Automated Vehicles: An Opportunity For Our Cities

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@gabe_klein

NACTO

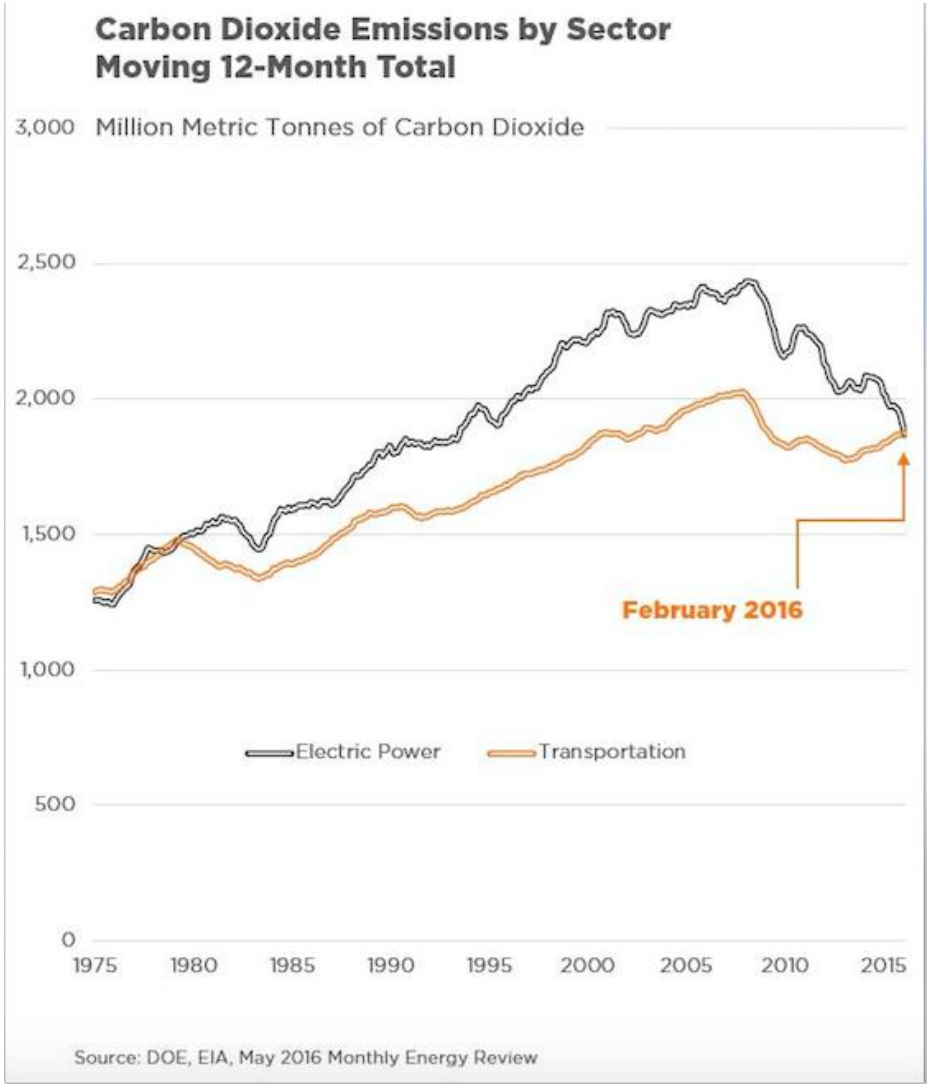
LADOT
Moving Los Angeles Forward

@seletajewel

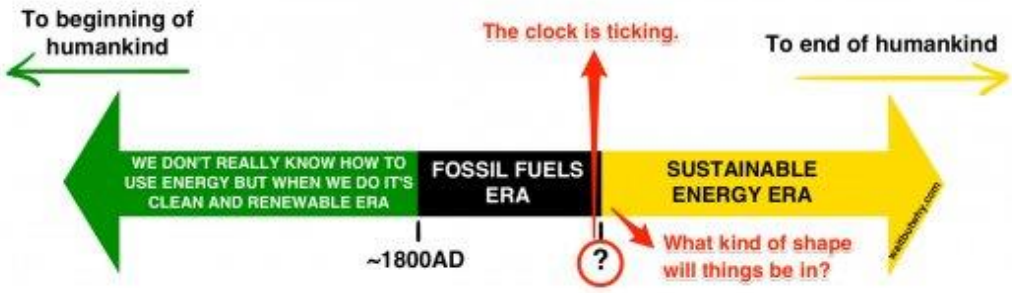
“If we can reconceive of our government so that the interactions and the interplay between private sector, nonprofits, and government are opened up, and we use technology, data, social media in order to join forces around problems, then there’s no problem that we face in this country that is not solvable.” —

