SUSTAINABLE SHARED MOBILITY

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ITDP

Three Revolutions

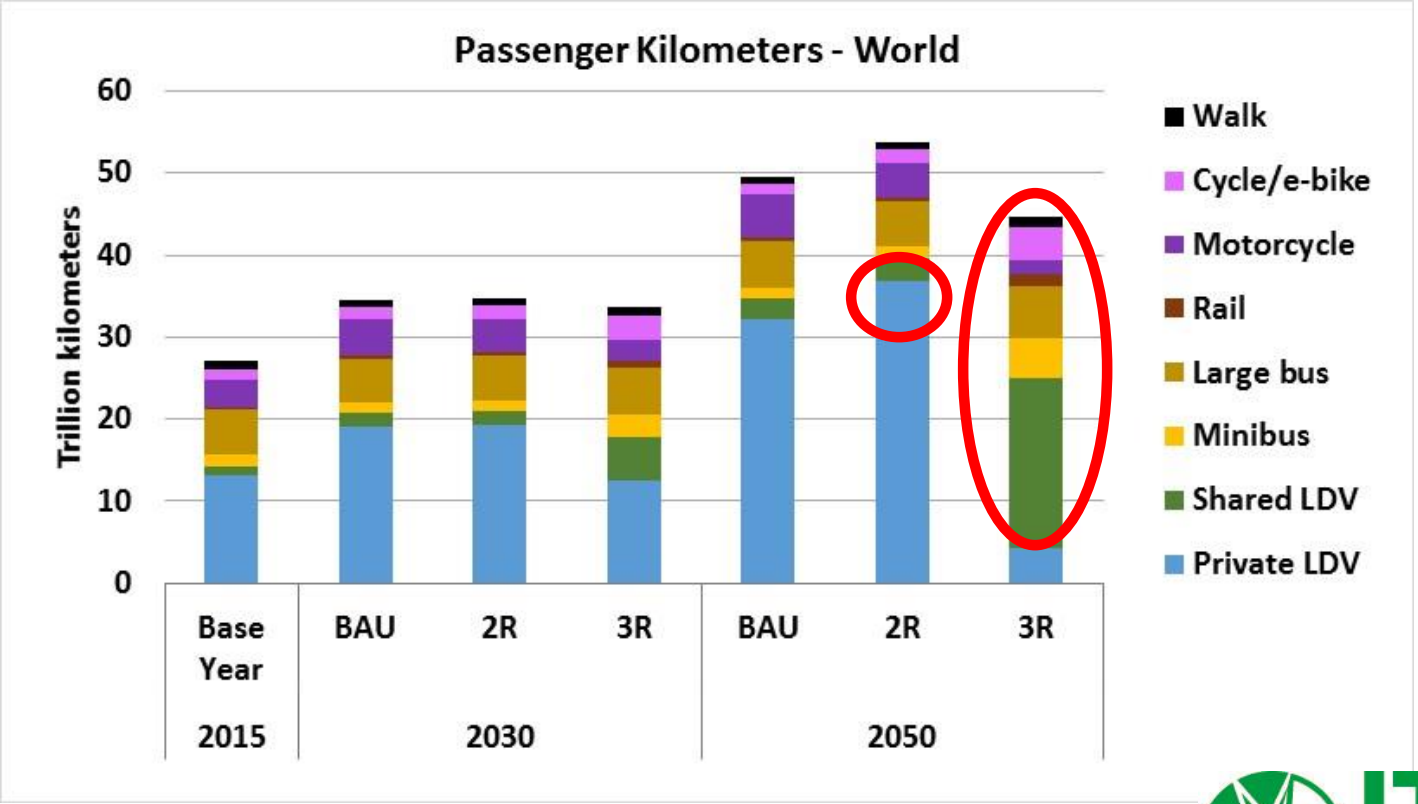
Scenarios:

- **1R:** Autonomous vehicles
- **2R:** Electric + 1R
- **3R:** Compact cities, transit, cycling, shared mobility + 2R

"Business As Usual" (BAU) aligns with IEA 4 degree scenario

Three Revolutions: World

- Automated vehicle results in much higher travel in 2R
- In 3R, nearly 50% of travel in 2050 is in transit or multiple-occupant vehicles.



UCDAVIS
SUSTAINABLE TRANSPORTATION ENERGY PATHWAYS

ITDP
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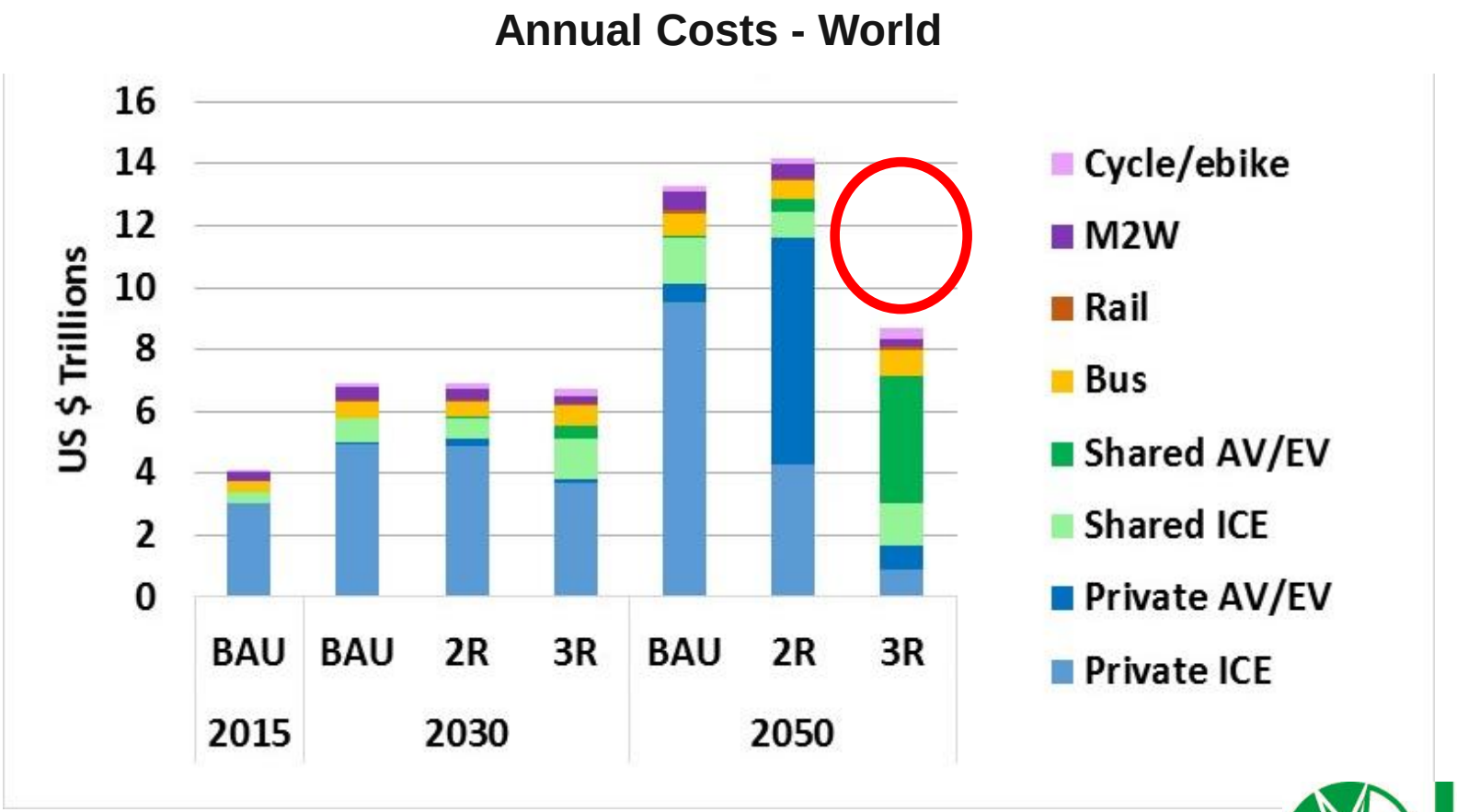
Save $130 trillion by 2050

