ITDP

Image: bricoleurbanism via Flickr

Harnessing Shared Mobility for Compact, Sustainable Cities

August 2015

Harnessing Shared Mobility for Compact, Sustainable Cities

In the past decade, the world has seen car sharing go mainstream, bike sharing become a global trend, and hundreds of startups stake their claim to reinventing transport. The new systems, collectively known as shared mobility, reflect the rise of both the on-demand and sharing economies. These dual economic phenomena are changing the way everyone from car owners to public transport users make travel choices. This policy brief addresses how shared mobility is affecting the urban transport landscape and suggests ways governments can guide the industry's growth toward supporting a sustainable, people-centered city.

A growing range of shared mobility systems has emerged to fill gaps in the transport network by offering ever more nuanced options for different travel needs. These include new options for door-to-door travel, "last/first mile" trips to destinations and nearby transit stations, special trips, and reaching underserved areas. Innovations in payment structures, variable routes, flexible schedules, and vehicle size all contribute to the new diversity of transit choices.

Yet shared mobility is just one of the ways the urban landscape is shifting. As the world's rapidly growing cities rethink their transport and land use policies, with increased focus on sustainability, transit-oriented development and road safety, both the benefits and shortcomings of shared mobility deserve attention as part of long-term planning.

In considering the relationship of shared mobility to our streets and our cities, several questions arise:

- How does shared mobility provide support for or draw people away from the existing transportation system, including public transport and private vehicles?
- What is the role of shared mobility in achieving transit-oriented development?
- How can shared mobility schemes improve access for low-income people, especially when these systems use public funding or public space?
- How can the different types of shared mobility be integrated with road safety initiatives?

While many shared mobility systems are still in their infancy, initial research and experience reveal a hopeful outlook. The benefits of shared mobility are numerous:

- Shared mobility systems can replace the comfort and convenience offered by personal vehicles, and offer new transport options for different types of trips.
- Shared mobility systems lead to a reduction in vehicle kilometers traveled, and ultimately CO2 emissions, by shifting travel trips away from personal vehicle use.
- Shared mobility both benefits from the dense, mixed-use environments created by transit-oriented development, and enables TOD by reducing the need for personal vehicles and parking spaces.
- Shared mobility systems may help lower income people meet their mobility needs.

There are also constraints and concerns regarding scale-up of the systems:

- Shared mobility cannot replace mass rapid transit. Passenger volumes and economies of scale mean planners need to remain focused on expanding and improving mass rapid transit to meet the needs of today's growing cities.
- Data on trip patterns tracked by shared mobility has the potential to transform transport planning, but only if that data is shared with governments and not kept solely in private hands.

- Cities must be cautious to not lose control over their public streets by ceding space to private companies.
- The private sector may need support and/or subsidies from the public sector to expand service to lower income neighborhoods.

Planners should seek to coordinate with shared mobility companies to encourage integration with mass rapid transit and to reduce stress on existing mass transit systems. Though shared mobility can never replace the ridership efficiency of mass rapid transit, it plays a strong role in complementing public transport network planning. Planners should also consider shared mobility as a tool to support transit-oriented development, especially when evaluating parking requirements.

Image: ITDP

What is Shared Mobility?

The term 'shared mobility' encompasses a range of transport options. Shared mobility systems combine smaller vehicles, flexible routes and schedules, a marketplace for trips, and access to vehicles and rides without the burdens of ownership. These services have also been referred to as microtransit, reflecting both their scale, in terms of ridership capacity, and their increasing role in urban transport networks.

While any form of transport that is shared could be counted as shared mobility, such as traditional public transit and taxis, this brief focuses on the emerging forms of on-demand transport. These include bike sharing; car sharing; ride sharing (carpooling, vanpooling); ride sourcing; scooter sharing; shuttle services and neighborhood jitneys. The rapid pace of innovation means new forms of shared mobility continue to emerge.

