MOBILITY ON DEMAND

State of the Industry Practitioner Census

Fall 2021
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The Transportation Sustainability Research Center (TSRC) at the University of California, Berkeley is pleased to present the results of the **Mobility on Demand (MOD) State of the Industry Practitioner Census**. The global pandemic has led to a challenging period for the transportation sector. Nevertheless, the industry has shown resilience and innovation. This industry outlook provides information on MOD and Mobility as a Service (MaaS) developments throughout the United States (U.S.) and highlights some industry changes in response to the pandemic.

Between December 2020 and April 2021, a survey was distributed to industry stakeholders (n=150) representing 127 distinct organizations to document the state of the industry. TSRC collected data from a range of transportation organizations representing public (n=72), private (n=39), and non-profit (n=16) sectors through an industry survey. The survey covers MOD and MaaS topics including:

- Concept understanding,
- Modal use cases,
- Opportunities and challenges,
- Data sharing, and
- COVID-19 impacts.

Responses may not add up to n=150 as an organization may have had more than one respondent. Additionally, some questions were only asked to certain subpopulations (e.g., public agencies) and respondents were not required to answer all questions. This may contribute to lower response rates for some questions. Percentages may not add up to 100% due to rounding and the ability for participants to select multiple responses.

This outlook includes:

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Mobility on Demand (MOD) and Mobility as a Service (MaaS)

Mobility on Demand (MOD) is a concept based on the principle that **transportation is a commodity where modes have distinguishable economic values**. MOD enables customers to access mobility, goods, and services on demand.
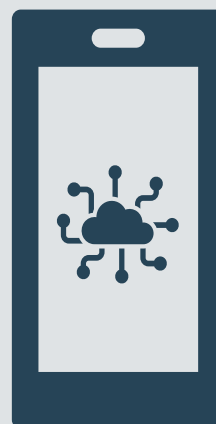
Mobility as a Service (MaaS) is a mobility **platform in which a traveler can access multiple transportation services** over a single digital interface. MaaS primarily focuses on passenger mobility (and, in some cases, goods delivery) allowing travelers to seamlessly plan, book, and pay for a multimodal trip on a pay-as-you-go and/or subscription basis.

Respondents (n=103) rated their familiarity with MOD and MaaS concepts on a scale of 1 (unfamiliar) to 10 (very familiar). Their median scores were:

7.1 MOD

7.3 MaaS

According to survey responses (n=107), the top three most commonly available MOD services include:

1. Taxis

2. Transportation Network Companies

3. Ridesharing

Use Cases

MOD can be employed for a variety of use cases including: 1) first- and last-mile connections, 2) low-density service, 3) medical transportation, 4) off-peak service, and 5) paratransit service. These use cases may be provided in-house by the public agency or transit operator and/or through vendor contracts or partnerships. Below are the most widely available MOD use cases according to survey respondents.

	In-House n=5	Vendor n=22	Partnerships n=30	Total n=57
First- and Last-Mile	20%	32%	20%	25%
Low-Density	20%	9%	13%	12%
Medical	0%	23%	23%	21%
Off-Peak	20%	18%	10%	14%
Paratransit	40%	18%	33%	28%
Total	9%	39%	53%	100%

Emerging Modes

MOD includes a variety of emerging modes (e.g., delivery robots) that are being tested and deployed across the U.S. Respondents were asked to select the emerging modes, which are currently available in their communities (n=40):

19% Small Delivery Robots

17% Unmanned Aerial Systems

15% Automated Transit Vehicles

14% Automated Passenger Vehicles

12% Automated Delivery Vehicles

12% Other

11% Urban Air Mobility

Urban air mobility is an emerging concept envisioning a safe, efficient, accessible, and quiet air transportation system for passenger mobility, cargo delivery, and emergency management within or traversing metropolitan areas.
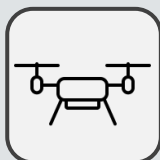
Unmanned aerial systems are unmanned aircraft and enabling technologies required for the safe and efficient operation of drones in the national airspace system.

Respondents were also asked about which emerging modes are currently being planned and/or piloted in their community. The top three responses are shown below.

Planned
n=74

24% Automated Passenger Vehicles

18% Automated Transit Vehicles

15% Urban Air Mobility

Pilots and Demonstrations
n=86

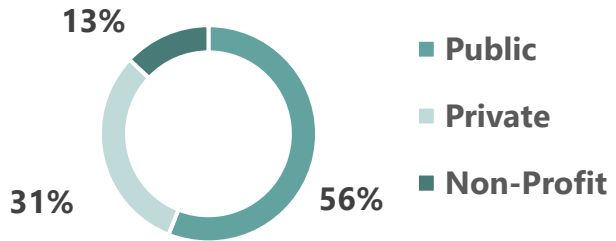**28%** Automated Passenger Vehicles

21% Automated Transit Vehicles

17% Small Delivery Robots

Survey Respondent Profiles

Sectors

The survey respondents included stakeholders from the public, private, and non-profit sectors (n=150).

13%

31%

56%

- Public
- Private
- Non-Profit

Areas of Expertise

In addition to the public, private and non-profit sectors, respondents represented various subject areas. The top three areas of expertise from each sector are listed below.

	Public	Private	Non-Profit
1.	Transportation Planning	Shared Mobility	Research
2.	Engineering	Transportation Planning	Shared Mobility
3.	Transportation Systems Operation and Management	Technology	Automated Vehicles

Public Agencies

The public sector included respondents (n=72) from the federal, state, regional, and local levels of governance.

