

THE FUTURE OF MOBILITY

TRENDS IN SHARED-USE MOBILITY
AND EMERGING TECHNOLOGIES

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THE FUTURE OF MOBILITY, AIR QUALITY, AND HEALTH

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UNIVERSITY OF CALIFORNIA *Berkeley*
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RESEARCH CENTER

OVERVIEW

- Demographic and Technological Trends
 - User behaviors and preferences
 - Millennials
 - Role of mobile and Internet technologies
- Shared-Use Mobility: Market Trends, Impacts, and Highlights
 - Definition
 - Carsharing
 - Bikesharing
 - Ridesharing, ridesourcing, for-hire vehicle services
- Connected Vehicles
- Acknowledgments

USER BEHAVIORS AND PREFERENCES

- Increasingly complex travel behaviors such as trip chaining and multi-tasking
- Transportation is used to email, work, socialize, and exercise

Health Impacts

- Increased exercise, mostly walking, shown to reduce health issues related to knee arthritis, dementia & Alzheimer's, diabetes, anxiety, depression, fatigue, and hip fracture risk
- Less auto use results in improved air quality

WALKING AND CYCLING TRENDS



Born between 1981-2000

30% OF CANADA'S POPULATION



Source Stats Canada, July 2012.

\$237B

ESTIMATED INCOME

21%

OF ALL INCOME EARNED
IN CANADA

75%

OF THE LABOUR FORCE
IN THE NEXT 15YRS

TCRP REPORT: MILLENNIALS & MOBILITY

Key Findings:

- Cost, convenience, & exercise are the top motivators for Millennials' transportation choices
- Multi-modality being driven by cost, convenience, and time-saving
- Attracted to mobile & digital services that provide detailed, real-time and multi-modal trip-planning information
- The decision to drive is largely about avoiding hassles — (finding parking, avoiding tolls, etc.)

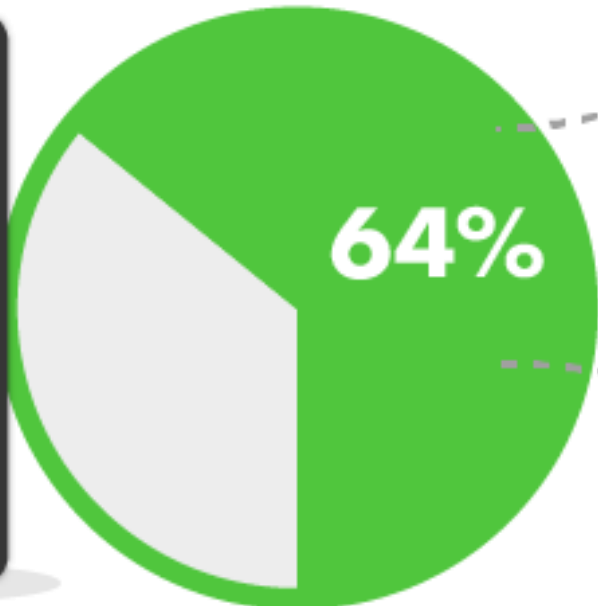
TCRP REPORT: MILLENNIALS & MOBILITY

Key Findings Continued:

- Millennials are multi-tasking — constant internet connectivity and the ability to multitask while commuting is key
- Environmental considerations are a plus but not a core motivator

