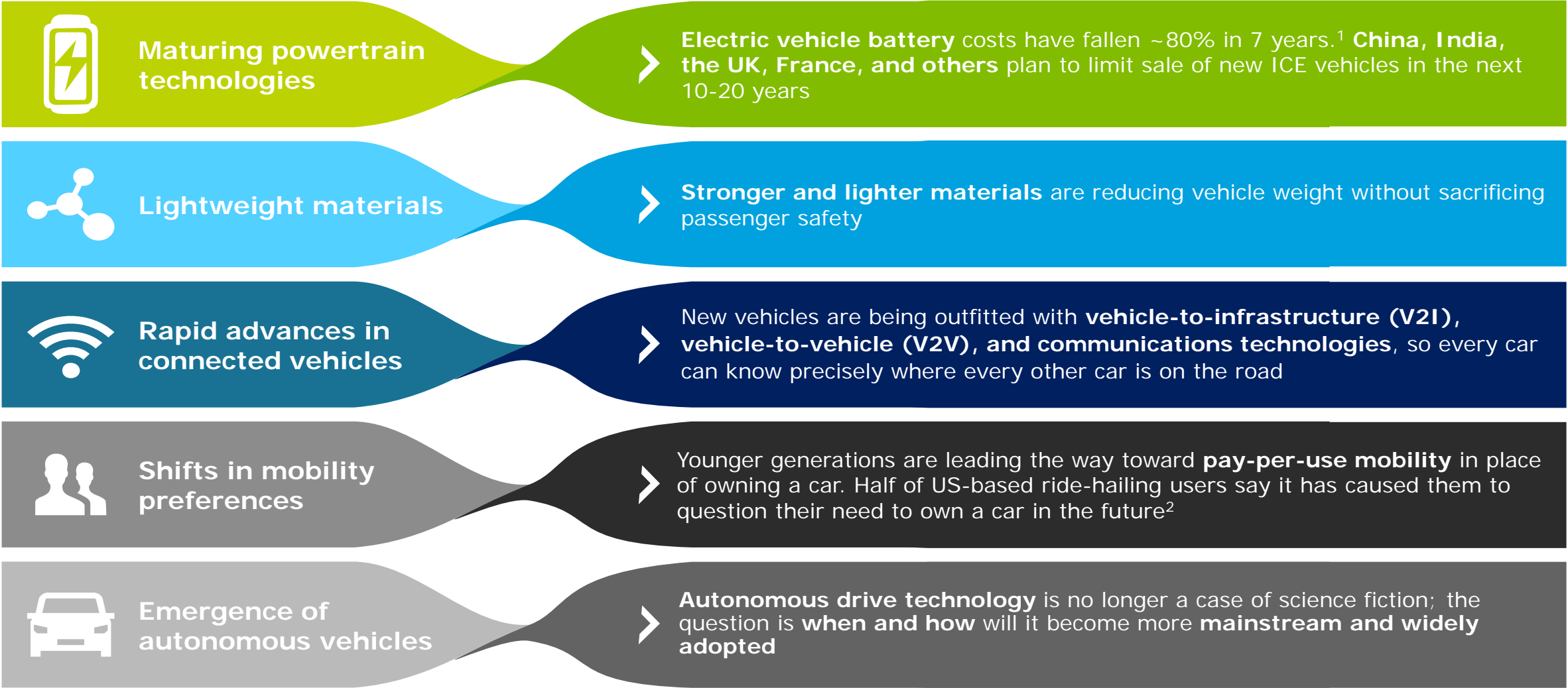


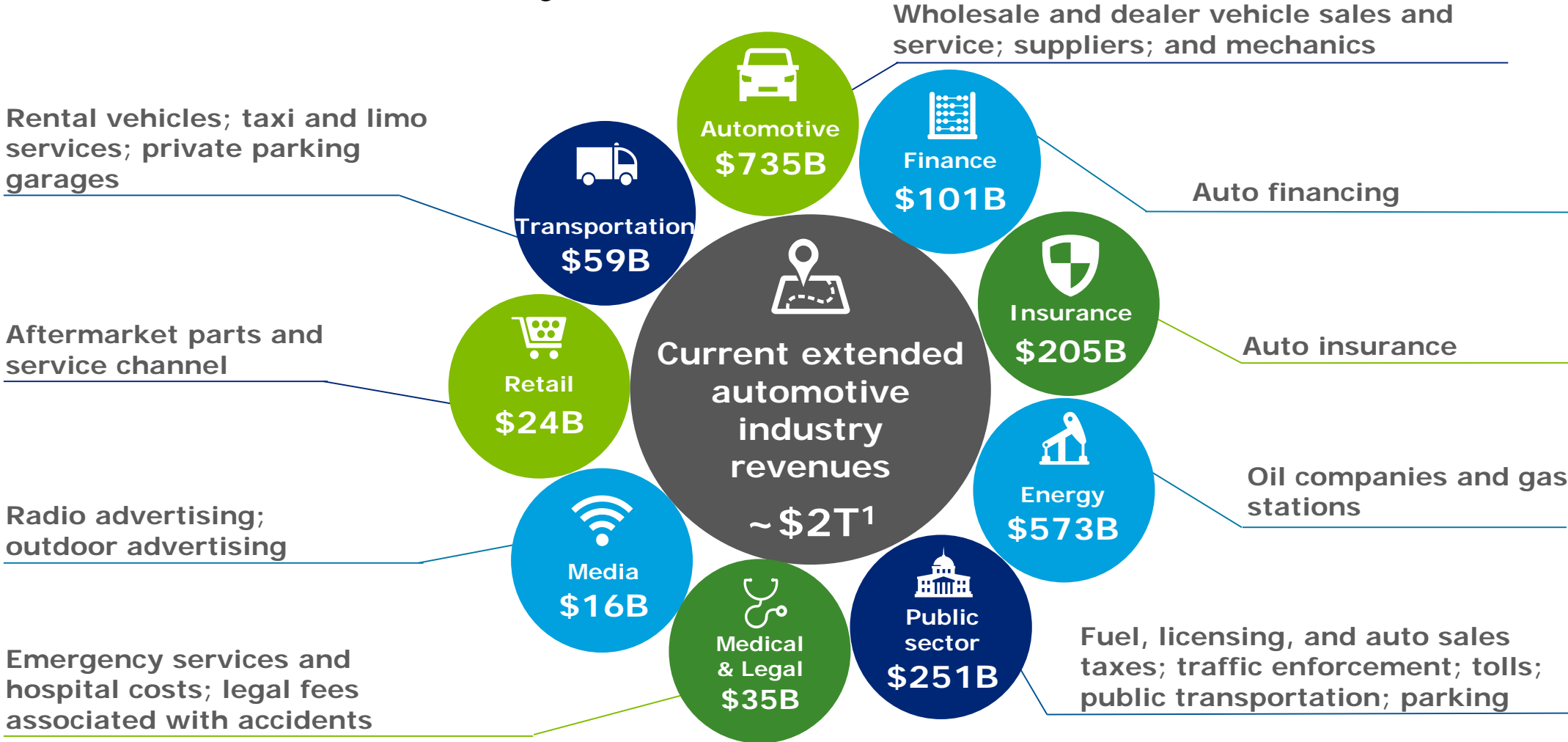
Faster, cheaper, cleaner, safer?
Autonomous vehicles, shared transportation,
and the future of mobility

Converging forces are transforming longstanding industry structures and dynamics



Source: Deloitte analysis
¹ Bloomberg, New Energy Finance ² Deloitte Global Automotive Consumer Study, 2017

Stakes are high – with approximately **\$2 trillion** in revenues collected annually by the current extended auto industry



¹Total revenue is \$1.99T.
 Source: Deloitte analysis based on IBISWorld Industry Reports, IHS, DOT, US Census, EIA, Auto News, TechCrunch. Current revenue represents 2014 figures (or earlier if 2014 data not available) in the United States.

