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Federal Highway Administration

FHWA Global Benchmarking Program Report

SHARED USE MOBILITY
European Experience and Lessons Learned

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16. Abstract

Shared mobility services provide users with short-term access to transportation on an as-needed basis rather than through ownership. While ride-sourcing services are recent entrants to the industry, they have come to dominate what is thought of as shared mobility in the United States, often drowning out other shared alternatives. In Europe, the concept of shared use mobility has existed for decades, with some services dating back to the 1940s. Several European cities have developed programs that successfully improved mobility and reduced drive-alone trips. Others have integrated these services with existing public transport services. European public entities also have experience with a greater range of public-private partnership arrangements than many U.S. counterparts. FHWA undertook this study to identify and assess European practices for establishing, supporting, and regulating shared mobility services that could be applied in the United States. This study presents key elements behind successful shared-use mobility programs in Europe, with findings falling under four main themes: 1) boundary-defying public-private partnerships and contracting methods, 2) proactive planning and design for shared infrastructure and electrification, 3) forward thinking transit agency leadership with a vision for shared mobility connectivity, and 4) development of "whole community" approaches to reduce personal vehicle travel and to create and support shared mobility.

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01.

INTRODUCTION

Background

Shared mobility, the shared use of a motor vehicle or bicycle (or other low-speed mode), is an innovative transportation strategy that enables users to gain short-term access to transportation on an as-needed basis rather than through ownership. The term "shared mobility" includes various forms of carsharing, bikesharing, scooter sharing, ridesharing (single-trip carpooling and vanpooling), personal vehicle sharing (e.g., peer-to-peer carsharing or fractional ownership), and on-demand ride services.[1] It can also include alternative transit services, such as paratransit, on-demand shuttles, and demand-response transit services (called microtransit), which can supplement fixed-route bus and rail services. Freight-related services from courier network companies and other goods delivery platforms that accommodate real-time delivery demands that substitute for personal travel and/or consolidate personal deliveries are often considered as part of shared mobility services. Smartphone "apps" that aggregate information about options and optimize routes for travelers have emerged as an important element of shared mobility.

Within the last several years, shared mobility services have exploded in popularity due to advances in technology and evolving social and economic perspectives toward transportation, car ownership, and urban lifestyles—especially among the younger generation. These services are having a transformative impact on many major cities in the United States (U.S.) and around the world by enhancing transportation accessibility while simultaneously reducing personal vehicle ownership and driving among users of these services. This, in turn, is changing the way that some people access jobs, take non-work trips, and select neighborhoods in which to live and work.

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[1]   Shaheen et al., *Shared Mobility: Current Practices and Guiding Principles* (2016). Available at: https://ops.fhwa.dot.gov/publications/fhwahop16022/fhwahop16022.pdf.

Recognizing these important transportation changes, the Federal Highway Administration (FHWA) completed a two-part domestic review focused on both current shared mobility practices and lessons learned in U.S. cities as well as the use of smartphone apps in transportation. Subsequent to this review, FHWA determined that more research is needed to further understand city and regional impacts, costs, and the potential for system performance improvements from a wide range of shared mobility modes. Information is also needed on key opportunities and challenges for public sector agencies in integrating shared mobility services into the transportation system.
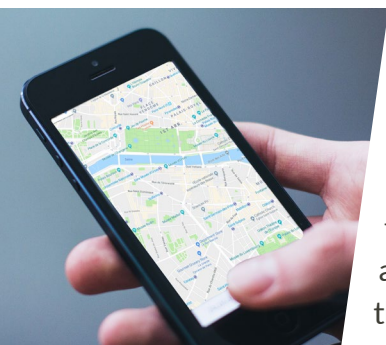
Photo: Pexel Images

While ride-sourcing services like Lyft and Uber are relatively recent entrants into the industry (the companies launched their ride services in 2012 and 2009, respectively), they have come to dominate what is thought of as shared mobility in the United States, often drowning out consideration of other shared alternatives. In Europe, by contrast, the concept of shared-use mobility has existed for more than half a century, with services such as bikeshare and carshare dating back to the 1940s. Several European cities have successfully developed initiatives and programs that have led to improved mobility and reduced drive-alone trips. Some of these cities have even moved beyond simply providing shared mobility services to fully integrating these services with existing public transport services. European transit agencies and other public transportation entities have, on the whole, a greater depth of experience with public-private partnership (P3) arrangements in transportation and shared mobility than their U.S. counterparts. Understanding their experiences, lessons learned, and the adjustments they have made could benefit transportation agencies in the United States that are seeking to implement new—and expand existing—shared mobility services.

Purpose and Scope

In pursuit of a better understanding of the shared mobility approaches used in Europe, the FHWA undertook a study to identify and assess effective European practices for establishing, supporting, and regulating shared mobility services that could be applied in the United States to improve accessibility and mobility. The study focused on three main topics:

1. *Incubating new shared mobility innovations.* This area focuses on European public-private partnerships forged to conceive, develop, test, and deploy new shared mobility solutions that fill important service and system gaps.

2. *Sustaining and growing the scale and scope of specific shared mobility programs to meet expanding mobility needs and population demands, particularly with respect to innovative carsharing, ridesharing, and bikesharing applications.* This includes European developments in peer-to-peer carsharing, electric one-way carsharing, electric-bicycle sharing, and ride-splitting with shared taxis and

microtransit that are more advanced than U.S. practices in terms of technology, delivery-to-scale, and government support.

3. ***Successful integration of shared mobility services with other existing public transport services, in areas such as on-demand services, first mile/last mile services, fare payment, and information/data sharing.*** This area includes European approaches to shared mobility and on-demand strategies, especially for the integration of these strategies with traditional fixed-route public transport and paratransit services. The intent was both to examine individual shared-mobility elements like carshare and bikeshare and to investigate the holistic approach taken by European cities to integrating these services with existing public transportation systems. The study was particularly focused on investigating the broad range of mobility-on-demand initiatives to better understand the role of public agencies in integrating shared mobility and public transport.

Study Approach

The study was conducted under the FHWA Global Benchmarking Program (GBP) which serves as a tool for accessing, evaluating, and implementing global innovations that can help FHWA respond to highway challenges in the United States. Instead of recreating advances that other countries have already developed, the GBP focuses on the U.S. acquiring and adopting technologies and best practices available and used abroad. Ultimately, the goal of the GBP is to help avoid duplicative research, reduce overall costs, and accelerate improvements to the U.S. transportation system.

The study largely focused on Munich, Germany; Paris, France; and Brussels, Belgium— three cities that have implemented innovative and sustainable shared mobility programs. FHWA selected these cities based on information collected through a review of European shared mobility programs as well as consideration of the size and scale of the shared mobility systems, impacts on mode shift, modal diversity, and innovative business models, partnerships, and policies relevant to U.S. practices. The review employed a three-tiered methodology that included a literature review, expert interviews, and synthesis. Information was collected by email, extensive Internet searches, and interviews with more than 20 leading European shared-mobility experts.

As part of the study, a team of four U.S. representatives conducted technical field visits and meetings with transportation and mobility experts in these cities between June 25 and July 1, 2017. These team members included:

➤ **Allen Greenberg,** Senior Policy Analyst, Federal Highway Administration

➤ **Jim Hunt,** Transportation Operations Program Manager, Federal Highway Administration

➤ **Brian Lagerberg,** Director, Public Transportation Division of the Washington State Department of Transportation (sponsored by the American Association of State Highway and Transportation Officials)

➤ **Sharon Feigon,** Executive Director of the Shared-Use Mobility Center (report facilitator for the study, and subcontractor to Leidos, Inc.)

The study team met with more than 50 transportation and mobility experts from European transit agencies, mayors' offices, departments of transportation, universities, shared-mobility operators, and regulatory entities. The team also met with representatives from the European Union (EU) and several Dutch cities (detailed background on the cities visited and related context for shared mobility is included in Appendix A).