SMARTPHONE PENETRATION **SOARS TO 64%** OF ADULTS IN BRITISH COLUMBIA, CANADA

UP FROM 37%
IN MARCH 2011



BY AGE



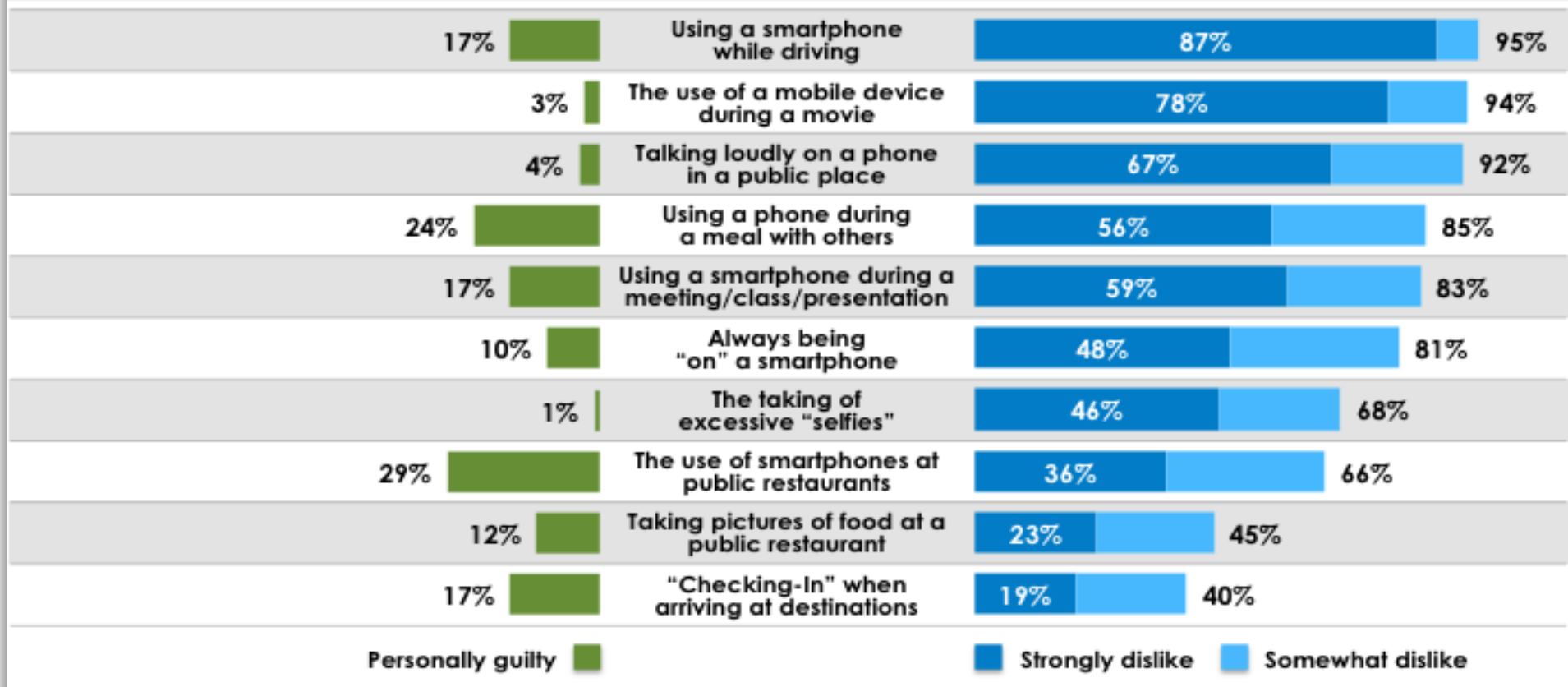
BY GENDER



Males and
18-34 year
olds are
leading the
charge.



Smartphone users report strong “Pet Peeves” with other mobile users. Only a small percentage of users admit to being guilty of the same actions.



Simplified Understanding



ROLE OF MOBILE & INTERNET TECHNOLOGIES

- Demographic shifts, improvements in computing power and mapping technology, the advent of ‘cloud’ computing, developments in wireless communications are impacting **how we travel**
- Increasing use of mobile “apps” for transportation functions
 - Vehicle routing
 - Real-time data on congestion, roadway incidents and construction, and parking availability
 - Trip planning
 - Ridesharing, ridematching, and for-hire vehicle services
 - Multi-modal routing and trip aggregation



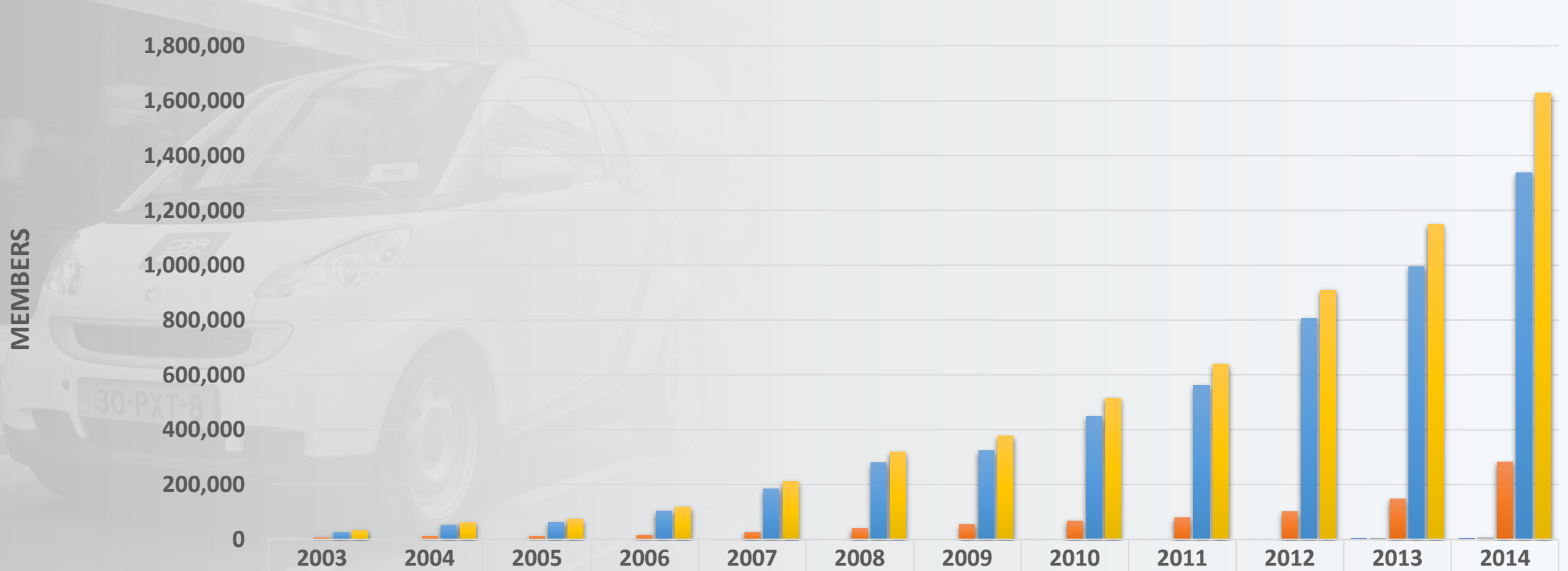
WHAT IS SHARED-USE MOBILITY?