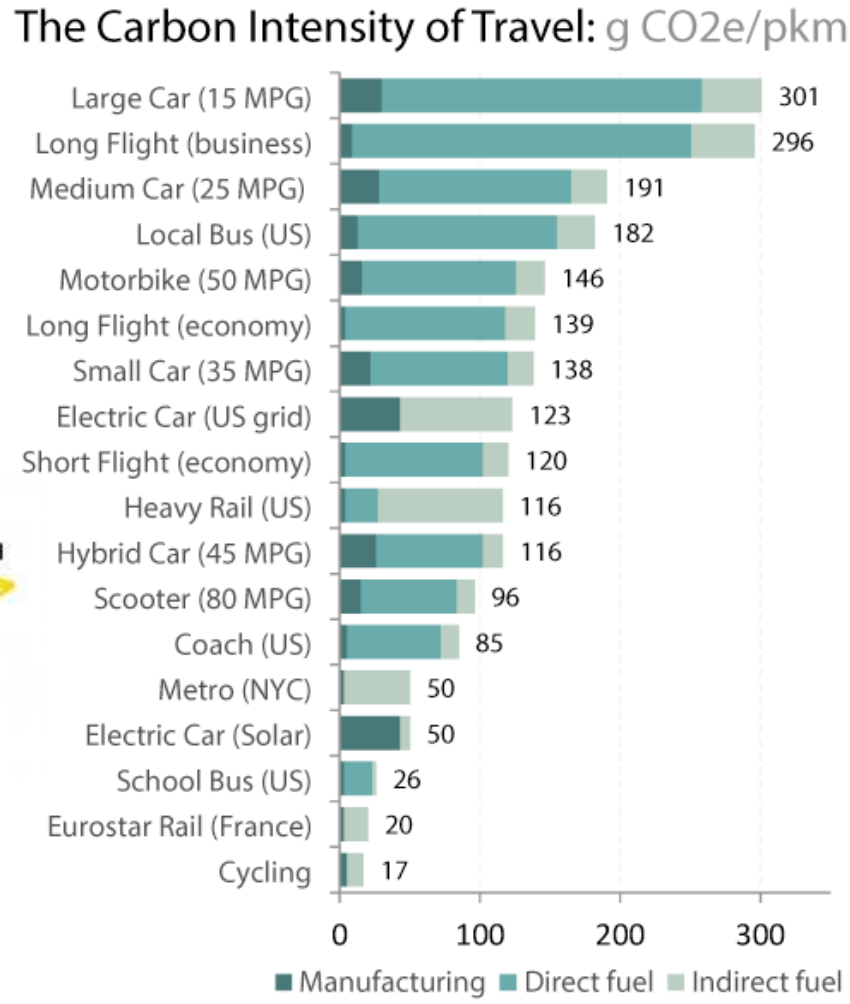
President Barack Obama

Vehicles now largest impact



The cost-benefit by mode to the environment





Sources: DEFRA, EIA, EPA, Chester & Horvath

shrinkthatfootprint.com

Newsweek

Feb. 17, 2016

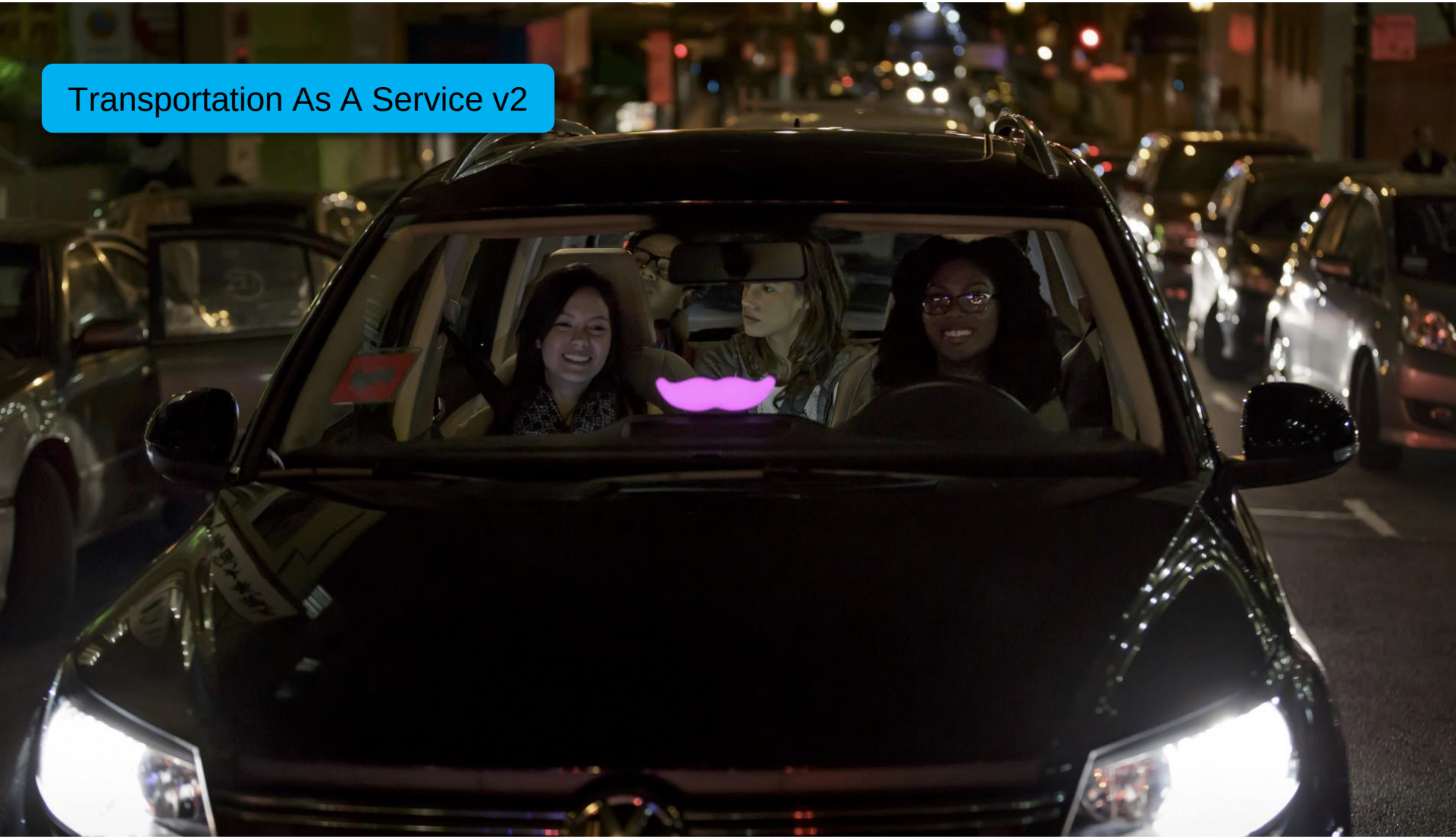
2015 brought biggest percent increase in U.S. Traffic deaths in 50 years

1,240,000

Leading killer of ages 10-19 & 15-29

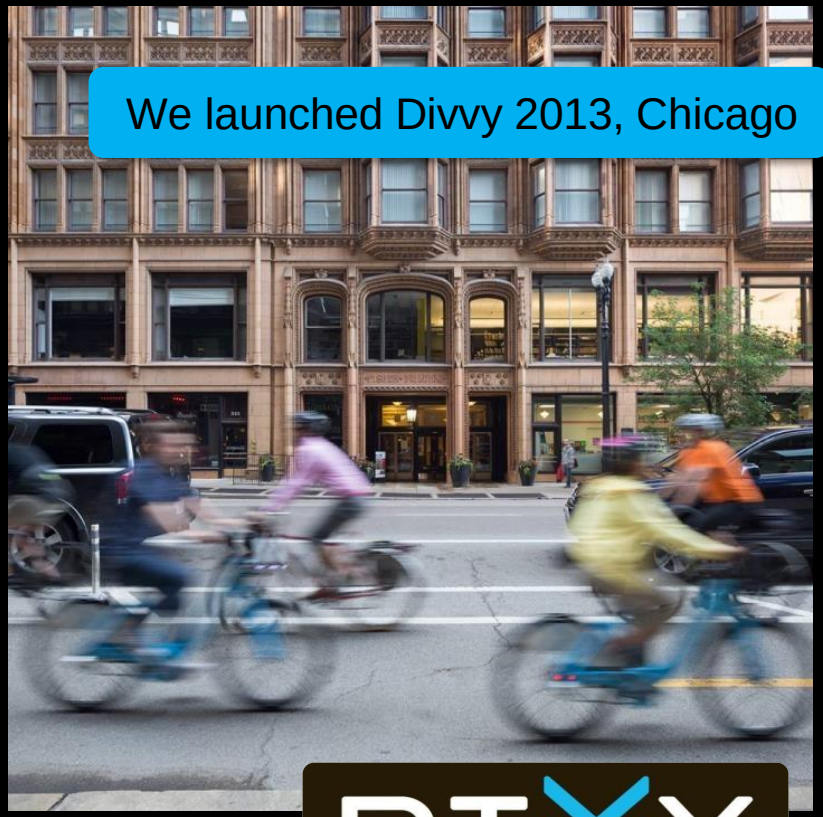
Survey: Boston Millennials Say MBTA is '**Very Important**' Factor In Where They Live And Work

www.wbur.org | Nov. 9, 2015


Transportation As A Service v2

We launched Capital Bikeshare 2010, D.C.