This report summarizes key findings from the GBP study and includes strategies and approaches for potential application in the United States. It is organized around four key findings, which the study team believes have contributed to the successful shared-use mobility programs in the three cities visited. These include: (1) boundary-defying public-private organizations and contracting methods, (2) proactive planning and design

for shared infrastructure and electrification, (3) forward thinking transit agency leadership with a vision for shared mobility connectivity, and (4) development of "whole community" approaches to reducing personal vehicle travel and to creating and supporting shared mobility innovations.

The report also references countries such as Finland, Italy, Austria, and Denmark, which have come to the forefront in recent years through their exploration of new concepts like one-way electric carsharing, mobility as a service (MaaS) and broadly deployed demand-responsive transit. In some instances, in-person meetings with European leaders were supplemented with telephone discussions and e-mail exchanges with new contacts that were suggested or identified through following up on specific issues with previous contacts.

02.

THE EUROPEAN CONTEXT

Overview

While bikesharing, carsharing, ridesourcing, and other forms of shared mobility are growing rapidly in the United States, many of these concepts originally began in Europe decades ago, and Europe today continues to lead the United States with innovations in areas such as fare payment integration, electric vehicle carsharing, and MaaS.

European advances can be attributed to factors ranging from increased public-sector involvement to culture and geography. Many European cities are densely populated, highly walkable, and closer in proximity to one another than are cities in the United States. They are often better served by public transit, which functions as a backbone to help support other forms of mobility. As a result, a culture of shared transportation is more prevalent in Europe than it is in the United States, where, in many regions, travel by private car is the default mode of choice. On average, cars cost more to own and operate in Europe (including expenses for vehicle registration, fuel, tolls and parking), and land use on the continent—from pedestrian-friendly "woonerfs" to narrower streets with less parking—make owning and operating a car less convenient and competitive with other modes of travel. In addition, there is a stronger tradition of providing public transit in smaller towns and suburban areas than in the United States.

Today, many European cities are also employing creative measures to reduce gridlock and greenhouse gas emissions from private autos. Examples of these strategies include London's congestion pricing system; Oslo's plans to ban cars from its central business district; Milan's Low Emission Zone and congestion charge, which restricts private vehicle access and parking in the city's historic core; and Paris's plans to convert the Georges Pompidou Expressway into parkland.

While new technological advances in shared mobility often tend to grab the headlines, these cultural and geographic factors help create an environment supportive of sustained shared mobility. Other approaches by European governments—such as taking an active role in overseeing and operating shared mobility programs, allowing for some private delivery of public services, and integrating public and private transportation systems with one another—have also helped grow shared mobility and offer best practices that may be implemented in the United States.

Photo: FHWA

Common Challenges across Europe and the United States

While both the United States and Europe have evolved in different ways over the past 50 years, they have many common challenges when it comes to transportation, mobility, and land use. It is largely due to these commonalities that lessons from Europe would be relevant to the United States. Common challenges include:

➤ **Parking:** The United States contains roughly three parking spaces for every one privately owned car.[2] Due to its narrow streets and limited available land, Europe has many fewer parking spots. However, both still have significant issues when it comes to managing demand, supply, and pricing for street parking. Most cities on both continents are still reluctant to meaningfully price residential street parking.

Photo: FHWA

Photo: FHWA

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[2]   C. Thompson, "No Parking Here," *Mother Jones,* January/February 2016. Available at: http://www.motherjones.com/environment/2016/01/future-parking-self-driving-cars/.

➤ **Traffic congestion:** Despite having mode splits that are much more favorable to multimodal transportation, cities such as Paris and Brussels are battling with high levels of traffic congestion. In the United States, commuters waste a full week in traffic each year.[3]

➤ **High vehicle ownership rates in some cities:** While most of Europe's capitals are densely populated, well-served by transit, and highly walkable, parts of many European cities, especially those that experienced major growth or reconstruction after World War II, have been built in a car-centric manner that resembles land-use patterns common in the United States. In cities such as Brussels, where auto ownership and usage are high, it is difficult for other modes to compete with the convenience and time savings provided by a private car, a status quo similar to that of the United States.

➤ **Rebalancing shared mobility systems to optimize efficiency and availability**: Point-to-point mobility services like bikesharing and one-way carsharing have succeeded in attracting users but often still struggle from the need to rebalance vehicles to ensure that the network functions as intended and vehicles are available when and where there is demand. Public expectations, especially as related to desired trip ends, often conflict with operational practicality, leading to challenges. New models for optimizing efficiency and availability at scale are being explored but are neither yet perfected nor yet widespread.

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[3] Texas A&M Transportation Institute, "Traffic Gridlock Sets New Records for Traveler Misery," August 26, 2015. Available at: https://mobility.tamu.edu/ums/media-information/press-release/

➤ **Public-private partnerships:** Europe has had notable success in establishing public-private partnerships to provide and manage transportation services, as highlighted at several points in this report, but both Europe and the United States also continue to face challenges related to private delivery of public services that fully support public goals equitably and cost-effectively.

➤ **Conflicts over street space for delivery services:** The rise of e-commerce and on-demand delivery services are contributing significantly to congestion in urban areas around the world. While some localities and companies have begun experimenting with solutions to cut down on the number of trucks navigating city streets—like neighborhood delivery hubs that provide secure storage and are serviced by last-mile home delivery via electric cargo bikes and delivery lockers (e.g., Amazon Locker in the United States)—congestion from delivery services remains a challenge in both Europe and the United States.

➤ **Concerns about autonomous vehicles:** Driverless cars offer the potential to transform cities by reducing the need for parking, allowing for greater housing density, and opening up land for new uses. Depending on how such vehicles are used and regulated, however, they could also undermine public transit, exacerbate sprawl, and significantly increase traffic congestion.

Addressing Transportation Challenges in Europe

The chapter that follows highlights the key findings and other noteworthy observations from site visits to three European cities. As the purpose of this report is to convey the broad lessons from the study, the findings are presented as experiences from Europe as a whole rather than by city. Nevertheless, context matters, so readers seeking more background on the cities visited, and specifically the conditions in which shared mobility exists in these cities, should refer to Appendix A of this report. In addition, both the study team and the Europeans with whom the team met did note that the United States may be more advanced than Europe in some areas of shared mobility. While highlighting these areas was not a study objective, it is still interesting to note them and their likely reasons. Appendix B provides this overview of shared mobility successes in the United States.

While Europe is steeped in history and tradition, the cities visited for this study had all taken on new approaches and embraced change in order to meet 21st Century urban transportation challenges. Many of these new approaches have subsequently been scaled up to levels beyond those seen in the United States, due in part to the urban density that is naturally more supportive of shared modes. Some ideas, such as start-up incubator spaces, may be familiar to U.S. readers. A number of these developments, however, have taken a decidedly European twist and, in their formulation, can offer some ideas for transportation practitioners in the United States.

03.

PRINCIPAL FINDINGS
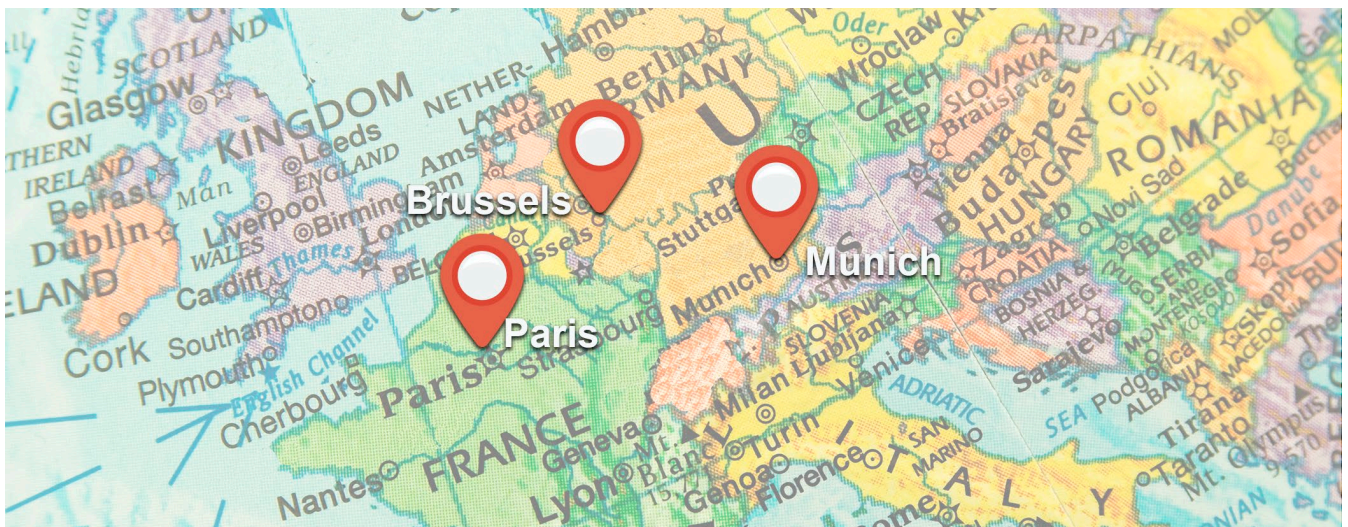
Photo: ThinkStock

This study revealed insights on the reasons for successful shared-use mobility programs in the three cities visited. The findings fall under four main themes, which are elaborated upon in this chapter:

1. Boundary-defying public-private partnerships and contracting methods.

2. Proactive planning and design for shared infrastructure and electrification.

3. Forward thinking transit agency leadership with a vision for shared mobility connectivity.

4. Development of "whole community" approaches to reduce personal vehicle travel and to create and support shared mobility.

Photo: FHWA

Boundary-defying Public-Private Partnerships and Contracting Methods

While public-private partnerships (P3s) in the United States and Europe share many common elements, European partnerships in public and private mobility services must often adhere to a more layered regulatory environment, including municipal, regional, country-specific and European Commission (EC) levels of oversight. While this multi-tiered regulatory environment can present challenges, it can also result in effective public-private partnerships with clear public benefit objectives and performance rules that meet long-range planning goals and other social objectives. The study team observed a collaborative approach both to developing and investing in cutting-edge shared mobility offerings and research and to creating innovative contracts that enable efficient and rapid scaling of successful shared-mobility services across both organizational and geopolitical boundaries.

Of particular note, the Polis Network, while not directly tied to the EU, is one of several nongovernmental networks of European cities and regions working together to develop innovative technologies and policies for local transport. Established in 1989 and with a secretariat based in Brussels, Polis supports the transfer of knowledge among European local and regional authorities, private transportation authorities, industry, research centers and universities, and engaged civic organizations. The network also formulates recommendations for European institutions.

The remainder of this section provides examples of "boundary-defying" arrangements and entities that exemplify: 1) contracting provisions tied to specific public policy goals; 2) innovative governance models for shared mobility; and 3) funding shared mobility projects past the pilot or startup phase.

Outcome Contracting Models

While the study team observed many noteworthy contracting provisions (most especially in Paris), a few from Milan, discussed in a wide ranging conference call with the city after returning from the European study tour, are provided here as good examples.

The City of Milan issued a variety of Requests for Proposal (RFPs) for shared mobility services, including one for one-way carsharing in 2013, as well as an updated carsharing RFP in 2016 that incentivized electric carsharing, and a variety of RFPs for scootersharing, dockless bikesharing, and quadri-cycles. These RFPs serve to both license shared mobility companies to operate in the city as well as incentivize operational models that best serve the public interest and mobility goals defined by the city. For example, the 2013 one-way carshare RFP called for carshare operators to fulfill the following requirements:

➤ At least one out of 100 vehicles fitted for people with reduced mobility.

➤ Required coverage of specific geographic areas of the city to ensure greater equity of access.

➤ Regular reporting of data and ownership of a subset of the data by the city (number of subscribers, users, vehicles, origins and destination of trips, etc.).

➤ A €1,100 (or $1,191.77 in 2017 dollars) charge per vehicle to operate in the city, and a heavily reduced fee for fully electric vehicles.

➤ Access to the Low Emission Zone of the city and parking permits in restricted parking zones.

In 2016, the City of Milan revised its RFP, offering new incentives including free parking, higher vehicle caps, and user incentives to promote the success of carsharing. New regulations included:

➤ Minimum mandatory fleet size increased from 80 to 400 cars.

➤ Additional fees for internal-combustion motor vehicles (€100, or $108.34 in 2017 dollars).

➤ Discounts on per-vehicle permit costs for increasing services in multiple municipalities, with up to a 30 percent discount for operating in 15 or more municipalities.

➤ Fee discounts for service providers that provide user incentives for:

- Leaving vehicles in "Mobility Areas" or pre-defined shared use spaces, with a related revenue guarantee.
- Using the service in non-peak travel times.
- Demonstrating discard of a vehicle registered in their name without a new vehicle purchase.
- Demonstrating possession of an annual subscription to local public transportation operator.

Along with Milan's one-way carsharing licensing model, the city has been proactive in licensing emerging mobility services such as dockless bikeshare and electric (motor-powered) scooter-sharing. For example, Milan issued an RFP for dockless bikeshare, which brought two dockless companies, MoBike and ofo, to operate in the city. The city captures a €30 (or $32.50 in 2017 dollars) charge per dockless bike, and has restrictions on fleet size (1,000-4,000 bicycles) per operator.[4]

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4   Comune di Milano, "Observatorio Sharing Mobility." PowerPoint Presentation, November 15, 2017.

Governance Models

An example of an organization engaged in partnerships that cross both types of boundaries is the Paris region's state-owned public transportation company, Régie Autonome des Transports Parisiens (RATP). Established in 1949, RATP operates most of the public transport in the City of Paris and its surrounding Île-de-France region, including the Paris Metro, bus and tramway services, and part of the regional intercity train network. RATP is also the parent company of the RATP Group, comprising nearly 100 subsidiaries providing public transportation, engineering, and urban development and real estate services around the globe. RATP Group first expanded into the private sector in the early 2000s by becoming a minor stakeholder in the TransDev group and Veolia Transport. Following the merger of TransDev and Veolia, RATP acquired some of TransDev's international operations and then continued an expansion into the contracted delivery of public transit services and infrastructure, including the operation of bus, train, rapid transit, and inter-city rail services in cities throughout Europe, Asia, Africa and the United States.[5]

Another innovative governance model for shared mobility is represented by Paris's Metropole regional consortium, the public entity launched in 2011 to oversee the Autolib' carsharing program, operated by Bolloré Group. This was in part a response to Paris's tough labor laws as well as to a legal requirement for public agency ownership and oversight.[6] Municipalities can join the consortium on a membership basis, which allows smaller municipalities to gain access to the assets of Autolib' and Vélib', a bikesharing program, without their own proposal process. In 2016, following the selection of a new operator for the Vélib' bikeshare system, Vélib' was also incorporated into the joint consortium. The bikeshare system will now offer electric bikes within the 24,000-bike fleet, and Vélib' is anticipated to expand to a total of 50 municipalities over the next few years.

Alongside this governance structure, Autolib's contract with the City of Paris exemplifies how cities can support shared mobility systems through investment and risk sharing. When Autolib' won the public contract, municipalities within the Parisian metropolitan region agreed to finance the electric vehicle charging infrastructure, which costs about €50,000 ($54,000 in 2017 dollars) per station, totaling a public investment of €50 million ($54.1 million in 2017 dollars) to match the Bolloré Group's €60 million ($65 million in 2017 dollars) investment.[7] Over the 12-year lifespan of the contract, the Bolloré Group can only lose as much as €160 million ($173.3 million in 2017 dollars), with the government covering the rest of any potential losses. This support has helped Autolib' remain operational when there have been financial challenges at many points of the program.[8]

5   RATP Group, *Financial and CSR Report 2016*, n.d. Available at: https://www.ratp.fr/sites/default/files/inline-files/ratp_1703145_ra_financier_gb_mel.pdf.

6   Autolib' Vélib' Métropole, "Qui Sommes Nous?" n.d. Available at: https://autolibmetropole.fr/autolib-metropole/qui-sommes-nous/.

7   Eltis, "Bolloré wins Autolib' contract in Paris (France)," last modified August 1, 2014, available at: http://www.eltis.org/discover/news/bollore-wins-autolib-contract-paris-france-0.