The result could be a new mobility ecosystem that provides substantial benefits



Vehicles operate autonomously and nearly never crash

Vehicles are consumed through end-to-end mobility providers and less likely to be personally owned assets



Taxation and public revenues shift from a fixed model to a more dynamic one

Seamless multi-modal transportation becomes the new norm



New predominantly "driverless" cargo transportation and delivery systems emerge

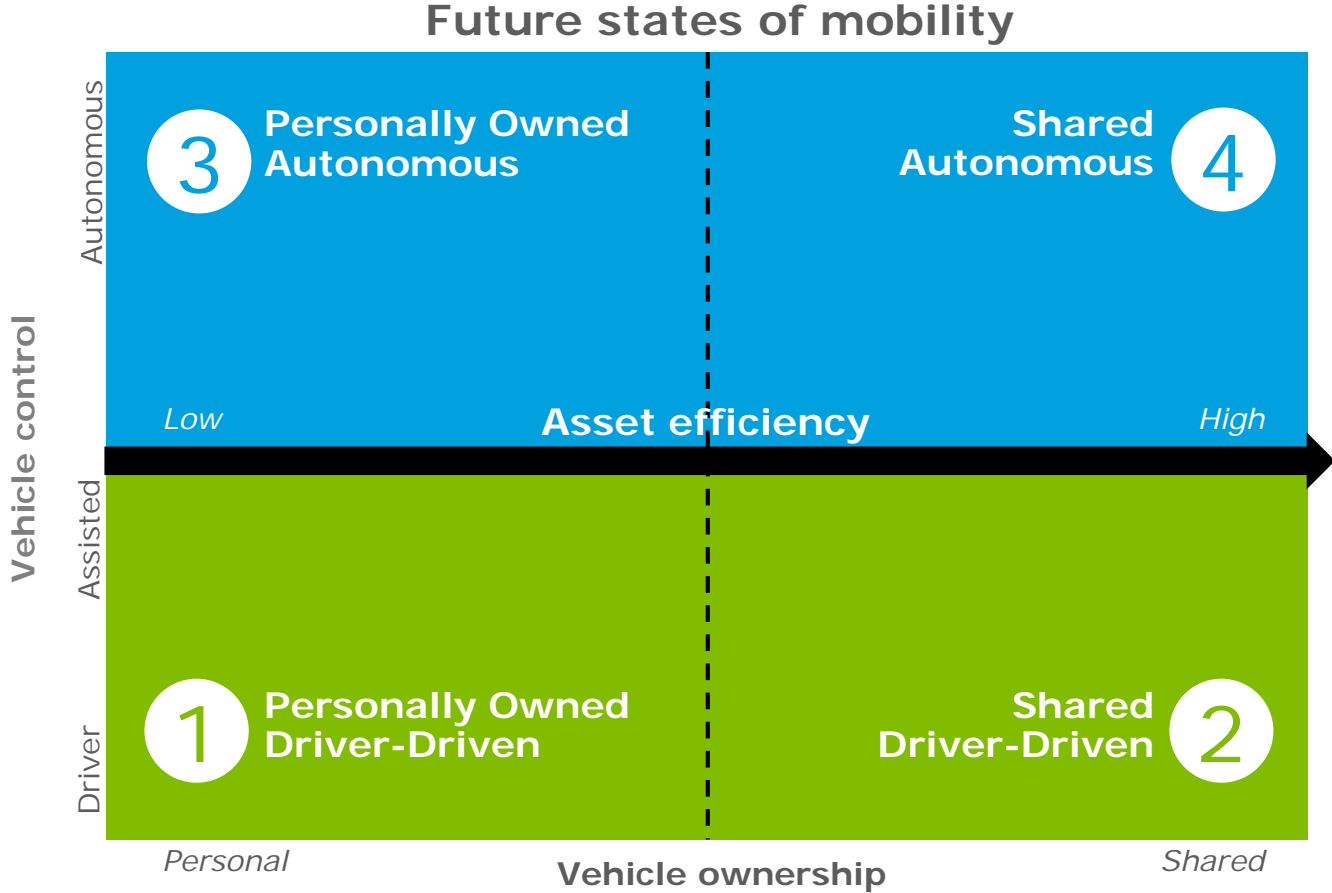
Consumer data provides the highest sources of value in the system



