Integrating City Access by Exploring the Opportunities Afforded by Smart Vehicle Technology

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Chair, Infrastructure Sustainability Council of Australia

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Plenary Three

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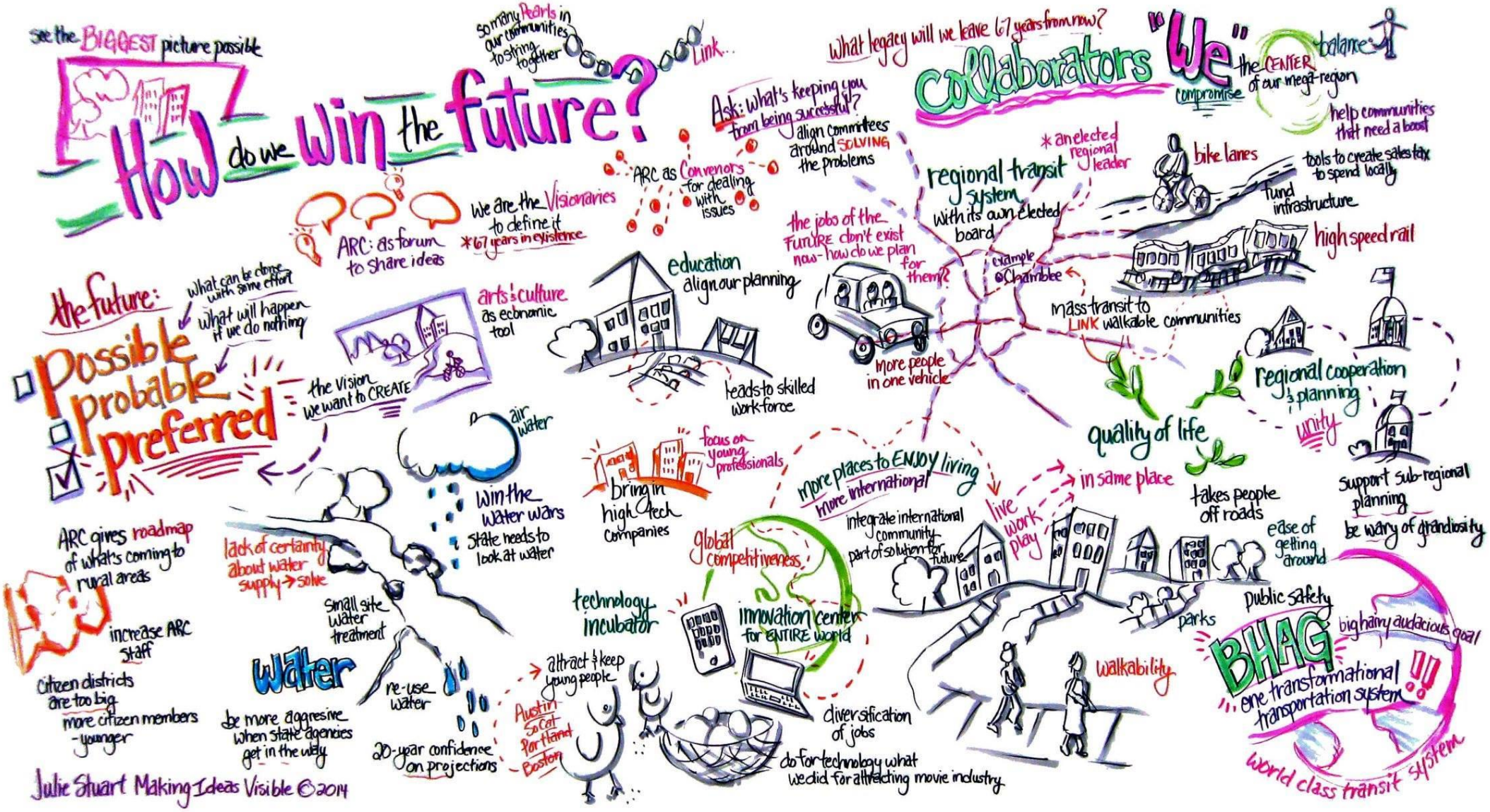
Infrastructure Sustainability Council of Australia



SMARTER SMART CITIES

The "smart cities" agenda is mainly focused on top down technological initiatives (embedded sensors, data integration and analytics).
The real smart cities of the future will mobilise human intelligence as well as artificial intelligence, bottom up creativity as well as top down control.

1. TOP DOWN SMART CITIES

City planners and corporations use IT infrastructure to optimise the flows of people and goods and deliver public services more efficiently

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Has embedded sensors in the city's infrastructure to monitor and manage water use

IBM
Has designed a centralised Intelligent Operations Centre to coordinate and manage all of a city's services

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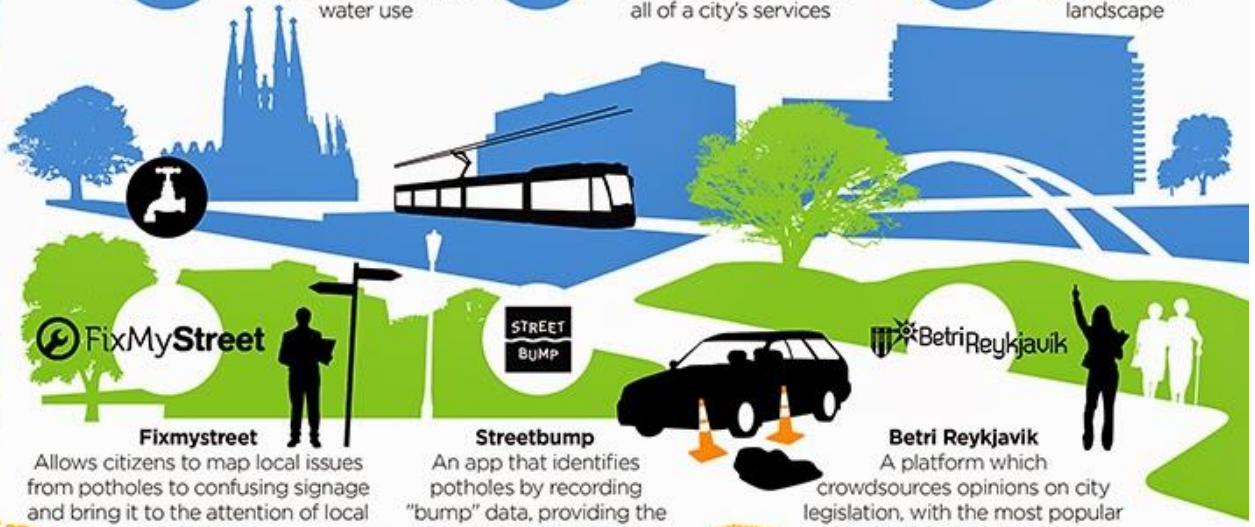
Is marketed as a way to manage the entire urban landscape



2. CONNECTING TOP AND BOTTOM

People use open data released by local authorities and companies to create services, and local authorities collect data from citizens to improve their services

Fixmystreet
Allows citizens to map local issues from potholes to confusing signage and bring it to the attention of local authorities

Streetbump
An app that identifies potholes by recording "bump" data, providing the city with real-time data on road conditions

Betri Reykjavik
A platform which crowdsources opinions on city legislation, with the most popular ideas debated by the council

3. BOTTOM UP SMART CITIES

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Smart Citizen Kit
The Smart Citizen project uses low cost sensors and a web platform to enable citizens to capture, share and make sense of environmental data about their city

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A place for citizens to put ideas into action to make their city a better place to live

Blindsquare
Uses crowdsourced information and GPS to help blind people navigate the city