Shared mobility has long been part of how people get around in the Global South, both as formal and informal service that people adopt where transport gaps exist. The latest generation of shared mobility uses savvier hardware and software technology so that users can more readily identify available services to fulfill their travel needs. These services are also accompanied by a seamless ease of payment, such as online or with a smartphone.

The wave of shared mobility systems brings a new set of opportunities and concerns to transit and urban planning. For example, a benefit of shared mobility's low-infrastructure and high-flexibility model is that piloting, before full system scale-up, allows for important data collection on where more transit service is needed, while minimizing disruptions to existing neighborhoods. Many of the effects of shared mobility, however, are still emerging. It is possible that as the industry develops each mode will have to be considered separately, as different benefits and planning challenges become clearer. Nonetheless, it is important to explore the initial implications of shared mobility, and begin to see how its growth can be directed to support sustainable, people-centered cities.

The Role of Ride Sourcing

In recent years, ride sourcing has become an especially high profile and controversial form of shared mobility. Conflicts with traditional taxi services and city regulations have sharpened questions about the service. In addition to concerns about rider safety and labor rights, many have voiced concern over the impact of these services on congestion and a car dependant lifestyle. At the same time, there are also potential benefits to the transport network, including new data, connecting areas underserved by transit, and the potential for more shared trips.[1] Thus far, no studies on the industry's effect have been conclusive, most services do not share their trip data, and barriers to low income communities remain high. The service's effect may vary from city to city. Cities should work to step in and guide this rapidly expanding industry toward its most beneficial roles. If the ride sourcing industry accepts stricter regulations, including data sharing and paying a surcharge toward public transit, its growth can be managed to support mass transit, transit-oriented neighborhoods, and sustainable cities.

[1] Santi, et al

Images: Alper Cugun via Flickr

Relationship to Public Transport and Private Vehicles

Shared mobility schemes are most beneficial to cities when they act as a complement rather than a supplement to conventional mass rapid transport systems. Shared mobility systems are not as efficient as mass rapid transit systems, and thus cannot support large flows of people at the scale necessary for most cities. Nonetheless, they can extend the reach of mass rapid transit into areas that are harder to serve by mass rapid transit. Their greatest addition to the transport network is helping users make the first/last mile connection to/from existing public transport service, thereby acting as a feeder system, or for making special trips. Shared mobility shuttle services and jitneys also help connect areas underserved by public transport to job centers.

Trips replaced or generated by shared mobility have implications for the public transport system. Initial studies of shared mobility suggest that system users are drawn more from public transit than from personal vehicles. The largest share of bike share trips - on average just above 40% - would previously have been taken on public transit.[2] A study of ride sourcing trips in San Francisco, USA finds that 39% would have otherwise used a taxi, 33% a bus or rail system, 8% would have walked, and 6% would have driven.[3] A study on car share users reported that slightly more users decrease their public transit use than increase it.[4] Nevertheless, many cities with shared mobility have seen record ridership on public transit in recent years, demonstrating that an increase in shared mobility and public transit use overall can occur in tandem.

Experts note that shared mobility could help alleviate pressure on transit systems that are over-capacity in high demand areas by offering an alternative for short trips.[5] Bike share stimulates interest and growth in cycling as a means of transportation. Many users report using shared mobility to extend their public transit trips,[6] and although shared mobility thus far has not appeared to directly stimulate an increase in public transit use, it provides the structure for more people to shift from personal vehicle use toward less carbon intensive modes.

