



*driving AV deployment*

The Canadian Automated Vehicles Centre of Excellence

# Autonomous Vehicles and the California Transportation Commission

## ‘Are we ready?’

California Road Charge Pilot Program Technical Advisory  
Committee (TAC) – 27 March 2015

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**Is there an elephant in the room in planning mtgs.?**

# **AUTONOMOUS VEHICLES**

**Are we ready for  
the arrival of  
Autonomous  
Vehicles (AVs)?**

# AUTONOMOUS VEHICLES

Are we ready for  
the arrival of  
Autonomous  
Vehicles (AVs)?

**NO!**

# Why?



- **Here soon**
- **HUGE socio-economic impacts**
- **Affects all aspects of life**
- **Not in future plans**
- **Potentially disruptive**

# Here soon

- **Automakers 2020-25?**
- **Google 2017-2020?**
- **Tipping Point 2026?<sup>1</sup>**



<sup>1</sup>CAVCOE estimate

# 2007 DARPA Urban Challenge



**'Boss' CMU Tartan Racing, 60 miles urban, 4h:10m**

## 2008 Levandowski's Prius



**Delivered pizza across SF Bay bridge**

## 2010 Audi 'Pikes Peak'



**12 mile hill climb, 156 turns, 27min (cf 11m48s)**

## 2011 AutoNOMOS Labs Berlin drive



**50 miles of autonomous driving on Berlin roads**

## 2013 Vislab BRAiVE, Parma



Rural-urban demo, in real, complex traffic, vision

# 2013 Daimler/Mercedes Bertha Benz Road Trip



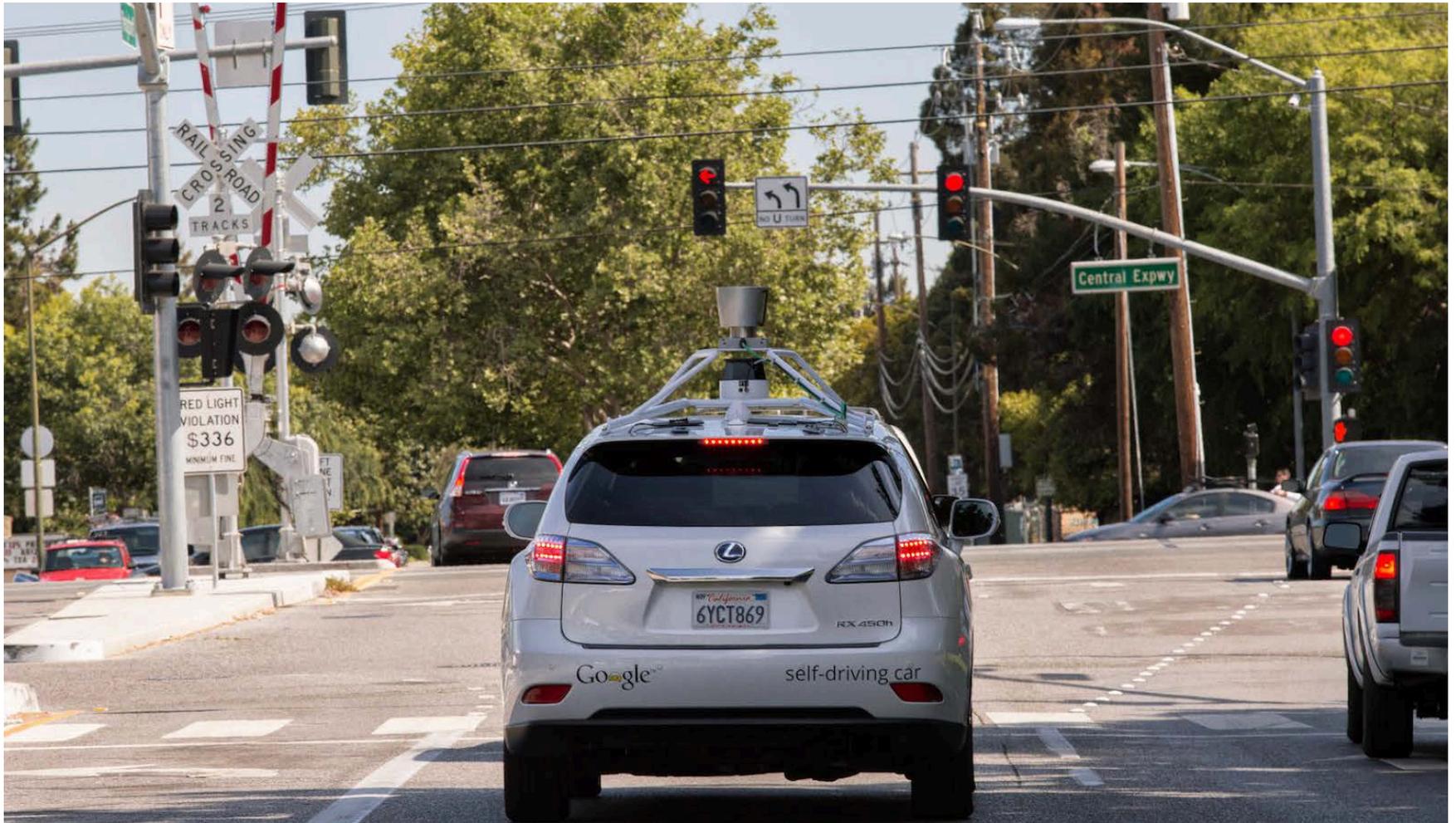
**60 mile rural-urban demo, vision based**

