

The Future of Moving People



ESI THOUGHTLAB

DVRPC Futures Group Presentation
December 11, 2018

Smarter Cities 2025



Project overview

A smart city is not just about technology. It is about making smart decisions across a range of areas, from economic and environmental sustainability, to business and government, to people and living standards.

Our study addresses key questions facing today's local government and business leaders:

- What are the characteristics of successful smart cities?
- In what ways will smarter cities create value for consumers, businesses, and local governments?
- Do cities need to get smarter?
- What is the return on smart city investments?
- What technological solutions can cities apply to improve economic opportunity and living standards for all citizens?
- How can cities transform themselves into future hubs of talent, business, and innovation?
- How can smart cities fund their future plans?

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Ten pillars of smart cities

- 1. Smart economy** – the use of data and technology to drive commerce, industry development, trade linkages, and economic performance.
- 2. Smart environment** – improved sustainability, energy use, and resource allocation through innovation and commitment from city stakeholders.
- 3. Smart financing and budgeting** – using data and technology to drive cost efficiencies and develop new sources of revenue that can help fund smart city strategies.
- 4. Smart governance** - enabling businesses and citizens to prosper through digitally enabled government procedures, public services, new partnerships, and models.
- 5. Smart infrastructure** – interconnected infrastructure and equipment that allows optimization of services, including transportation, buildings, energy, and water.
- 6. Smart mobility** – fully integrated end-to-end transportation options, including public and private services across all modes of transportation.
- 7. Smart payment systems** – digital payment systems in cities that enable frictionless transactions between consumers, businesses and government.
- 8. Smart public safety** – the use of advanced data and technology and other innovative solutions to prevent crime and ensure public safety.
- 9. Smart talent** – a strong academic and cultural foundation that attracts the talent and nurtures the skills needed by the private and public sectors.
- 10. Smart public health** – digitally-enabled diagnostic tools, devices, and treatment that improve the quality of life for city dwellers.



Smart Mobility

We surveyed 136 global cities from 55 countries ranging in population from 35,000 to over 37 million.

We choose 11 cities for a deep-dive analysis where we surveyed approximately 200 citizens and 75 businesses in each city.

We focused on the following areas of smart mobility:

Autonomous vehicles: including plans, pilots, and deployment.

Improved traffic management: dynamic traffic lights and signs, variable speed limits, tax incentives for car pooling, cashless toll booths, etc.

Private sector: availability and usage of apps for smart parking, ridesharing, vehicle sharing, and other mobility initiatives.

Public transportation: multi-modal transportation, public transportation app with real time updates, and other mobility initiatives.

Smarter vehicles: tax incentives and subsidies for electric vehicles, electrical vehicle charging stations, etc.

Each area were ranked as follows:

- 0 Have not considered yet, not planning
- 1 Planning stage: Just starting to explore and develop plans
- 2 Implementation stage: Starting to pilot and implement, seeing early results
- 3 Maturing stage: Making good progress on many aspects and seeing tangible results**
- 4 Advanced stage: A best practice area for our city that offers significant benefits**

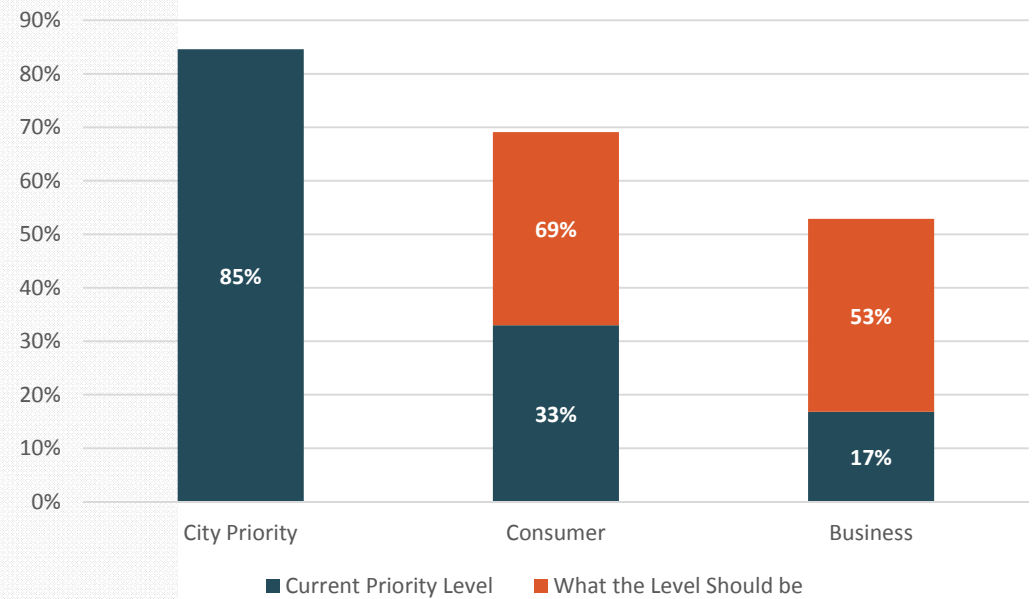


Smart Mobility – Level of Priority – Perception vs Reality

85% of the cities surveyed feel that they are placing a **high or very high priority** on their smart mobility investments.

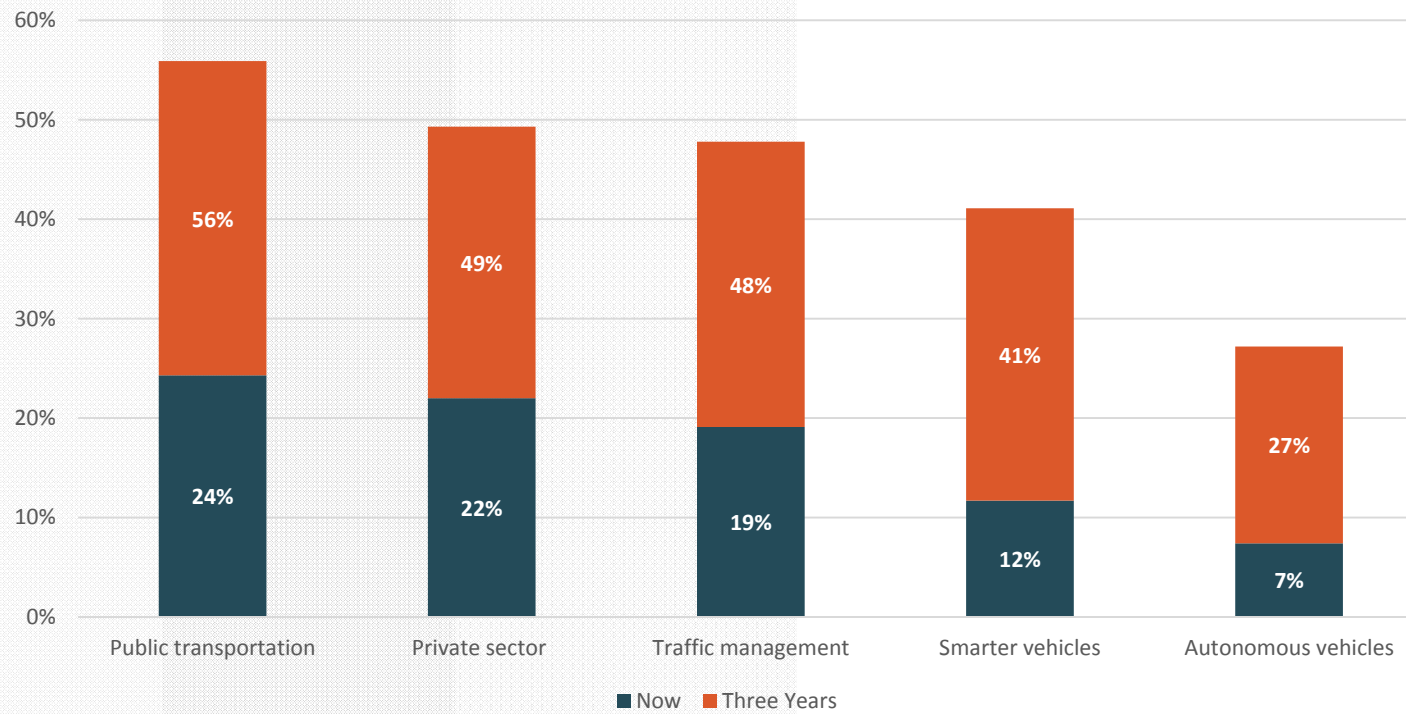
Only **33%** of citizens in our 11 proxy cities feel the same the way. And for businesses the number is even lower – only **17%** of businesses in our 11 proxy cities feel that their city is place a high or very high priority.

However, **69%** of citizens and **53%** of businesses feel that the city should place a high or very high priority on smart mobility investments.





Smart Mobility – Level of Maturity



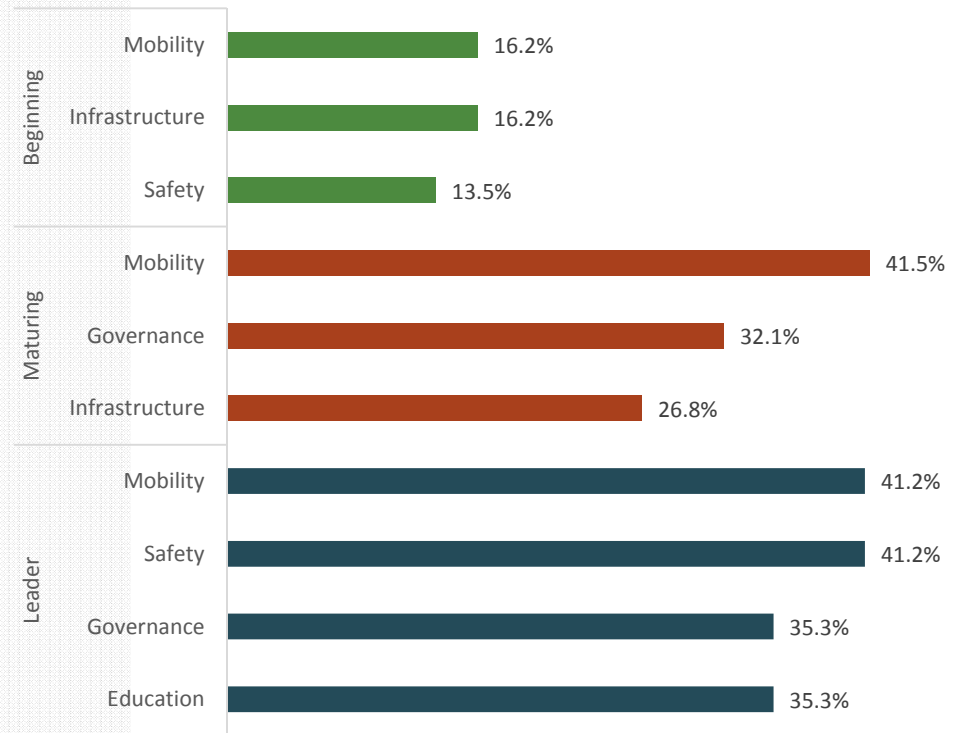


Investments in smart mobility expected to increase across all maturity levels

Cities in all maturity stages plan to make large investments in smart mobility over the next three years.