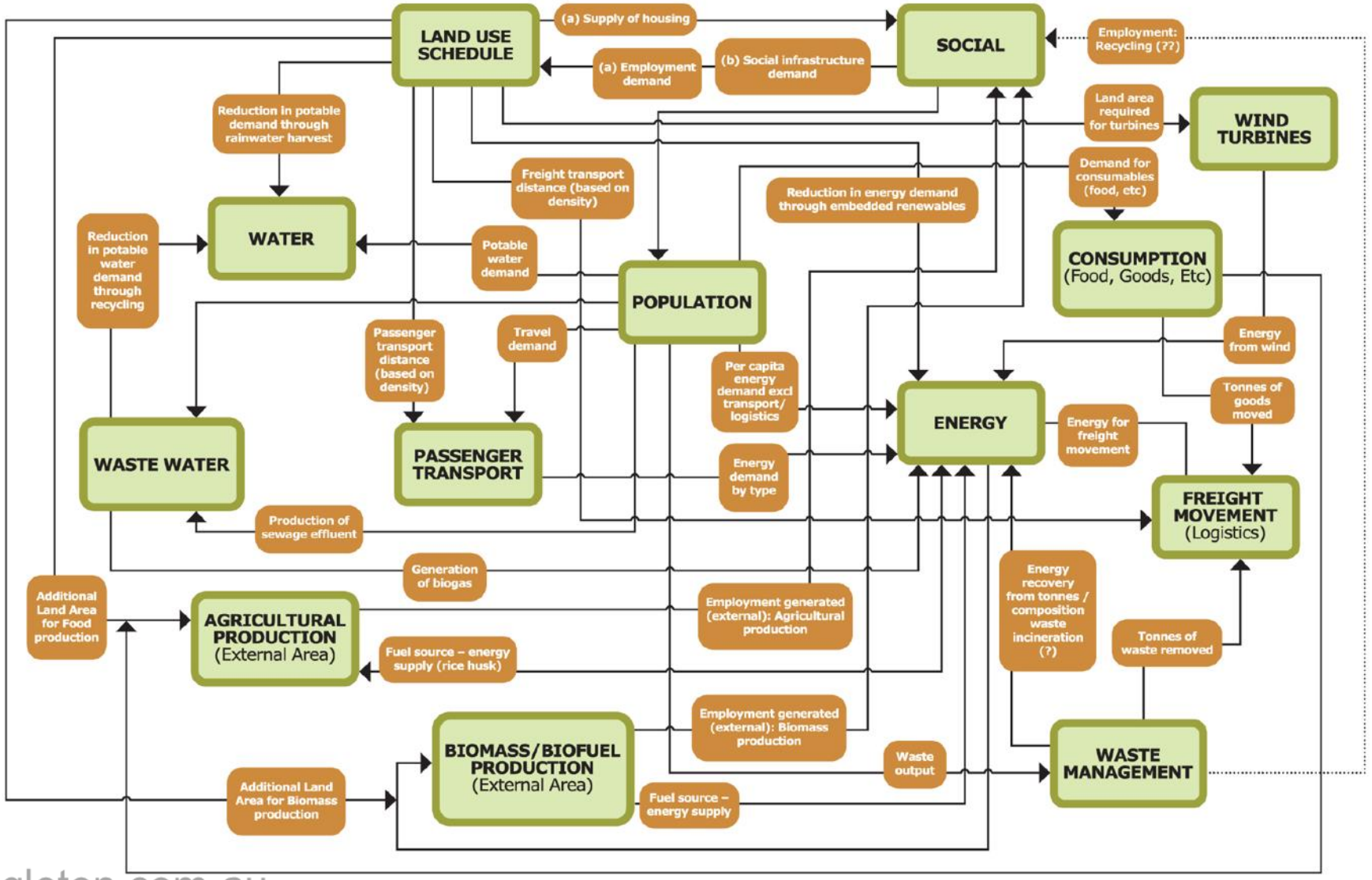
Peerby
Promotes collaborative consumption by allowing neighbours to share or rent their possessions

City Planning Objectives

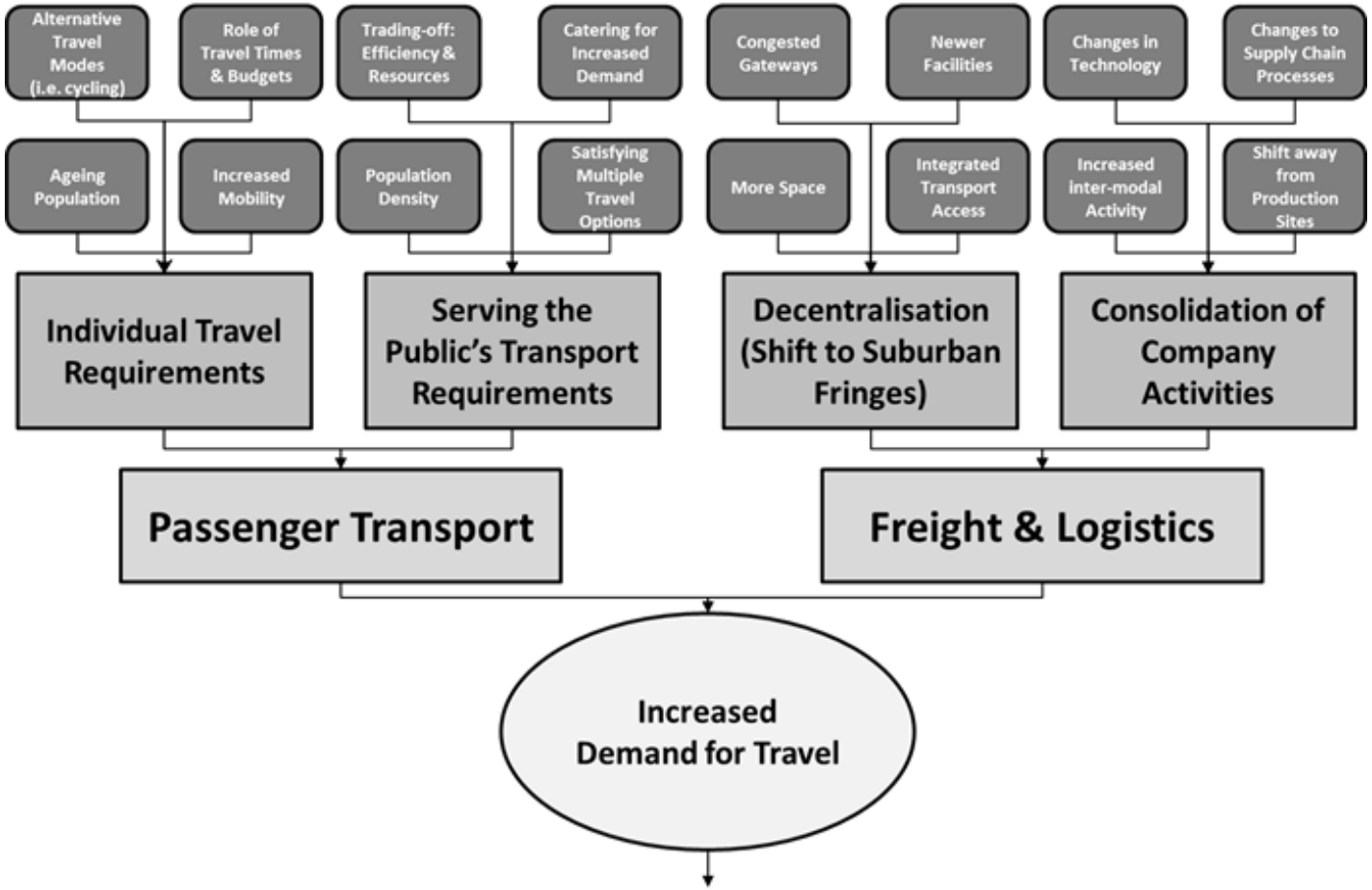
- **City Resilience –** Urban management, techniques and systems to ensure cities can respond to shocks and stresses (foreseen or otherwise).
- **City Adaption –** turning adaptive measures in addressing the long term effects of climate change and carbon reduction into opportunities for enhancing city life.
- **City Life –** the design of our places and spaces the buildings people occupy and the education, health and mobility services they rely on.
- **City Growth –** seizing opportunities for economic growth from airports, interchanges, infrastructure and services investment.
- **City Regeneration** – transforming the rundown, abandoned and damaged pieces of our cities back to places where people want to live work and play.
- **Host Cities –** capitalising on major events to deliver transformational change to cities and their populations.
- **City Operations** – The governance, funding, delivery and management programmes that help our cities function and grow

