Slide 1


LUTP
Leaders in Urban Transport Planning
New trends in urban mobility
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Slide 2

Objectives

1. Present new trends in urban transport and their interconnectedness with technological innovation and behavioral changes.

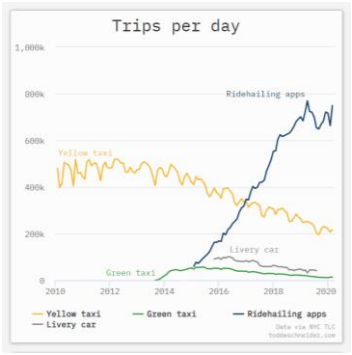
2. Discuss key issues for policy makers and regulators to facilitate innovation, keeping public transit as the backbone of urban transport transformations.

3. Give examples of good practices and city cases.

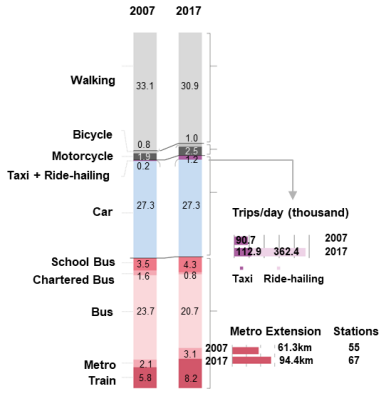
Slide 3

Opening Exercise

Taxi and Ride-hailing Usage in NYC



Travels by modes in Sao Paulo



Source: Folha de Sao Paulo; Sao Paulo OD Surveys 2007 and 2017

- Are trends in ride-hailing and transit the same?
- How to regulate new mobility in cities with different contexts?

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In New York city ride-hailing trips have increased exponentially from 2014 to 2019, reaching a plateau, as stricter regulation, capping the number of new vehicles in the city, have come into effect. We also note the dramatic decrease in taxi riders over the years, accentuated when ride-hailing apps started to operate in the city. The NYC metro has also blamed ride-hailing apps for their loss in ridership.

In Sao Paulo, trends seem different, at least for the time-frame in the graph. The Origin-Destination Survey shows an increase in ride-hailing trips (which did not exist in 2007), as well as an increase in taxi trips. On the other hand, there was a decrease in the share of bus trips, but a significant increase in the share of metro trips, most probably resulting from the expansion investments during the decade.

Is the correlations between public transportation and ride-hailing the same in both cities? How should ride-hailing be regulated?

Slide 4

New Modes, New Platforms, New Business Models

Slide 5

Sharing Economy and On-Demand Mobility

1. Sharing economy and mobility

Peer-to-Peer sharing of underutilized goods and service capacity

Owning physical assets vs Paying for services.

- **Music, Temporary Home, Office Space, Transport.**

2. On-demand services and mobility

What we want, when we want it, and how we want it.

3. Transportation as a commodity

Economic values in terms of *cost and experience.*

4. Smartphones and Backend mobility technologies

Matches rider and transport services, optimized routes, real-time location and price adjustment.

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1. Sharing economy and mobility

The technology-enable sharing economy has permeated different sectors of our lives

- Transport: Uber, Lyft, DiDi, Grab, Ola, Yandex, Lime, Jump, Wind, Bird, Zipcar, Car2Go.
- Temporary Homes: AirBnb, Home Away.
- Media Streaming: Spotify, Deezer, Netflix, Amazon Video.
- Office Space: WeWork.

2. On-demand services and mobility

The on-demand economy is defined as the economic activity created by digital marketplaces and technology companies to fulfill consumer demand via immediate access to goods and services.

3. Transportation as a commodity

Transportation is valued beyond price and time, but also experience - wait time, connections, comfort, safety, information and payment integration, etc.

4. Backend mobility technologies

New trends in urban transport are enabled by smartphones, GPS navitation, real-time connections and backend technologies.

Slide 6

Car sharing pioneered new trends

Provides transport alternatives, while using underutilized assets

Padova City Car Sharing System

TABLE 8.2: Impacts of roundtrip and one-way carsharing

Carsharing Service Model	Vehicles Removed Per Carsharing Vehicle	% Reduction in VMT/VKT	% Reduction in GHG
Roundtrip	9 to 13	27% (average)	34% to 41%
One-way	7 to 11	6% to 16%	4% to 18%

Source: Lazarus et al., 2017

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The evolution of car-sharing:

1. Roundtrip, Station-Based Car Sharing. It is the typical car rental company, where one picks up and returns a car in the same location, paying by the hour/km.
2. One way, Free Floating or Station-Based Car Sharing. Car sharing 2.0 evolved from the conventional car rental model, can be dropped off anywhere within a specified geographic zone (free-floating) or at a station that differs from the pick up station.
3. Per-to-Peer Car Sharing. Through a network, where individuals can rent out their personal vehicles to others when not in use.