## 2014 Induct Navia



**Electric, 12mph, commercially available Jan '14**

# 2014 Google 'mastering city street driving'



700k miles, cyclists signals, construction zones

## 2014-2016 Google Prototype 'Vehicle' (NEV)



25mph, 100 pilot project CA for 2yrs. 2017-2019?...

# 2014-2017 Volvo 'Drive Me', Gothenburg



100 increasingly autonomous – 2020 Zero deaths

# 2015 Tesla 'Autopilot' (Autonomous 2023)



**'will go from on-ramp to off-ramp autonomously'**

# 2015 Mercedes Benz F 015 Concept



**“Innovative perspective into the future of mobility.”**

# 2020-2025 Nissan Autonomous Drive



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**Range of Commercially viable AVs on road**

# Mercedes Benz Future Truck 2025



**Many technological elements already available**

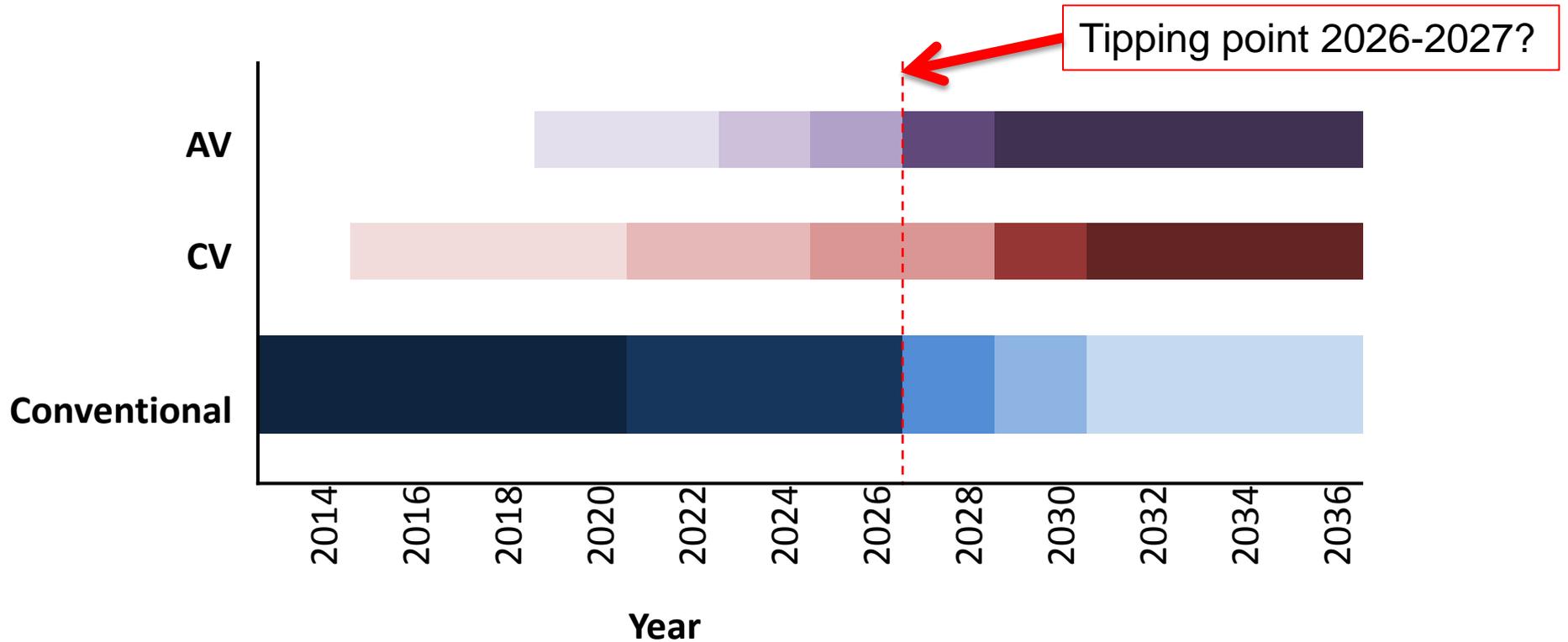


***This technology  
is coming like a  
freight train.  
If we're ready,  
great.  
If we're not,  
tough.  
It's coming  
anyway.***

