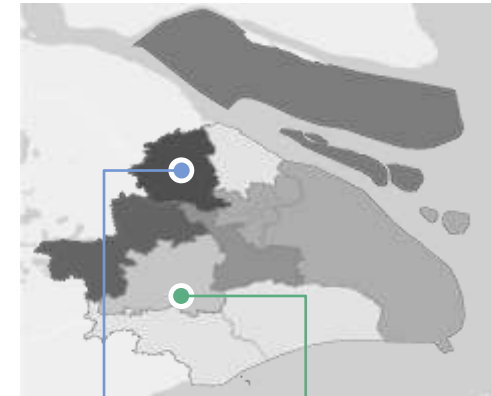
26

€100-€149K

€25-€49K

Friedrichshain-Kreuzberg

Marzahn-Hellersdorf



46

37

¥200-¥299K

¥100-¥199K

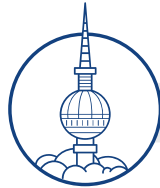
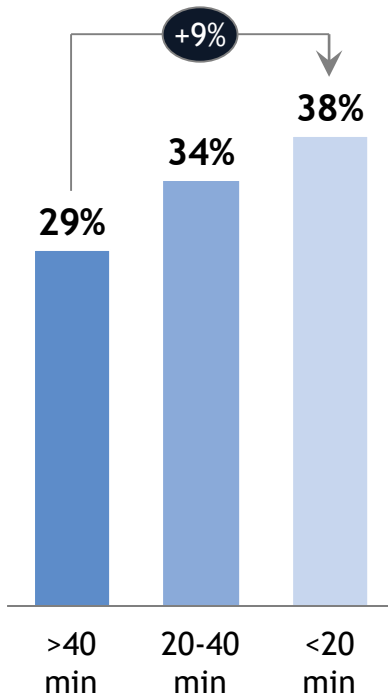
Jiading

Songjiang

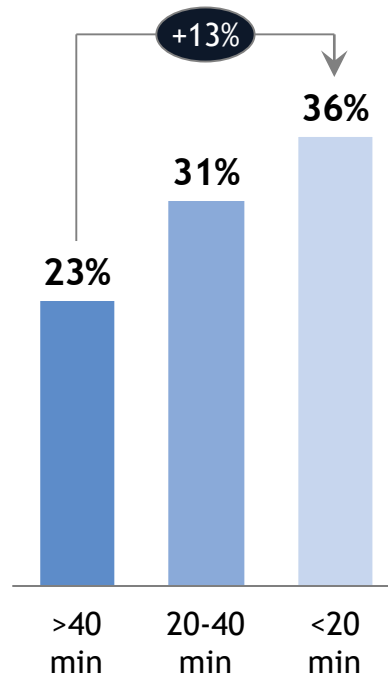
# ④ The shorter the trip, the higher the AV adoption