Shared-use mobility - ***the shared use of a motor vehicle, bicycle, or other low-speed mode*** - is an innovative transportation solution that enables users to gain short-term access to transportation modes on an “as-needed” basis

CARSHARING



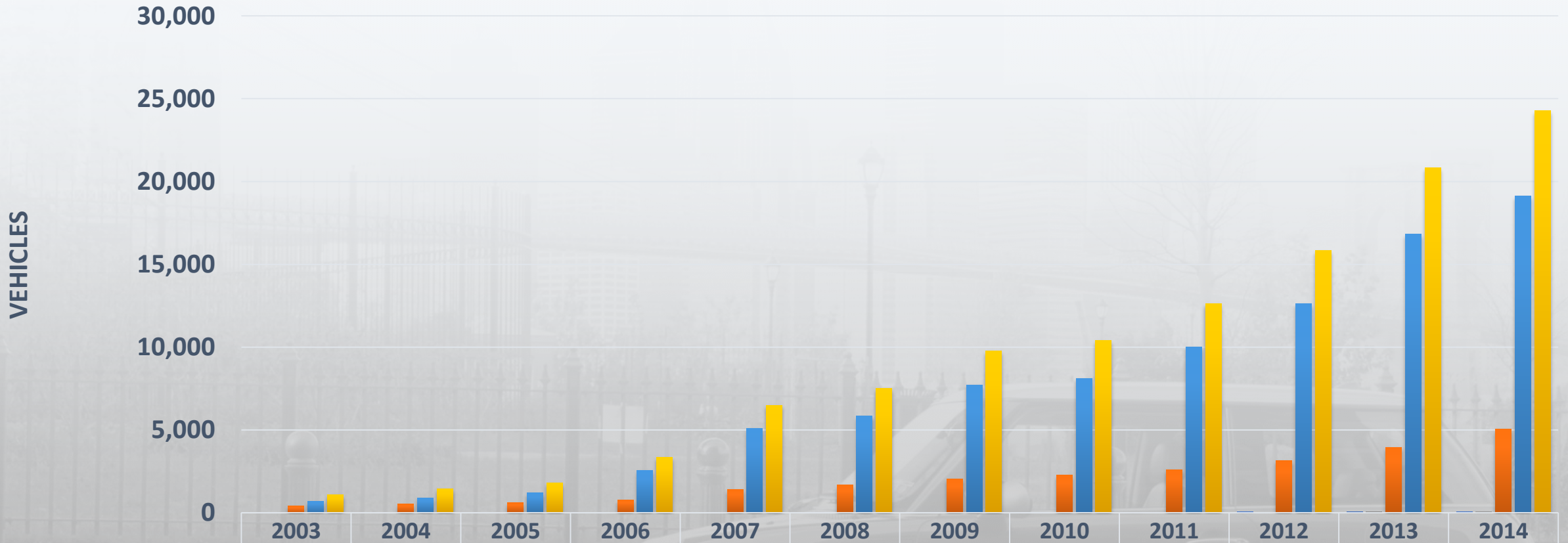
CARSHARING MEMBERSHIP GROWTH: AMERICAS



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
■ Brazil (n=1)								98	347	910	2,884	2,857
■ Mexico (n=1)										750	2,654	6,174
■ Canada (n=20)	7,007	10,001	11,932	15,663	26,878	39,664	53,916	67,526	78,856	101,502	147,794	281,675
■ United States (n=23)	25,640	52,347	61,658	102,993	184,292	279,234	323,681	448,574	560,572	806,332	995,926	1,337,803
■ The Americas (n=45)	32,647	62,348	73,590	118,656	211,170	318,898	377,597	516,198	639,775	909,494	1,149,258	1,628,509

Shaheen and Cohen, 2014

CARSHARING VEHICLE GROWTH: AMERICAS



	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
■ Brazil (n=1)								12	18	58	46	56
■ Mexico (n=1)											40	47
■ Canada (n=20)	397	521	599	779	1,388	1,667	2,046	2,285	2,605	3,143	3,933	5,048
■ United States (n=23)	696	907	1,192	2,561	5,104	5,840	7,722	8,120	10,019	12,634	16,811	19,115
■ The Americas (n=45)	1,093	1,428	1,791	3,340	6,492	7,507	9,768	10,417	12,642	15,835	20,830	24,266