We launched Divvy 2013, Chicago



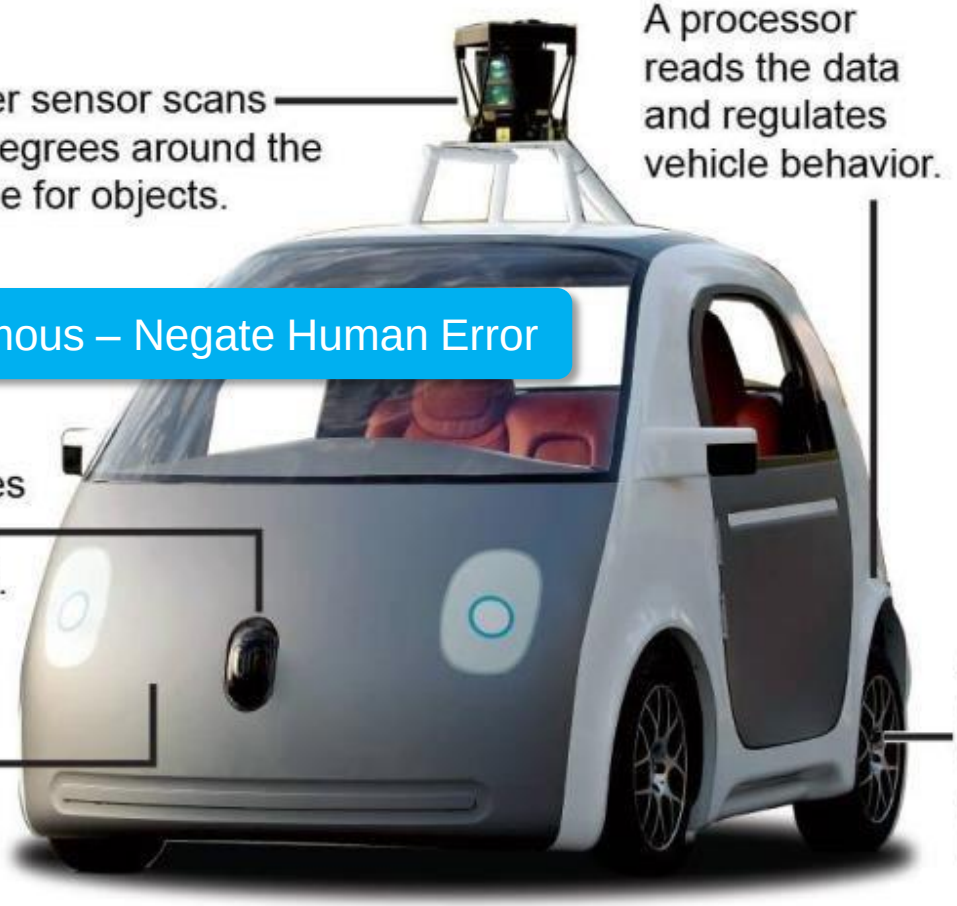
MOBILITY AS A SERVICE

Transit Agencies as connective-tissue

Image by Telematica News

Public/Private Need to Align Incentives

New Technology: Autonomous – Negate Human Error



Source: Google

Raoul Rañoa / @latimesgraphics

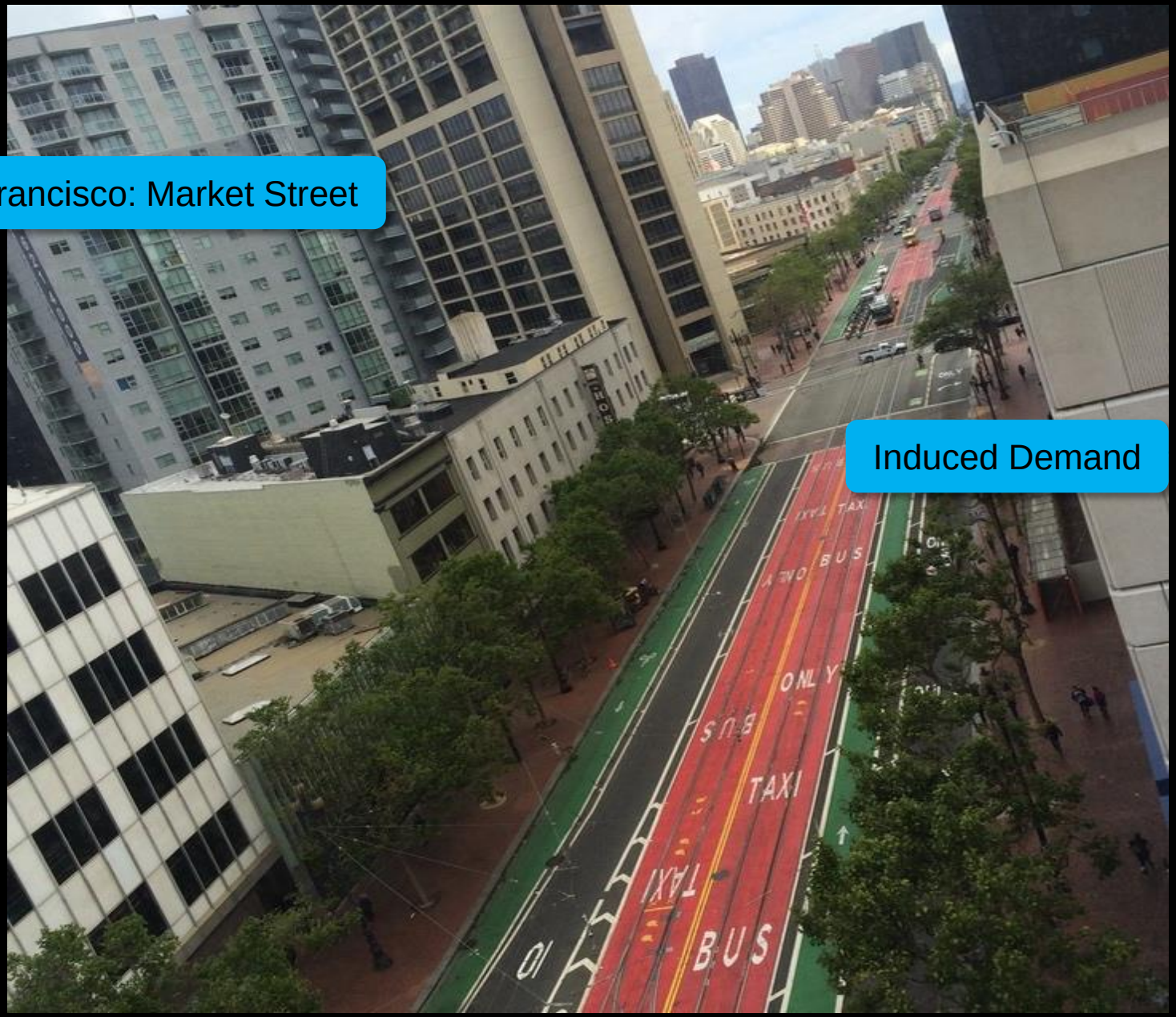
.....This is why:

December 21, 2015

Tesla Model S driver caught sleeping at the wheel while on Autopilot

Image by REUTERS/Stephen Lam

Do self-driving cars matter here?
theguardian
home › environment › pollution
climate change
wildlife
energy
election 20
all
Greenhouse gas emissions
Oslo moves to ban cars from city centre within four years
Proposed ban on private vehicles is part of a plan to slash greenhouse gas emissions 50% by 2020 compared to 1990 levels


San Francisco: Market Street
Induced Demand
BUS ONLY
TAXI
BUS ONLY
TAXI
BUS

Complete Streets Policy, Chicago
People Come First.

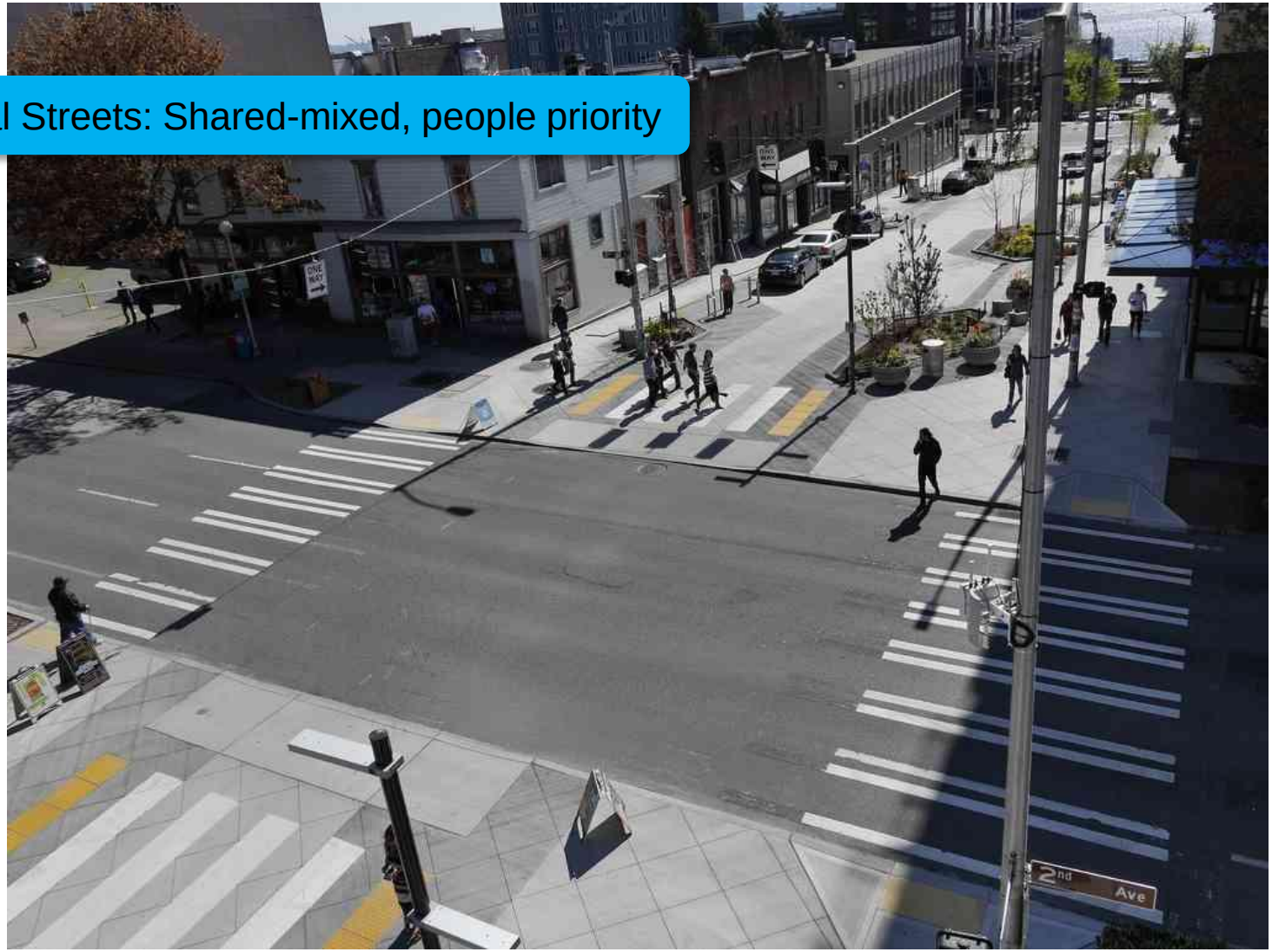
1 PEDESTRIAN

2 TRANSIT

3 BICYCLE

4 AUTO

Local Streets: Shared-mixed, people priority



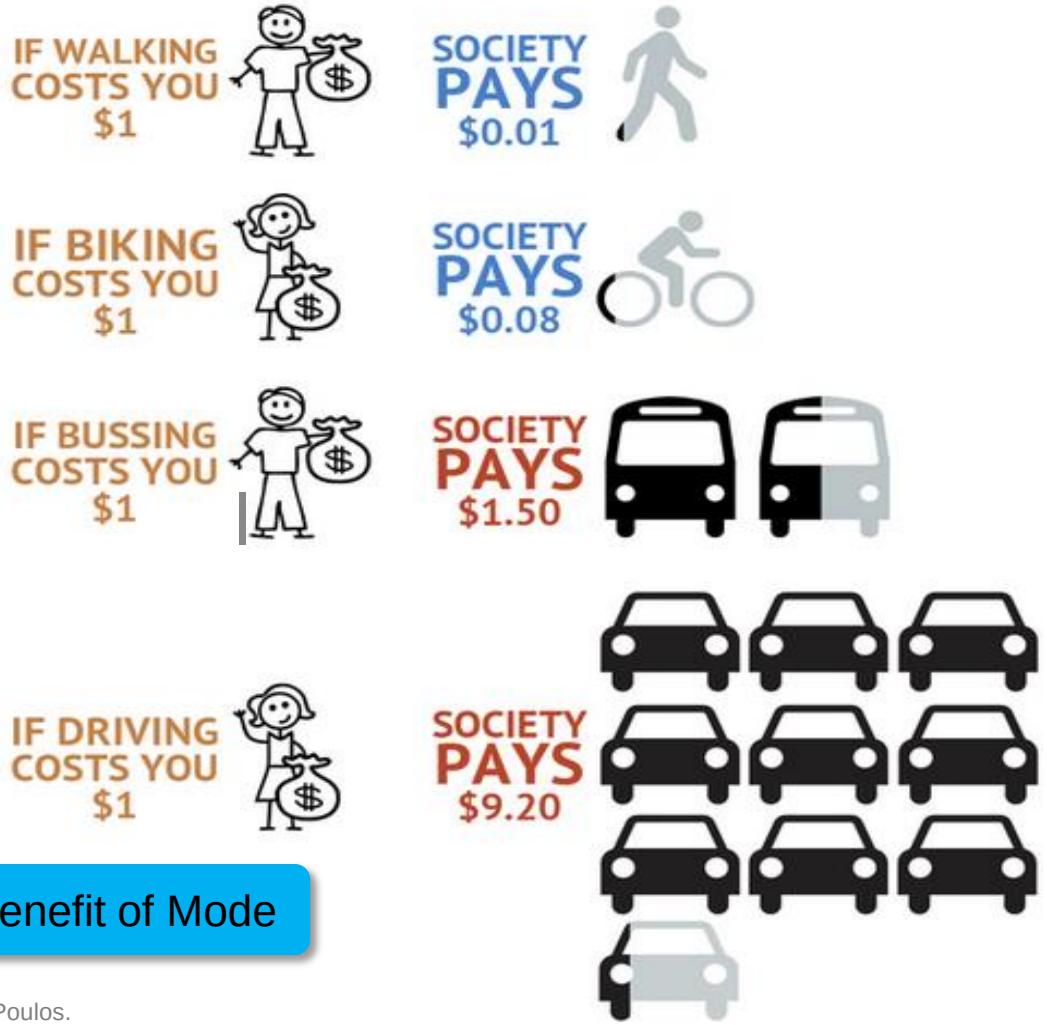
Arterial Streets: Separated, people oriented

How much does your commute cost (or save) society?

