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Policy Paper

Data for Environmentally Sustainable and Inclusive Urban Mobility

BY ANUSHA CHITTURI AND ROBERT PUENTES

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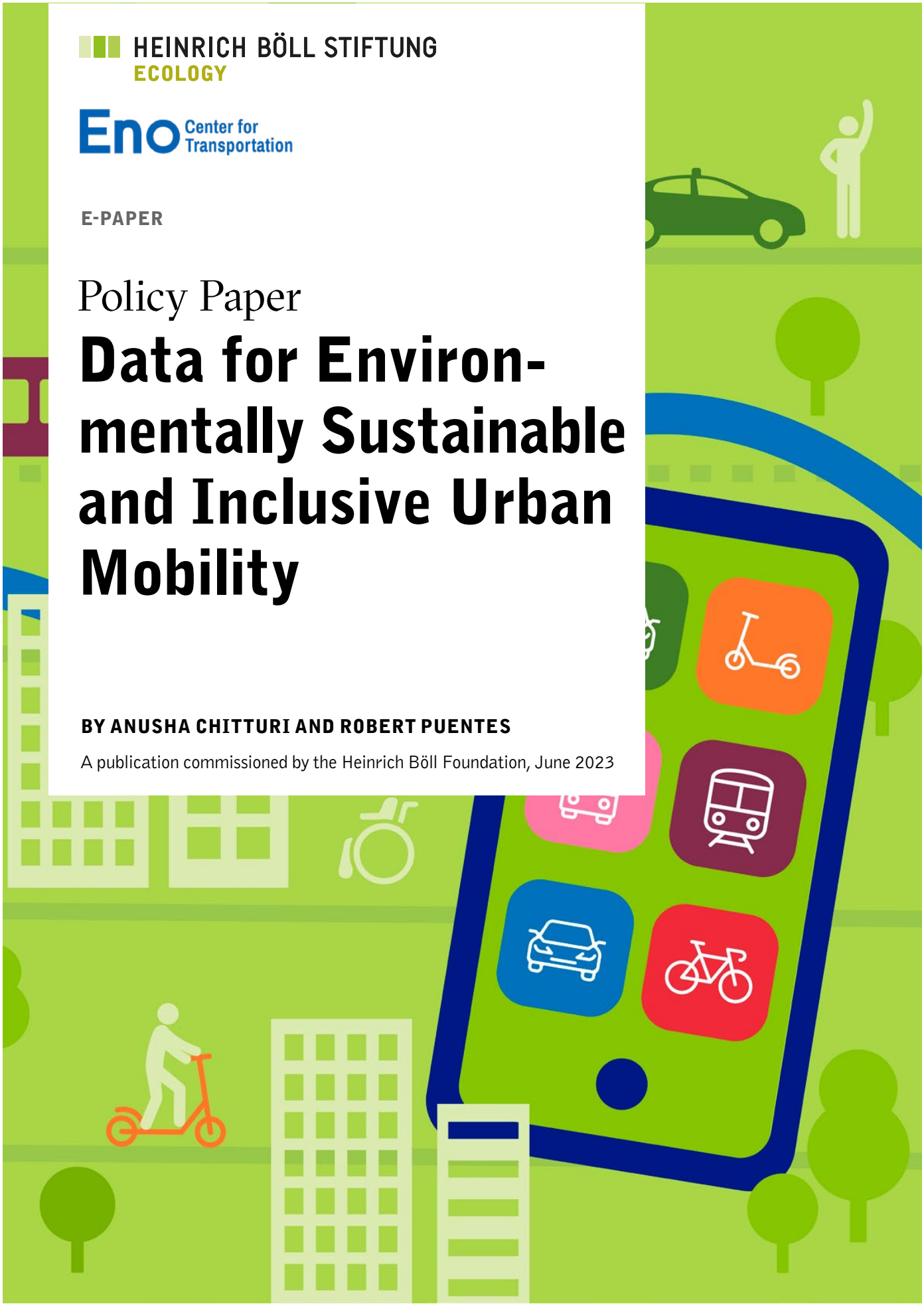

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Executive Summary

Data on passenger movements, vehicle fleets, fare payments, and transportation infrastructure has immense potential to inform cities to better plan, regulate, and enforce their urban mobility systems. This report specifically examines the opportunities that exist for U.S. cities to use mobility data – made available through adoption of new mobility services and data-based technologies – to improve transportation's environmental sustainability, accessibility, and equity.

Cities are advancing transportation sustainability in several ways, including making trips more efficient, minimizing the use of single-occupancy vehicles, prioritizing sustainable modes of transport, and enabling a transition to zero and low-emission fuels. They are improving accessibility and equity by planning for and offering a range of transportation services that serve all people, irrespective of their physical abilities, economic power, and geographic location.

Data sharing is an important instrument for furthering these mobility outcomes. Ridership data from ride-hailing companies, for example, can inform cities about whether they are replacing sustainable transport trips, resulting in an increase in congestion and emissions; such data can further be used for designing targeted emission-reduction programs such as a congestion fee program, or for planning high-quality sustainable transport services to reduce car trips. Similarly, mobility data can be used to plan on-demand services in certain transit-poor neighborhoods, where fixed transit services don't make financial sense due to low urban densities.

Sharing mobility data, however, often comes with certain risks, as the United States doesn't currently have the needed regulatory, enforcement, and technological systems to monitor data collection, sharing, and usage. Privacy is a major risk, since data collected by mobility service providers comprises sensitive information such as geo-location or the path of the user. Misuse, whether intentional or unintentional, is another major concern arising from uncontrolled and unmonitored usage of data. Data collection also can be biased against certain user groups, leading to outcomes that could replicate existing discriminatory structures. Furthermore, sharing mobility data can sometimes create proprietary risks for companies that operate in a competitive marketplace, as there is potential for such data to be used by a competitor to gain advantage.

The ability of governments, especially cities, to use mobility data from private companies for building sustainable and inclusive mobility systems depends on the regulatory and governance structures. About two-thirds of U.S. states have preempted local governments from regulating Transportation Network Companies (TNCs) or app-based ride-hailing companies, limiting the usability of the data for local planning and enforcement. Regulating micromobility service providers (such as shared bikes and scooters) has been simpler

for cities as compared with ride-hailing companies, and many cities have tied licensing to data-reporting requirements.

When it comes to regulation of consumer privacy and of data security, the United States has no broad federal law, but individual states have their own laws and regulations. As of March 2023, six states have passed comprehensive privacy laws that are primarily applicable to businesses, and at least 32 states have enacted laws that require state agencies and other government entities to employ data-security measures. While data-security laws are increasingly being adopted by states to protect data that state agencies can access, most of these do not apply to local governments. Cities and municipalities, however, are innovating to improve privacy regulations within their jurisdictions.

Recommendations

This report presents a few recommendations to improve data sharing and usage in U.S. cities for moving toward an urban mobility system that is sustainable, accessible, and equitable. These are primarily applicable to cities, but also can apply to the federal government, private mobility service providers, and nonprofits:

Harmonize data-sharing requirements for private mobility service providers: Lack of uniformity of data in terms of formats, regulations, and governance models can create regulatory and procedural uncertainty for private mobility service providers and impose unnecessary time and cost burdens for businesses. Cities and states should, therefore, work toward harmonization to the extent possible while retaining necessary differences needed to address local data and regulatory needs.

Improve data usage in the public sector: Cities have been slow to integrate the available mobility data into their planning processes because they currently lack human, technological, and financial resources to support data processing and analytics. Cities should invest in building internal capacities to manage data-based activities, at least those that are crucial for performing basic planning and enforcement. For small cities with smaller data needs, engaging a third party makes more sense than investing to build in-house capacities.

Vest regulatory power and responsibility in cities: Cities have an operational responsibility to ensure that their urban transportation systems are safe, accessible, and environmentally sustainable, as defined in the state or local laws. To fulfill this responsibility, they must be equipped with regulatory power over private mobility service providers, whose business interests might often conflict with public interests. Advancing coalitions of cities that share the common interest of better regulating TNCs can build negotiating power of cities in relation to private interests.

1. Introduction

Data on what, when, and how people, vehicles, and goods move represents an important opportunity for cities to make informed decisions to advance sustainability, accessibility, and equity goals. More than 1,000 transit agencies in the United States offer data on transit ridership, vehicles, and fares in the Global Transit Feed Specifications (GTFS) format.[1] TNCs have a huge repository of data on their rides, including origin-destination data, fares, trips requested, and driver wages, among other information. Micromobility service providers also share data on bike ridership and stations wherever they operate a bike share program, typically under a contractual agreement with cities. Data analytics and the growing "internet of things" are creating an ever-wider array of tools for managing transportation systems and infrastructure.

This all leads to a tantalizing prospect: All this personal mobility and demographic data has the potential to help practitioners better understand travel behavior, optimize operations, enhance public safety, improve environmental sustainability, and allocate scarce resources based on real-time evidence. Many cities realize this potential and are actively using data, especially from private mobility service providers, to design and implement programs that help achieve their mobility goals. Chicago, for example, used such trip data to analyze the impacts of ride-hailing trips and, as a result, introduced a new taxation structure for TNCs to reduce congestion and encourage the use of sustainable modes of transit.

The massive influx of data also brings new challenges related to privacy, inclusivity, and data governance. There is still much work to be done to understand the maximum utility of the data being created, while minimizing its relevant personal, societal, and business risks. There are few standards for how data should be collected and shared between the public and private sectors. Public entities are also falling behind the private sector in terms of data innovation, and often do not have enough data scientists on staff or senior management leadership to negotiate contracts to obtain, share, and analyze data.

Yet despite these challenges, today's potential and promise of data is too great to ignore. What's more, there is an excellent opportunity to take advantage of opportunities for mutual learning by sharing advice, guidance, and best practices among stakeholders from different countries. This report is a result of collaboration with the Heinrich Boell Foundation, the Eno Center for Transportation in Washington D.C., and the Wuppertal Institute in Germany. The objective is to evaluate opportunities for unlocking better data-sharing partnerships between public and private stakeholders to improve sustainability and equity outcomes in the mobility sector. This report examines this issue from the perspective of the

1 U.S. Department of Transportation, "National Transit Map," March 2022.

United States and, combined with a companion report produced by the Wuppertal Institute in Germany, showcases transatlantic learnings on how data can be leveraged to advance mobility outcomes.