2008 NORTH AMERICAN CARSHARING SURVEY: KEY FINDINGS

- Between **9 to 13 vehicles removed**, including postponed purchase
- **4 to 6 vehicles**/carsharing vehicle **sold** due to carsharing
- 25% sell a vehicle; 25% postpone purchases
- **27 - 43% VMT/VKT** reduction per year, considering vehicles sold and purchases postponed
- More users increased overall public transit and non-motorized modal use (including bus, rail, walking, and carpooling) than decreased it

2008 NORTH AMERICAN CARSHARING SURVEY: KEY FINDINGS

- Net CO2 reduction of **~27%**
- Reduction of **0.58-0.84 metric tons of GHG** emissions per year for one household (mean observed and full impact)
- 34% - 41% reduction of **GHG** emissions per year for one household
- \$154 - \$435 monthly household savings per U.S. member after joining carsharing



CARSHARING HIGHLIGHTS: 2015

- E-bikesharing and carsharing to launch in SF Bay Area
- New entrants and the growth of one-way and electric service models:
 - Shift (Las Vegas, NV)
 - BlueIndy (Indianapolis, IN)
- Expansion of airport-based p2p FlightCar, providing p2p carsharing at nine international airports
- Fractional ownership through Audi “Unite”

(Shaheen, 2015)

BIKESHARING

BIKESHARING IMPACTS

- Studies have shown that bikesharing members in larger cities ride the bus less, attributable to reduced cost and faster travel associated with bikesharing
- Rail usage increased in small cities (Minneapolis-St. Paul) and decreased in larger cities (Mexico City, Montreal, and Washington D.C.) – all larger regions with denser rail networks
 - Shifts away from public transit in urban areas are often attributed to faster travel times and cost savings from bikesharing use

WORLDWIDE, CANADA, AND U.S. BIKESHARING: DECEMBER 2014

Worldwide: **835 cities** with IT-based operating systems

- **946,000 bikes**
- **45,104 stations**

Canada: **4 cities** with IT-based systems

- **6,340 bikes**
- **532 stations**

U.S.: **68 cities** with IT-based systems

- **22,000 bikes**
- **2,266 stations**



Source: Russell Meddin, 2015

BIKESHARING HIGHLIGHTS: 2015

- Recent Launch of North American Bikeshare Association (NABSA)
- Campus-based systems (Zagster, SoBi)
- Free-floating bikesharing (SoBi)
- p2p Bikesharing (Spinlister)
- E-bikesharing & carsharing
- Keyless bike locks (e.g., BitLock)



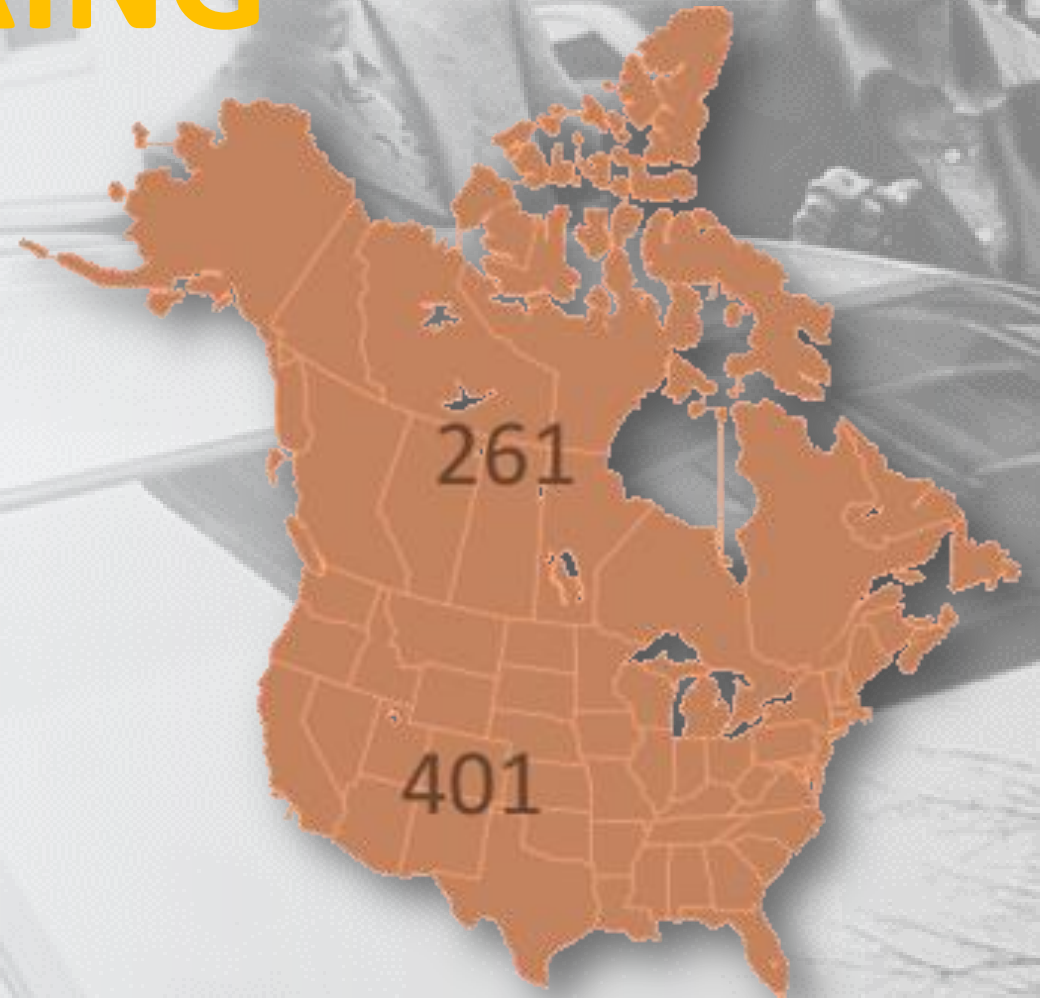
(Shaheen, 2015)