8   N. Loucet and G. Jacquemain, "Autolib' is still not profitable and perhaps it will never be," January 20, 2017. Available at: http://6t.fr/en/autolib-not-profitable/.

Funding Models

Often these boundary-defying entities allow for a more sustainable revenue stream for shared mobility programs past the pilot or startup phase. Examples are given below from three major transport companies, which were a focus of this study, RATP in France, Deutsche Bahn in Germany, and Wiener Stadtwerke in Austria. Each demonstrates different approaches to developing and funding innovative mobility.

RATP Dev, a subsidiary for operations and maintenance within RATP, acts as an in-house venture fund that invests in different mobility services, often participating directly in the co-creation of startups in the shared mobility realm, including microtransit, integrated trip-planning apps, and shared autonomous vehicles.[9] This model is almost the reverse of many U.S. P3s, as the public entity is providing the means for private entities to pursue innovative mobility solutions. In the process, RATP Dev is building and diversifying its own revenue streams while continuing to work in support of its public goals. Notably, the French government determined in 2016 that despite RATP being a public entity, its "engagement in gainful activities" makes it subject to many of the same corporate taxes as private entities; the company paid about €22 million ($23.8 million in 2017 dollars) in taxes that year.[10]

Another example of a "boundary-defying entity" is Deutsche Bahn Digital Ventures (DBDV), the corporate venture capital arm of Deutsche Bahn Group, Germany's largest railway company and leading mobility provider.

With funds of €100 million ($108.3 million in 2017 dollars), DBDV launched in November 2016 with the goal of investing in start-ups with data-driven business models in the areas of mobility, logistics, Internet of Things (IoT), artificial intelligence, and big data.[11] DBDV sources investments on a global basis with emphasis on Europe, the United States, and Israel. Funding is provided for start-ups from seed through the Series C stage (core focus being Series A), with additional possibilities for follow-on funding. An early investment includes Berlin ridesourcing company Talixo (€6 million ($6.5 million in 2017 dollars) investment in August 2017). Deutsche Bahn is also a partner in Berlin – and Munich-based electric on-demand door-to-door ridesharing service CleverShuttle and the multimodal travel application Qixxit. Alongside external investments, Deutsche Bahn Group is also focused on promoting intrapreneurship within the Group and collaborates with other industry partners on joint business development initiatives with the most promising start-ups in mobility and logistics on the unique, open-innovation platform Beyond 1435.

An entity similar to RATP and Deutsche Bahn is the holding company Wiener Stadtwerke GmbH in Austria, which through its subsidiaries offers municipal infrastructure services across the country and is one of the largest companies in Austria. Wiener Stadtwerke also owns Vienna's transport company, Wiener Linien. The company works closely with the City of Vienna to implement plans such as the Smart City Vienna Framework Strategy and the STEP 2025 urban mobility plan, which was

9   RATP Dev, "Innovative mobility" web page, n.d. Available at: https://www.ratpdev.com/index.php/en/commitments/innovative-mobility.

10   RATP Group, *Financial and CSR Report 2016*, n.d. Available at: https://www.ratp.fr/sites/default/files/inline-files/ratp_1703145_ra_financier_gb_mel.pdf.

11   Crunchbase, "Deutsche Bahn Digital Ventures GmbH" web page, n.d. Available at: https://www.crunchbase.com/organization/deutsche-bahn-digital-ventures.

passed in 2014. In line with these city plans, stakeholders outlined a strategic roadmap to transform the transport agency into a Mobility as Service (MaaS) provider. Wiener Linien looked to not only provide the "hardware"—i.e. the buses, trains, and paratransit vehicles—for public transportation service, but also the software required for the transport company to coordinate bundled mobility services for the city. Wiener Linien had successfully piloted a MaaS program called Vienna Smile from 2012-2014, which was funded by the Austrian government's Climate and Energy Fund. Wiener Stadtwerke created a private subsidiary called "Upstream – next level mobility GmbH," a private company responsible for the expansion and management of the WienMobil digital infrastructure, and to improve the digital services to strengthen Wiener Stadtwerke's position as a central integrator and contact for networked urban transport. This public-private partnership model allowed for the creation of a city-owned MaaS platform called WienMobil that launched in 2017.[12]

Photo: FHWA

Proactive Planning and Design for Shared Infrastructure and Electrification

The European Commission's Energy Union identified the transition to an energy efficient, decarbonized transport sector as one of its key areas of action. The EC Energy Union provides a comprehensive vision for all member countries within the European Union. Initiatives such as HORIZON 2020, the 2013 Urban Mobility Package, and the Climate and Energy Policy Framework 2030 all support this low-carbon mission and inject funding into cities, regions, and countries to address specific goals, such as vehicle electrification and greenhouse gas reductions, and to encourage lower-emission transport modes. Although the EC has limited ability to enforce its policies, the EC employs a general strategy of publicly prodding city and federal governments that are falling behind in meeting sustainability objectives, including those related to reducing the climate impacts of transportation, and promoting bikesharing, carsharing and carpooling, and rapid electrification of personal and shared cars.

Physical infrastructure plays an important role in supporting the launch and growth of shared mobility. Features such as bike lanes, on-street carshare parking spaces, and electric vehicle (EV) charging hubs are crucial to making shared mobility services highly visible, easily accessible, and reasonably safe and convenient. In many cases, such infrastructure requires well-defined partnerships between public and private sector entities. Both sectors can benefit from shared infrastructure, but reasonable steps must also be taken to ensure that burdens and risks are shared and that the public good and shared mobility systems are well served. The team was particularly impressed by the integrated mobility hubs and EV charging networks it encountered as well as the factors behind these successes, as described in the following section.

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12   For more information on the WienMobil platform, see the section on Progressive Transit Agency Leadership with a Vision for Shared Mobility Connectivity.

Integrated Mobility Hubs

Pioneered in Bremen, Germany, mobility hubs provide physical integration among modes by co-locating carsharing, bikesharing, and other shared-mobility services at or near public transit stops. Mobility hubs can also feature bike parking, dedicated curb space for taxis and ridesourcing providers, and wayfinding and place-making elements. Capital costs are often funded through a mix of public and private sources, with public entities financing the projects as a whole, but with individual mobility providers being responsible for their own infrastructure and operating costs and paying rental costs that go toward maintenance of the sites.[13]

Mobility hubs may also have an attendant or a digital kiosk to help passengers access information about the various modes offered. With their physical presence, these hubs can help to increase the visibility of and access to shared mobility services. Recent findings also indicate that mobility hubs can help increase the use of shared mobility.[14] Germany, Austria, Switzerland, and Italy have mobility hubs, and the concept is one that other cities are eager to adopt, including U.S. municipalities such as Los Angeles and Kansas City.

The study team visited the Münchner Freiheit mobility hub while in Munich and met with mobility hub experts at the Technical University of Munich (TUM). TUM conducted a survey of mobility hub users in June 2016, finding that 67 percent are public transit subscribers (i.e., maintain a weekly, monthly, or yearly transit pass), about one-third have no car, the majority walk to access carsharing

Photo: FHWA

vehicles or bikes at the hubs, and many see potential for more multimodality to help reduce car ownership.[15] Munich is working to increase the visibility of its mobility hub with better branding and more visible colors. The city is also exploring a way to offer "mobility packages" that would feature fare integration and, in the summer of 2017, added cargo bikes for a trial period. These cargo bikes can be used by residents as well as delivery services such as UPS and DHL for last-mile delivery.

While in Munich, the study team also visited Domagkpark, a new residential development. Domagkpark includes approximately 1,600 apartments and is connected to the Münchner Freiheit by tram line. It was also designed as a "living lab" for sustainable mobility solutions and features a private "residential mobility hub" available to residents. The hub includes e-bikes, e-scooters, cargo bikes, and electric carshare cars available for use by residents and the general public. Members of the mobility station also receive discounted transit passes and, at move-in, information about the variety of available transportation options.

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[13]   Werkstatt-Stadt, "Car sharing stations in public street space," last modified June 1, 2010, available at: http://www.werkstatt-stadt.de/en/projects/212/.

