

HOW DO AUCKLAND CITIZENS GET WHAT THEY WANT FROM DRIVERLESS CARS?

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February 16, 2018



Will vehicle automation mean...

- Fewer vehicles
- Fewer drivers
- Easier travel
- Less congestion
- Fewer accidents
- Less parking needed
- Less car ownership
- Fewer roads
- More ride sharing

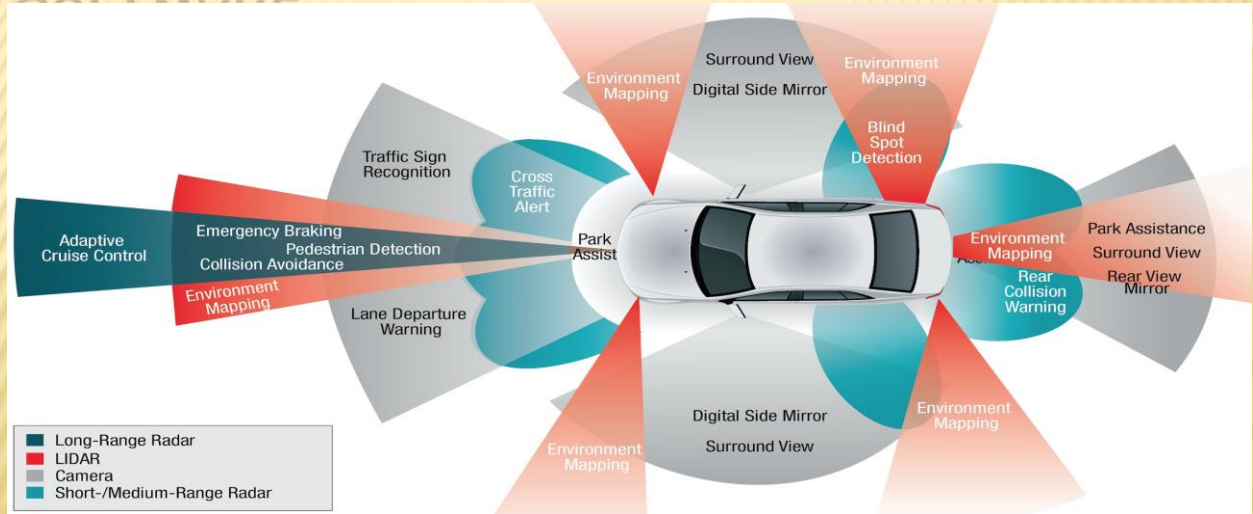


- More vehicles
- More drivers
- More travel
- More congestion
- New accident types
- More parking needed
- More sprawl
- More roads
- Less ride sharing