Save ~30% due to less infrastructure, vehicles, fuel



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SUSTAINABLE TRANSPORTATION ENERGY PATHWAYS

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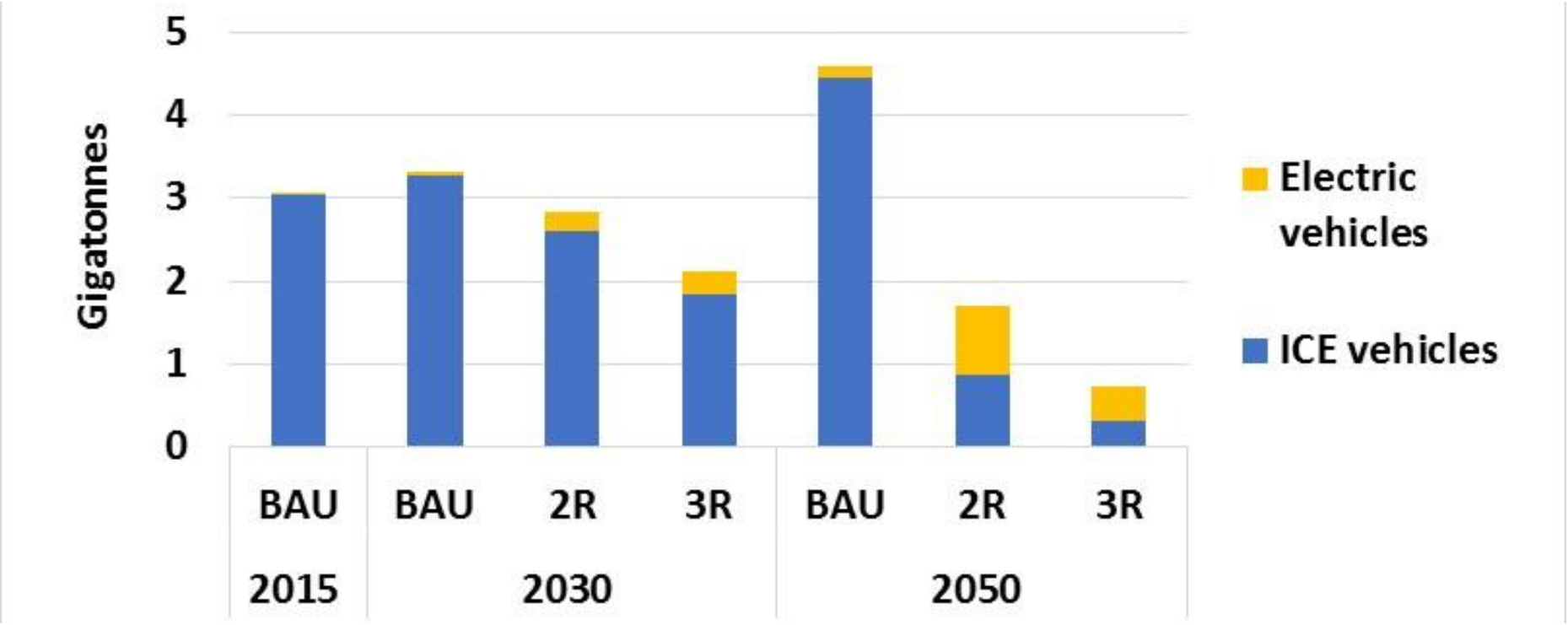
Cut annual CO2 emissions 3.8 GT (83%)

Global urban passenger transport CO2 emissions



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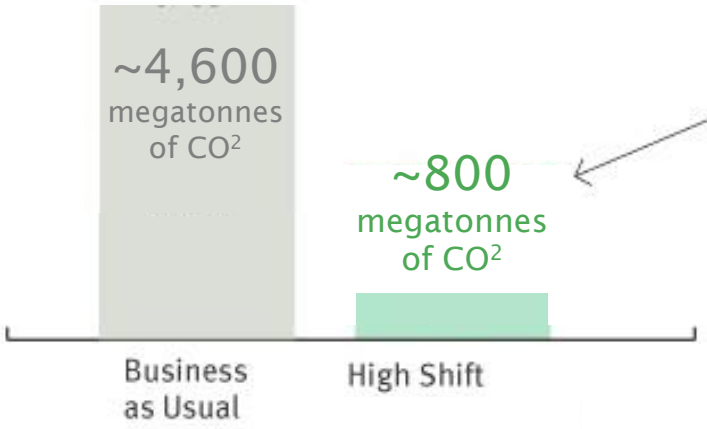
2050 EMISSIONS
FROM URBAN TRANSPORT



We could avoid

~3.8 gigatons

of global C02 emissions,

an 83% reduction in urban transport emissions over BAU

2015-2050 CUMULATIVE
COSTS OF TRANSPORT

And save cities

$130 trillion

over the next 35 years

Real-World Context

BUSINESS | ASIA | ASIAN BUSINESS NEWS

Indian Court Lifts Ba

The judge says Uber should be allowed t

TIONS SEARCH

Y SEP. 24, 2016 ALL SECTIONS NEWS SI

Need a ride? Alt pay your Uber tr

From The Atlantic
CITYLAB

CITYFIXER

São Paulo Offers the Best Plan Yet for Dealing With Uber

Call it congestion pricing for taxi cabs.

ERIC JAFFE | @e_jaffe | Jan 28, 2016 | 13 Comments

A traffic jam in São Paulo on June 6, 2014, during a subway strike. (AP Photo/Nelson Antoine)

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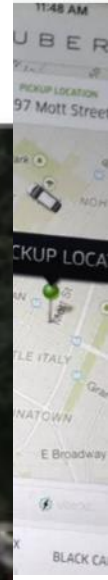
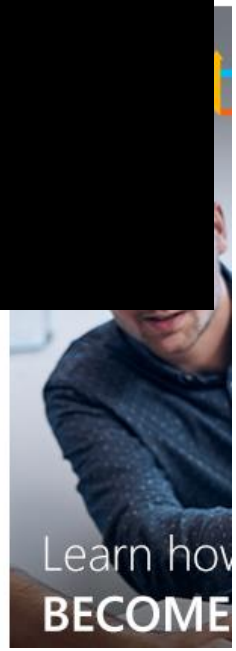


a look at where things are going:

CONSOLIDATION

Auto Manufacturer
+
Public BikeSharing Assets
+
RideSource / MicroTransit
+
Aggregator



Why are we interested?

1. **Stakes are high.**
   - Biggest change in personal mobility since the car.
   - Heaven (encourage) vs. Hell (discourage) scenarios.

2. **Cities remain ill-equipped.**

   There is often no credible voice representing sustainable mobility and the public good.

3. **Time is critical.**

   Policy precedent being set today may define impacts for decades. New innovations are scaling exponentially. So could their impact.

Define shared mobility

What is Shared Mobility?

Short-term access to mobility services on an 'as-needed' basis.

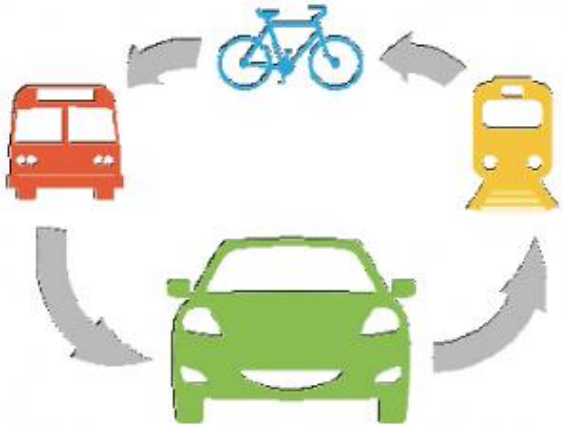
- Bikesharing
- Carsharing
- Ridesharing
- On-demand services
- Microtransit
- Aggregator Apps
- Courier Network Services

Vision of Shared Mobility for sustainable transport

Shared Mobility Vision: Disrupt Vehicle Ownership

Shared Mobility Vision: Disrupt Vehicle Ownership

Integrated Ecosystem



VISION for shared mobility

20th Century Model:

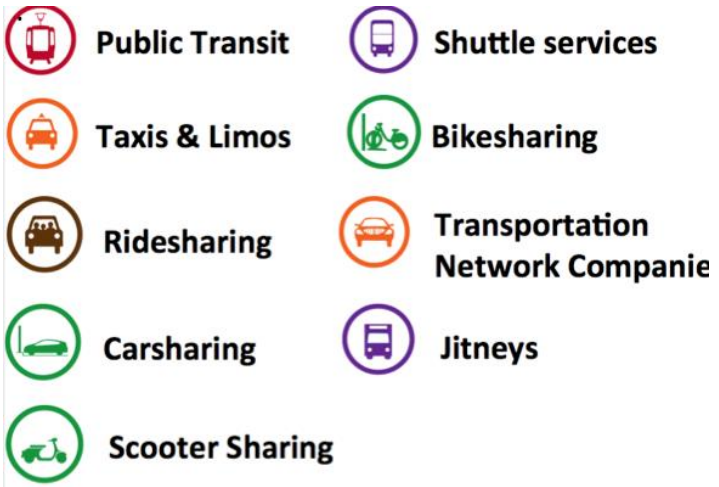
One vehicle for all trip types.

Car ownership induces driving.
Once you invest in a car, you use it.
Car ownership is the mobility plan.

VS.