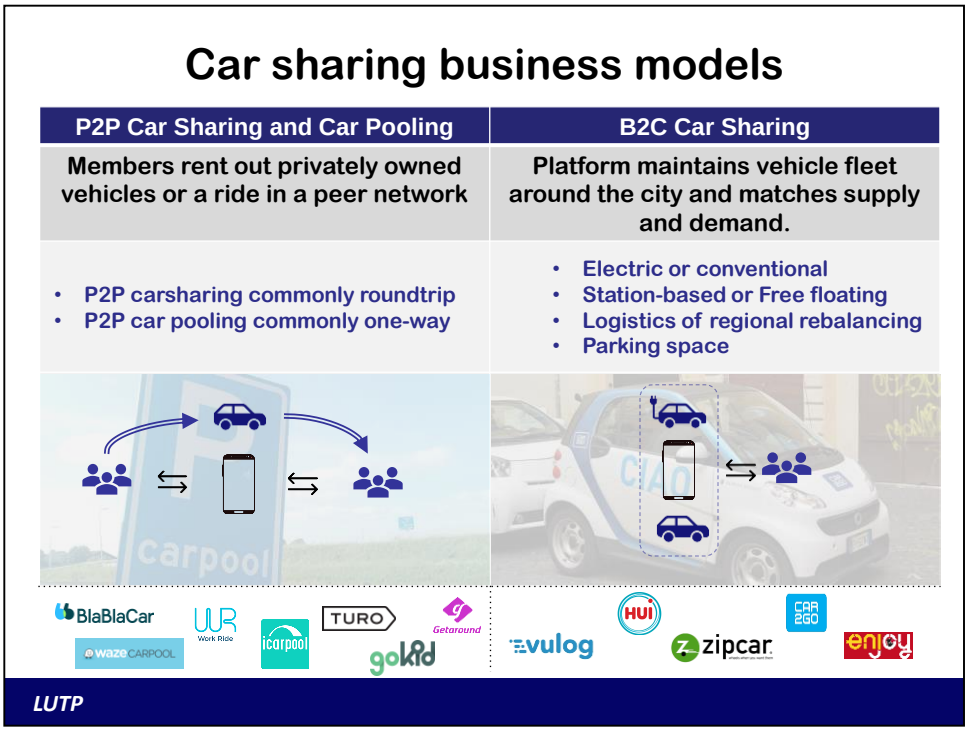
A study found that, on average, roundtrip sharing members reduced VKT by 27 percent. Roundtrip carsharing members increased their use of public transit, carpooling, and non-motorized modes, including biking and walking. However, in some cases, carsharing members decreased their use of public transit use.

Sources:

Graph and Table: Shaheen, S., Totte, H., & Stocker, A. (2018). Future of Mobility White Paper. *UC Berkeley: Institute of Transportation Studies at UC Berkeley*. http://dx.doi.org/10.7922/G2WH2N5D Retrieved from https://escholarship.org/uc/item/68g2h1qv

Image: https://en.wikipedia.org/wiki/File:-_01_Car_Sharing_Alfa_Romeo_MiTo.JPG

Slide 7



- Driver or rider pays for car or ride by the hour/km
- Prices can be dynamic, according to time, distance and preferences

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Images sources:

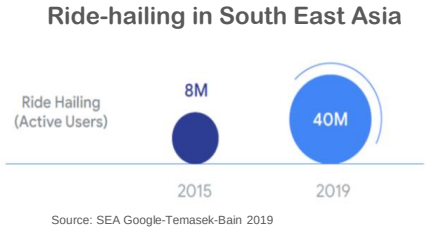
https://commons.wikimedia.org/wiki/File:Carpool_parking_sign,_Winschoten_(2018).jpg

https://commons.wikimedia.org/wiki/File:Car2go_Rome_carsharing_04_2016_6418.jpg

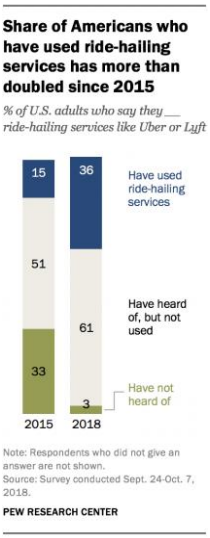
Auto Rickshaw and Scooter icons made by Freepik from www.flaticon.com.

Slide 8

Ride-hailing Has Grown Exponentially



Source: SEA Google-Temasek-Bain 2019



Sources:

Ride-hailing in SEA: https://www.blog.google/documents/47/SEA_Internet_Economy_Report_2019.pdf

Pew Research on ride-hailing in the USA: https://www.pewresearch.org/fact-tank/2019/01/04/more-americans-are-using-ride-hailing-apps/

Slide 9

Ride-hailing has driven the on-demand mobility trend

Passengers are connected in real time by an online-enabled platform to drivers using their personal vehicles

- Ubiquitous service
- Estimated Time of Arrival (ETA)
- Real time tracking
- Cashless rides
- Dynamic pricing
- Review and rating system
- Can be shared
- Targets riders who want promptness, convenience and comfort

Cars	Motorbikes	Rickshaws
lyft, Uber, DiDi, Gett, OLA, Grab	BYKEA, GO JEK, max.ng, OLA, halan, pathao	GOZEM, OLA, halan, OYE!

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Also commonly referred to “ride-sharing”, most transport specialist prefer the term “ride-hailing”, as ride-sharing doesn't accurately describe the services since not all rides are shared. On the other hand, unlike taxis, ride-hailing companies cannot pick up street hails.