Planned behavior vs. consumer behavior

SENSORS, ACTUATORS, MAPS, INTELLIGENT SOFTWARE

video



Graphic courtesy of <http://mtri.org/automotivebenchmark.html>

AUTOMATED CARS SEE WITH LIDAR

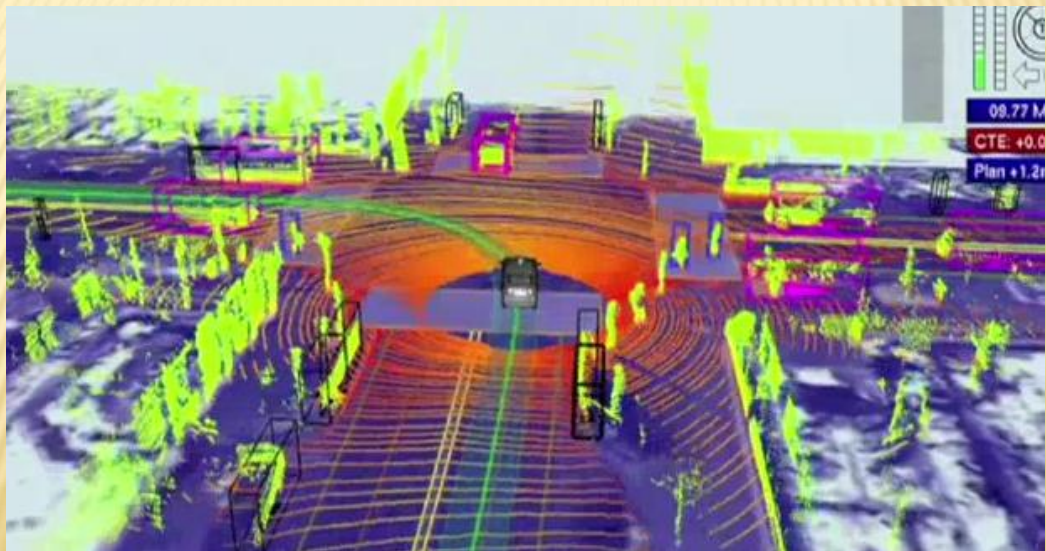


Image: Sebastian Thrun & Chris Urmson/Google

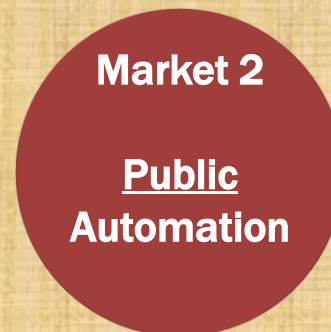
Sensors and computers work constantly and quickly to determine:

- + Where is this vehicle and what's around it that doesn't move?
- + What is around this vehicle that's moving or might move?
- + What will happen next with what's moving or might?
- + What should the vehicle do now?

TWO KINDS OF AUTOMATED VEHICLES ARE GOING TO HAPPEN



People buying CARS



People buying RIDES

TWO MARKETS FOR AUTOMATED VEHICLES

- ✘ Market-1 or Guardian function, Evolving Personal Cars, driver behind the wheel, mindful distraction allowed, works in simple enough environments
- ✘ Market-2 or Chauffeur function, Robo-cabs, Uber without a driver, remotely monitored, limited to mapped urban zones

AV IN MARKET 1: JIM'S 2013 MITSUBISHI IN NEW ZEALAND, PURCHASED PRE-OWNED



DRIVER ASSIST AUTOMATION IN 2013 OUTLANDER



MARKET 1 PREVENTING ACCIDENTS AND SAVING LIVES NOW

- ✗ Adaptive cruise control
- ✗ Adaptive light control
- ✗ Automatic braking
- ✗ Lane keeping
- ✗ Driver drowsiness detection
- ✗ Hill descent control
- ✗ Intelligent speed adaptation
- ✗ Night vision

Video of Volvo DriveMe Project in Gothenberg is at <https://www.media.volvocars.com/global/en-gb/media/videos/158339/drive-me-self-driving-cars-for-sustainable-mobility1>



Humans are very safe drivers.

45.6 billion VKT in 2016

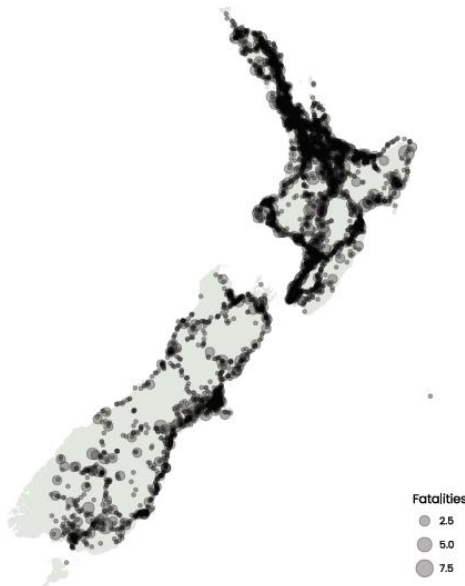
330 fatality road toll

138 million km per fatality

A challenge for the robots!

Graphic courtesy of <http://ellisp.github.io/blog/2017/10/15/traffic-crashes>

ellisp.github.io/img/0113-all-nz.svg
Fatal crashes in New Zealand, 2000 – 2017



Source: NZTA Disaggregated Crash Data



WILL TRAFFIC ACCIDENTS BECOME A THING OF THE PAST?

- ✗ No.
- ✗ Reductions yes, but there are likely to be new kinds of crashes in Market-1 vehicles because of the complexity of maintaining human attention with automated control.
- ✗ Collisions of robo-cabs with other robo-cabs and with human-driven vehicles are likely to rise at first and fall later as technology evolves.

WILL PEDESTRIANS AND CYCLISTS BE SAFER ?

- ✖ Yes, safer, or there won't be automated vehicles.
- ✖ Detecting and hard-stopping before striking a ped or bike is an easy problem to solve.
- ✖ You can buy automated braking now.
- ✖ Automated vehicles killing pedestrians and cyclists will be banned from the roads.
- ✖ Target Zero is the vision for safety.