The next section of this report outlines the state of mobility data in the United States, including data availability across different modes of transportation, data formats, and the typical use cases for mobility data in cities. It highlights various types of stakeholders engaged in data collection, processing, and governance. The third section identifies a few risks and concerns surrounding mobility data usage, and lays out the regulatory framework at the federal, state, and local level for data sharing and for protecting data privacy and security.

The fourth section reviews various data-reporting and partnership models in cities, especially for engaging with private mobility service providers, and outlines the overall implications for mobility outcomes and data-sharing concerns. Three case studies in section five of the report – Los Angeles, Chicago, and New York – examine governance approaches and associated outcomes. Drawing on findings from each of these sections, the report concludes by highlighting a few opportunities for leveraging mobility data responsibly to advance sustainability, equity, and accessibility goals of cities.

In preparing this report, we relied on expertise within Eno, the Heinrich Boell Foundation, and the Wuppertal Institute. We conducted an extensive review of recent literature to understand the varied availability of mobility data across different cities, given the differences in local laws and governance structures. We interviewed experts from the public, private, and nonprofit sectors, and these discussions were crucial in weighing the varied data-sharing models and understanding existing constraints in sharing mobility data. Our discussions with city and state departments were especially illuminating in understanding the data needs of cities and current efforts to expand data access and usage.

Acknowledgements

We are grateful to the following stakeholders for their willingness to share their valuable insights and contribute to our work: Los Angeles Department of Transportation, California Public Utilities Commission, Chicago Department of Transportation, Chicago Business Affairs and Consumer Protection Department, New York City Taxi and Limousine Commission, Open Mobility Foundation, MobilityData, Open Transportation Partnership, SharedStreets, University of Washington, New Urban Mobility Alliance (NUMO), Populus, Streetlight Data, Uber, and Lyft.

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2. The State of Mobility Data in the United States

2.1 Data types

Mobility data is widely collected in the United States across different modes of transportation. This report will focus specifically on data that is generated through urban mobility trips.

Fixed route or mass transit services

In the United States, transit services are mostly operated by public agencies, which collect massive amounts of static and dynamic data on ridership and vehicles. Static data pertains to system data that remains fairly constant with time, whereas dynamic data includes real-time information on transit operations. Real-time data collected by transit agencies using intelligent transportation systems (ITS) can be broadly categorized as:

1. Automatic Vehicle Location (AVL): Vehicle location data is collected through devices installed on transit vehicles that return real-time data on the location along with a timestamp.
2. Automatic Passenger Counting (APC): Ridership data is collected through smart cards, passenger counts at stations and buses, and through passes.
3. Automated Fare Collection (AFC): Fare payment data (AFC) is collected through smart cards and bank cards.

System data such as the number of buses, bus routes, and bus schedules are maintained and periodically updated by the agencies. Transit agencies use this data to monitor the health of their assets and perform predictive maintenance, to monitor ridership and rider behaviors for predicting demand, to improve their day-to-day operations (e.g. bus arrival prediction), and for service planning and scheduling.[2]

Data on ridership, vehicle locations, and fare payments are shared by public agencies in the above-referenced standard GTFS format, which was independently developed and widely adopted by the industry. GTFS, therefore, offers a common language for transit agencies and independent web developers to analyze transit feeds and develop rider-facing transit

2 David Perlman, Kristin Tufte, Lafcadio Flint, and Tara Reel, "Emerging Data Science for Transit: Market Scan and Feasibility Analysis," Federal Transit Administration, U.S. Department of Transportation, Volpe Center, FTA Report No. 0218, June 2022.

applications that can share real-time information.[3] More than 1,000 transit agencies in the United States offer transit data in the uniform GTFS format.[4]

Not all transit agencies share all their data in open data formats. In some cases, agencies have data-sharing agreements or partnerships with third-party research institutions. For example, the Massachusetts Institute of Technology (MIT) Transit Lab has partnerships with transit agencies in Boston, Chicago, and other locations to use data to perform a range of analysis that can inform agency-level planning and operations.[5]

Sharing of transit data can lead to wider economic and societal benefits. One recent examination of the value of open data and digital partnerships to the integrated transport authority Transport for London (TfL), for example, found that it has numerous potential benefits, including emission savings, time and cost savings, improved customer satisfaction resulting in more journeys on the network, and high-value job creation supported by open data.[6]

On-demand services

On-demand mobility services such as microtransit, micromobility, and ride-hailing respond to ride requests that typically are coordinated by an app-based technology.[7] As opposed to fixed-route services, which are mostly owned and operated by public entities, on-demand services are often at least partially run by private operators. They are operationalized either through public-private partnerships supported by a contractual agreement or via a license or permit obtained from the public entity to run private operations.

Microtransit or on-demand transit is an emerging mode of transport that is currently being supported by private technology providers such as Via. Since these services are often owned by cities or transit agencies, mobility data collected from such operations is owned and managed by public entities. Data from these operations can help provide information

3 Bibiana McHugh, "Pioneering open data standards: The GTFS Story," in Beyond Transparency: Open Data and the Future of Civic Innovation, edited by Brett Goldstein and Lauren Dyson, Code for America Press, 2013.

4 U.S. Department of Transportation, "National Transit Map," March 2022.

5 Massachusetts Institute of Technology, "MIT Transit Lab," undated.

6 Deloitte, "Assessing the Value of TfL's Open Data and Digital Partnerships," July 2017.

7 In this report, "microtransit" refers to demand-responsive bus or shuttle services that are offered in addition to conventional fixed-route services, typically to cater to people living in transit-poor neighborhoods or people with disabilities; "micromobility" refers to shared services offered via small vehicles, such as bikes and electric-scooters, that operate under the speed of 25 km/hr and are driven by users; "ride-hailing" refers to taxi services that users can hire along with a driver, and "TNC" specifically refers to companies that offer app-based ride-hailing services that connect users to drivers or taxis.

on transit demand and travel behavior in neighborhoods that are not adequately served by conventional public transport.

Micromobility services such as docked and dockless bike and scooter share systems have grown significantly since 2015. As of July 2022, about 60 docked bike share systems are operated in the United States.[8] Dockless bike share systems operate in about 35 cities and dockless scooter systems in about 158 cities. Bike share services are typically operated by a single private mobility service provider either under a contractual agreement (e.g. Chicago and Boston) or a public-private partnership model (e.g. New York) where the operator owns the bike system. The data-sharing requirements, in most of these cases, are outlined in the agreement. In some cities, such as Los Angeles, multiple micromobility service providers can apply for permits from the city for operation, and the city requires data sharing as part of the permit process. General Bikeshare Feed Specification (GBFS) and Mobility Data Specification (MDS) are two common formats used for micromobility data sharing.

Ride-hailing or transportation network companies (TNCs), such as Uber and Lyft, are operated by private providers.[9] While conventional meter-based taxis are subjected to regulations and permits, app-based taxi companies fall outside such regulatory purview in most cities, given their non-traditional mode of operation. TNCs have a huge repository of data on their rides, including origin-destination data, fares, trips requested, and driver wages. However, accessing data from app-based services has particularly proven challenging for cities that did not have a pre-existing regulatory framework for such operations, limiting their access to a huge data repository.

Other data

Cities and transit agencies also conduct periodic surveys to understand travel patterns and behavior of their existing and potential commuters. The U.S. Census Bureau has wide-ranging information that is aggregated and available at the neighborhood tract level. The National Household Travel Survey (NHTS) is conducted by the Federal Highway Administration and collects travel information at the household level. In addition, the data collected and owned by cities and state agencies, such as street-level data, parking records, vehicle counts, and traffic data can be useful in street-infrastructure planning and managing traffic in real time, among other things.

Another potential source of information is collected by location-based services (LBS) companies through smartphone apps. These services are being offered by a handful but

8 U.S. Department of Transportation, "Bikeshare and E-Scooter Systems in the U.S.," August 2022.

9 Lyft, "Cities," accessed April 15, 2023; Uber, "Use Uber in Cities Around the World," accessed April 15, 2023.

growing number of technology-service providers such as HERE, INRIX, Google, and Uber Mobility. For example, the Massachusetts Bay Transportation Authority (MBTA) used LBS data from StreetLight Data, a private data-analysis and solutions company, for making decisions on service expansion.[10]

2.2 Data usage

In the United States, cities and public agencies tend to use mobility data in the following ways:

1. **Planning:** Cities use data to develop long-term and short-term transportation plans to achieve safety, accessibility, and sustainability goals. Historical trip data that is anonymized and aggregated (either at the census tract or neighborhood level) is used for planning purposes. For example, Boston's comprehensive transportation plan, Go Boston 2030, used data from the local transit agency (MBTA), the public bike share system (BlueBikes), and a private mobility solutions provider (INRIX) to evaluate mobility patterns in the city.[11] Such trip-related information is typically combined with census data and survey results to understand existing mobility trends, set quantitative goals for positive mobility outcomes, and allocate resources.
2. **Enforcement:** One of the most important uses of mobility data for cities is enforcement. Cities monitor and manage the public right of way – sidewalks and streets – to ensure that mobility users and businesses are not violating rules or regulations or causing disruption to the normal functioning of streets and the transportation system. Enforcement activities are primarily directed toward reducing safety incidents and congestion. Cities access vehicle, trip, and driver data from private mobility service providers to ensure that these businesses are operating on a level playing field and offer an equitable mobility experience for vendors and riders. For example, some cities obtain and use mobility data to verify that riders are not being overcharged and that drivers are not being underpaid.
3. **Regulations:** Cities and regulatory agencies at the state level need mobility data to frame policies and regulations that can advance safety, accessibility, and equity. Specifically, data can help track performance of different mobility services and create compliance mechanisms to reduce negative external effects. Some cities, such as New York, have used TNC data to draft new regulations on vehicle license caps and set minimum pay standards for drivers. Cities can also create policies that

10 Massachusetts Bay Transportation Authority, "How We Used Data to Design an Equitable Bus Network," September 7, 2022.

11 City of Boston, Boston Transportation Department, "Go Boston 2030: Vision and Action Plan," March 2017.

distribute incentives and costs to nudge rider behavior for positive outcomes. Some cities, such as Chicago, for example, use TNC data to study impacts on congestion, in that case introducing additional taxes on TNC trips in certain congested neighborhoods to encourage people to shift to more sustainable modes.[12]

4. **Operations:** Cities can use real-time vehicle data to make their operations more dynamic, including responding to incidents and emergency situations. One example could be automatic rerouting of traffic in case of a safety incident and real-time information-sharing with users to coordinate traffic better. Real-time data is typically collected through mobile phone data, in-road or toll sensors, security cameras, and connected vehicle data.[13] There are many documented uses of real-time vehicle data, such as intelligent parking around public facilities, intelligent routing and congestion management during mass events, and better-coordinated ride-sharing, among other things.[14] Such data applications are limited given that cities currently don't have the resources, in-house talent, or established data management teams to utilize real-time data for managing operations.