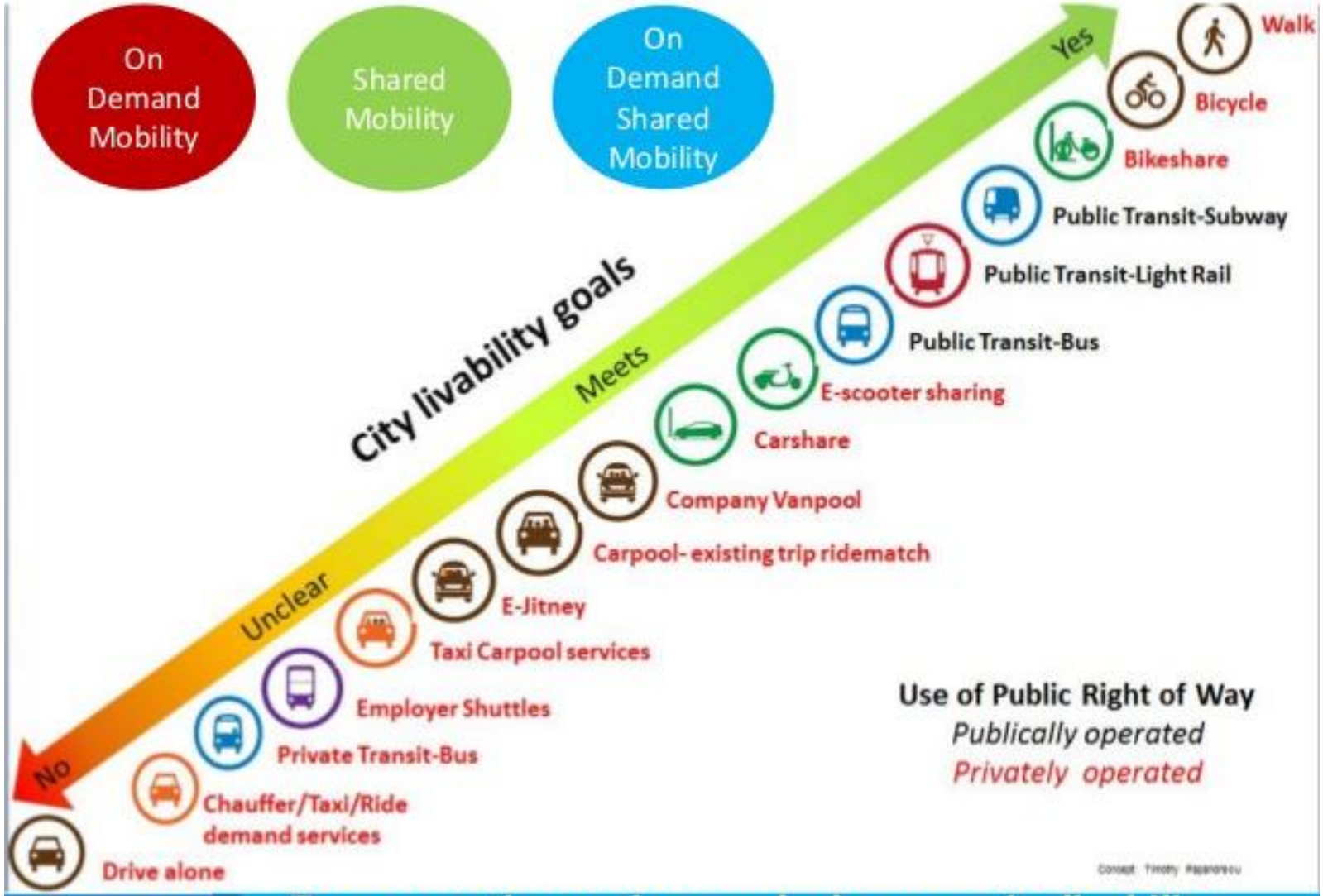
21st Century Model:

A spectrum of travel modes available for any trip type. **The sum of options is greater than the whole.**



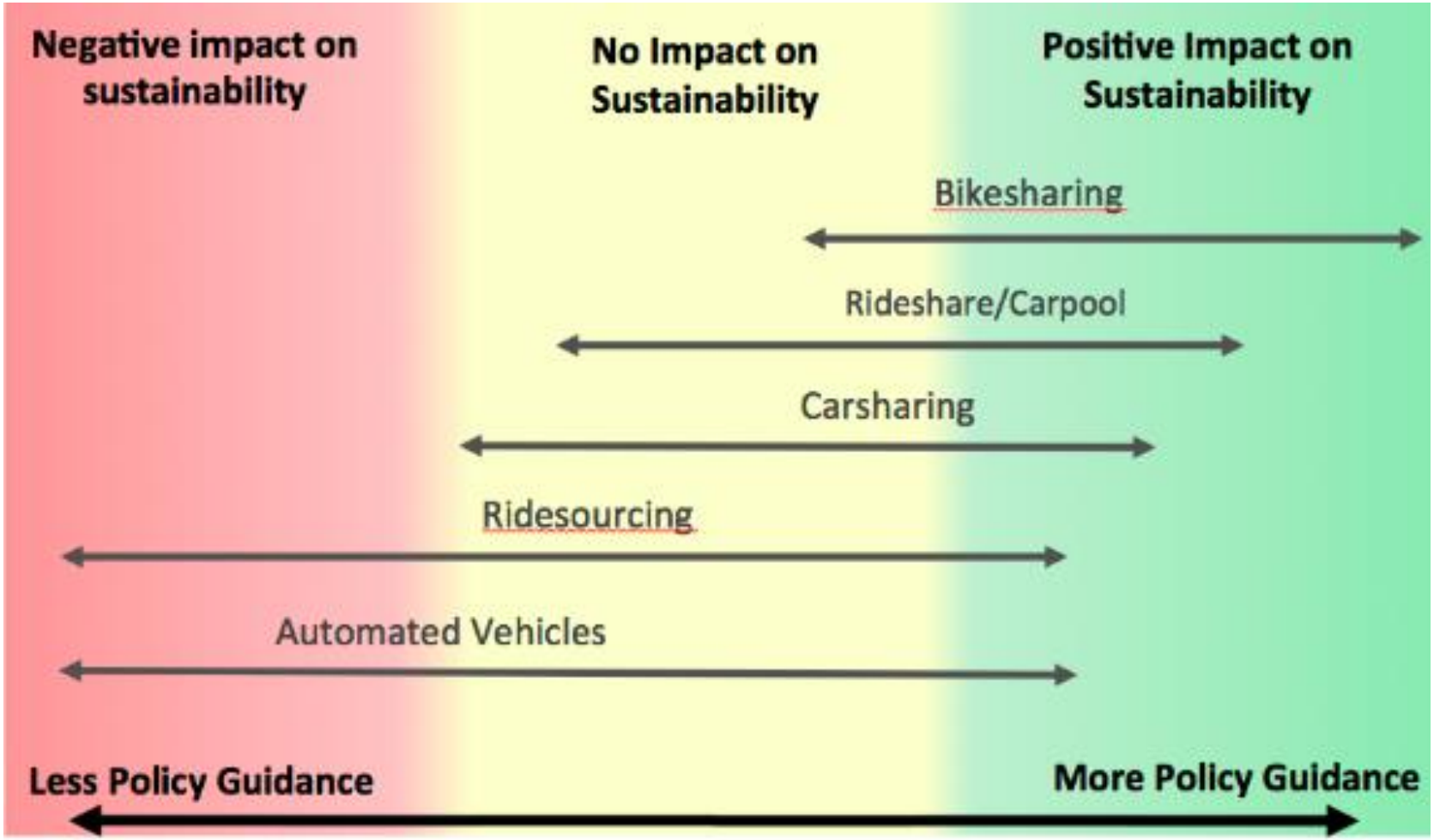
Transit, walking & cycle remain core.
No sunk costs. No depreciation.
No ownership-induced travel.
Pay for every kilometer driven.

Is Shared Mobility Sustainable?



Cities must actively promote societal benefit

Possible Range of Impact on Sustainability



Policy Approach

1. Vision- and outcome-driven

Craft the conditions that ensure sustainable impacts. Rather than choose solutions in a rapidly changing sector, craft policies that support desired outcomes and a sustainable vision.