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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Traffic jam video at
<https://www.youtube.com/watch?v=Suugn-p5C1M>

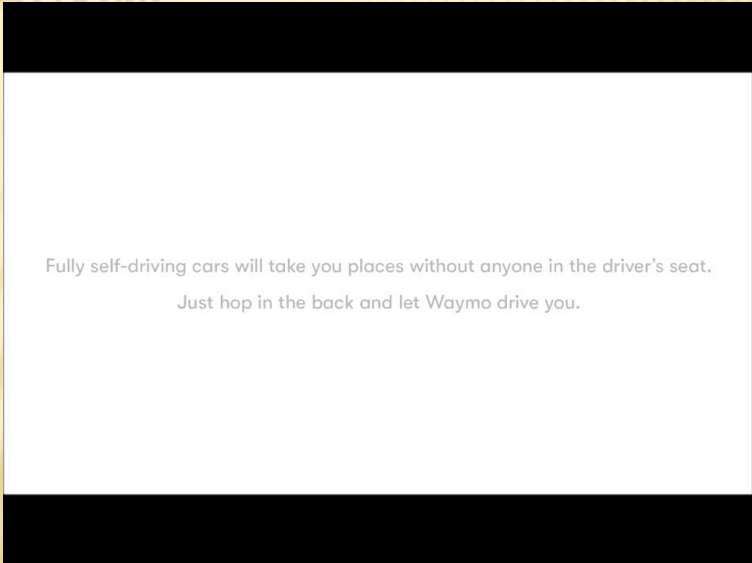


MARKET 2 – RIDE BUYING



MARKET 2 RIDE BUYING

Video of Waymo self-driving cars at <https://www.youtube.com/watch?v=aaOB-ErYq6Y&feature=youtu.be>





Babcock Ranch

...a green field new community development in Florida

Driverless Community Shuttle – MicroTransit!