5. **Transparency:** One of the objectives of collecting mobility data is to share this information with the public to increase transparency and their awareness of mobility services. For example, GTFS data shared by transit agencies can heighten awareness of transit services among the public.[15] Users and web developers often use this data to create journey planning applications that share information on transit schedules and prices. Many large cities also have open-data portals that host extensive information and data on mobility trips.[16]

Private mobility service providers also heavily rely on the data that they collect from their vehicles, drivers, and trips to inform their internal operations and business strategies. Among other things, they use data to optimize their operations, identify market opportunities, determine pricing, and anticipate demand.[17]

12 Shared-Use Mobility Center, "Chicago Congestion Tax on TNCs," January 6, 2020.
13 Otonomo, "The Promise of Connected Vehicle Data," undated.
14 Ibid.
15 Sean Barbeau and Aaron Antrim, "The Many Uses of GTFS Data Opening the Door to Transit and Multimodal Applications," April 2013.
16 The City of New York, "NYC Open Data," accessed May 12, 2023.
17 Neil Patel, "How Uber Uses Data to Improve their Service and Create the New Wave of Mobility," undated.

Mobility-as-a-Service (MaaS)

Another significant use case for mobility data is Mobility-as-a-Service (MaaS) platforms, which are customer-facing applications that help with integrated trip planning and payment across different transport modes. MaaS solutions can reduce dependency on private car usage by making transportation services more versatile, reliable, and convenient.

In the United States, there have been several efforts at the federal, state, and local level to launch technology tools that can help in modal integration and the adoption of MaaS. Broadly, there are two kinds of modal integration programs, which integrate different transport modes. The first kind is public-private partnerships to supplement traditional transit services through first-mile, last-mile (FMLM) connectivity and on-demand service offerings for special mobility needs or for fixing transit service gaps. Many cities and transit agencies attempted these partnerships through the federal Mobility-on-Demand (MOD) Sandbox Program run by the Federal Transit Administration (FTA). Examples of this include partnerships that both Los Angeles County and the Puget Sound region of Washington state entered with the transportation tech company Via to provide FMLM services.

The second kind of modal integration is geared toward integrating all modes via a customer-facing application (or a MaaS platform), to facilitate a one-stop shop for trip planning and payments. This requires data sharing on vehicle or trip availability, cost, schedule, and estimated travel time, among other considerations. There are few examples of cities leading such efforts. The most recent comprehensive MaaS tool was launched in Pittsburgh through a collaborative partnership among the city's Department of Mobility and Infrastructure (DOMI), the regional transport system (PRT), bike share (POGOH), electric-scooter provider (Spin), car-share provider (Zipcar), and carpool-service provider (Waze Carpool). The trip-planning program is called Move PGH, and the application is designed by the private mobile app design vendor Transit. This is also supplemented by integration of physical infrastructure through setting up of "mobility hubs."[18]

MaaS applications rely on integration at three levels. The first is integration of different mobility services by offering real-time information on trip schedules, trip durations, and prices. The second is integration of physical infrastructure, through allocation of street space to all modes, proximate location of multiple modes to allow for easy transfers, and "mobility hubs" that serve as nodes to connect different modes. The third is integration of payments, which will allow the user to pay for

18 Jason Plautz, "Pittsburgh's New MaaS platform and Mobility Hubs Aim to Support Universal Basic Mobility," SmartCitiesDive, July 22, 2021.

different services through one mobility account or card. Integration at multiple levels requires access to real-time data from service providers in standard data formats to drive interoperability.

A significant challenge in the United States, as supported by the research in this report, is availability of data from private mobility service providers. Cities and local governments that have tested such modal-integration solutions have had to negotiate with private service providers for access to data, especially because there is no clear and wider legal mandate that requires data sharing.[19] While micromobility and microtransit service providers are increasingly adopting norms and standards for sharing anonymized trip-level data, TNCs are still resistant to data sharing. Beyond reasons of data privacy and proprietary issues, discussed in detail in other sections of this report, TNCs don't support trip-planning applications that would lead to price comparison with their competitors.[20] Lack of mobility data from all types of providers, therefore, remains a huge barrier for the development of MaaS applications that can offer multi-modal trip planning and integration in the United States.

Another key component of MaaS development is a governance structure that enables collaboration among different public and private stakeholders. Integration of mobility services, physical street infrastructure, and payments require the public sector to establish partnerships with private mobility service providers. While these exist in limited form, none of the models in the United States have so far established broad-based collaboration among all kinds of modes. Even recent MaaS efforts as comprehensive as the Move PGH program in Pittsburgh, which is based on a substantive partnership among different stakeholders, excludes TNCs.[21] Full-fledged MaaS applications will require a governance and regulatory framework that would enable mutually beneficial partnerships among all stakeholders and alignment of mobility goals. A key question to answer would be whether these applications should be led by the public sector (city/ transit agency) or the private sector. A private sector-led effort, especially those led by big mobility service providers, runs the risk of creating "walled-gardens" that prioritize mobility services offered by the private company over other options such as public transit. Such prioritization can lead to increase in car use and emissions.[22]

19 Alice Grossman and Paul Lewis, "Data on Demand: A Case Study in the Los Angeles and Puget Sound Regions," February 11, 2020.

20 Elliot Martin, Ph.D, Adam Cohen, Evan Magsig, Susan Shaheen, Ph.D, and Les Brown, "Mobility on Demand (MOD) Sandbox Demonstration: Tri-County Metropolitan Transportation District of Oregon (TriMet) OpenTripPlanner (OTP) Shared-Use Mobility Evaluation Report," FTA Report No. 0170, July 2020.

21 The City of Pittsburgh, "Pittsburgh Launches Innovative Mobility and Equity Initiatives Move PGH and Universal Basic Mobility," July 9, 2021.

22 Erin Evenhouse, "Towards the Promise of Mobility as a Service (MaaS) in the U.S.," Shared-Use Mobility Center, July 2020.

In Europe, MaaS applications are outcome-driven and are geared toward reducing car dependency by expanding sustainable mobility options, inherently prioritizing public transport and operated by public transport agencies.[23] Regulations in Europe also support open data sharing among mobility service providers. Furthermore, street-design practices allow for coexistence of different mobility modes while emphasizing environmentally sustainable transport. All these factors explain why there is a stronger foundation for MaaS applications to emerge and be feasible over the long term in European cities as compared with U.S. cities.

2.3 Stakeholders

The process of data collection, aggregation, usage, and regulation of mobility data involves many public, private, and nonprofit stakeholders. As the motives are different for each of these actors, it is important to understand how each of them interface with mobility data and the implications for transportation outcomes and for associated data concerns (explained in detail in the next section).

Public entities often lack in-house resources and therefore rely on external support to process data for decision-making. So, keeping data open source is helpful in partnering with research institutions and transit labs.[24] Such public entities also are subject to public records legislation, obligating them to share data when requested by the public unless state legislation exempts them from sharing certain data types to eliminate privacy and other risks.[25] Sharing data openly saves time and effort that goes into responding to public record requests.

Private companies, unlike public agencies, tend to share data sparingly, with the intention of protecting customer data and proprietary information. Private entities also generally refrain from sharing data unless the monetary benefits of doing so clearly outweigh the costs. They are also wary of inviting regulatory oversight, surveillance, and enforcement through the data that they share. So government entities tend to use multiple levers and

23 American Public Transportation Association, "Being Mobility-as-a-Service (MaaS) Ready," APTA International Study Mission, June 2-8, 2019.

24 David Perlman, Kristin Tufte, Lafcadio Flint, and Tara Reel, "Emerging Data Science for Transit: Market Scan and Feasibility Analysis," Federal Transit Administration, U.S. Department of Transportation, Volpe Center, FTA Report No. 0218, June 2022.

25 Cecilia Viggiano, Glen Weisbrod, Shan Jiang, Emma Homstad, Melissa Chan, and Sarah Nural, "Data Sharing Guidance for Public Transit Agencies – Now and in the Future," Transportation Research Board, The National Academies of Sciences, Engineering, and Medicine, TCRP Research Report 213, 2020.

avenues, such as regulatory enforcement and partnerships, to nudge private stakeholders to share mobility data.[26]

Data-technology providers or mobility solution providers typically sell data processing and analytical capabilities to government agencies and other entities. For these entities, the objective is to equip state and local governments to make data-informed decisions while increasing their relevance in the marketplace.

Federal regulators play a role in defining and addressing larger data concerns related to privacy, security, and misuse of data. The Federal Trade Commission (FTC) and Federal Communications Commission (FCC) regulate and enforce privacy in specific cases (which are discussed in Section 3.2). The U.S. Department of Transportation (USDOT) along with its subsidiary agency, the Federal Transit Administration (FTA), has some regulatory authority over transit agencies as it disburses funding to these agencies.

Transit agencies that receive federal funding are required to share data on ridership, schedules, and other metrics, which is then aggregated and made available through the National Transit Database (NTD).

USDOT sometimes releases guidance and directives to states and local governments on how they could partner with mobility service providers. Currently, while there is no overarching federal regulatory framework to guide mobility-data collection and data sharing by the private sector, there have been many efforts by USDOT to build knowledge and expertise in that arena. States and local governments have greater regulatory power over private mobility service providers than the federal government (discussed in detail in Section 3.2).

26 Luke Rush, Matthews Cribioli, David Gohlke, Yan Zhou, Jarod Kelly, and Xinyi Wu, "Shared Mobility Data Availability and Usage Trends," Energy Systems Division, Argonne National Laboratory, May 2022.