Encouragingly, shared mobility has been shown to reduce vehicle ownership and use. For round-trip car sharing, the net impact is a decrease in private car use. Each car sharing vehicle replaces from 9 to 13 personally-owned cars, as users of car share systems abstain from purchasing a personal car or give it up after becoming a car share member.[7] Of ride sourcing users who owned a car, the majority report driving about the same amount as before they

Image: Bradley Schroeder

[2] Fishman, et al, 15
[3] Rayle, et al, 13
[4] Martin and Shaheen, 11
[5] Fishman, et al 15
[6] Creighton, 7
[7] Martin, et al, 158

began ride sourcing, but 40% report driving less.[8] Some bike share systems, such as CityCycle, in Brisbane, Australia, have seen up to 21% of bike share trips replacing personal vehicles.[9] More generally, in the highly developed countries with the greatest proliferation of shared mobility, car use is on the decline.[10] Total car travel per person has dropped, the age when people first obtain a driver's license has risen, and more people are forgoing obtaining a license at all. That the rise of shared mobility and the decline of reliance on private vehicles have occurred simultaneously suggests that shared mobility can further contribute to this trend.

Experts note that shared mobility could help alleviate pressure on transit systems that are over-capacity.

Shared mobility appears to have a moderate effect of reducing a city's vehicle kilometers traveled (VKT) and greenhouse gas (GHG) emissions, but more research to evaluate the impact of these systems over time is needed. Most car sharing systems reduce the environmental impact of driving. They typically offer newer, low emission vehicles, and members report driving less, using public transport more, and opting out of private car ownership. After joining car share, "the vehicle holding population exhibited a dramatic shift toward a carless lifestyle".[11] For bike share, some question the VKT and GHG impacts, based on their reliance on rebalancing vans to adjust bike levels at different stations. Evidence suggests this is only the case in cities with exceptionally high public transit mode share, such as London, as this is where the highest share of bike share trips replaces public transit relative to personal vehicles. The majority of cities with bike share, including Brisbane, Melbourne, and Minneapolis/St. Paul, see a significant reduction in VKT. In 2012, bike share resulted in an estimated net reduction of 243,291 VKT in Washington, DC.[12]

Shared mobility's use of technology provides an opportunity to amass significant data on the transport patterns of cities. This information could become extremely useful to transport and land use planners who are seeking to improve city functions and mobility for all. Unfortunately, as private companies, many shared mobility operators have little incentive to share their data publically, or with city planning departments. Some cities, such as Boston, USA, have successfully partnered with shared mobility companies to gain access to their trip data[13], but more attention must be directed at finding a solution to this issue. This data can then be used to improve public services for residents.

Recommendation

Governments should guide and regulate shared-use mobility companies to become complements to public transportation, not competitors. Incentives can be provided for shared mobility services to connect underserved areas, extend the reach of public transit, and increase transport access. It it important that governments work with shared mobility companies to gain access to the data needed to plan a better overall transportation system. For example, data access can be shared in exchange for operating rights and use of public space (e.g. roads and parking spaces).

[8] Rayle, et al, 13
[9] Fishman, et al, 16
[10] The Economist
[11] Martin, et al, 157
[12] ibid, 17
[13] Dungca, 2015

Relationship to Integrating Land Use and Transport as Transit-oriented Development (TOD)

Shared mobility can be integrated with long-term plans to help increase access to travel options. TOD neighborhoods are compact, mixed-use and have public transport sustaining density—conditions that increase market opportunities for shared mobility. Most forms of shared mobility systems, such as car share and bike share, require higher densities to be financially sustainable. These systems often perform poorly in low-density, car-oriented, single-use suburbs.[14, 15] Mixed-uses allow for more even distribution of vehicles, thus lowering rebalancing costs (where applicable) of vehicles between different areas.

Together, shared mobility integrated with TOD can encourage more walking, cycling and mass rapid transit trips while significantly lowering private car usage—especially single passenger trips. Shared mobility can be a piece of the sustainable transport puzzle by combining with other principles of sustainable urban development to create environments where it's easy to not own or use a private car. Many shared mobility schemes, by decreasing private car ownership, open up space for other uses of public streets. For example, public street space previously dedicated for private car parking can be converted to parklets, bicycle paths, or other uses, which improve mobility and the public realm.