Targeting private car reduction downward to a 0.38 per capita target

1 car per household

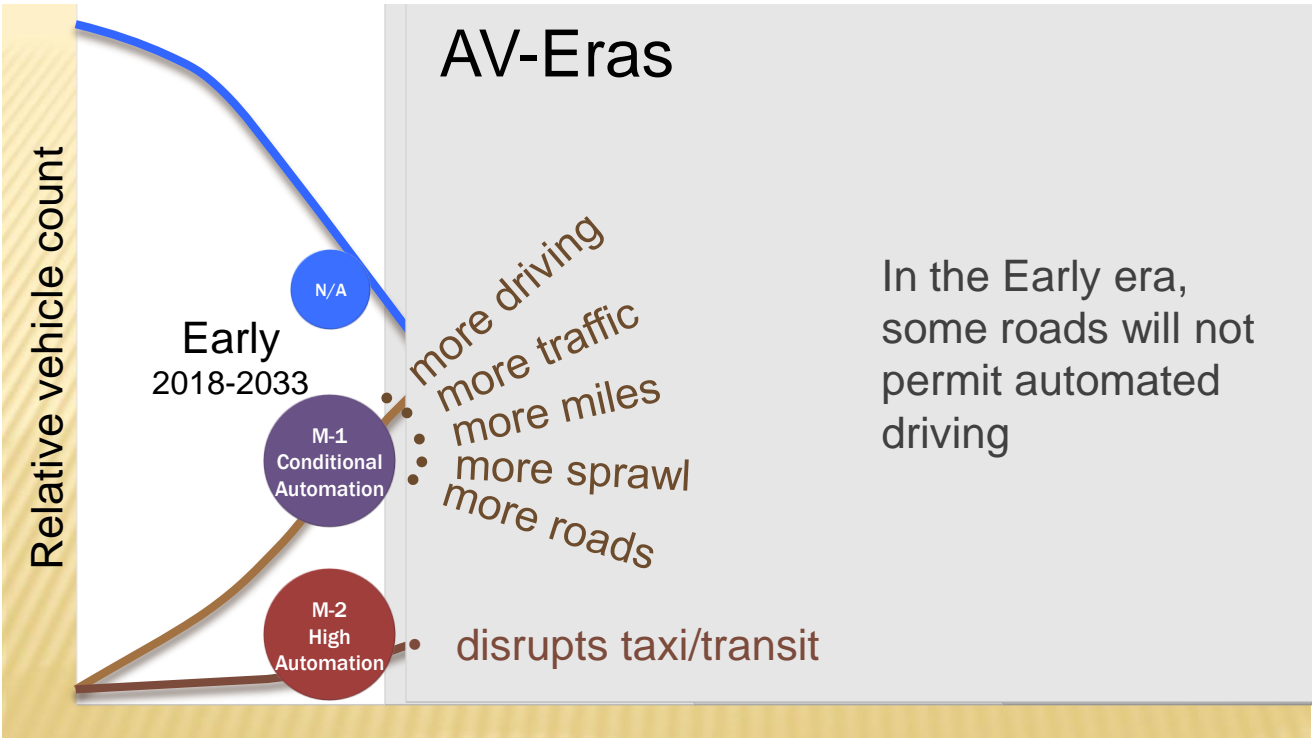
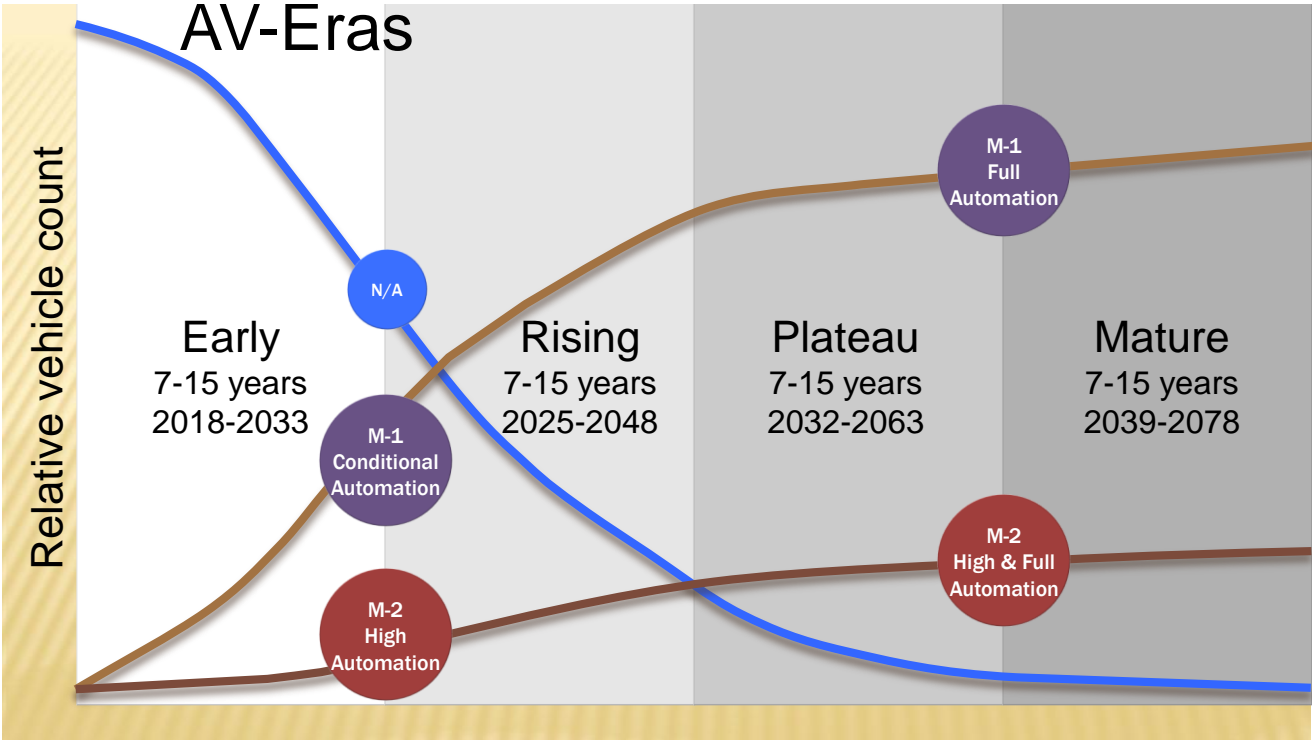
AV-Eras