Figure 1: Mobility Data Stakeholders in the United States

<table>
<tr><td colspan="2"></td><td colspan="5">Data Type or Source</td></tr>
<tr><td colspan="2"></td><td>Mass Transit</td><td>Microtransit/ On-demand transit</td><td>Micromobility</td><td>Ride-hailing</td><td>LBS</td></tr>
<tr><td rowspan="10">Function or Role of the Stakeholder</td><td>Data Provider/ Subject</td><td colspan="4">Mobility Service User or Subscriber</td><td>LBS User</td></tr>
<tr><td rowspan="2">Data Collectors</td><td colspan="2">Transit Agencies</td><td colspan="2">Mobility Service Providers</td><td>Internet Service Providers</td></tr>
<tr><td></td><td>Mobility Solution Provider</td><td colspan="2"></td><td></td></tr>
<tr><td>Data Owners</td><td colspan="2">Transit Agencies</td><td colspan="2">Mobility Service Providers</td><td>Internet Service Providers</td></tr>
<tr><td rowspan="3">Data Aggrega-tors/ Processors</td><td colspan="2">USDOT (FTA)</td><td colspan="2">Cities</td><td>BigData Tech Providers</td></tr>
<tr><td></td><td>Data Tech Providers</td><td colspan="2">Data Tech Providers</td><td rowspan="2"></td></tr>
<tr><td colspan="3"></td><td>States</td></tr>
<tr><td>Data Regulators</td><td colspan="2">USDOT (FTA)</td><td colspan="2">Cities</td><td>Federal Communications Commission (FCC)</td></tr>
<tr><td rowspan="2"></td><td colspan="2">Transit Agencies/ Cities/ States</td><td></td><td>States</td><td></td></tr>
<tr><td colspan="2"></td><td colspan="3">Federal Trade Commission (FTC)</td></tr>
</table>

Note:

a. This chart presents the universe of stakeholders involved in mobility data sharing in the United States. Due to varied regulatory approaches in different regions, there is some overlapping of stakeholders. For example, data processing for micromobility and TNC modes is handled in-house in certain cities and through a data-tech provider in certain other cities. In a few cities, it is a combination of both. The chart does not intend to suggest that all stakeholders listed are involved in the specific function.

b. "Mobility Service Providers" here refers to private companies that own and operate vehicle fleets and mobility infrastructure such as bike stations; "Mobility Solution Providers" refers to companies that offer technology and analytical platforms for supporting mobility operations; "Data Tech Providers" refers to private companies that process mobility data and offer data-analysis services; and "Big Data Tech Providers" refers to companies that procure and analyze big data from mobile devices.

3. Risks and Regulations

3.1 Data risks and barriers

Access to mobility data adds significant value to both public- and private-sector stakeholders. That value, however, comes at a risk, as the United States currently does not have the needed regulatory, enforcement, and technological systems to monitor data collection, sharing and usage.[27] Some data risks, such as privacy, misuse, and bias, impact the public and result in societal implications, whereas some risks specifically impact businesses and other entities.

Risks to the public

- **Privacy:** Data collected by mobility service providers comprises sensitive information, such as single locations a user has visited or even continuous movement paths and periodic mobility patterns. While removing personal identifiers from data before sharing it can enhance privacy, geolocational data can still be tied back to an individual based on regular trip patterns. Research shows that human mobility traces are highly unique, and just four spatio-temporal points with an hourly frequency and a spatial resolution offered by mobile phone carriers' antennas are enough to uniquely identify nearly 95 percent of individuals whose data was studied (the study covered 1.5 million individuals over 15 months).[28] This means that someone only needs very little additional information to re-identify a person within a mobility dataset. Datasets like voter lists and phone and address books can provide information about the home location, and that might already be sufficient. Social media or any other location-related dataset could provide the missing link.
- **Misuse:** Ubiquitous availability of data and easy mediums for data sharing can create the conditions for uncontrolled, unmonitored, and unauthorized usage of data. Data misuse often arises from the use of data from one context for which consent was provided and applying it to another context for which consent was not provided. One recent report noted that the risk of "loss of control" and misuse of data is amplified when the data is moved outside the information system of the data holder and shared

27 This section is informed by the report released by Cecilia Viggiano, Glen Weisbrod, Shan Jiang, Emma Homstad, Melissa Chan, and Sarah Nural, "Data Sharing Guidance for Public Transit Agencies – Now and in the Future," Transportation Research Board, The National Academies of Sciences, Engineering, and Medicine, TCRP Research Report 213, 2020.

28 Yves-Alexandre de Montjoye, César A. Hidalgo, Michel Verleysen, and Vincent D. Blondel, "Unique in the Crowd: The Privacy Bounds of Human Mobility," Scientific Reports 3, 1376, 2013.

further downstream.[29] Not all data misuse is intentional; incomplete or inaccurate data can lead to conclusions that are often misinformed and misguided.[30]

- **Bias:** Depending on the systems and technologies used, data collection could be biased against certain user groups, leading to outcomes that are non-inclusive. For example, micromobility and ride-hailing services are disproportionately used by people who have economic means to afford those services and have access to a smartphone and high-speed internet. Using such data to plan transportation services and infrastructure can exclude disadvantaged populations. Greater availability of data from companies such as Uber, Lyft, Waze, and TomTom, which are highly vehicle-based, can lead to solutions that cater more to vehicle users than an average mobility user.[31] For example, data on travel speeds and congestion from these companies can lead to cities adopting congestion-mitigation strategies, such as allocating more street space to vehicles, that are contrary to improving sustainability.

  Further, using data from location-based services over-represents people with access to mobile phones and internet services. Transit agencies and cities using such data to assess transit demand and make service-planning decisions will end up establishing policies that favor a minority of users if they don't use other complementary datasets to triangulate the data. Boston used an application to collect smartphone data about the condition of streets but realized that the results overrepresented wealthier neighborhoods where people have better access to smartphones.[32]

Risks to private companies and transit agencies

- **Proprietary:** Since private companies operate in a competitive marketplace, there is potential for mobility data to be used by a competitor to gain advantage. Mobility service providers have at times gained access to data to undermine their competitors.[33]

29 OECD, "Enhancing Access to and Sharing of Data: Reconciling Risks and Benefits for Data Re-Use across Societies," OECD Publishing, 2019.

30 Cecilia Viggiano, Glen Weisbrod, Shan Jiang, Emma Homstad, Melissa Chan, and Sarah Nural, "Data Sharing Guidance for Public Transit Agencies – Now and in the Future," Transportation Research Board, The National Academies of Sciences, Engineering, and Medicine, TCRP Research Report 213, 2020.

31 Lia Cattaneo, "Opportunities and Potential Bias in New Transportation Data," The Center for American Progress, March 21, 2018.

32 The White House, Executive Office of the President, "Big Data: Seizing Opportunities, Preserving Values," May 2014.

33 Alex Hern, "Uber Allegedly Used Secret Program to Undermine Rival Lyft," The Guardian, April 13, 2017.

Another concern related to sharing transit data via open data platforms is the risk of creating a competitive disadvantage for public transit agencies.[34] Private mobility service providers may have more resources to use publicly generated GTFS real-time and system data for understanding mobility demand and to then offer services that compete with transit providers.

– **Strategic:** Transit agencies are concerned about how the data they share can affect public perception of the entity, especially if it reveals shortcomings in performance or operations.[35] Private mobility service providers also share similar strategic risks when sharing mobility data. First, such data can expose these operators to regulatory oversight of their business practices, such as driver management and fare policy. Second, sharing data can also invite public scrutiny in a way that can have negative impacts on brand perception and customer trust. Such risks often make both transit agencies and private providers hesitant to share data.

In addition to these risks, there are other concerns such as the high costs of data collection, storage, and processing. Further, lack of internal capacities and expertise for data handling can dissuade an agency from investing in such information. Poor data standards and non-uniform data-sharing requirements across multiple jurisdictions also can lead to uncertainty for mobility operators and increase their costs of data reporting. Oversharing of data and excessive digitization is another concern that can have negative environmental impacts, as processing huge amounts of data requires data centers and servers, increasing energy use and emissions. These risks and concerns must be weighed against the benefits of data sharing, and steps must be taken to minimize them.

3.2 Regulations on data sharing

In the United States, there is little uniformity in how different stakeholders can engage with each other for sharing mobility data.

At the federal level, the adoption of the Digital Government Strategy and the Open Data Policy have led to efforts by public agencies to create open data platforms that allow for public data sharing.[36] All federal public agencies are also governed by public records laws

34 UITP Asia-Pacific Center for Transport Excellence, "Sharing of Data in Public Transport: Value, Governance and Sustainability," November 2020.

35 Cecilia Viggiano, Glen Weisbrod, Shan Jiang, Emma Homstad, Melissa Chan, and Sarah Nural, "Data Sharing Guidance for Public Transit Agencies – Now and in the Future," Transportation Research Board, The National Academies of Sciences, Engineering, and Medicine, TCRP Research Report 213, 2020.

36 National League of Cities, Center for City Solutions and Applied Research, "City Open Data Policies," 2016.

(the Freedom of Information Act), which require these agencies to share data with the public when requested. As mentioned, the FTA requires that transit agencies share information, which it makes available in the NTD.[37] The NTD data-reporting requirements might also extend to trips offered by private mobility companies via a partnership with transit agencies for improving multi-modal trip integration (e.g. MOD Sandbox Pilot).[38] There is no clear guidance from FTA on this.[39] Some transit agencies, however, require data sharing as part of the partnership.

Data-sharing regulations are nascent in the more recent on-demand mobility space. At the time of their launch, given their novel operational models, cities did not have the legal and governance framework to regulate TNCs. Some researchers argue that they are not only a "market disruptor," but also a "policy disruptor."[40] This meant that cities and states had to re-examine their regulatory approach and significantly reshape their response to these new market entrants. Many cities are currently working toward answering the question of how best to regulate and engage with private mobility service providers.[41]

In the United States, TNC regulations are absent at the federal level, except for some legal requirements concerning accessibility, which are governed through the Americans with Disabilities Act (ADA). State and local regulations, therefore, govern the operation of TNCs. California was the first state to regulate TNCs, and Colorado was the first to pass a statewide TNC legislation. As of 2019, 49 states and the District of Columbia have TNC laws.[42] State-level TNC regulations typically span issues such as taxi permit requirements, public safety requirements, fare regulation, insurance requirements, data reporting, and accessibility, among other considerations.

Most states (about two-thirds) have preempted local governments from regulating TNCs, therefore retaining authority to make regulations and enforce them, including

37 Martin Catalá, "FTA Open Data Policy Guidelines," Federal Transit Administration, U.S. Department of Transportation, FTA Report No. 0095, April 2016.

