

# Automated Vehicles, More Driving, and The End of Driving

Presentation by John Niles, Global Telematics  
On behalf of



**CATES**  
Center for Advanced Transportation and Energy Solutions

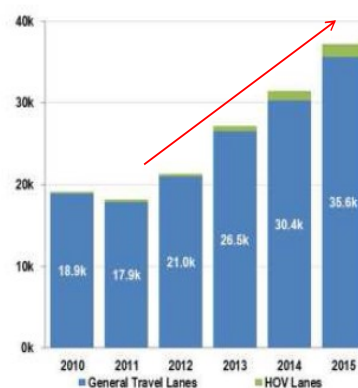
For the  
ULI Autonomous Vehicle Research Group  
August 12, 2016

## Puget Sound Regional Council Reports:

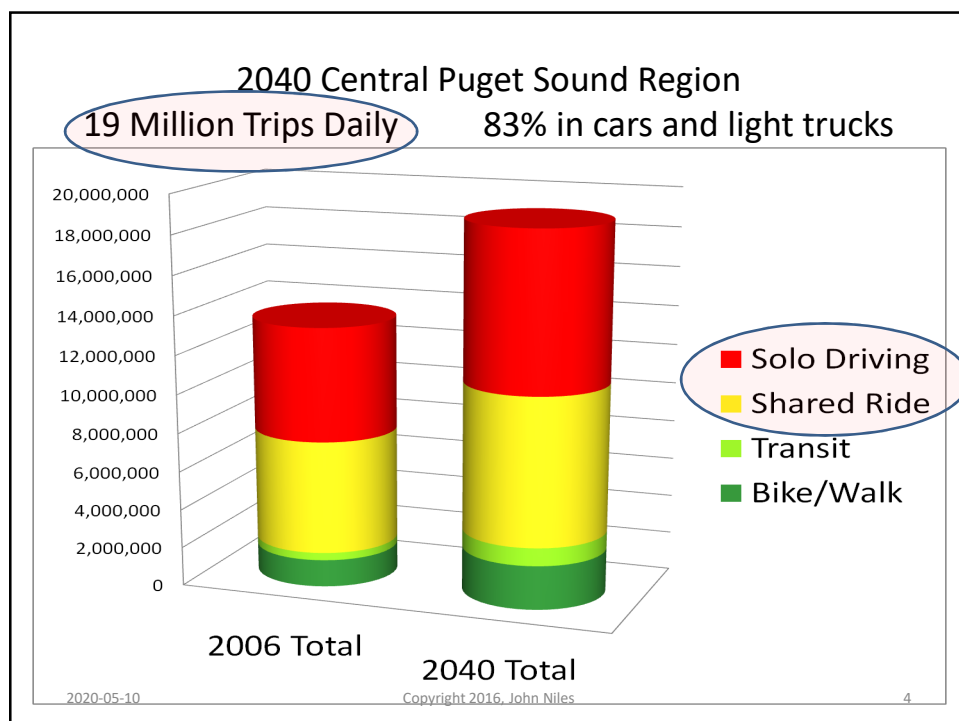
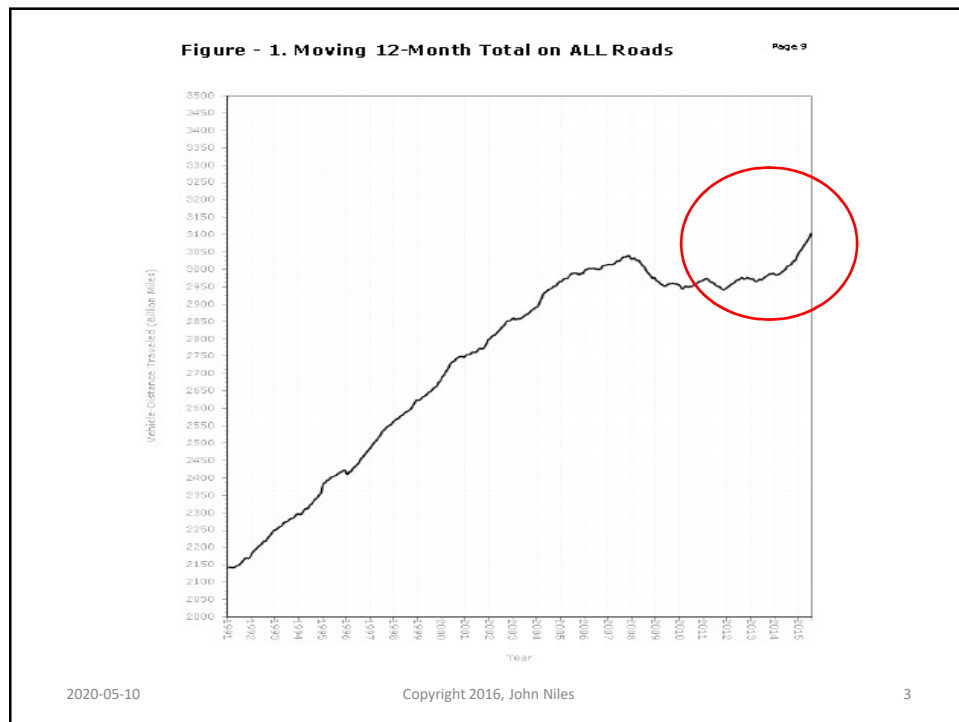