Though shared mobility often provides convenient door-to-door service, much like a private vehicle would, this feature has benefits for the individual user with implications for the city fabric. In today's car-centric cities, planning too often prioritizes point-to-point travel. When streets are seen as corridors for shuttling people between destinations, it erodes the public space in between. As cities shift toward a new model of planning, where active streets and vibrant public spaces support transit-oriented development, care should be taken that shared mobility does not undermine the progress being made. Nonetheless, by supporting TOD neighborhoods

Image: green4now via Flickr

[14] ITDP, 44
[15] Shareable.net

Shared mobility can be a piece of the sustainable transport puzzle by combining with other principles of sustainable urban development to create environments where it's easy to not own or use a private car.

with diverse transit options, shared mobility can be a part of the solution and help minimize this problem.

Shared mobility systems often require dedicated space. Parking spaces, docking stations, and drop off/loading zones are all necessary for the function of various systems. By maximizing the use of vehicles through shared use, the physical requirements are minimized, but they are not eliminated. In many cases, the physical components (e.g. stations) are located in public space. Planners will need to rethink urban design to integrate these systems. For example, new docking stations can be placed in former parking spaces, rather than on limited sidewalk space.

One example of successful integration has been the adjustment of parking regulations in cities such as Portland and San Francisco, USA. These cities have incentivized developers to build fewer parking spaces, with some dedicated to car sharing vehicles, and in return get more allowances to build residential or commercial space.[16] This model can be adjusted for a variety of shared mobility models. For example, in the case of peer-to-peer car sharing systems, those who own private vehicles that are shared by other users can use spaces reserved for shared use. These kinds of policies encourage greater development density and promote TOD. They may also reduce housing prices by boosting housing supply and reducing construction costs, as parking spots are very expensive to build, especially underground.

Shared mobility can complement TOD by increasing travel options for different trip types, including special trips and trips to underserved areas. TOD supports shared mobility by creating a good customer base through denser development and creating lively places with mixed uses.

Recommendation:

Shared mobility integrated with urban design will benefit the urban environment. In this way, shared mobility can support strong transit-oriented development. Integration can be achieved through multimodal stations, the preservation of public space, and regulations that use shared mobility to encourage a reduction in car use and ownership. While the public sector should cultivate and combine shared mobility systems with long-range plans for a metropolitan region's growth, the benefits to the public must outweigh the costs of hosting these vehicles on public streets.

[16]Car Share Fact Sheet, ITDP

Questions on Ownership, Funding, and Equity

Shared mobility has quickly become a magnet for investment and innovation. However, the relationship between private companies and public resources is becoming increasingly complex. At a time when public sector infrastructure investment has lagged behind the growing needs of local populations for timely and comfortable mobility, private investments have supported much of the growth of shared mobility companies. The growth of transit options should not overshadow the need for increased investment in public transit.

Although the majority of shared mobility systems are privately owned and funded, some have received government grants from local or national transportation departments to finance establishing or expanding a system. Government grants may offer an opportunity for the public sector to influence the growth of shared mobility. Nonetheless, care is needed to assure that shared mobility systems do not detract from investments in public transport that yield greater benefits for more people in the long term.

Private enterprises often benefit significantly from public investments and goods, including public roads and parking space. To protect the public interest, cities can introduce mechanisms for shared mobility companies to financially contribute to maintenance and repairs. Options include a surcharge per trip or paying for an agreement on parking fees. This can be another opportunity for cities to influence how the shared mobility industry grows. Giving up ownership of assets, such as curb space, can be problematic for cities, as it may interfere with the long-term ability to design and improve public space.

Public transit agencies and private shared mobility schemes have different roles and objectives. While shared mobility systems generally operate only in the most profitable areas, public transport agencies must balance an entire mobility network, including investing in underserved areas and underwriting less well performing routes that are nonetheless vital to improving the city's accessibility and economic development. Private ventures have little incentive or mandate to support those areas and routes. Shared mobility systems that mimic traditional taxi service can connect areas where there is a dearth of travel options, but these systems operate at a premium cost and could never serve regular travel such as daily commuting trips.