2. Proactive

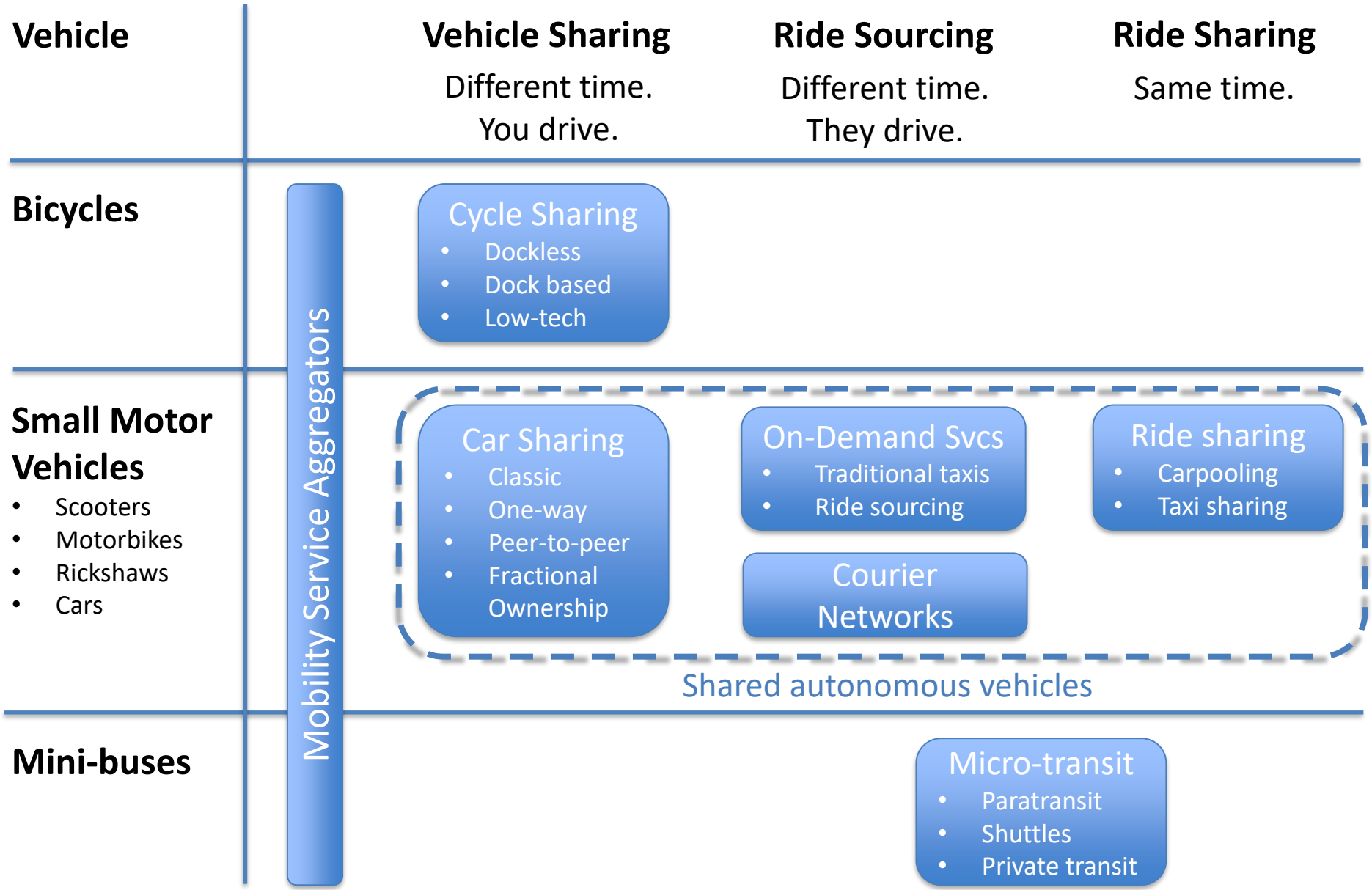
Quickly shape shared mobility outcomes through proactively policy, rather than wait for historical research on impacts while a service consolidates its market and political power, reducing the ability for regulation to shape outcomes for the public good.

3. Contextual

Develop policies that respond to local realities, innovations, and possibilities, and adjust them over time. Shared modes, services, technologies and their impacts are always changing, as are their contexts.

Typologies, Modes, & Impacts of Shared Mobility

Shared Mobility Modes



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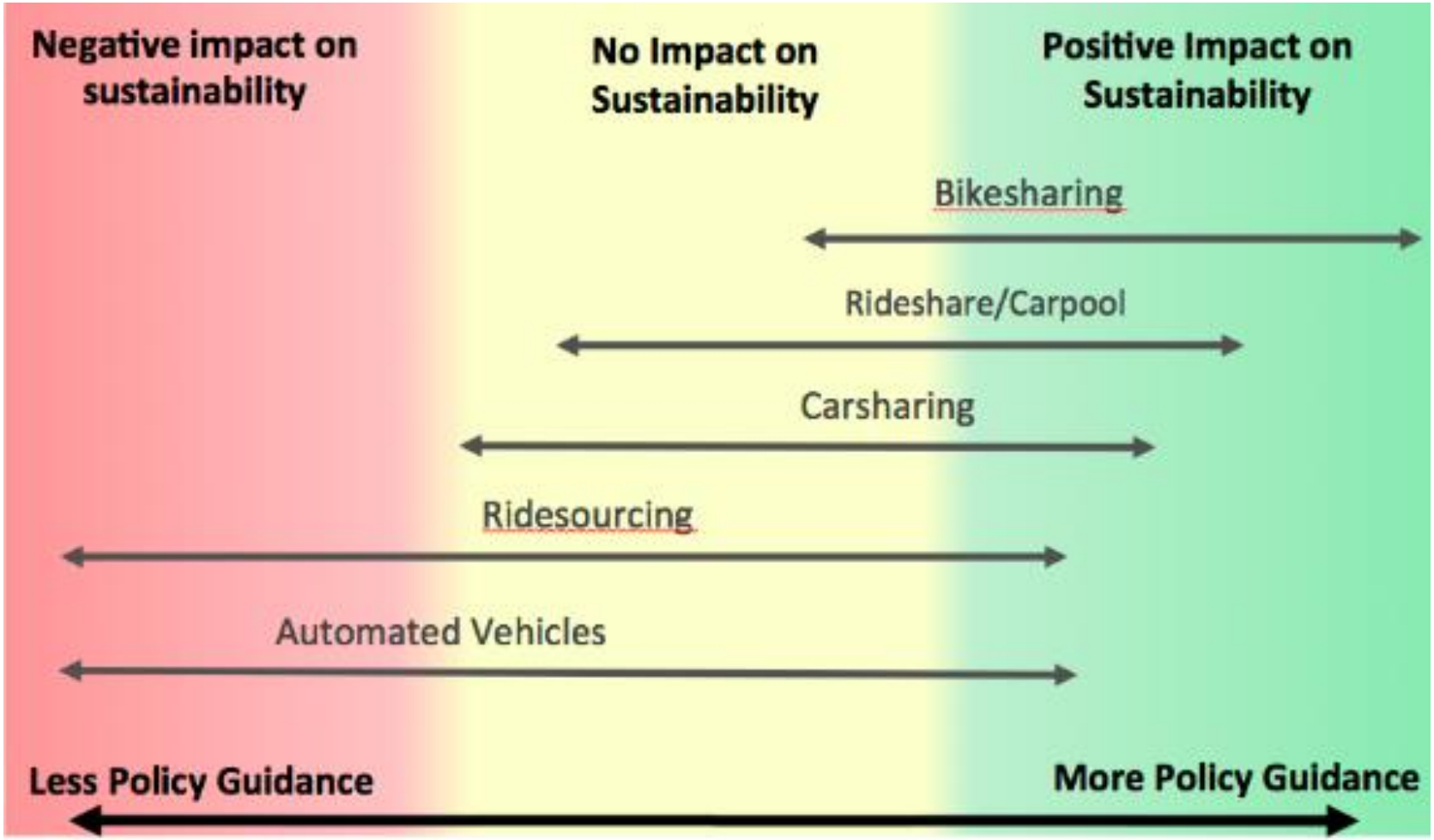


Bicycle Sharing

Sub-typologies

- Low/no-tech systems
- Dock-based systems
- Dockless smart-bikes

Bicycle Sharing

96%

of bike sharing users in Lyon, France, had never ridden a bicycle in the city before.

Impacts

- Increases overall cycling
- Reduces transit use (urban areas) and increases transit use (suburban areas).
- Improves overall crash rates
- Reduces GHGs
- Increases physical activity