2%	55%	4%	39%
Federal	State	Regional	Local
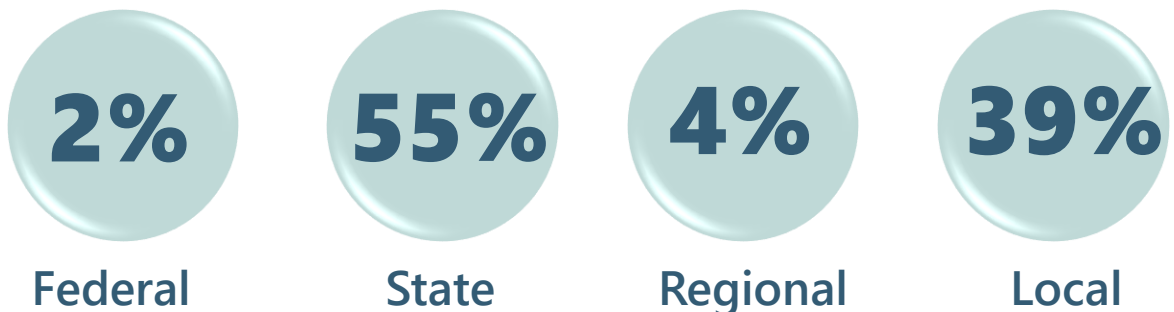
Survey Respondent Roles

Respondents represented a variety of roles within their organizations. The top three organizational roles of respondents for the public, private, and non-profit sectors are summarized below.

Public Sector
n=72

21% Engineer

21% Program Manager

11% Department Director

Private Sector
n=39

26% C-Suite

23% Engineer

16% Program Manager

Non-Profit Sector
n=16

75% Researcher

6% Agency Staff

6% Department Director

Survey Respondent Locations

The survey asked respondents (n=150) to share the location of their agency and/or employer represented as part of the survey. The geographic distribution of the sample is shown below. Some respondents (e.g., consultants and federal government employees) indicated that their employer is national, representing all 50 states.
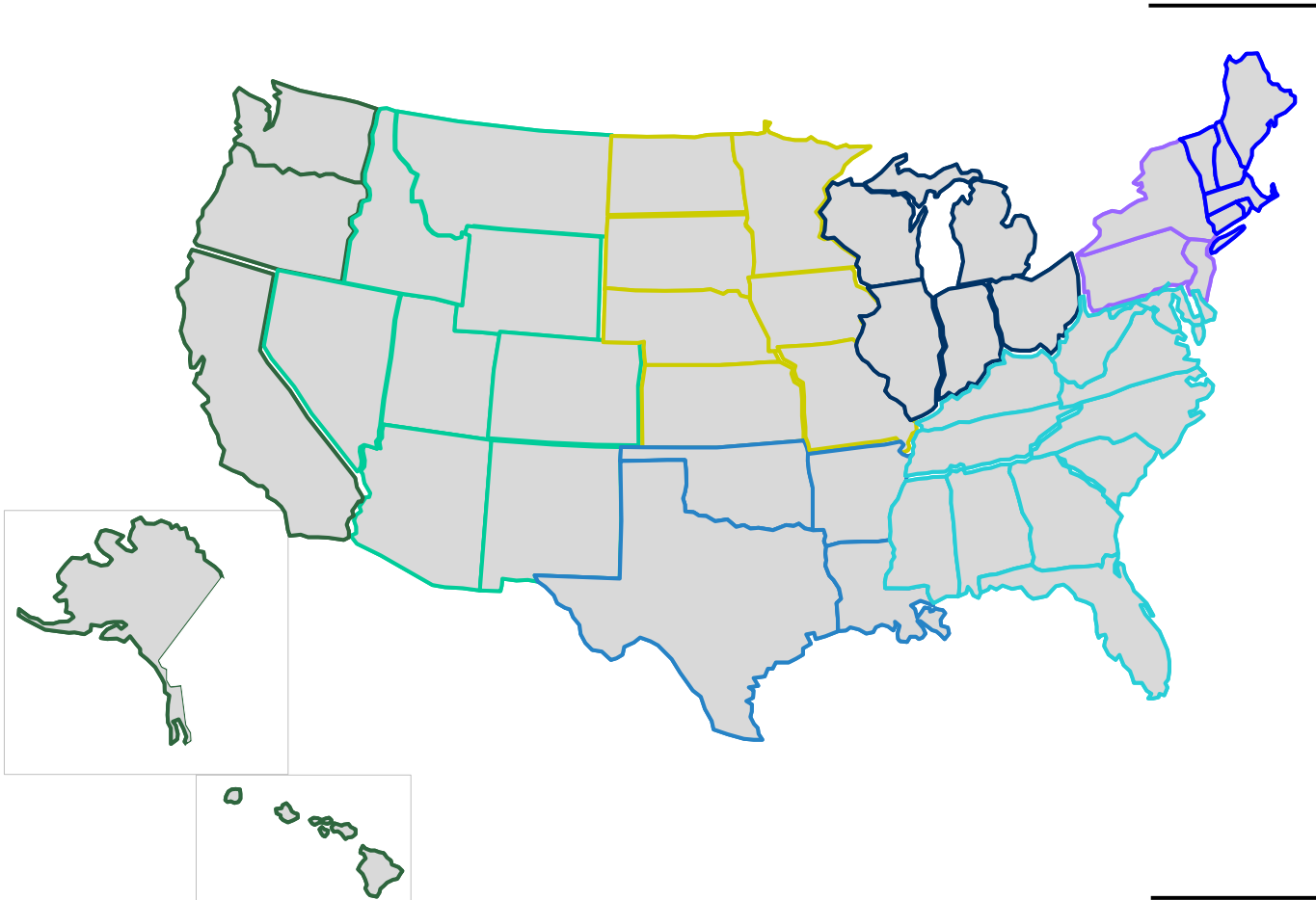
Key		
	Entire U.S.	**26%**
	Pacific Coast	**15%**
	Rocky Mountains	**7%**
	Great Plains	**4%**

	Midwest	**17%**
	Mid Atlantic	**6%**
	Northeast	**7%**
	Southeast	**11%**
	Southwest	**7%**

Survey Respondent Built Environments

The survey asked respondents (n=150) to identify the built environment where their employer and/or agency operates.