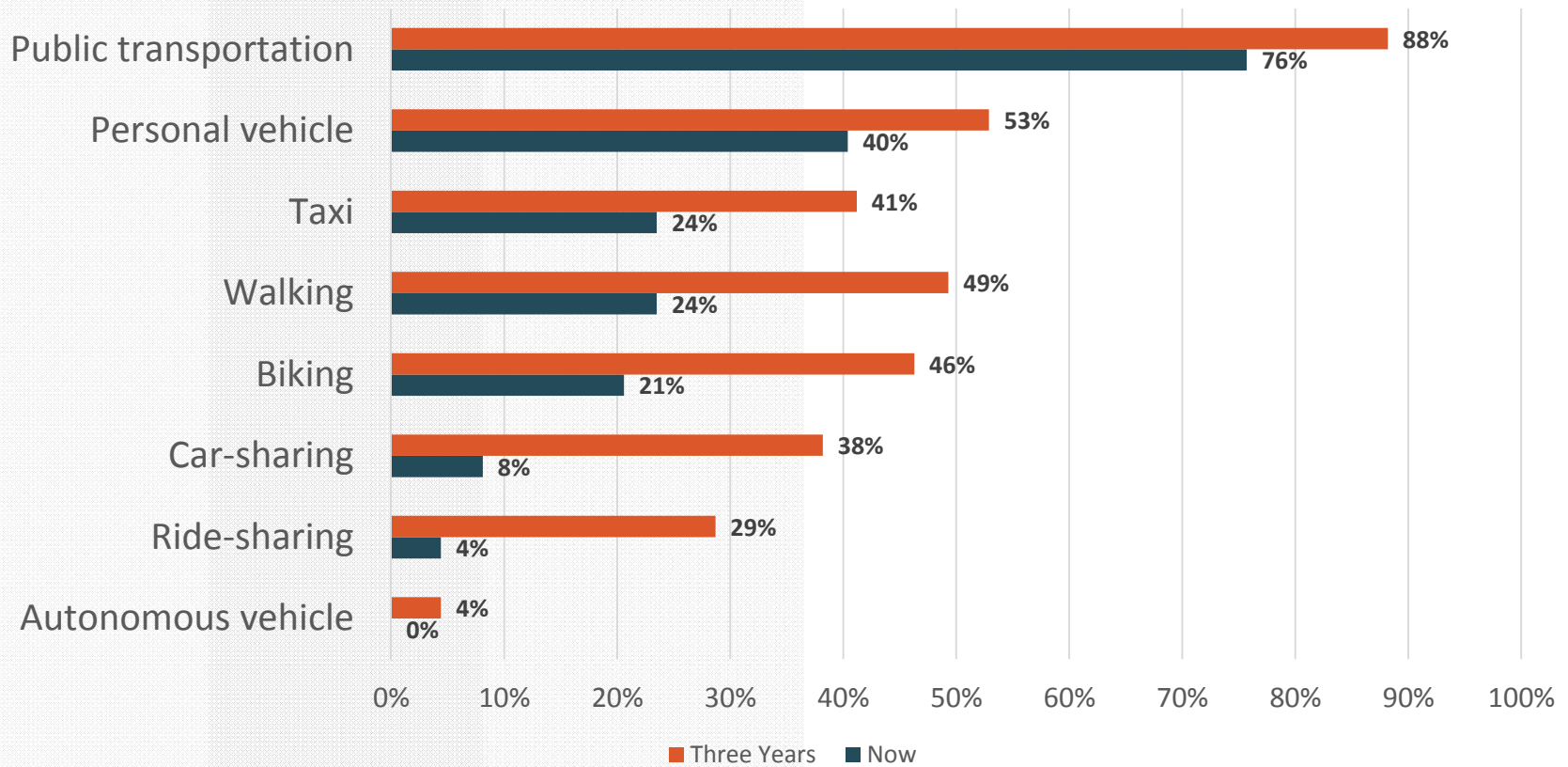
In addition to mobility, maturing and beginning cities will devote more investment to upgrading outdated infrastructure, which is likely tied to mobility as well.

Q: How do you expect your smart city investments to change over the next three years?





The future of mobility will be multi-model





How ride-sharing is changing mobility

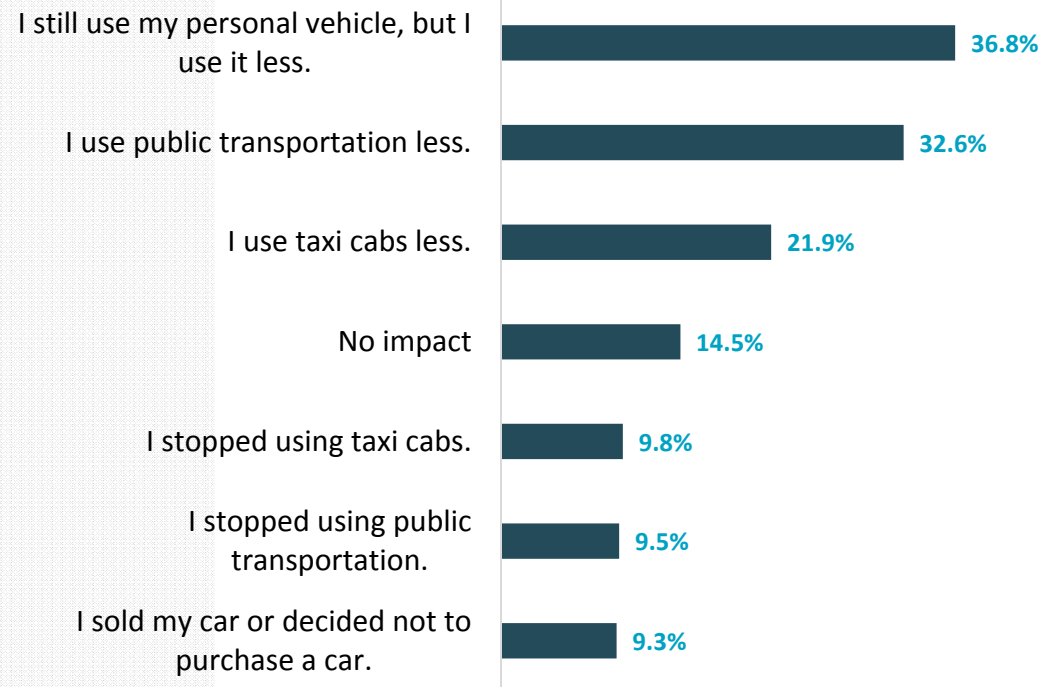
Most citizens in our 11 proxy cities now rely chiefly on public transportation, but they also use ride-sharing apps regularly.

Nearly a third say that ride-sharing apps have decreased their use of public transportation.

Moreover, **36.8%** of citizens across the 11-proxy cities said that ride-sharing has reduced their car usage—and more than **9%** have opted to forgo car ownership as a result.

Q: How have ride-sharing apps changed your behavior?

The impact of ride-sharing apps





Urbanites want investment in a wide array of transportation modes

Over half of the people living in cities believe that their local governments should invest in a wider mix of smart transportation solutions, from using data to improve transportation routes and dealing swiftly to traffic problems, to offering more travel options and universal payment accounts covering all local modes of transportation.

Younger generations, which represent the future for urban centers, have a greater desire for smarter transportation options. For example, 53% of millennials would like cities to use their data to personalize travel suggestions vs 39% of boomers. A similar divide can be seen on providing more travel options and planning for autonomous vehicles.

Q: In your view, how much should your city invest in the following initiatives to improve mobility and transportation in your city?