Every time you travel you put money into the system, but you also cost the system. Your contribution to and burden on the system differs depending on how you travel.

For example, when you ride the bus you pay a fare – money into the system. Your burden on the system includes the cost of operating the bus, and also less obvious impacts like emissions and noise pollution.

By looking at the ratio of what we put in versus what we cost the system, we see that different ways of travelling are more subsidized than others.

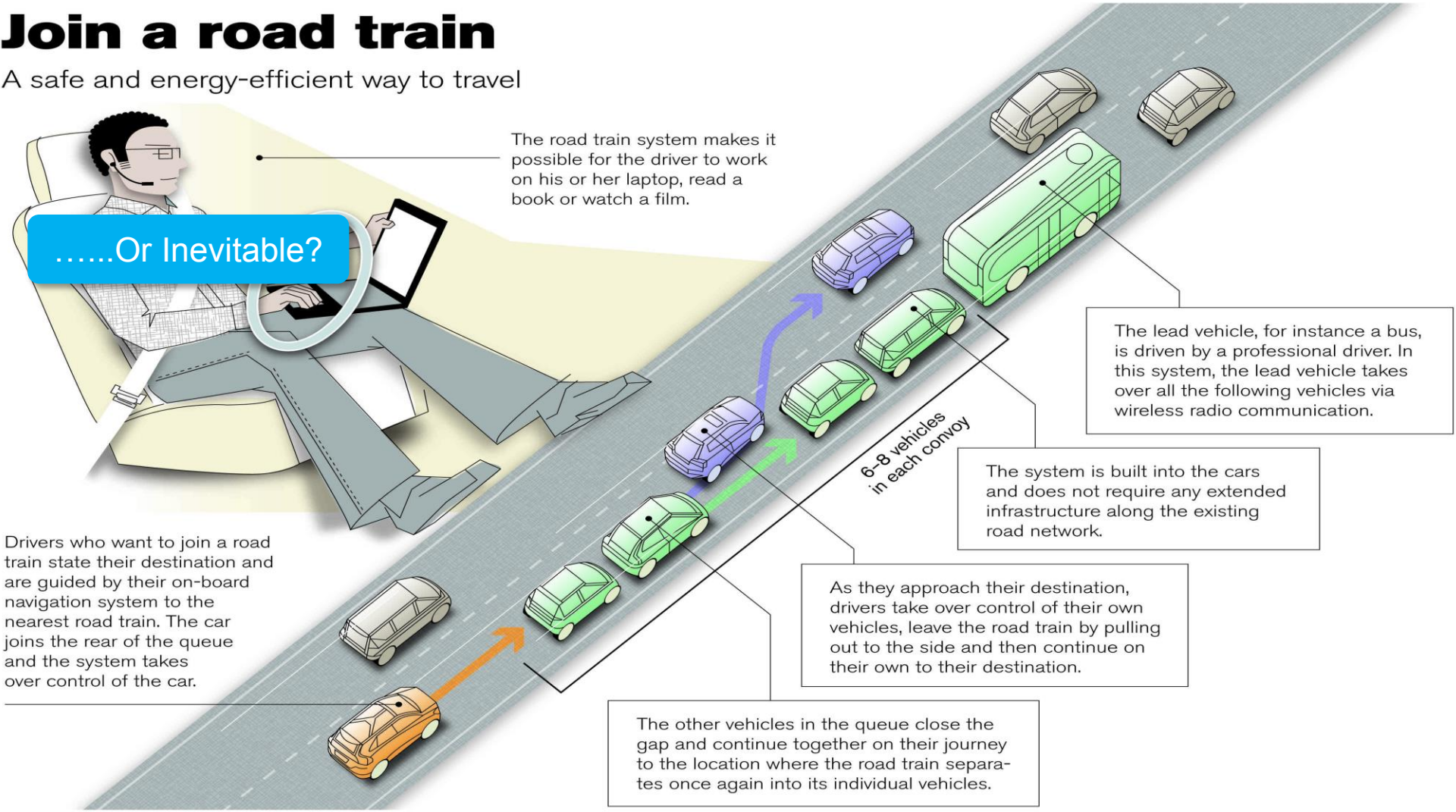


The Fully Loaded Societal Cost/Benefit of Mode

reative commons: Produced by Discourse Media, data by George Poulos.

Join a road train

A safe and energy-efficient way to travel

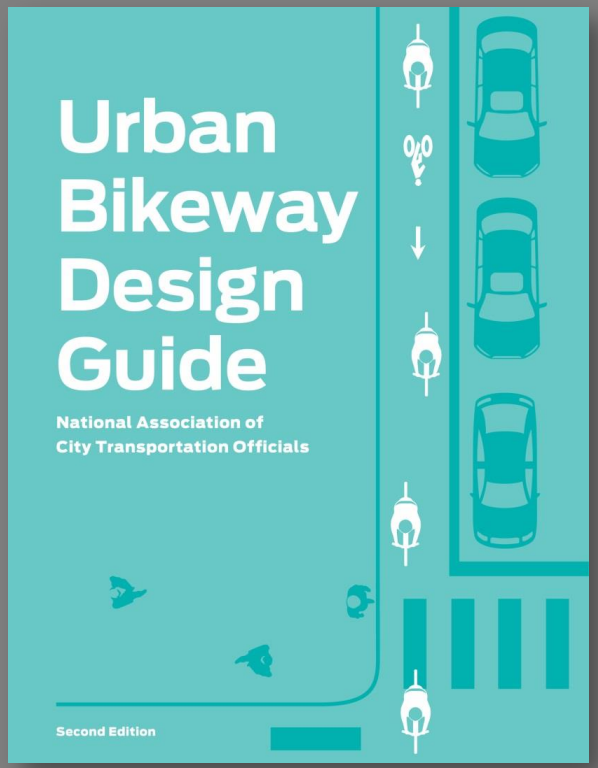


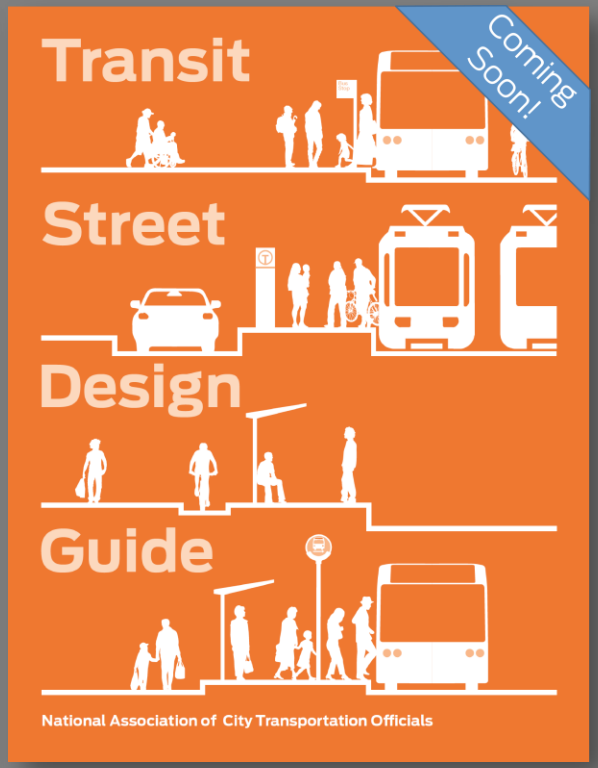
September 2016:

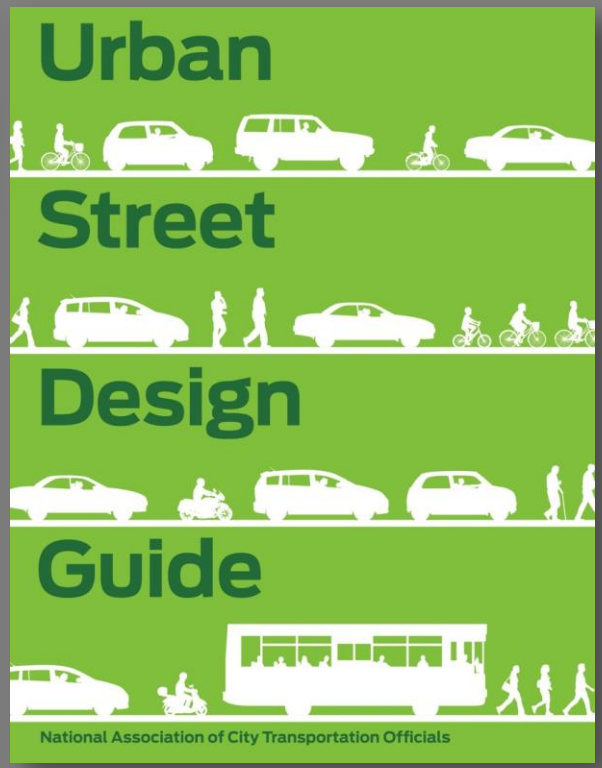
Using vs. Owning

Image courtesy of Rachel Botsman: “The Rise of Collaborative Consumption”

Design guides to change the practice and agency norms, ready for tech:







Endorsed by ULI

Urban Policy

NACTO MENU National Association of City Transportation Officials

NACTO Releases Policy Recommendations for the Future of Automated Vehicles

New disruptive technology has the potential to remake city streets, and policies must directly address their expected widespread impact on safety, mobility, and land use

NACTO urges stakeholders at all levels—from federal regulators and state transportation departments to automated vehicle manufacturers—to adopt the following recommendations:

- **Plan for fully automated vehicles, not half-measures:** Going halfway with partially automated vehicles, instead of fully automated, would require drivers to take over if the vehicle encounters a dangerous situation. In practice, such vehicles have been shown to encourage unsafe driving behavior, with drivers reading more, texting more, and generally being inattentive while the vehicle is in motion.
- **Rethink our streets and expressways:** Advances in automated vehicle technology will dramatically increase our current expressways' capacity, making some currently planned expressway expansions potential 'white elephants' that could overwhelm surface streets with traffic. Capacity must be carefully planned and routed.
- **Ensure safe operation on city streets, including limiting automated vehicles to a maximum speed of 25 miles per hour:** By working with cities, regulators and automakers can ensure that automated vehicles can operate safely where people are increasingly choosing to live: in dense, complex urban environments.
- **Create data-sharing requirements for automated vehicles:** Automated vehicle technology has the potential to create vastly more useful, and cost-efficient, data than is currently collected through laborious means. Requiring the sharing of high-quality, standardized data from automated vehicles would allow for cities to take a more data-driven approach to transportation.
- **Change planning models to incorporate the expected disruptive impact of this technology:** Current travel demand modeling assumes the same opportunity cost for time spent driving a car as time spent traveling in an automated vehicle, while recent research shows that the time opportunity cost in an automated vehicle could be lower by as much as 80%. This dramatic shift will necessarily change how and where people will choose to get around in the future.

NACTO Policy:

VISION

NACTO supports a future transportation system that provides a sustainable, accessible, and affordable backbone to the strong cities at the center of our 21st century economy. New technology has the capacity to reduce the footprint of vehicular travel, moving more people in new forms of medium and low density transit, while creating space for safe and inviting walking and cycling infrastructure. Positioning new mobility services to provide access and mobility to all, and to buttress rather than undermine the successful transit lines at the heart of our cities, is vital to realizing the value of fully automated vehicles for mobility. At the same time, policy at every level of government should address head-on the destructive potential for increased traffic, emissions from additional driving, and on-street congestion that could easily result from automated vehicle technology.

SHAPING AUTOMATED VEHICLE POLICY

Fully automated vehicles (often referred to as level 4 automation by NHTSA) are a disruptive technology that will have widespread impacts on safety, mobility, land use, labor, and the built environment. Considering the complexity of urban environments and the many demands placed on city streets, as well as existing city policy goals of reduced greenhouse gas emissions and vehicle miles travelled, NACTO supports automated vehicle policies and regulations designed to:

- **promote safety** for pedestrians, bicyclists, transit riders, automated vehicle passengers, and all street users within the multi-modal urban context;
- **incentivize shared, automated, electric vehicles** to reduce the environmental impacts of vehicular travel and refocus planning on the principle of mobility as a service;
- **support the future vision of communities** as great places to live, work, and play by using technology as a tool to change land use as well as how streets are built;
- **rebalance the use of the right-of-way** with less space for cars and more space for people walking, cycling, using transit and recreating;
- **support public transit** by providing first and last mile connections to major transit lines via shared, automated vehicles, and by providing cost-effective, on-demand transit in lieu of low-performing fixed routes; and
- **improve mobility for all,** contributing to a more equitable transportation system, where benefits reach all demographics and any negative effects are not unjustly concentrated.

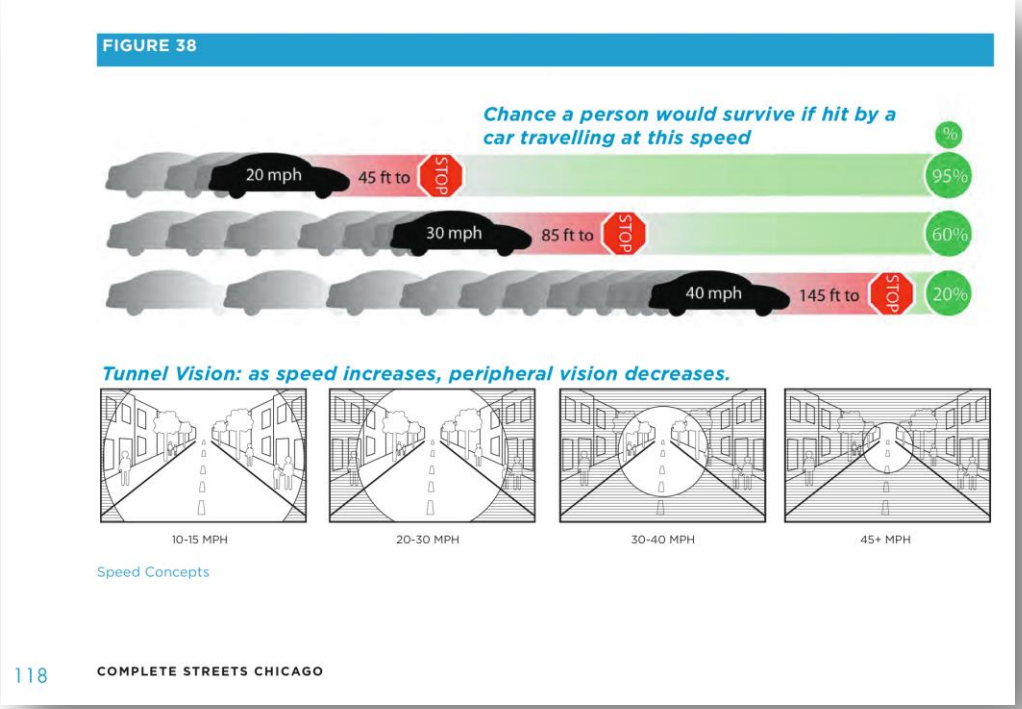
NACTO

NACTO Policy:

1. ***Safety.* Plan for fully automated operation (NHTSA Level 4) to support Vision Zero:** In general, protection of humans of all ages and abilities—whether they are walking or cycling in parallel, or stepping off a bus in perpendicular to the path of travel—should be the primary goal of modeling and software development for vehicular movement on city streets.

   Regulators and product designers should bar the use of partially automated vehicles (NHTSA Level 3) on any roadway without controlled access, like city streets. Such vehicles have been shown to encourage unsafe driving behavior, with drivers reading more, texting more, and generally being inattentive, while still operating under the expectation that the driver will take over if the vehicle encounters a dangerous situation.

   Maximum operating speed in a city street environment should not exceed 25 miles per hour in order to support Vision Zero policies, lessening the likelihood of death upon impact for the human body. Reducing speeds to allow for sufficient stopping distance to avoid or mitigate crashes is critical for safety in a mixed traffic environment, particularly as vehicles approach crosswalks, intersections, driveways, or on-street parking.

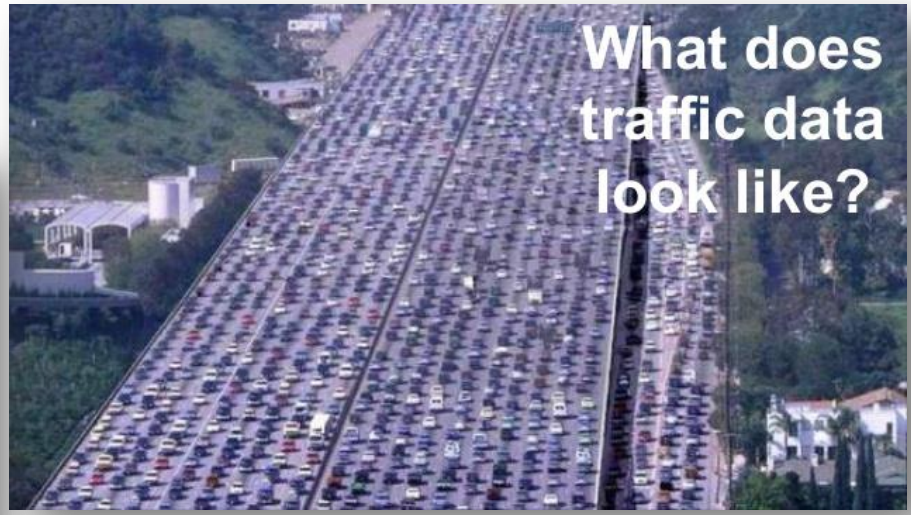


NACTO Policy:

2. ***Rethink expressways.*** **Modernize plans for expressways, pivoting from expansion to modernization and management** to account for the needs and impacts of automated vehicles. Existing lanes on expressways will be able to accommodate significantly more vehicles if they are able to platoon through connected technology, making new physical capacity unnecessary in the near future.