### Regional Freeway Hours of Delay

- There were 18,100 more hours of delay in 2015 than 2010 (95% increase)
- Delay increased by 18% between 2014 and 2015.
- HOV Lanes are about 4% of the total delay



Source: WSDOT Freeway Detector Data 2010 – 2015, Monday through Friday Average, January to June



## Will AVs reduce congestion?

### YES SIDE...

- Driver assistance automation & collision avoidance → **reduce accidents.**
- Automated speed control & braking → **smoother flows.**
- Precision guidance → **fit more cars** into existing road space.
- Automated parking → cars quickly **out of the way.**

### NO SIDE...

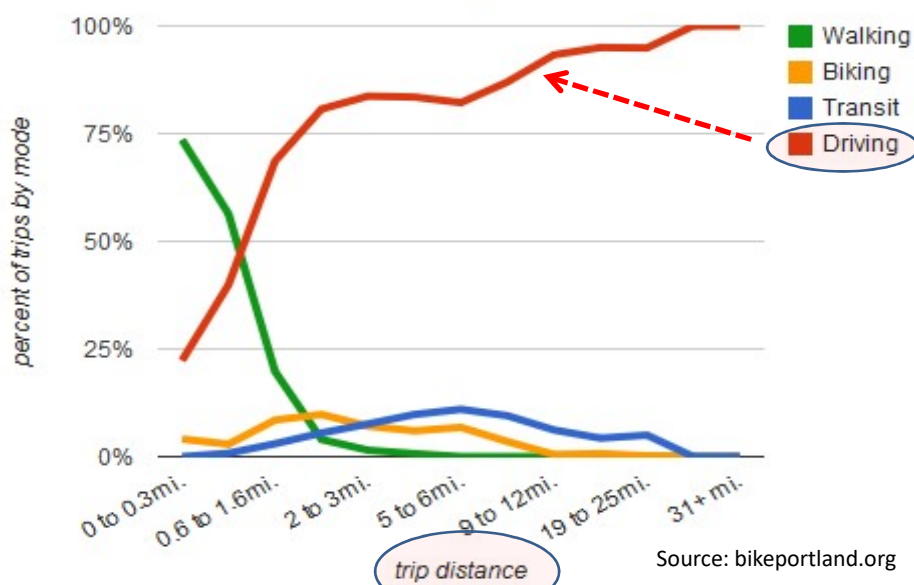
- Automated features → **more/longer trips.**
- Travel time **more productive** → **more trips.**
- Older, younger, unlicensed and disabled drivers → **more trips.**
- Volume of cars and driving → may **exceed efficiency gains.**
- **Infrastructure** investment → may be insufficient.

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## How Portlanders get around



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## Preference for Automobility is Ingrained

- Controlled, flexible routing & stops
- Controlled, flexible start & arrival times
- Door-to-door, any origin, any destination
- Private, customized space while traveling
- Perceived safety & security
- Protection from heat, cold & rain/snow
- Ease of bringing family, friends, & cargo
- Emotional sensations - control, style, wealth
- “Love affair” or “addiction” <=> behavioral economics!

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Source: Global Telematics  
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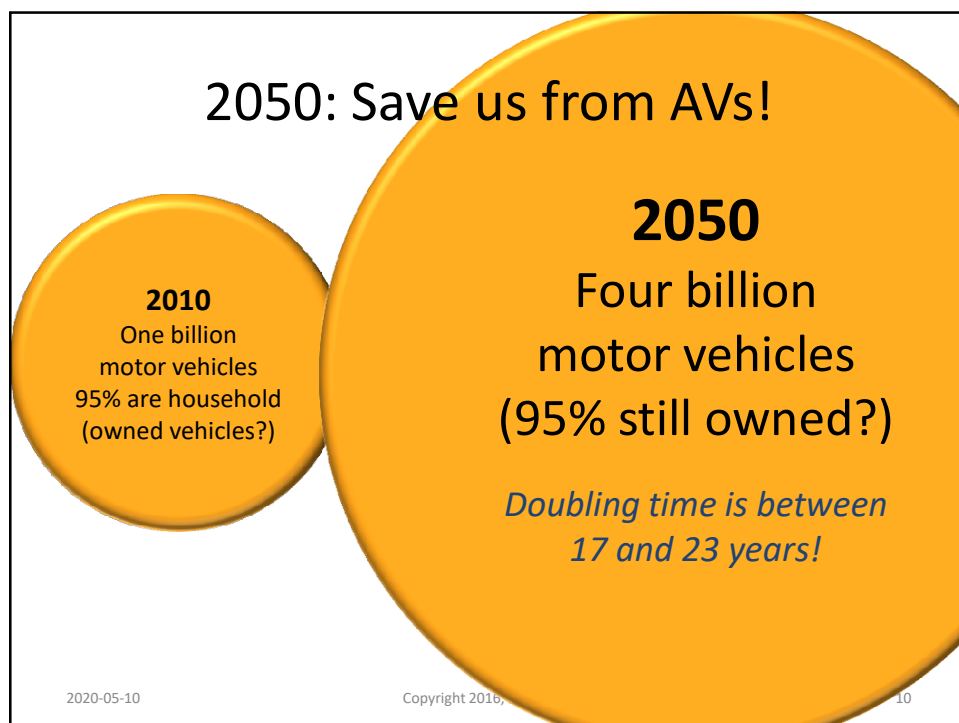
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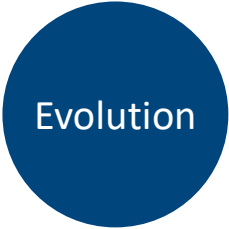