[14]   Miramontes, M., Pfertner, M., Rayaprolu, H. et al. (2017). "Impacts of a multimodal mobility service on travel behavior and preferences: user insights from Munich's first Mobility Station." *Transportation* 44(6) 1325-1342. 10.1007/s11116-017-9806-y.

[15]   Ibid.

Other European mobility hub sites the team learned about include:

➤ **Bremen, Germany:** The small town of Bremen is the site of the first mobility hubs in Europe, with more than a dozen "mobil.punkt" ("mobility point") mobility hubs in the early 2000s, which feature Cambio carshare vehicles and bikeshare parking at transit stops.[16]

➤ **Offenburg, Germany:** In 2012, Offenburg kicked off a multimodal mobility initiative called "Einfach-Mobil," ("easy mobile") which included targeted mobility outreach and research as well as the installation of four Einfach-Mobil mobility stations. These mobility stations feature carshare and bikeshare along Offenburg's main transit stations, and payment and activation of these services are integrated through a single smartcard called the Einfach-Mobil card.[17]

➤ **Würzburg, Germany:** Funded collaboratively by the city and the Federal Ministry of the Environment, Würzburg installed nine mobility hubs across the city, which feature bikeshare, carshare, and informational kiosks along major transit stations.[18]

➤ **Hamburg, Germany:** Hamburg's "Switchh" mobility stations—11 in total across the city—feature round-trip carshare vehicles, free-floating carshare vehicles, bikeshare bikes, bike parking, and electric carsharing charging stations. The transit agency (HVV)

smartphone application integrates transit information with locations of bikeshare and carsharing.[19]

➤ **Leipzig, Germany:** Leipzig's "Mobil" station combines electric and standard carsharing, bikesharing and transit. These services are integrated on a smartphone app called "Leipzig mobil" which offers payment integration and discounted monthly rates for carshare and bikeshare.[20]

➤ **Switzerland:** Swiss carsharing provider Mobility has vehicles located along every major SBB rail line in Switzerland, with mobility stations at popular rail stops.

➤ **Milan, Italy:** The City has installed 27 "Digital Islands" across Milan with digital kiosks, Level 1 and Level 2 charging stations for public and private use (free to use for electric carsharing providers) and shared electric quadracycle parking and charging stations.

Photo: FHWA

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16   Maximilian Pfertner (2017). "Evaluation of Mobility Stations in Würzburg – perceptions, awareness, and effects on travel behavior, car ownership, and CO2 emissions." Master's Thesis, Technical University of Munich. p. 15.

17   Eva Heller (2016). "Evaluation of Mobility Stations in Offenburg: Assessment of Perception and Acceptance of an integrated Multimodal Mobility Service and Potential Changes on Mobility Behavior." Master's Thesis, Technical University of Munich.

18   Pfertner (2017). "Evaluation of Mobility Stations in Würzburg." pp. 24-28.

19   Heller (2016), "Evaluation of Mobility Stations in Offenburg," p. 17.

20   For additional information on Leipzig mobil, visit: https://www.l.de/verkehrsbetriebe/produkte/leipzig-mobil.

EV Charging Networks

Extensive and reliable EV charging networks are necessary to accelerate EV adoption. They can, however, be costly and time consuming to install and maintain, and they require significant cooperation between public and private entities. Sharing infrastructure between owners of personal EVs and carsharing providers can help to support EV charging networks by providing the user revenue necessary to keep charging ports in good working order. In some cases, EV charging stations can also be co-financed by shared mobility providers and electric utility companies. The study team discussed the issue of EV charging networks with several contacts in Europe, including representatives from the Autolib' carsharing system in Paris and BMW in Munich.

In Paris, the city decided to make all of the charging stations for its one-way EV carshare system available to the public and to price its public usage higher than for carshare vehicles, which helps to provide additional revenue for the system. In an interview, Autolib' told the study team that public use of the charging network has been increasingly popular despite the high prices and limited availability and helps subsidize shared services.

> *The Munich public transport operator is collaboratively operated with Stadtwerke München (SWM), Munich's electric utility company. This cooperation has yielded large investments in electro-mobility, including establishing a municipal charging network of more than 100 charging stations, that are coordinated within the region (Bavaria/Saxony) and funded through the Federal Ministry of Transport.*

Photo: FHWA

BMW has charging networks in 11 cities in seven different countries. Approximately 16 percent of BMW's DriveNow carsharing fleet is electric, and the company has charging infrastructure access agreements in place with several cities. For instance, in Copenhagen, DriveNow users can access municipal charging stations, and approximately 75 percent of charging station use there is by carshare users (which is higher than usual). The City of Copenhagen has responded by working closely with DriveNow and is following its recommendations when siting new charging stations.

Elsewhere in Europe, the City of Amsterdam has made special citywide parking permits available for electric carsharing fleets. Amsterdam has more than 500 EV charging stations and plans to eventually grow the network to 2,000 stations. All car2go vehicles in Amsterdam are 100 percent electric and can be parked at any public charging station in the city without the driver incurring additional fees. Other notable EV carsharing systems include:

➤ **Bluetorino:** Operating in Turin, Italy, the service launched in 2016 and will scale to 400 vehicles and 200 stations by the end of 2018.[21]

➤ **BlueCity:** Launched in London in Summer 2017, this system will scale to an estimated 3,000 cars by 2018. BlueCity took longer than expected to debut because of ongoing negotiations between Bolloré Group and local authorities.[22]

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[21]   M. Kane, "Bolloré To Launch Car Sharing In Rome & Turin," *Insideevs*, n.d. Available at: https://insideevs.com/bollore-launch-car-sharing-rome-turin/.

[22]   R. Boagey, "Bluecity to spread electric fleet across London," *Business Car*, November 6, 2017. Available at: http://www.businesscar.co.uk/analysis/2017/bluecity-to-spread-electric-fleet-across-london.

- **Cite Lib:** This Toyota pilot project operates in Grenoble, France, with 35 three-wheeled EV Toyota i-Roads, 35 single-seat electric quadri-cycles, and approximately 1,000 registered users as of mid-2016.[23]

- Various providers, Milan: ShareN'Go, DriveNow, E-vai, GuidaMi, Enjoy and car2go all operate in Milan, collectively offering almost 3,000 carshare vehicles for over 600,000 users. Twenty-seven percent of the total carshare cars in Milan are electric, and the largest all-electric fleet is ShareN'Go, with 691 zero-emission vehicles.

Forward Thinking Transit Agency Leadership with a Vision for Shared Mobility Connectivity

In many European cities, multimodal travel is a way of life that is backed by a strong public-sector commitment. European residents often engage in walking, bicycling, and other forms of active transportation to meet their day-to-day travel needs. At the heart of Europe's mobility mix lies an extensive public transportation system—including buses, trams, trains and high-speed national railways—that provides fast and convenient access within and between cities throughout the continent.

European transportation agencies and regional and local governments often view shared mobility as a way to expand the geographic and temporal range of transit service.

Often, shared mobility in European cities is recognized as a part of the existing transit system— not as a separate or competitive mode, but rather an additional option that the public sector can manage and connect with already existing services.

European entities make few distinctions between how to manage public and private sector participants in transportation. Government rules apply regardless of the provider. Transit agencies frequently add carsharing and bikesharing to their fleets, for instance, and bundle options as part of their full-service approach.

To support these robust networks of mobility choices and encourage further multimodal travel, European governments, transit agencies, and private-sector mobility providers have focused for years on ways to improve multimodality, or the ability to combine different modes of transportation in a seamless travel experience, through more closely aligned public and private transportation services. These efforts include developing integrated fare payment solutions that combine multiple systems on a single smart card or mobile app (an approach that several U.S. metropolitan areas have also begun pursuing in recent years), as well as coordinated marketing and co-location of carshare cars and bikeshare bikes at mobility hubs along train lines.

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23   Carol Coolsaet, "Toyota's i-ROAD half way through Cité Lib by Ha:mo trial," Toyota Europe (blog), June 10, 2016, available at: https://blog. toyota.eu/green/toyota-iroad-cite-lib-by-hamo-trial/.