Founded in 2009, Uber was the first ride-hailing company to succeed, naming a new type o sharing economy model – “Uber economy” or “Uberization” of services. Although in most countries car ride-hailing is cheaper than taxi services, traditional ride hailing platforms’s price point is a viable solution for only a higher-end portion of the population. Today, particularly in Southeast Asia and Africa, there is an emerging market for ride-hailing motorbikes and rickshaws. Lighweight ride hailing provides a solution for:

- Long duration (60+ min) trips. A long commute makes the absolute price of a private car journey unaffordable, especially for middle class commuters.
- Last mile. Given the challenges of passenger cars navigating traffic, as well as high up-front pricing for starting a ride, another transport mode suited for shorter journeys and with a lower price point.

Image source: https://www.piqsels.com/en/public-domain-photo-oqvgv/

Slide 10

Ride-hailing business model

Ride-Hailing	Shared Ride-Hailing
Online platform matches a passenger and a driver using his or her personal vehicle.	Online platform matches driver to passengers going the same route. •Door-to-door •Pick up and drop off spots

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1. In the ride-hailing model, drivers use their personal vehicle and may choose different platforms to offer their services, according to the platform fee, expected demand, and general experience. Passengers can also choose from different providers, based on price, estimated time of arrival (ETA), safety and general user experience.
2. The service can be one-to-one, or one-to-many. In the shared ride-hailing model, commonly offered by the same app that offers the conventional ride, the algorithm can match passengers in close locations that are travelling the same route. The service can be door-to-door, which makes the whole trip longer if it has 2 or more passengers, or the algorithm can calculate “virtual stops” to where passengers should walk to take the ride. This maximizes the route and trip time for all passengers.
3. Prices are dynamic to better balance supply and demand throughout the day and areas of the city, and determined in real time based on time of the day, distance and user’s preferences.
4. Most of the debate over how to regulate ride-hailing companies stems from the controversial legal definition of their services – “technology companies” that intermediate riders and drivers, therefore with responsibilities similar to internet companies, or “transport companies” that have responsibilities similar to conventional transport operators.

Sources:

Image: https://gozem.co/en/media-library/

Auto Rickshaw and Scooter icons made by Freepik from www.flaticon.com.

Slide 11

MicroTransit

technology-enabled transport services that offers the agility of on-demand systems with the efficiency of public transport

- **"Micro" in contrast with "Mass" Transit.**
- **Publicly, privately or PPP operated.**
- **Shared, usually in medium-sized vehicles.**
- **Dynamic or semi-fixed routing.**
- **Supply and demand match in real time.**
- **May have dynamic pricing to improve efficiency.**
- **Targets times and areas that are difficult for traditional transit operators to serve.**

via INTERBUS BRIDJ Citymapper MOIA Chronopro

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The idea of offering flexible transit in small vehicles has been around for a while, commonly offered by a municipal transit agency and specially targeted at those who require special transport services to and from mass transit stations, health facilities, etc. However, they are inefficient and costly to the service provider.

More recently, enabled by technology and complex predictive algorithms, some platforms have ventured in matching a vehicle, typically van-sized, to passengers who are going the same route. Most commonly, to maximize efficiency and reliablity, those services do not offer door-to-door rides; rather passengers have to walk a short distance to "virtual stops", as directed in their mobility apps.

- They target times of the day – at night for instance – and less dense areas in the city where traditional transit operators are cost-inefficient. Often, these services aim to connect commuters with mass transit systems, in a comfortable and relatively affordable ride.
- Microtransit supporters that the service can nudge a modal shift from personal cars to shared modes and public transport.

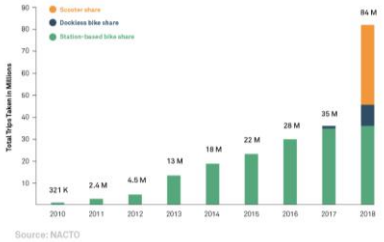
Slide 12

Shared Micromobility

App-enabled shared-used fleets of small, fully or partially-human powered vehicles, including bikes, e-bikes and e-scooters.

- Last 5 years witnessed an explosion of shared bikes and scooters.
- Docked or free floating ("dockless").
- Public, public-private partnership, or privately-operated.
- User pay the hour/km.
- Targets small distances (<7.5km)

84 Million Trips in the US on Shared Micromobility in 2018



Velib' Métropole · Bird · Lime · Joyride · grow · JUMP · motivate · Medina Bike · mobike

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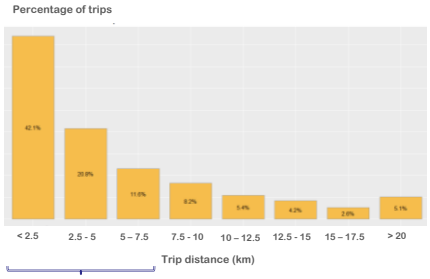
Even though docked bike-sharing schemes have been around for over a decade – pioneers *Vèlib* in Paris and *Bicing* in Barcelona were launched in 2007 – the second revolution of micromobility began in China, with the launch of app-enabled dockless bicycles in 2014.