Converging forces will give rise to the emergence of four future states of mobility, which will exist in parallel

Extent to which autonomous vehicle technologies become pervasive:

- Depends upon several key factors as catalysts or deterrents—e.g., technology, regulation, social acceptance
- Vehicle technologies will increasingly become "smart"; the human-machine interface shifts toward greater machine control



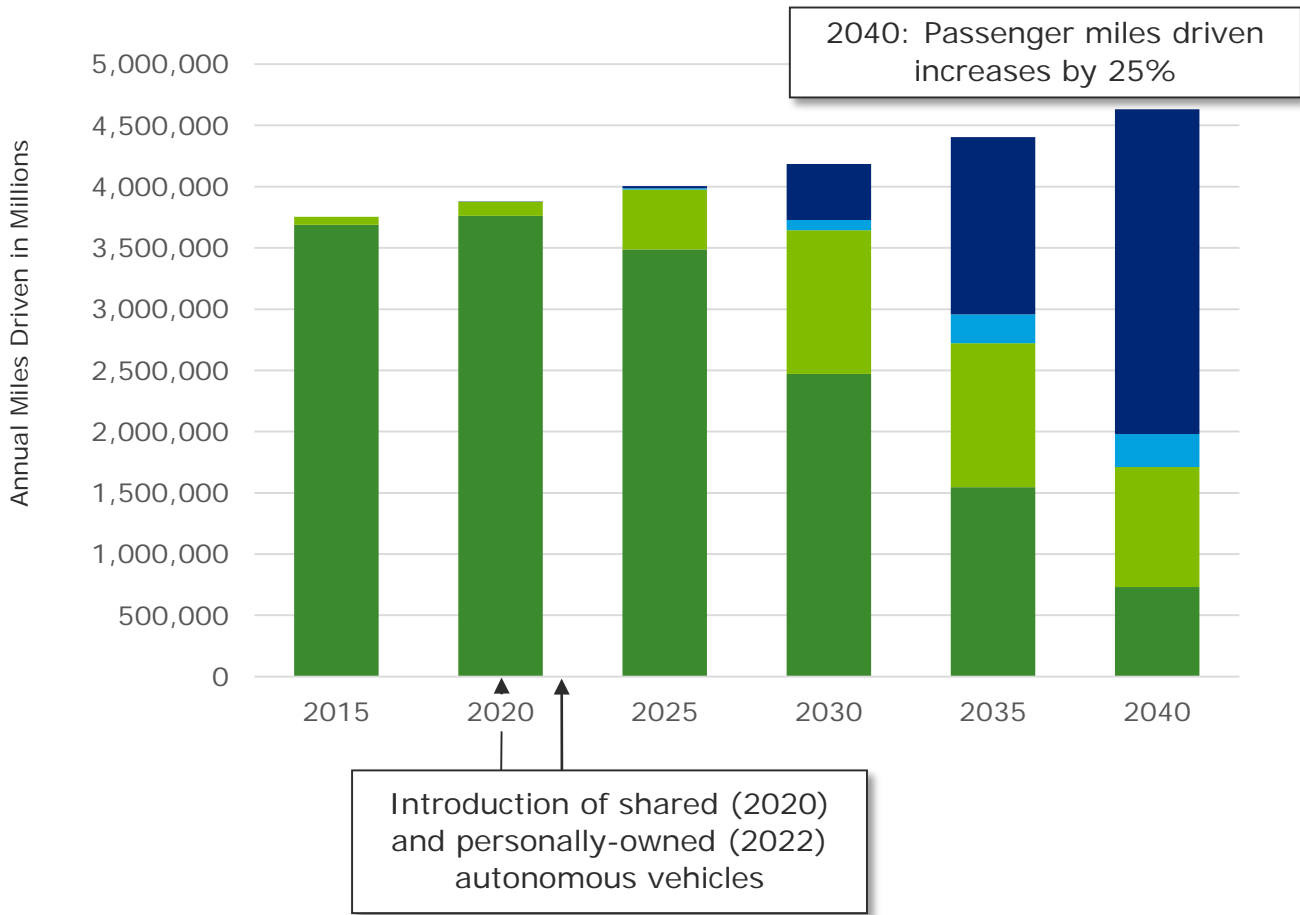
Fully autonomous drive means that the vehicle has full responsibility for controlling its operation. It is fundamentally different from the most advanced form of driver assist.