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or

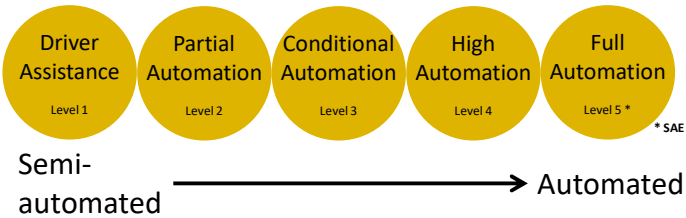


- *“Automation of driving is seen to be a continuum, with the distinction between driver assistance and self-driving as an evolution in design and production.”*  
Automated Vehicles: Implications for the Insurance Industry in Canada
- *“Self-driving cars remain a long way from commercial reality. They are suitable only for tightly controlled road environments, at slow speeds, and face a regulatory minefield.”*  
Carlos Ghosn in Gordon-Bloomfield, “Nissan Changes Expectations, Timeline for Autonomous Drive Technology.”

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## Evolution is technical

*SAE standard levels of automation*



Driver Assistance Level 1    Partial Automation Level 2    Conditional Automation Level 3    High Automation Level 4    Full Automation Level 5 \*

Semi-automated → Automated

\* SAE

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## Level 3 – **Conditional** Automation



Coming Soon...

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## Level 4 – **High** Automation



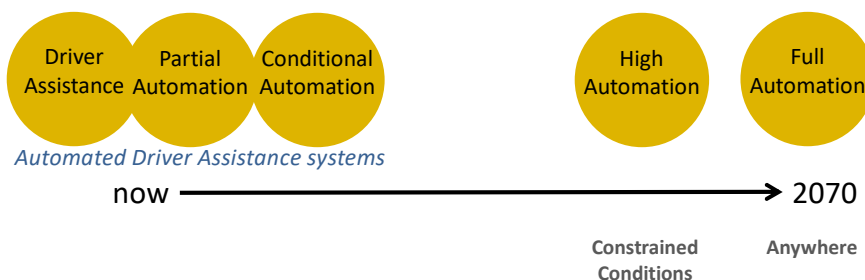
Potential

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## Technical is difficult



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## How will AVs mix with the existing fleet?

“...just as the early 20th century had a chaotic mix of horses and cars sharing roadways, there will be setbacks as we **mix AVs and conventional vehicles** over the next couple of decades.”

Bob Denaro, in ITS International March/April 2016

Denaro is a member of the USDOT's ITS Program Advisory Committee, and chairs TRB's Joint Subcommittee on Challenges and Opportunities for Road Vehicle Automation.

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## Will we consume trips or cars?

"What I think is going to happen is that nobody will own a car."

*"...self-driving cars paired with [TNCs] such as Uber will pretty much kill the need to own a car in 25 to 30 years"*

Jamais Cascio, futurist, senior fellow at the Institute for Ethics and Emerging Technologies

*"If you're financially smart and living in the city and you don't need a car to get to work, you're insane to own one," Chase says.*

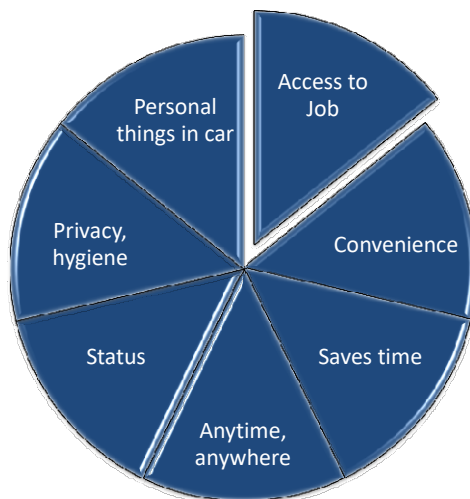
**Robocabs are the solution to all our transportation problems**

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## Why do we prefer ownership over sharing?



Classic carsharing today addresses a small fraction of demand: **less than 1/10<sup>th</sup> of one percent.**