City Center		**25%**
Suburban		**22%**
Edge City		**23%**
Exurban		**17%**
Rural		**13%**
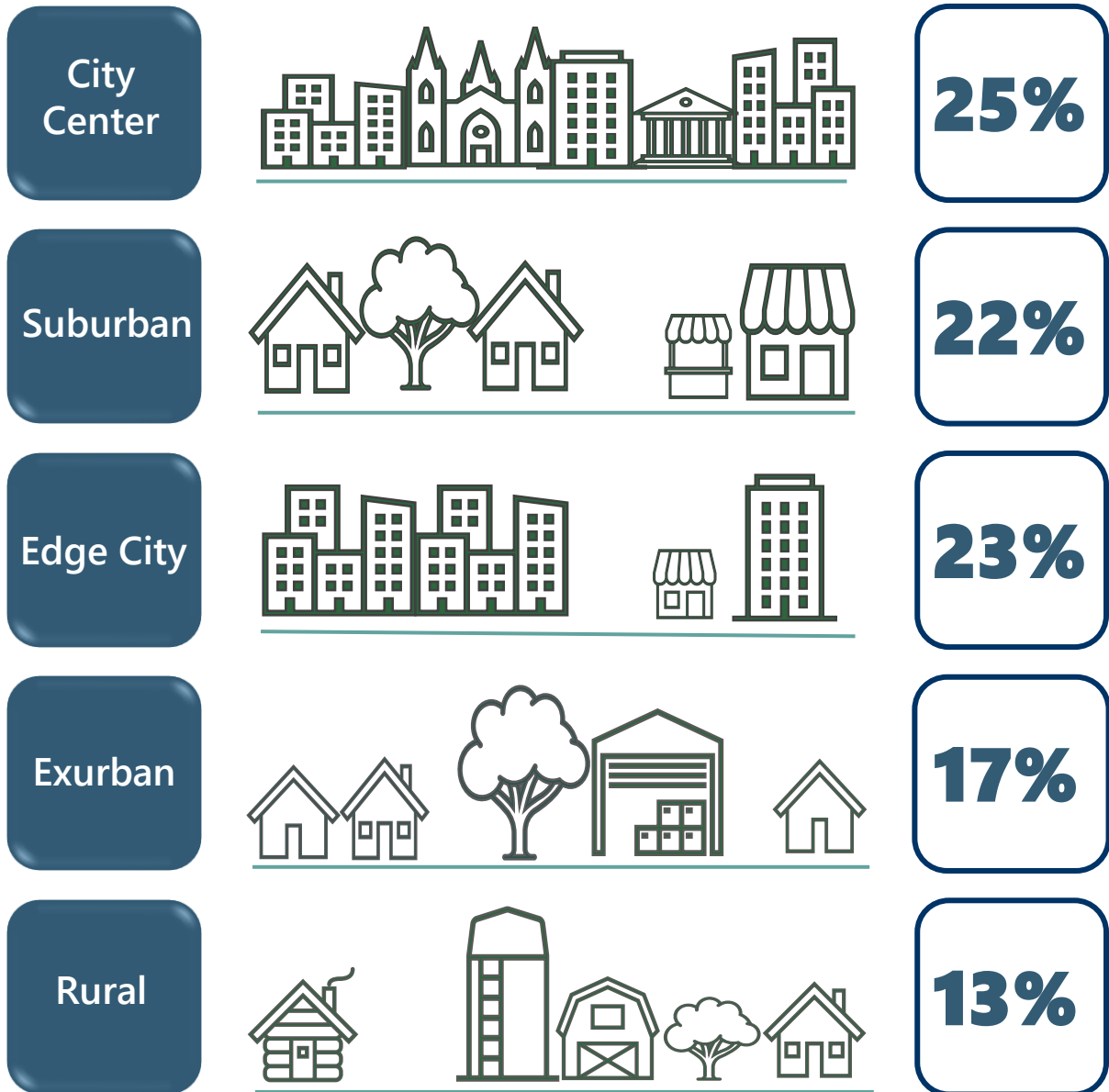
Institutional Readiness for MOD & MaaS

Public sector respondents were asked to share information on their readiness and agency role with respect to MOD and MaaS. Survey respondents were asked how prepared their organization is for MOD and MaaS. **Approximately fifty percent of respondents (n=34) said they think their agency is "somewhat" or "moderately" prepared** for MOD and MaaS deployment.

Desired Resources to Improve Institutional Readiness

Survey respondents (n=53) provided the top three resources they would like to help prepare their agencies for MOD and MaaS:

Best Practices

Data Standards

Case Studies

Public Agency Role

Public sector respondents representing all levels of government (n=27) said they believed their role is to:

Implement pilots or projects

Research best practices

Research impacts

State Government Role

State agency respondents (n=21) said they believed their role is to:

Include MOD/MaaS in strategic/system plans

Partner with mobility providers

Regulate MOD and MaaS

Opportunities and Challenges for MOD and MaaS

Public sector respondents (n=42) identified perceived opportunities and challenges associated with MOD and MaaS. The top five opportunities and challenges identified include:

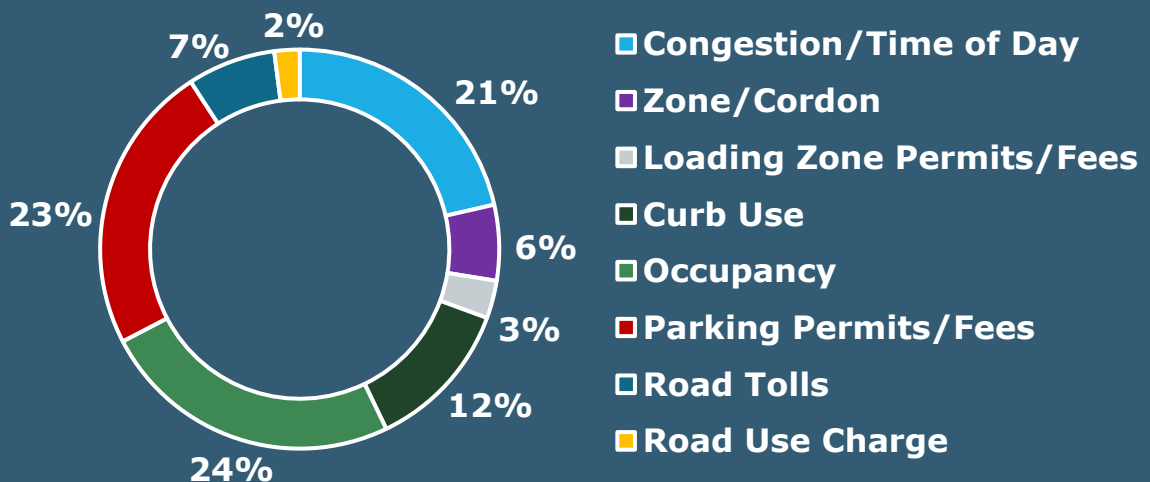| Opportunities	Challenges
Social Equity and Inclusion	Public Agency Affordability
Vehicle Miles Traveled Reduction	Curb Space Management
Employment Access	Technology Access for Users
Data Sharing	Data Sharing
User Affordability	Social Equity and Inclusion

Curb Space Management

MOD/MaaS may contribute to increased demand for curbside access and use requiring strategies to help manage the curb. Respondents (n=27) identified three primary strategies they are implementing at the curb. These include:

15% Electric Vehicle Charging

15% Shared Vehicle Parking

14% Shared Micromobility Corrals
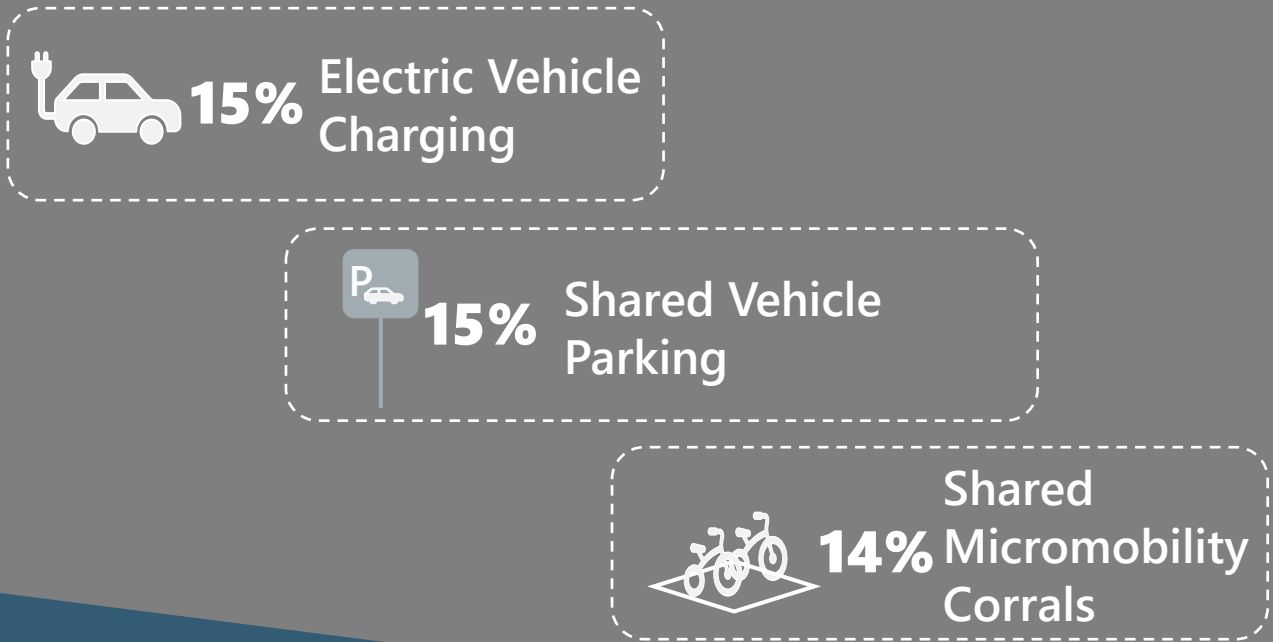
Pricing Strategies

A variety of pricing strategies can be used to manage MOD/MaaS impacts. Public sector respondents (n=27) identified a variety of pricing strategies currently employed by their agency:

2%
7%
21%
23%
6%
3%
12%
24%

- ■ Congestion/Time of Day
- ■ Zone/Cordon
- ■ Loading Zone Permits/Fees
- ■ Curb Use
- ■ Occupancy
- ■ Parking Permits/Fees
- □ Road Tolls
- ■ Road Use Charge

MOD and MaaS Policy

Respondents (n=113) were asked the types of regulation, legislation, and guidance they would like to see implemented to help guide MOD and MaaS implementation. Key policy areas identified include:

Regulation
n=19

- User Affordability
- Data Sharing
- Ease of Use for Travelers
- Accessibility for Un- and Under-Banked Households
- Social Equity and Inclusion

Legislation
n=37

- Accessibility for People with Disabilities
- Greenhouse Gas Emissions
- Cybersecurity
- Social Equity and Inclusion
- Privacy Protection

Guidance
n=57

- User Affordability
- Greenhouse Gas Emissions
- Accessibility for People with Disabilities
- Data Sharing
- Cybersecurity

Transportation Data

The survey asked respondents about data sharing and management practices, such as the types of data they currently receive and would like to receive. The survey also asked questions about open data policies and practices for protecting traveler information.