RIDESHARING AND FOR-HIRE VEHICLE SERVICES



CLASSIC RIDESHARING

- Grouping of travelers into common trips by private auto/van (e.g., carpooling and vanpooling)
- Historically, differs from ridesourcing in financial motivation and trip origin/destination
- 662 ridematching services in the U.S. and Canada (24 span both countries)
 - 612 programs offer carpooling
 - 153 programs offer vanpooling
 - 127 programs offered carpooling and vanpooling



Chan and Shaheen, 2011

BLURRING LINES

- Sharing a ride no longer requires prearrangement or street hails
- Mobile technology and social networking can facilitate finding a ride in real-time (e.g., app-based taxi dispatch or “e-hail”)
- Companies testing ridesplitting within ridesourcing: Lyft Line, Sidecar Shared Rides, uberPOOL
- Less distinction among classic ridesharing, ridesourcing, and commercial transportation

(Shaheen, 2015)

TRANSPORTATION NETWORK COMPANIES (TNCS) AND RIDESOURCING

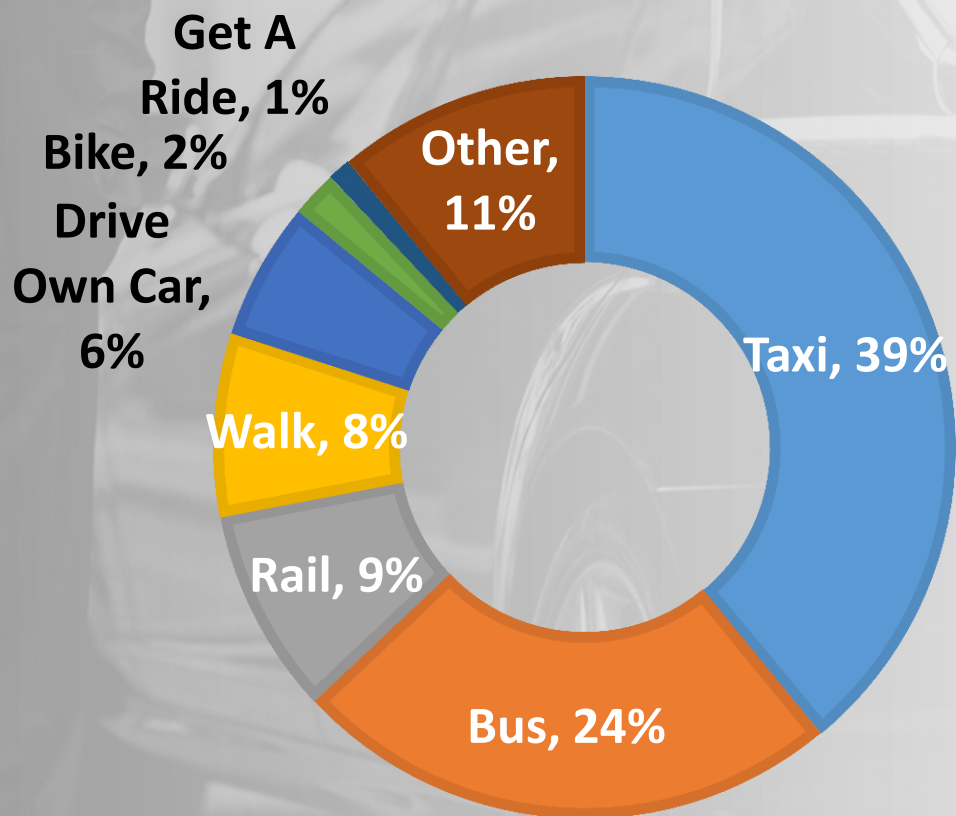
- Platform used to “source” rides from a driver pool
- App-based, on-demand ride services
- Transportation Network Companies (TNCs)
 - Uber (uberX and uberXL)
 - Lyft
 - Shuddle
 - Sidecar
 - Summon
 - Wingz



(Shaheen, 2015)