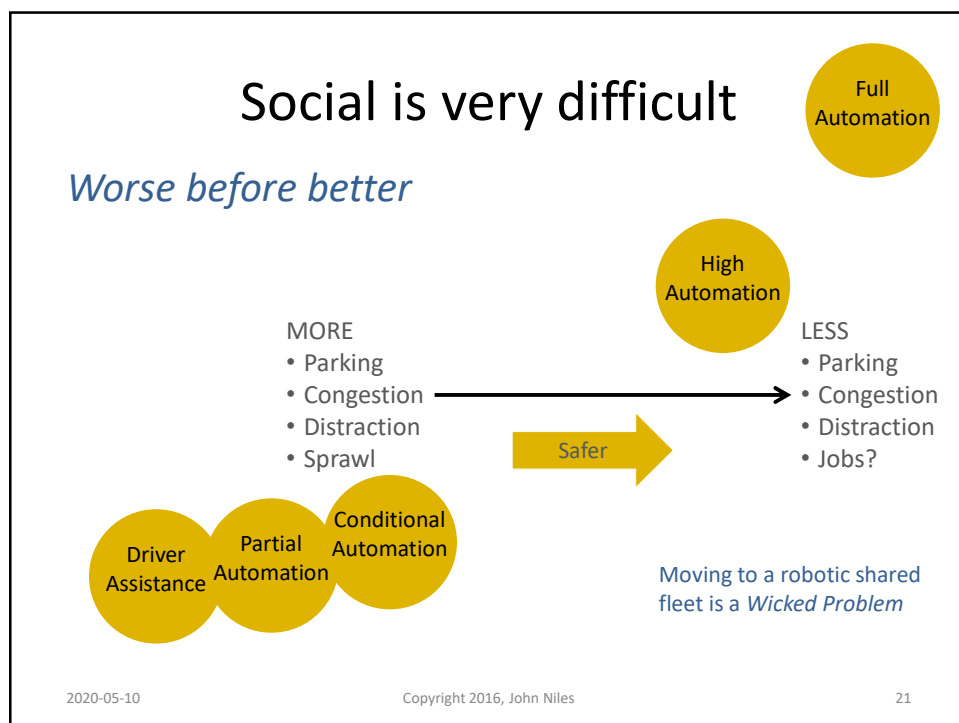
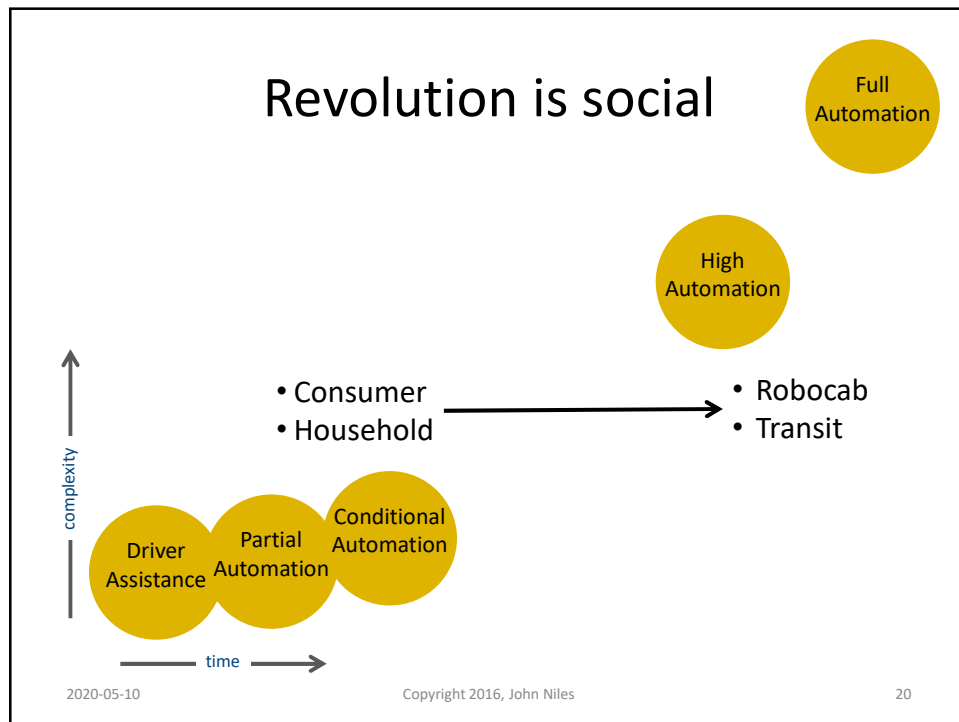
Total non-personal vehicle travel: **under ten percent.**

We need to address *all or most of the reasons* for preferring ownership **to change an owner into a 100% sharer.**

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## Level 3 Household: significant sales

- How long until peak? (2030-2035?)
- Competition from MaaS / TaaS?
- Sprawl?
- Mixed traffic: household L3 and robocab L5
- Interim dystopia until L5 utopia?

## Level 5 Household: No sale in 2020s

Not yet a “Whole Product”

- Vehicle
- Infrastructure
- Regulation
- Insurance
- Acceptance

Access Anxiety

- *Range Anxiety*  
slowed EV penetration
- *Access Anxiety* will  
hamper AV penetration

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## Access Anxiety

*“A critical AV leverage available to local governments and transit agencies is Level 5 Access Anxiety.”*