- Paul Godsmark

# Estimated Timeline and Tipping Point

## RELATIVE IMPACT OF AVs/CVs TO CONVENTIONAL TRAFFIC



# Huge Impacts

- **Safety – save >27k/yr**
- **Time – save 5.5 Bn hrs**
- **Shared TaaS**
- **Savings \$1.3 trillion/yr<sup>2</sup>**
- **Money flow >20%GDP?<sup>3</sup>**

<sup>2</sup>Source: Morgan Stanley

<sup>3</sup>CAVCOE estimate

# TaaS: Compelling Business Case

**Car Rentals**

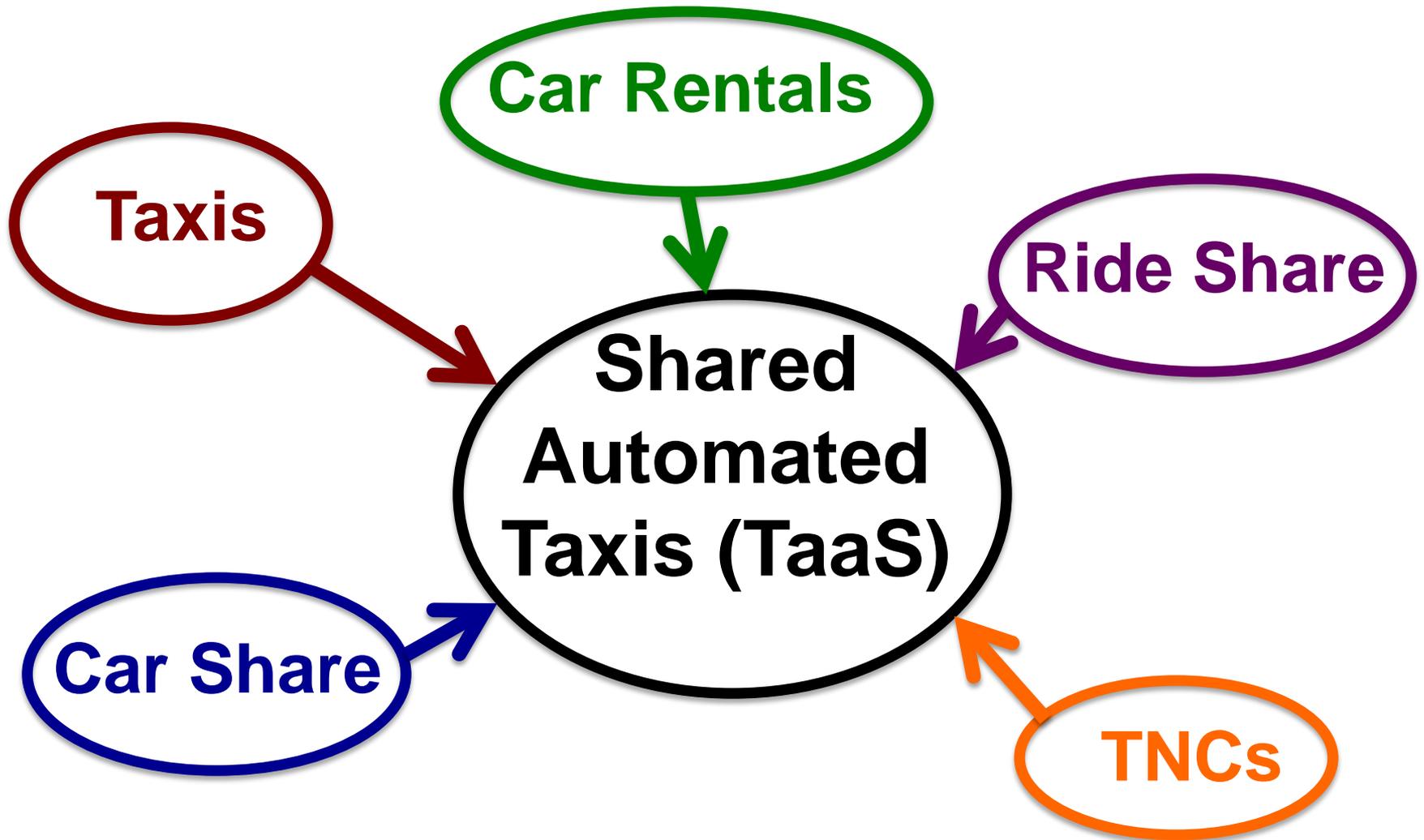
**Taxis**

**Ride Share**

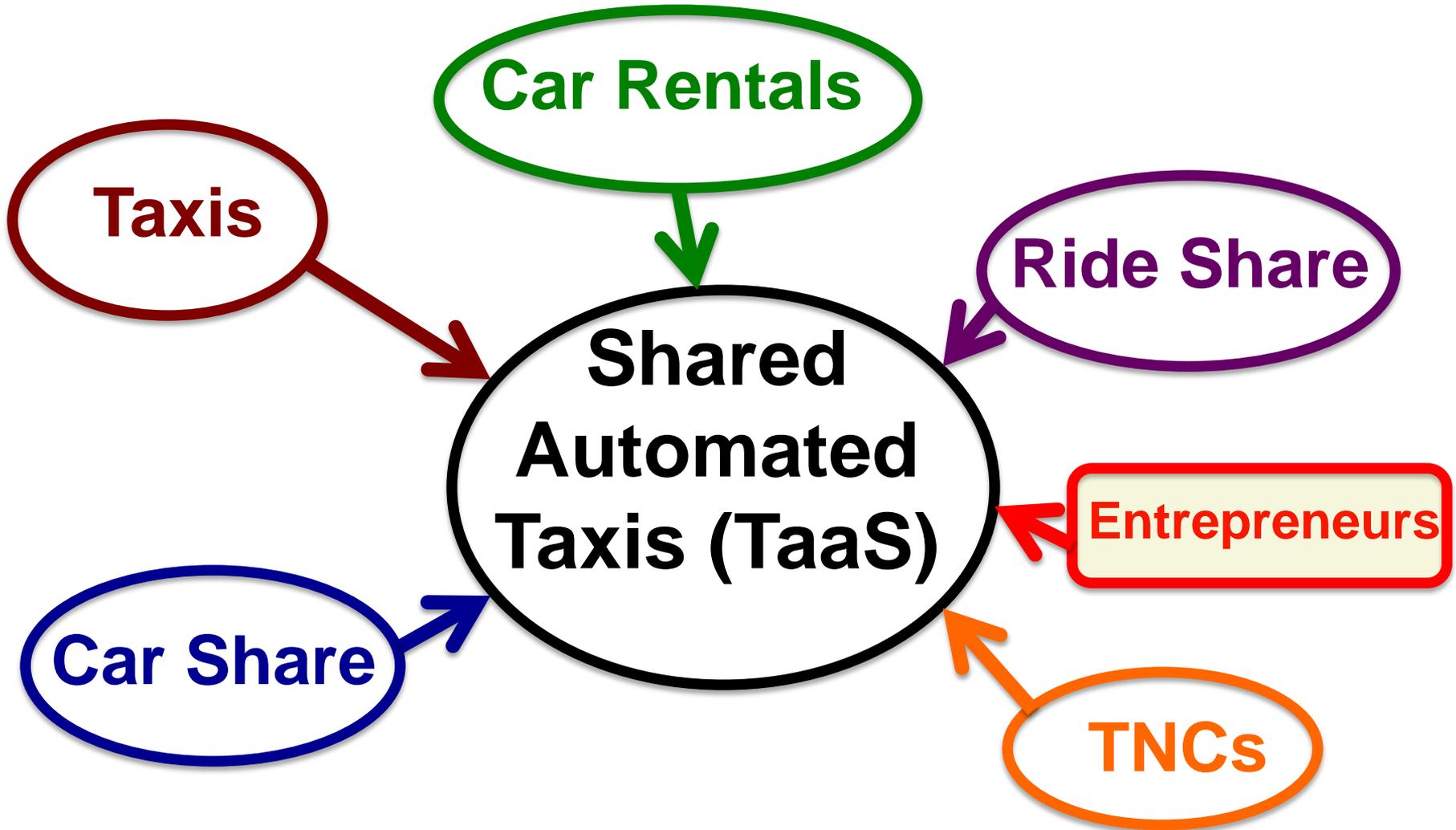