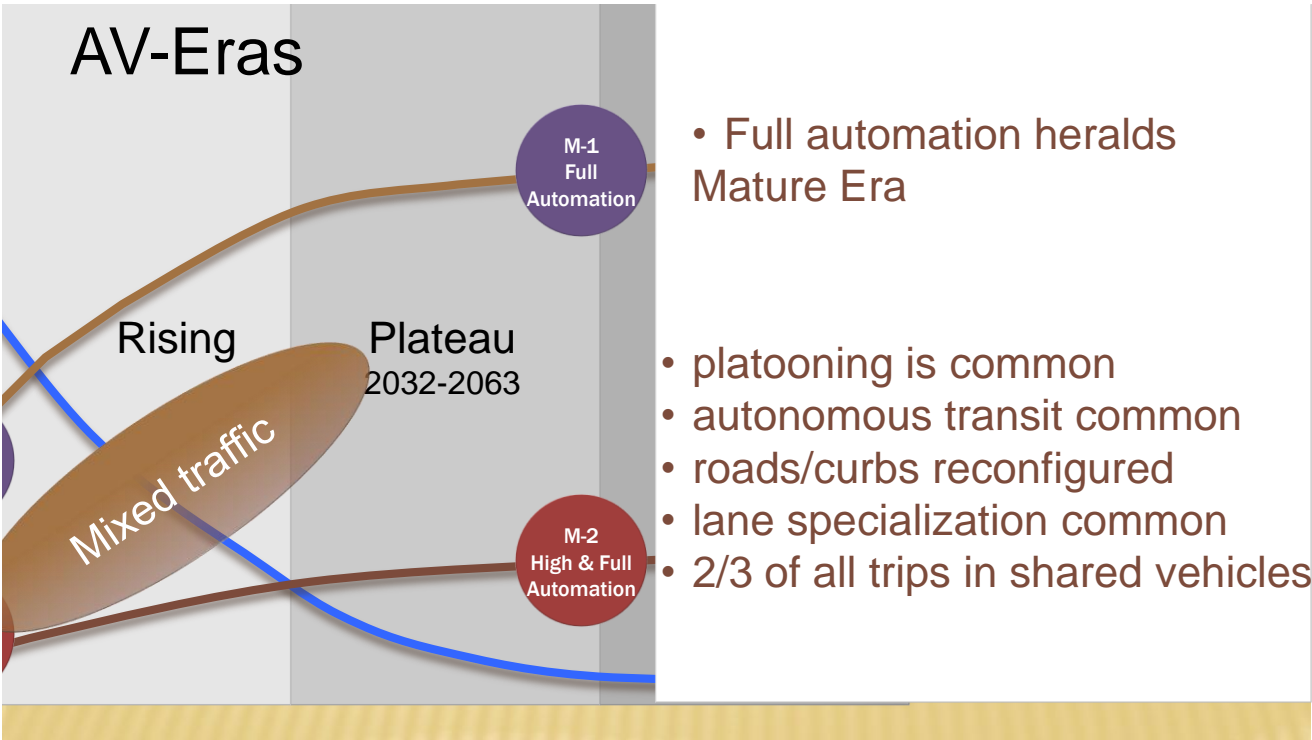
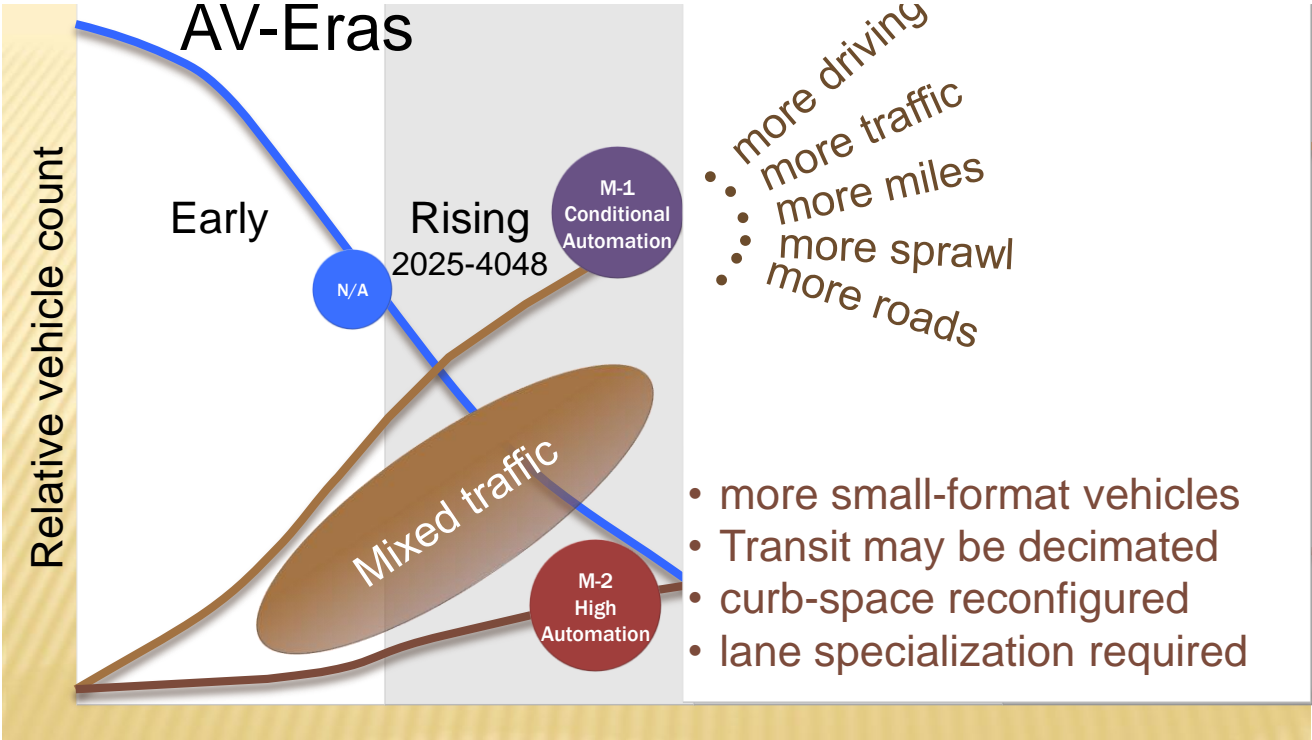
planning stages