*This is a bigger market issue than user uncertainty, cost, and fear.*

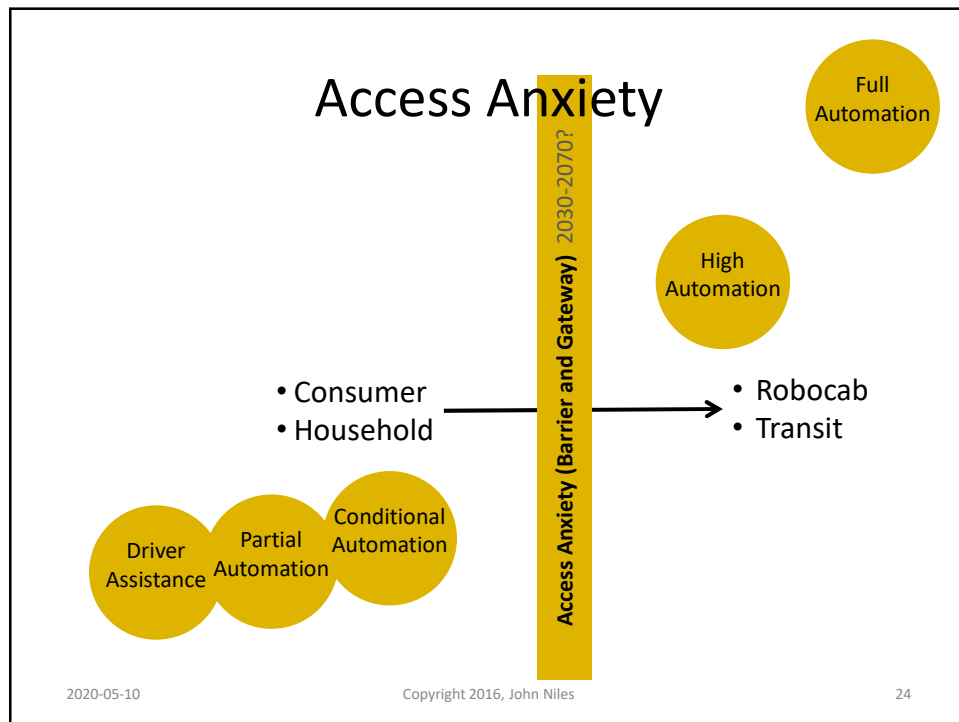
*Autonomous transit and robocabs applications provide the advantages of Level 5 automation two decades sooner than household ownership.”*

*Grush, Niles, End of Driving*

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## Access Anxiety Switchover

After 2030...

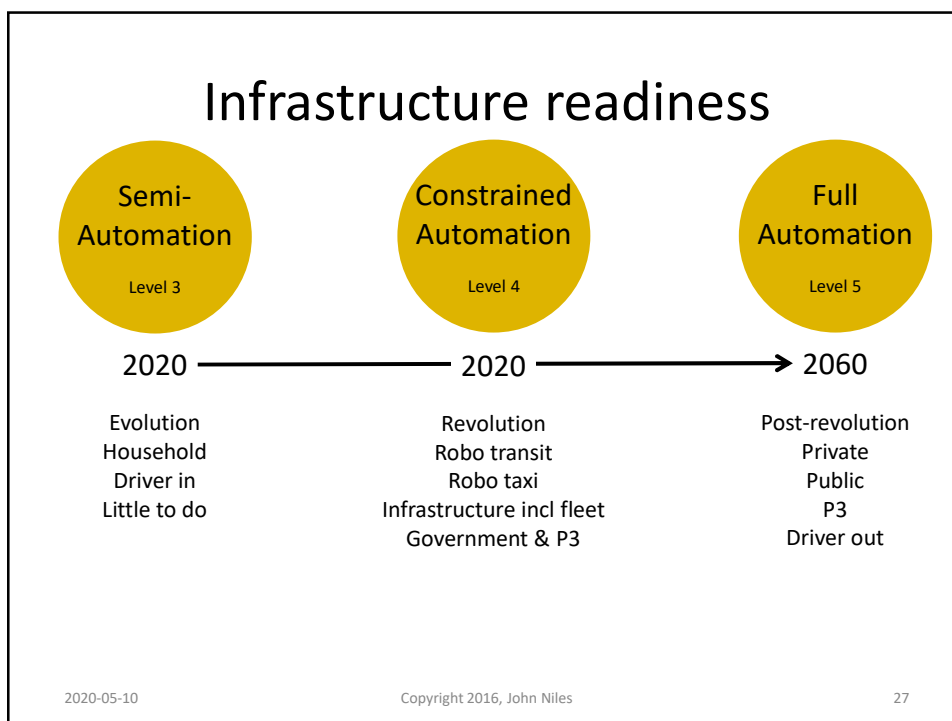
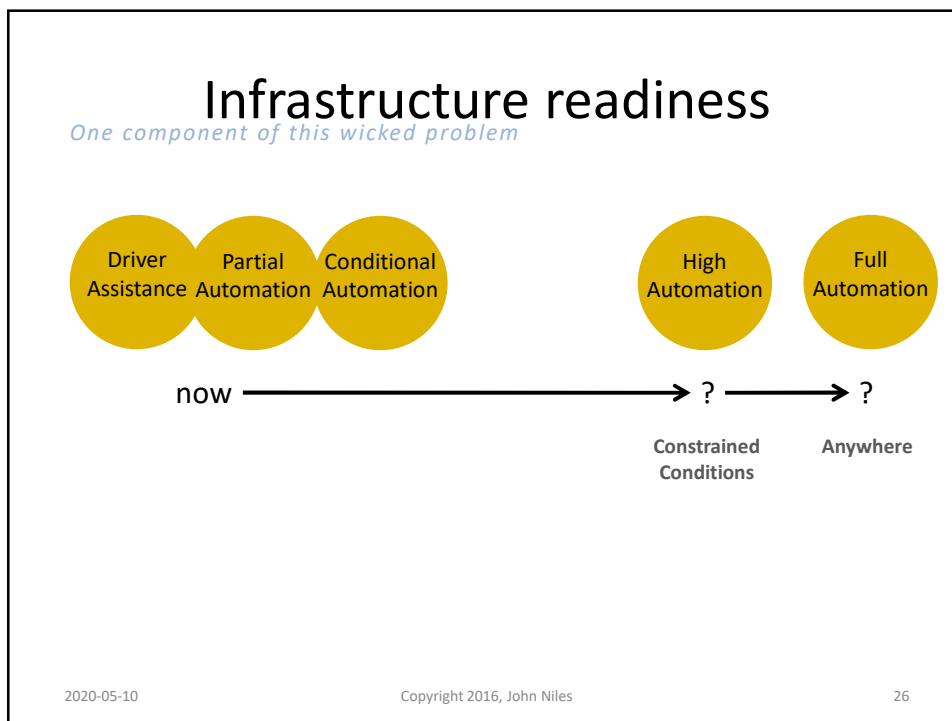
*“There will be fewer restrictions on where [L5] cars can operate—instead there'll be more rules on where manual cars can be driven.”*