**Car Share**

**TNCs**

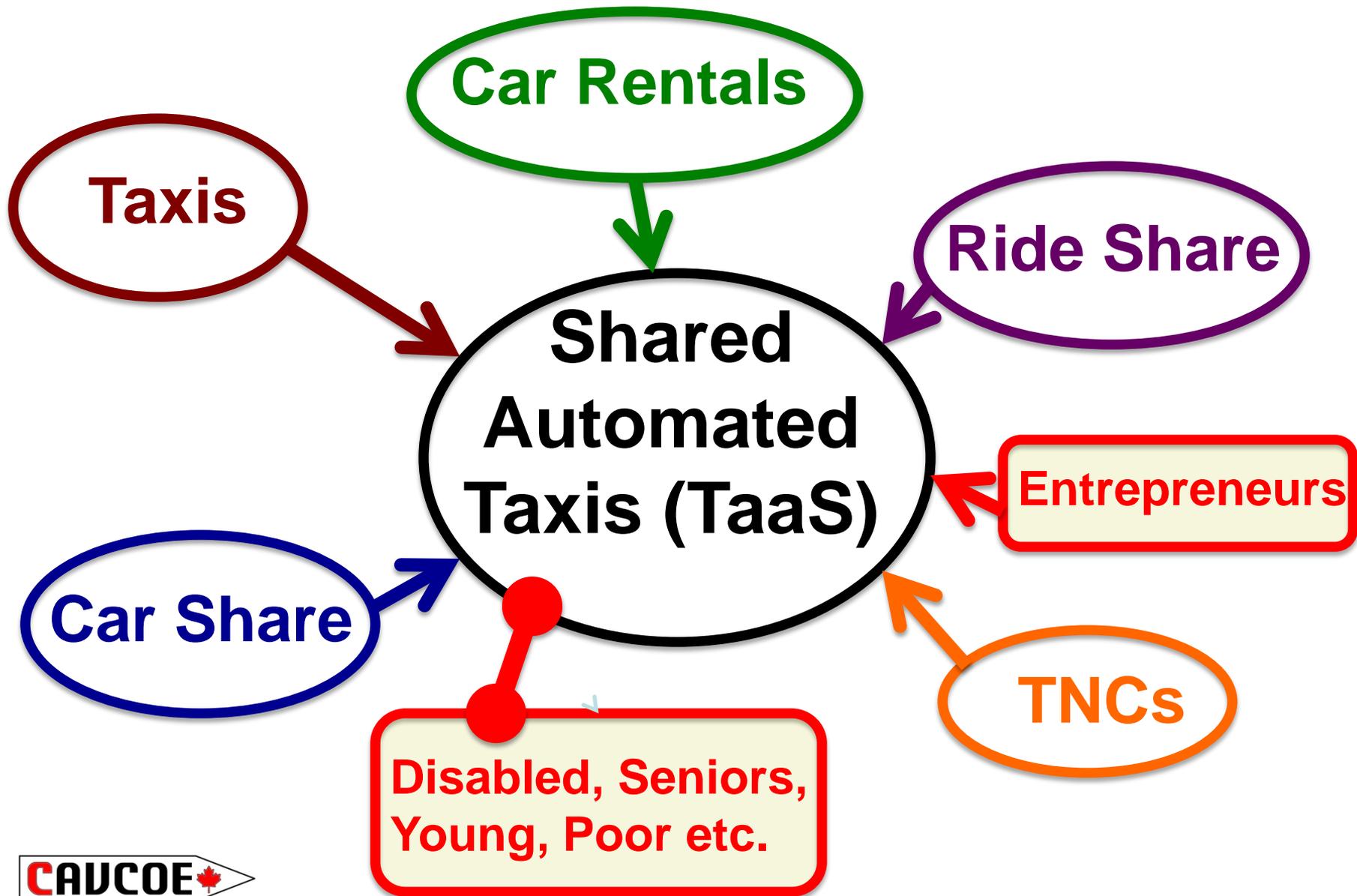
# TaaS: Compelling Business Case



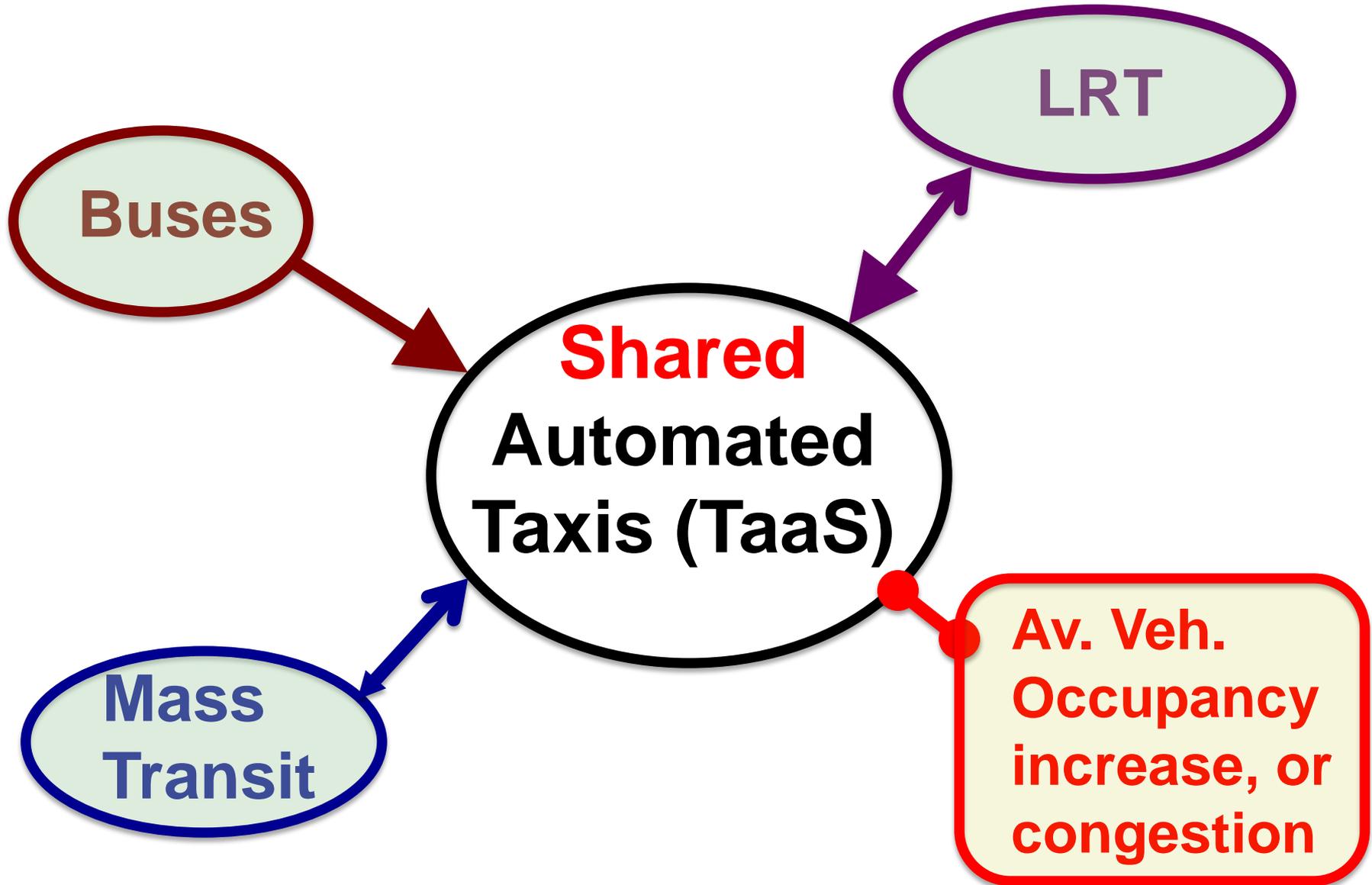
# TaaS: Compelling Business Case



# Compelling Business Case



# TaaS: Modal Shift





**Affects all  
aspects of life**

**Just like Car 1.0 ...**



**Affects all  
aspects of life**

**Autonomous  
vehicles  
will change  
*how and where*  
we  
*live and and work***

# Fundamental Changes

**Do plans and forecasts 15 yrs out allow for:**

- **Sprawl**
- **Densification**
- **Move from ownership to TaaS**
  - **Users save approx. 40%/yr\***
  - **One AV replaces 2 to 13 private vehicles**

\* Source: Earth Institute, Columbia University 'Transforming Personal Mobility

# Not in future plans

- Transportation
- Municipal
- Parking
- Transit
- Fleet replacement
- Trucking
- High speed rail
- Government depts.
- Pensions

...and no standards or guidelines



# **New social norms, behaviours, business models**

**Do plans and forecasts 15 yrs out allow for:**

- **Mobile (AV) offices**
- **Mobile (AV) homes**
- **Nomadic travelling communities**
- **Retailers/services come to you**
- **Freight logistics revolutionized**
- **Autonomous bicycles**
- **Sidewalk friendly ‘deliverbots’**

# Autonomous Friendly Corridors (AFCs)



Truck costs ↓40%, use ↑40%

- Central North America Trade Corridor Association (CNATCA)
- Roadway designed for autonomous trucks
- Air corridor - drones
- Mexico to Canada
- **Opportunities for West Coast AFC**
- Start planning now