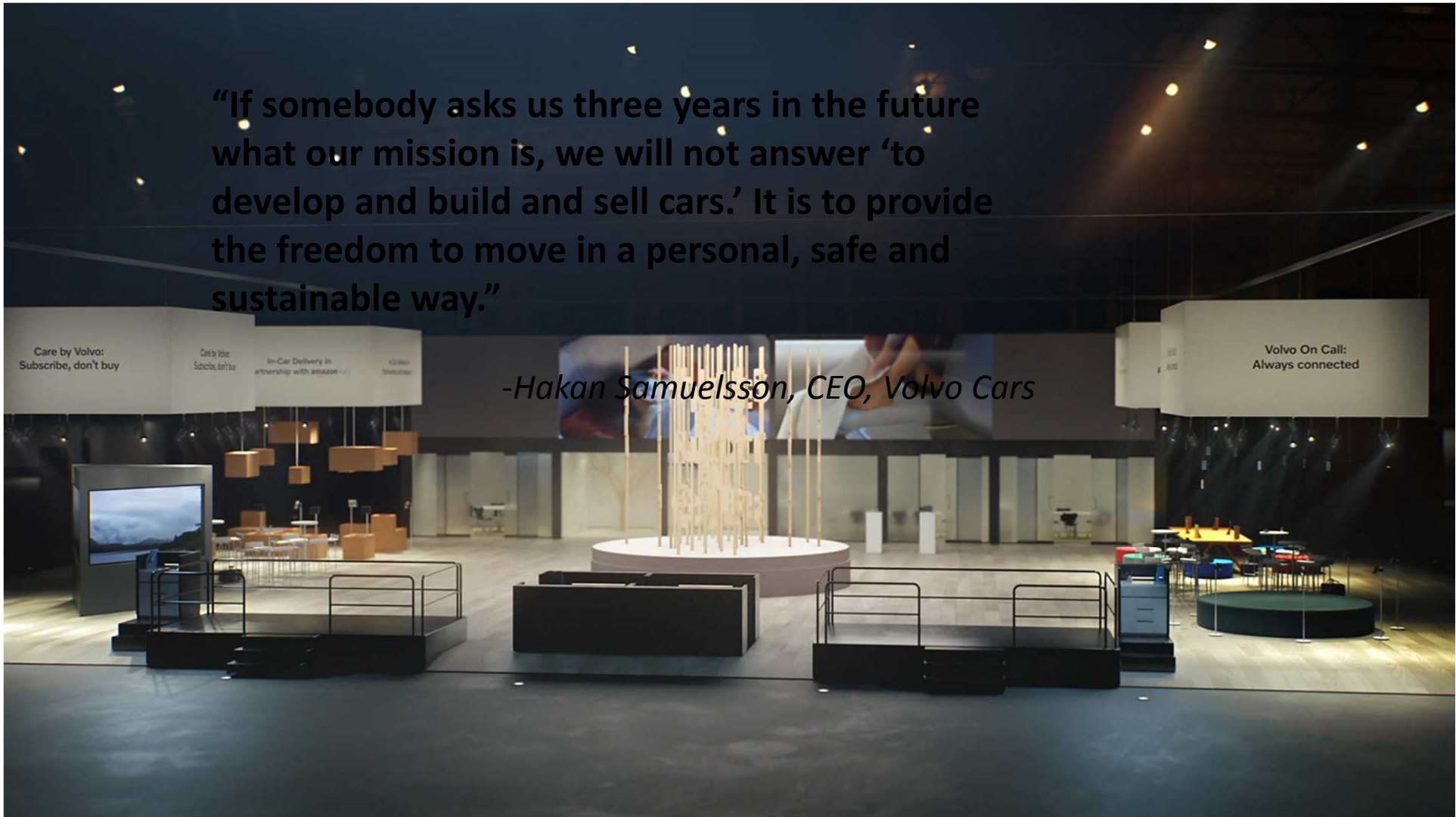
Where residents think cities should make transportation investments	Total	Age		
		18-37	38-53	54+
Using data to improve transportation routes	60%	62%	56%	63%
Improving the speed/reliability of public transportation	59%	60%	55%	59%
Using real-time data to respond quickly to traffic issues	59%	60%	55%	61%
Offering payment accounts for all transportation modes	57%	58%	57%	52%
Sharing data with public on traffic, roads, etc.	57%	60%	52%	54%
Providing more travel options (bikes, ferries, etc.)	57%	61%	52%	41%
Providing electric vehicle charging stations	55%	57%	51%	56%
Using my data to personalize travel suggestions	49%	53%	42%	39%
Planning for autonomous vehicles	49%	52%	45%	37%
Exploring drones/driverless trucks for moving goods	42%	44%	38%	35%

Autonomous Vehicles



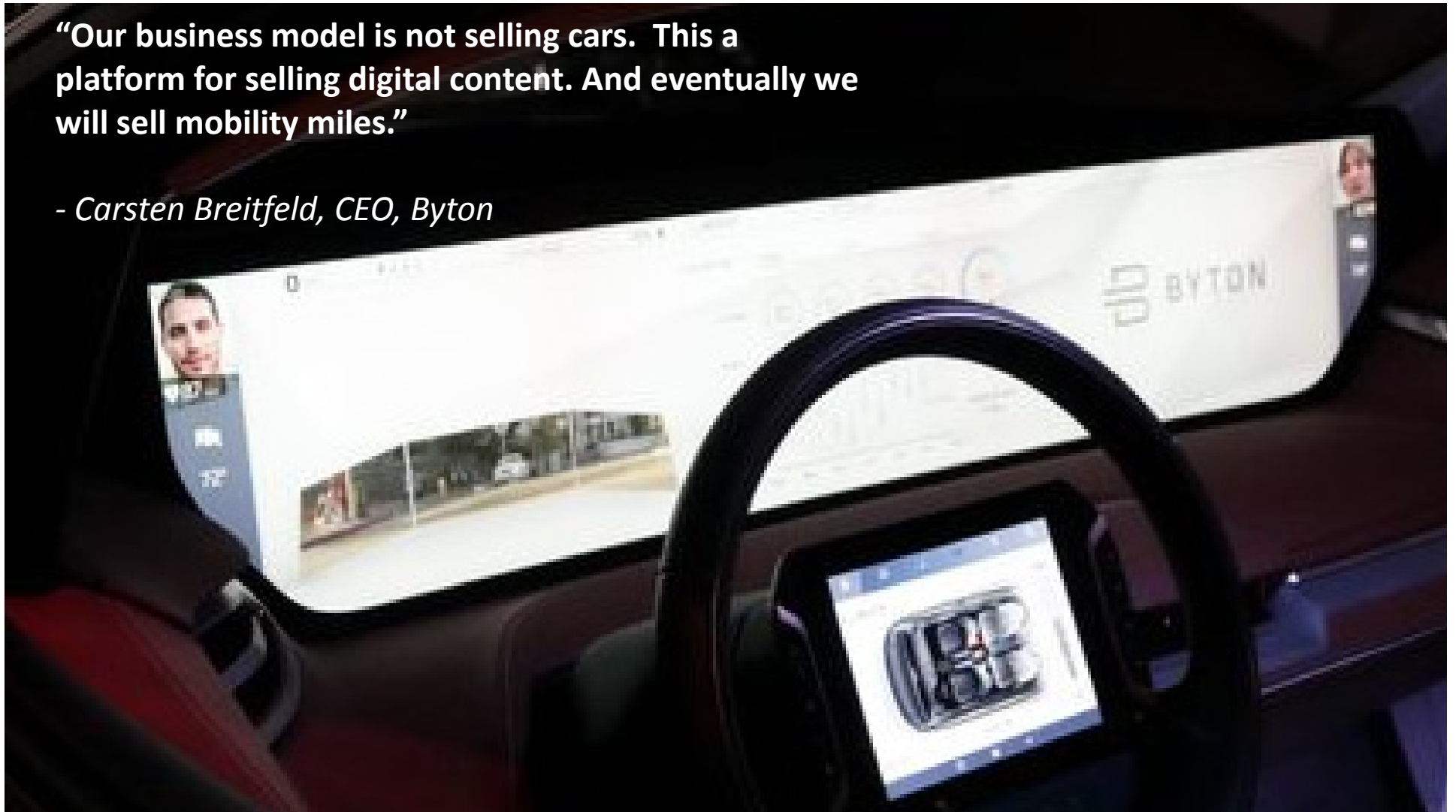
“If somebody asks us three years in the future what our mission is, we will not answer ‘to develop and build and sell cars.’ It is to provide the freedom to move in a personal, safe and sustainable way.”

-Hakan Samuelsson, CEO, Volvo Cars



“Our business model is not selling cars. This a platform for selling digital content. And eventually we will sell mobility miles.”