In recent years, public and private-sector transportation stakeholders have become increasingly interested in developing new payment technologies that can link intermodal trips across operators using a single, easy-to-use payment platform. Multimodal payment integration has been instituted in transit agencies across Europe, including in Switzerland, Germany, the Netherlands, Finland, Italy, Austria, and Belgium. Switzerland in particular is a leader in this domain, with carsharing, bikesharing, and the entire country's transit system all accessible through the Swiss Pass fare card. Some of these early advances have also formed the basis for the Mobility as a Service concept and have helped to set the stage for further advancements.[24] Additionally, technology companies such as moovel Group (a subsidiary of Daimler), Siemens, Xerox, and Cubic are currently working with cities in Europe and around the world to pursue new advances in digital ticketing and payment, real-time travel information, and trip planning.

Key European fare integration programs observed or discussed as part of the study include:

➤ **MVG more App in Munich, Germany:** Developed by Munich's MVG public transport operator, the MVG more app[25] integrates payments from multiple transit providers. These include the MVG Rad bikesharing system and several carsharing operators such as BeeZero, DriveNow, STATTAUTO and car2go. The MVG more app also offers real-time travel information for some services and is developing a route planning functionality.
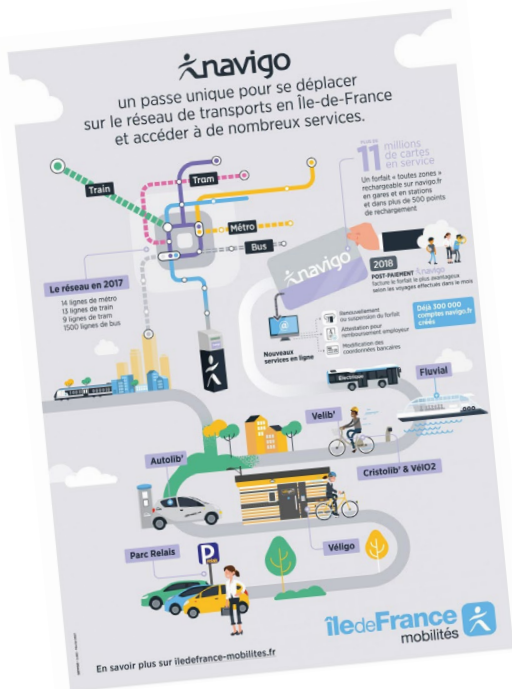
➤ **MOBIB Card in Brussels, Belgium:** The Brussels public transit agency STIB's MOBIB card includes bikesharing (Villo), carsharing (Cambio), taxis, parking and several other Belgian railways. The card is an "electronic wallet" that can be linked to multiple fare cards or accounts.[26] Although not fully integrated with each mode, the STIB card does allow for subscription-based additions to the MOBIB card, allowing users to add value for each service.

➤ **OV-Chipkaart in the Netherlands:** The OV-Chipkaart is a contactless card system that provides access to public transit systems across the nation as well as to OV-Fiets bikeshare bikes, which are stored in bike lockers at the station or at kiosks with valets. The OV-Chipkaart offers varied pricing and mobility options for different types of users, including for students, seniors, business users, tourists, and children. For example, one of the business platforms for the OV-Chipkaart, called Mobilitymixx, provides a suite of MaaS options that includes public transit, carsharing and car rental, parking at park-and-rides, OV-Fiets bikeshare, and taxi service all in one payment structure.[27]

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24   For more information, see the section titled "Mobility as a Service" in the desk review.

25   MVG, "MVG more," n.d., available at: https://www.mvg.de/services/mobile-services/mvg-more.html.

26   Belgian Rail, "Don't have a MOBIB card yet?" n.d., available at: http://www.belgianrail.be/en/travel-tickets/mobib/no-mobib.aspx

27   Mobility Mixx, n.d., https://mobilitymixx.nl/home.html.

Source: Île-de-France

➤ **Navigo Pass in Paris, France:** Developed in 2001 by STIF (now IDF Mobilités), this contactless card system and companion smartphone application integrate payment for all transit, buses, and SNCF railways in the region, as well as bikeshare and carsharing, where the contactless cards can be used to unlock both Autolib´ cars and Velib´ bikeshare bikes.[28] Additionally, the Navigo pass allows for users to reserve bike parking in the Veligo pilot and use the electric scooter pilot in a few municipalities in the region.

➤ **Cambio in Belgium:** This carshare system offers another interesting public-private model, with the transit agency STIB/MIVB holding 49.5 percent of its stock and serving as a founding shareholder.

➤ **WienMobil in Vienna, Austria:** Developed first as a research project led by the City of Vienna called "Smile" in 2012, Smile was a MaaS platform combining payment integration for public transit, rail, bikeshare, carshare, taxi and access to several other amenities.[29] After this research project concluded in 2015, the City developed a Wien-Mobil smart card, and then the WienMobil mobile application in 2017. WienMobil combines real-time information, journey planning, and a single payment platform for all providers, including free-floating and round-trip carshare, bikeshare, taxi sharing, car rental, and shared parking.[30]

Many of these integrated payment systems are paired with infrastructure that facilitates multimodality, such as Munich's downtown mobility hub, the Navigo Pass's Veligo bike-and-ride program in Paris, and in all three study cities (Brussels, Munich, and Paris) the co-location of carsharing and bikesharing at transit stations. In Belgium, the successful Cambio carshare has become well integrated with the public transit system across the larger metropolitan region, and many of the carshare stations are along transit lines and are featured on transit maps. Pairing integrated payment and shared infrastructure can help to increase visibility and access to shared mobility services.

Mobility as a Service (MaaS)

In addition to integrated payment smartcards and applications, MaaS is a concept that emerged in Europe and has begun to be adopted elsewhere in the world. MaaS can

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[28]   The Navigo pass currently does not offer payment integration across Autolib' and Velib', however.

[29]   Transform: Transformation Agenda for Low-Carbon Cities, "SMILE Project in Vienna," February 9, 2011. Available at: http://urbantransform. eu/2015/02/09/smile-project-in-vienna/.

[30]   Wiener Linien, "WienMobil."

be defined as "a mobility distribution model in which a customer's major transportation needs are met through a single interface."[31] MaaS has the potential to integrate several public and private mobility solutions together on the same platform, offering users a menu of options that fit a variety of travel needs. Due to the high profile of MaaS in Europe, many governments and transit agencies are pursuing such programs, either by launching MaaS pilots of their own or by creating regulatory environments that support the growth of market-driven MaaS solutions. While the subject of MaaS came up often during discussions in Europe, it was not a focus of this study generally, or of any of the meetings, due in part to time and budget constraints. The study team believes that European MaaS innovations would be very worthy of further examination.

Development of "Whole Community" Approaches to Reduce Personal Vehicle Travel and to Create and Support Shared Mobility Innovations

In many European cities, a general orientation toward multimodal lifestyles has set the stage for the successful deployment of transportation demand management (TDM), or the application of strategies and policies to anticipate, reduce, and distribute travel demand and change consumer travel behavior.[32] Unlike the United States, where TDM is often regionally or municipally focused and has little State or Federal collaboration, European initiatives such as Share North,

CIVITAS, Polis, UITP, and Taxistop have funded TDM research and pilots across the continent.

Source: FHWA

When mobility policies are adopted in Europe, they tend to be very comprehensive and focus on regional solutions, as illustrated by the treatment of parking. That a parking space should be available to urban dwellers is a less common assumption in Europe than in the United States (although a reluctance to adequately price preexisting on-street residential parking remains on both continents). For example, the regional government in Brussels has created a parking policy framework and, while municipalities can adjust it, if the municipalities cannot reach consensus, the regional government can dictate what happens. Other examples include Oslo, which has set goals to eliminate all parking within its city center, and Germany, which has new federal legislation governing carsharing. The new law, "Carsharing-Gesetz" (CsgG), took effect in September 2017 and includes preferential treatment of carsharing for street parking. Brussels decided to constrain parking to force innovative alternative mobility solutions, so the city established an environmental tax on parking spots beyond a maximum level, subject to a 10 percent annual increase for 15 years starting in 2014.[33]

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[31]   S. Hietanen (2014). "'Mobility as a Service' – the new transport model?" *Eurotransport Supplement: ITS & Transport Management* 12(2), pp. 2–4.