Static data remain the same after they are recorded (e.g., number of vehicles in a fleet, fare prices for different modes).

Dynamic data change after they are recorded (e.g., trip time, number of public bus onboardings).
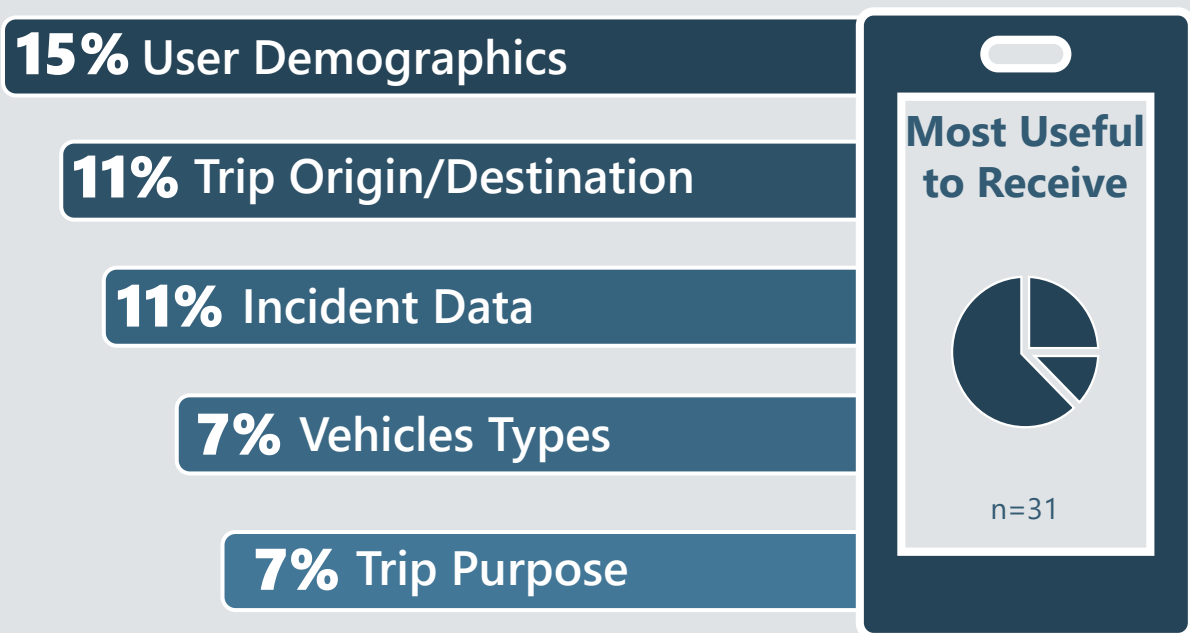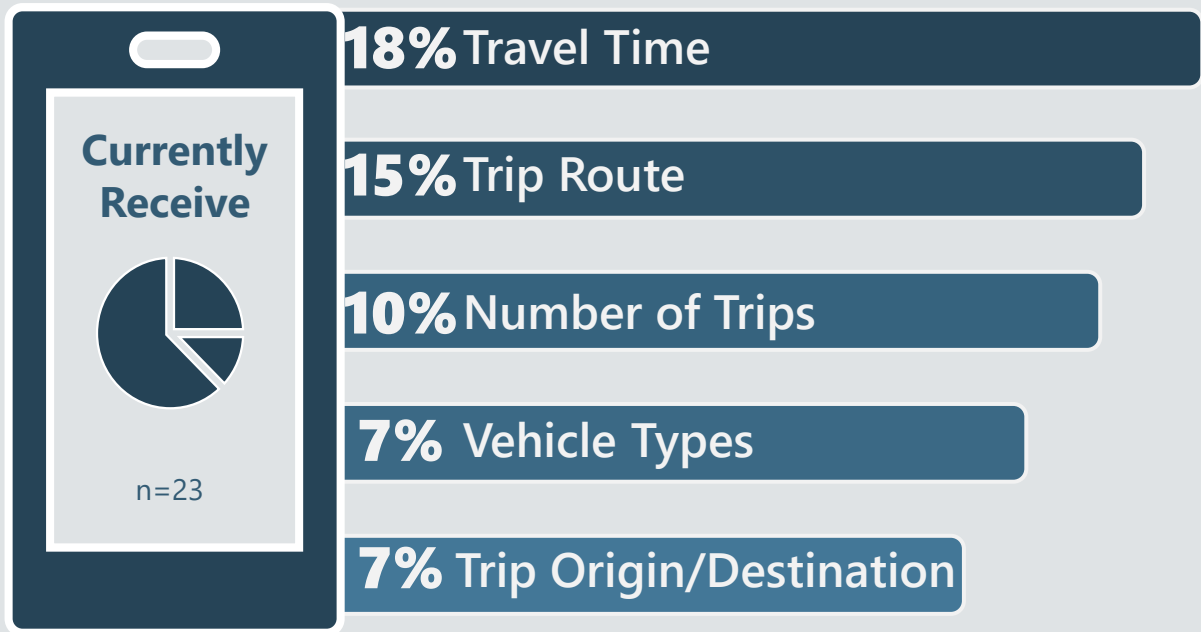
Approximately **42% of agencies surveyed (n=45) release data when requested**. Additionally, 49 public agencies have data protection policies to securely manage data containing personally identifiable information (PII). Common policies include:

21% Standardizing PII Data Collection

18% Communicating Data Collection Policies

17% Removing PII

16% Aggregating Data

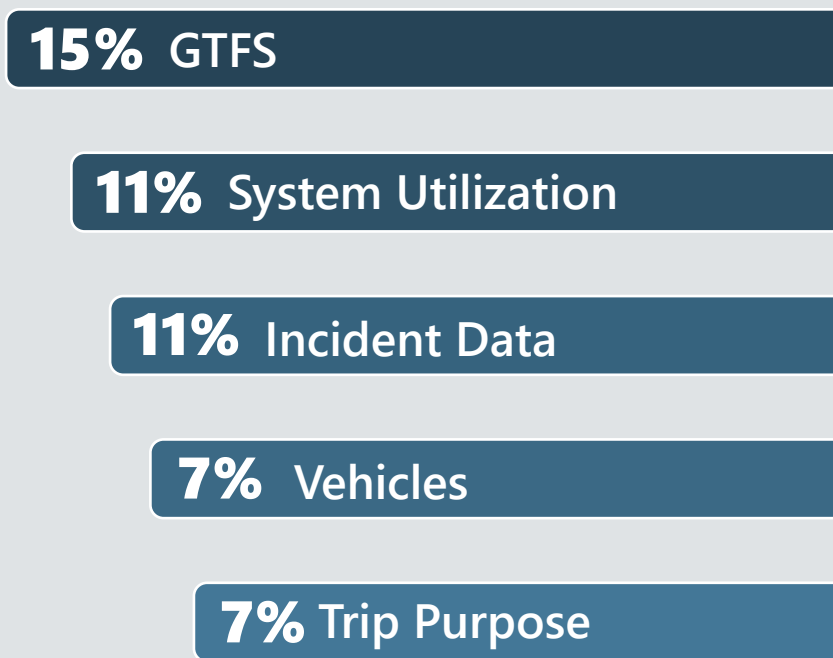**14%** Communicating Data Storage Policies

14% Encrypting PII

Data Sharing – Static

The survey collected information on the types of static data respondents currently receive and are most useful to receive.

Currently Receive

n=23

- **18%** Travel Time
- **15%** Trip Route
- **10%** Number of Trips
- **7%** Vehicle Types
- **7%** Trip Origin/Destination

Most Useful to Receive

n=31

- **15%** User Demographics
- **11%** Trip Origin/Destination
- **11%** Incident Data
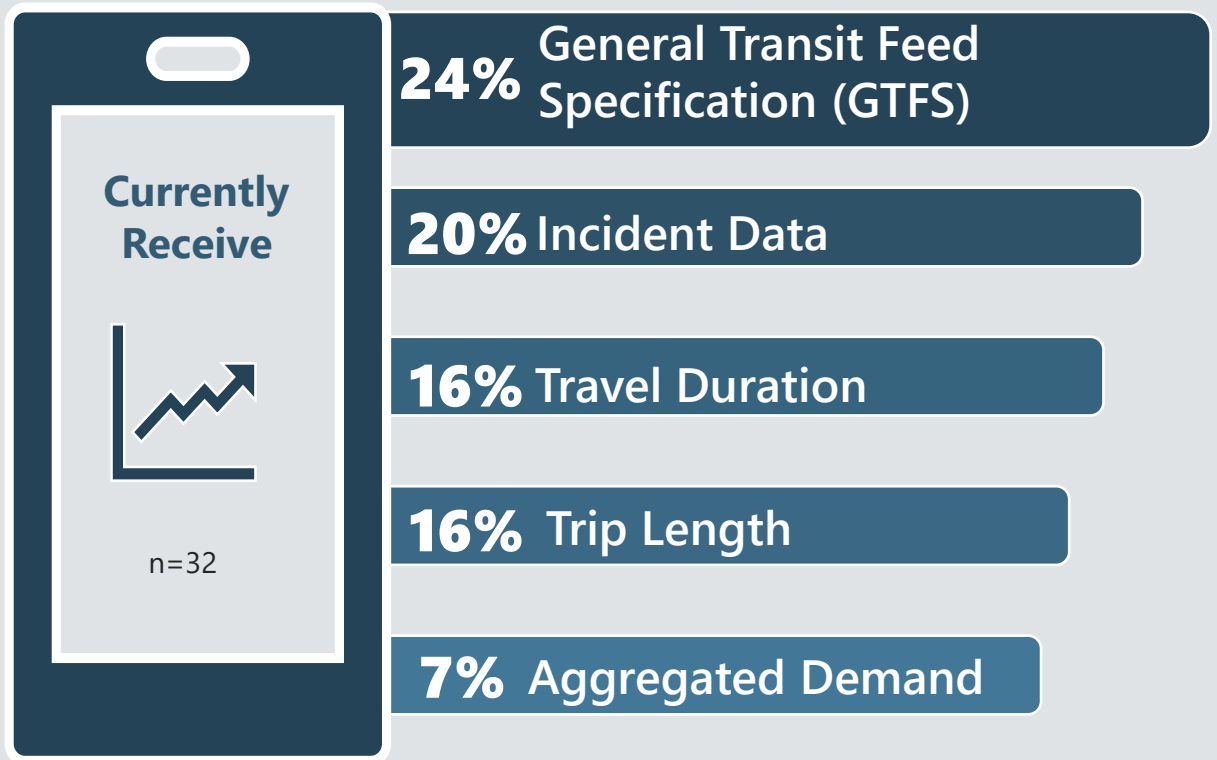- **7%** Vehicles Types
- **7%** Trip Purpose

Data Sharing - Dynamic

The survey also collected information on the types of dynamic data respondents currently receive and are most useful to receive.