New Generation- Dockless bike sharing

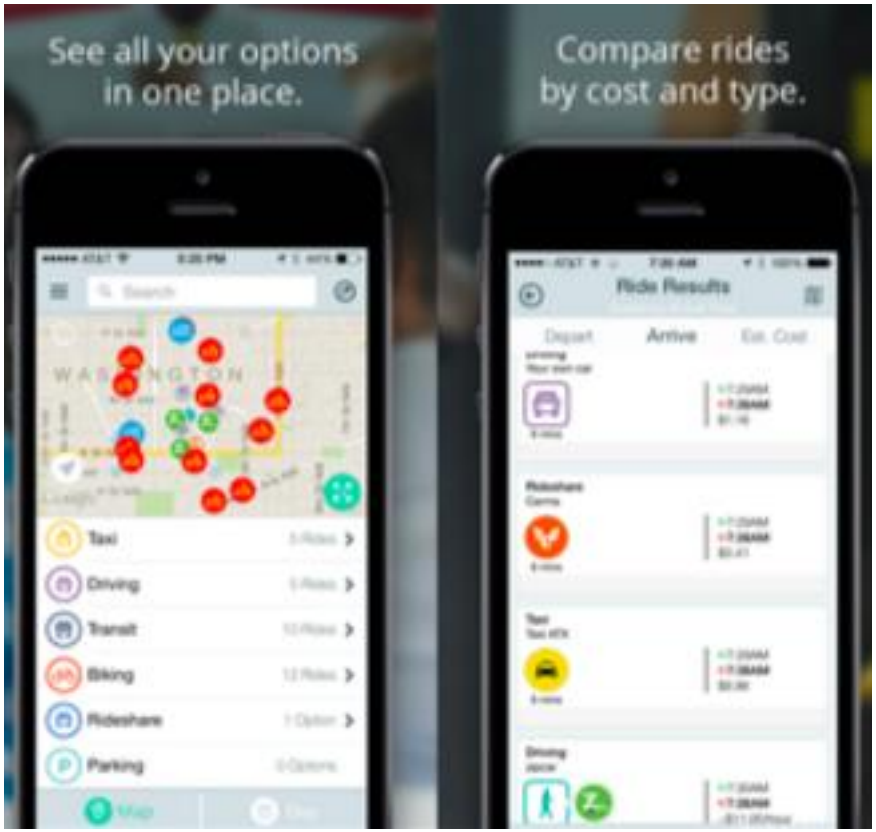
Mobike

Bluegogo

Ofo

Xiaoming Bike

Mobility Service Aggregators



Definition

Mobility Service Aggregators (MSA's) can integrate geographic, time, cost, and/or booking and payment for multiple mobility services through a single mobile application for ease of comparison, wayfinding, and/or payment.

Examples

- Google Maps
- Citymapper
- Moovil
- GoL

Impacts

A study by USFHWA showed MSA's decreased cognitive burdens, increased user sense of trust, perceived control, and information for users.

Car Sharing

Definition: Car sharing is a membership-based, self-service, short-term car-access system with a network of vehicles for which members pay by time and/or distance.

Car Sharing

The car for people who don't want one.

zipcar

Sub-typologies

- Classic two-way
- One-way
- Fractional ownership
- Peer-to-peer

Car Sharing

Impacts

Mode	Vehicles Replaced per Shared Vehicle	VKT Reduced per Sharing Household
Classic Car Sharing	9 to 13[a]	-28%[c] to -80%[d]
One-Way Car Sharing	7 to 11[b]	-6% to -16%[e]

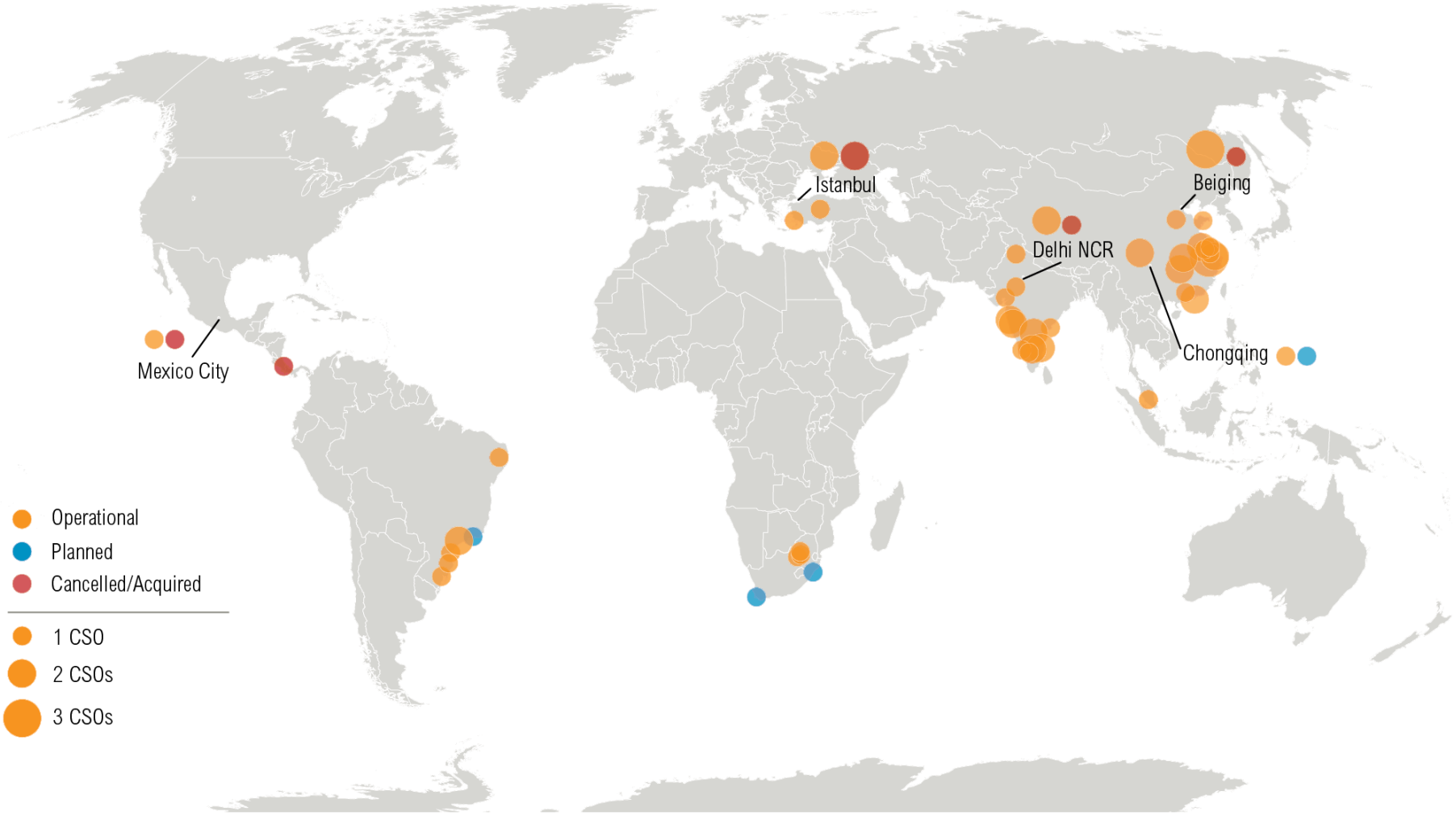
Also:

- increases use of walking, biking, and public transit
- shifts driving toward cleaner cars

a - Martin, Shaheen, and Lidicker 2010
b - Martin and Shaheen 2016
c - Shaheen and Cohen 2009 – average 44% VKT reduction over 12 North American surveys
d - Muheim 2006
e - Martin and Shaheen 2016

Car Sharing

Car Sharing in Emerging Markets (2015)



RideSharing

Definition: Ridesharing is a one-time shared ride among multiple passengers at the same time.

Ride Sourcing

Definition: A private car and driver on-demand, for short-term use.

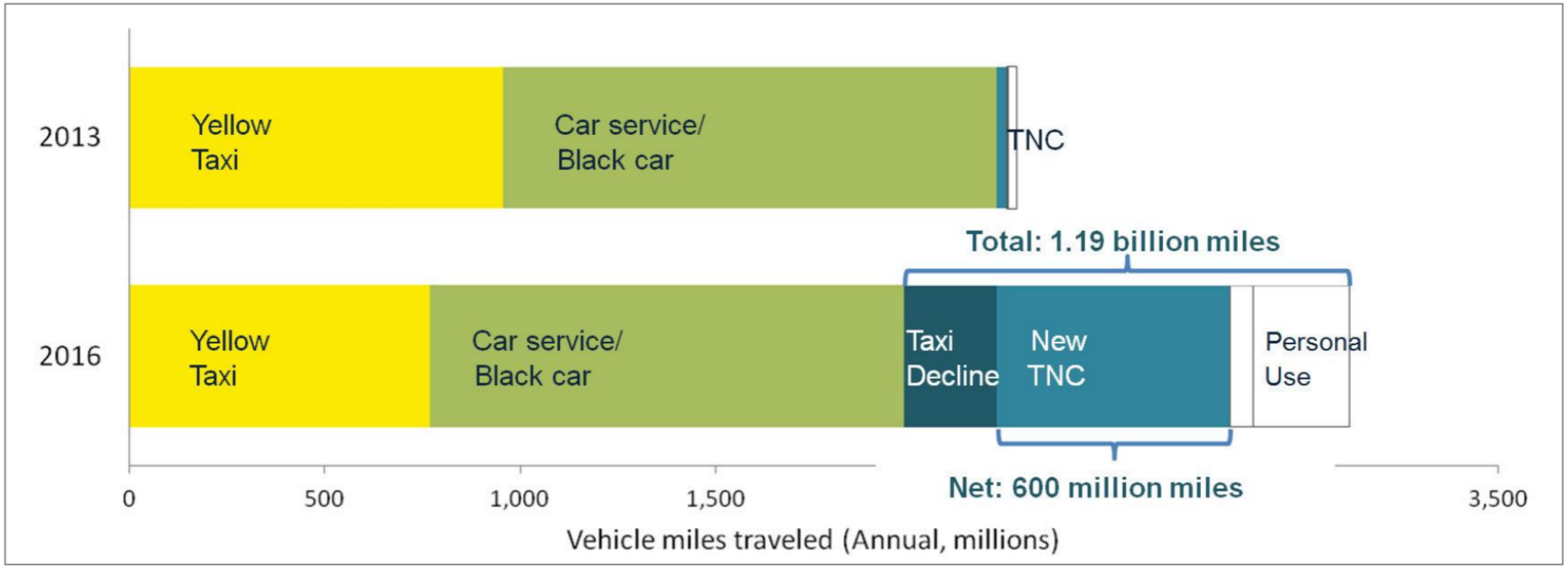
Sub-typologies

- Ridesourcing
- Traditional taxi

Ride Sourcing Impact… So Far

New York City

Figure 4. Annual vehicle mileage, 2013 and 2016



Source: TLC odometer and trip files.

