Smart Mobility: Factors Driving the Future of Transportation

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US EPA
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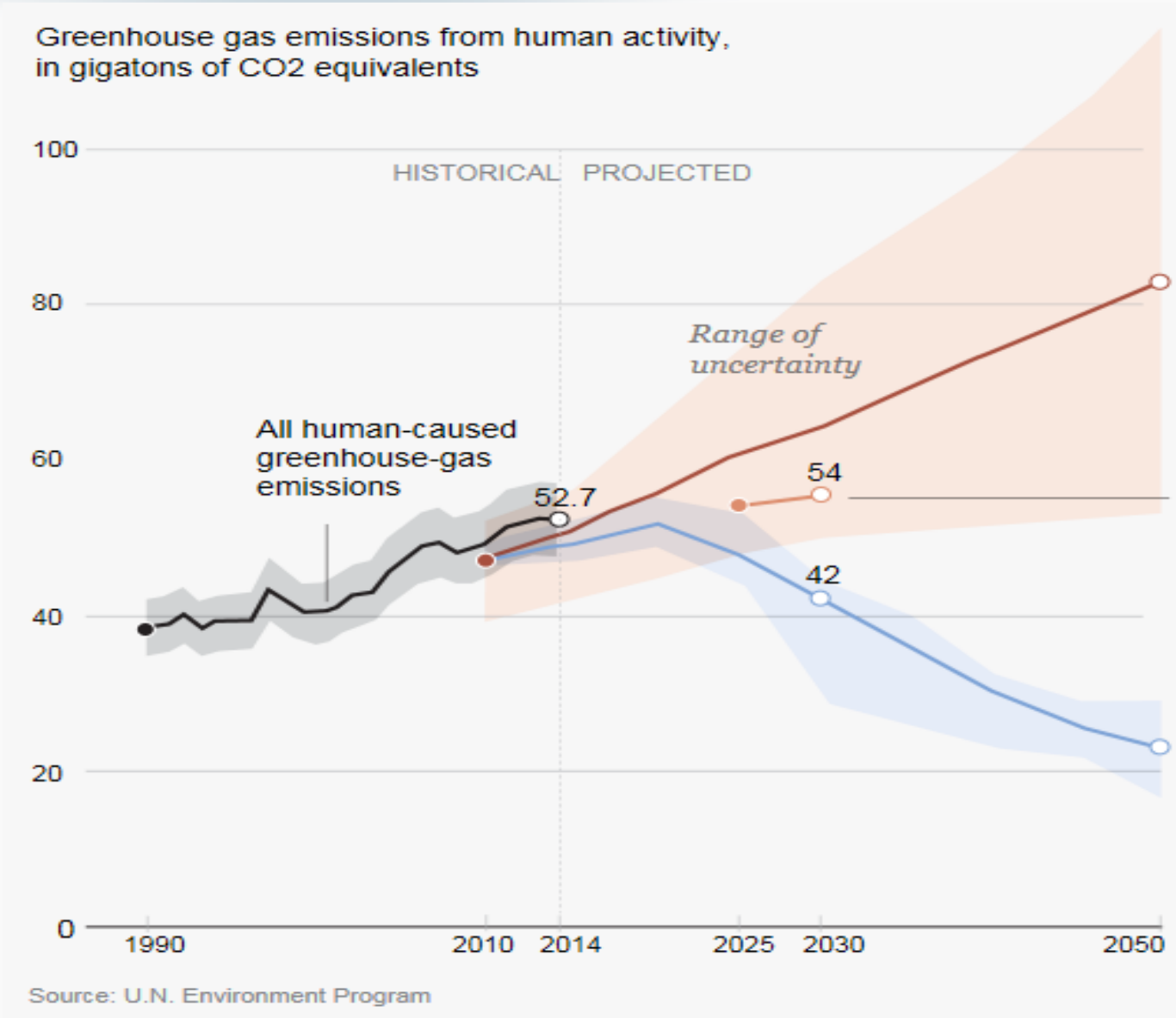
The Challenge



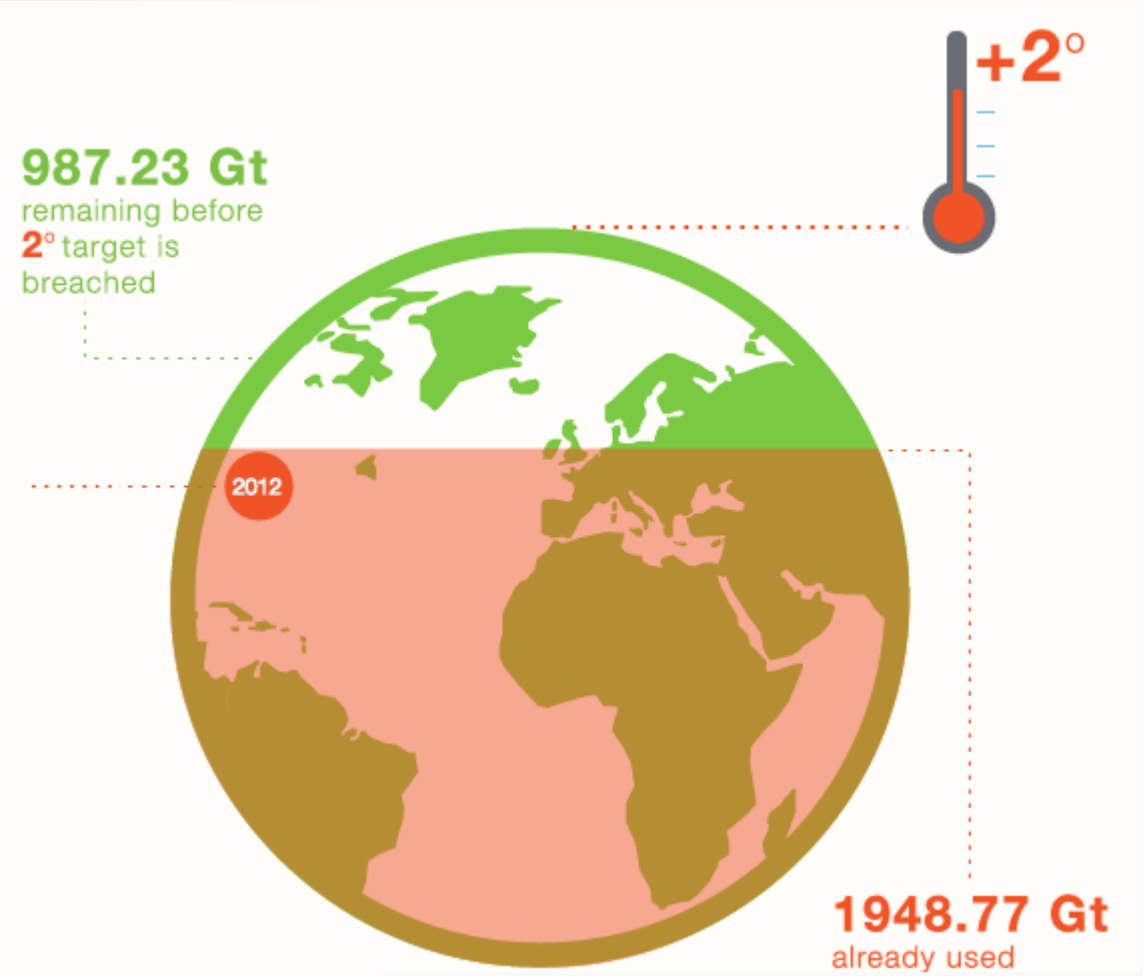
Current trajectory (not including large-scale burning of biomass) would probably result in a greater than 4°C rise in average global surface temperature.