Currently Receive

n=32

- **24%** General Transit Feed Specification (GTFS)
- **20%** Incident Data
- **16%** Travel Duration
- **16%** Trip Length
- **7%** Aggregated Demand

- **15%** GTFS
- **11%** System Utilization
- **11%** Incident Data
- **7%** Vehicles
- **7%** Trip Purpose

Most Useful to Receive

n=32

Data Sharing

Data shared with stakeholders can serve a variety of functions (e.g., informing models, measuring performance). Survey respondents (n=62) from each sector identified the top three uses for data sharing.

Public Sector

Measuring Performance

Managing Real-Time Traffic

Informing Planning Decisions

Private Sector

Modeling Demand

Informing Planning Decisions

Measuring Performance

Non-Profit Sector

Managing Real-Time Traffic

Managing Mobility in Real-Time

Informing Planning Decisions

Mobility Apps

Twenty-three public agencies responding to the survey indicated having a mobility app. Common app features include:

12% Real-Time Travel Information

11% Public Transit Schedules

11% Road/Highway Conditions

10% Route Planning for Multimodal Trips

8% Fare Payment for a Single Mode

Transportation services offered through mobility apps may be provided by a public agency or through partnerships. Below are the types of services agencies provide in-house and through partnerships:

In-House App-Based Services

32% MOD/MaaS

31% Integrated Fare Payment

25% Trip Planning Information

12% Other

Services Provided Through a Partnership

32% Trip Planning Information

29% MOD/MaaS

27% Integrated Fare Payment

13% Other

Integrated Fare Payment

Four public agencies surveyed stated that they are interested in offering integrated fare payment but lack the resources. These respondents were located in the Pacific Coast and Northeastern regions of the U.S. with urban, suburban, and edge city built environments. Additionally, **four ot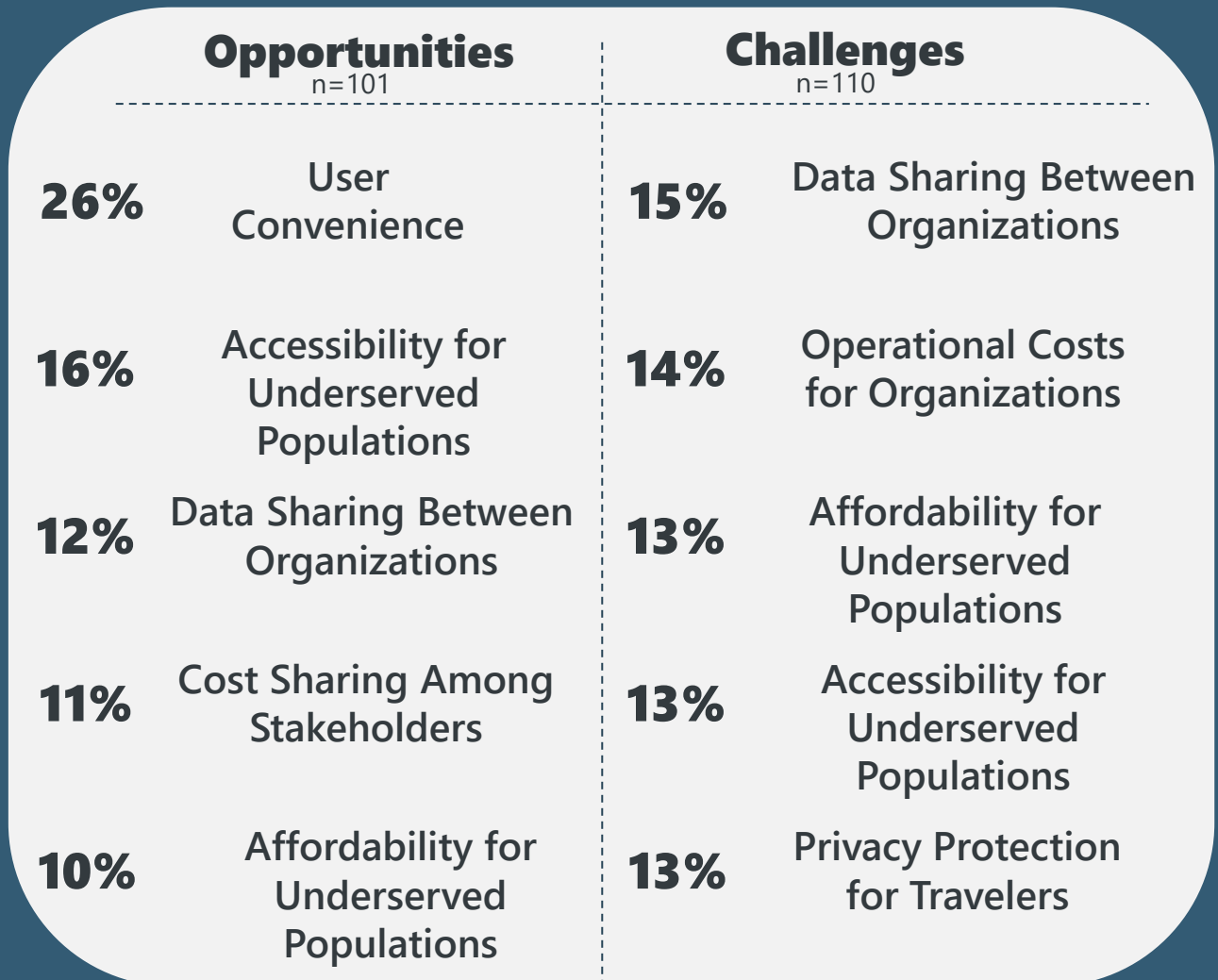her public agencies said their organizations are not interested in offering integrated fare payment**. These respondents were located in the Great Plains and Midwest regions of the U.S. with service areas in urban and suburban communities. These differing views may be due to perceived opportunities and challenges of fare payment integration. The top five opportunities and challenges identified include:

Opportunities n=101		**Challenges** n=110	
26%	User Convenience	15%	Data Sharing Between Organizations
16%	Accessibility for Underserved Populations	14%	Operational Costs for Organizations
12%	Data Sharing Between Organizations	13%	Affordability for Underserved Populations
11%	Cost Sharing Among Stakeholders	13%	Accessibility for Underserved Populations
10%	Affordability for Underserved Populations	13%	Privacy Protection for Travelers

Pandemic Impacts

In response to the global pandemic that began in March 2020, public agencies surveyed (n=48) made a variety of institutional and operational changes in response to a rapidly changing environment.