**Boston**



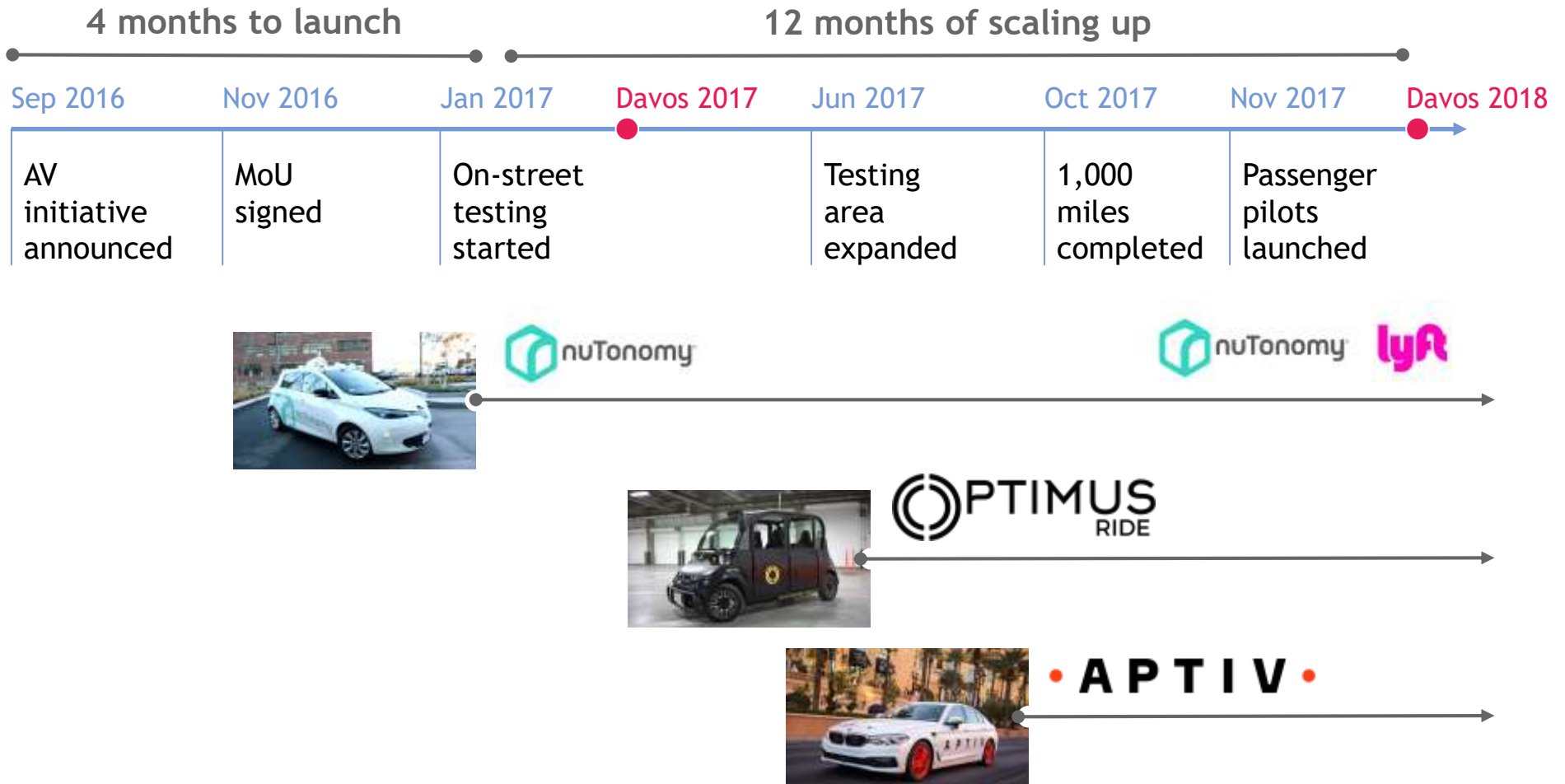
**Berlin**



**Shanghai**

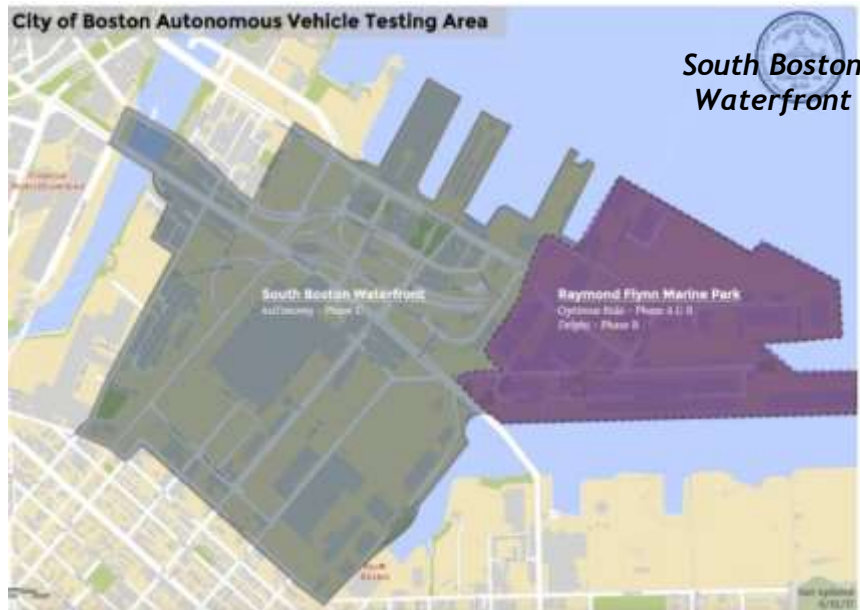


# AV testing in Boston—an example for fast scaling

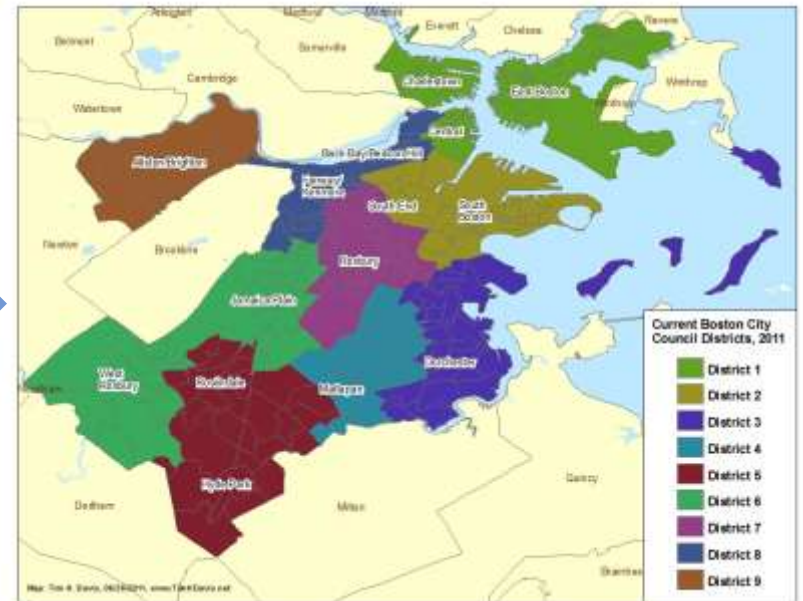


# Testing initially allowed in small area; June 2018 expanded to entire city

Testing Started in “Seaport”



Expanded to Entire City



# Identified best practices for launching an AV pilot



Develop clear mobility vision and KPIs



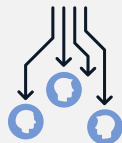
Balance stakeholder interests in approval process



Create a tiered testing plan with achievement milestones



Build public awareness early, e.g. AV petting zoo/robot block party



Publish regular updates on testing progress to residents

# Last year: Agent-based model for downtown Boston

We took a real world environment ...



... and simulated traffic flows in its streets

Traffic participants, autonomous and traditional



Cars



Taxis



Pedestrians



Buses



Minibuses

Environment and infrastructure



Traffic lights



Streets

Dynamic behaviors



Following distance



Speed



Traffic rules



Capacity



# Expanded impact study across four key dimensions

- 1** Expanded study to cover entire City of Boston



**316x**  
larger area  
(142 km<sup>2</sup>)

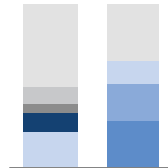
- 2** Added enriched trip data and commercial vehicles

CITY of BOSTON  



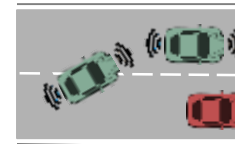
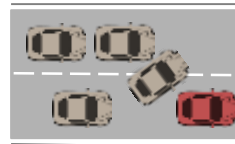
**11x**  
more trips  
(2M/day)