Modeling Sustainable Cities

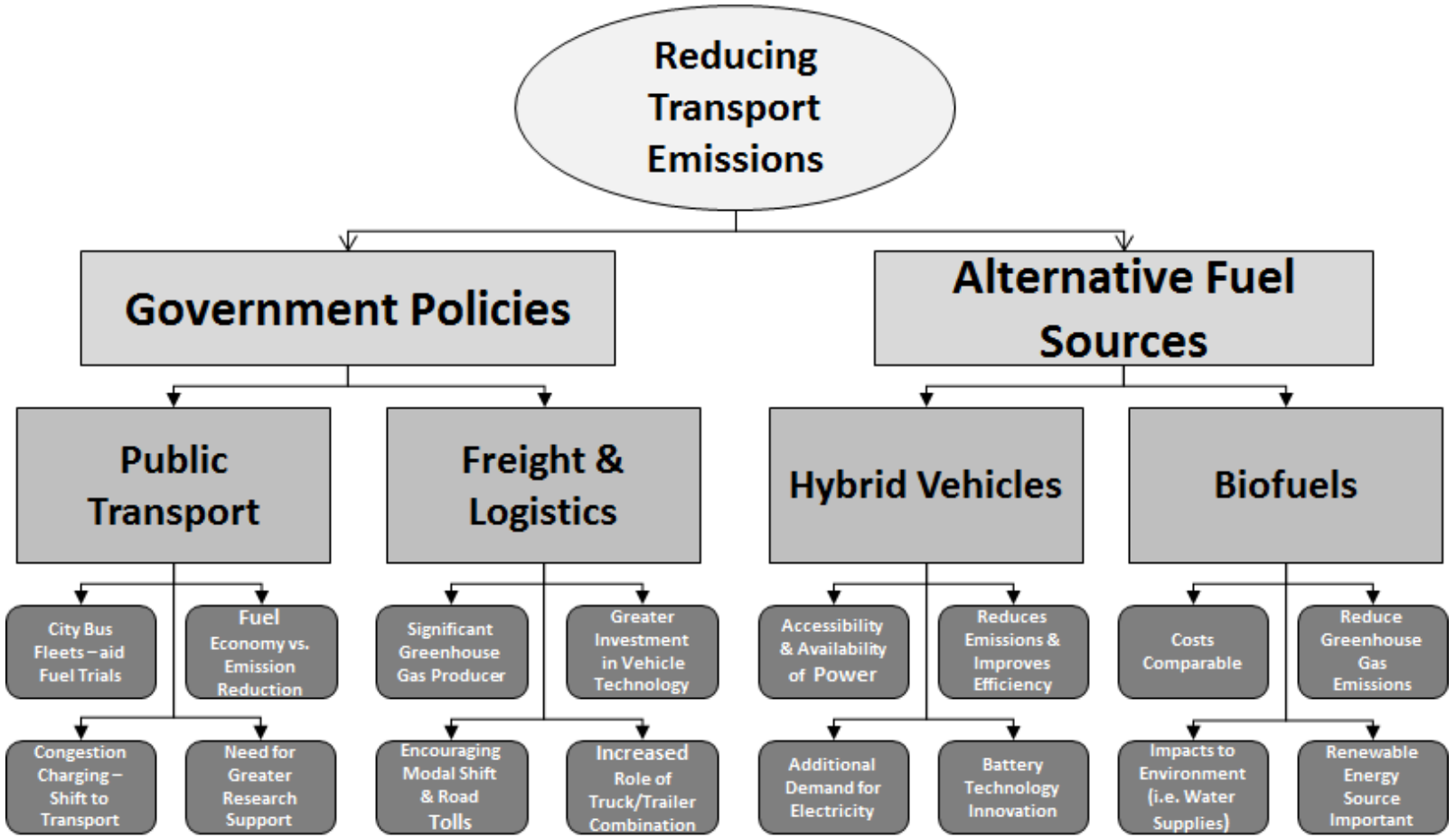
Integrated Resource Management



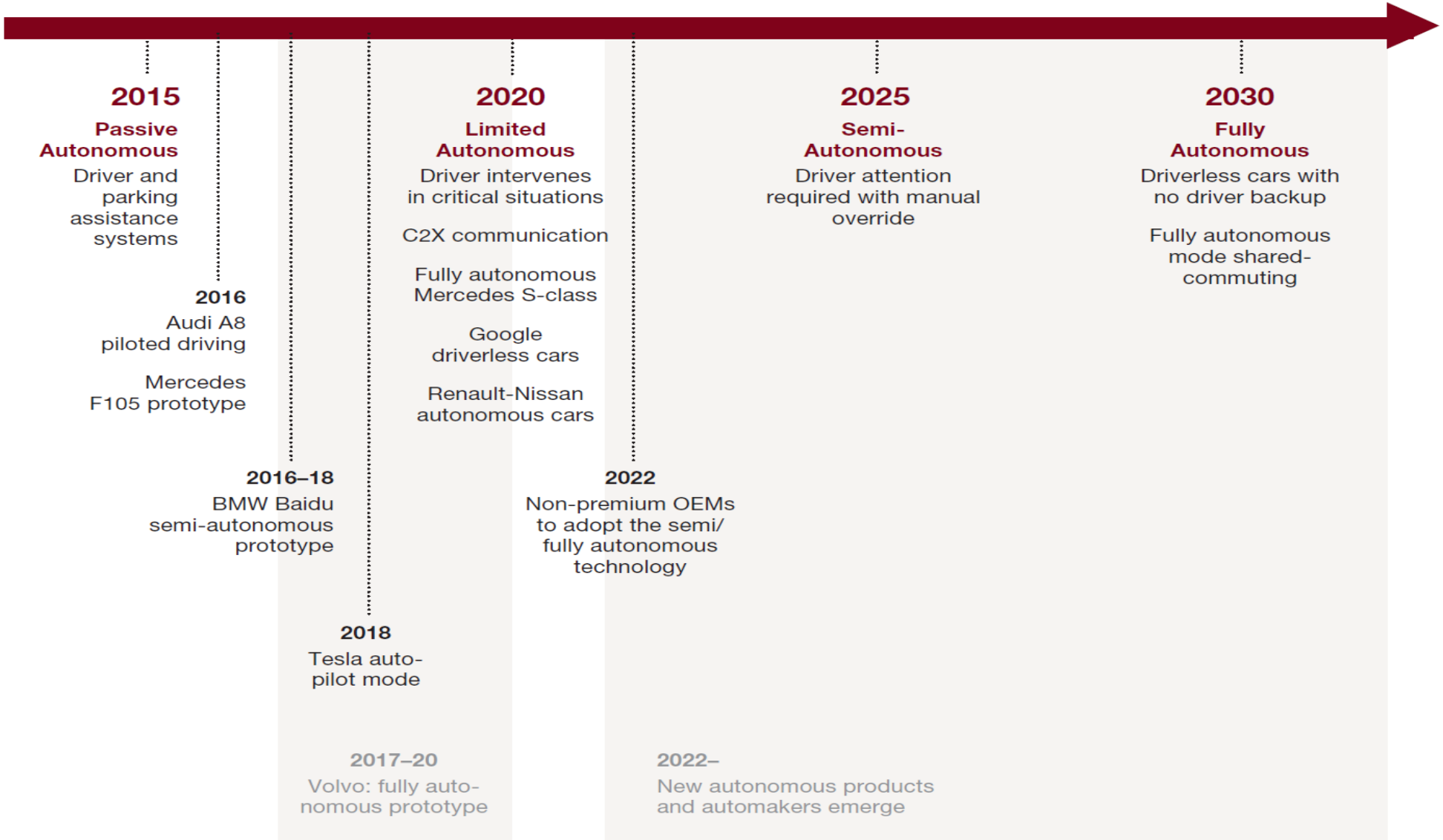
Transport is a derived demand: in order to understand how technology can serve the future demand for mobility it is important to understand what drives that demand for mobility