   Transportation planning at all levels should refocus on modernizing existing expressways with instrumentation for new technology. This includes flow management of exiting traffic so that increased volumes on expressways do not overwhelm surface streets with traffic, simply pushing system failure to a new place on the network. Increased throughput on expressways and other limited-access roads will eventually need to be absorbed by local streets. Exiting flows managed by a connected vehicle network should be controlled so that they do not exceed local street capacity. Built-in vehicle routing software should avoid busy local streets for through traffic.

3. ***Modernize traffic data.*** **Develop and implement robust data-sharing requirements for new vehicle technology** to improve the quantity and quality of data collected, and to reduce the millions of dollars spent annually on technologically primitive data collection, both from regular traffic operation and from traffic crashes. Traffic management will remain a function managed or regulated by the public sector even in a future dominated by private mobility providers. Public policies should foster open data platforms that enable robust private innovation to better serve transportation customer needs, while reducing aggregate social and environmental costs and inequities through a regulated utility model framework.



NACTO

NACTO Policy:

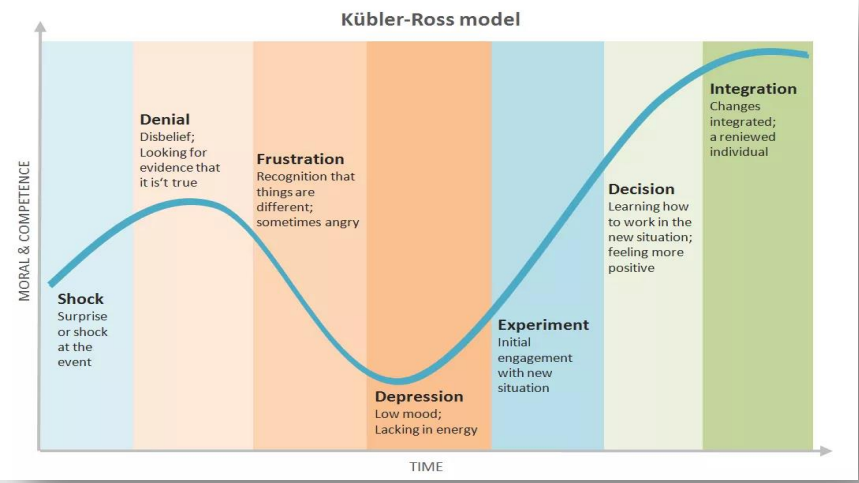
4. ***Plan with cities.*** **Include transportation professionals from cities** in all planning processes at the national and state levels. To date, many discussions of regulatory action have taken place in state legislatures or at departments of motor vehicles (DMVs), which have limited experience with street operations. Regulators will benefit from discussions with city transportation agencies, which are charged with managing the majority of current traffic technology.

5. ***Focus research on technology that works for cities.*** **Federally and state supported research on automated vehicles should focus on city street operations of shared, automated, electric vehicles.** City streets are the locus of the most complex problems for automated vehicles, with mixed traffic environments, many variable-speed activities within the right-of-way, and many possible destinations. By contrast, expressways have few entries and exits, little variation in speed, and little or no other activities in the right-of-way.

   Increased Federal and State funding for city operation of automated vehicles that are electrically powered and shared will enable technology developers to work toward a set of clear technical principles that maximize safety, economic development along city streets, and human health through promotion of active transportation. This increase in funding should be based in an understanding of positive and negative externalities in the transportation marketplace.

   Research should address any needs for on-street infrastructure in the city environment and how to cover those costs. Research and policy must address standardization of vehicle "behavior" so that everyone—from human drivers to small children—understands how to interact with automated vehicles.

   The future of transit vehicles and their unique needs in terms of automation should be investigated to ensure transit can benefit from advances in technology.



NACTO

NACTO Policy:

6. ***Systematize lower travel costs.*** **Adjust and standardize lower travel time costs beginning with model year 2020** based on projections of Level 4 (fully automated vehicles) for regional 4-step travel models, environmental impact statements and other cost-benefit analysis modeling. Researchers in automated vehicle technology widely agree that people will perceive significantly lower travel costs while using automated vehicles, yet modeling continues to use outmoded travel costs as the standard for models that extend into the 2050s in some cases.

   Beginning as soon as model year 2020, per-minute travel time costs could be an estimated 80 percent lower.* This revised standard for evaluating the effects of projects will allow planners to more accurately predict future travel demand, weigh the costs and benefits of infrastructure projects, and understand how shared, automated vehicles can complement transit and other modes.

   To support this change in modeling, a metropolitan modelling exercise for North America similar to the Lisbon model released by the International Transport Forum in 2015 would be beneficial in understanding how this shift in transportation costs may affect overall travel patterns.

7. ***Set the stage for modernized freight and delivery.*** **Support safer, more efficient, environmentally sustainable freight systems** by fostering consolidation of shipments to boost average load factors, non-peak hour deliveries in congested areas, automated truck route enforcement, and use of best available clean truck technologies. Automated freight movement and delivery has the potential to improve energy efficiency and reduce crashes with large trucks.

NACTO

NACTO Policy:

8. ***Rethink the funding base for transportation.*** **Policies at the Federal and State levels for infrastructure funding must be revised to reflect the restructuring of the transportation system** under automation. Current models of funding, such as fuel and vehicle fees, will see radical changes in revenue streams under potential new automation scenarios. Future funding models should assess investment needs for infrastructure and mitigate the negative externalities in the transportation sector, such as congestion and air pollution. Regulations, technologies, and user interfaces should provide incentives for users of automated vehicles to schedule trips in advance, to fill empty seats in passenger vehicles and empty space in trucks.

9. ***Plan for the future of cities.*** **Future visioning for automated vehicles should begin from the inside out, from the centers of our economy, looking at land use as well as transportation.** Theories of automation that focus simply on fitting more vehicles into an expressway lane every hour are beginning from the product of the economy rather than the motor of the economy. Great cities generate traffic; traffic does not generate great cities. Technology has the power to help communities achieve their visions both for transportation and for land use, taking public space back from congestion, traffic and parking. Parking requirements and general curb space usage are particular areas where a decrease in vehicle storage needs could bring about a new era for city streets. Planning should begin with a vision for the future city and put resources into solving for the best methods for providing mobility in low, medium, and high density corridors and environments, from a public investment and a total investment perspective.

NACTO

Design Around People

People on Foot and Universal Access

Streets must be designed to accommodate safe, accessible, and comfortable use by everyone. Streets with active storefronts, foot traffic, and human scale contribute to an active and economically vibrant community. Public safety, adequate sidewalk width, visual variety, protection from rain, and shade from the sun make a successful street.

People on Cycles

Cyclists include users of bicycles, cycle–rickshaws, and cargo bikes. Facilities should be direct, safe, intuitive, clearly delineated, and part of a cohesive network to encourage use by people of all ages and confidence levels. Cycle tracks that create an effective division from traffic and are well coordinated with signal timing and intersection design form the basis of an accessible cycle network.

People Using Collective Transport

Dedicated space on the street for people using collective transit supports safe, convenient, reliable, and frequent service. Whether using rail, bus, or small collective vehicles, transit service dramatically increases the overall capacity of the street and should have safe and easily accessible boarding areas. The overall level of access and scope of a transit network should be aligned with demand, meeting service needs without sacrificing streetscape quality.

People in Personal Motorized Vehicles

Personal motorized vehicles provide on–demand, point–to–point transportation and include automobiles, for–hire vehicles and motorized two– and three–wheelers. Streets and intersections should be designed to facilitate safe movement and manage interactions between motorized vehicles and people walking and cycling.

People Moving Goods and City Services

Freight operators benefit from dedicated curb access or docks for easy loading and unloading and rigorous management of space and movement throughout the traffic system. Emergency responders and cleaning vehicles need adequate space to operate, which can be accommodated while ensuring the safety of all other street users.

People Doing Business

Vendors, street stalls, and commercial activity connected to storefronts provide important services that support vibrant, active and engaging street environments. Adequate space in appropriate places on the street should be allocated to these uses. Providing regular cleaning, maintenance schedules, power, and water can support commercial activity and improve local quality of life.