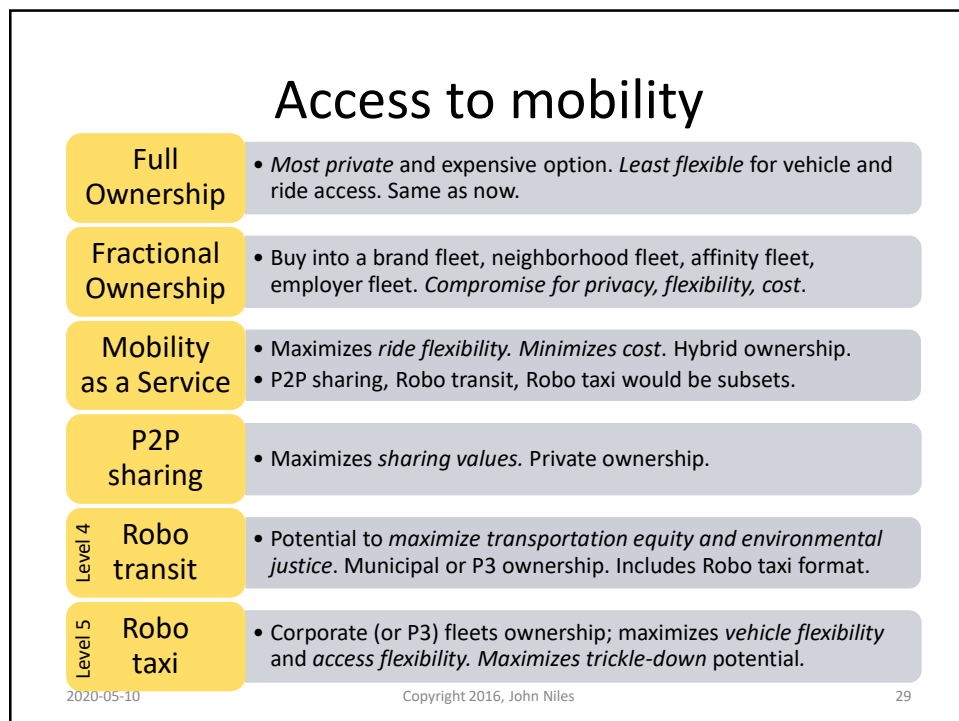
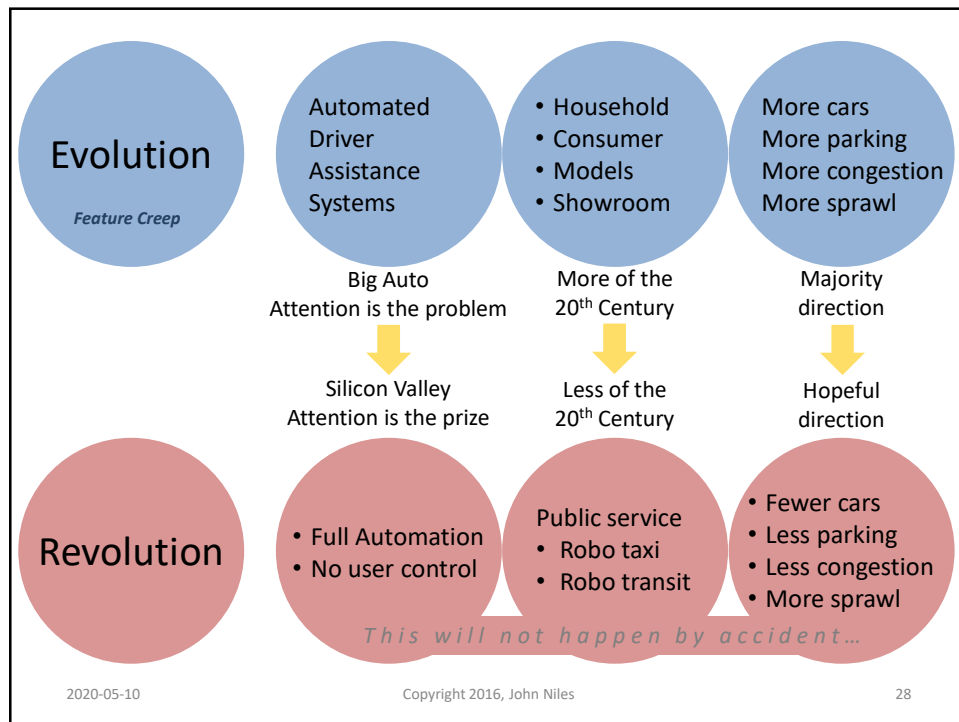
<http://www.recode.net/2016/5/16/11635628/self-driving-autonomous-cars-timeline>