# Autonomous Vehicle Zones (AVZs)



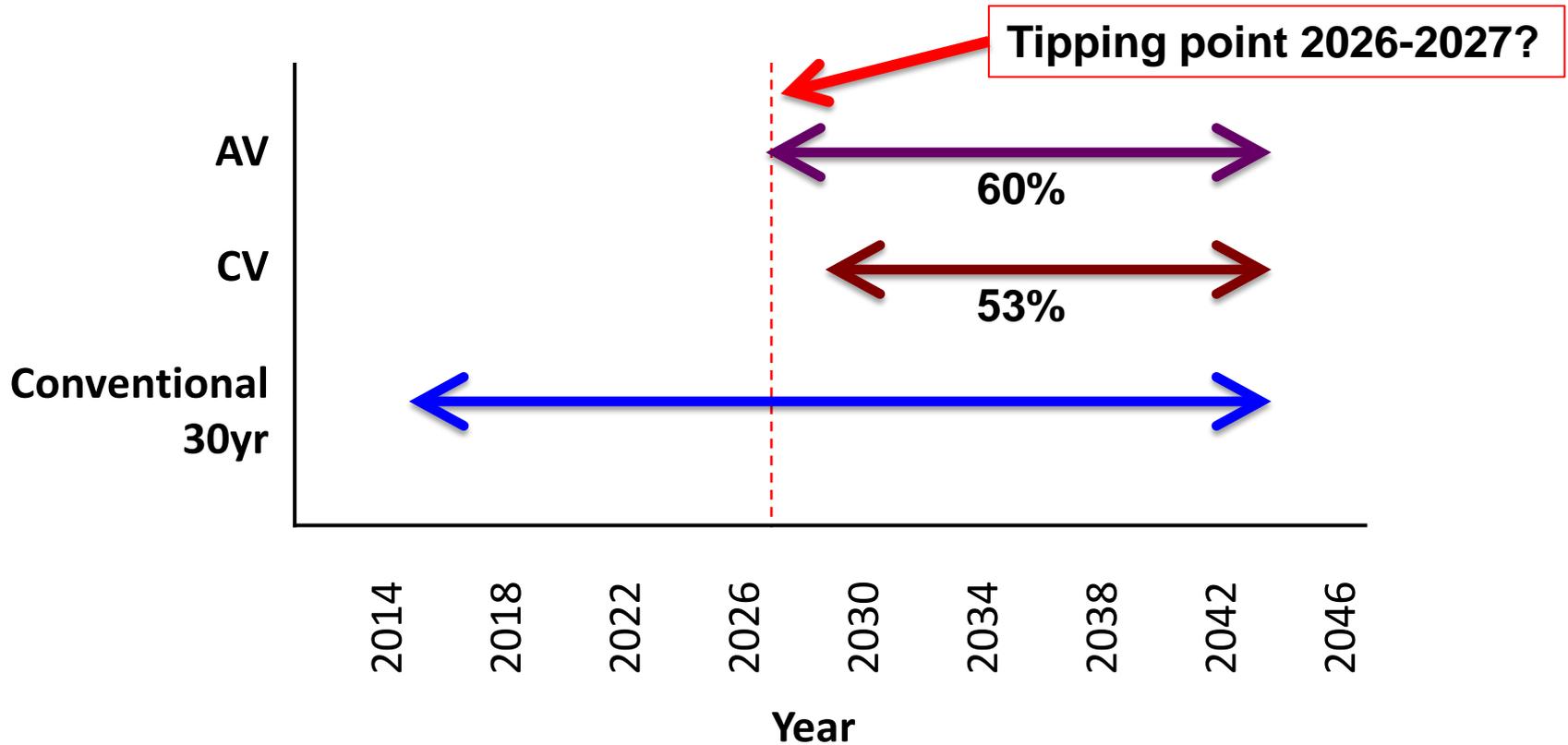
Concept drawing of Landsdown Park in Ottawa. Copyright/Courtesy OSEG, Barry Hobin and Richard Brisban Architects, Canon Design and General Motors for the EN-V pods

*LA Mayor, Eric Garcetti, wants LA to be the first major city with a 'driverless car neighbourhood'*

- **Remove human drivers = Maximum Benefits ASAP**
- **Improve quality of life ranking in all categories**
- **Promote walkability and active transportation**
- **The 'forgotten 30%' – unlicensed, disabled, seniors etc**
- **Being discussed in LA, Singapore, Helsinki**

# 30 Year Transportation Plans/Forecasts

## LONG RANGE TRANSPORTATION PLAN/FORECASTS IMPACTS



# Municipal Policy/Reg's/Standards & AVs

## Planning for AVs:

- The San Francisco MTC 'Bay Area Plan' p.144
  - picture of Google AV and
  - *'planners will be watching with keen interest in years to come'...*
- Most plans EVERYWHERE don't even mention AVs
- **No policies, laws, regulations, standards, guidelines or codes of practice to guide us...**
- But already within the AV planning timeframe.
- California will have draft regulations for the operation of AVs in place by 1<sup>st</sup> Jan 2015
- Possible EIS legal challenge – 'AV alternative solution'