[32]   Mobility Lab, "What is TDM?" n.d. Available at: https://mobilitylab.org/about-us/what-is-tdm/.

[33]   Loyens Loeff, "The Legal Consequences of Owning Too Many Parking Spaces in Brussels," 2017. Available at: https://www.loyensloeff.be/en/news/the-legal-consequences-of-owning-too-many-parking-spaces-in-brussels/.

Milan, another city of interest for this study, created a congestion charge in what it calls "Area C" in the historic core of the city,[34] and is going to put in place a Low Emission Zone that covers the vast majority of the municipal territory. The congestion charge is applied to every vehicle entering the city center, except electric and hybrid vehicles, scooters, carsharing, public transit, police and emergency vehicles, on weekdays from 7:30 am to 7:30 pm (on Thursdays the operation is limited to 6 pm). The city therefore has incentivized electric-vehicle usage in Area C through providing free access for electric and hybrid vehicles. Through a series of regulations passed by city council in 2013 and 2016, carshare and scooter-sharing vehicles are also given free access and parking spaces in Area C. The city has seen a major decrease in congestion within Area C (31% decrease)[35] and a reduction in city-wide vehicle ownership, with the number of cars reduced from 58 to 50.5 per 100 inhabitants.[36]

In the United States, planning for shared mobility and active transportation occurs across a patchwork of agencies and planning organizations. Locally, transit agencies and metropolitan planning organizations (MPOs) develop long-range transportation plans, while State departments of transportation develop similar statewide plans.[37] In Europe, a more nuanced and redundant planning structure exists for sustainable mobility planning, with collaborative efforts across the EC, EC-funded initiatives, and membership bodies, such as the Polis Network (discussed earlier), which

all contribute to establishing a comprehensive ecosystem of funding, research, and planning dedicated to sustainable mobility that is harmonized across many jurisdictional levels.

Although urban mobility is normally seen as a regional or local issue, rather than a European-wide level policy matter, there has been much cooperation at the EU level. The European Commission's roles are three-fold: 1) providing EU-wide regulations (e.g., of products or data) that affect products and services that are part of urban mobility; 2) funding European research and innovation programs to create scale and cooperation on common challenges, including with academic and industry partners; and 3) European-level exchange of best practices, guidelines, and information about common challenges. The EC financially supports initiatives like CIVITAS (an acronym for CIty-VITAlity-Sustainability) for research and innovation in urban mobility.

The EC's Mobility and Transport Division works closely on urban mobility issues with networks such as the International Association of Public Transport (UITP), the Polis Network, and the European Platform on Mobility Management (EPOMM). This broad set of actions has helped provide support for European cities working to encourage broad adoption of multimodal behavior. Several of these key programs and their associated funding streams are described in greater detail in the funding section of Chapter 4.

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[34] Urban Access Regulations in Europe, European Commission, "Milano Area C: Low Emission Zone & Charging Scheme," n.d. Available at: http://urbanaccessregulations.eu/countries-mainmenu-147/italy-mainmenu-81/lombardia/milan-ecopass.

[35] EuroCities, "Area C: Milan's congestion charge zone," September 2013. Available at: http://nws.eurocities.eu/MediaShell/media/Sep_Cities%20in%20action_Milan_AreaC.pdf.

[36] Marco Bedogni, "Air Quality: Urban Transport Measures in the City of Milan." PowerPoint Presentation, dated September 12, 2016. Available at: https://www.polisnetwork.eu/uploads/ModuleXtender/PublicEvents/401/7._Bedogni_-_Air_quality_in_Milan.pdf.

[37] U.S. Department of Transportation, Federal Transit Administration, "Metropolitan, Statewide & Non-Metropolitan Planning Fact Sheet (Sections 5303-5304-5305)," n.d. Available at: https://www.transit.dot.gov/regulations-and-guidance/transportation-planning/metropolitan-statewide-non-metropolitan-planning-0.

A key focus of the EC's efforts on urban mobility is the Sustainable Urban Mobility Plan (SUMP) Framework, which is tied to different tiers of implementation funding in order to incentivize planning.[38] These SUMPs contribute to energy and emissions goals in key policy documents, including the EC's Action Plan on Urban Mobility (2009) and Transport White Paper (2011), which help to guide transportation policy in the European Union. The SUMP Framework sets a new paradigm for transportation planning by reorienting focus from the traditional traffic flow capacity and speed metrics to people-focused metrics such as quality of life, economic viability, and social equity.[39]

In the European cities visited by the study team, both long – and short-range plans are directly tied to funding streams and are very comprehensive in guiding development of new services. In Munich alone, projects funded by the CIVITAS ECCENTRIC program (an EC initiative focused on sustainable mobility in lower density areas) include the Domagkpark residential mobility hub, a MaaS application visited by the study team that includes a cargo-bikesharing pilot for e-commerce last-mile delivery, electric mobility options at the mobility hub, and an electric bikeshare fleet for the MVG-Rad municipal bikeshare system.[40] Specific goals identified in Munich's long-range plans—including lower greenhouse gas emissions, reduced vehicular traffic, and integration of residential development with

innovative mobility services—are broken down into granular implementation plans that are addressed through ECCENTRIC's "Living Laboratory" funding for Munich through 2020.[41]

Cities are assessing the scope and scale of new services needed and then issuing requests for proposals to fill those needs. In addition, specific plans tied to greenhouse gas emission reduction goals have led to greater emphasis on pedestrians, bicycles, and multimodal transportation.

Many European initiatives have compiled best practices and case studies into online toolkits, including Share North's online database, UITP's combined mobility toolkit, and the Eltis urban mobility observatory.

The European Platform for Mobility Management (EPOMM) provides an online mapping tool called TEMS ("The EPOMMS Modal Split" tool) that displays mode split data from 487 cities in Europe.[42] TEMS provides longitudinal data on each city's mode split, which is useful for understanding how demand and the modal mix of each city evolves over time. The EC's DGMOVE also has a flagship annual campaign called "European Mobility Week," where more than 2,000 European cities participate to promote sustainable urban mobility through such activities as hosting a car-free day and marketing active and sustainable transportation options.

[38]   European Commission, Mobility and Transport, "Sustainable Urban Mobility Plans," n.d. Available at: https://ec.europa.eu/transport/themes/urban/urban_mobility/urban_mobility_actions/sump_en.

[39]   European Commission, European Platform on Sustainable Urban Mobility Plans, "Guidelines for developing and implementing a sustainable urban mobility plan," 2013. Available at: http://www.eltis.org/sites/default/files/guidelines-developing-and-implementing-a-sump_final_web_jan2014b.pdf.

[40]   European Union, The Civitas Initiative, "Exploring innovative urban mobility solutions," n.d. Available at: http://civitas.eu/mobility-measures?title=&field_city_for_measure_target_id=38987.

[41]   European Union, The Civitas Initiative, "Munich," n.d. Available at: http://civitas.eu/fr/eccentric/munich.

[42]   EPOMM web page: http://www.epomm.eu/index.php.

The study team observed a host of creative and widely applied TDM strategies. These include:

➤ Personalized transportation marketing for new residents and target groups.

➤ Event-based transit provision and marketing.

➤ New freight models with limits on freight delivery to homes in downtown cores.

➤ Mandated mobility plans for employers.

➤ Secured-access bike parking solutions built into integrated payment smartphone applications.

In Munich, the city implements a variety of TDM strategies, including highly personalized "multimodal mobility consulting" that provides new residents with information on mobility options and a phone conference to assess particular mobility needs and feedback on customer experience. Munich has a full-time Coordinator for Mobility Management[43] to lead this program, along with other mobility management initiatives. The city government—in partnership with the transit agency (MVG), the regional ticketing authority (MVV), and a variety of shared mobility providers—developed this program to address barriers to sustainable mobility through providing information, consulting, and incentives to encourage people to adopt more sustainable travel behavior.

The five main areas of Munich's intermodal mobility consulting program include:

1. Continuous market research.

2. Segmentation of the mobility market into target groups (i.e., seniors, new immigrants, students) for mobility training.