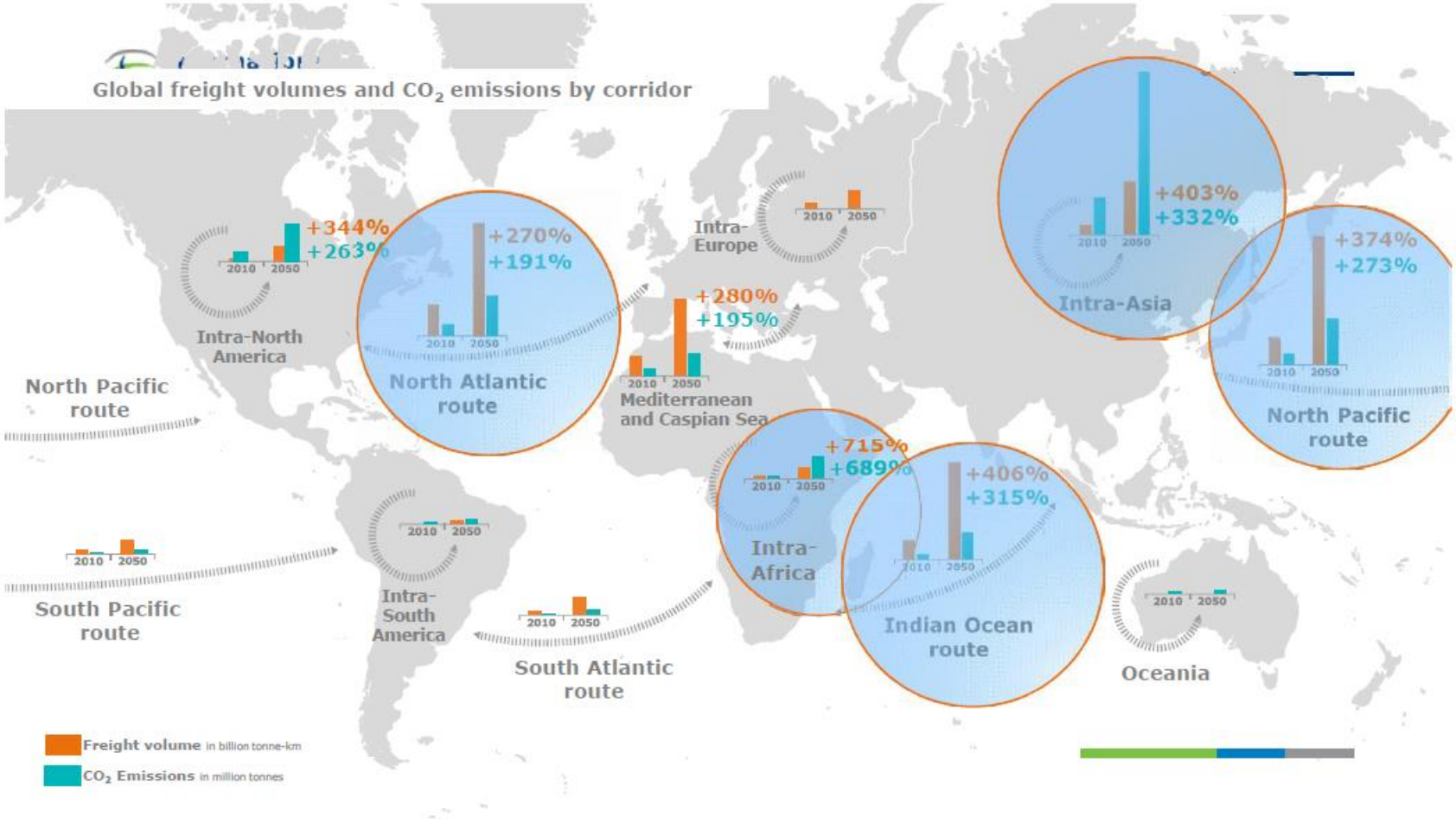
Proposed pledged reductions from the Paris summit would bring levels to 54 by 2030, still far above what is needed to prevent a 2°C rise.

Levels needed to avoid a 2°C temperature rise over preindustrial levels.

Carbon Budget

On current trends the global budget will be fully exhausted in approximately 25 years, meaning that exceeding the **2°** target becomes increasingly inevitable. Only dramatically reducing emissions can change this reality.



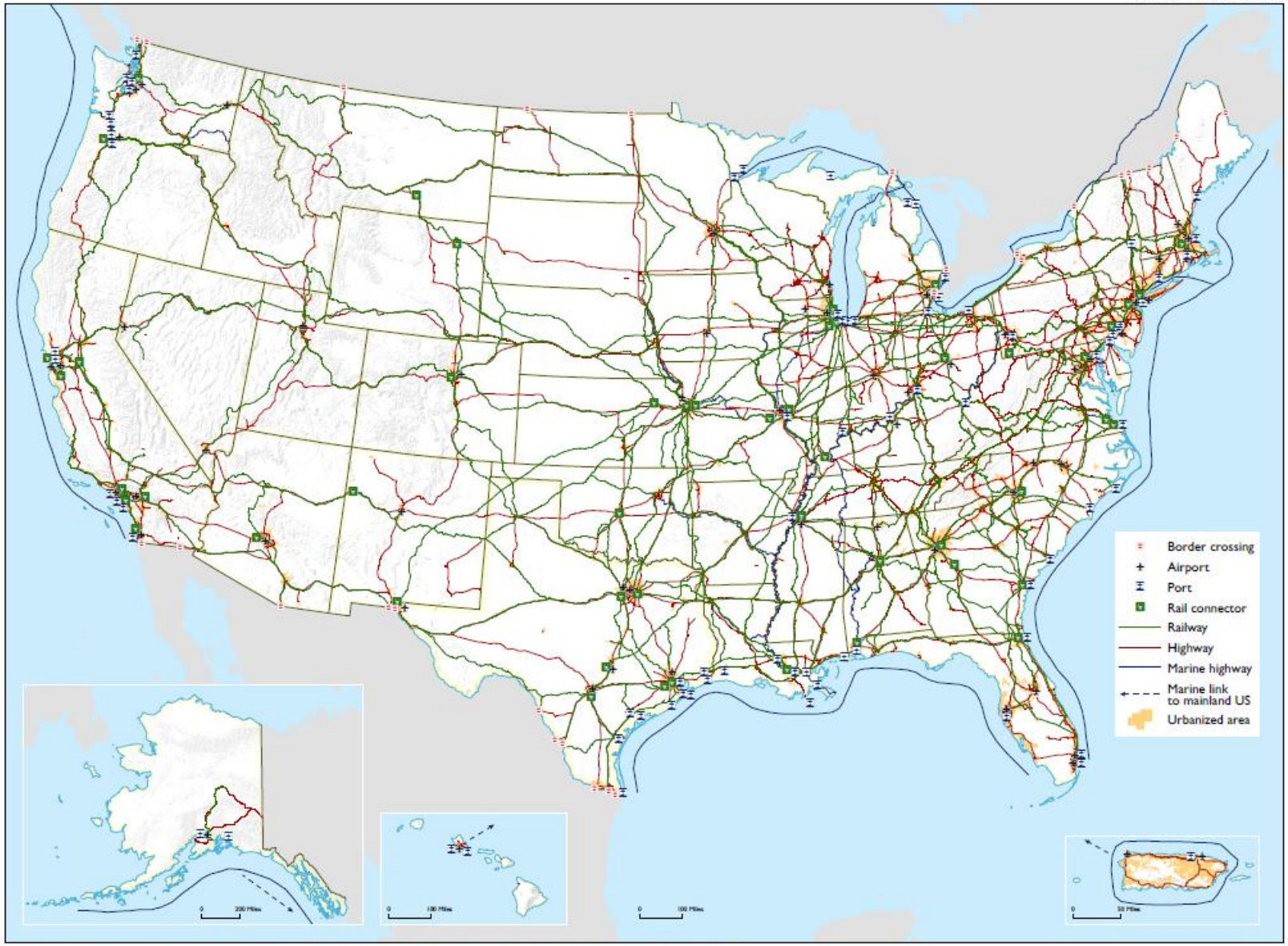


Global freight will more than quadruple by 2050 (by a factor of 4.3)

Source: Jari Kauppila
Senior Economist, Head of Outlook and Statistics, OECD
Smart Freight Leadership, Leipzig, 26 May 2015

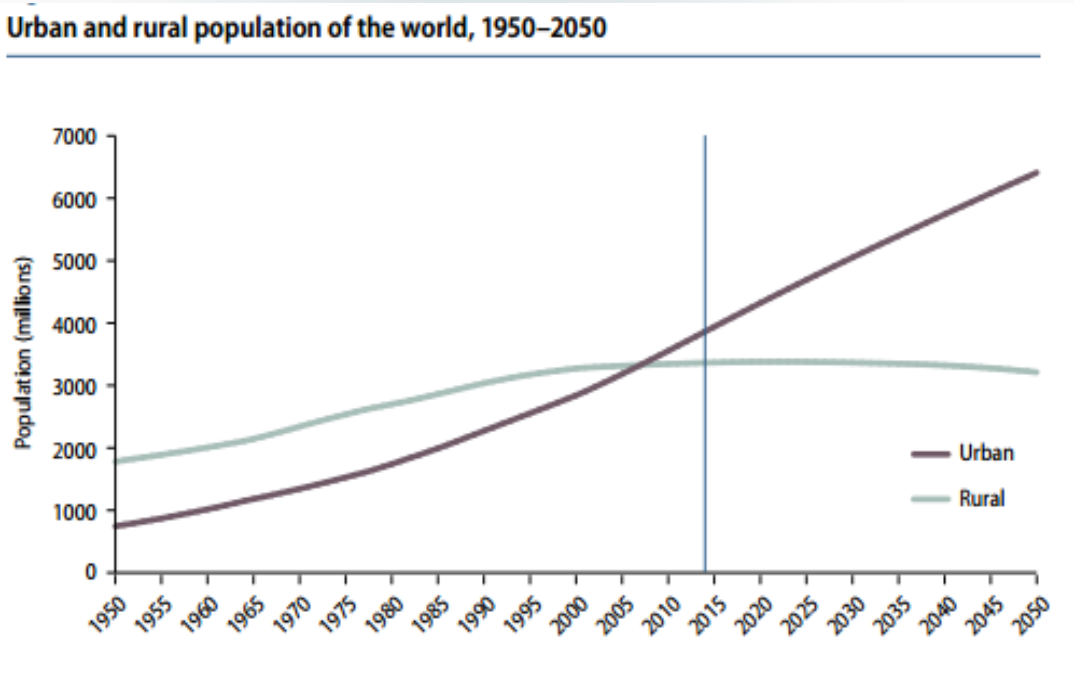
Multimodal Freight Network - Draft Representation

U.S. Department of Transportation



Note: For information on methodology used for feature selection in this map, please see U.S. Department of Transportation, *National Freight Strategic Plan*, Appendix D, 2015.