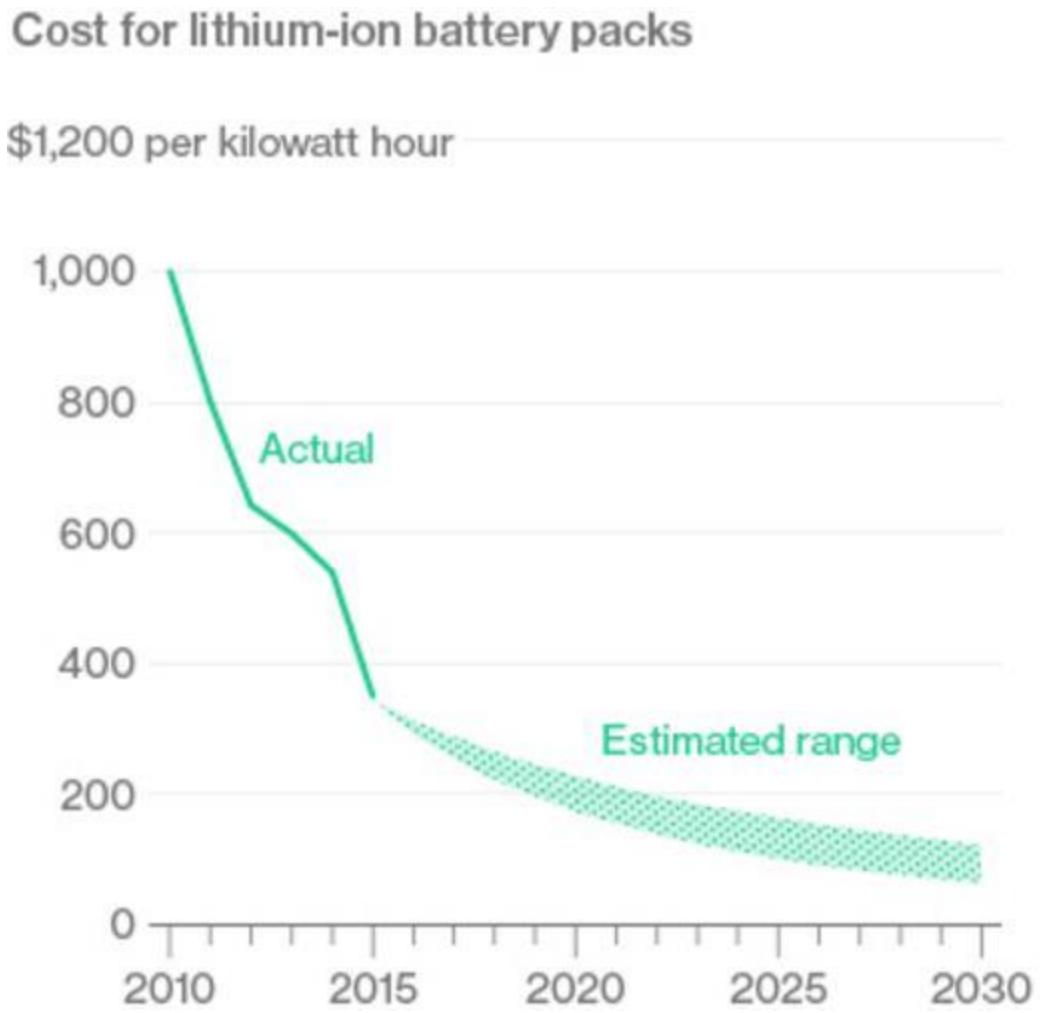


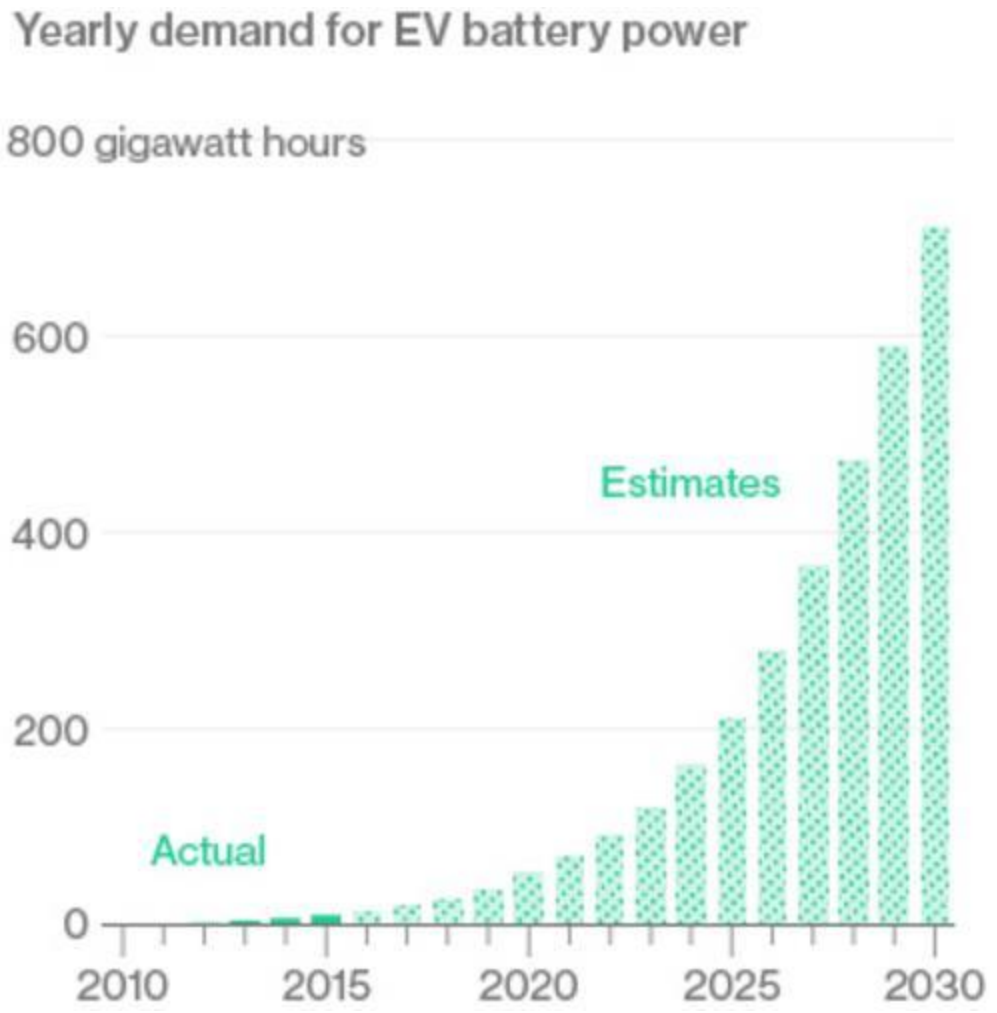
At the same time as travel demand is increasing, countries and governments are under pressure to reduce the carbon emissions from travel