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# CityMobil2 Driverless bus in reserved lane



- Helsinki, Finland
- La Rochelle, France
- Lausanne, Switzerland
- Trikala, Greece

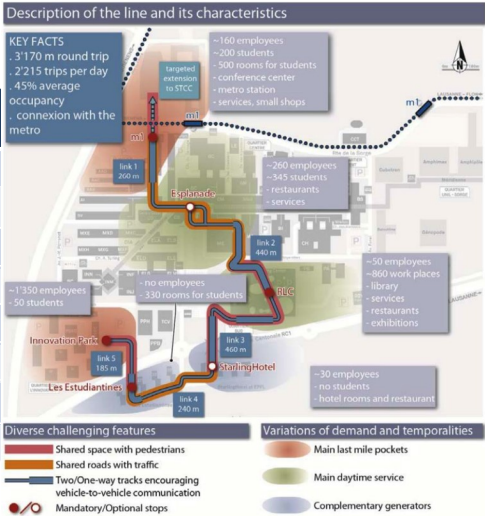
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# Transit Leap 1 example

EPFL, Switzerland	EasyMile
Environment	University Campus
Type of traffic	Ped, bike, low speed cars
Duration	Apr-Aug 2015
Track Length	2.3 km
Number stops	6
Number shuttles	6
Passengers	+6,000
Hours	07:45-20:00 daily



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## Transit Leap 1 example

La Rochelle, France	Robosoft
Environment	City Center
Type of traffic	Ped, bike, low speed cars
Duration	Dec 2014 Apr 2015
Track Length	1.5 km
Number stops	7
Number shuttles	6
Passengers	+8,500
Hours	10:00-17:00 daily



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## Singapore Autonomous Vehicle Initiative



- Planning**
- fixed mass-transport services
  - on-demand shuttle services
  - freight transport
  - Utility (e.g., road sweeping)

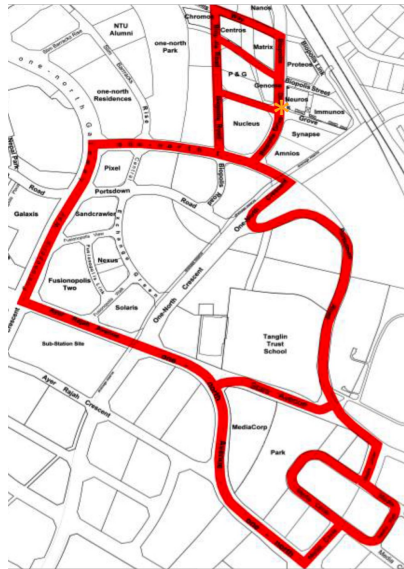
<http://www.lta.gov.sg/content/ltaweb/en/roads-and-motoring/managing-traffic-and-congestion/intelligent-transport-systems/savi.html>

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## A Transit Leap 1 route in One-North



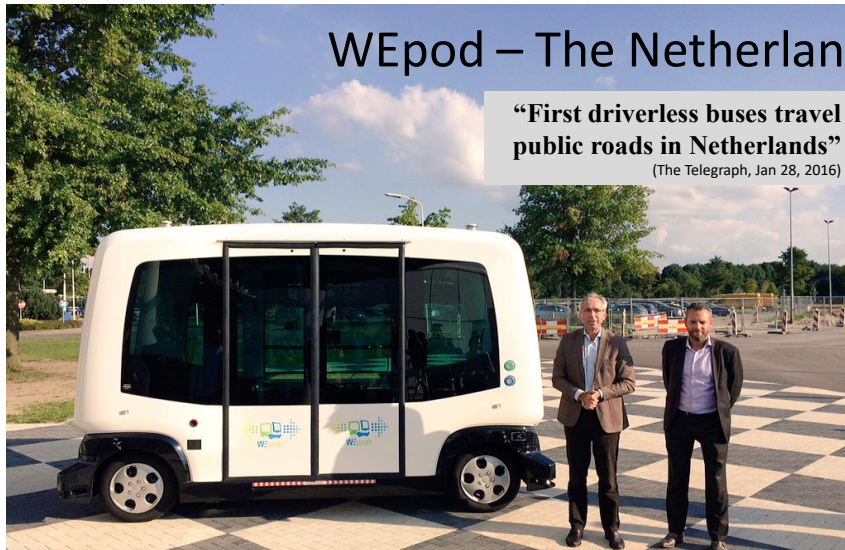
**Singapore  
Autonomous  
Vehicle  
Initiative  
(2km<sup>2</sup>)**

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## WEpod – The Netherlands

**“First driverless buses travel  
public roads in Netherlands”**  
(The Telegraph, Jan 28, 2016)



Self-driving WEpod to move passengers on public roads among public traffic between Wageningen and Ede, about 11k apart; buses carry 6-12 people at 25 kph.