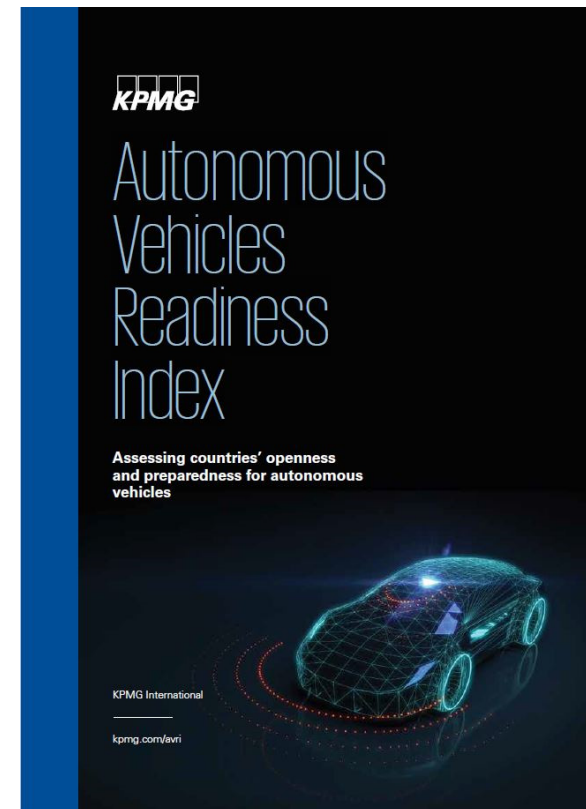
- Carsten Breitfeld, CEO, Byton





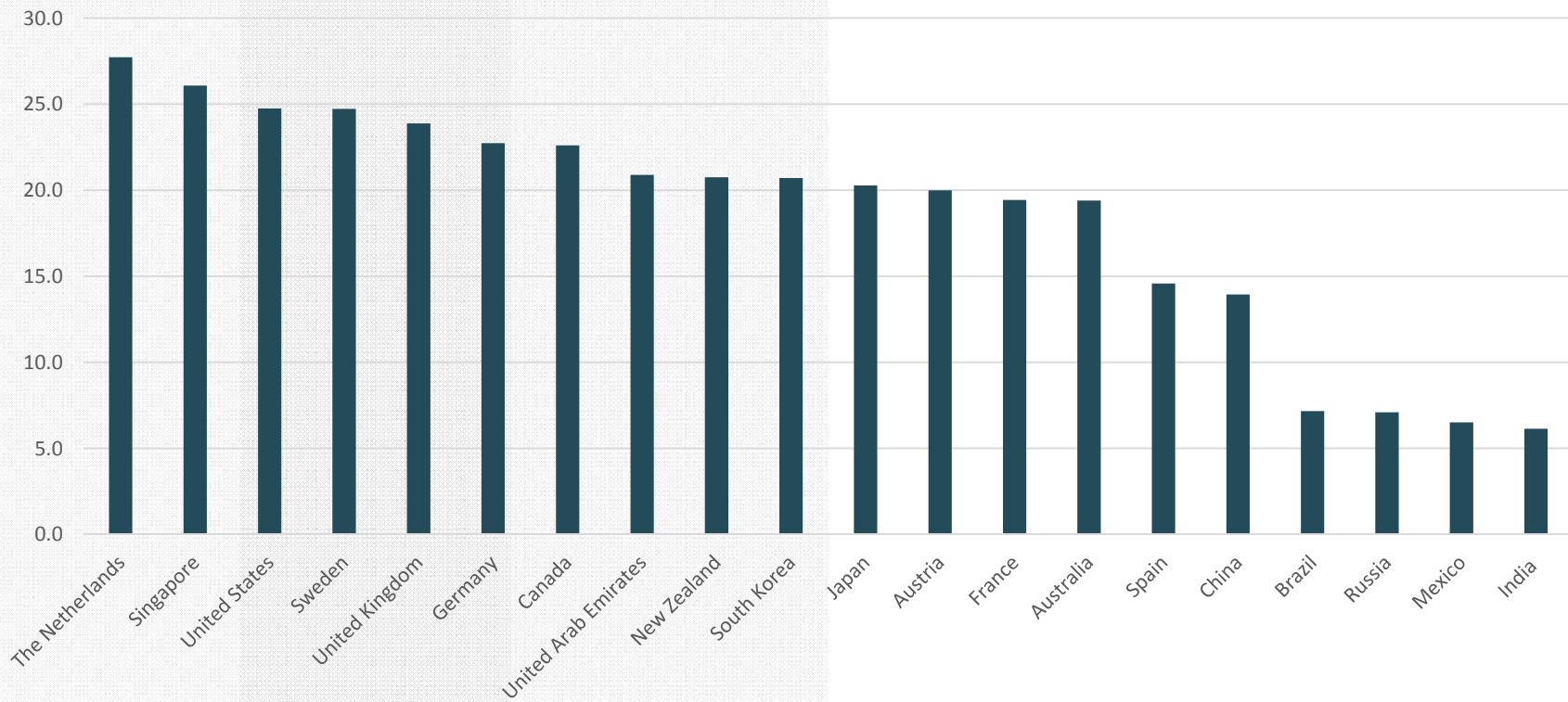
KPMG's Autonomous Vehicle Readiness Index

- The AVRI examines where countries are today in terms of progress and capacity for adapting AV technology.
- It evaluates each country according to four pillars that are integral to a country's capacity to adopt and integrate autonomous vehicles.
 - Policy & legislation; technology & innovation, infrastructure and consumer acceptance.
- The pillars are comprised of variables that reflect the wide range of factors that impact a country's AV readiness





2017 Autonomous Vehicle Readiness - Who will be first?



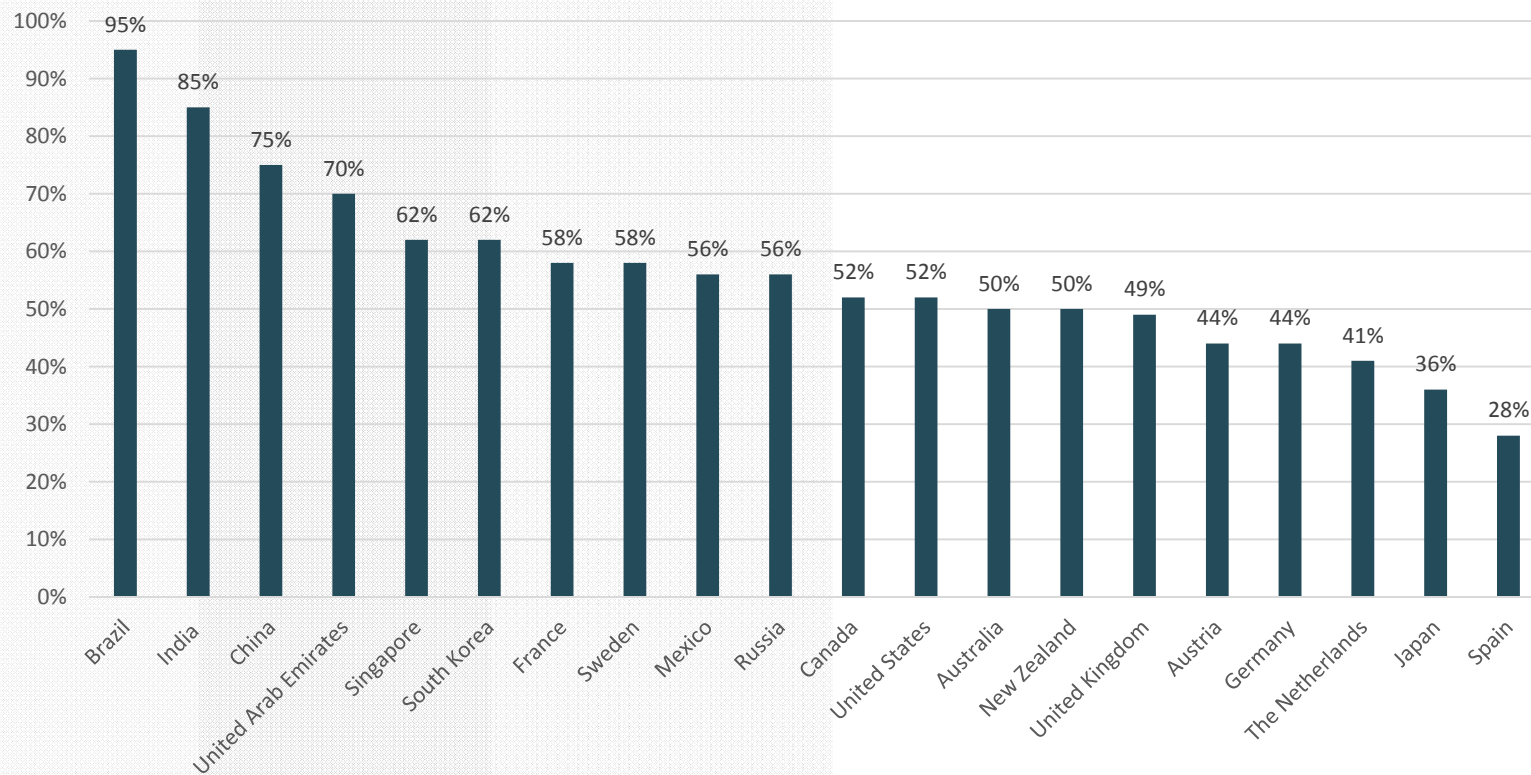


Where does the US rank?

- 10th for Policy and Legislation
- 1st for Technology and Innovation
- 7th for Infrastructure
- 4th for Consumer Acceptance



Consumer Acceptance of AVs

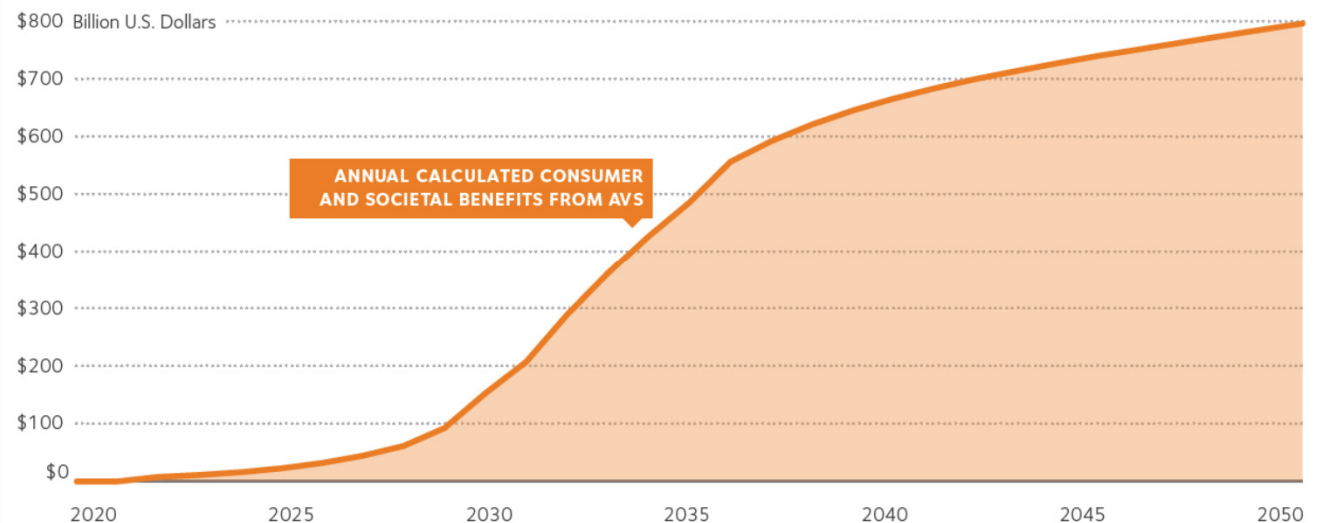




The Societal Benefits of AVs - \$800 billion by 2050

- Benefits include:
 - Congestion mitigation
 - Accident reduction
 - Reduced oil consumption
 - Value of time
 - Cheaper taxi fares

Projected Annual Consumer and Societal Benefits from AVs



Source: David Montgomery, *Public and Private Benefits of Autonomous Vehicles*, June 2018.



Potential Issues to Widespread Adoption

- AVs can currently handle 99% of driving conditions. The last 1% is the hardest.
- When will they arrive?
- Safety regulations need to catch up with the technology.
- Who is liable? Criminal negligence?
- Consumer trusts - 66% of Americans and 80% of senior citizens feel unsafe around AVs.
- The current state of the country's infrastructure.