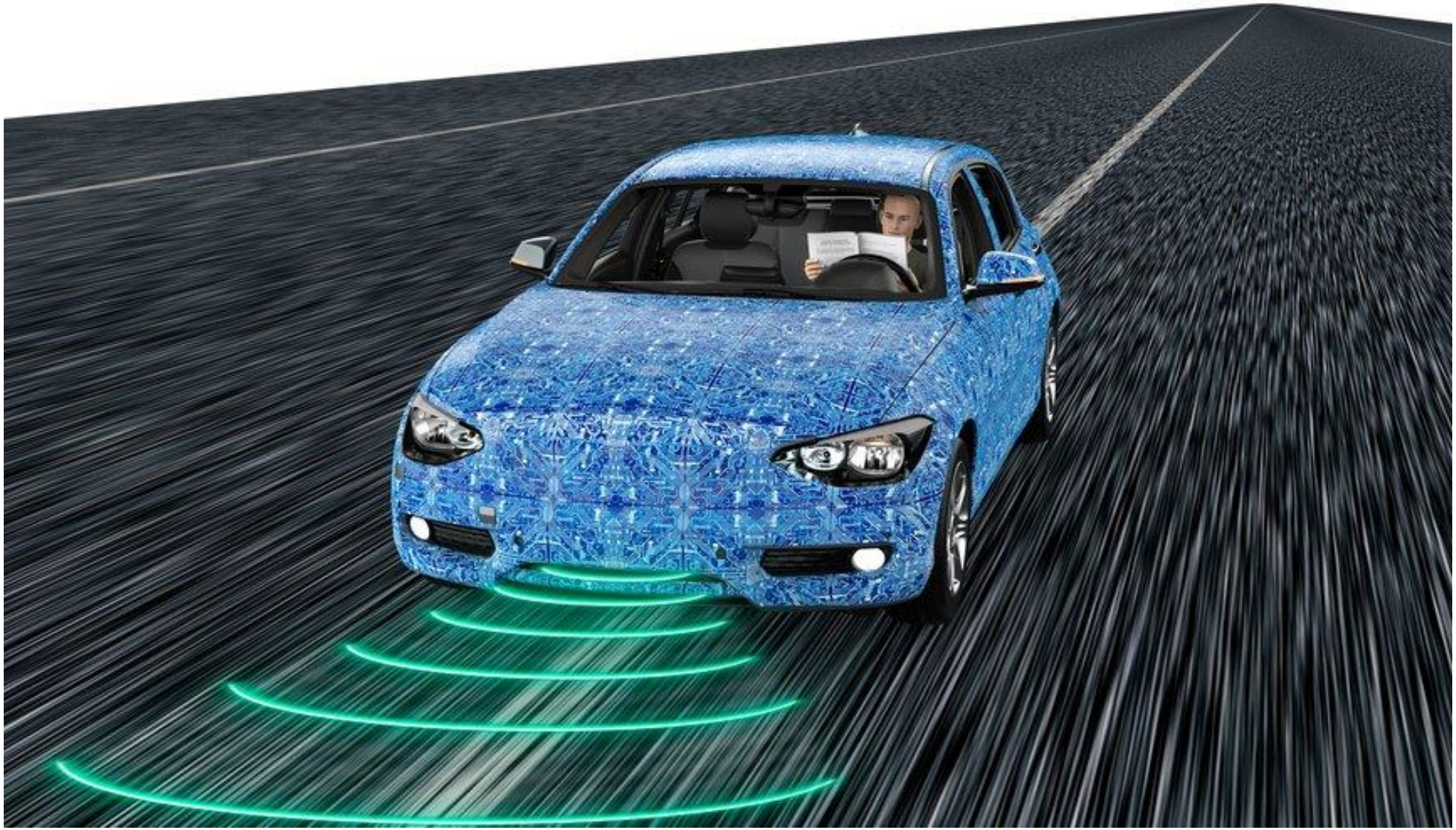


Possible time line of autonomous car innovation




Cost for lithium-ion battery packs
$1,200 per kilowatt hour
1,000
800
600
400
200
0
Actual
Estimated range
2010
2015
2020
2025
2030

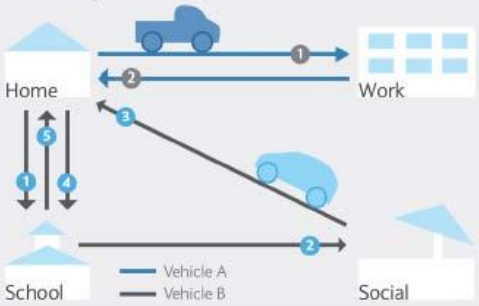

Yearly demand for EV battery power
800 gigawatt hours
600
400
200
0
Estimates
Actual
2010
2015
2020
2025
2030



Traditional Vehicles

- limited self-driving capabilities
- work or personal use
  work: pickups, large SUVs, commercial vans
  personal: cars/CUVs, performance

Flow: Family with two vehicles

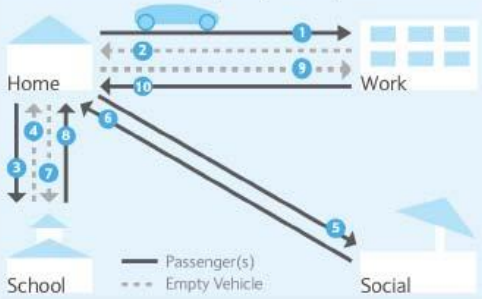


Family Autonomous Vehicles (FAVs)

Vehicles/household
2.1
1.2 vehicles

Annual miles/vehicle
12,000
24,000 miles

Flow: one vehicle shared by multiple family members



Shared Autonomous Vehicles (SAVs)

9:1
traditional vehicles displaced per SAV

8%
additional VMT due to empty trips

Annual miles/vehicle
12,000
64,000 miles

Sedan
$0.44
mile ride cost to consumers per SAV

Two seater
$0.16
mile ride cost to consumers per SAV

Flow: "robot taxis" with average wait time of 1min

Pooled Shared Autonomous Vehicles (PSAVs)