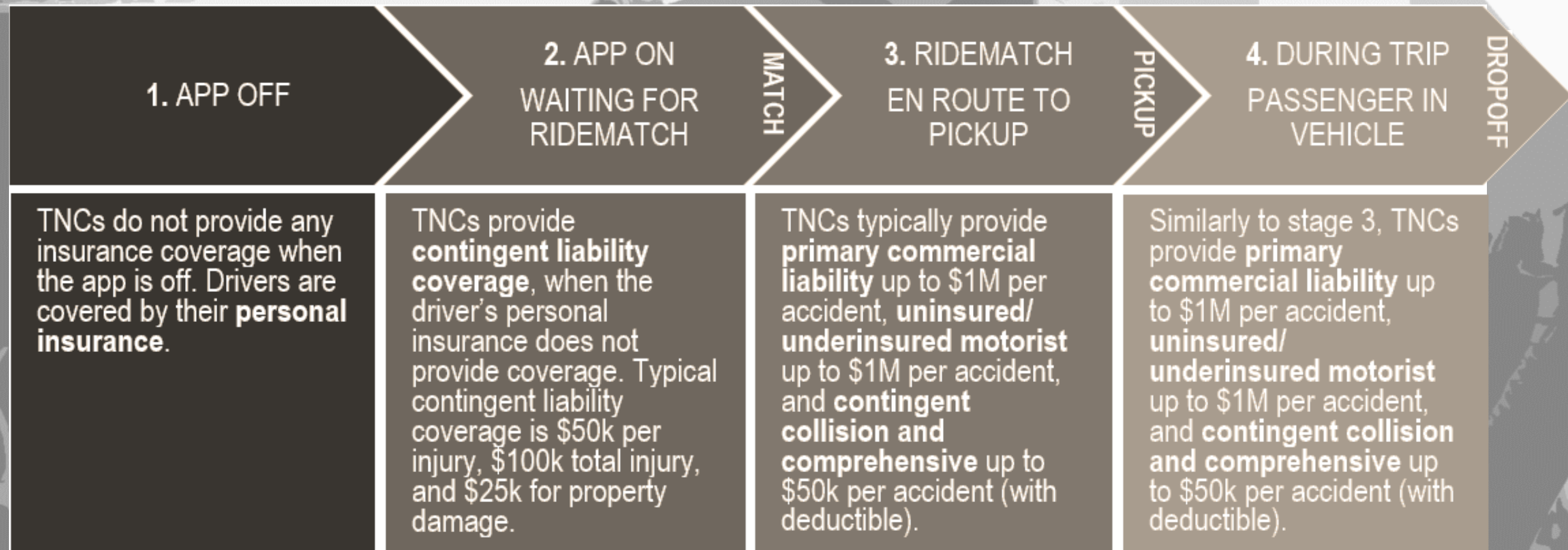
RIDESOURCING: SOME EARLY UNDERSTANDING

How would you have made this trip if Uber/Lyft/Sidecar were not available?



- 92% would have still made this trip
 - 8% induced travel effect
- 33% would have taken public transit (bus or rail)
- 4% named a transit station origin/destination, suggesting some ridesourcing usage to access public transportation
- 20% avoided driving after drinking.

INDUSTRY DEVELOPMENTS: INSURANCE



INDUSTRY DEVELOPMENTS: MERCING INNOVATIONS

- **Ridesplitting** within TNCs/ridesourcing
 - Lyft Line
 - Sidecar Shared Rides
 - uberPOOL
- **Via** in Manhattan merges aspects of taxi, TNCs/ridesourcing, and ridesplitting
 - Drivers and vehicles contracted to taxi/limo company
 - Flat-rate fares with set zone and operating hours
 - Shared rides with others going similar direction

(Shaheen, 2015)