What will Autonomous Vehicles mean for land use?

- AVs over time could change the structure of cities, towns and neighborhoods.
- AV's could increase the use of personal vehicles, exacerbating sprawl, congestion, and pollution.
- Alternatively, the use of self-driving vehicles predominately for shared rides could reduce the need for parking and expansion of roads and encourage infill and higher-density development.
- The impact will depend on land use and other policies.

**MIT
Technology
Review**

Intelligent Machines

Phoenix will no longer be Phoenix if Waymo's driverless-car experiment succeeds

Shared autonomous vehicles could transform American cities built around car ownership.

by Ed Finn June 26, 2018

Thank You

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For additional information:

Smarter Cities 2025

<https://econsultsolutions.com/esi-thoughtlab/smarter-cities-2025/>

KPMG AVRI

<https://home.kpmg.com/xx/en/home/insights/2018/01/2018-autonomous-vehicles-readiness-index.html>

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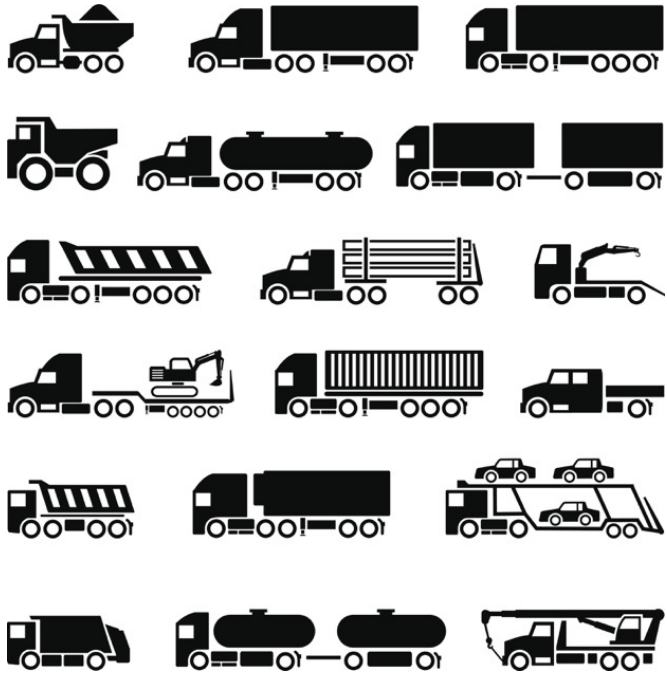


**Driverless, Digitized and Door-to-Door?
Emerging trends and the future of goods
movement**

**Steve Viscelli
University of Pennsylvania**

Goods movement is in a period of rapid transformation

- Shift from Big Box Supply chains to Ecommerce
- Digitization (a.k.a. “Uberization of Freight”)
- Automation
- Labor Issues (e.g. shortage, hours of service, misclassification, minimum wage, breaks)
- Electrification and alternative fuels



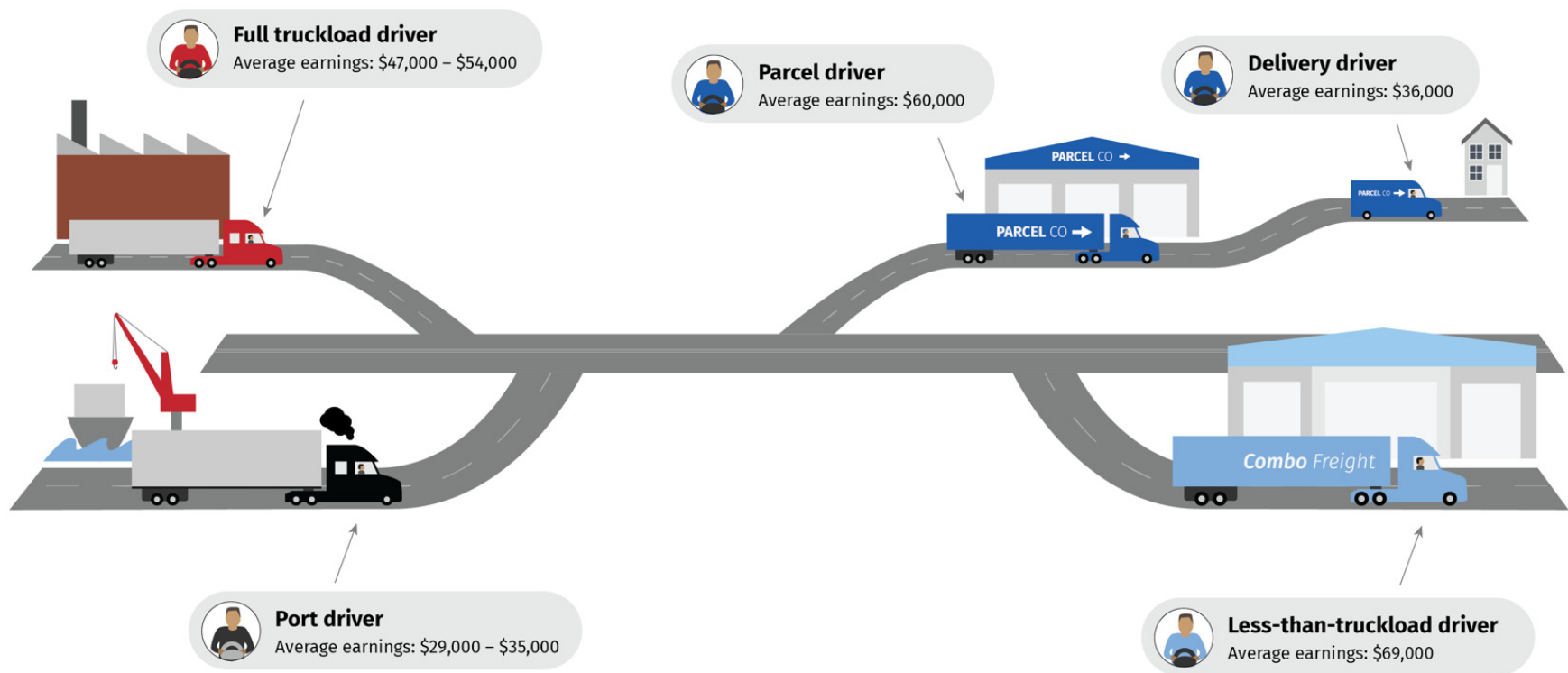
Key Variation in Trucking

- OTR (long-haul) or Local
- Truckload, LTL or Parcel
- Speed (expedited)
- For-hire, dedicated, private
- Freight type (determines trailer and *a bunch of other stuff*)



Today's trucking industry

Job quality varies widely











A robot apocalypse?

Fears of massive job loss

1.8 million American truck drivers could lose their jobs to robots. What then?

One of the last well-paying working-class jobs is basically doomed.
By David Roberts | @drvox | david@vox.com | Aug 3, 2016, 8:40am EDT

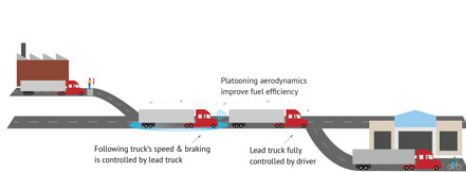
Self-Driving Trucks Are Going to Hit Us Like a Human-Driven Truck

...imminent need for basic income in recognition of our machine-driven future

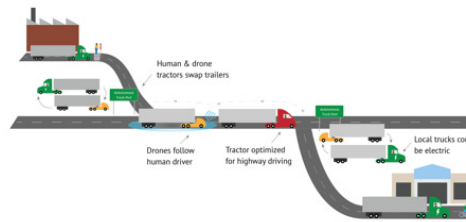
GOLDMAN SACHS: Self-driving trucks will kill 300,000 jobs per year