15-18:1
traditional vehicles displaced per PSAV

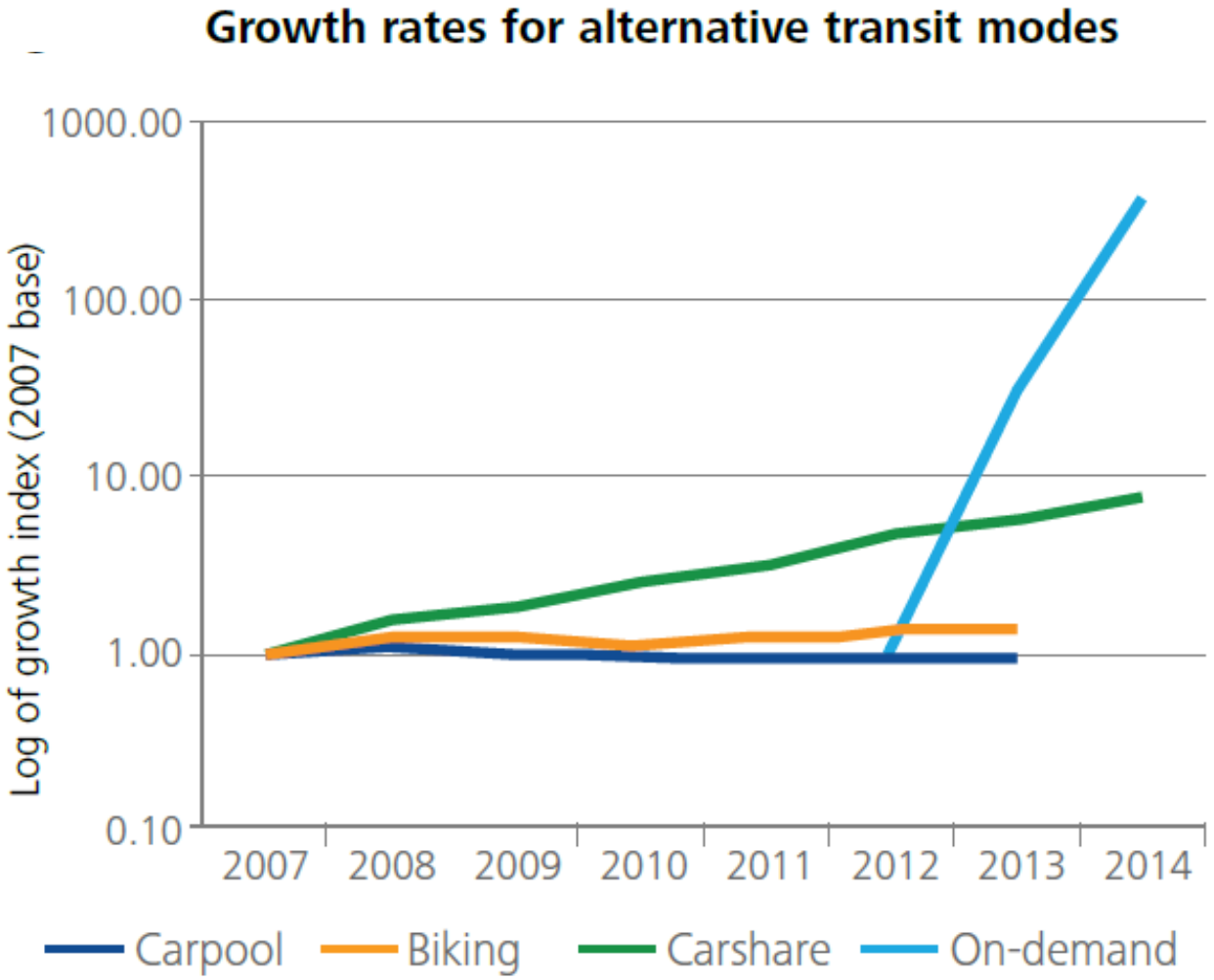
40-50%
reduced VMT due to shared rides

Annual miles/vehicle
12,000
64,000 miles

Sedan
$0.21
per mile ride cost to consumers per PSAV

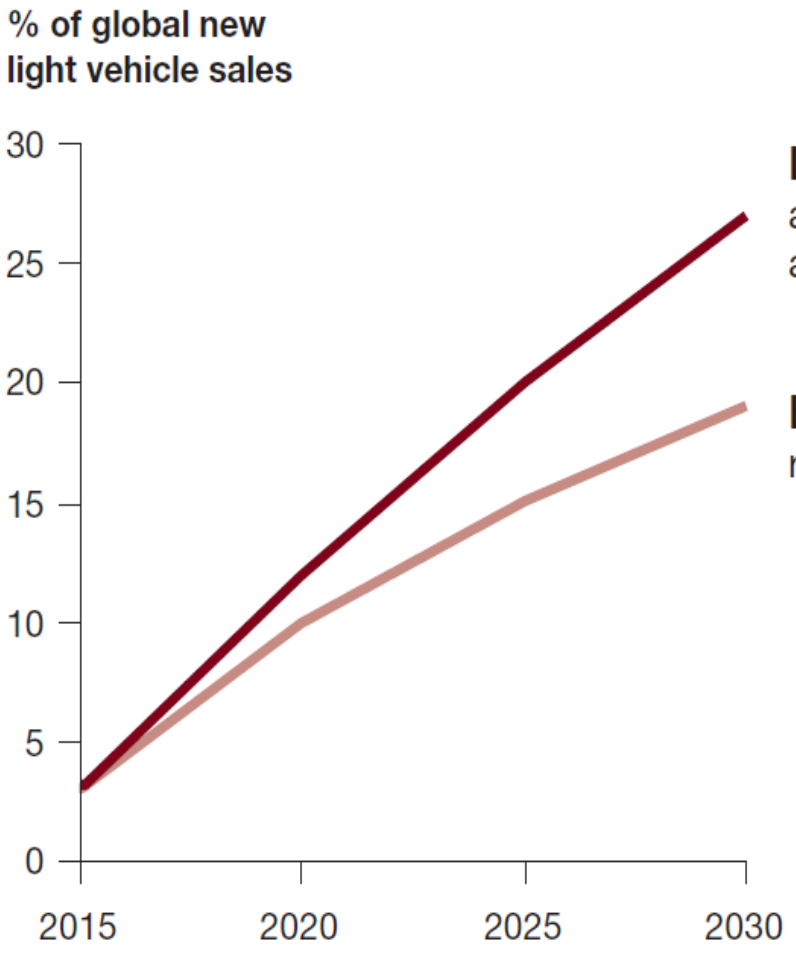
Two seater
$0.08
per mile ride cost to consumers per PSAV

Flow: "perpetual ride" with average wait time of 5min



Note: On-demand growth figures use 2012 base year as index and are approximated from slate.com and futureadvisor.com.

Scenarios for the penetration of autonomous vehicles



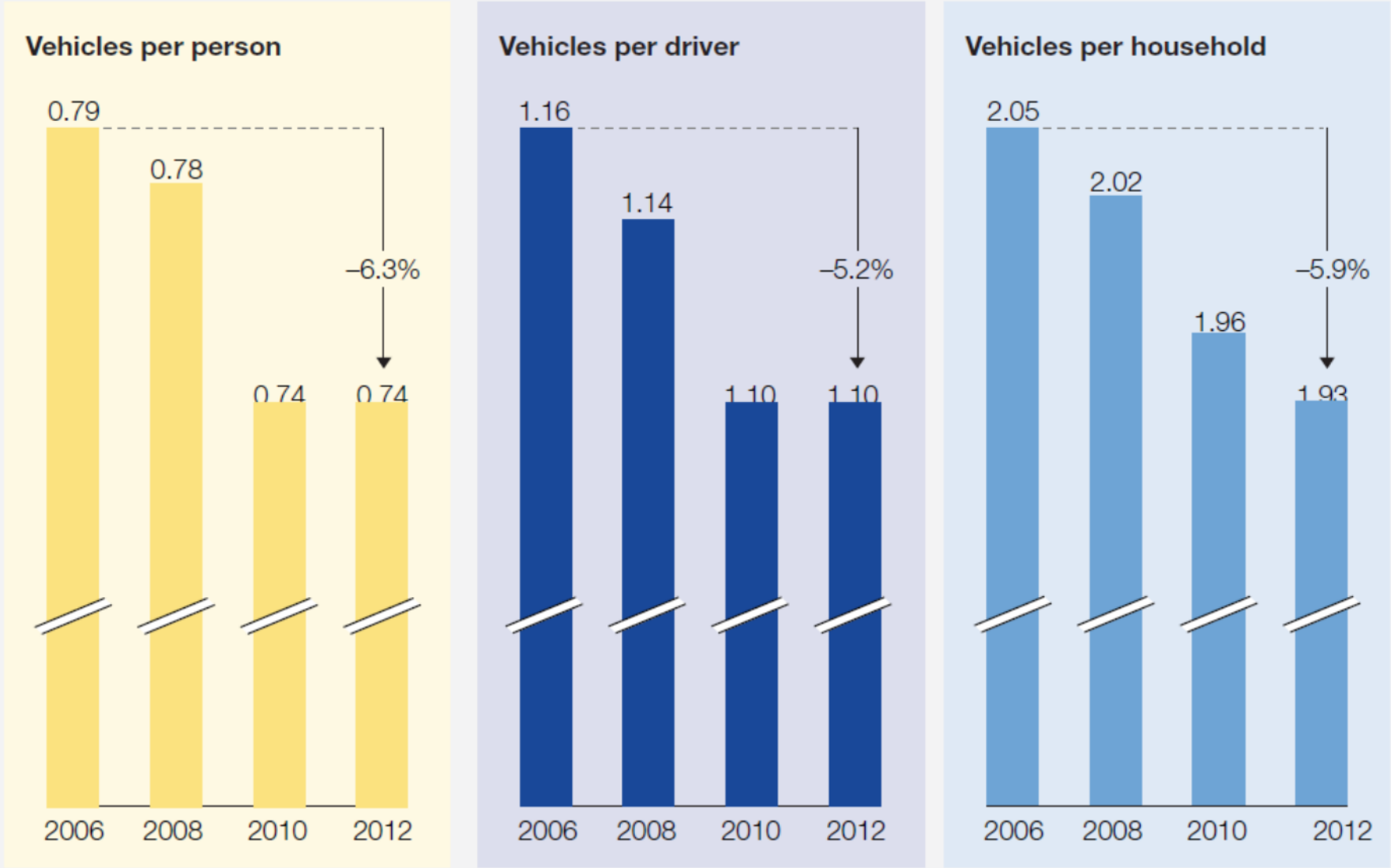
Disruptive scenario (less safety regulation and more financial support by governments; a new player entering the market in mid-2020)