Many aspects of shared mobility offer opportunities to improve accessibility for low income individuals, such as reduced costs, increased choice, and flexible schedules and routes. Usage in this population, however, remains low.[17] With explicit focus on reducing the barriers to entry for low income communities, shared mobility could become a useful tool in the transport network for connecting these populations with jobs and opportunities. The public sector may have to underwrite some of the risk for these private companies to serve lower income areas. Non-profit or social entrepreneurs may also fill the gap. The private sector may be able to provide the service more efficiently at certain price points, but this should be weighed against excessive risk put on the public sector.

Recommendation:

Public funding is usually best spent on improving existing mass rapid transit services by assuring a good state of repair, as well as predictability and reliability of service. Governments can guide the ways that shared mobility might improve mobility to low-income areas. Shared mobility can help make needed links for users in the short-term and will be most useful when integrated into long-term plans for a region.

[17] Kodransky and Lewenstein, 1

Relationship to Street Safety

How shared mobility will affect road safety is still uncertain. As shared mobility continues to increase and diversify, city roads will need to support many more varieties of vehicles of different sizes and moving at different speeds. An increase in bikes, electric bikes, and scooters, as well as jitneys and ride source vehicles making frequent curbside stops, could complicate traffic patterns and presents increased risk of crashes. Roads designed for car throughput will need to reconsider these other modes to assure safety.[18]

Thus, it will be important to integrate shared mobility planning with traffic safety initiatives such as Vision Zero, a policy that aims to eliminate all road related deaths and severe injuries. Well-designed complete streets could increase road safety, allowing for a range of different road users. But roads designed for cars that suddenly become shared streets without any changes to their design are not necessarily safe.

In addition, the impact of shared mobility vehicle use on VKT and GHG emissions will depend on how road designs are modified to reflect the new mobility reality and how traffic congestion with these vehicles is managed. As shared mobility evolves and progresses, such as with improved vehicle maneuverability guided by autonomous technology, road design will still need to be factored into how these vehicles will use the public right of way.

Recommendation:

Governments should integrate shared mobility planning with new street designs, accounting for shared mobility in traffic safety initiatives such as Vision Zero.

Conclusion

Shared mobility, in its modern form, remains a dynamic and evolving industry. Though it has significant potential to complement sustainable transport networks, cities must actively manage the industry's growth to capitalize on the benefits and minimize the risks. Regulators, funders, planners, and advocates all have a role in shaping how cities react to the growth of shared mobility systems.

By offering diverse transit options for different trip needs, shared mobility can facilitate a shift away from reliance on personal vehicles and encourage non-motorized transit. Integrating shared mobility into the urban landscape through multimodal transit hubs, conscious street design, and transit-oriented development can allow city residents to more easily choose the transport mode best suited to their needs, be it walking, cycling, rapid transit or car, and reduce or avoid private vehicle use.

However, the sheen of a fast-growing industry should not be allowed to distract from concerns about its impact. The industry's success at reducing VKT and emissions is promising, but thus far limited. Though new systems have risen to meet unmet transit needs, shared mobility cannot replace the need for increased investment in mass transit and active public spaces. Care must be taken to integrate the new players in the transit industry with other urban initiatives, including transit-oriented development and road safety.

Through cooperation with other actors in urban transit, shared mobility systems can be a positive influence on cities. If transit data is shared with city agencies, convergent interests incorporate low-income communities, and integrated planning carves a complementary role for these systems, then cities can reinvent their transit with the same efficiency, convenience, and modernity symbolized by shared mobility.