JON LESAGE, OILPRICE.COM
NOV. 15, 2017, 6:06 PM

6 potential adoption scenarios



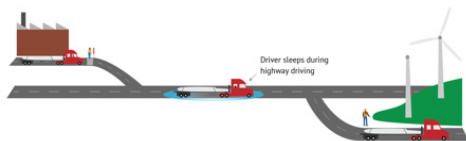
Human-human platooning



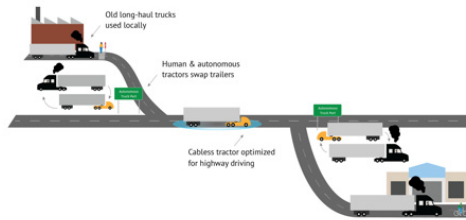
Human-drone platooning



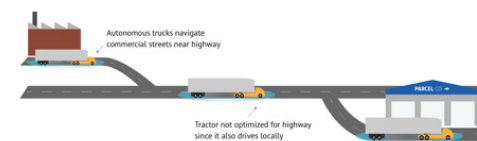
Highway automation + drone operation



Autopilot

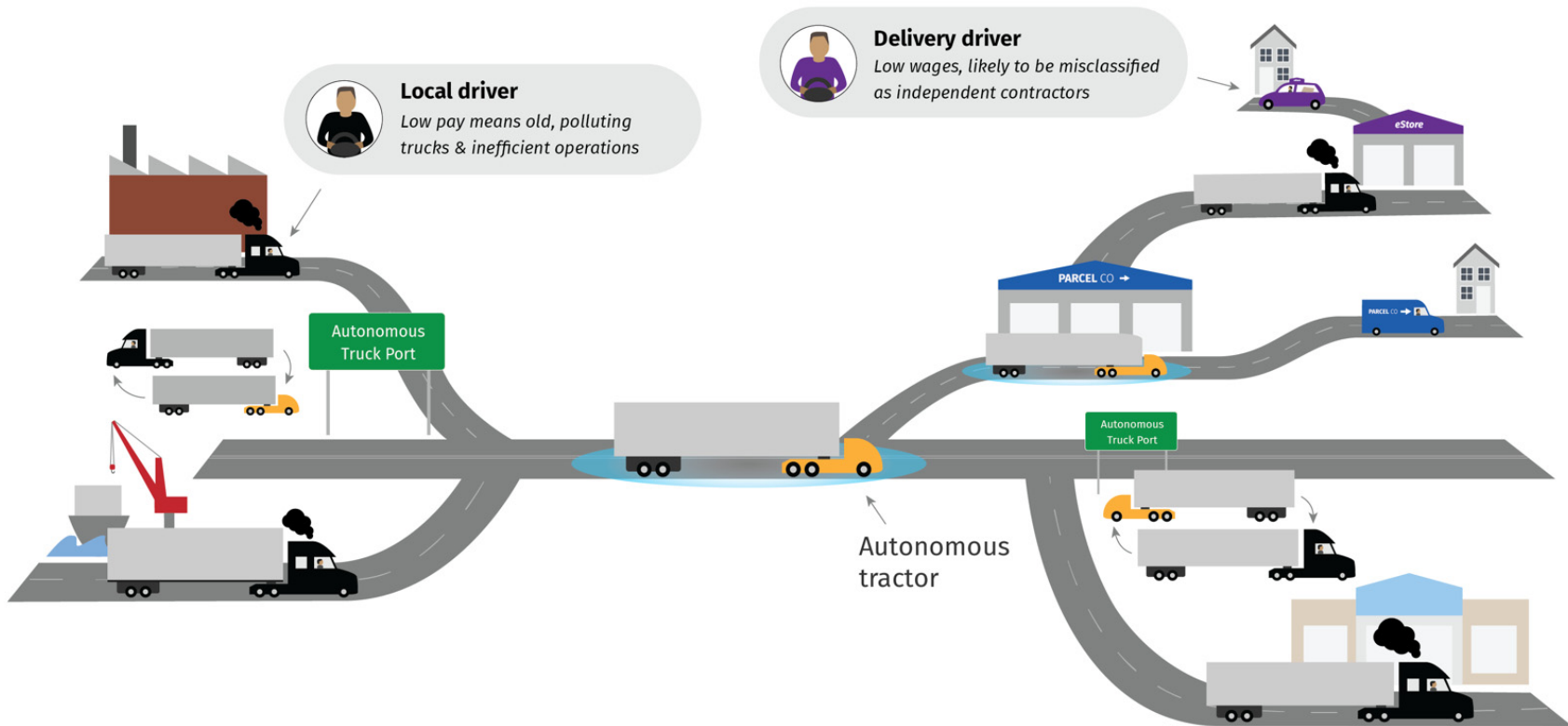


Highway exit-to-exit automation



Facility-to-facility automation

Most likely adoption scenario absent policy intervention



Most at risk: Long-distance drivers

CHARACTERISTICS AFFECTING ADOPTION

■ Strengthens case for adoption
 ■ Weakens case for adoption
 ■ Obstacle to adoption

INDUSTRY SEGMENTS

	Primary driving environments	Uninterrupted highway driving	Non-driving tasks	Customer facility Type	Route regularity	Union presence	Typical carrier size	
For-hire truckload (dry and refrigerated)	Highway	Extensive	Minimal	Large Warehouse	Moderate	None	Medium/Very Large	} High risk of automation
Less-than-truckload and parcel linehaul	Highway	Extensive	Minimal	Internal Terminal	High	Moderate	Medium/Very Large	
Port driving	Urban/Highway	Minimal/Significant	Minimal	Large Warehouse	Moderate to High	Low	Small	} Lower risk of automation
Specialized truckload	Highway/Complex	Significant/Extensive	Significant/Extensive	Varied Commercial	Varied	Low	Small/Medium	
Intermodal	Urban	Minimal	Minimal	Large Warehouse	Moderate	Varied	Small/Medium	
Local pickup and delivery (part of LTL and parcel)	Local/Urban	Minimal	Significant/Extensive	Commercial or Residential	Varied	Varied	Very Large	
Local – other	Local/Urban	Minimal	Significant/Extensive	Varied	Varied	Varied	Small	

Key segments of the trucking industry	Average annual wage	Number of drivers	Independent contractors	Potential impact of autonomous trucks
LONG DISTANCE DRIVING				
Full truckload	\$46,641– \$53,690	211,000	Common	Significant job loss
Less-than-truckload	\$69,208	51,000	Uncommon	Significant job loss
Parcel	\$59,660	32,000	Uncommon	Significant job loss
LOCAL DRIVING				
Ports	\$28,783 (contractors) \$35,000 (employees)	75,000	Predominant	Uncertain
Pickup and delivery	\$35,610	877,670	Mixed, potential to shift towards contractors	Strong job growth
POTENTIAL NEW SEGMENT (PROJECTED)				
Autonomous truck ports	?	100,000+	?	Strong job growth

**Lose
better-
paying
jobs**

**Gain
bad
jobs**

Disparate impacts

Older & rural workers lose better-paying jobs, urban & younger workers gain bad jobs

Demographics

- Displacement likely to be concentrated in current long-distance workforce (older white men)
- New workers coming into the industry and employed in growth jobs (local driving) will likely be younger and disproportionately workers of color and immigrants
- They will feel the impact of how public policy shapes the wages and working conditions of future driving jobs

Geography

- Growth in driving jobs will likely be in urban and suburban areas
- Rural areas will likely be left behind

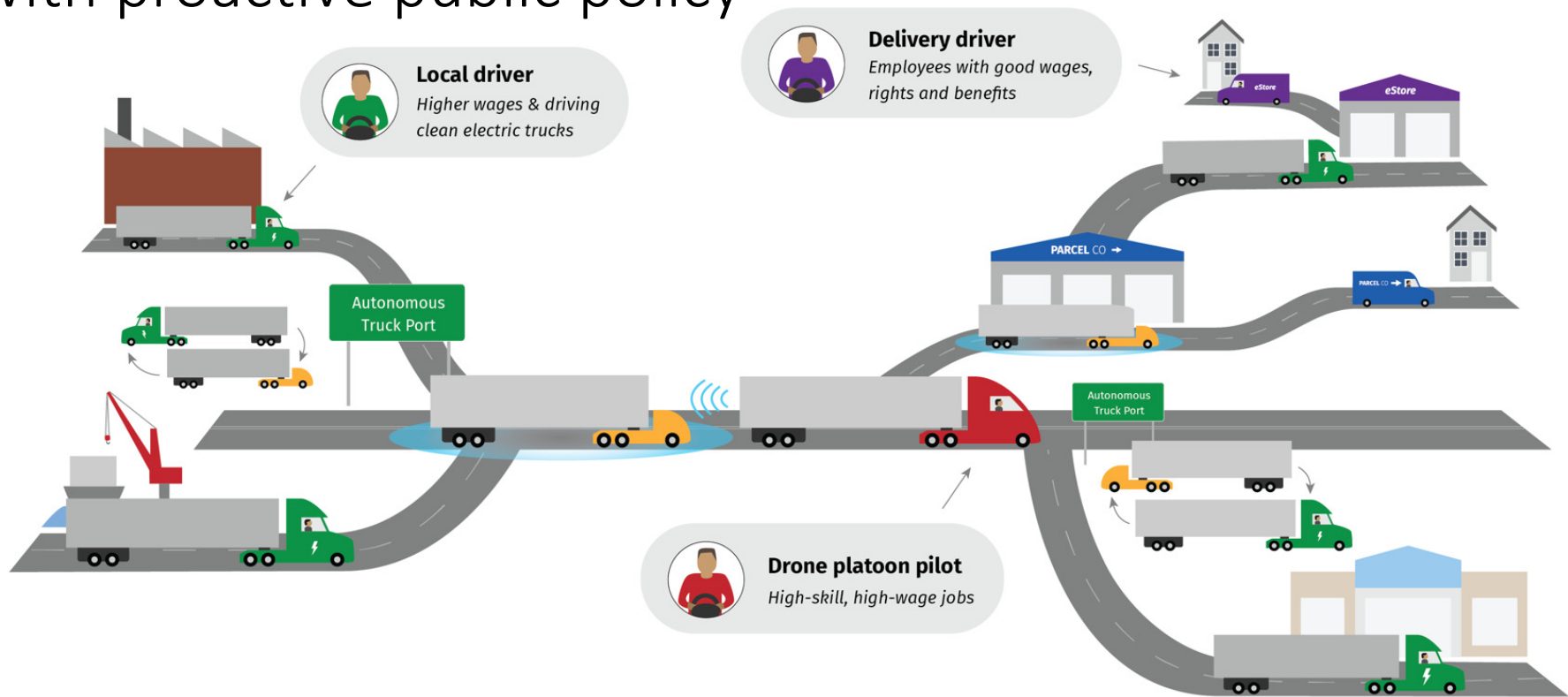


Outcomes of Concern

- Inefficiency in operations
- Infrastructure impacts
- Congestion
- Safety
- Underinvestment in equipment
- Air pollution
- Waste of public money
- Job Quality



Future Goods Movement with proactive public policy







DVRPC FUTURES GROUP: FUTURE OF MOVING PEOPLE AND GOODS

Mimi Sheller, Ph.D., Professor,
Department of Sociology; Director,
Center for Mobilities Research and
Policy, Drexel University





MOBILITY
JUSTICE

The Politics
of Movement
in an Age of
Extremes

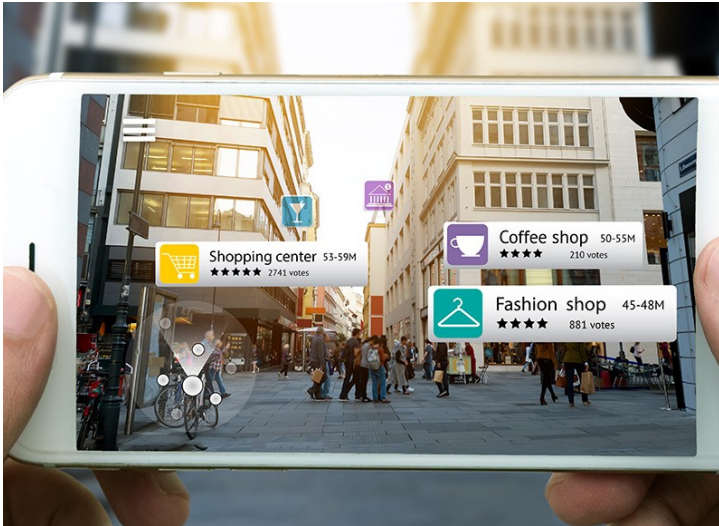
Mimi
Sheller

Mobility Challenges 2050

- By 2040 the Northeast is expected to add seven million new residents, putting further pressure on travel modes. We also will have an aging population, with changing mobility needs.
- Climate: By 2050, transportation will be responsible for 35% of all CO2 emissions in the world. How is transport linked to energy transitions?
- Congestion: Over 9% of world-wide driving time is spent in congestion at speeds lower than 8mph. Congestion contributes to air pollution, asthma and threats to human health.
- Inequality: Families in the lowest third of income in the USA spent 16% of their income on transportation vs. the highest third who spent only 8%. They are also at increased risk of pedestrian road fatalities.