38 The Mobility on Demand (MOD) Sandbox Program is supported by FTA to encourage innovative mobility projects implemented by public, private, or nonprofit entities to improve integration across all modes, with the objective of improving transportation efficiency and effectiveness.

39 Jocelyn K. Waite, "Legal Considerations in Relationships Between Transit Agencies and Ridesourcing Service Providers," Transportation Research Board, National Academies of Sciences, Engineering, and Medicine, 2018.

40 Zachary Spicer, Gabriel Eidelman, and Austin Zwick, "Patterns of Local Policy Disruption: Regulatory Responses to Uber in Ten North American Cities," Review of Policy Research, 2018.

41 Ashley Z. Hand, "Urban Mobility in a Digital Age: A Transportation Technology Strategy for Los Angeles," Office of the Mayor and Department of Transportation, City of Los Angeles, August 2016.

42 Washington State Joint Transport Committee, "Policy Guide: Regulation of Transportation Network Companies," January 2019.

data-reporting requirements.[43] There are very few exceptions to this norm, including New York City, Philadelphia, and Washington D.C., which have specific authority to regulate TNCs. A few other states have legal carve-outs for state preemption, allowing for local regulatory authority over TNCs.[44] Illinois and South Dakota have set floor regulations while allowing cities to pass more stringent local laws. Nevada allows large cities to be exempted from preemption.

One outcome of such preemption laws is that data reported by the TNCs to state agencies can't easily be shared with local agencies, limiting the usability of the data for local planning and enforcement. It also limits the regulatory authority of the city to minimize negative effects, such as congestion and vehicular emissions, from TNCs and improve positive outcomes, such as improved accessibility and mobility choice. For example, Chicago taxes single-ride TNC trips in the downtown area, and the money from this is used to fund public transit initiatives. Such outcomes are not possible if regulatory power is not vested in cities.

Regulating micromobility service providers has been simpler for cities than regulating TNCs. This is because these services can be easily subject to enforcement, given that bikes and scooters are lighter and easier to confiscate in case of a violation.[45] Many cities have tied licensing to data-reporting requirements for private micromobility service providers. Such reporting requirements differ from city to city and are typically outlined in the licensing requirements of the local municipal code. In cases where the city contracts out the operation of these services to a private operator, data reporting can be made mandatory as part of the contract agreement. Data sharing in the GBFS or MDS format has become a norm in most cities. Some operators also voluntarily share trip data on their platforms.

3.3 Privacy and data security regulation

Privacy and data security are important considerations affecting data sharing not just in the mobility sector, but across all sectors that involve collecting and handling personal information. Privacy and data security laws have become more popular in the last two decades with the increase in digitization: 71 percent of countries globally have laws that regulate data protection and privacy in some form or the other.[46] The EU General Data

43 Jocelyn K. Waite, "Legal Considerations in Relationships Between Transit Agencies and Ridesourcing Service Providers," Transportation Research Board, National Academies of Sciences, Engineering, and Medicine, 2018.

44 Washington State Joint Transport Committee, "Policy Guide: Regulation of Transportation Network Companies," January 2019.

45 Rasheq Zarif, Derek Pankratz, and Ben Kelman, "Small is Beautiful: Making Micromobility Work for Citizens, Cities, and Service Providers," Deloitte Insights, April 16, 2019.

46 UNCTAD, "Data Protection and Privacy Legislation Worldwide," accessed April 27, 2023.

Protection Regulation (GDPR) was adopted in 2016 and came into force in 2018 to protect the personal data, privacy and other fundamental rights of people in the EU. It covers all entities within the EU that process personal data, as well as all entities outside the EU that either process personal data of people in the EU in the context of offering them goods or services, or that monitor the behavior of people in the EU.[47]

Federal regulation

The Privacy Act of 1974 was the first to regulate privacy in the United States, but the applicability is limited to handling of personal data in the systems and records of federal agencies.[48] A broad federal privacy law which protects personal data of all citizens is absent in the United States. Congress has considered bills that are similar to GDPR for regulating data privacy in the past, but none have passed. These efforts are ongoing.

The FTC and FCC regulate and enforce privacy in specific cases when there is breach in consumer privacy, when privacy problems constitute "unfair" or "deceptive" trade practices, or when mobile operators release consumer data without the needed consent. For example, in 2018, FTC filed a complaint against Uber alleging the company did not take enough security measures to protect customer and rider information.[49] FTC and FCC also regulate mobile operators that handle geolocational data, which is often used for mobility planning. Recently, FTC sued a data broker, Kochava, for mishandling geolocation data that revealed sensitive information of mobile users.[50]

State regulation

Individual states have their own laws applicable to public and private entities to regulate consumer privacy and data security. Privacy laws generally define the obligations of businesses or data collectors to share information with consumers about the data being collected and the rights of the consumers to opt out of collection and sale of information. Data security laws require that entities employ necessary security measures to protect personal information, including limiting unauthorized access, usage, or modification.[51]

47 NACTO, "Managing Mobility Data," 2019.

48 U.S. Department of Justice, Office of Privacy and Civil Liberties, "Privacy Act of 1974," accessed April 25, 2023.

49 United States of America before the Federal Trade Commission, "Complaint in the Matter of Uber Technologies, Inc, a Corporation," Docket No. C-4662, October 2018.

50 Federal Trade Commission, "FTC Sues Kochava for Selling Data that Tracks People at Reproductive Health Clinics, Places of Worship, and Other Sensitive Locations," August 29, 2022.

51 National Conference of State Legislatures, "Data Security Laws: Private Sector," updated May 29, 2019.

There are no sector-specific privacy and data security laws that pertain to mobility data. In some cases, the state law specifies rules for sharing PII by TNCs. For example, Colorado law, with some exceptions, states that no TNC is allowed to disclose PII of the rider to a third party without their consent.[52] In the absence of a uniform regulatory framework at the federal level for privacy and data security in the transportation sector, some private companies adopt and publish their own privacy guidelines on their sites. StreetLight Data, for example, follows a set of "privacy by design" principles and only works with vendors that follow privacy guidelines.[53]

At least 32 states have enacted laws that require security measures to protect the data they hold.[54] While most of these laws are limited to state agencies, some (e.g. Alabama, Nevada, North Dakota) also include local governments and others (e.g. Texas) are applicable to third party vendors and contractors of state agencies. Further, at least 25 states have passed data security laws that are specifically applicable to private entities.[55]

As of March 2023, six states passed comprehensive privacy laws. California's Consumer Privacy Act (CCPA) was the first in 2018 and requires businesses to proactively disclose to their consumers what information is being collected, the purpose of collection, and if the information is being shared with or sold to a third party.[56] It also requires that businesses implement necessary data protection measures to prevent unauthorized access. Consumers are empowered to request the deletion of collected data and opt out of the sale or sharing of personal information with a third party. California also has a dedicated privacy protection agency.

Privacy laws also exist in Colorado, Connecticut, Virginia, Utah, and Iowa, and are under consideration in several others. While California's law is applicable to businesses (defined broadly), other states have expanded the applicability of law to "controllers," which can include individuals, corporations, businesses, trusts, nonprofits, and other entities.[57]

52 State of Colorado, Secretary of State, Department of Regulatory Agencies, "Code of Colorado Regulations: Rules Regulating Transportation by Motor Vehicle," 4 CCR 723-6, undated.

53 StreetLight Data, "StreetLight Data privacy principles," accessed April 7, 2023.

54 National Conference of State Legislatures, "Data Security Laws: State Government," updated February 14, 2020.

55 National Conference of State Legislatures, "Data Security Laws: Private Sector," updated May 29, 2019.

56 Office of the Attorney General, "California Consumer Privacy Act of 2018."

57 International Association of Privacy Professionals, "US State Comprehensive Privacy Laws: 2022 Legislative Session," March 2023.

Aggregated or anonymized information typically is exempt from such regulation.[58] In most states, the attorneys general have rulemaking and enforcement authority in implementation of privacy laws.[59]

Local regulation

State-level privacy and data security laws apply to local governments only in some rare cases.[60] Most major cities are, however, cognizant of data privacy and security issues and are innovating to improve their privacy regulations within their jurisdictions. New York City Administrative Code defines procedure for its employees, contractors, and subcontractors for handling "identifying information" and has set forth privacy protection policies to be implemented by the Chief Privacy Officer.[61]

Transit agencies also have privacy guidelines that they follow when sharing data. The general norm is that they avoid sharing individual records that can reveal personal information unless the data is being shared with trusted partners through a non-disclosure agreement. Transit agencies also have varied practices for sharing aggregated data that has fewer records and has the potential for revealing personal information.[62]

58 Cecilia Viggiano, Glen Weisbrod, Shan Jiang, Emma Homstad, Melissa Chan, and Sarah Nural, "Data Sharing Guidance for Public Transit Agencies – Now and in the Future," Transportation Research Board, The National Academies of Sciences, Engineering, and Medicine, TCRP Research Report 213, 2020.

59 International Association of Privacy Professionals, "US State Comprehensive Privacy Laws: 2022 Legislative Session," March 2023.

60 Golden Data Law, "Smart Cities, Privacy and Community Control: Are We There Yet?" Medium, May 16, 2022.

61 Michael Fitzpatrick, Chief Privacy Officer, "Citywide Privacy Protection Policies and Protocols," City of New York, Office of Technology and Innovation, February 6, 2023.

62 Cecilia Viggiano, Glen Weisbrod, Shan Jiang, Emma Homstad, Melissa Chan, and Sarah Nural, "Data Sharing Guidance for Public Transit Agencies – Now and in the Future," Transportation Research Board, The National Academies of Sciences, Engineering, and Medicine, TCRP Research Report 213, 2020.

4. Data-Sharing Models

Cities take varied approaches to accessing, sharing, and using mobility data, depending on the state and local regulations. This section focuses on models that cities use to access mobility data from private mobility service providers. Transit agencies are not a focus here given that cities and other public and private entities already have access to public transit data in most cities. Borrowing from previous research, we identify four primary data-sharing models:[63]

Permit/licensing rules: The common data-sharing model for TNCs and micromobility services is for cities to include data reporting as a requirement for obtaining a permit or license to operate in their jurisdiction. These requirements vary depending on the data needs and statutory responsibilities of the regulatory authority. For example, in New York, TNC data is generally geared toward assessing labor issues such as driver pay and working conditions. In some cases, a state agency (e.g. California) has regulatory authority over licensing and, therefore, also has the authority to collect data from the provider. As compared to TNCs, there is more uniformity in data sharing and usage in the micromobility space, due to the existence of the GBFS and MDS data standards.