Population and Urbanization



UN: World Urbanization Prospects 2014

We will create the equivalent of one new city of one million people every 5 days between now and 2050

--International Geosphere-Biosphere Programme

UNEP: Keeping Track of our Changing Environment 2011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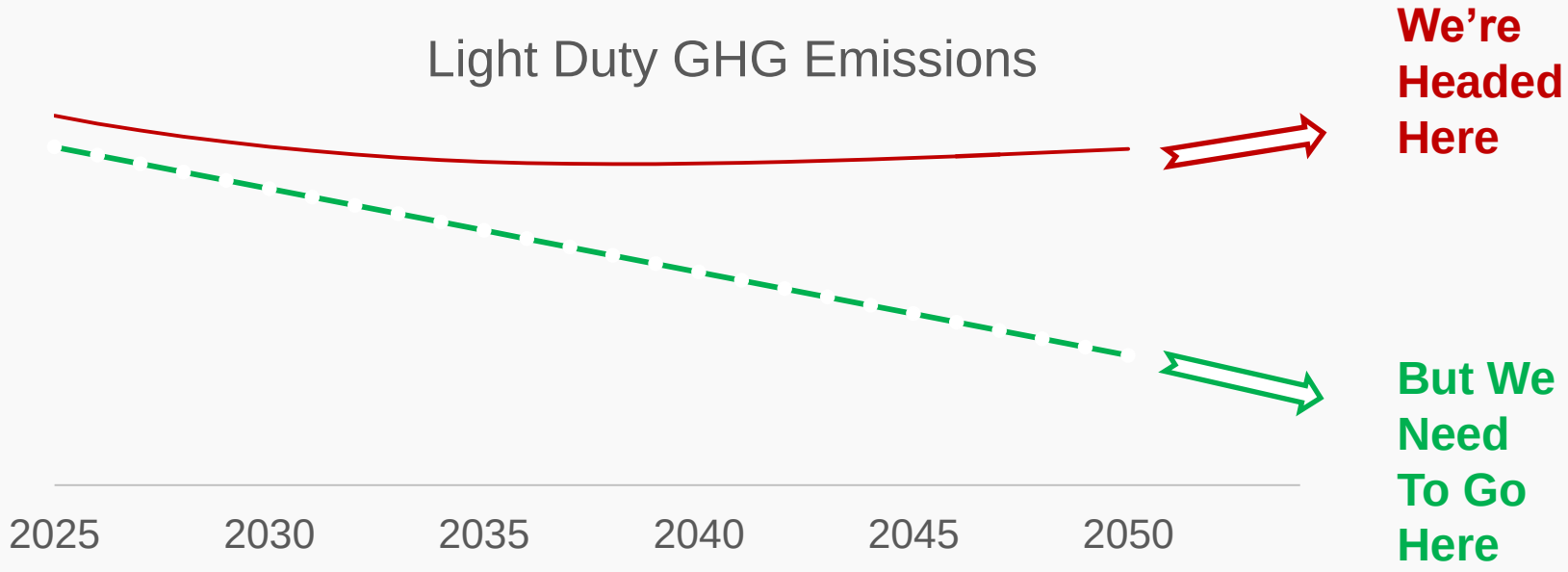
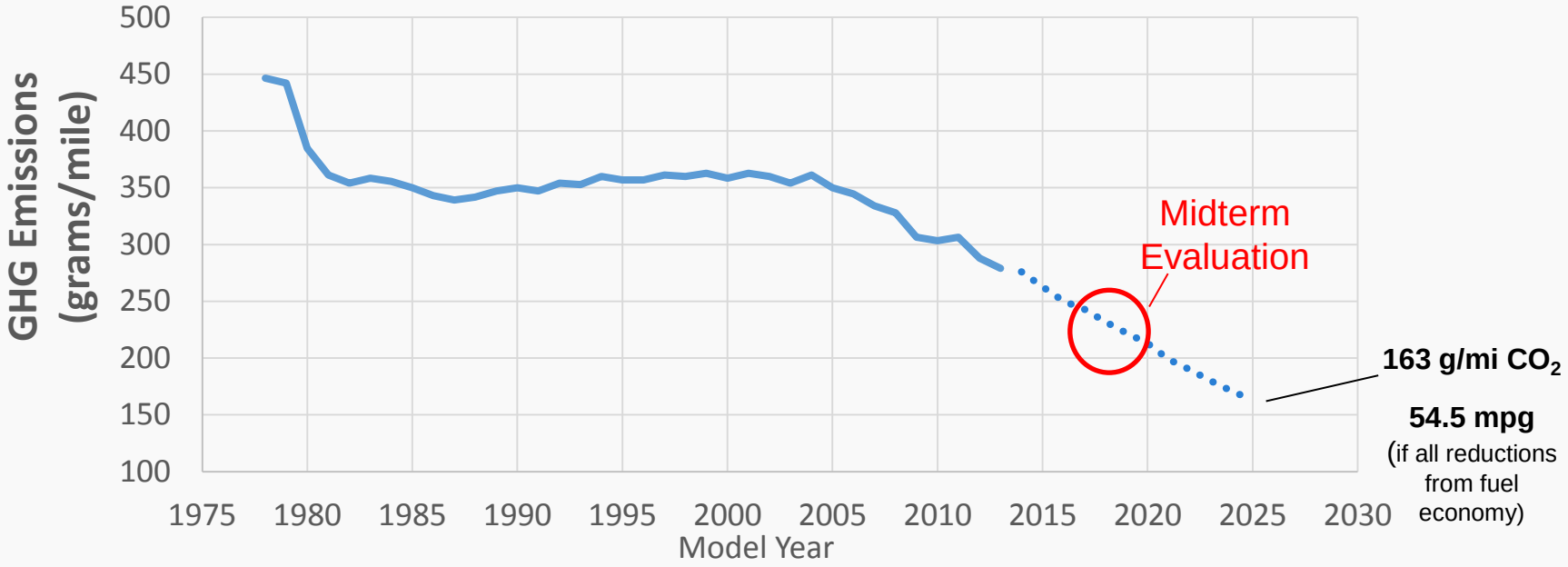
Northeast
Arizona Sun Corridor
Texas Triangle
Gulf Coast
Piedmont Atlantic
Florida
America 2050
Metro Area Population
150,000 to 1 million
1 to 3 million
3 to 6 million
6 million +
© 2008 by Regional Plan Association

Even with our GHG Rules



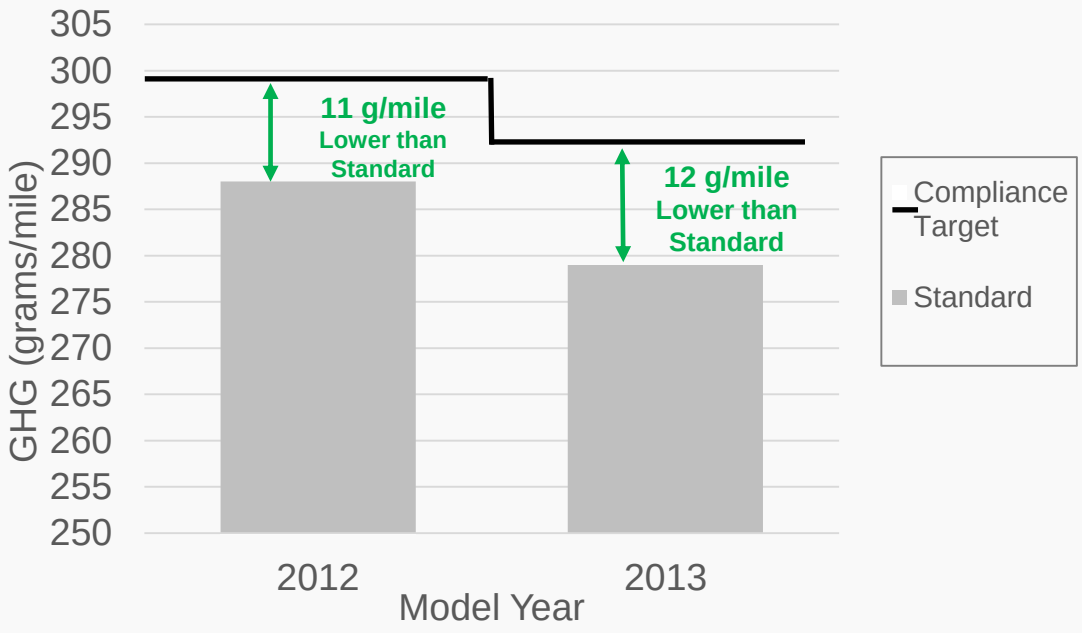
Light Duty Vehicles

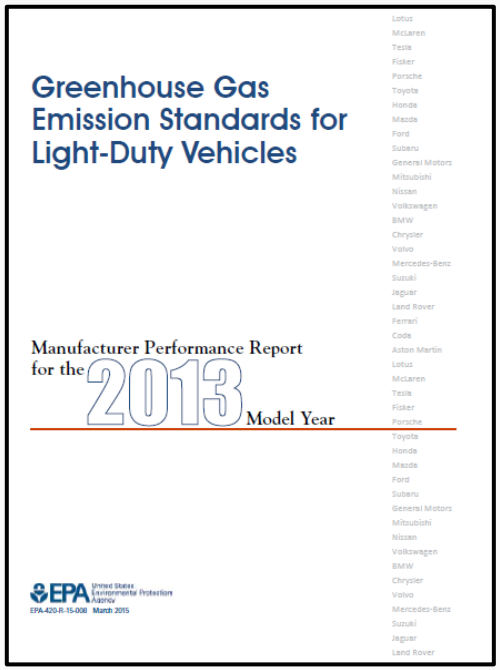
U.S. GHG/Fuel Economy standards provide significant benefits to climate, oil, consumers