The dockless bike hire schemes consist of a bicycle with a lock integrated onto the frame and does not require a docking station. This allows the user to park the bike anywhere, not having to return it to a kiosk or station; rather, the next user can find it by GPS on their mobile app. Dockless schemes popularized the use of QR code to unlock bikes through a smartphone, which is now also used in e-scooters schemes.

Slide 13

Shared Micromobility targets short distances

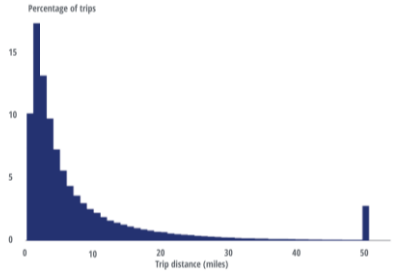
Most Sao Paulo car-based trips are short



Micro-mobility target

Source: 99 Policy & Research analysis based on 2012 Sao Paulo Origin Destination Survey.

Most US car-based trips are short

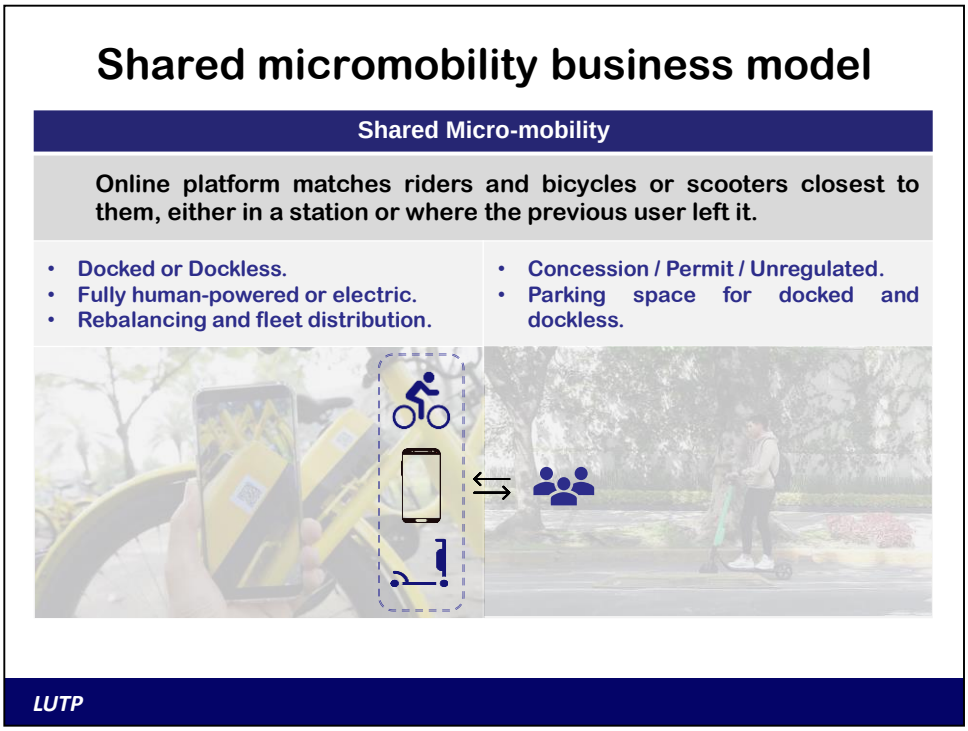


Micro-mobility target

Source: Deloitte analysis based on 2017 National Household Transportation Survey,

The similar distribution of car-based trips in countries/cities that have in common a car-based culture shows that car trips are usually very short. The widespread availability of bicycles and scooters has the potential of addressing the first and last mile problem and of nudging a modal shift away from personally-owned cars.

Slide 14



In micromobility schemes, differently from ride-hailing, the platform (i) matches riders and scooters/bicycles and (ii) also owns the vehicle fleet. Therefore, the micromobility company is also responsible for fleet maintenance and rebalancing the fleet throughout the city. Pendular movements of commuters to and from work in mornings and evenings require companies, for both docked and dockless vehicles, to relocate the fleet at night to where they will be used the next morning.

Schemes can be fully privately operated, most often for dockless schemes, or in partnership with the municipality, which most commonly concession docked bicycles systems. Together, public and private partners also evaluate the best spots for the docking stations in the city.