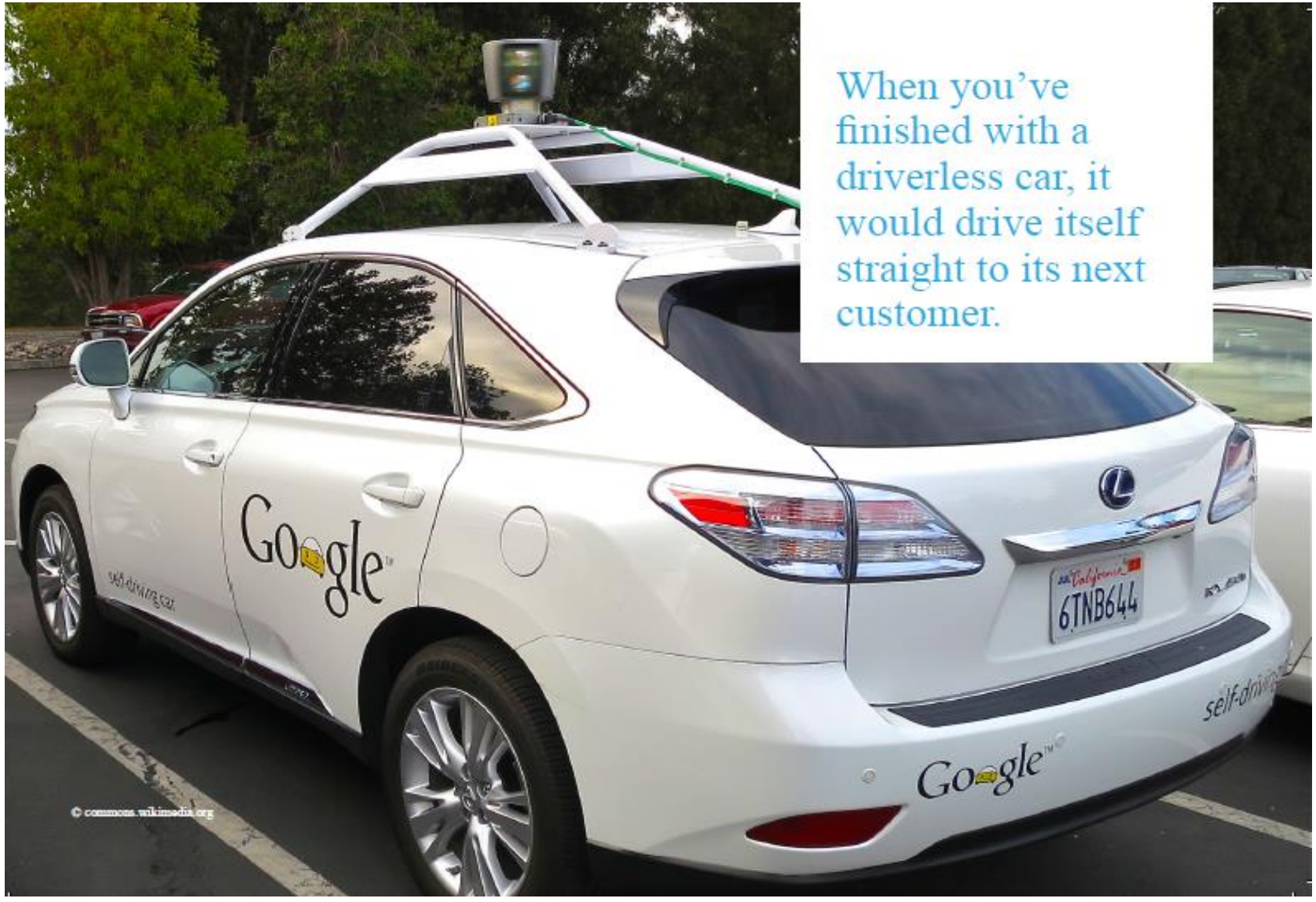
Basic scenario (current sales growth and regulations continue)

Note: Figures reflect semi-autonomous and fully autonomous vehicles only, not other connected-car features.

Source: IHS; Internet research; Strategy& analysis

In the United States, vehicle ownership rates are declining.




When you've finished with a driverless car, it would drive itself straight to its next customer.
Google
6TNB644
Google
self-driving car
© commons.wikimedia.org

Driverless car technology 'too unsophisticated' to be safe, expert warns

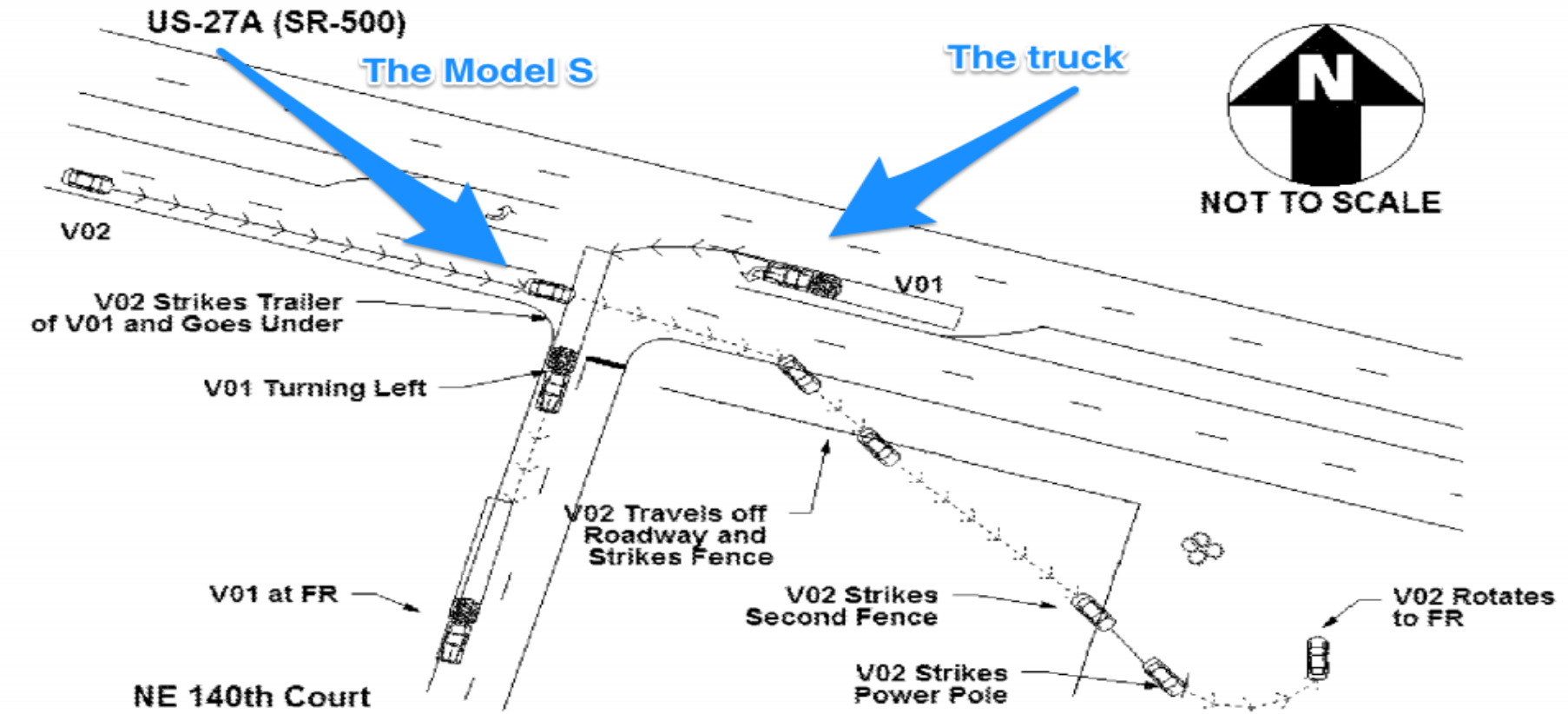
Professor Ann Williamson from the University of New South Wales said the testing was proceeding too quickly.