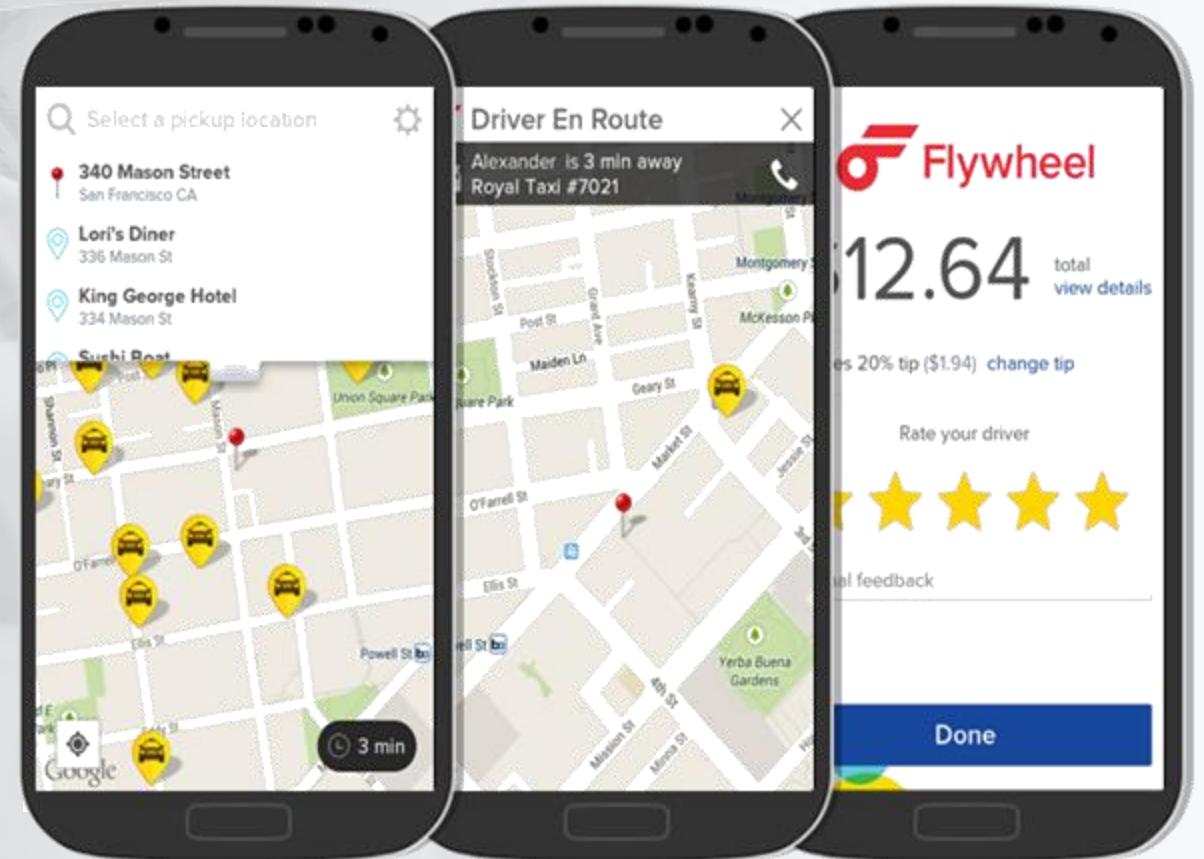
INDUSTRY DEVELOPMENTS: COMMUTER CARPOOLING

- **Carma** targeting longer commute trips with app-based, real-time carpooling
 - Experimenting with bridge toll reimbursement for Bay Area carpools
- **CarmaHop** in Lawrence, KS: riders write destination on whiteboard and record trip on smartphone, drivers pick up along the way
- **Commutr** replicating casual carpooling/slugging on a smartphone, beta testing this winter

(Shaheen, 2015)

INDUSTRY DEVELOPMENTS: TAXIS

- **Taxis** starting to compete with TNCs/ridesourcing
 - E-Hail apps (e.g., Curb, formerly Taxi Magic, Flywheel)
 - Employ peer-to-peer drivers (e.g., Yellow X)
 - Potential for less regulation from municipalities (e.g., lift limits on taxi permits)



(Shaheen, 2015)

RIDESHARING/RIDESOURCING HIGHLIGHTS: 2015

- Ridesourcing appears to be meeting a latent demand for urban travel, with short wait times and point-to-point service
- Impacts to congestion and VMT/VKT still uncertain, due to lack of available data
- Emerging public policy focused on insurance coverage, driver and vehicle safety checks, and taxi competition
- More research needed to inform future regulation for taxis and TNCs

(Shaheen, 2015)

CONNECTED VEHICLES

Wide range of technologies aimed at improving safety, efficiency, and convenience of surface transportation network including:

- Electronics,
- Information processing,
- Wireless communications, and
- Controls



4 LEVELS OF VEHICLE AUTOMATION

Level 1: One or more specific functions (e.g., vehicle automatically assists with braking)

Level 2: Combined function automation (2 or more control functions working together; e.g., adaptive cruise control + lane centering)

Level 3: Limited self-driving automation (e.g., Google car)

Level 4: Full self-driven automation (i.e., driver not expected to do any control functions during trip)