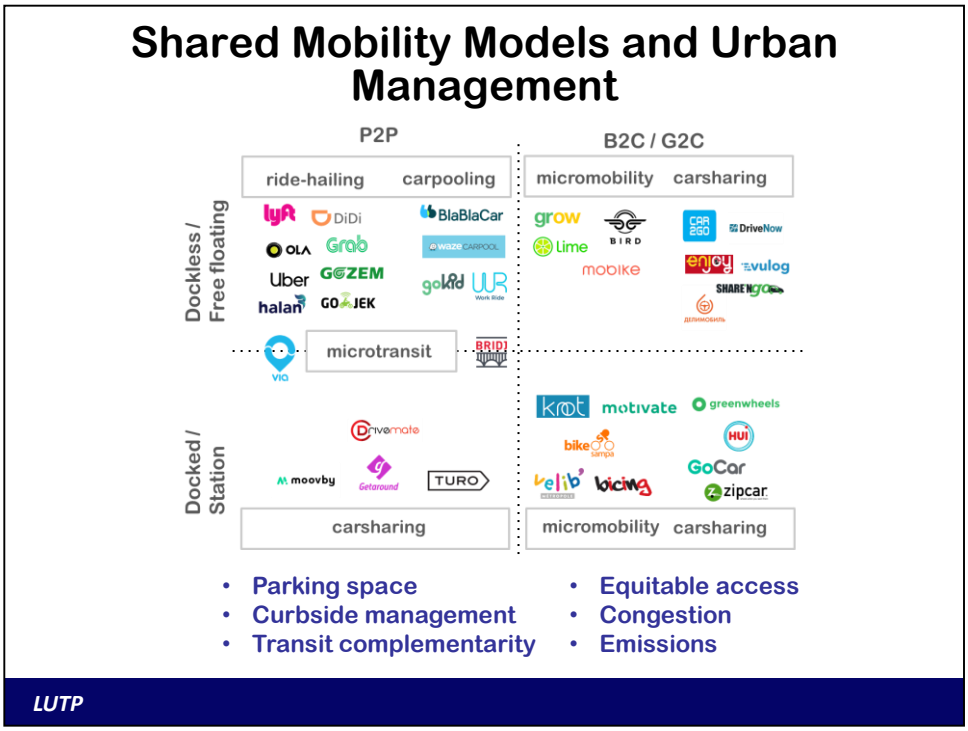
For dockless schemes, cities are still struggling to have a balanced regulation, but commonly companies apply for permits and are responsible for users correctly and safely parking of vehicles.

Image sources:

https://pxhere.com/pt/photo/1601949

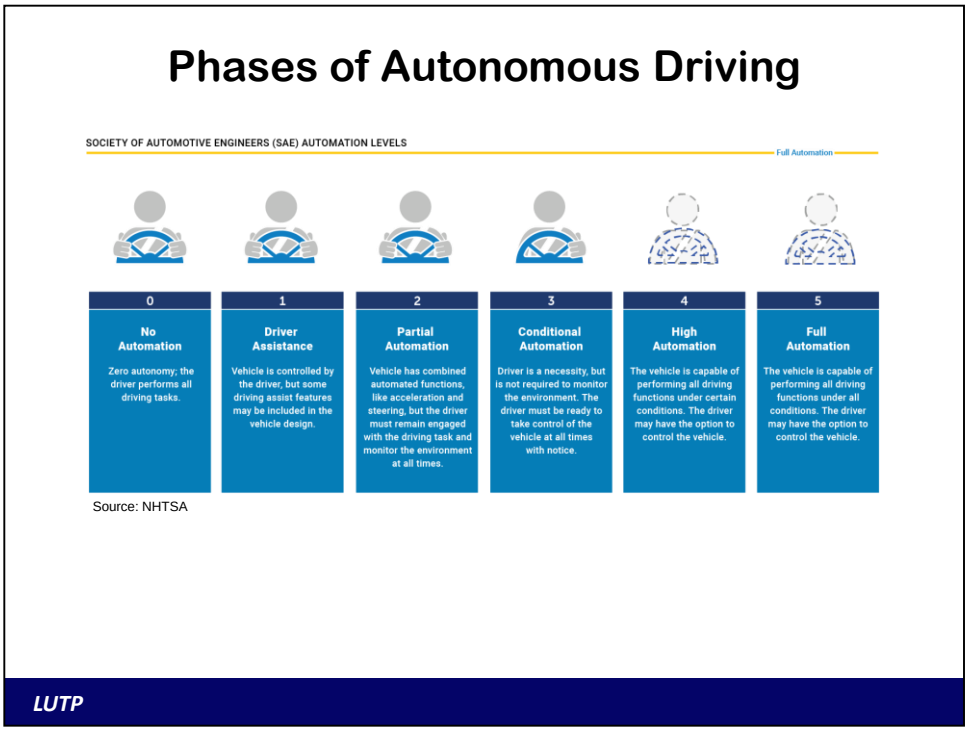
https://en.m.wikipedia.org/wiki/File:Grin_e-scooter_rider_in_Mexico_City.jpg

Slide 15



The different business models of shared mobility have implications for urban management and the assignment of responsibility over the externalities.

Slide 16



Most new vehicles today have some safety-critical control function – such as steering, throttle, brakes and cruising – already automated. However we are still a few years before full automation.