Global Design Guide

Design Guides to change the practice and agency norms…NOW

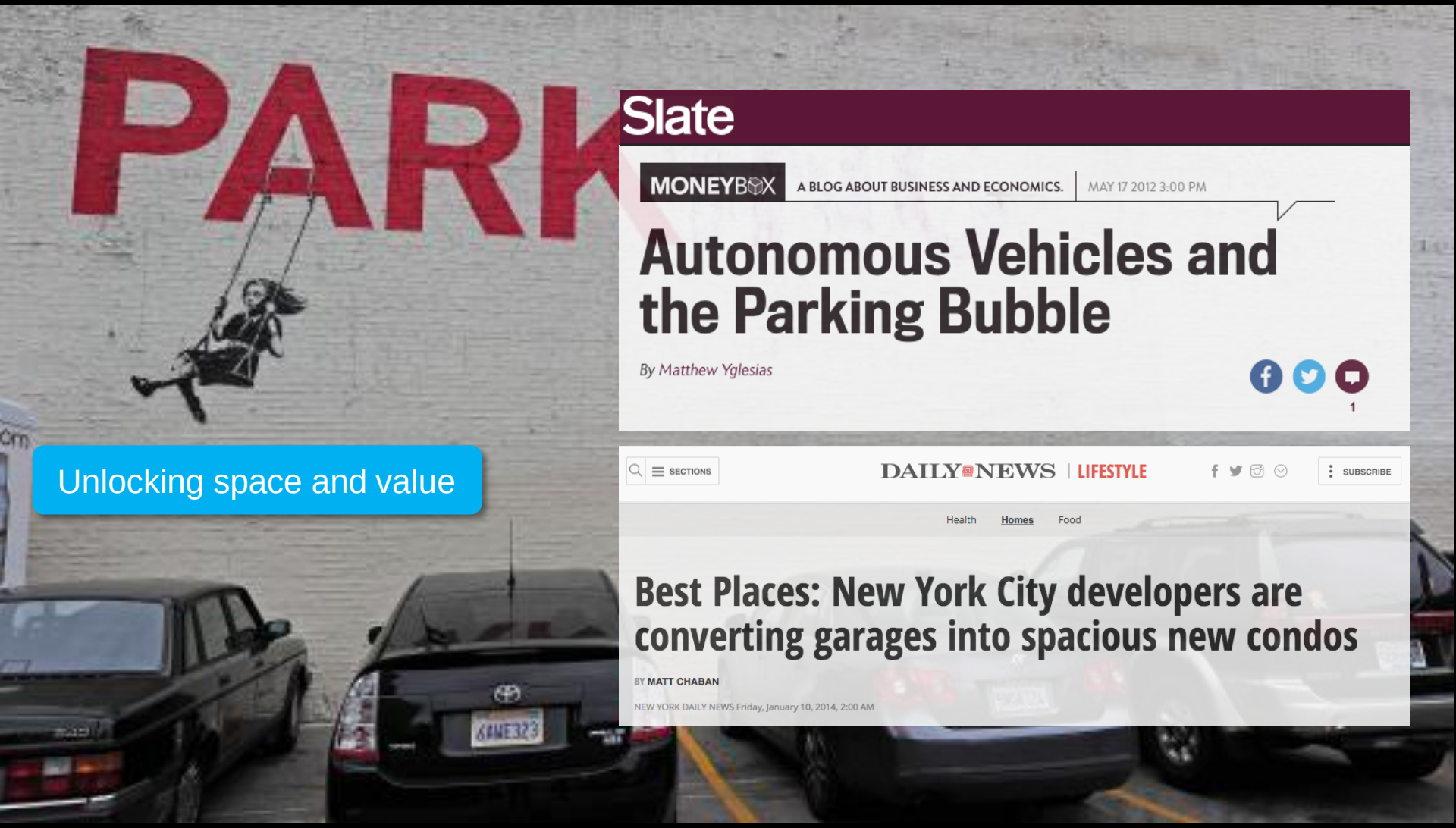
Courtesy: People for Bikes

Public Street Opportunities

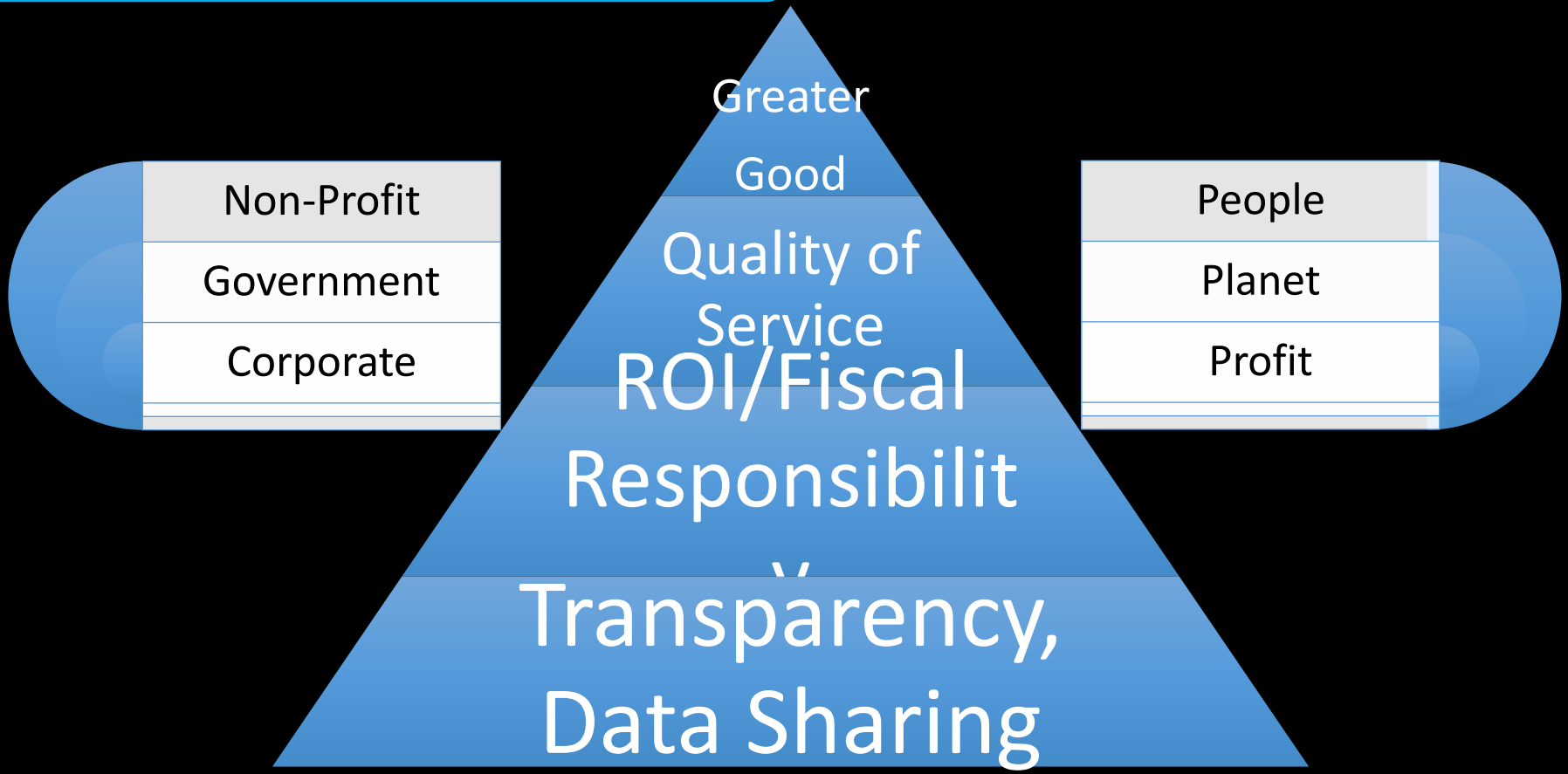
Reimagining our Streets

Source: A presentation by Gerry Tierney from Perkins + Will suggests a new future for 40th Avenue in San Francisco.

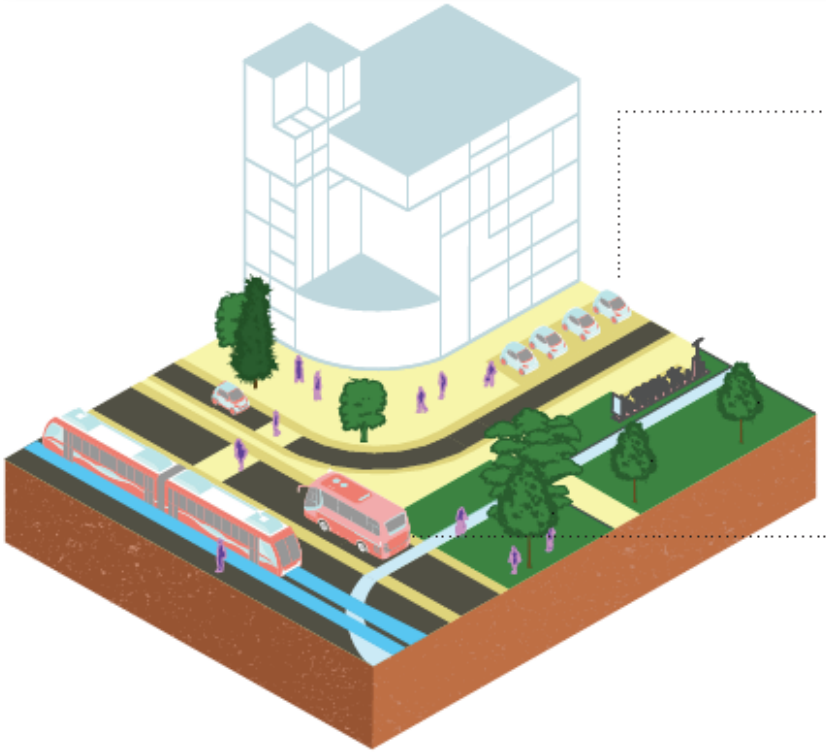
Why wait for the technology.