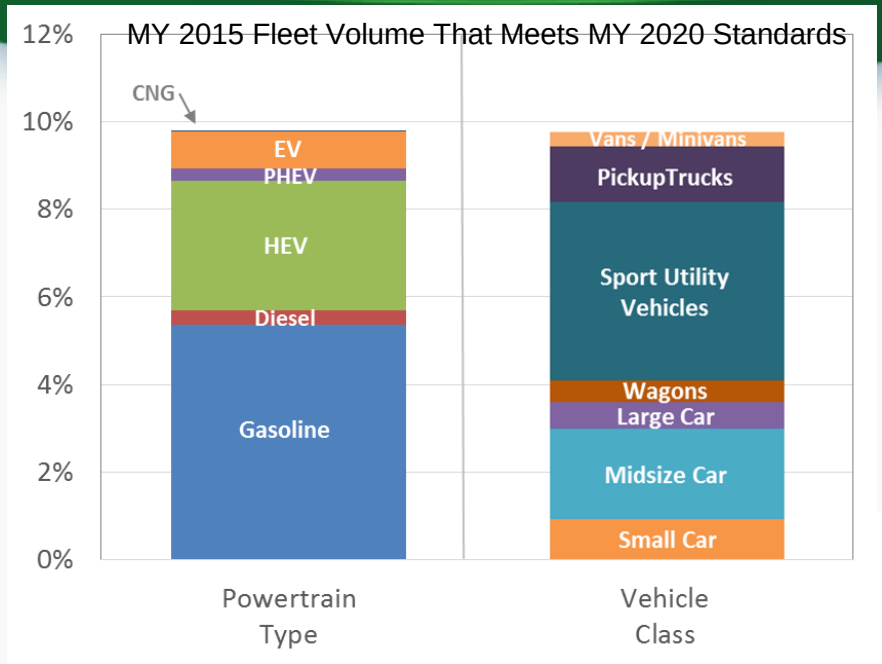
Light Duty Vehicles

GHG Compliance … Good News So Far





Light Duty Vehicles



Vehicles are meeting future standards with a variety of technologies

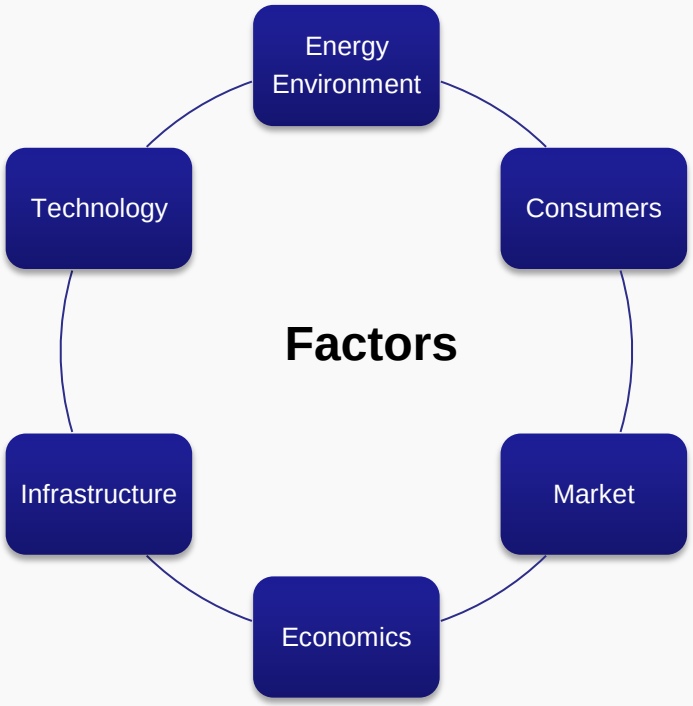
		Trucks			SUVs				Cars			
		Ford F-150	Ram 1500	Chevy Silverado	Subaru Outback	Nissan Rouge	Honda CR-V	Jeep Renegade	Mazda 6	Honda Civic HF	Hyundai Sonata	Ford Focus SFE
Engine	Diesel		X									
	Turbocharging	X						X			X	X
	High Compression Atkinson								X			
	GDI	X		X			X		X		X	X
	Cylinder Deactivation			X								
	Stop-start	X										
Transmission	8+ Speed Transmissions		X									
	CVT				X	X	X			X		
Road Loads	Mass Reduction*	X					X		X			
	Tires**		X			X	X		X	X	X	
	Aero**	X	X	X							X	X

*compared to MY2008 curb weight
** Top 25% of class + other active/passive features

Light Duty Vehicles

Midterm Evaluation – Overview

- Technical review of longer term standards for 2022-2025
- In coordination with NHTSA and CARB
- EPA's decision could go one of 3 ways:
  - Standards remain same
  - More stringent
  - Less stringent