Contracting or partnerships: Cities commonly have contractual agreements with private companies to provide microtransit and bike share services. In these scenarios, cities have better control over the data-sharing process, as such requirements can be part of the service- or partnership agreement. Microtransit services are often operated as a public-private partnership between the transit agency and a private company. The responsibility of the private company could be limited to providing technology platforms and analytics for coordinating on-demand transit rides or could also include providing vehicles and drivers. The private company shares mobility data with the transit agency or the city. Similarly, private companies that operate bike share services for the city share data in the GBFS format on their platforms. As for e-scooter share services, cities are still in the process of testing these models through short-term pilots. Data from such pilot operations can be more detailed and are shared with the city by the operator.

Third parties: Some cities gain access to and use mobility data via a third-party agency, often a nonprofit research organization or an educational institute. The agency mediates data sharing and analysis between the public and private sector.[64] The benefits of such a system are that the third party is better equipped with talent and resources to maintain secure access to data and deal with data privacy concerns. Some cities, however, do not

63 Ibid.

64 International Transport Forum, "Reporting Mobility Data: Good Governance Principles and Practices," International Transport Forum Policy Papers, No. 101, OECD Publishing, 2021.

prefer such a system, as it is hard to maintain direct regulatory control over mobility service providers, and the cities do not have direct access to data for enforcement. Large cities that deal with extensive transport systems can invest in building in-house resources and capacity to access and analyze mobility data for informing planning, regulation, and enforcement. Smaller cities do not have sufficient need to build such capacities, making room for third-party entities to provide such expertise.

Data purchase: This is a common way for cities and transit agencies to obtain LBS (location-based services) data from internet service providers (ISPs). This data is often anonymized and aggregated at the census-tract level and is often used for transportation planning. Since this data covers all types of users with access to a smartphone and location-based applications, it can offer multi-modal insights and help capture latent transit demand in neighborhoods that are not served by transit agencies. LBS data is typically procured by mobility-solution providers and sold to cities and transit agencies via data-licensing agreements along with analytical capacities.

Figure 2: Data-Sharing and Reporting Approaches in U.S. Cities

Data reporting or sharing model	Permits/Licensing	Contracting/ Partnerships	Third-party	Data Purchase
Data type or source	Micromobility Ride-hailing	Microtransit Micromobility	Micromobility Ride-hailing	LBS Data
Data access instrument	Permit Regulations	Service Agreement/ Partnership Agreement	Pertnership Agreement/ License Agreement	License Agreement

Note: This chart outlines the predominant data-reporting approach used for different transport modes or data types. It does not try to indicate that the approach is fixed for each mode or data type.

5. Case Studies

Los Angeles, New York, and Chicago serve as good examples to examine mobility data-sharing practices in big U.S. cities. They are the top three cities in the country in terms of population, with each serving as home to upwards of 2.5 million people. Their mobility systems are extensive, comprising a range of public transport, ride-hailing, and micromobility options. Los Angeles pioneered the Mobility Data Specification (MDS) for micromobility data sharing, whereas New York and Chicago have been comparatively more successful in accessing data from ride-hailing companies for furthering their sustainability and equity goals. These case studies illustrate how regulations, governance, and local policy priorities positioned these cities to access data from private mobility service providers. We also evaluate the tools these cities have used to gain greater access to mobility data, the resistance they faced from private providers, and some past examples of data usage.

5.1 Los Angeles

The MDS open source data specification that Los Angeles pioneered serves as a two-way communication system between the city and the mobility service provider through which notifications are shared. Through MDS, mobility service providers notify the city of various events and incidents at a preset frequency, and the cities push notifications to the mobility service providers to ensure compliance. These specifications are applicable for shared micromobility services and include the trip start and end locations and the route of the ride. Taxis are regulated by local governments, while app-based ride-hailing services (TNCs) are regulated by the California Public Utilities Commission (CPUC).

Micromobility data: development of MDS

The expected development of autonomous vehicles (AVs) provided the impetus for the city to develop MDS, as it anticipated that communicating with vehicles (which operate without a driver) would require a new approach as compared to their conventional means of communicating with the drivers. Ultimately, the city could not employ MDS for regulation of AVs, but the subsequent arrival of dockless micromobility systems – scooters and bikeshare systems – provided an opportunity to test this new regulatory approach. MDS is now used by about 120 cities around the world.[65]

The Open Mobility Foundation (OMF) is a private, nonprofit organization that manages MDS and was established by a coalition of cities interested in finding regulatory solutions to the evolving mobility options in cities. As per OMF, an open-standard specification model

65 Open Mobility Foundation, "Lessons Learned from the Open Mobility Foundation," March 2021

like MDS reduces complexity and costs for the government and the private sector alike. Any updates to MDS are based on consensus from the members of the OMF, including private mobility service providers.

Privacy concerns

Los Angeles initially faced resistance from mobility service providers, which raised concerns that MDS data could put riders' privacy at risk and harm business competitiveness by leaking proprietary information. Both concerns, are tied to the fear that public agencies do not have systems and capacities in place to ensure data security. Some public agencies are also subject to public records requests under local equivalents of the federal Freedom of Information Act, requiring them to share data that they own and collect. The Los Angeles Department of Transportation (LADOT) was sued by the American Civil Liberties Union (ACLU) over the use of MDS,[66] alleging that the system violated the Fourth Amendment of the U.S. Constitution, which prevents unlawful search and seizure. The ACLU argued that MDS data could be used for law enforcement and could also lead to race- or gender-based violence. The U.S. District Court, however, ruled that MDS did not violate the Fourth Amendment, finding LADOT's interests as "legitimate and substantial" and dismissing the privacy concerns raised by the ACLU.[67]

In California, privacy is governed under the state's Consumer Privacy Act (CCPA), which is applicable to businesses (defined broadly). State agencies also are subject to a data security law, but neither of these laws cover local governments. In response to concerns raised by mobility service providers, Los Angeles established a set of Data Protection Principles in 2019 and committed to apply them to MDS data. These principles exempt certain confidential data (such as raw trip data) from the state's public record laws, minimize data through de-identification and aggregation, limit access to third parties, and ensure data security and protection.[68] Los Angeles also updated its document-retention procedures to ensure that the public cannot access individual trip-level data that can endanger riders' privacy.

The collection of MDS data can have varying privacy implications depending on the purpose of data collection by the public entity, whether the riders are informed about what data is collected, the state and local laws, and the governance structure.[69] One way privacy can be endangered is when MDS data is combined with other external datasets, which can lead

66 Andrew J. Hawkins, "The ACLU is Suing Los Angeles over its Controversial Scooter Tracking System," The Verge, June 8, 2020.

67 United States District Court, Central District of California, "Justin Sanchez, et. al v. Los Angeles Department of Transportation, et al.," February 23, 2021.

68 City of Los Angeles, Department of Transportation, "LADOT Data Protection Principles," April 12, 2019.

69 Open Mobility Foundation, "Using MDS under GDPR," accessed March 22, 2023.

to identification of personal information. OMF offers guidance to its members and other public entities for complying with widely accepted privacy standards such as Europe's General Data Protection Regulation (GDPR).[70]

California Public Utilities Commission: TNC data

State law in California gives exclusive regulatory authority over for-hire passenger services (limos and charter bus services) and TNCs to the CPUC. Medallion taxis are outside CPUC's purview and are governed by local governments. In 2013, CPUC started regulating TNCs in San Francisco and other parts of the state, requiring that all TNCs obtain a license from the commission to operate. As part of the licensing process, the commission adopted data-reporting requirements, which required that licensees share data on drivers, traffic incidents, trips (origin and destination location and time of request), and accessibility (trips catering to persons with disabilities) with the commission.

The commission has since expanded the reporting requirements and, in 2020, published a decision to align TNC data-reporting requirements with confidentiality rules applicable to all other regulated entities.[71] This meant that TNC data would now be made available to the public. Further, this rule places the burden of proof on TNCs to demonstrate that the data TNCs share with the CPUC contains confidential information (if they are opposed to it being shared openly). Following this decision, Uber and Lyft argued that publishing the data can have privacy implications for its drivers and riders and can disclose trade-secret information.[72] They requested that certain trip information be redacted from their data-sets before making them public. Subsequently, an Administrative Law Judge (ALJ) issued a ruling denying such redaction while allowing redaction of personally identifiable information (PII), such as driver names and geolocational data (latitude and longitude information).[73] CPUC publishes TNC annual reports on their website by redacting PII and trade-secret information.[74]

70 Ibid.

71 State of California, California Public Utilities Commission, "Decision on Data Confidentiality Issues Track 3," Decision 20-03-014, March 12, 2020.

72 State of California, California Public Utilities Commission, "Motion of Uber Technologies, Inc. for Leave to File Confidential Information Under Seal; Proposed Order," R.12-12-011, December 20, 2012

73 State of California, California Public Utilities Commission, "Order Modifying Decision 22-05-003 and Denying Rehearing of the Decision, as Modified," Rulemaking 12-12-011, February 23, 2023.

74 State of California, California Public Utilities Commission, "TNC Data Portal," accessed April 18, 2023.

Data usage

The MDS data that cities collect is currently being used to advance varied objectives, including efficiently managing right of way, improving road safety, and planning infrastructure. Based on an extensive list of MDS use cases maintained by OMF, the data collected was found to be used for planning, enforcement, mobility operations management, program evaluation, and improved public communication and transparency of data.[75]

Using MDS data, LADOT ran a one-year pilot to study the mobility impacts of dockless services in the city. The data showed that dockless services expanded mobility options for residents and demonstrated the potential to advance accessibility, equity, safety, and people's quality of life. The pilot, however, showed that dockless services primarily served residents from wealthy neighborhoods, exacerbating some equity concerns.[76]

TNC data collected by CPUC is used for policymaking and enforcement, including dealing with cases of substance abuse and other kinds of violations (CPUC performs enforcement activities in a quasi-judicial manner). CPUC also uses this data to fulfill its statutory requirements, including planning the transition to zero-emission vehicles in the state. For example, in 2018, CPUC studied TNC data to evaluate the potential for transition to electric vehicles in the TNC industry.[77] Further, CPUC is working with the California Air Resources Board (CARB), which oversees air quality, to implement the Clean Miles Standard to reduce greenhouse gas emissions from TNC vehicles by switching to zero-emission alternatives.[78]

5.2 New York

New York, unlike most other major cities, has wide regulatory authority afforded to it by the state to regulate and enforce all mobility operations in the city. It is also one of the first few cities to mandate reporting of trip-level data from TNCs. The New York City Taxi and Limousine Commission (NYC TLC) is responsible for regulating medallion taxis, for-hire taxis (limos and community-based liveries), and paratransit services. The commission issues licenses to TNCs and mandates data reporting as part of that process. The city's 2012 Open Data Law mandated that all eligible public records and datasets, including TNC

75 Open Mobility Foundation, "What's Possible with MDS," October 20, 2020.

76 City of Los Angeles, Department of Transportation, "LADOT Year One Snapshot: A Review of the 2019-2020 Dockless Vehicle Pilot Program," July 2020.