Microtransit

Definition: Microtransit is the shared use of vans or small buses by multiple passengers at the same time. Shared mobility commonly refers to flexible, on-demand micro-transit services.

Sub-typologies

- Flex-route paratransit
- Shuttles
- Private transit

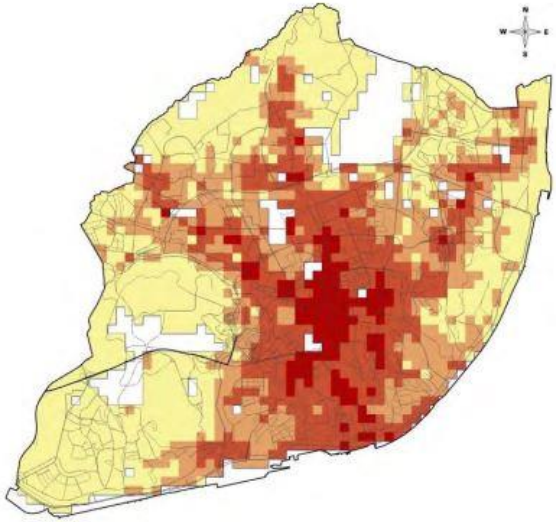
Microtransit

Impacts

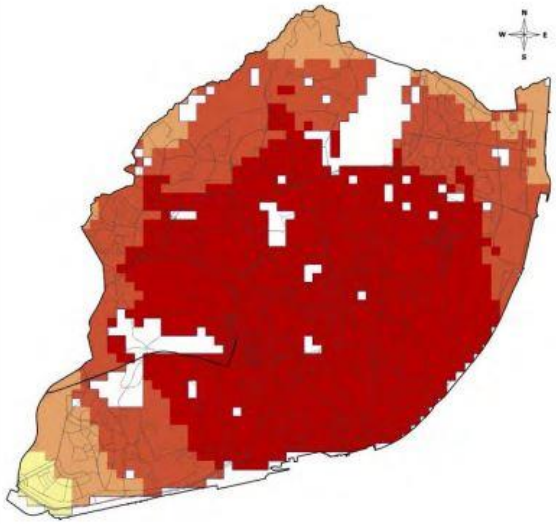
OECD model suggests that replacing traditional buses with shared buses (and shared taxis) would reduce social inequality and provide higher service quality.

Access to Jobs

Current Configuration



Simulated three-mode configuration



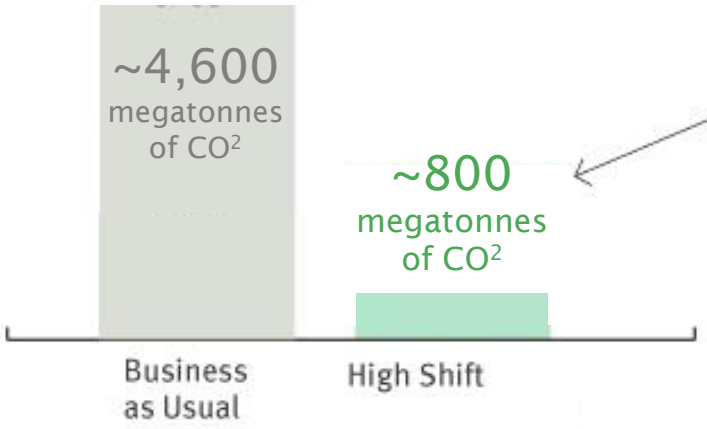
Classes of Access by percentage of total jobs

- 0% to 25%
- 25% to 50%
- 50% to 75%
- 75% to 100%

Equity Indicators

Indicator	Current Configurat.	Three-mode simul. config.
P90/P10	17.3	1.8
Gini coeff.	0.27	0.11

2050 EMISSIONS
FROM URBAN TRANSPORT



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ITDP

VISION for shared mobility

1. **Diverse, rich multi-modal network**
   High-quality transit, walking, and cycling anchor complementary, well-integrated, responsive shared mobility, to provide a highly accessible system that sustainably serves all mobility needs.

2. **Leapfrogging vehicle ownership**
   All motor vehicle use is priced per kilometer. Instead of 350% vehicle fleet growth by 2050, zero growth.

3. **Abundant cycling**
   Easy, safe, affordable, and accessible to all

4. **Better public transport**
   Bus systems adopt technology and regulations that aggregate demand and enable more flexible, demand-responsive, dependable, well-integrated, cost-effective services.

5. **More TOD, public space, and complete streets**
   Vastly reduced parking demand enables higher density, more public space, and “locking in” sustainable land use that favors walking, cycling, and public transport. It also enables rebalancing roadways toward bike lanes, sidewalks, and transit lanes.

Big Risk – What to AVOID

1. **Uncoordinated system, privatized mobility**
   Private companies compete for your data and mobility. The competition disincentives integration. Companies guide you to only use their services. Privatized mobility leaves many markets under-served.

2. **Spur more vehicle ownership and driving**
   The ease of driving spurs more of it. Shared mobility serves as a "stepping stone" to vehicle ownership.

3. **Cycling without safety, reliability**
   Without safe cycling networks, bike sharing puts a large number of cyclists at high risk. Meanwhile, dockless bike sharing replaces traditional systems, but without reliable, well-maintained, well-balanced operations. Private capital pulls out, leaving companies unable to provide good service.

4. **Eroded, struggling public transport**
   Ride sourcing competes with public transport, particularly in underserved markets, and siphons away enough riders to reduce service quality and coverage for all users.

5. **More sprawl, less public space, streets only for cars**
   Ride sourcing and car sharing dominate transport and public policy, making it easier to drive and drive farther. Land use follows, as the city sprawls. More space is required for cars.

Role of Policy in Shared Mobility

1. **Promote sustainable outcomes:**
   - Improve accessibility, equity, efficiency, environmental sustainability
   - Support viability of walking, cycling, public transport, and TOD
   - Reduce overall VKT (and vehicle ownership)

2. **Promote service integration**, coordinated infrastructure planning, and provisions for unified payment systems.

3. **Align economic policy** (incentives and disincentives) for all modes according to their positive and negative externalities. Apply "true-cost", per-trip pricing for unsustainable transport modes.

4. **Protect labor and avoid exploitation.**

5. **Requires open data**, to facilitate the above.

Mobike:

- First launched in Shanghai in April, 2016;
- Till January, 2017, Mobike provides services in 26 cities;
- More than 100,000 bikes in Shanghai, Shenzhen Guangzhou

Ofo:

- First launched in University in 2014;
- Till January, 2017, Ofo provides around 160,000 bikes in more than 5 cities;
- Bike has no GPS chips, very had to track all the bikes

New Generation- Dockless bike sharing

Bicycle Sharing

Dockless Bikeshare v.s Tranditional Bikeshare

	Tranditional Bikeshare	Dockless Bikeshare
Infrastructure	Fixed station, dock and terminal at the site	Flexible station, no dock and terminal Much less initial cost
Space requirement	Flat, relatively large space, and electricity access	Flexible
Station construction	Road civil construction	No civil construction, much faster implementation
User registration	Go to specific offices for registration	Register by phone Limitation for no smart phone group

Dockless Bikeshare v.s Tranditional Bikeshare

	Tranditional Bikeshare	Dockless Bikeshare
Bike rebalance	Real time rebalance and pre-balance plan	Hard to rebalance since bikes scattered in the whole city
Maintenance	On site maintenance and maintenance plan	Hard to maintain all the bikes
Bike loss	CCTV and station staff to prevent bike loss	Hard to prevent bike loss and vandalism

Problems? – Poor Management

- Bikes occupied public space, block the walkway and bike lane;
- Hard to prevent bike loss, vandalism and private occupation
- Lack of rebalance, hard to find available bikes at peak hour;
- Lack of maintenance;
- No control of level of service

What if the investors pull out the money?