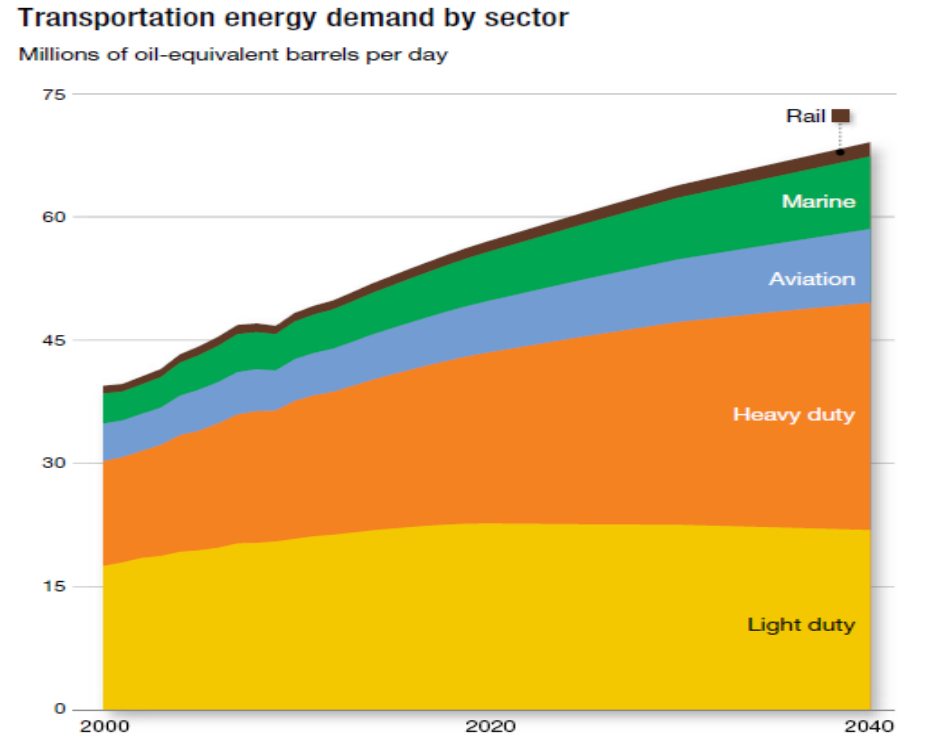


Heavy Duty Trucks

Freight has fastest-growing transportation GHGs in US and globally

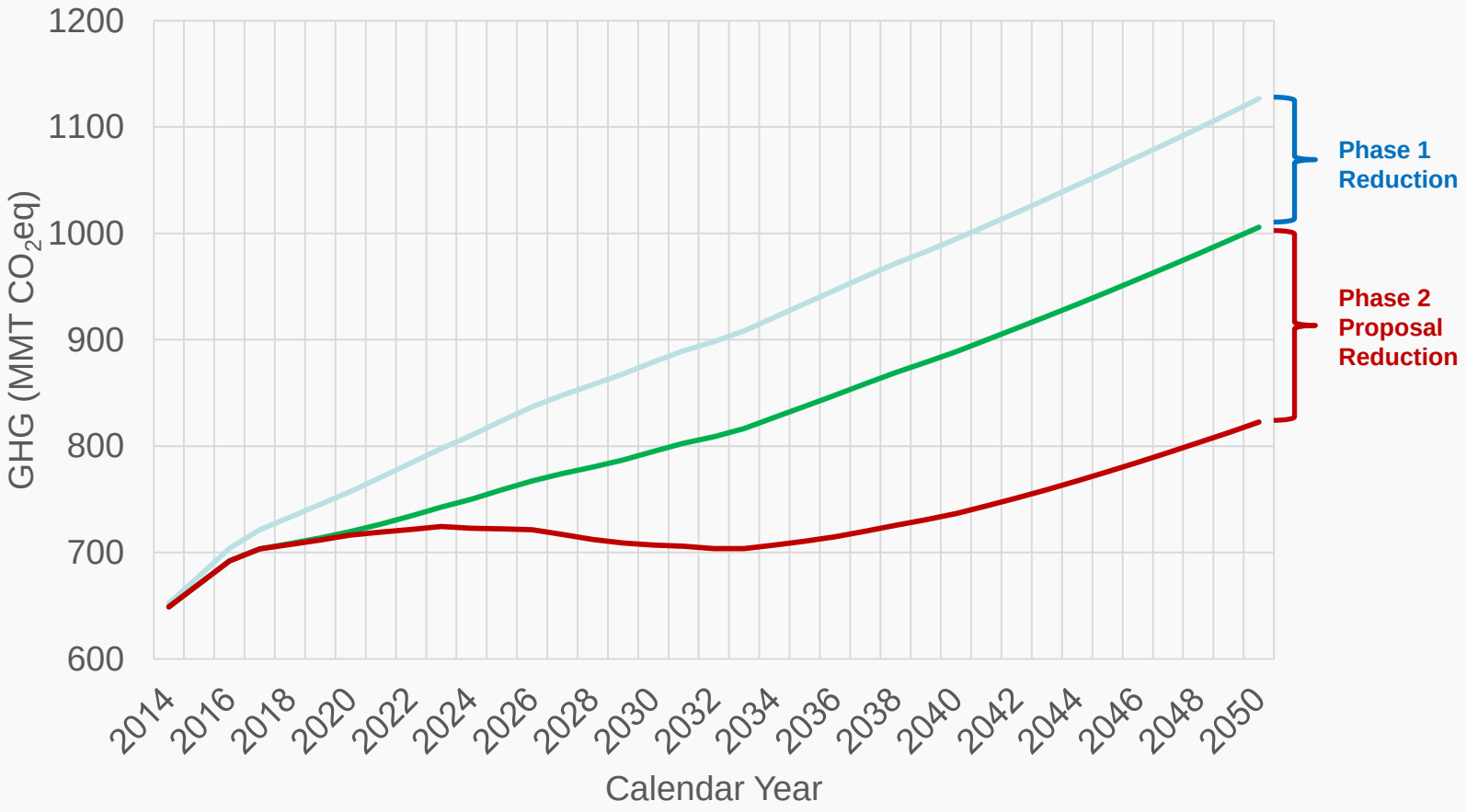
- Worldwide, freight projected to outstrip passenger vehicle GHG emissions within several decades
- Rapid demographic, geo-economic and technical change will disrupt freight patterns in US and globally
- United States and EPA must lead

worldwide



ExxonMobil 2013 Energy Outlook Report

Heavy Duty Trucks



Heavy Duty Trucks

Federal Phase 2 Proposed Standards

- The Phase 2 program builds on the success of Phase 1, with similar design and vehicle categories – and, for the first time, including fuel efficiency standards for trailers

65% of HD Fuel Consumption and GHG Inventory (together)

Combination Tractors

Trailers Pulled by Combination Tractors (currently unregulated Federally)

Standards in g/ton-mile and gallons/1000 ton-miles

Vocational Vehicles

21% of HD Fuel

Standards in g/ton-mile and gallons/1000 ton-miles

Large Pickups & Vans

14% of HD Fuel Consumption and GHG Inventory

Standards in g/mile and gallons/100 miles

Aircraft

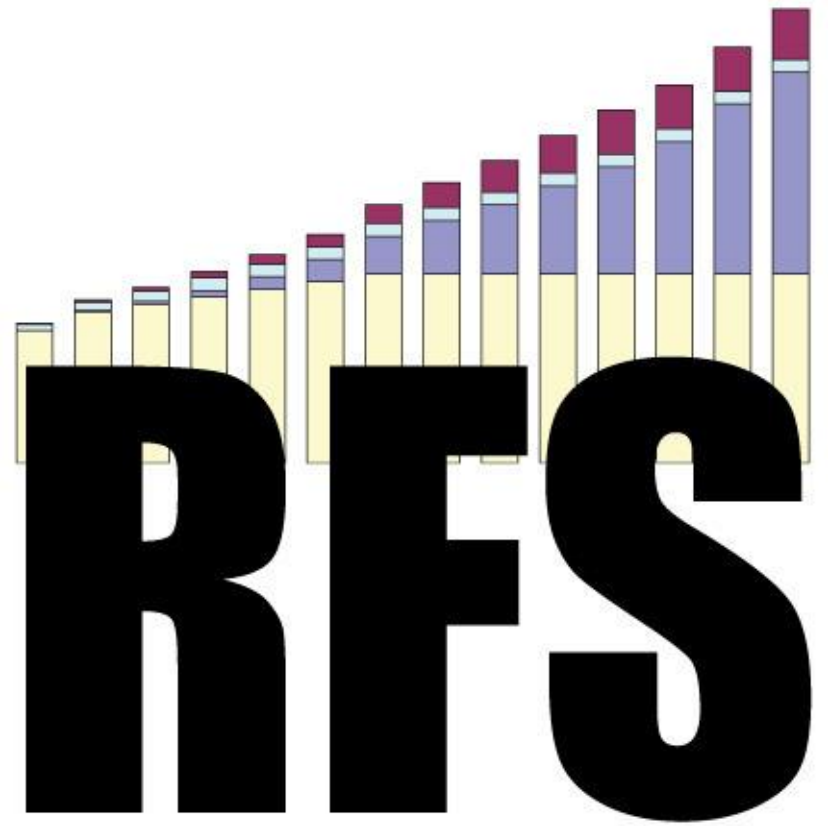
U.S. Contributions

- 11% of U.S. transportation GHGs
- Largest remaining transportation category not yet regulated for GHGs
- 3% of total U.S. GHG contributions

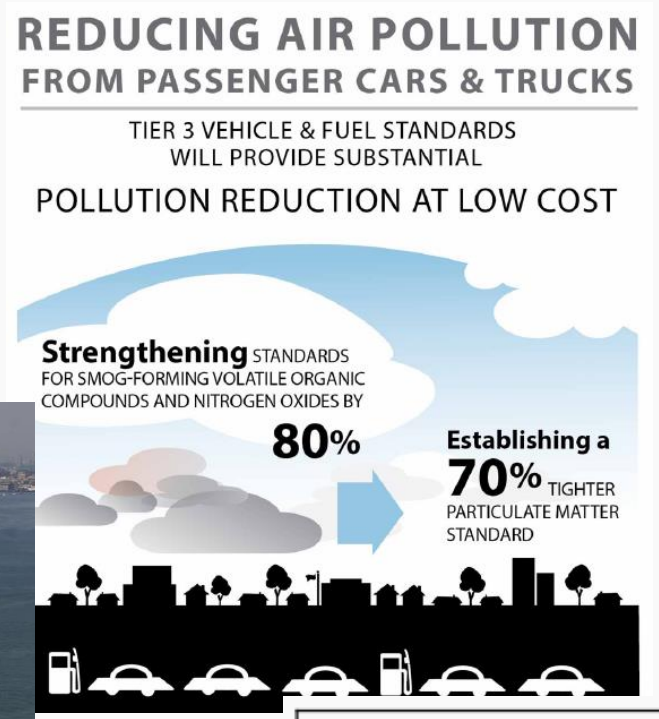
Global Contributions

- 2% today, but future growth is very high
- If ranked as a nation, would be 9th, just behind Germany
- U.S. aircraft GHG emissions are ~7 times higher than China's GHG emissions (second ranked country for aircraft GHG emissions & fastest growing)

Renewable Fuels



It is not just about GHGs



Attainment Schedule by Classification	
Classification	**Schedule***
Marginal	3 years to attain
Moderate	6 years to attain
Serious	9 years to attain
Severe	15 to 17 years to attain
Extreme	20 years to attain

United Nations
Framework Convention on
Climate Change

There is no such thing as a failed experiment, only experiments with unexpected outcomes.

–R. Buckminster Fuller

SCIENTIFIC METHOD

PURPOSE
State the problem.

RESEARCH
Find out about the topic.