Extent to which vehicles are personally owned or shared:

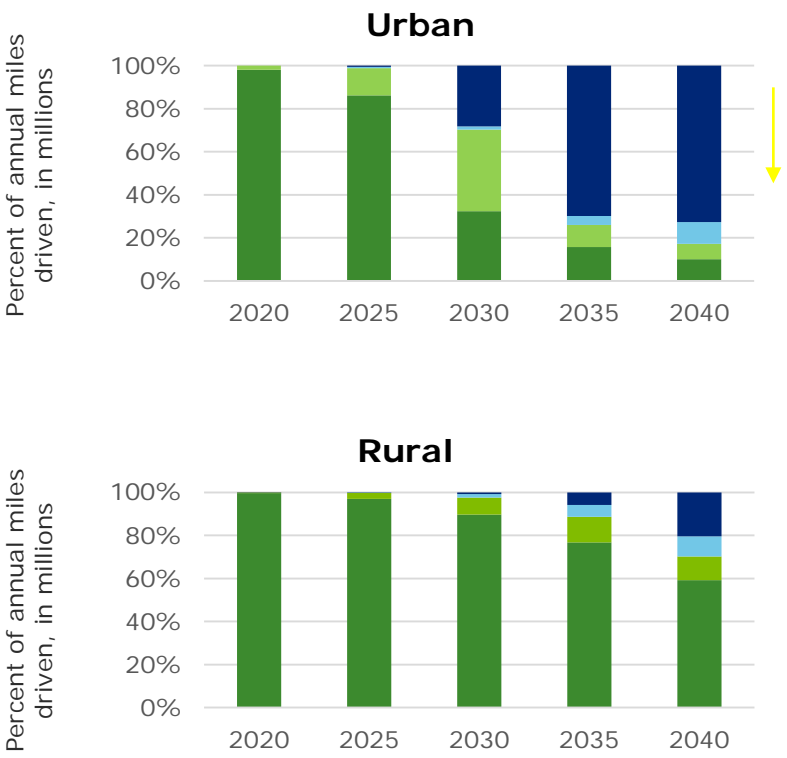
- Depends upon personal preferences and economics
- Higher degree of shared ownership increases system-wide asset efficiency

Our forecasts estimate an increase in total miles traveled, a decline in overall vehicle sales, and faster shifts in urban centers towards AVs and shared vehicles