Recommendations:

1. **Set up national/regional/local standard or development strategy for both traditional and dockless bike sharing systems.**

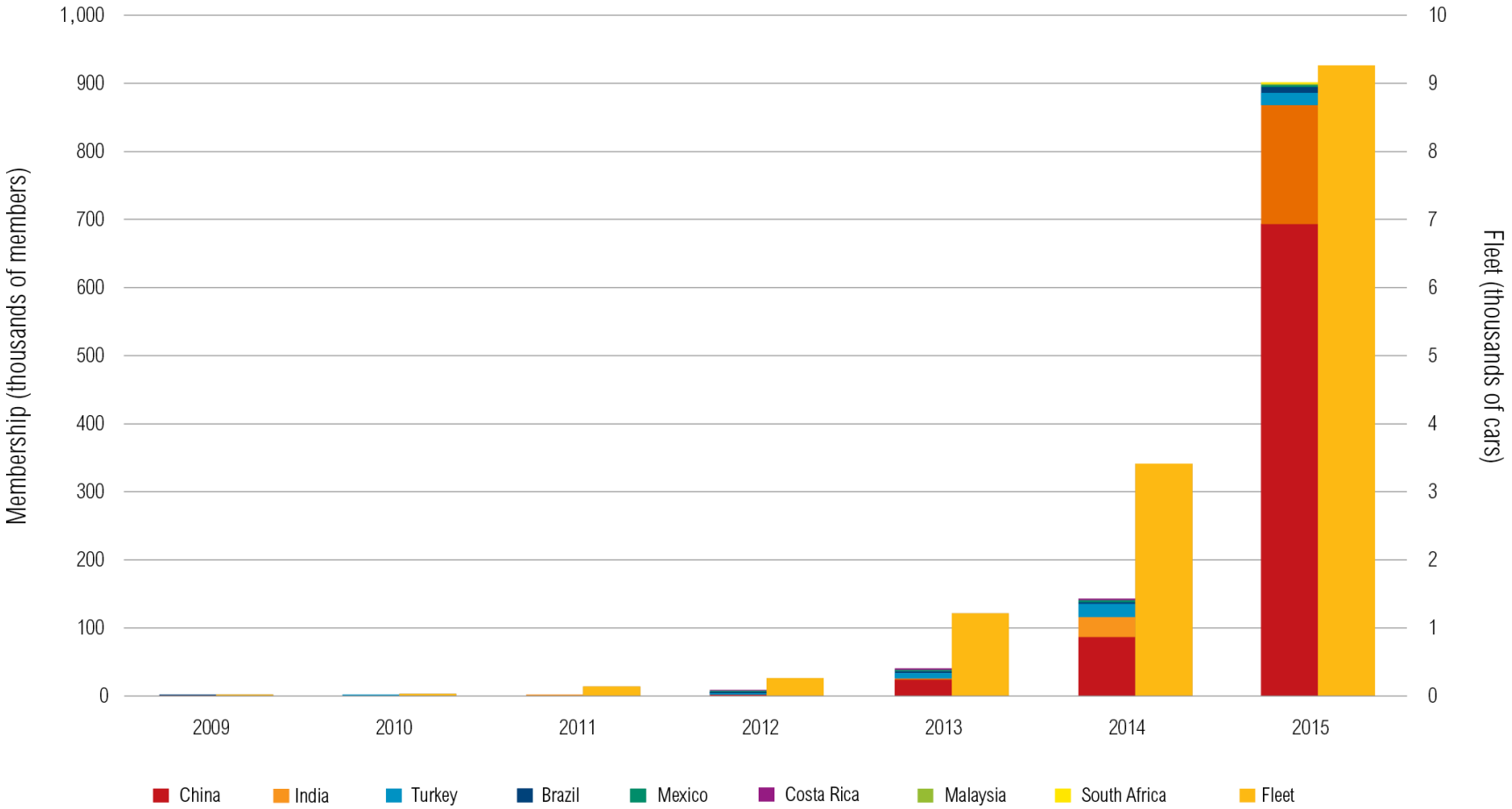
2. **Evaluate the service level and put it under the government's supervision.**

3. **Open data**

4. **Set up efficient business model, and ensure sustainable operation.**

Car Sharing

Car Sharing in Emerging Markets (2015)



Car Sharing

Stepping Stone Scenario: Carsharing would catalyze interest in driving, and be a stepping stone toward car mobility.

Leapfrog Scenario: Carsharing would delay car purchase, complement walk/bike/transit, and support lifestyles with less driving.

100%

of focus group participants in Hangzhou said they planned to purchase a car as soon as economically feasible.

48%

of those same participants said they would delay or forego car purchase plans if car sharing was available.

Car Sharing

Early evidence suggests positive potential

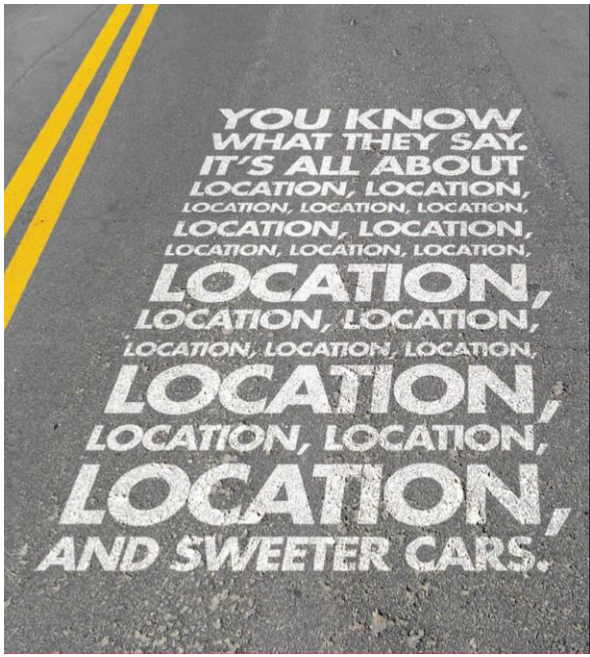
- **Brazil:** 24% of Zazcar members in Sao Paulo sold their cars after joining the service and 73% thought less about purchasing a vehicle (Zazcar 2012).
- **Mexico:** Early adopters of Carrot in Mexico City delayed or avoided car purchase plans (Carrot 2015).
- **China & India:**
  - 46% of prospective members in Shanghai (CAUPD 2016) and 31% in Beijing say they would forego car purchase plans (Yoon 2014).
  - 48% of focus group participants in Hangzhou and 30% in Bangalore said they would use car sharing to delay or forego car purchase plans (Lane et al 2015).

Government partnership

Joint Marketing & Communications

Visible locations

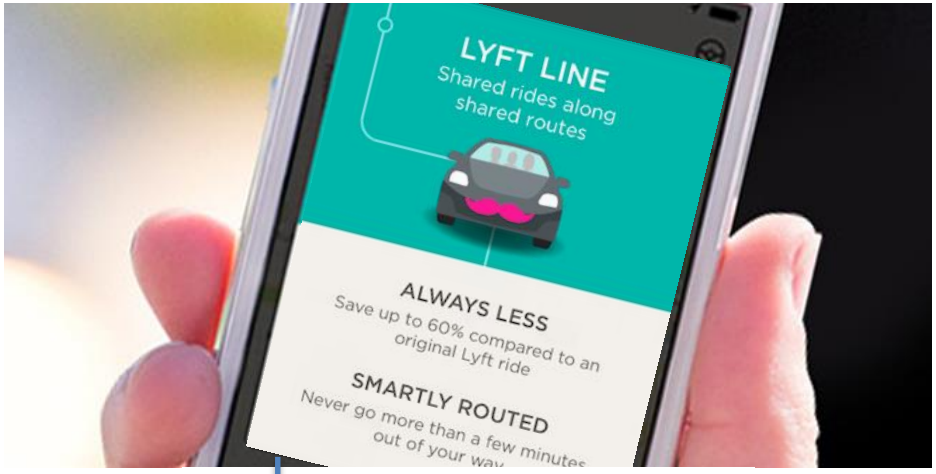
Joint media events



Bus shelter ads

Joint award applications

RideSharing



60% of Lyft & Uber trips now use Lyft Line and Uber Pool, according to the companies, in markets where the ridesharing options are offered.