PARK
Unlocking space and value
Slate
MONEYBOX
A BLOG ABOUT BUSINESS AND ECONOMICS.
MAY 17 2012 3:00 PM
Autonomous Vehicles and the Parking Bubble
By Matthew Yglesias
1
SECTIONS
DAILY NEWS | LIFESTYLE
SUBSCRIBE
Health
Homes
Food
Best Places: New York City developers are converting garages into spacious new condos
BY MATT CHABAN
NEW YORK DAILY NEWS Friday, January 10, 2014, 2:00 AM

Public/Private Need to Align for Citizen Benefit



An Autonomous, Shared, Connected…and Multimodal Future



Autonomous Futures

The Evolution of a New Paradigm for Autonomous and Connected Mobility

Electric, light-weight urban vehicles

On-demand, subscription services

Self-driving vehicles running slowly in convoys on shared streets

Autonomous on-demand transit

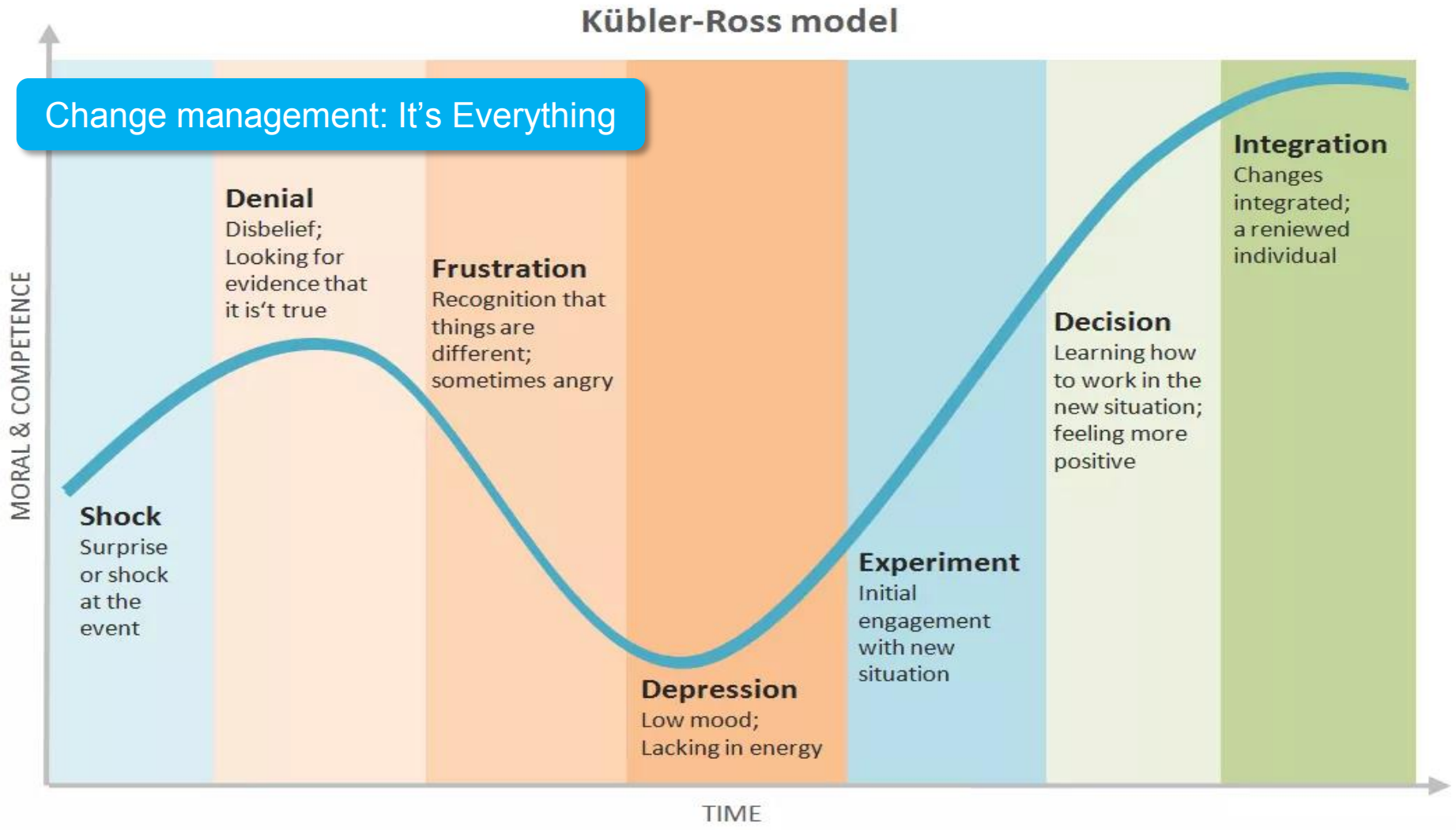
Expanded transit backbone

Bike-sharing connectivity, separated facilities on larger streets, greenway networks linking our towns

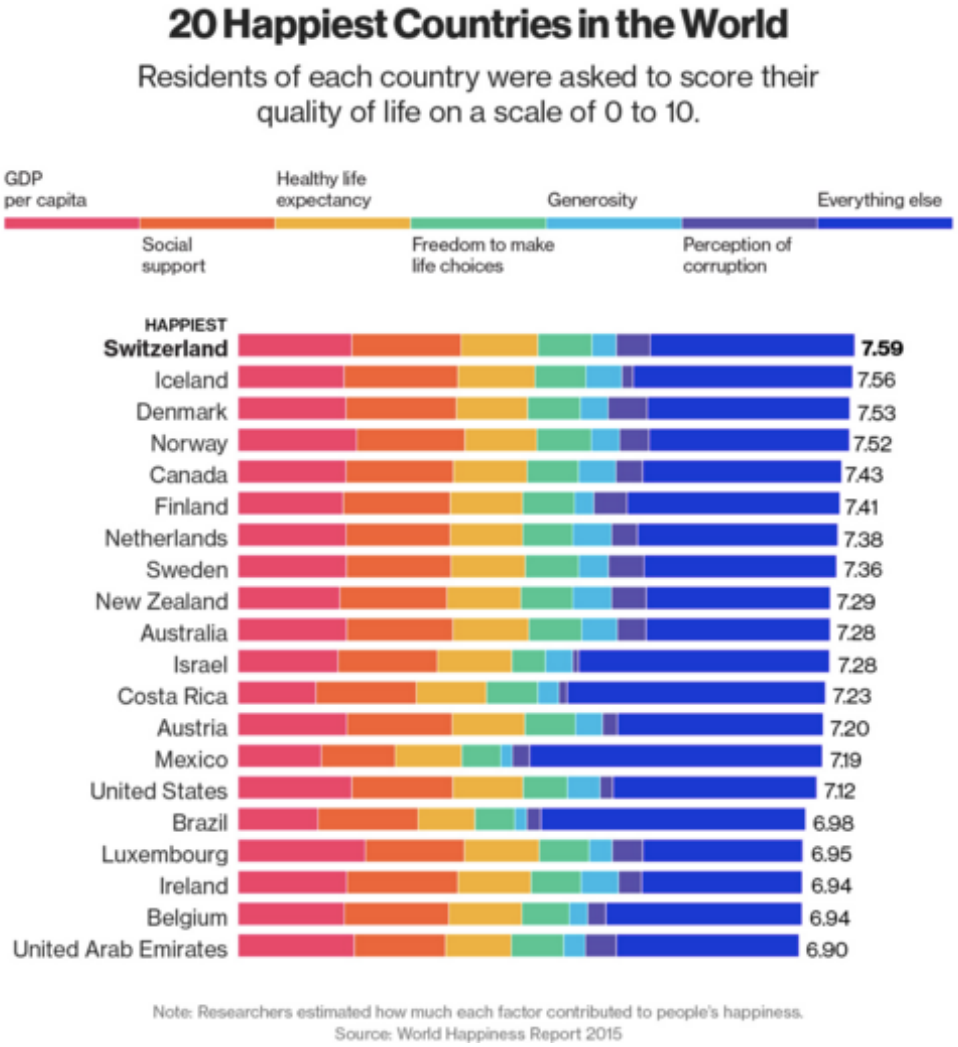
A new framework for safer cities is emerging based on trends in sensor technology, changing lifestyles, and mobile connectivity.

Cities of the future can leverage the benefits of autonomous technology for an achievable and true Vision Zero, to reclaim public space for people and active transportation, extend the transit backbone, and to provide new transportation options and equity where it is lacking today.

Autonomous future (infographic by Kate Chanba and David Vega-Barachowitz)


Kübler-Ross model
Change management: It's Everything
MORAL & COMPETENCE
TIME
Shock
Surprise or shock at the event
Denial
Disbelief; Looking for evidence that it is't true
Frustration
Recognition that things are different; sometimes angry
Depression
Low mood; Lacking in energy
Experiment
Initial engagement with new situation
Decision
Learning how to work in the new situation; feeling more positive
Integration
Changes integrated; a reniewed individual

…% Policies, Tech, Biz Models that Prioritize Transportation Happiness



Thank you

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