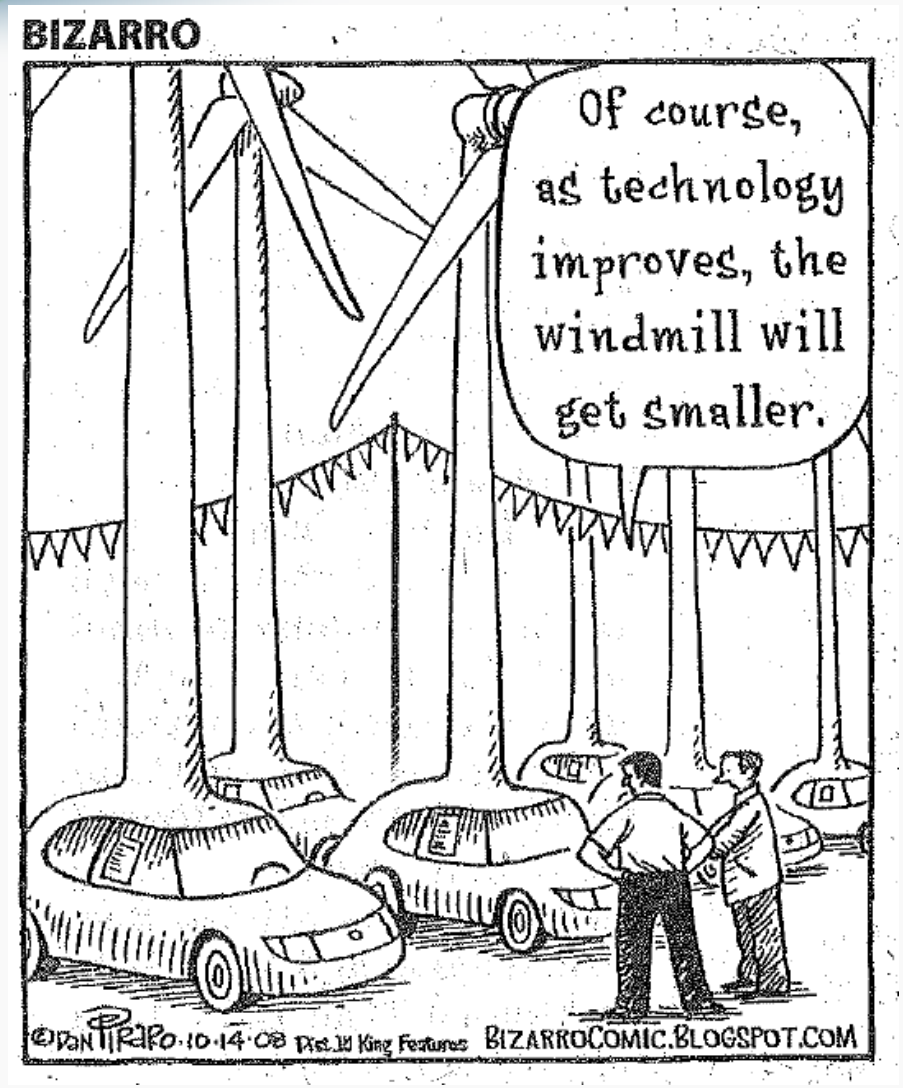
HYPOTHESIS
Predict the outcome to the problem.

EXPERIMENT
Develop a procedure to test the hypothesis.

ANALYSIS
Record the results of the experiment.

CONCLUSION
Compare the hypothesis to the experiment's conclusion.