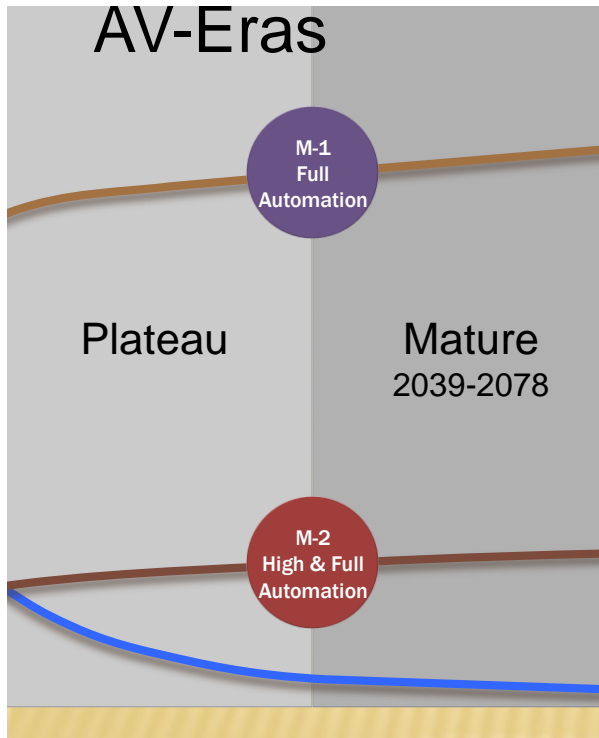
10% Early 7-15 years ~2018-2033	25% Rising 7-15 years ~2025-2048	50% Plateau 7-15 years ~2032-2063	75% Mature 7-15 years ~2039-2078
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AV-Eras represent percent trips in Market-2 vehicles (public, shared vehicles)

- Acceptance
- Weather
- Infrastructure
- Investment
- Labor
- Regulations







- full automation common
- some roads do not permit driving
 - platooning is default
 - autonomous transit is default
 - roads/curbs reconfigured
 - lane specialization reducing

A VISION FOR CHINA

Video from
General Motors
exhibition in
China:

<https://www.youtube.com/watch?v=0tiHwzGsotA>



WHEN AND HOW SHOULD AUCKLAND AND NEW ZEALAND PREPARE FOR AVS?

- ✘ Do micro-transit deployments that address real problems
- ✘ Establish harmonized regulation for taxicabs, Uber, and all hail-on-demand ride sellers.
- ✘ Boost programs that encourage ride-sharing to shift SOVs to HOVs.
- ✘ Start now!

THANK YOU – QUESTIONS?

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Expertise in
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College textbook coming:
The End of Driving: Transportation Systems and Public Policy Planning for Autonomous Vehicles
by Bern Grush and John Niles
(Elsevier, 2018)