People Miles Driven by Future State



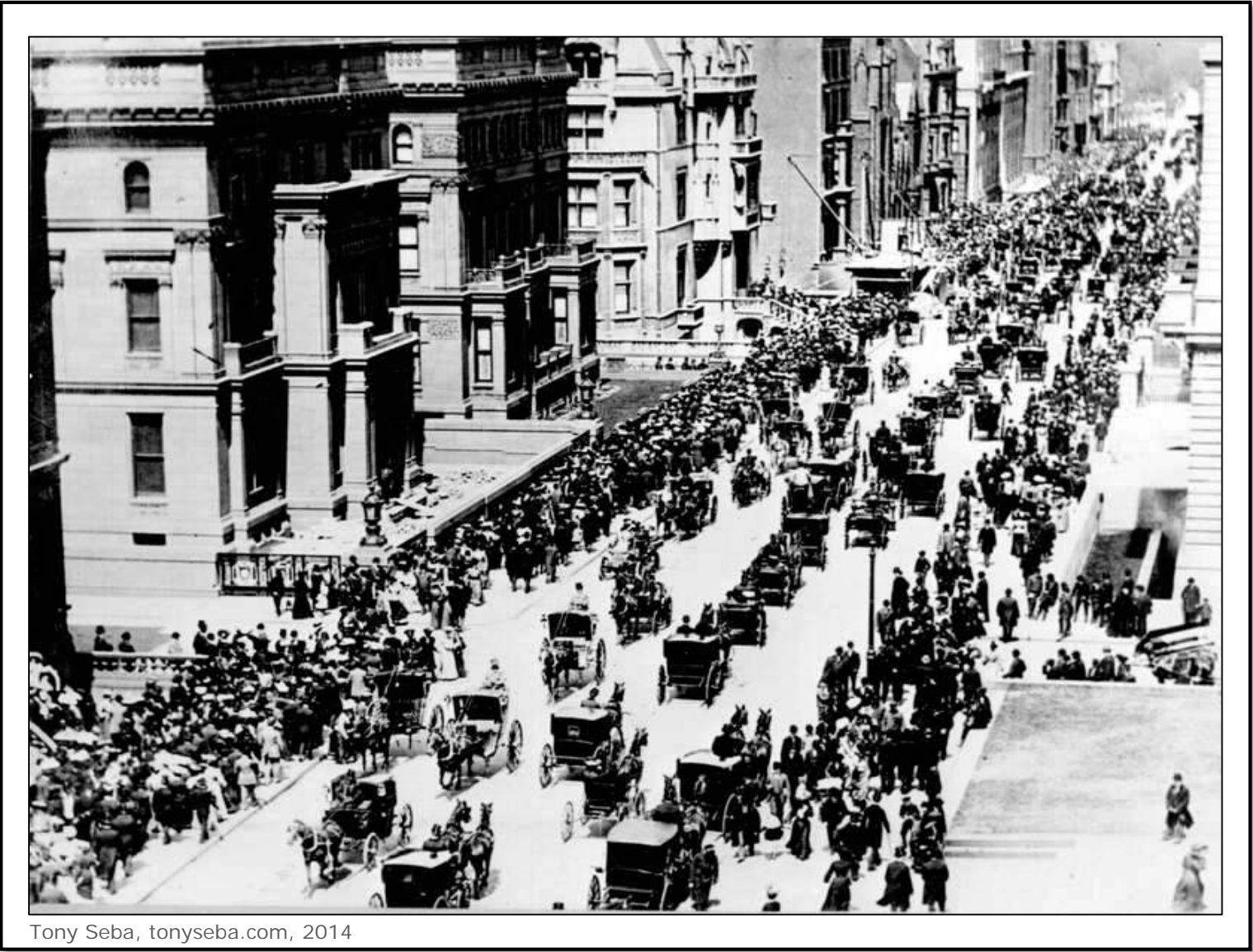
Adoption by Geography



■ Personally owned driver-driven
 ■ Shared driver-driven
 ■ Personally owned autonomous
 ■ Shared autonomous

Source: Scott Corwin, Nick Jameson, Craig Giffi, and Joe Vitale, *Gearing for change: Preparing for transformation in the automotive ecosystem*, Deloitte University Press, September 29, 2016.

Easter Sunday, Fifth Ave., New York City, 1900



Tony Seba, tonyseba.com, 2014

Easter Sunday, Fifth Ave., New York City, 1913



There are a number of forces that will influence the rate at which the new mobility ecosystem takes shape

Forces of Delay or Acceleration



Regulation & Government

Federal, state and local policies



Privacy and Security

Cyber-security, communication protocols



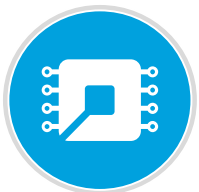
Public Attitudes

Human-machine interface, safety, shared economy



Wall Street Valuations

Technology investments, cost of capital projections



Technology Development

Early experiments, pilot programs



Employment Changes

Dislocation effects, reactions, job retraining

Source: Corwin, Vitale, Kelly, Cathles, *The future of mobility*.

Let us explore how people will likely experience a seamless intermodal journey in the future



Meet Ben...

...he is a millennial living just outside the city

...he wants to pick up groceries

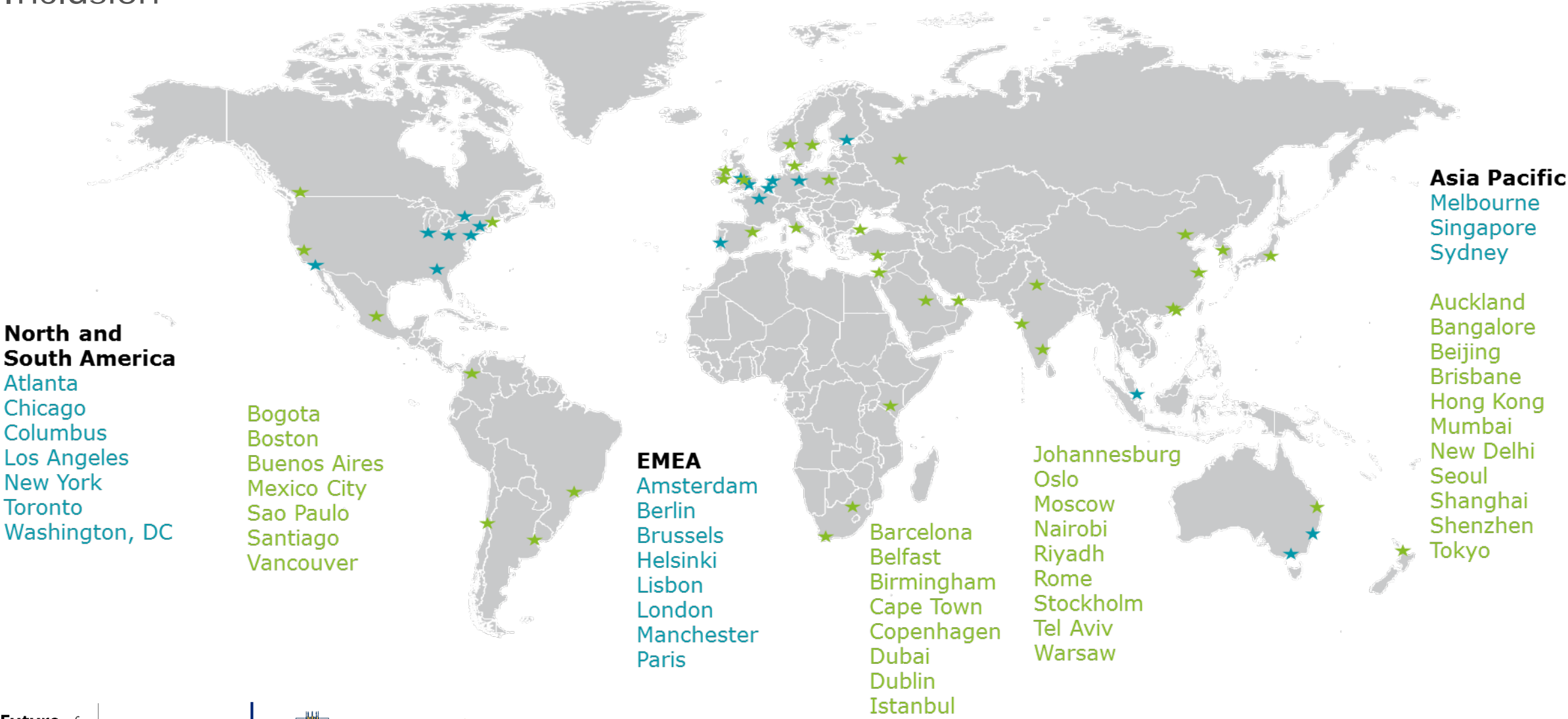
...he is ready go home after a long day at work