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## Attention is the battle ground

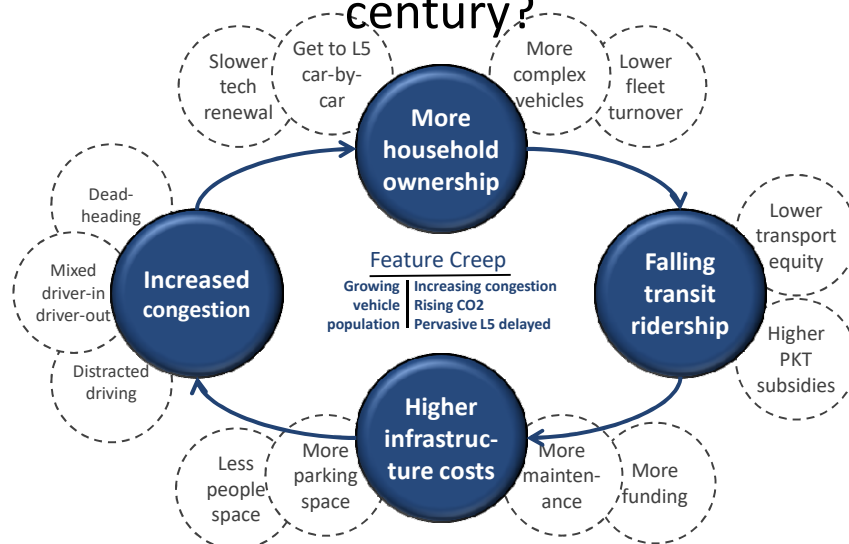
- Critical, non-renewable resource for
  - **Safety**
    - Inadequate attention causing rise in fatalities
  - **Productivity**
    - Promise to reduce the effective cost of congestion
  - **Consumption**
    - Data is really about marketing
  - **Social Media**
    - This will grow as an Attention Hog

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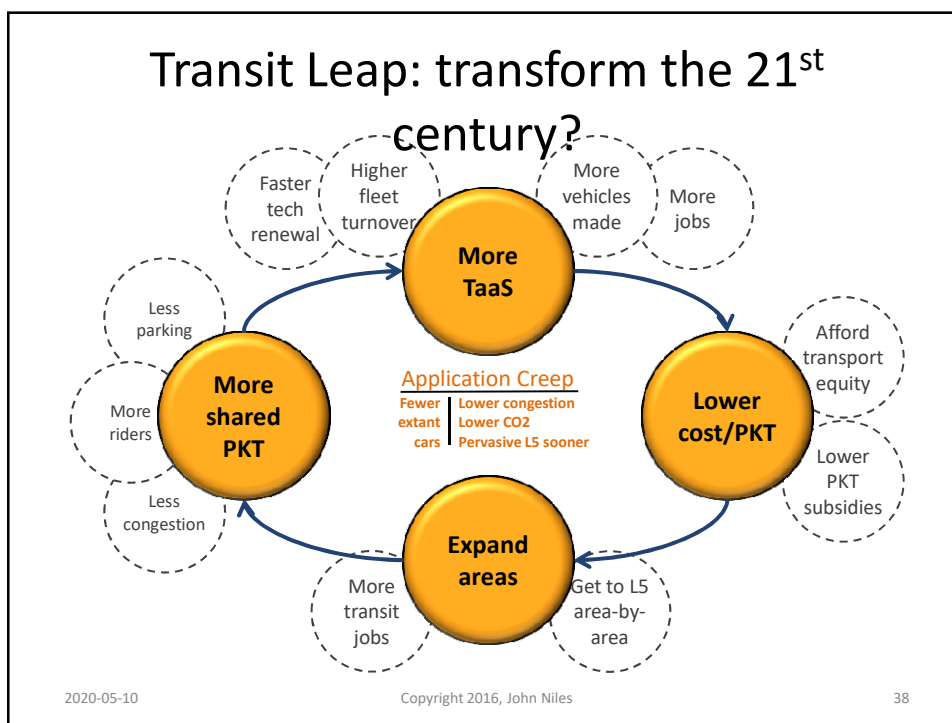
## Feature Creep: repeat of the 20<sup>th</sup> century?



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## The route to massive shared fleets

1. Create (don't predict) the future we want
2. Respect the commercial, social and safety value of attention
3. Respect the wickedness of automobility
4. Use behavioral economics

<b>Personal</b>		<b>Public</b>
 <p><b>Level 3</b> Conditional Automation</p>	<b>2016-2035</b>	 <p><b>Level 5</b> Full Automation</p>
<p><b>Goes anywhere a licensed human can drive</b></p> <p><b>Household/consumer use</b></p> <p><b>(prefer over Level 5 due to access anxiety)</b></p> <p><b>Operator in seat</b></p>		<p><b>Managed use</b> <b>Constrained locations</b> <b>Scheduled operations</b> <b>Controlled situations</b> <b>Prepared routes</b></p> <p><b>Robocab   Robotransit</b></p> <p><b>At first: stewards &amp; video surveillance</b></p>
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Pathways to *Transportation as a Service*

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Recent <http://endofdriving.org/publications/>

- *Planning for transportation-as-a-service* (2016) Ontario Planning Journal
- *Getting past the hype: revisited* (2016) Connected Canada. ITS Canada
- *How cities can use autonomous vehicles to increase transit ridership and reduce household ownership.* (2016) Canadian Transportation Research Forum (**Runner-up: Best Conference Paper**)

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