"Our technology is too unsophisticated — the sensors that are being used in many of the vehicles just aren't quite good enough to allow the vehicle to take complete control," she said.


Driverless
Cars Ahead

On May 7th 2016, 40 year-old Joshua Brown died in a car crash near Williston, Florida. So many people die in car crashes that this in itself is hardly remarkable, something that does not reflect terribly well on us as a species. Yet this one was remarkable as Brown was driving a Tesla Model S in 'Autopilot mode' at the time.

Date of Crash	Date of Report	Invest. Agency Report Number	HSMV Crash Report Number
07/May/2016 04:40 PM	07/May/2016 04:40 PM	FHPB16OFF012208	85234095



Who should driverless cars save: pedestrians/cyclists or passengers?

Mercedes tackles the self-driving car dilemma, historically referred to as the 'trolley problem'

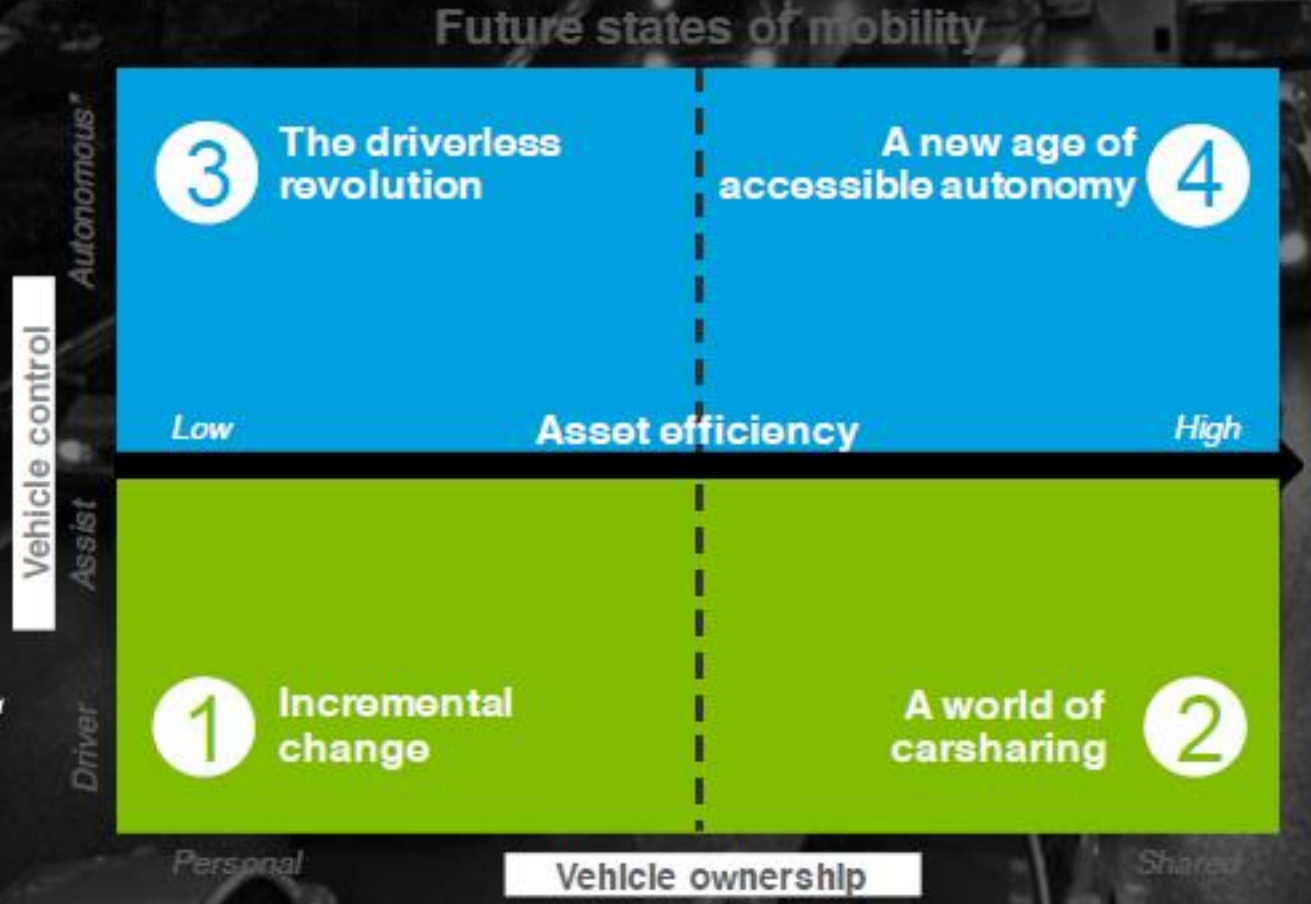
The trolley problem is a classic thought experiment in ethics, which asks you to imagine a trolley headed toward a track that five people are bound to. If you pull a lever, you can redirect the trolley to another track, where only one person is bound. Do you do nothing at all and watch five people die? Or pull the lever, change fate and be personally responsible for the death of one person?

The Amy Gillett Foundation's Rod Katz predicted a moral hazard in which an autonomous vehicle was programmed to protect the passenger in the vehicle, even if it meant hitting a pedestrian or cyclist on the road.

"It could be fantastic but there are also real risks there," he said. "That's my concern, that the risks are not going to get picked up in the excitement."

Extent to which autonomous vehicle technologies become pervasive:

- *Depends upon several key factors as catalysts or deterrents —e.g., technology, regulation, social acceptance*
- *Vehicle technologies will increasingly become "smart"; the human-machine interface shifts toward greater machine control*



Extent to which vehicles are personally owned or shared:

- *Depends upon personal preferences and economics*
- *Higher degree of shared ownership increases system-wide asset efficiency*

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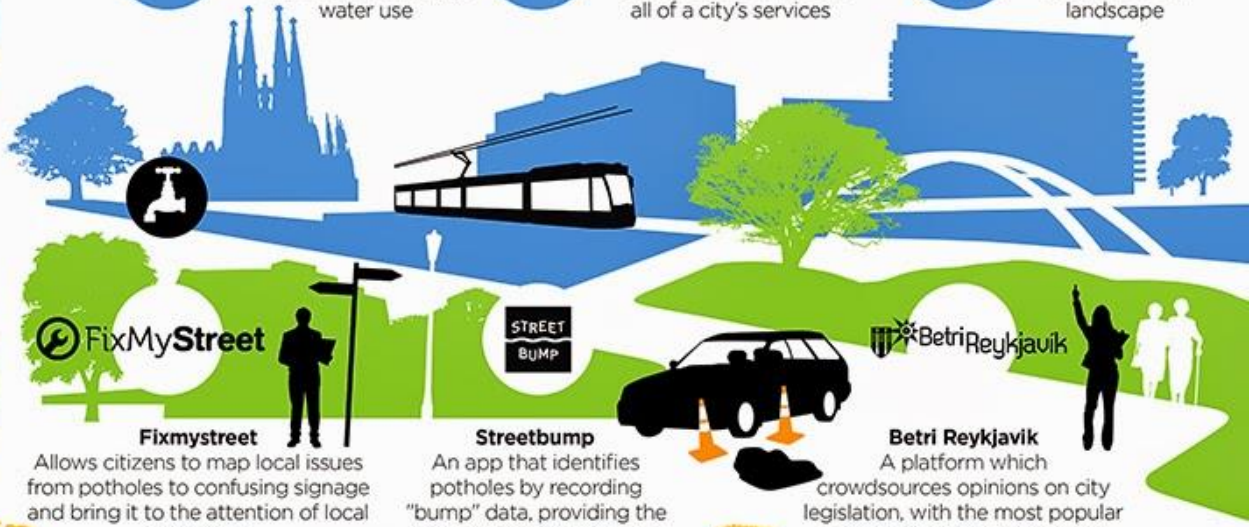

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