Technology alone will not save us



The Promise

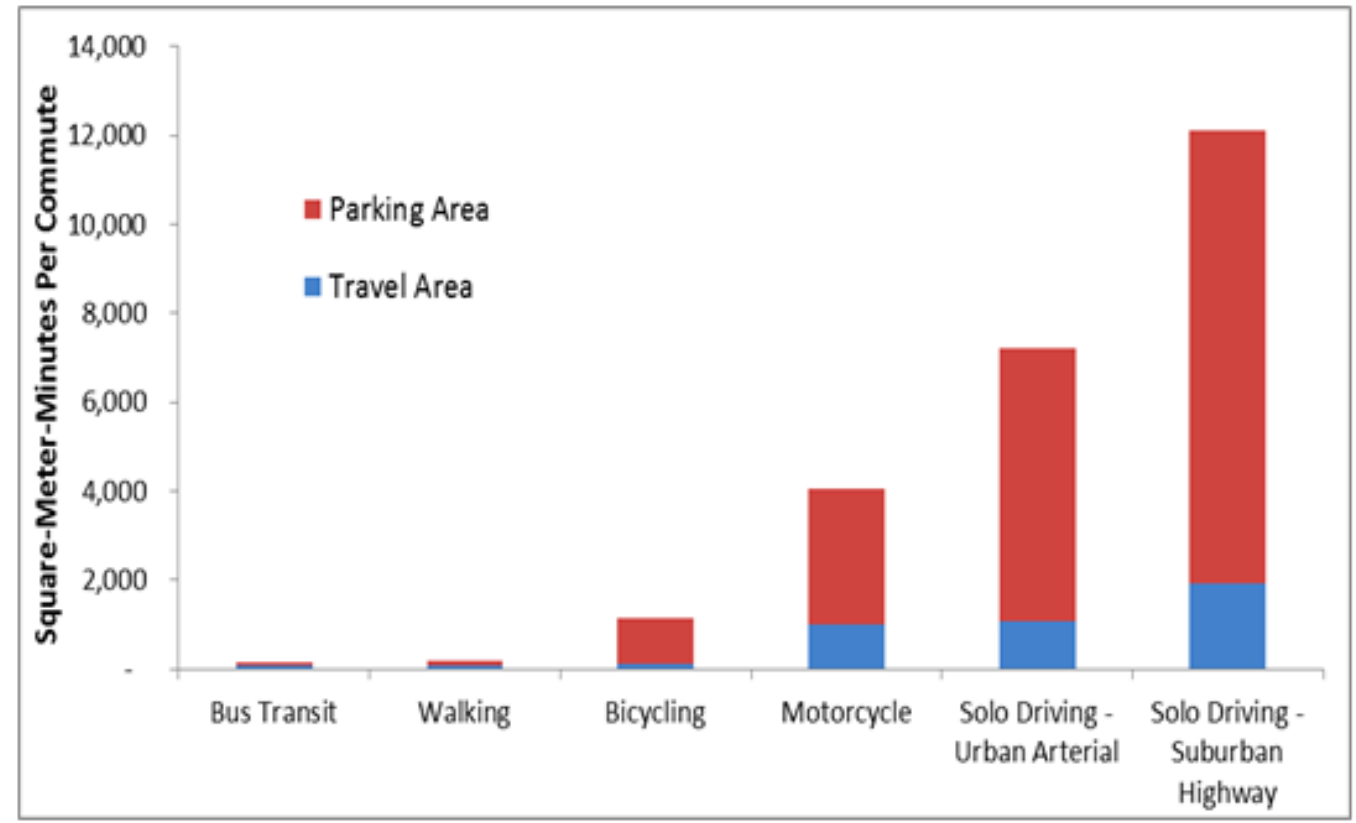
The Reality

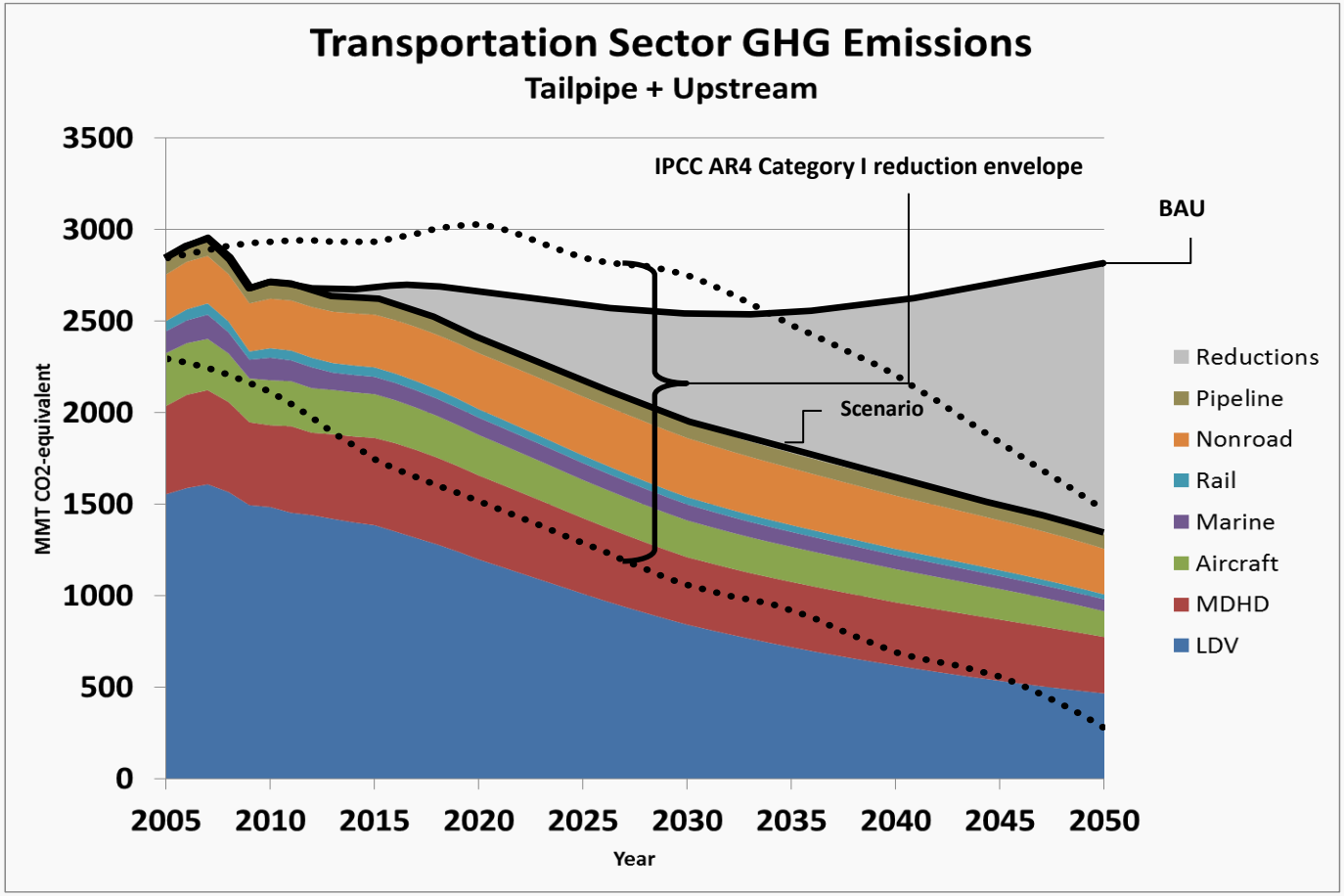
Today's Cars

- 80% empty
- 95% stationary
- 99% owned

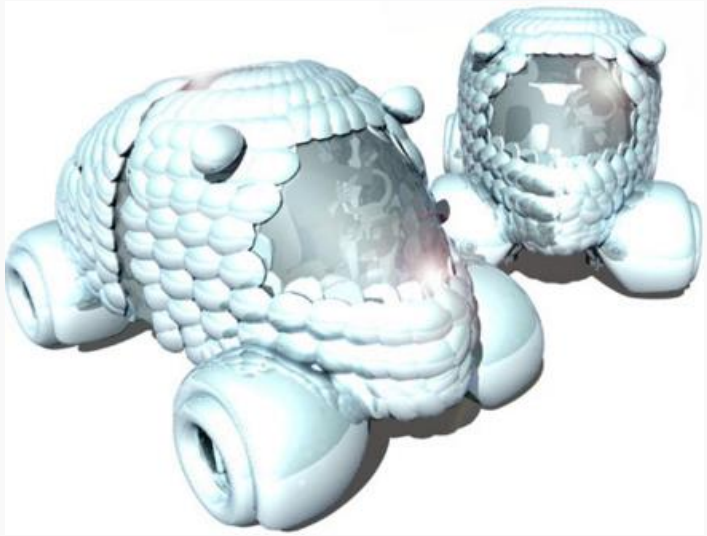
Parking or Parks?

Red= Surface Parking
Yellow=parking garage
Green=Parks


Square-Meter-Minutes Per Commute
14,000
12,000
10,000
8,000
6,000
4,000
2,000
-
Parking Area
Travel Area
Bus Transit
Walking
Bicycling
Motorcycle
Solo Driving - Urban Arterial
Solo Driving - Suburban Highway


Transportation Sector GHG Emissions
Tailpipe + Upstream
IPCC AR4 Category I reduction envelope
BAU
Scenario
MMT CO2-equivalent
3500
3000
2500
2000
1500
1000
500
0
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
Year
Reductions
Pipeline
Nonroad
Rail
Marine
Aircraft
MDHD
LDV

Transformational Change is Possible




Vehicle Efficiency
Vehicle Connectivity
Personal Connectivity
Built Environment
Fuels and Electrification
CAVs and the Environment

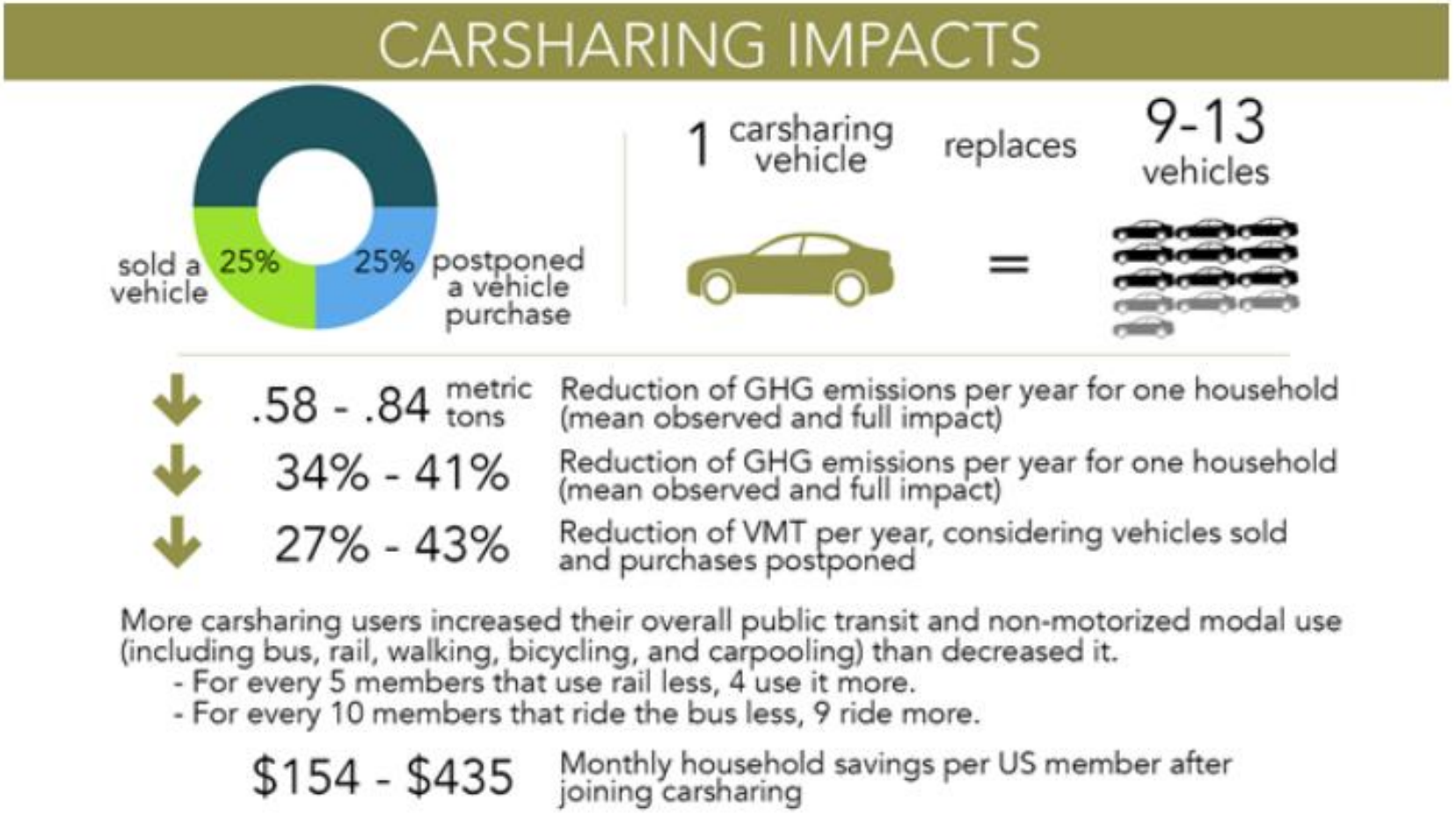


Figure 2: Impacts of Roundtrip Carsharing (graphic excerpted from Shaheen and Chan (2015))