- 3** Determined future modal mix through conjoint study with 2,400 consumers



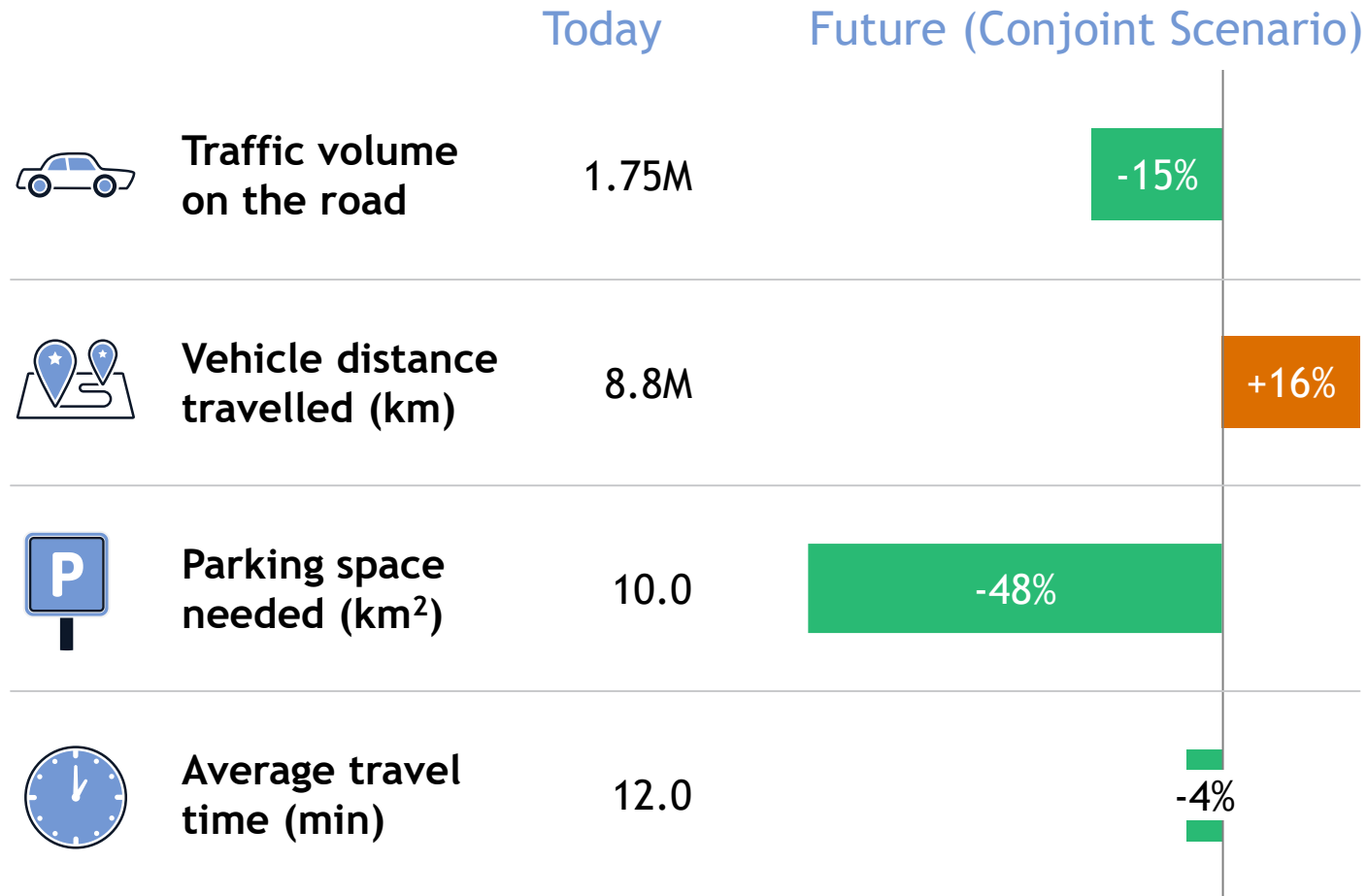
**72**  
modal mixes,  
by area & use case