29% Allowing staff to work from home

19% Cleaning more frequently

19% Enhancing cleaning requirement

17% Changing the physical workspace

17% Requiring staff to wear personal protective equipment

The pandemic is also impacting MOD partnerships in a variety of ways. The figure below summarizes how public agencies responding to the survey (n=21) changed their MOD partnerships in response to COVID-19.

5%

14%

10%

33%

33%

5%

☐ Changed potential partner requirements

☐ Created new partnerships with new providers

☐ Created new partnerships with current providers

☐ Changed conditions, operations, and terms

☐ Decreased duration

☐ Suspended
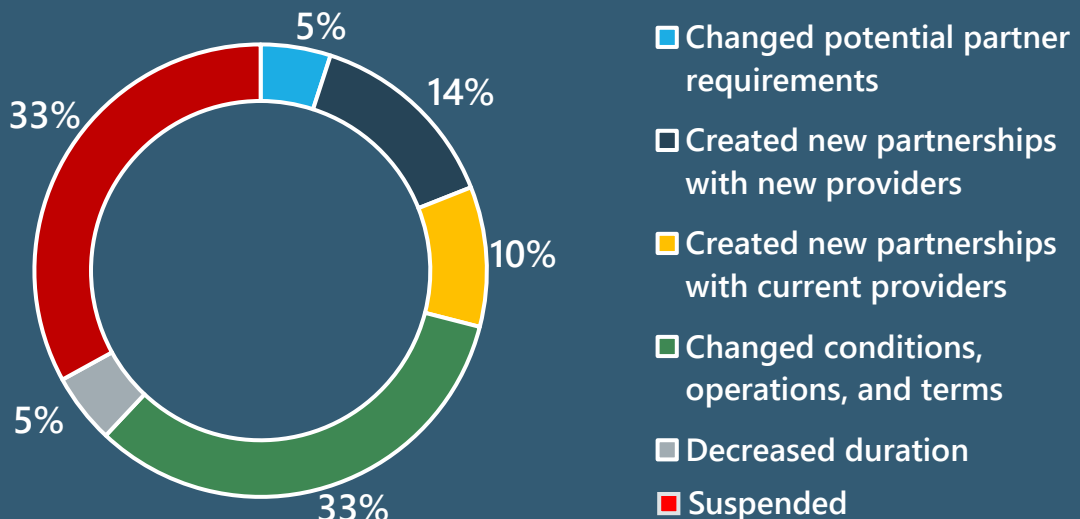
Glossary

Integrated Fare Payment:
A policy strategy where a public or private entity offers a single fare payment platform for multiple modes of transportation.

Mobility Application:
A computer or smartphone app with the primary function of assisting users in planning, booking, and/or paying for transportation modes. Typically, mobility applications assist users in planning multimodal trips.

Mobility as a Service (MaaS):
A mobility platform in which a traveler can access multiple transportation services over a single digital interface. MaaS primarily focuses on passenger mobility (and, in some cases, goods delivery) allowing travelers to seamlessly plan, book, and pay for a multimodal trip on a pay-as-you-go and/or subscription basis.

Mobility on Demand (MOD):
A concept based on the principle that transportation is a commodity where modes have distinguishable economic values. MOD enables customers to access mobility, goods, and services on demand.

Shared Automated Vehicles:
Automated vehicles that are shared among multiple users and can be summoned on-demand or can operate a fixed-route service similar to public transportation. Automated vehicles that serve a specific use case, such as transit, passenger mobility, or goods delivery are typically referred to as automated transit vehicles, automated passenger vehicles, and automated delivery vehicles, respectively.

Unmanned Aircraft Systems (UAS):
Unmanned aircraft (also referred to as drones) and its associated elements (including communication links and the components that control the small unmanned aircraft) that are required for the safe and efficient operation of the small unmanned aircraft in the national airspace system.

Urban Air Mobility (UAM):
A concept envisioning safe, sustainable, affordable, and accessible air transportation system for passenger mobility, goods delivery, and emergency services within or traversing metropolitan areas. Also referred to as advanced air mobility.

Acknowledgements

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About the Authors

The Transportation Sustainability Research Center (TSRC) was formed in 2006. TSRC is managed by the Institute of Transportation Studies of the University of California, Berkeley. TSRC uses a wide range of analysis and evaluation tools including: questionnaires, interviews, focus groups, automated data collection systems, GIS, and simulation models to collect data and perform analysis and interpret data. The center develops impartial findings and recommendations for key issues of interest to industry and policy makers to aid in decision making. TSRC has assisted in developing and implementing major California and federal regulations and initiatives regarding sustainable transportation including: zero-emission vehicle credits for carsharing vehicles as part of the Zero Emission Vehicle (ZEV) Mandate in California. Others include the California Global Warming Solutions Act (AB 32), the Low Emission Vehicle Program, the California Clean Cars Program (AB1493), Low Carbon Fuel Standards policies, the Sustainable Communities and Climate Protection Act (SB 375), and the federal Energy Independence and Security Act of 2007.

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