Let's explore his journey home and the supporting ecosystem



The Deloitte City Mobility Index – A global initiative covering 54 cities in 2018

Three key themes: Performance & Resilience, Vision & Leadership, and Service & Inclusion



Across our 54 cities, several key points stood out in the initial findings

1. What's past is prologue

History plays a role—but is not destiny

- Current transport systems are a result of decisions made over years
- Authorities must tackle and transform existing systems
- Cities can overcome past legacies with innovative approaches



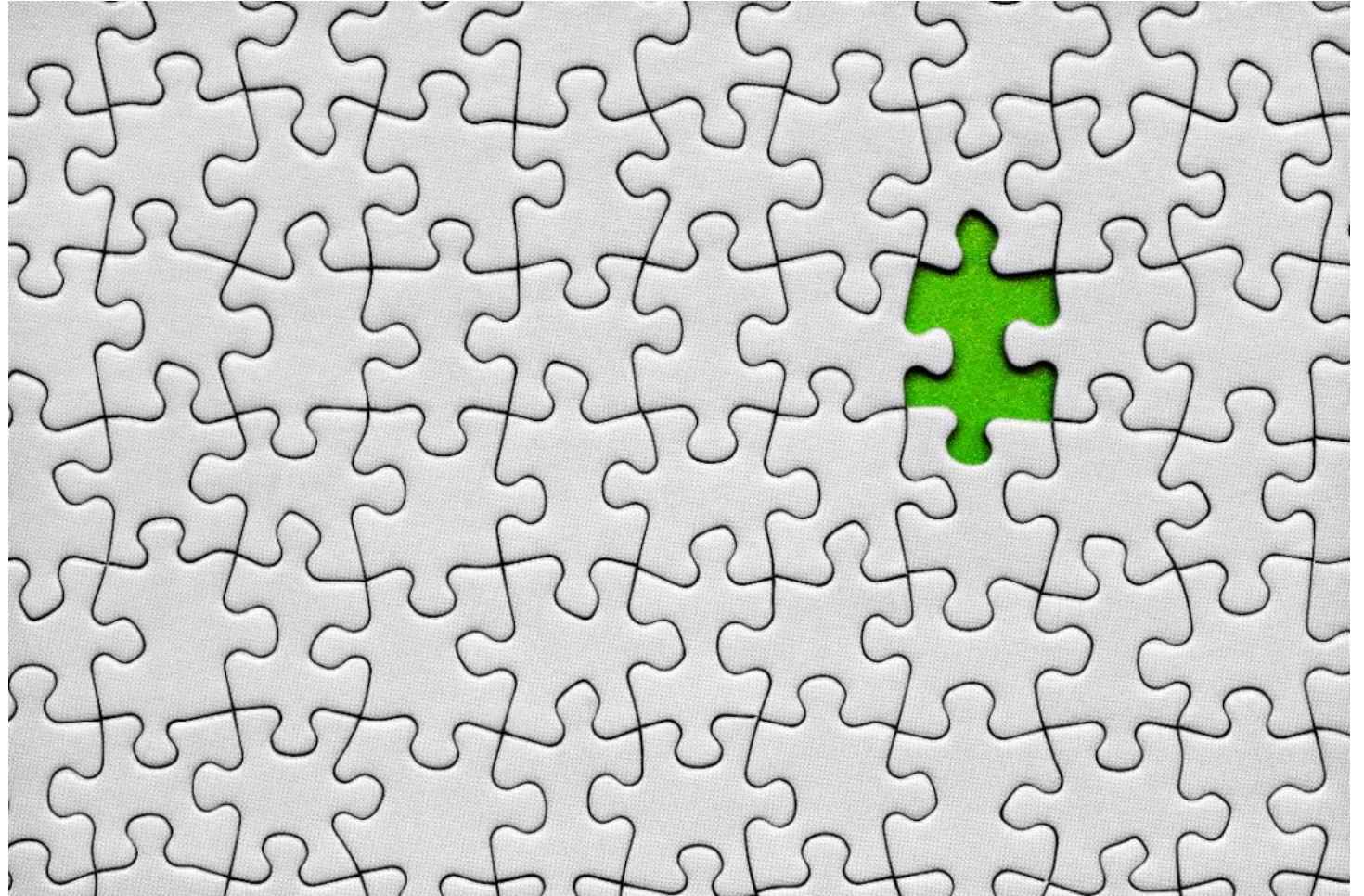
<http://www.deloitte.com/insights/city-mobility-index>

Across our 54 cities, several key points stood out in the initial findings (cont.)

2. Integration is key

Include a wide range of players

- Good coordination should exist between different players:
 - central/local,
 - public/private,
 - suburb/city,
 - regulator/operator
- This makes it easier to join up
 - Timetables
 - Transport modes
 - coverage
 - payment systems



Across our 54 cities, several key points stood out in the initial findings (cont.)