- 4** Quantified traffic efficiency gains from AV technology



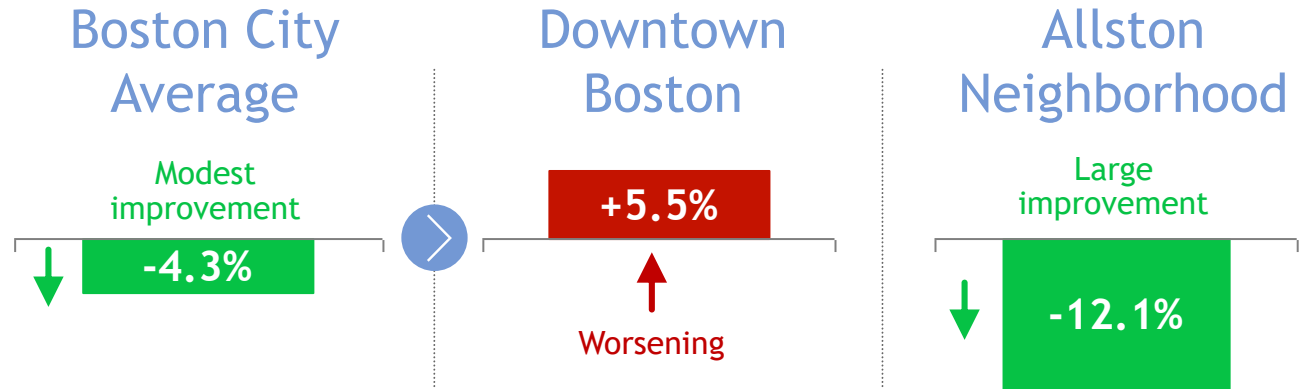
**6.3%**  
gain in throughput  
with 37.5% AV share