Mobility opportunities

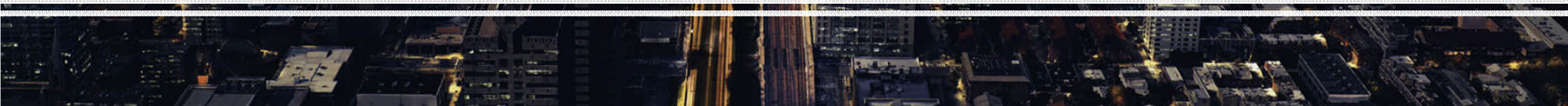
- Information and communication technology are transforming mobility: mobile technology, open data, big data, real-time data and route finding, interoperable systems, seamless fare systems.
- Shared use is transforming mobility: collaborative consumption, fractional use services, ride hailing, mobility-on-demand models.
- Preparing for automated and driverless vehicles: infrastructure, regulation, insurance, cybersecurity, measuring impacts on traffic.
- New Mobility Enterprises are emerging: new strategic alliances, public-private partnerships, innovative financing mechanisms.
- Policy changes: e.g., Complete Streets, Vision Zero, Costing the Curb



Four Future scenarios based on John Urry's *What is the Future?*



1. FAST MOBILITY CITY





AV TechFutures?

- *“The technology is essentially here... We have machines that can make a bunch of quick decisions that could drastically reduce traffic fatalities, drastically improve the efficiency of our transportation grid, and help solve things like carbon emissions that are causing the warming of the planet.”*

- *President Obama*

- Sperling (2018) and others describe the potential for a “nightmare” transportation scenario in 2040, where increased AV usage only leads to more vehicle usage, more urban sprawl, declining transit use, privacy violations and increased inequity.

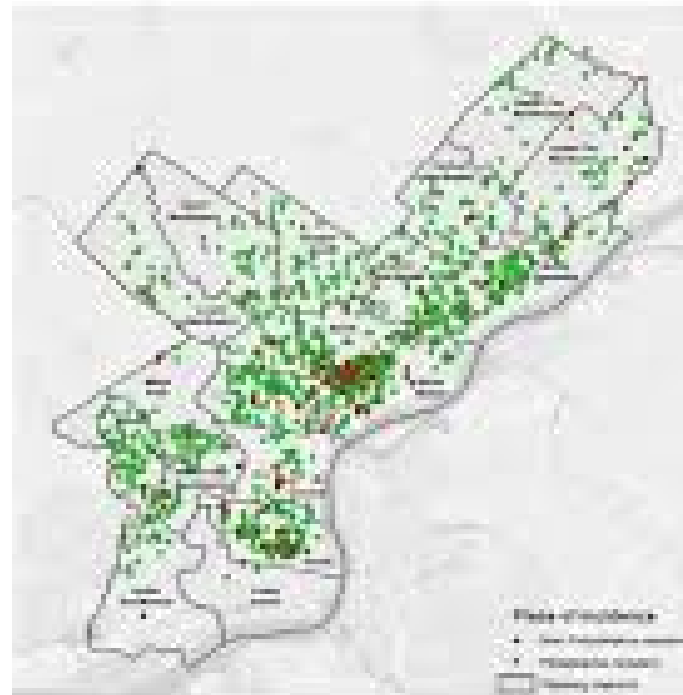




Vertical Mobility:
Personal Drones




Drug overdoses in Philadelphia, 2014-2015




While many overdose deaths occur in the Kensington area, they happen across all of the city

Medical Examiner's Office, Philadelphia Department of Public Health



 Shopping center 53-59M
★★★★★ 2741 votes

 Coffee shop 50-55M
★★★★★ 210 votes

 Fashion shop 45-48M
★★★★★ 881 votes

2. Digital City



Glenn Lyons: Transport's digital age transition (2015)

- People will use forms of physical and virtual mobility much more interchangeably in order to access people, goods services and opportunities.
- 'Multimobilities' will enable individuals and organizations to be flexible and responsive to changing circumstances such as price signals or life events.
- People will much more easily adjust their mobility split between physical and virtual (and between motorized and non-motorized mobility).
- Distinctions between activity time and travel time will blur further and individuals will move seamlessly between physical, augmented reality and virtual encounters.
- Workers in the knowledge economy will have an increasingly weak link between where they live and who they work for and with.
- Car ownership will seem increasingly less important and car use will seem increasingly banal. Shared use of mobility resources will be favored. The car will be seen as a background technology serving a purely functional purpose.



Together We Ride



NISSAN IDS CONCEPT CAR



Transmobility: Adam Greenfield

- In “the near-future evolution of urban mobility in the presence of networked informatics... as the prominence in our lives of vehicles as *objects* is for most of us eclipsed by an understanding of them as networked *services*, as the necessity of vehicular *ownership* as a way to guarantee access yields to on-demand *use*, our whole conception of modal *transportation* will tend to soften into a more general field condition I think of as *transmobility*.”
- “Transmobility would offer us a quality of lightness and effortlessness that’s manifestly missing from most contemporary urban journeys, without sacrificing opportunities for serendipity, unpressured exploration or the simple enjoyment of journey-as-destination. You’d be freer to focus on the things you actually wanted to spend your time, energy and attention on, in other words, while concerns about the constraints of particular modes of travel would tend to drop away.”

3. Livable City









"Schuylkill Bluffs" Park Over the Northwest Corridor, Looking South from Spring Garden Street



New Pedestrian Bridge at Race Street Connecting Logan Square to the District, Looking West from Center City



Expansion of Drexel Park as a Neighborhood Amenity, Looking West Towards Powelton Village



A Central Greenway along the High Line and New 31st Street above the Rail Yards, Looking South



Autonomous Rapid Transit (ART)

Peter Calthorpe

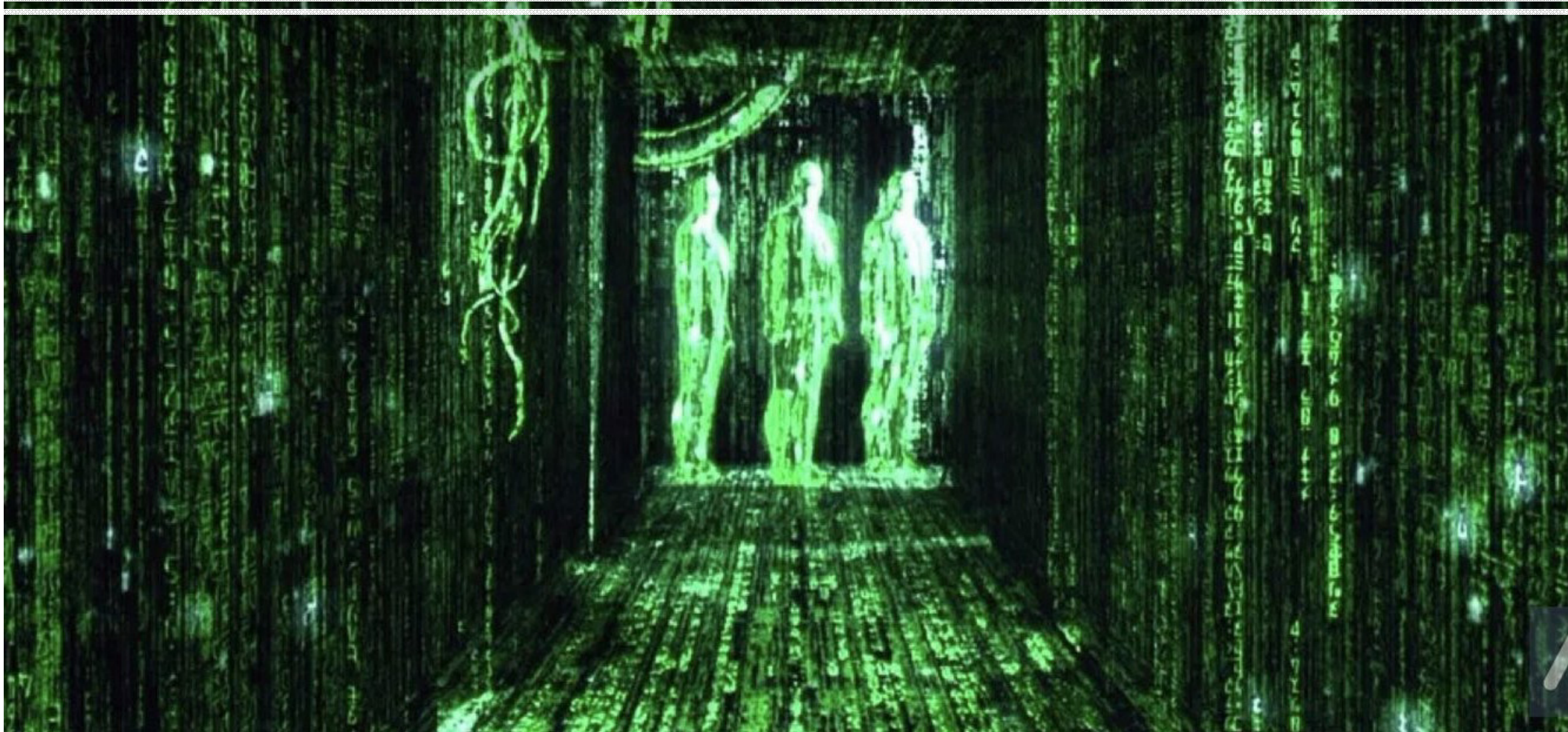
What's the downside? Mobility Austerity

- Limits on automobility
- Congestion pricing
- Carbon pricing
- Personal carbon budgets
- Parking scarcity
- Road diets
- Delivery Restrictions