[18] Jaffe, 2015

References

Creighton R. “Buffalo CarShare: Two Years in Review. A Look at the Organization’s Growth, Membership and Impact”. 2011. https://www.dot.ny.gov/divisions/engineering/technical-services/trans-r-and-d-repository/C-08-24%20Buffalo%20CarShare%20Final%20Report.pdf (accessed July 21, 2015)

Dungca, Nicole. “In first, Uber to share ride data with Boston”. Boston Globe. January 13, 2015. Accessed July 7, 2015. https://www.bostonglobe.com/business/2015/01/13/uber-share-ridership-data-with-boston/4Klo40KZREtQ7jkoaZjoNN/story.html

Fishman, Elliot, Simon Washington, Narelle Haworth. “Bike share’s impact on car use: Evidence from the United States, Great Britain, and Australia”. Transportation Research, Part D. 2014.

Hallock, Lindsey and Jeff Inglis, Frontier Group. “The Innovative Transportation Index. The Cities Where New Technologies and Tools Can Reduce Your Need to Own a Car” USPIRG. February 2015.

Institute for Transportation and Development Policy. “The Bike Share Planning Guide” 2013.

Institute for Transportation and Development Policy. “Car Share Fact Sheet”, 2014.

Jaffe, Eric “It’s Time to Treat Bike-Share as Mass Transit”. CityLab. October, 2013. Accessed July, 7 2015. http://www.citylab.com/commute/2013/10/its-time-treat-bike-share-mass-transit/7421/

Jaffe, Eric “The Most Persuasive Evidence Yet that Bike-Share Serves as Public Transit” City Lab. July 28, 2015. Accessed July 7, 2014. http://www.citylab.com/commute/2014/07/the-most-persuasive-evidence-yet-that-bike-share-serves-as-public-transit/375142/”

Jaffe, Eric “ These Futuristic Driverless Car Intersections Forgot About Pedestrians and Cyclists”. June 4, 2015. Accessed July 7, 2015. http://www.citylab.com/tech/2015/06/these-futuristic-driverless-car-intersections-forgot-about-pedestrians-and-cyclists/394847/?utm_source=SFFB

Kodransky, Michael and Gabriel Lewenstein. “Connecting Low-Income People to Opportunities with Shared Mobility”. Living Cities, December 2014.

Martin, Elliot and Susan Shaheen. “The Impacts of Carsharing on Public Transit and Non-Motorized Travel: An Exploration of North American Carsharing Survey Data”. Energies, November, 2011.

E. Martin, S. A. Shaheen, and J. Lidicker. “Impact of Carsharing on Household Vehicle Holdings”. Transportation Research Record: Journal of the Transportation Research Board, No. 2143, Transportation Research Board of the National Academies, Washington, D.C., 2010, pp. 150–158.

Rayle, Lisa; Susan Shaheen, Nelson Chan, Danielle Dai, and Robert Cervero. “App-Based, On-Demand Ride Services: Comparing Taxi and Ride sourcing Trips and User Characteristics in San Francisco”. University of California, Berkley, Transportation Sustainability Research Center. August, 2014.

Roland Berger Strategy Consultants. “Shared Mobility: How new businesses are rewriting the rules of the private transportation game”. July 2014.

Santi, Paolo, Giovanni Restab, Michael Szella, Stanislav Sobolevskya, Steven H. Strogatzc, and Carlo Rattia. " Quantifying the benefits of vehicle pooling with shareability networks". PNAS. September 16, 2014. Vol. 111 No.37, 13290-13294.

"Seeing the Back of the Car" The Economist. September 22, 2012. Accessed July 14, 2015. http://www.economist.com/node/21563280

Shaheen, Susan and Matt Christensen. "Shared-Use Mobility Summit". University of California, Berkley, Transportation Sustainability Research Center. 2013.

Shareable.net "What is the future of shared mobility" April 20, 2012. Accessed July 7, 2015 http://www.shareable.net/blog/what-is-the-future-of-mobility

Tal, Gil. " Evaluating the Effect of Car-Sharing: Exploring the Gap Between What We Know vs. What We Need to know and Its Effect on Optimism Bias". Institute of Transportation Studies. University of California, Davis. 2009.