77 Simi Rose George and Marzia Zafar, "Electrifying the Ride-Sourcing Sector in California: Accessing the Opportunity," California Public Utilities Commission, State of California, April 2018.

78 State of California, California Public Utilities Commission, "Clean Miles Standard," accessed April 12, 2023.

data, be published on a single open data portal by 2018.[79] New York's public bike share system operator, Lyft, also publishes trip data on the Citi Bike website.[80]

TNC Data: NYC Taxi and Limousine Commission (NYC TLC)

TLC already had a regulatory framework for TNCs in 2012. This allowed it to issue licenses to these companies based on the requirement that they share trip records with the city when requested. In 2015, TLC started collecting trip data from TNCs, including vehicle license plate, driver license, pick up locations, and pick up time. This move was opposed by Uber on the grounds that it could reveal private information about its riders, leading to Uber temporarily closing a few of its offices in the city. [81] [82]

Since inception, TLC has expanded the amount of data it collects from TNCs, including wait times, drop-off locations, driver pay, and fares, which repeatedly invited opposition from these TNCs.[83] Currently, TNCs are expected to report data either every two weeks or monthly depending on the data file, but there are efforts by the TLC to increase the frequency.[84] TLC initially published these trip records on the city's open-data portal by merely redacting the driver and vehicle license information. Since then, TLC has modified the data formats that it publishes to redact any PII that could endanger privacy.[85]

The TLC essentially requires the same information from medallion taxis as from TNCs, but the technology installed in the vehicles is different. The in-vehicle technology in regular taxis is provided by two technology providers, Curb and Arro, which collect and share the data with the city. TNC data is compiled and reported by the businesses that operate them.

79 The New York City Council, "A Local Law to Amend the Administrative Code of New York, in Relation to Publishing Open Data," July 2012.

80 Citi Bike, "System Data" accessed March 30, 2023.

81 Dana Rubinstein, "Uber Objects, Selectively, to Data-Sharing Requirement," Politico, November 20, 2014.

82 Alex Hern, "Uber NYC Closes Five Offices over Data Sharing Squabble," The Guardian, January 12, 2015.

83 Faiz Siddiqui, "Uber and New York City Spar over Rider Data," The Washington Post, January 5, 2017.

84 City of New York, Taxi and Limousine Commission, "High-Volume For-Hire Services," accessed March 24, 2023.

85 New York City Taxi and Limousine Commission, "What Makes a City Street Smart," Medium, January 31, 2019

Micromobility: NYCDOT

New York's public bike share system is operated as part of an exclusive multi-year public-private partnership between New York City and the operator, Lyft.[86] The data generated from bike operations, including trip records and real-time feeds of station status, is fully owned by the operator, not the city. The operator publishes trip-level data, including latitude and longitude of origin and destination, for all its trips. It also publishes real-time system data on the status of bike stations and bikes in the GBFS format. In addition to this, it shares monthly operating reports with NYCDOT that contain aggregate data on the total number of trips and financial data such as total surcharges and refunds.

Data usage

The data published by TLC is used to inform planning and regulations on a wide range of issues, including congestion-pricing policy, comparison of average speeds of buses and taxis, and charging infrastructure. One example is regulations pertaining to driver working hours. TLC analyzed trip data to understand the working hours of drivers, and passed regulations on daily and weekly working-hour limits along with penalties for violating companies.[87] This may have led to a decrease in road fatalities involving TLC drivers in 2018 as per some reports.[88] TLC also passed minimum pay standards (which establishes a pay floor for each trip) for drivers after analyzing driver pay,[89] and introduced vehicle caps to deal with increasing congestion.[90] TLC intends to use the data it collects to also aid a transition to electric vehicles in the TNC industry and aims to modify the data to include information about whether a vehicle is electric or not. Anonymized TNC trip data published by TLC has also been used by researchers to study impacts of ride-hailing on mobility and usage of transit in New York City.[91]

TLC has in-house capacity (database administrators and data analysts) to ingest, clean, and analyze the data collected. TLC data analysts publish several reports based on analysis of for-hire vehicle movements in the city, including density of trips in different neighborhoods and wheelchair accessibility in vehicles.[92] TLC, however, is in the exploratory phase

86 Alissa Walker, "What Does the Potential Demise of Lyft Mean for Citi Bike," Curbed, April 6, 2023.

87 City of New York, Taxi and Limousine Commission, "Driver Fatigue," accessed April 11, 2023.

88 New York City Taxi and Limousine Commission, "What Makes a City Street Smart," Medium, January 31, 2019

89 City of New York, Taxi and Limousine Commission, "Driver Income Rules," December 4, 2018.

90 Emma G. Fitzsimmons, "Uber Hit with Cap as New York City Takes Lead in Crackdown," The New York Times, August 8, 2018

91 Schaller Consulting, "Unsustainable? The Growth of App-Based Ride Services and Traffic, Travel, and the Future of New York City," February 27, 2017.

92 New York City Taxi and Limousine Commission, "What Makes a City Street Smart," Medium, January 31, 2019

of working with a third party to manage the data-ingestion process. Engaging a third party for data processing has become a bigger possibility now, given the ongoing workforce shortages in the public sector across the United States.

The trip-level data published by the public bike share system is widely accessed and analyzed by universities and independent researchers to understand trip patterns and whom the trips are serving. In 2022, researchers from three universities used this data to study the environmental benefits from the bike share system in New York.[93] In 2019, a study published by McGill University using this data concluded that the Citi Bike network primarily serves privileged people that already experience strong transit connections in their neighborhoods.[94] In response, NYCDOT and Lyft announced the formation of an Equity Advisory Board, which will work toward ensuring the new expansions of the bike share system are inclusive and equitable.[95]

5.3 Chicago

Chicago, like New York, has broad regulatory authority afforded to it by the state to access mobility data from private providers. This is because the state's TNC law, the Transportation Network Providers Act, only preempts local governments from regulating TNCs in a manner that is less restrictive than the state governments.[96] This means that Chicago has authority to regulate TNCs as long as it meets the regulation floor set by the state. The city owns the data collected through its public bike share system and permits the operator to share historical trip data and live station data in the GBFS format.[97]

TNC data

Chicago's Business Affairs and Consumer Protection (BACP) department regulates TNCs, including licensing and data-reporting requirements.[98] The data collected pertains to vehicles, drivers, trips, sessions, and compensation, and is collected in CSV file formats. The

93 Yan Chen, Yongping Zhang, D'Maris Coffman, and Zhifu Mi, "An Environmental Benefit Analysis of Bike Sharing in New York City," Cities, Volume 121, February 2022.

94 David Wachsmuth, Robin Basalaev-Binder, Natalie Pace, Lou Seltz, "Bridging the Boroughs: How Well Does New York's Bike Sharing System Serve New Yorkers," School of Urban Planning, McGill University, July 2019.

95 City of New York, Department of Transportation, "NYC DOT and Lyft Announce New Citi Bike Equity Advisory Board to Ensure Inclusive and Equitable Bike Share Expansion to Additional NYC Neighborhoods," November 20, 2019.

96 Illinois General Assembly, "Vehicles (625 ILCS 57/) Transportation Network Providers Act," 2021.

97 City of Chicago, Department of Transportation, "Divvy Data," accessed March 7, 2023.

98 City of Chicago, "Municipal Code of Chicago," Chapter 9-115 Transportation Network Providers, 9-115-210 Records and Reports

BACP Commissioner periodically updates the data format and reporting procedure, usually after discussing such changes with the TNCs and giving them time to comply with the new regulations. The data was originally collected quarterly and is now gathered monthly.

Chicago takes several steps to ensure data security and to safeguard the privacy of drivers and riders. BACP does not require TNCs to report any personally identifiable information (PII) such as name, date of birth, zip code, phone number, or gender of the rider. To prevent re-identification, Chicago also aggregates location data at the census-tract level and rounds times to the nearest 15 minutes and fares to nearest $2.50.[99] Further, an additional layer of data protection is added by aggregating trips to the community-area level in census tracts where two or fewer trips occur in any given 15-minute window.[100]

Micromobility

The public bike share system in Chicago (Divvy) is operated through a public-private partnership between the city and Lyft. The trip data is anonymized and includes trip start date and time, trip end day and time, geolocational data of trip start and end stations, and rider type. This data is available for trips starting from 2013. While the data was summarized and reported quarterly until 2020, it is now being reported once a month. Lyft also publishes live data on the status of Divvy stations and bikes in the GBFS format.

Between 2019 and 2020, Chicago ran pilot programs to test e-scooter sharing services. One of the conditions for vendor participation in the pilots was that they had to share data on scooter trips and operations.[101] In 2022, the city added scooters to its existing bike share system and issued licenses to three operators.[102] In 2023, Chicago released a set of rules and regulations applicable to licensees, including rules on how they should report data.[103] The requirements stipulate that the operators should provide full access to their MDS API and interface their API to the city's API. The operator is also expected to make system data available to the public in the GBFS format.[104] Chicago hired a third-party

99 City of Chicago, "Chicago Data Portal: Transportation Network Providers – Trips (2018-2022)," updated March 29, 2023.

100 City of Chicago, "How Chicago Protects Privacy in TNP and Taxi Open Data," accessed March 19, 2023.

101 City of Chicago, Department of Transportation, "Scooter Sharing in Chicago," accessed March 19, 2023.

102 City of Chicago, Department of Transportation, "2022 Shared Scooters," June 14, 2022.

103 City of Chicago, "Scooter Sharing Business Rules," February 24, 2023.

104 Ibid.

company, Populus, to manage and analyze the data received from micromobility (bike share and scooter share) operators.[105]

Data usage

Bike share data released by Chicago in the past has been used by independent researchers to study trip patterns, types of users, and associated equity impacts. [106] [107] [108] The city analyzed ride-hailing trips from 2015, showing that traffic in the downtown area was higher than in any other area in the city.[109] Based on these findings, it introduced a new taxation structure for TNCs to reduce congestion and encourage usage of sustainable modes of transit. It increased per-trip taxes on single ride-hailing trips, decreased per trip taxes on shared ride-hailing trips, and assessed a new downtown surcharge on all trips within the designated downtown area during peak times on weekdays.[110]

The Chicago Metropolitan Agency for Planning (CMAP) also used the data published by the city to conduct an analysis of TNC trips to study their impacts in the region.[111] CMAP used this data to draw some useful observations, including that TNC trips in economically disconnected areas are longer than average and that they are more likely to be shared by multiple people as compared with trips in other regions.