The Matrix

4. AI CITY



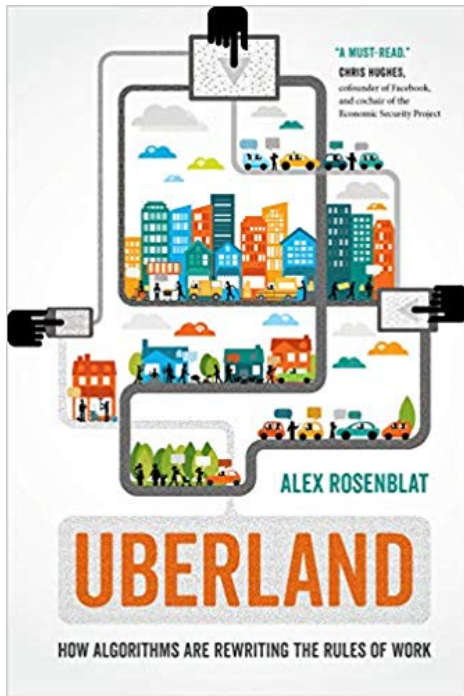
Social Credit Score Schemes

- China plans to rank all its citizens based on their "social credit" by 2020.
- People can be rewarded or punished according to their scores.
- Like private financial credit scores, a [person's social scores](#) can move up and down according to their behavior.
- China has already started punishing people by restricting their travel. Nine million people with low scores have been blocked from buying tickets for domestic flights, [Channel News Asia reported in March](#), citing official statistics.
- They can also clamp down on luxury options — three million people are barred from getting business-class train tickets.



AI for Mobility Control

- Drone surveillance, video-surveillance and facial recognition technology combined with massive biometric Databases screen people at borders, stations, and other checkpoints.
- Beijing and Shanghai have used AI and facial recognition systems to regulate traffic and identify violators of traffic laws; Shenzhen began using AI to display photos of jaywalkers on large LED screens at major intersections in April 2017.
- Special glasses with facial-recognition software also have been invented for police use. During the Lunar New Year holiday travel rush, police used these glasses to search for wanted criminals at the Zhengzhou East high-speed rail station.



Algorithms and the Gig Economy



Conclusions

Moving Towards Mobility Justice

Mobility Transitions & Social Justice

- In order to address the current limits and challenges of the existing system of automobility – climate resilience, congestion, air pollution, sprawl, social inequality – we need to create a new transportation infrastructure of the future while also addressing the social inequities that underpin the unsustainability of the current system.
- While new “solutions” and “innovations” have the capacity to disrupt the current transportation mix, these disruptions are by no means inherently conducive to sustainable, livable, economically vital communities, and socially equitable and fair communities. Countervailing trends toward unequal mobilities, digital divides, and secessionist fortressing are undermining “green” trends.
- We need a dual transition toward environmentally sustainable mobility *and greater mobility justice* to ensure that future urban mobility transitions will not entrench even greater social inequities, exclusions, and externalization of harms.
- We need regional and urban planning processes that reject technological determinism and claims of market inevitability and instead bring all stakeholders together to ensure deliberative and procedural justice, facilitate communication across communities and social strata, and purposefully build more equitable new mobility futures.



Thank you!

- Comments and Questions Welcome:
- mimi.sheller@drexel.edu
- mCenterDrexel on Twitter



CONNECTIONS

2045



Updating Greater Philadelphia Future Forces

Greater Philadelphia Futures Group
12.11.18

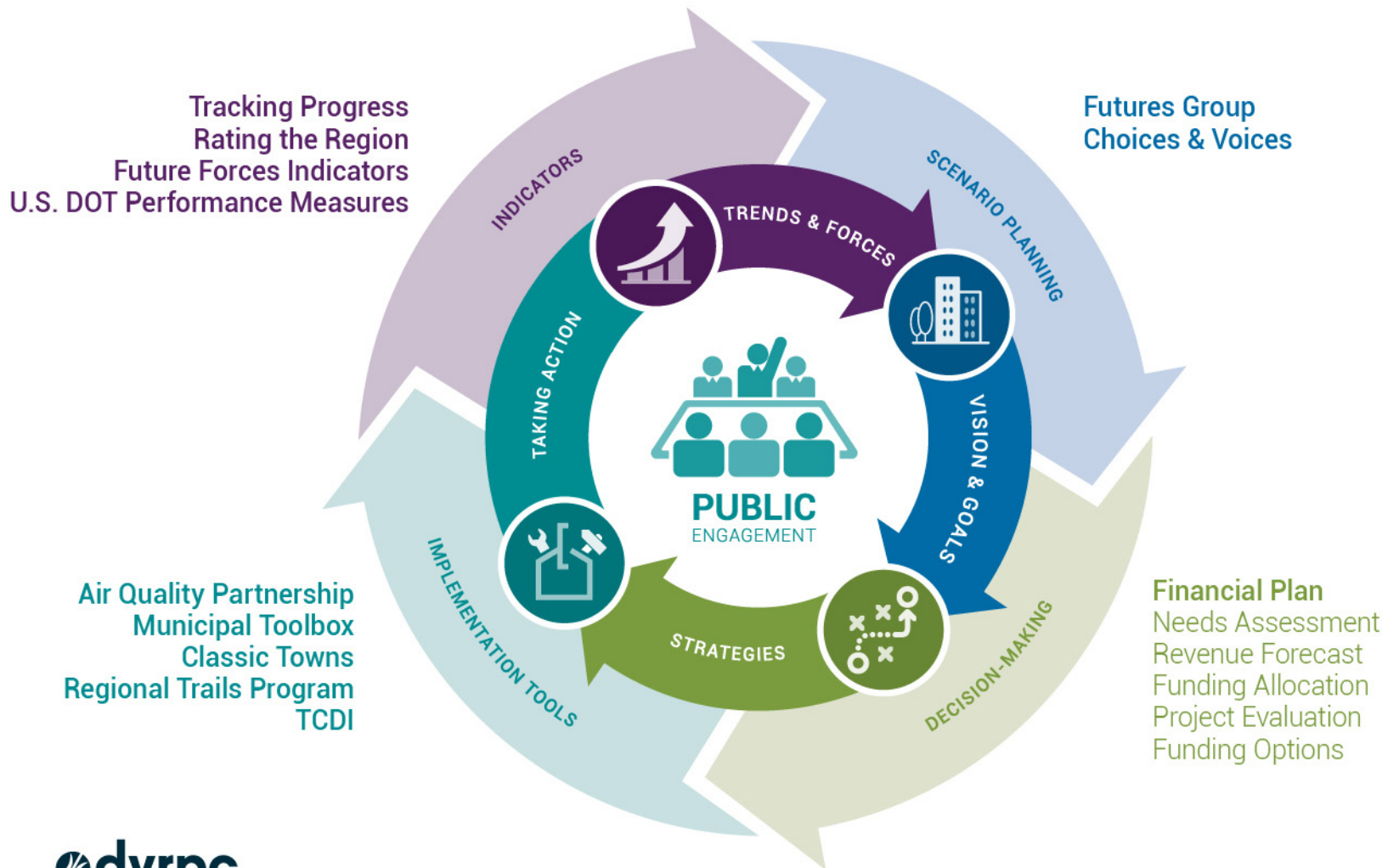


2018 Recap

- **May 2 – Scenario Planning**
- **July 19 – Dialogue on Smart Cities and Regions**
- **October 3 – Current Trends in Globalization**
- **December 11 – Future of Moving People and Goods**



DVRPC Long-Range Planning



Forthcoming Futures Group Effort

1. Identify the focal research question.
2. Identify influencing factors for scenario analysis.
3. Brainstorm key 'future' forces, shorten list based on importance to research question.
4. Vote on Future Forces likelihood and impact.
5. Use resulting likelihood and impact vote to create 3-5 highly differentiated What-If Scenarios.
6. Develop scenario narratives, incorporating discussion from brainstorming.
7. Analyze scenarios based on research question and influencing factors.
8. Identify universal and contingent actions.
9. Determine leading indicators and/or tipping points for each scenario.

Draft Research Question

*What endogenous or exogenous forces generate the most **uncertainty** for Greater Philadelphia's socio-demographics, built and natural environment, and travel within and through it over the next 30 years.*

Some Scenario Influencing Factors

1. Regional socio-demographics.
2. Travel demand, and transportation infrastructure condition and funding.
3. Climate change and environmental impacts.
4. Land use and development.
5. Regional and global economic implications, including jobs and work.
6. Equity repercussions.

Uri Avin Recommendations

1. Clarify main purpose and audience.
 - Audience is broad, clearer research purpose.
2. Comprehensive 2 or 3D scenarios.
 - Working group meeting 3.
3. Push the envelope on assumptions, increase differentiation between scenarios.
 - Crowdsourcing for influencing factor inputs to updated Impacts 2050 model.
4. Broaden indicators, particularly through a land use model
 - Currently developing an UrbanSim model.
 - Will also use Impacts 2050 (socio-economics) and Regional Strategic Planning Model (RSPM) sketch travel model.

Upcoming Schedule

- Starting Now: Recruit Futures Working Group.
- February – May 2019: 4 monthly meetings with Futures Working Group to develop scenarios.
- May 2019: Public meeting during Philly Tech Week to discuss draft scenarios.
- Summer 2019: Model scenarios.
- Fall 2019: Share draft report with Futures Working Group.
- Early 2020: Publish Future Forces 2050 & Incorporate New Scenarios into Choices & Voices.



CONNECTIONS

2045



Thanks for your support!

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