3. Cars do have a role

But they must be managed

- Can be utilized as part of wider, integrated system
- Can play an important role in first-mile/last-mile journeys
- They must be “right-sized” for the local conditions:
 - infrastructure,
 - commuter culture,
 - who they share the road with



<http://www.deloitte.com/insights/city-mobility-index>

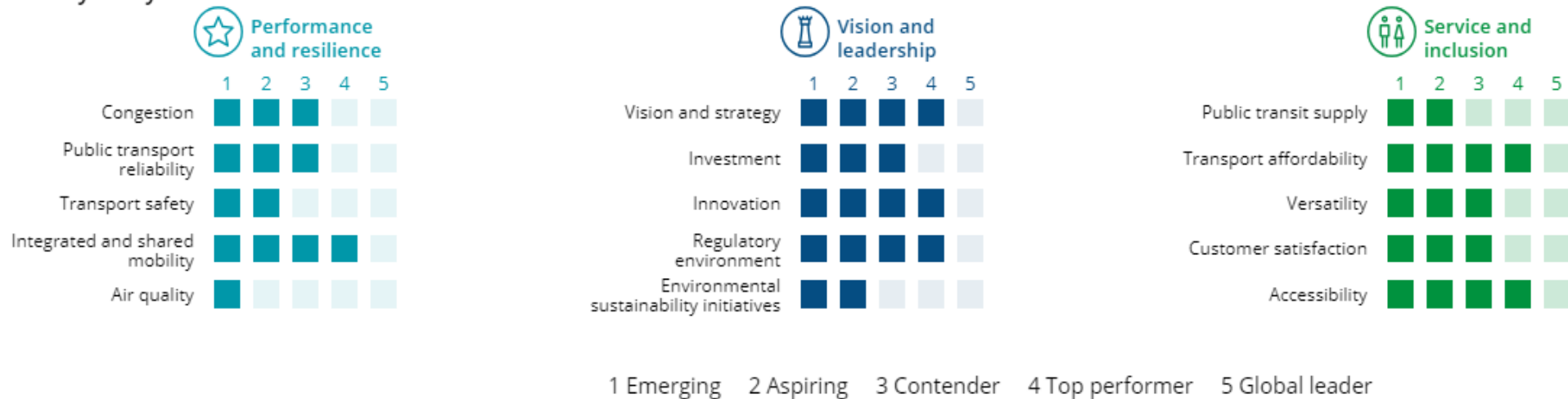
Chicago

Download city profile

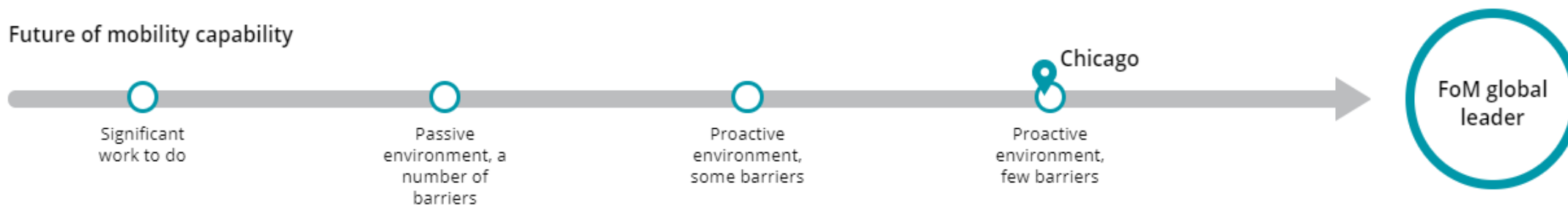
Analysis area 6,326 km² Population 8,660,237 Population density 1,369/km²

Definition of analysis area Chicago, IL-IN urbanized area (includes city area and surrounding suburban regions)

Mobility analysis



Future of mobility capability



Chicago has an extensive and affordable public transport system that is well-integrated, secure, and easy to use. Still, the majority of Chicagoans choose to drive. It has strong leadership that promotes public transport as the preferred mode and ambitious targets for digital and technological options.