1950 - 2000

Safety/Convenience Features

Cruise Control
Seat Belts
Antilock Brakes

2000 – 2010

Advanced Safety Features

Electronic Stability Control
Blind Spot Detection
Forward Collision Warning
Lane Departure Warning

2010 – 2016

Advanced Driver Assistance Features

Rearview Video Systems
Automatic Emergency Braking
Pedestrian Automatic Emergency Braking
Rear Automatic Emergency Braking

Rear Cross Traffic Alert
Lane Centering Assist

2016 - 2025

Partially Automated Safety Features

Lane keeping assist
Adaptive cruise control
Traffic jam assist
Self-park

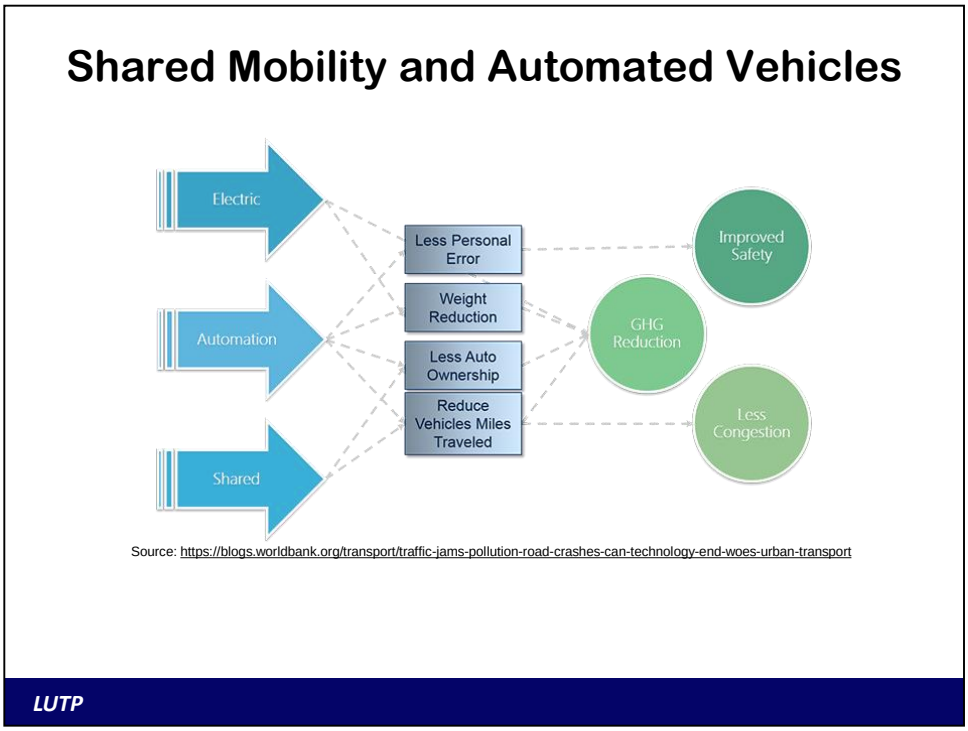
2025+

Fully Automated Safety Features

Highway autopilot

Source: https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety

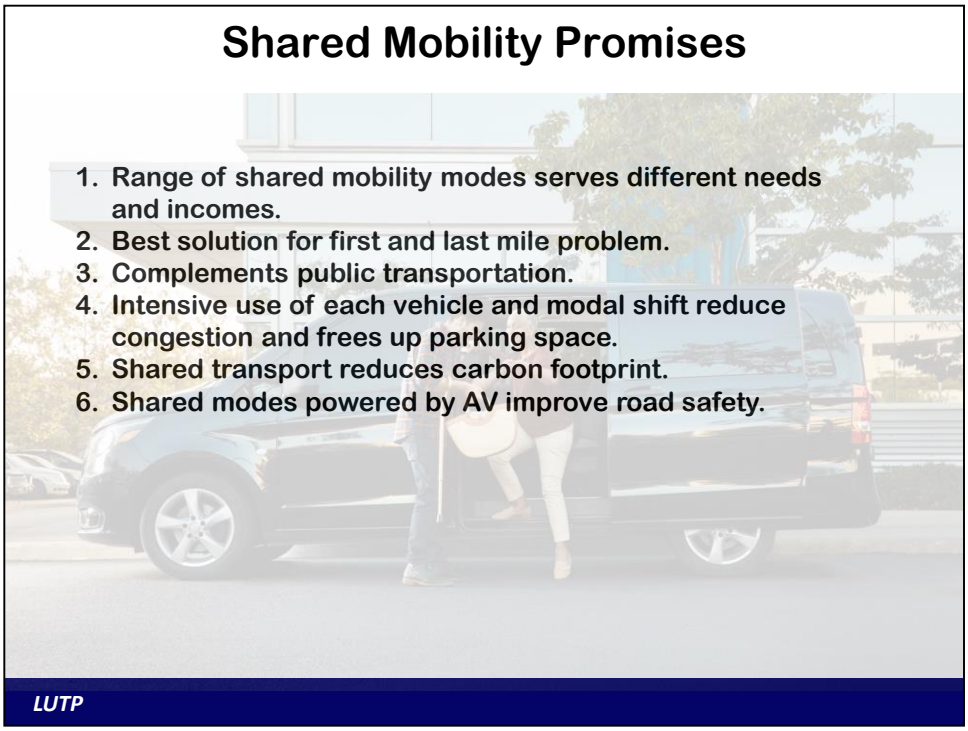
Slide 17



Advances in ICTs, connectivity and analytics in recent years, as we have seen, are only starting to revolutionize the transport sector. The combination of intensive sharing mobility, electric technology and automation of vehicles, with **adequate coordination and policy steering** could develop efficient, safer and more sustainable mobility.