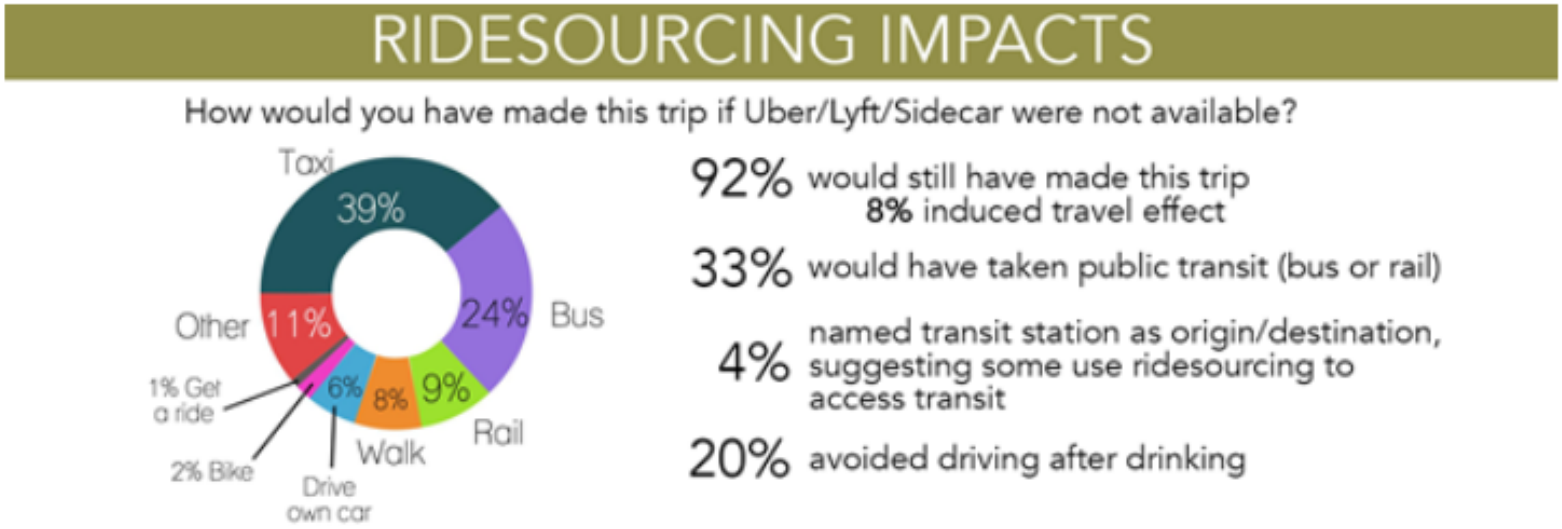
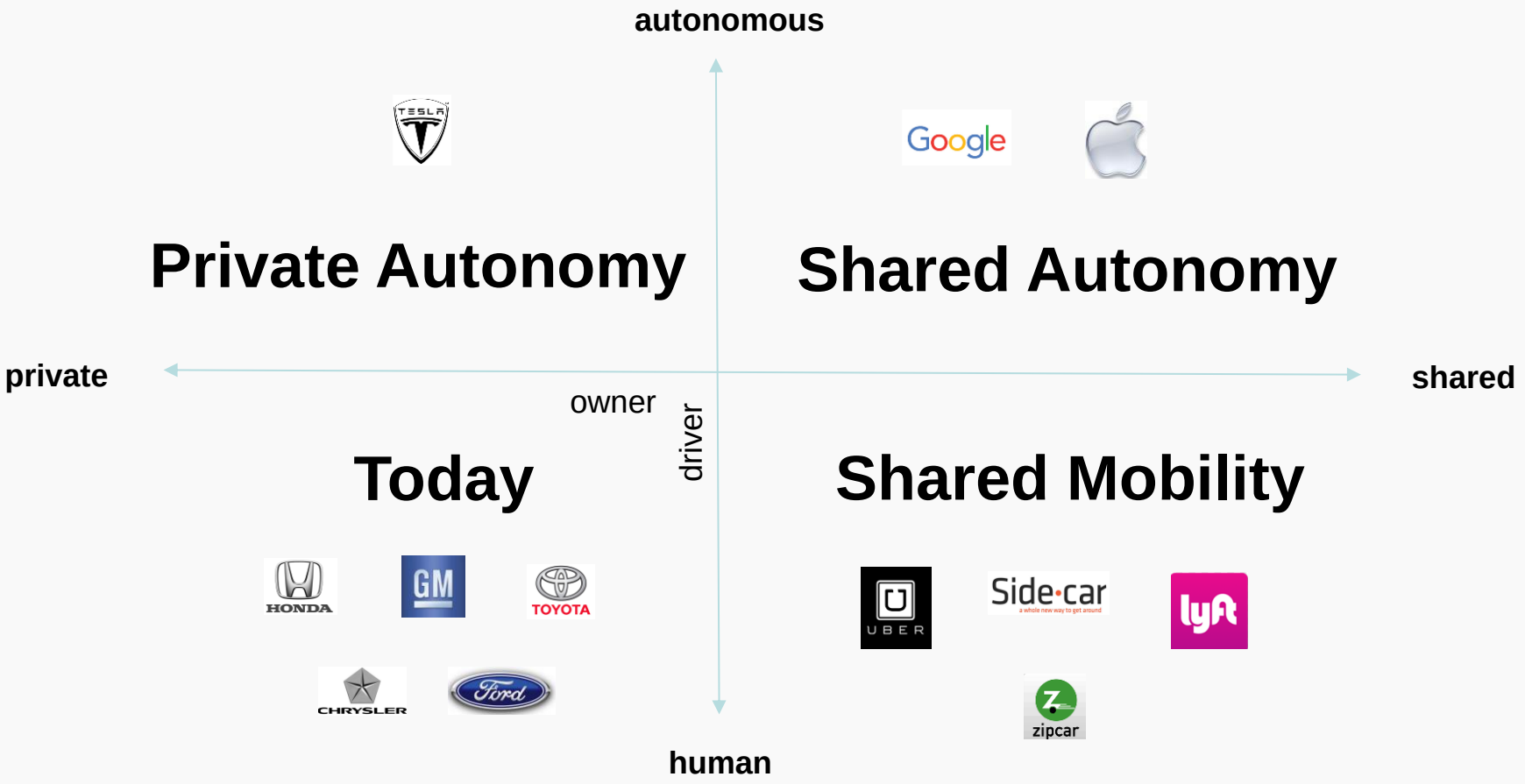
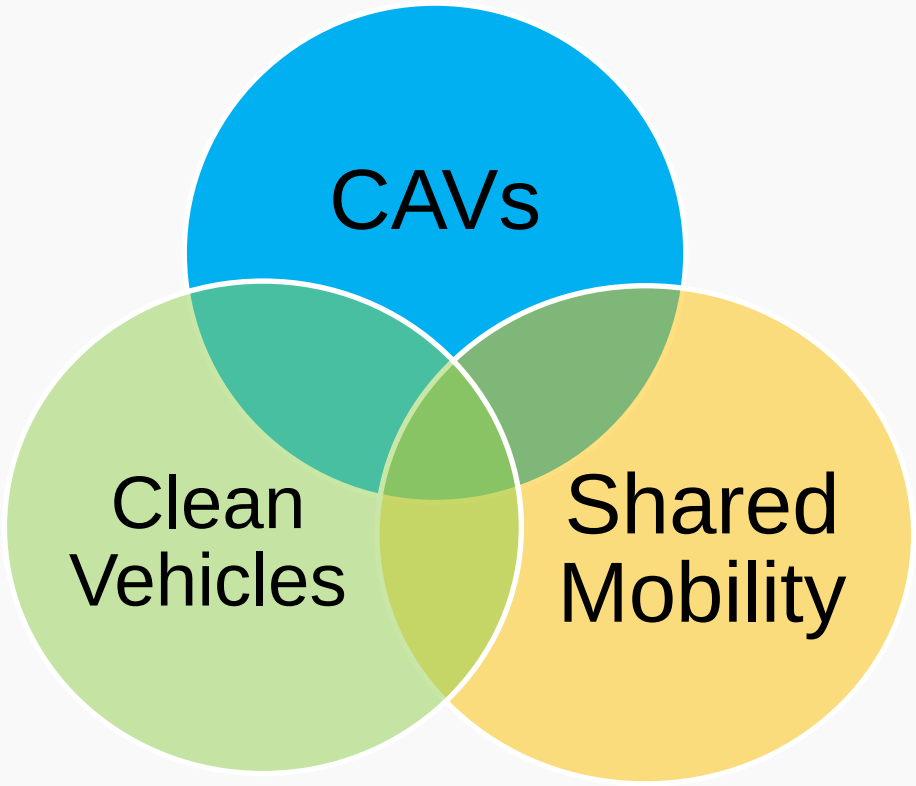


Figure 4: Impacts of Ridesourcing/TNCs (graphic excerpted from Shaheen and Chan (2015))


autonomous
Private Autonomy
Shared Autonomy
private
shared
owner
driver
Today
Shared Mobility
human



Some combination of these factors can lead to:

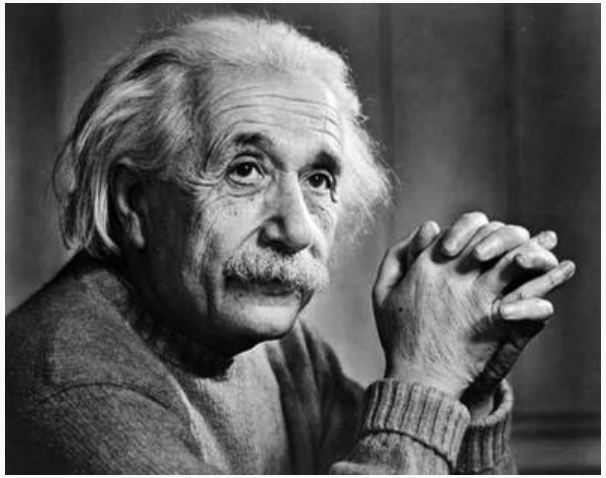
Equitable access to mobility

Space for people, not cars

Slowing the rate of climate change

We cannot solve our problems with the same thinking we used when we created them.

ALBERT EINSTEIN



We need to rethink the mobility paradigm

"There is such a thing as being too late when it comes to climate change."

- President Obama, August 3, 2015




BLA BLA
BLA...
ACT NOW!