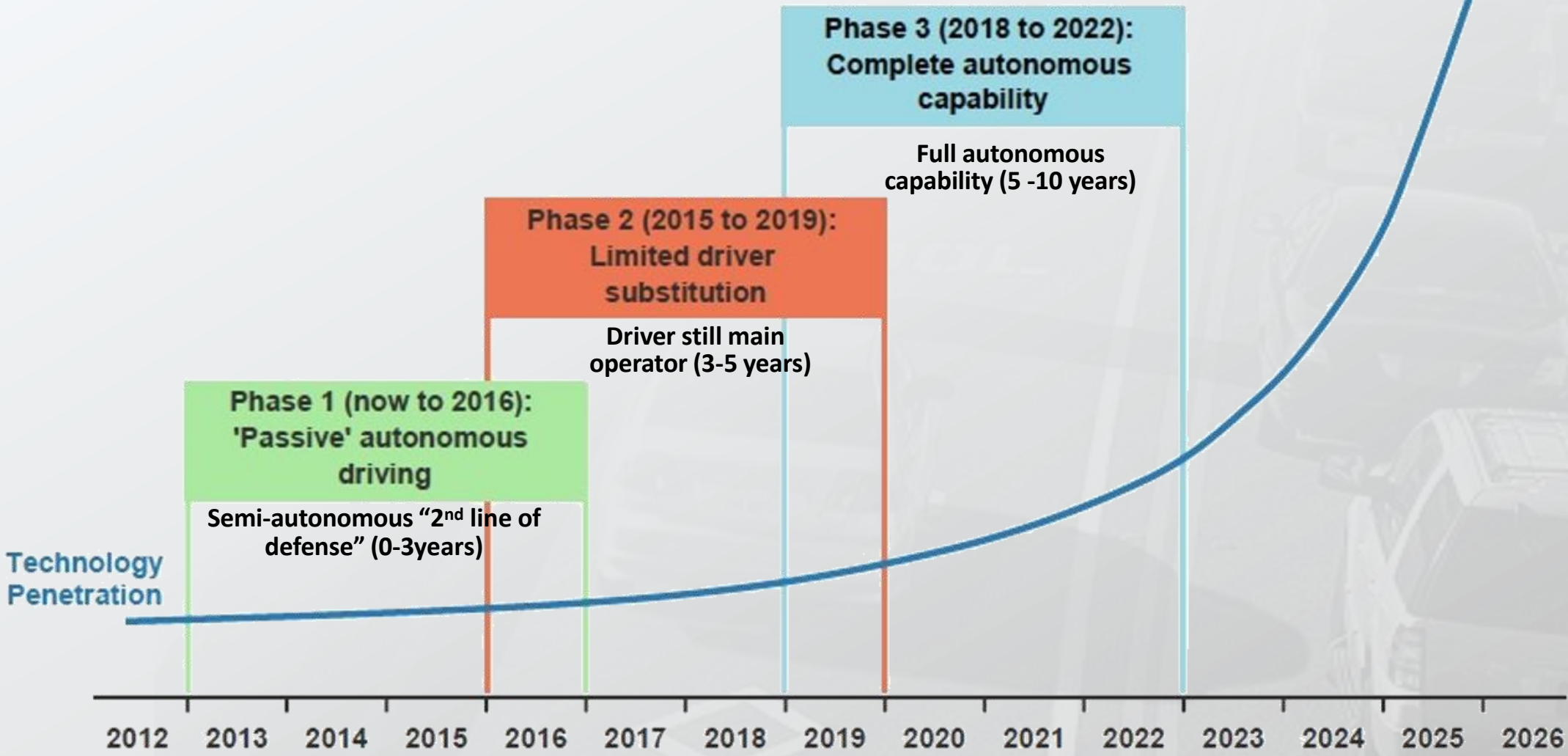
U.S. DOT, May 2013



ADOPTION TIMELINE

Phase 4 (two decades):
100% autonomous
penetration, utopian
society

Cost to customer at
today's prices: \$10K

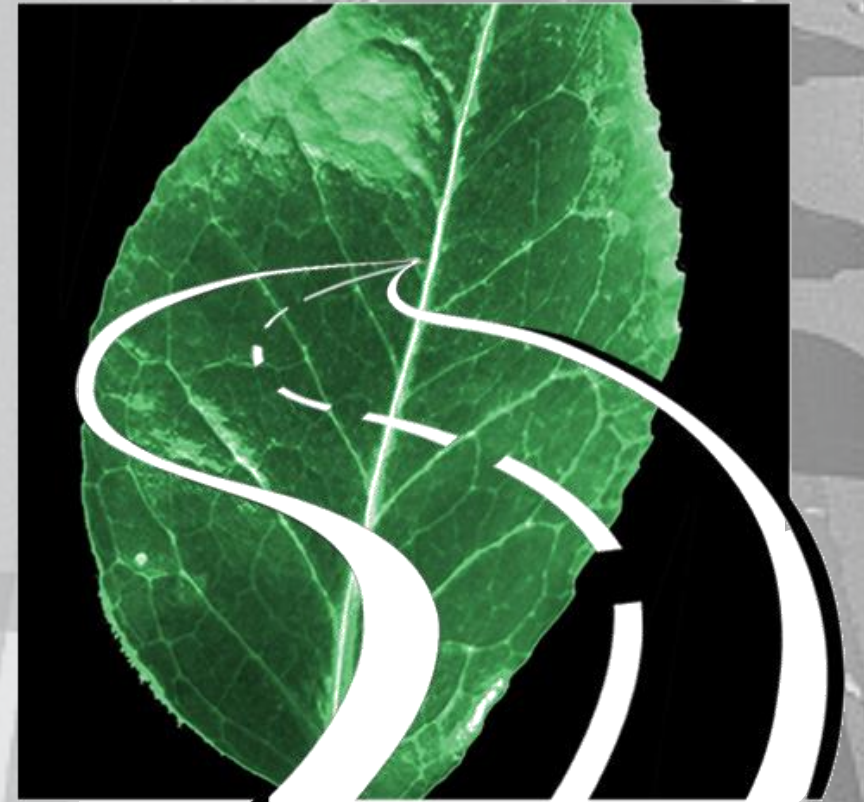


SUMMARY

- Paradigm shift: access trumps ownership
- Millennial demographic
- Increasing role and importance of smartphone and web-based technologies
- Definition of shared-use mobility
- Highlights, trends and impacts of common shared-use service models
- Blurring lines between existing services and new models
- Connected vehicles

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