Economic  
Growth & Job  
Creation

Efficient  
Mobility



21<sup>st</sup> Century  
Transportation

Enhanced  
Safety

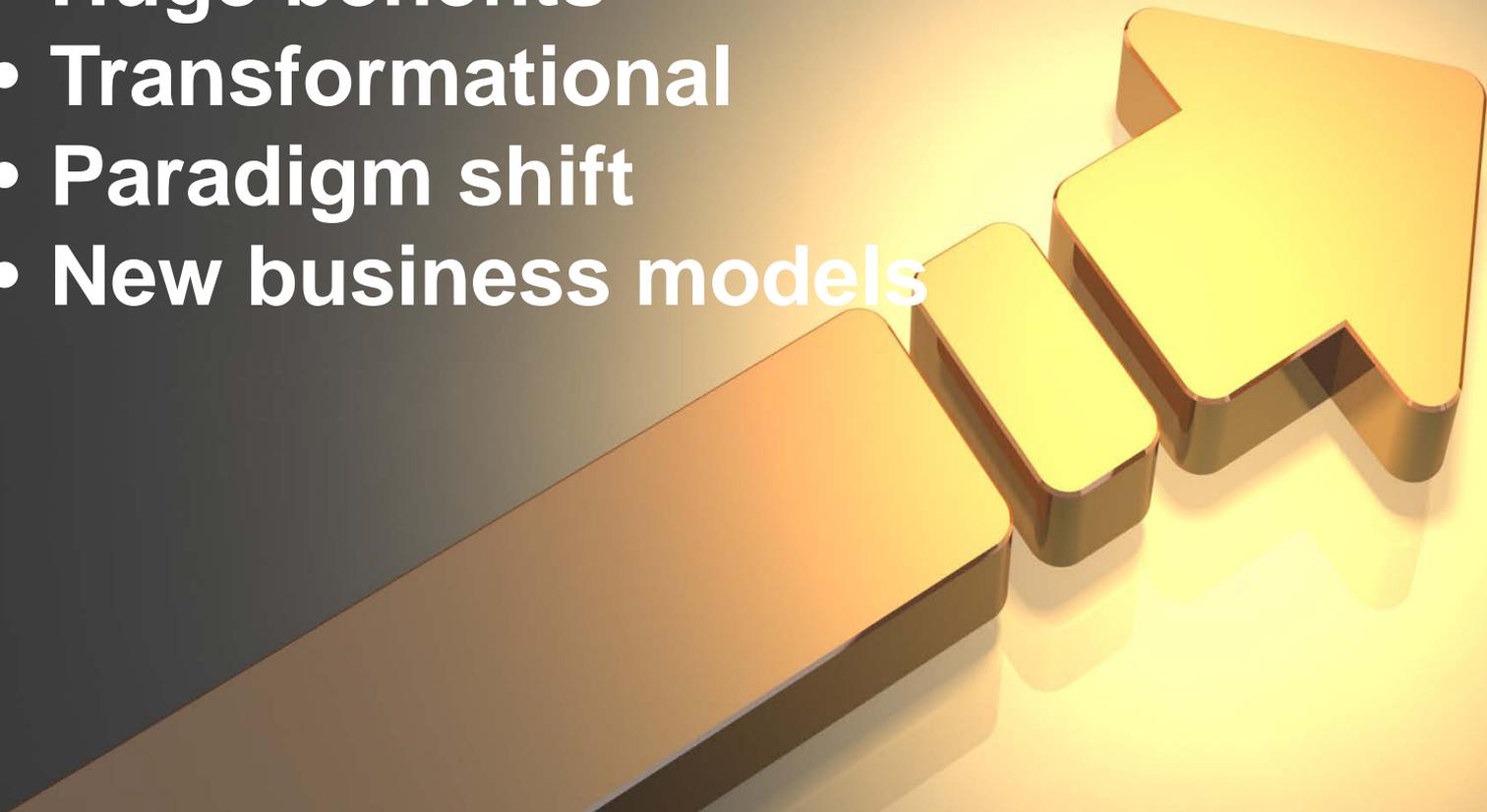
Healthier  
Environment



# Opportunities and challenges

## UPSIDE

- Huge benefits
- Transformational
- Paradigm shift
- New business models





# Opportunities and challenges

## **DOWNSIDE**

- **Formidable**
- **Job displacement**
- **Privacy**
- **Obesity**
- **Disruptive**

# Let's plan now

- **Good policies**
- **Due diligence**
- **Maximize benefits**
- **Mitigate downsides**



**Autonomous vehicles are coming soon**

**Let's get ready!**

**It's better to be over-prepared than to  
allow unnecessary socio-economic  
collateral damage.**





**‘Taxi!’** - Let's prepare for the new paradigm

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