Sub-typologies

- Real-time taxi-share
- Carpooling

RideSharing

Impacts

- Largely unknown
- MIT estimates 95% of trips in cities could be shared if users were willing to wait 5 minutes.
- Traditional carpool reduced VKT by 23% during the 1973 US a fuel shortage, but has declined since

On-Demand Services

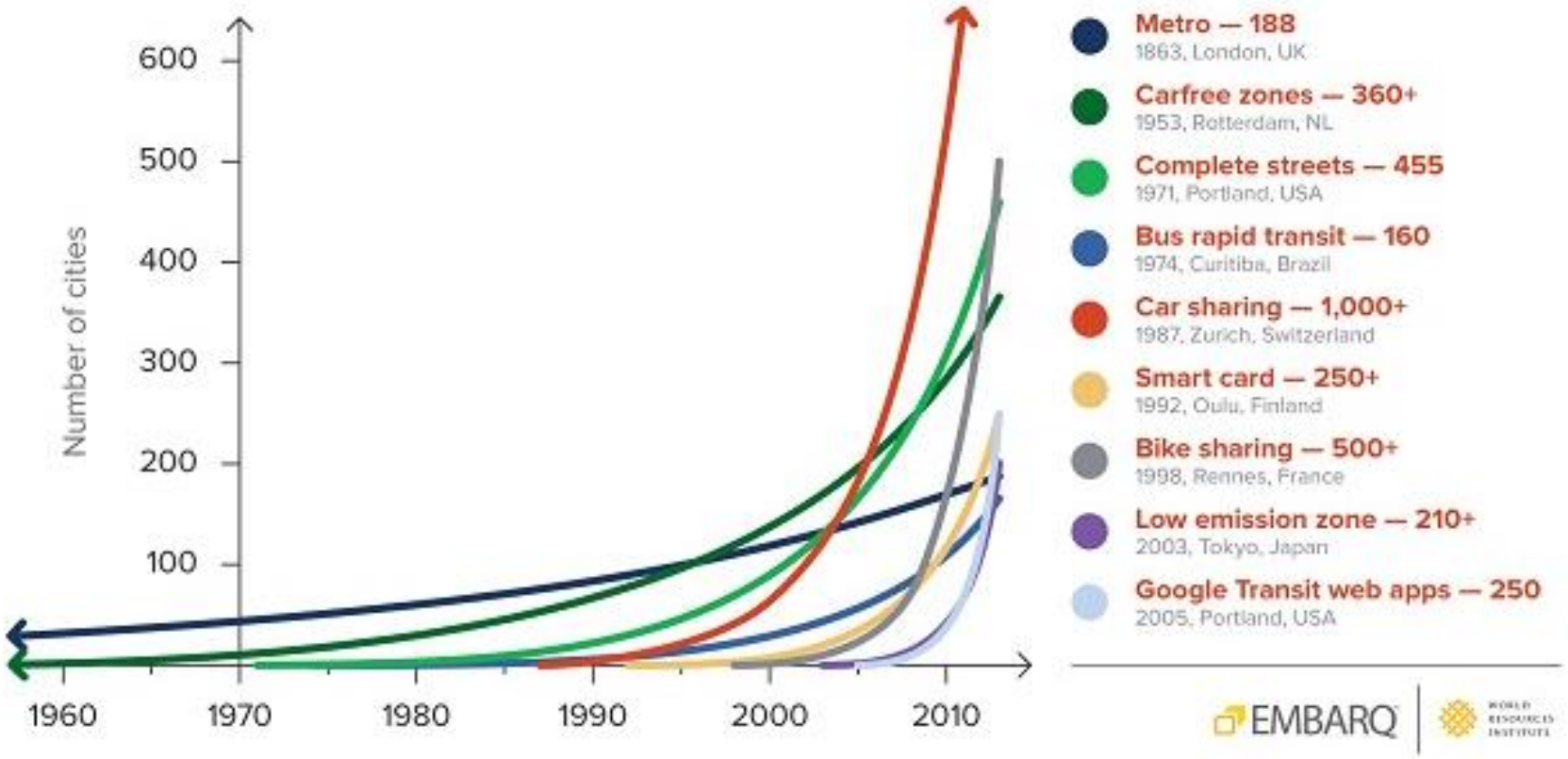
Impacts

Yet to be studied comprehensively. Early U.S. studies show:

- 40% of users reported driving less due to ride sourcing
- 67% of trips are off-peak, especially late nights
- Ride sourcing reached areas underserved by taxis
- On-demand replaces some transit trips

Shared Mobility is highly scalable

Shared mobility modes are replicating quickly around the globe.



As a percentage of total urban transport trips, these modes are still small, but growing fast. How can cities harness this scale-ability, and use it to supplant vehicle ownership?

Car Sharing: Barriers in Emerging Economies

Category	Some Barriers
Government	- **Vehicle restriction policies** - Lack of driving record checks - Lack of personal credit system - Public agencies unfamiliar
Potential users	- Strong aspiration for car-ownership - Price sensitivity - Limited driving experience - Unfamiliarity
Transport system	- **Congestion** - Insufficient public transit, cycling infrastructure - **Limited parking for carsharing**
Business	- **Competition from rickshaws, taxis and personal two-wheelers.** - Limited access to capital - Difficult to reach operational scale - High capital investment

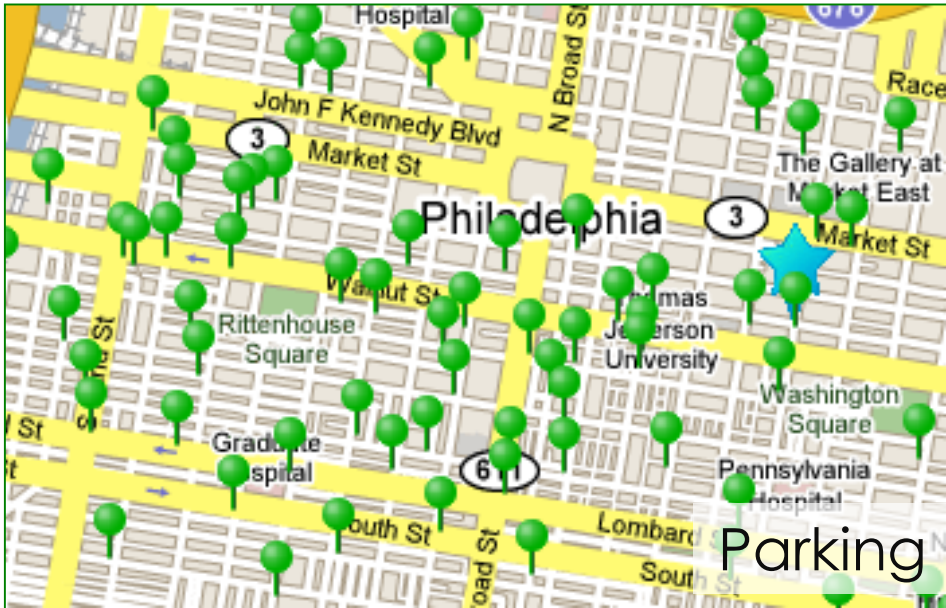
Taxis in Hangzhou, China

Car sharing

Municipal Fleet Reduction

Transit Integration

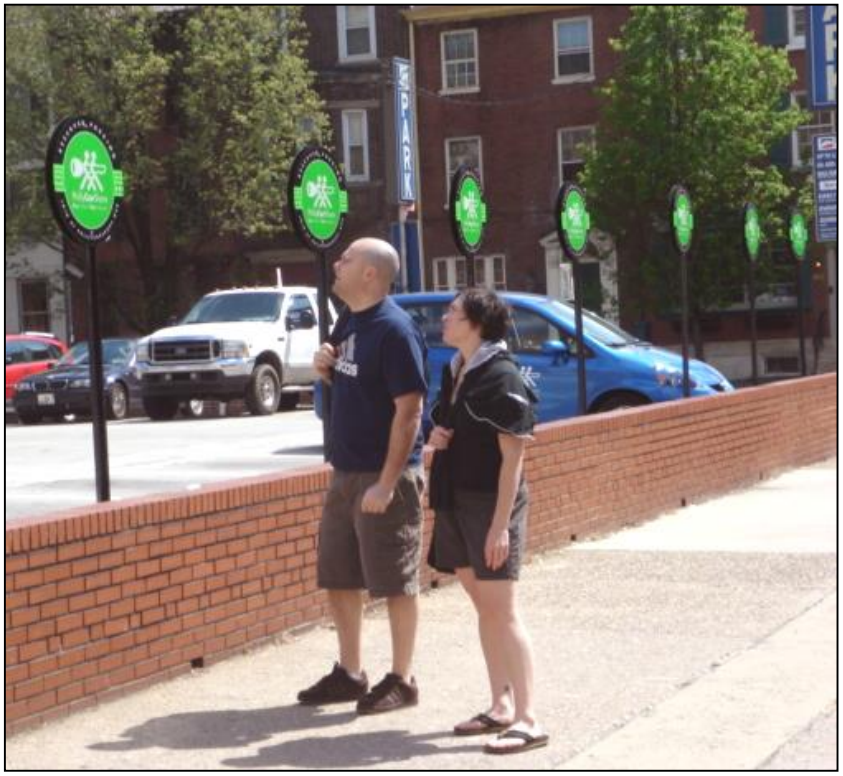
Funding



Parking

Car sharing

Public Benefit – Impact of 50,000 members



- **20,000** fewer cars
- **80 million** fewer VKT
- **72%** considered car sharing in residential location choice
- More walking, transit, taxi use

Car sharing

Zero off-street parking allowed for new developments with rapid transit + car sharing

Example: 40th & Market St

- Mixed use
- 41 residential units
- Zero off-street parking