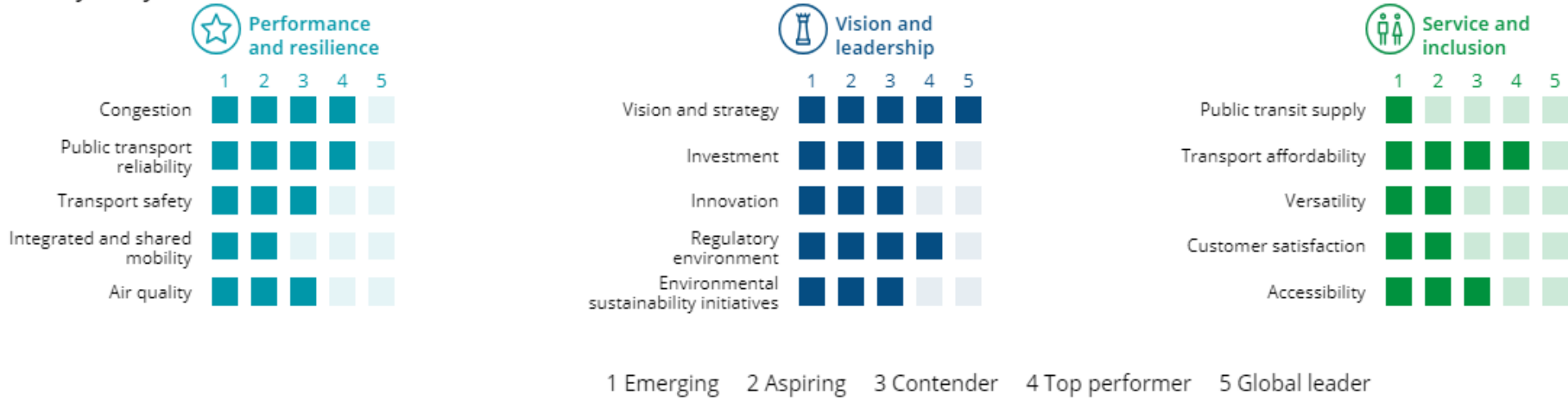
Columbus

Download city profile

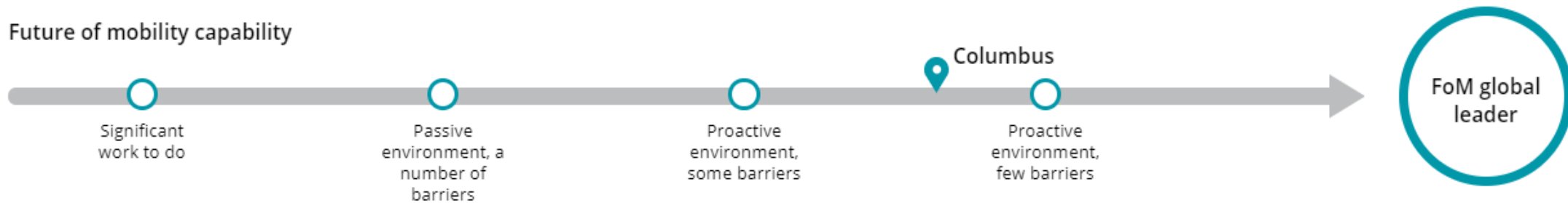
Analysis area 1,322 km² Population 1,515,000 Population density 1,146/km²

Definition of analysis area Columbus, OH urbanized area as designated by US Office of Management and Budget (includes city area and surrounding suburban regions)

Mobility analysis

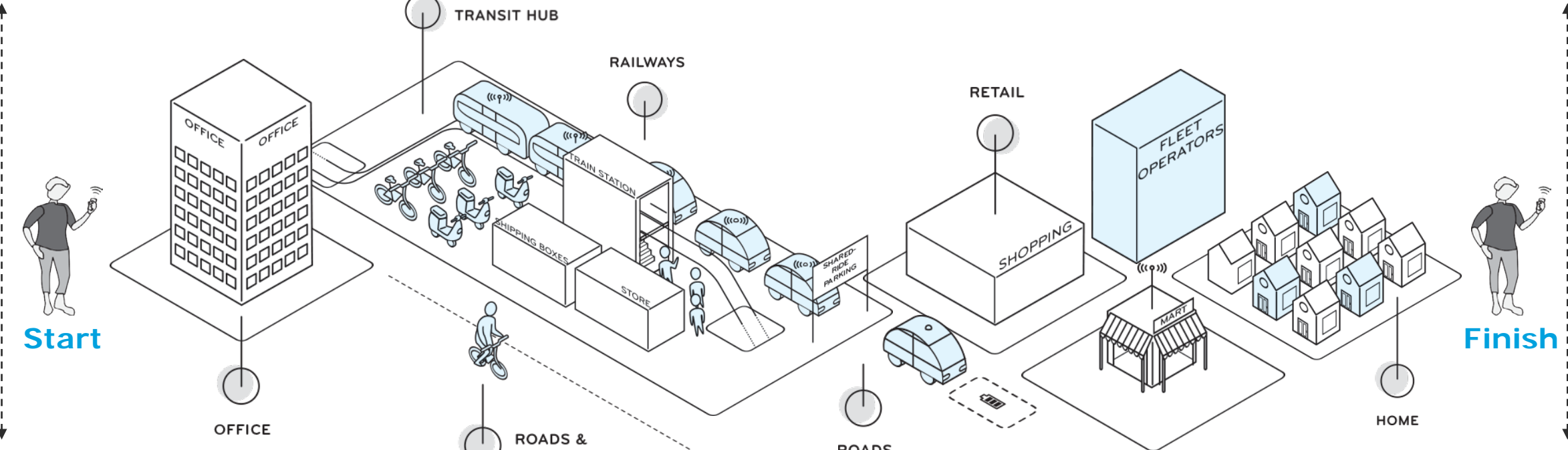
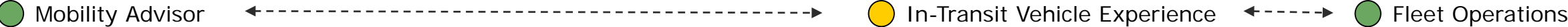
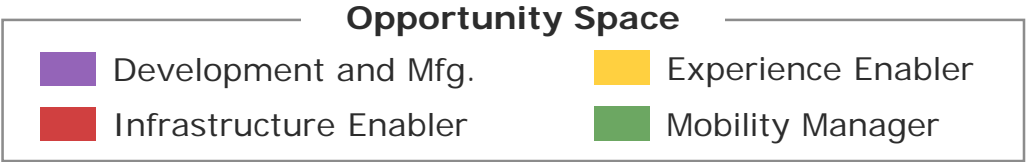


Future of mobility capability



To date, congestion and pollution have been managed, but with a growing population this will not always be the case. Columbus already scores poorly on quality-of-life indicators, and these problems are likely to be exacerbated in the future absent investment in more accessible and active modes of transport. The award of the Smart City Challenge fund has the potential to transform Columbus's transport system.

A new mobility ecosystem will emerge delivering seamless intermodal transportation faster, cheaper, and safer than today





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