Image and further analysis: https://blogs.worldbank.org/transport/traffic-jams-pollution-road-crashes-can-technology-end-woes-urban-transport

Slide 18



Intensive use of vehicles may decrease congestion and reduce carbon footprint

- 96% time cars remain parked and idle; 30% of traffic generated by cars seeking parking space.

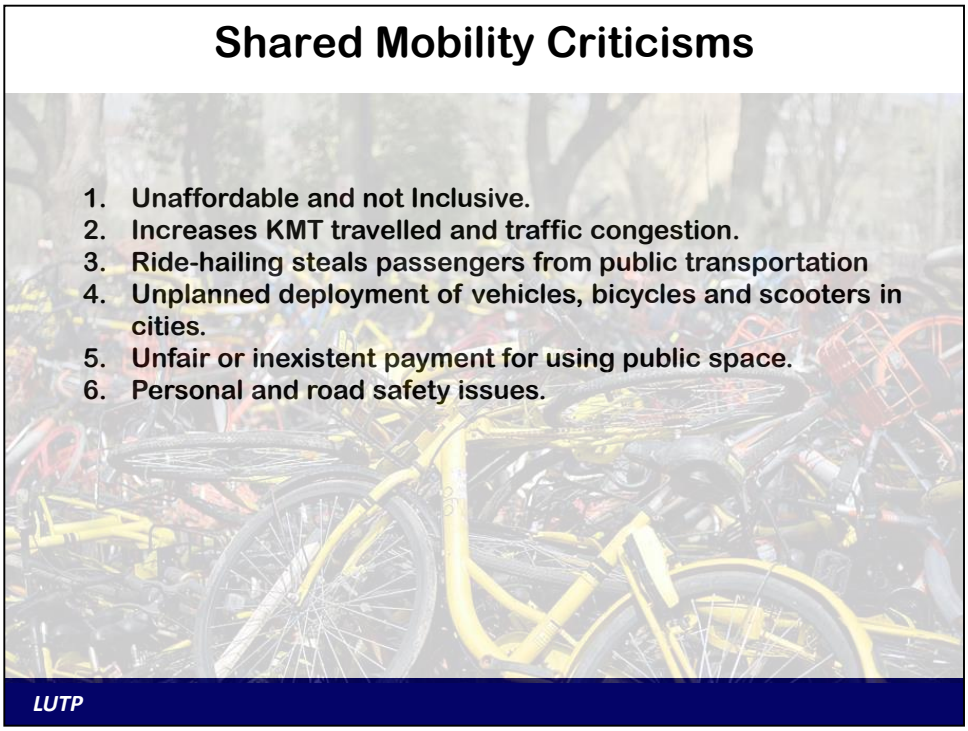
Modal shift from privately owned to on-demand and public transport and active modes:

- Customized and seamless transportation: what, when, and how we want.
- Studies have found that multitude of first and last mile options, particularly micromobility and microtransit, may increase public transport use, shrinking transit “deserts” in underserved or less dense localities.
- Surveys have found that on-demand mobility users who give up on cars may use more public transportation.
- Sustainable shared transport to address pollution, congestion, road safety, noise, public space scarcity.

Slide 18

Image source: https://www.viavan.com/

Slide 19



Mobility platforms are technology intermediaries but might have transportation responsibilities related to their potential – albeit controversial - negative externalities (congestion, pollution, safety). This is more clear for micromobility platforms, as they also own the vehicle fleet.

- Studies on ride-hailing causing more vehicle kilometers travelled – resulting from idle cars between passengers – and therefore more traffic congestion and pollution are inconclusive and depend on the city's characteristics, such as density. However, they indicate that without coordination and regulation this could be a trend.
- Ride-hailing may steal passengers from public transportation, but studies are inconclusive.
- Micromobility today might be unaffordable for lower income communities, concentrated in wealthier areas of the city.
- While cities are still struggling to coordinate and regulate, shared mobility platforms are not paying for

public space use or for its potential negative externalities.

- Personal safety is a key issue for ride-hailing (sexual harassment). For micromobility road safety is the main topic to be addressed: (i) road infrastructure is not adapted to scooter, and (ii) shared bikes and scooters flood sidewalks, blocking pedestrians and wheelchair users.

Image: https://www.pxfuel.com/en/free-photo-qnfks

Slide 20

- Coordination and regulation are necessary. Prohibiting is hardly the solution: difficult to inspect and encourages illegal and unsafe transportation.
- Over-regulating shared mobility and innovation in AVs may go against urban mobility objectives.
    - Should not be stricter than for privately-owned vehicles and not encourage private ownership.
- Adaptive, outcome-based regulation, updated as market evolves.
    - Regulation should focus on pricing and

incentivizing the desired outcomes (more here: https://www.worldbank.org/en/topic/digitaldevelopment/brief/from-sidewalk-to-subway).

- E.g: (i) percentage of trips that otherwise would have been made in a car or public transport (user survey); (ii) assessing public transit ridership and the percentage of shared mobility trips beginning or ending at a transit hub; (iii) proportion of trips originating or ending from/at underserved areas of the city; (iv) rebalancing & fleet redistribution to underserved neighborhoods either at the beginning or throughout the day; (vi) congestion charge to discourage the zero-occupant vehicles driving around in traffic all day to avoid parking fees; (vii) special lanes or zones - such as low-emission zones and high-occupancy.