However, CMAP also pointed to significant data limitations that prevent drawing conclusions that are useful for regional planning. First, the trip data only pertains to trips originating or ending within the Chicago city boundaries, limiting the effectiveness of data for regional planning. Second, aggregating geo-locational data to the census-tract level does not offer the granularity needed for performing detailed analyses of TNC operations. Third, lack of information on vehicle dwell times and vehicle occupancy, limits analyses of how TNCs impact congestion in the city. All these point to legitimate data needs of city and regional planning agencies that are currently not being met through the existing data-reporting requirements.

105 Skip Descant, "Populus Tapped as Data Management Platform for Chicago Scooters," Government Technology, July 7, 2022.

106 Usman Aftab Khan, "Exploratory Data Analysis: Cyclist Bike-Share Analysis Case Study," Medium, August 9, 2022.

107 Samaksh Goyal, "Oh, the Places You'll Go! Analyzing Chicago Divvy Bike Share Data," Heavy.Ai, July 11, 2019.

108 Julia Ursaki and Lisa Aultman-Hall, "Quantifying the Equity of Bikeshare Access in US Cities," University of Vermont Transportation Research Center, TRC Report 15-011, June 2015.

109 City of Chicago, "Transportation Network Providers and Congestion in the City of Chicago," October 2019.

110 City of Chicago, Business Affairs and Consumer Protection, "City of Chicago Congestion Pricing," accessed March 28, 2023.

111 Chicago Metropolitan Agency for Planning, "New Data Allows an Initial Look at Ride Hailing in Chicago," accessed March 28, 2023.

6. Key Observations and Recommendations

Mobility data has immense potential to help cities realize their vision of making transportation safe, efficient, environmentally sustainable, and equitable. Cities are aware of this potential and are building regulatory, governance, human, and technological capacities to collect, access, and use mobility data. They are also taking measures to ensure that harnessing data for improving mobility outcomes does not come at the cost of invading privacy or causing proprietary concerns, misuse, or misapplication of data. Likewise, private mobility service providers are finding ways to collaborate with cities to share data securely. In some cases, they are resisting government intervention in their operations to protect their business interests. As we have seen, cities are testing a variety of regulatory and engagement approaches to push mobility service providers to share data.

The following key observations, derived from our research and interviews with industry and government stakeholders, are aimed at improving data sharing and usage in U.S. cities for moving toward an urban mobility system that is environmentally sustainable, accessible, and equitable. These are mainly applicable to cities but also the federal government, private mobility service providers, and nonprofits.

6.1 Harmonize data-sharing requirements for private mobility service providers

The process of sharing mobility data is not necessarily uniform in terms of format, regulations, and governance.

Formats: Data-reporting formats and frequency vary widely for TNCs operating in different cities.

Regulations: Legislation and rules pertaining to TNCs, privacy, and data security vary significantly as well, depending on state and local laws. There also are differences in data-sharing obligations for micromobility service providers that offer services through a contract or partnership with cities.

Governance: While cities have regulatory authority over micromobility services, the same is not the case for TNCs because of state-level preemption laws. U.S. cities are not uniformly equipped to plan and manage mobility in their cities, as some cities don't have control over TNC operations.

Expectations of data reporting vary based on the negotiating power of cities. This can create regulatory uncertainty and impose unnecessary time and cost burdens for businesses

that navigate these regulatory differences. There are a few positives to maintaining non-standard data-reporting requirements across different cities as it will allow for a nuanced local approach depending on the data and regulatory needs the city has. But standardization should be the goal, to the extent possible, to reduce regulatory and procedural uncertainty for private mobility service providers.

Data standardization, as MDS has shown, will create procedural certainty for mobility service providers operating in different cities and help reduce data-reporting time and costs. Nonprofits such as OMF and MobilityData already are trying to standardize data reporting through a coalition of public- and private-sector members. Efforts could also be directed toward standardizing regulations and contractual obligations, at least across major cities, to offer a uniform experience for mobility service providers. The federal government could also issue guidance on regulatory approaches to engage with mobility service providers in big and small cities.

6.2 Improve data usage in the public sector

Mobility data is already widely available for cities to process and analyze. Transit ridership, vehicle, and payment data for most agencies is available via open-data platforms. Cities also have access to aggregated data from private mobility service providers. LBS data from big data-analytics companies such as StreetLight Data, HERE, and Inrix, is also available for purchase. Cities, however, have been slow to integrate the available mobility data into their planning processes. One of the reasons for that is that they currently lack human, technological, and financial resources to support data processing and analytics.

To fix this gap, a few cities have partnered with private companies to manage data-intensive processes. Such partnerships are undoubtedly beneficial in the short term, as cities acquire more know-how and resources to manage data. In the long-term, however, cities should invest in building internal capacities to manage data-based activities, at least those that are crucial for performing basic planning and enforcement. This is especially true for big cities that are highly reliant on data analytics for planning, regulating, and enforcing. Building capacities would involve hiring dedicated staff, acquiring technology, and allocating funds. City representatives we interviewed seemed to indicate that they are already on that path. They want to build internal capacities to undertake more data-intensive activities, including using real-time data for managing operations. For small cities that have smaller data needs, engaging a third party makes more sense than investing to build in-house capacities.

Cities also should actively anticipate their data needs – based on their sustainability and equity goals and programs – and use that understanding to inform their data-collection practices. If a city's main priority is to collect data from mobility service providers, and use cases are merely an afterthought, it could lead to a situation of overcollection and underuse

of data. This could erode trust of private mobility service providers – and even the public. Currently, cities' data-reporting requirements for mobility providers are not linked to mobility programs or plans that such data can support. While it is difficult to preempt data usage and data needs, which are constantly evolving based on emerging mobility challenges, cities should at least develop and publish the most common use cases for data. This also could give more legitimacy to cities to exercise regulatory authority to access mobility data.

Another way to maximize data usage is by making data available across different governmental departments. Currently, there are barriers to inter-departmental and inter-agency data sharing. One reason may be that the agency that owns the data wants to protect the data from misuse and unauthorized access. Building secure data repositories (like USDOT's Secure Data Commons) that can store data of multiple public agencies could address that issue, and such efforts could be funded by the federal government or state governments.[112]

6.3 Vest regulatory power and responsibility in cities

Cities have operational responsibility to ensure that urban transportation systems are safe, accessible to everyone, and environmentally sustainable. To fulfill this responsibility, they must be equipped with regulatory power over private mobility service providers, whose business interests might often conflict with public interests. This is especially true in the case of new mobility services that are untested.

While all big cities have regulatory power over micromobility services, they are often not vested with the same power when it comes to TNC services. Preemption laws in most states prevent cities from having regulatory authority over TNC operations. This takes away agency from cities to, for example, monitor TNC impacts on people and the environment and to create policies to influence positive outcomes. Changing preemption laws to provide cities more authority is not preferred by TNC operators as they fear interference with the conduct of their business. To that end, it would be important to build the negotiating power of cities in relation to private interests. This could be achieved through a coalition similar to OMF made up of cities that share the common interest of better regulating TNCs.

Expanding the regulatory power of cities, however, should go hand-in-hand with placing responsibility on cities to use the data productively and secure it from risks of privacy and misuse. Currently, most state privacy laws are not applicable to city agencies. This means that cities frame their own privacy and data-protection guidelines. As we have seen, mobility data shared by private mobility service providers can often contain PII and other

112 Mollie D'Agostino, Paige Pellaton, and Austin Brown, "Mobility Data Sharing: Challenges and Policy Recommendations," UC Davis Institute of Transportation Studies, 2019.

sensitive information that can put an individual's privacy at risk. Cities must, therefore, build regulations, processes, and infrastructure to maintain data security before they mandate data reporting from private companies.

Cities also should maximize use of the data they maintain. Some representatives of private mobility service providers we interviewed were dissatisfied with the current usage of data that they shared with cities. City and local government websites sometimes don't show the datasets they rely on for making plans, policies, and regulations. Cities should demonstrate how mobility data is being used to improve planning, regulations, and enforcement. Such steps could also give more legitimacy to cities to exercise regulatory authority to collect data.

7. Conclusion

As technology is adopted across different mobility services, the resulting data will continue to be an important instrument for cities to achieve their sustainability, equity, and accessibility goals. Cities and private mobility service providers alike can benefit from the potential of mobility data if they take steps to manage data risks.

To that end, states and cities can begin developing a feasible regulatory approach for accessing and handling mobility data to further the public interest. Such an approach will focus on exercising regulatory control over private mobility services to minimize negative external impacts from their operations while also minimizing the regulatory uncertainty and burdens experienced by private mobility service providers.

Specifically, the public sector should strive toward harmonizing data standards, regulations, and governance by building coalitions of cities. Not-for-profit organizations can play a role in coordinating such coalitions while also including private sector voices in decision-making. Cities should also assume leadership in better using mobility data that they already have access to and in securing it from risks of privacy and misuse. To that end, they must build the necessary regulations, processes, and infrastructure before they mandate data reporting from private companies.

Private mobility service providers can also reap sustainability and social benefits of sharing mobility data by collaborating with the public sector in framing regulations and processes that would allow for secure access to their data. Resisting legitimate regulatory authority by cities can have net negative outcomes for everyone in the long-term. Rather, forging relationships with cities to address specific data concerns related to privacy and proprietary issues will help cities and the private sector realize the full potential of mobility data to improve safety, sustainability, accessibility, and equity of urban transportation systems.

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