# Key outputs from the city-wide impact study

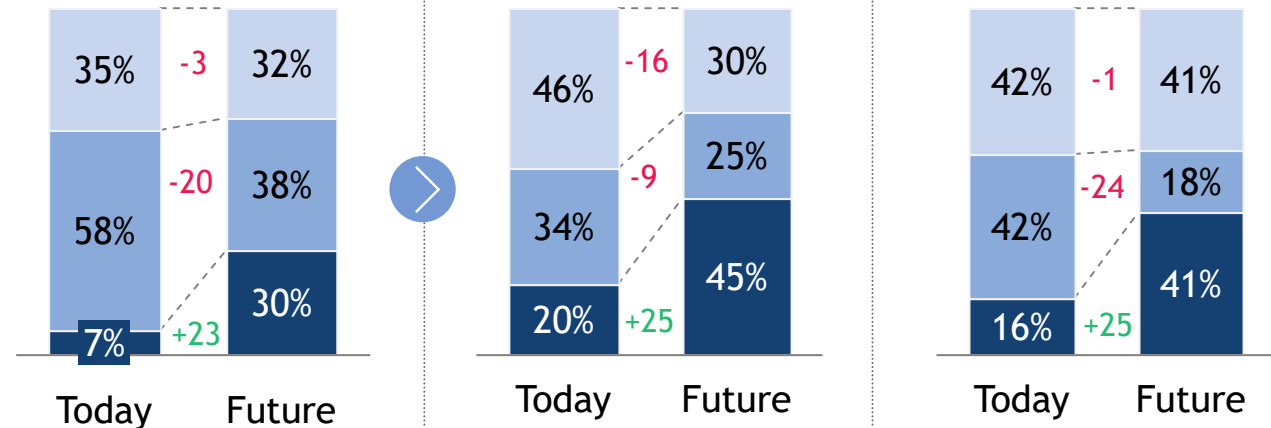


# Congestion increases in Downtown Boston

Average Travel Time



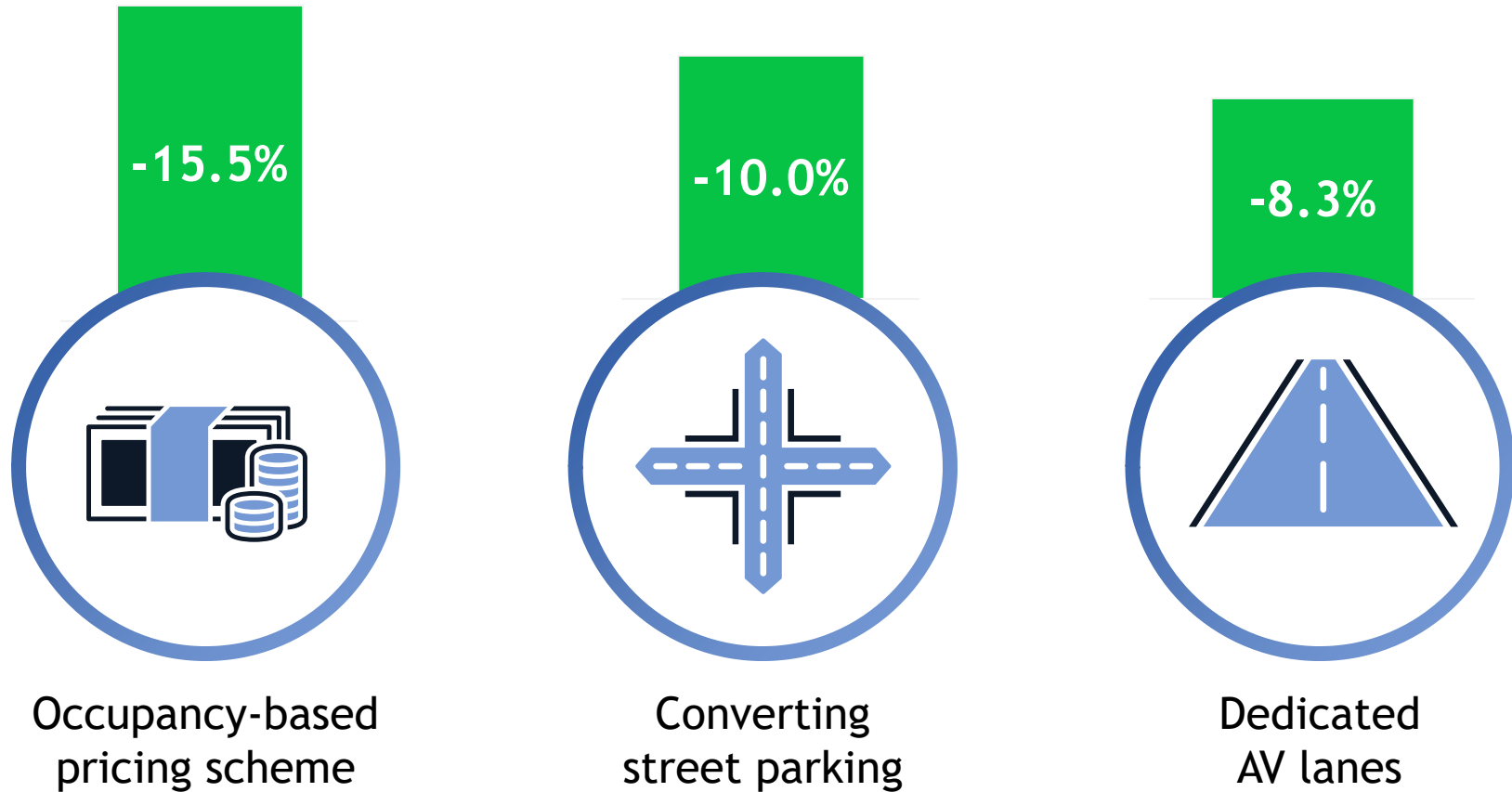
Modal Mix



- Mass transit = Bus /subway + Commuter rail
- Personal car = Personal car + Autonomous personal car
- Mobility on demand = Taxi / ride sharing + Autonomous taxi + Autonomous shared taxi + Autonomous minibus

# Cities can influence outcome through policy levers

City-wide travel time improvement vs. today



Thank you

An abstract geometric pattern consisting of numerous overlapping, thin, light-colored lines that form a complex, web-like structure. The lines intersect to create various shapes, including triangles and polygons, and the overall effect is a dense, intricate mesh that fills the right side of the page.