- Piloting different approaches at different times and areas of the city.
  - E.g.: (i) management and parking

space to incentivize new modes to feed into public transport, for instance regulation that allows bikes and scooters to part in car space, instead of sidewalk; (ii) adjusting fees and incentive structures, for example, or varying rules regarding vehicle parking or on-street riding to see how behaviors and outcomes change.

- Data-sharing should be both ways, government and companies.
  - To offer real time information on public transport to citizens and to integrate with market apps.
  - For policy planning according to government’s capacity to process and protecting user privacy
  - Consider the use of third-party, independent data-aggregators to guarantee user privacy.

- Stakeholder involvement in planning and regulation is essential. Examples from cities being criticized for building bicycles lanes without consulting local commerce abound and can hamper a well-intentioned initiative.

Slide 21

Best Practices

Sao Paulo Ride-hailing Regulation	On-demand shuttle service 'BerlKönig' in Berlin
• Prices vehicle use • Incentives and disincentives for desired outcomes: • kms-travelled, hour of the day, underserved areas, women drivers • Data-sharing sufficient for planning; protects users' privacy	• Public-Private partnership: Transit authority BVG and ViaVan • Electric vehicles • Test-run to monitor, evaluate results, and change. • 5,000 "virtual stops" (not door-to-door)

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Sources:

https://blogs.worldbank.org/transport/sao-paulo-s-innovative-proposal-regulate-shared-mobility-pricing-vehicle-use

https://www.uitp.org/news/uitp-awards-bvg-and-viavan-introduce-world%E2%80%99s-largest-demand-offer-public-transport-company

The range of new shared mobility services has triggered MaaS

BIKES & SCOOTERS

motivate, scoot, Lime, SPIN, skip!, BIRD, JUMP, Razor

RIDE HAILING

UBER, lyft, VIA, Gett

CAR SHARING

MAVEN, CAR2GO, Getaround, TURO

The Incumbent Mobility System

Personally-Owned and Public Transport

Technology	Business Model
Internal combustion engine, disconnected vehicles	Public transport complemented by privately-owned vehicles

Public Transport complemented by Privately-owned vehicles

CAR

MOTORBIKE

BICYCLE

RAIL

BUS

HIRED VEHICLE

Slide 24

Why now? Technology advancements, new shared modes.

- Public transport is in essence transport-as-a-service; MaaS integrates all mobility alternatives, enabled by technology.
- Through a platform individuals can book and pay their trips and receive real-time travel information before and during the trip.
- Dynamic pricing and mobility subscription packages to encourage modal shift.

MaaS could enable integrated multimodal transport:

- Real time, seamless information and integrated payment.
- Shift from *owning* a vehicle to using transport *service* network.
- Modal shift toward mass and active

transportation.

- Potential to address pollution, congestion and space scarcity problems.
- Integrated information and payments system allow:
  - better demand quality data;
  - pricing systems to nudge modal shift;
  - bridge region/income/age divides.
  - Coordinating on demand shared mobility with scheduled public transport – through pricing system and operational times – could increase rides of public transport and pave the way towards more sustainable urban mobility.

MaaS Layers:

- The mobility network layer — where customers go to select their mode of transport by choosing from public, private and shared options, or a combination of the three.
- A real-time mobility optimization layer — where customers can view the available modes of transportation and estimate travel times or check for disruptions.
- A mobility pricing layer — where customers can choose from available payment options.
- A value services layer — where the MaaS provider has the option to insert additional useful information into the planned travel route, such as nearby restaurants or attractions to visit.
- A future services layer — which can be adapted to meet additional needs that may arise, or for the future implementation of loyalty benefits for repeated use of the app.

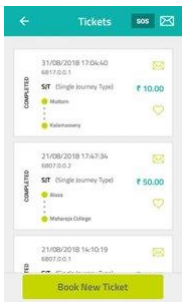
MaaS Toward Societal Goals

MaaS topological scheme, including MaaS levels and examples of these (Sochor et al., 2018)

Best Practices

UbiGo whim smi)e BVG Jelbi

Kochi One in Kochi, India



- Due to the potential impacts that MaaS can bring to the cities, policy makers need to decide on their take and involvement in MaaS at an early stage.
- Public, private or PPP? Chosen approach can have impacts on:
  - Innovation
  - Modal shifts
  - Continuity
- Develop competitive position of public transport in MaaS by evolving from “transport provider” to “solution provider” through innovative business models and partnerships to foster sustainable transport.
  - Backbone: open loop data and integrated

payment systems to coordinate on-demand shared-mobility with scheduled public transport and allow subscription services.

- Governing the physical space/curb – integration nodes, pick-up/drop-off.
    - Park and Ride facilities that allow car drivers to avoid congestion by completing the inner-urban part of their journey by rail or public transport, etc
    - Pick-up and drop-off spaces for on demand shared mobility.
- Data privacy - balance between planning potential and privacy.
- Digital divide and how to address it:
    - Smartcard and charging points in convenience stores
    - WiFi hotspots
    - Offline options