3. Development and implementation of suitable instruments on information, consulting and promotion.

4. Modification of the current mobility landscape to respond to customer needs.

5. Quality control of existing options.[44]

Munich also provides a mobility center where residents can get assistance on a walk-in basis, and where the city offers training tailored towards particular groups, such as seniors and recent immigrants, on how to use mobility options.

Within this mobility consulting strategy, the city established a "control board for mobility management," which consists of city government leaders, CEOs of the local transportation companies, and the MVV. This control board sets the overall strategy for the program and responds to all feedback. Although the mobility marketing concept has been used in the context of TDM programs before, the comprehensive and well-integrated nature of this program within the operational structure of the transit agency and transportation companies in Munich makes it a uniquely innovative program.

Other municipally led TDM approaches include:

➤ **The Munich bike+ride program,** which placed more than 30,000 bike racks across the transit network, including protected parking readily visible to station staff.
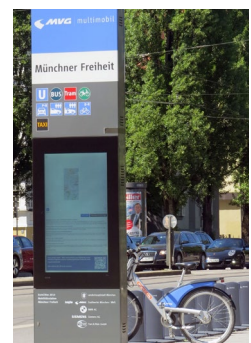
Source: FHWA

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43   This role is currently held by Martin Schreiner in Munich. For more on his role, see the Political and Other Leadership section in Chapter 4.

44   M. Schreiner and R. Knäusl, "Never walk alone! Processes, results and purposes of an innovative and successful mobility partnership in Munich," *Epomm*, 2004. Available at: http://epomm.eu/ecomm2004/workshops/anglais/Schreiner.pdf.

Source: FHWA

➤ **The Brussels STIB/MIVB transit** agencies' initiative to offer free roundtrip public "event pass" transit tickets with concert tickets at specific venues.[45]

➤ **Urban-core alternative delivery pilots** in Amsterdam and Brussels, including the CityLab collective in Brussels, the ParkStadt residential commons in Munich, and cargo bikesharing for delivery services at the Munich downtown Mobility Hub and Domagkpark residential building.

➤ **The Veligo** integrated bicycle parking solution in Paris that allows users to reserve bike parking at nearly 60 stations across the Île-de-France region.

➤ **iDVroom**, a commuter carpooling online service owned by SNCF, the French railway company, which offers planned ridesharing along crowdsourced routes, peer-to-peer and business-to-business

services, and access to reserved parking spaces in many public transportation stations.

Many European cities, including Paris and Brussels, are beginning to mandate mobility plans for businesses with 100 employees or more (which is also seen in the United States, but without great frequency and only in a few states). Recent French legislation[46] requires Parisian businesses to develop mobility plans with goals for reducing greenhouse gas emissions, offering new sustainable mobility options, and analyzing commuter travel behavior. The businesses have to develop a program that includes specific TDM measures, a financing plan, and a timetable for implementation. IDF Mobilités oversees the program and has developed an online toolkit and resource library to guide businesses developing action plans.[47] Additionally, many companies in Paris offer employees a 50 percent discount for the Navigo pass and are no longer obliged to build parking at their office buildings. Companies must also pay the equivalent of 1-2 percent of each employee's salary in taxes for public transportation.

Brussels has new regulations for employer mobility plans that went into effect at the beginning of 2018[48] and is working to shift away from its car-focused paradigm. Until recently, it had been common for companies to provide cars that employees can use to commute to work each day. The new regulations require companies to offer two additional options alongside the offer of a

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45 Pro Mobilite, n.d. Available at: http://www.promobilite.fr/.

46 Article 51 of the Energy Growth Transition Act for Green Growth passed on August 17, 2015 which went into effect on January 1, 2018. For more information, see https://www.legifrance.gouv.fr/affichTexteArticle.do?idArticle=JORFARTI000031044944&cidTexte=LEGITEXT000031047847&categorieLien=id.

47 Pro Mobilite, n.d. Available at: http://www.promobilite.fr/.

48 The regulation was announced in June 2017 and went into effect in January 2018. Available at: http://www.xpats.com/brussels-government-approves-new-mobility-plan-companies.

company car: the first is a more economical vehicle with a bikeshare or train subscription, and the second is a "mobility package" that includes subsidized rates for services including carsharing, bikesharing, and taxis.

In Munich, the study team was able to see how the transit system had been developed beyond the traditional city limits prior to allowing housing development, and then, how housing was carefully planned to be within walking distance of the new transit stops. Within the city, dense infill development is encouraged along major rail and tram lines. In reviewing new development, the city's planning guidelines direct that 80 percent of the population and jobs should be within walking distance of quality transit service.[49]

In Paris, the $35 billion Grand Paris Express Metro project—a group of new rapid transit lines being built across the Île-de-France region—is being paired with vast improvements in the bike lane network across the city, and bikesharing has been designed to extend transit lines and provide first/last mile connections. Paris also has a plan to constrain private car parking that will be implemented beginning in 2020.

In Italy, Milan decided it wanted to have a comprehensive shared mobility system. The city defined the quality and number of services that it thought appropriate for its geography and density, and then had a public tender to attract providers using a "licensing" model, an approach currently undergoing trial in U.S. cities like Seattle (for free-floating carsharing[50] and dockless bikesharing[51]) and San Francisco (for private shuttles and microtransit vehicles[52]). Munich has also worked extensively with the private sector, including partnering with BMW, to establish expectations around shared mobility. However, Munich's shared mobility services have been largely led by private automobile companies, and there has been less public guidance and regulation compared to a city like Milan, which was discussed earlier.

Milan's efforts to create a supportive regulatory environment for shared mobility has paid off—the city boasts six one-way carsharing operators, a total fleet of 3,394 vehicles (28 percent of which are all-electric), with 743,000 users, a total of 4,650 dock-based (electric-assist and traditional) bicycles, 12,000 dockless bikeshare bikes, and 200 shared scooters.

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49   Landeshauptstadt München, Referat für Stadtplanung und Bauordnung, "Nahverkehrsplan der Landeshauptstadt München," July, 2005. Available at: https://www.muenchen.de/rathaus/dam/jcr:f9a570d9-2fe7-4985-9528-f6d69ea1d8e9/Nahverkehrsplan.pdf.

50   Norm Mah, "Seattle Car Share Program Update," Seattle Department of Transportation (Blog), March 4, 2016. Available at: http://sdotblog.seattle.gov/2016/03/04/seattle-car-share-program-update/.

51   Josh Cohen, "Seattle Test Will Lead to Regulating Dockless Bike-Share," Next City, December 21, 2017. Available at: https://nextcity.org/daily/entry/seattle-dockless-bikeshare-pilot-regulation.

52   San Francisco Municipal Transportation, "Private Transit Vehicle Permitting," October 17, 2017. Available at: https://www.sfmta.com/projects/private-transit-vehicle-permitting.

04.

OTHER KEY FINDINGS ON WHAT'S BEHIND EUROPEAN SHARED MOBILITY SUCCESSES

European countries such as France, Germany, and Belgium have made significant progress in fostering innovation and helping to establish and scale new transportation solutions. This progress is due to a number of factors in addition to those already highlighted in the previous chapter. These factors center on public sector and other leadership priorities, funding commitments, and public policy initiatives.

Public Sector and Other Leadership Priorities

During the site visits, the study team was able to observe direct links between visionary leadership, reflected in forward thinking planning documents, and successful implementation of new ideas. The team also saw business leadership that strongly influenced acceptance of new ideas. In Munich, for example, it was the automakers that were leading the charge for new mobility solutions,

offering carsharing, testing automated vehicles, and promoting electrification, all with strong government support.

On a local level, all three of the study cities provide examples of strong public sector leadership models for mobilizing interest in shared mobility. Notable examples include the Minister of Mobility and Public Works at the Brussels Capital Region, the City of Munich's Head of Strategy and Policy Division for the Road Transport Department in the Department of Public Order, and the former and current mayors of Paris, all of whom have mobilized interest in shared mobility through shepherding innovative policies and plans for their cities. While we have seen similar efforts by mayors in the United States, these European leaders are looking beyond their immediate jurisdictions and have made a compelling case for broadening transportation choice to bring about positive outcomes for entire regions.

These leaders have linked better transportation options very clearly with economic development and job access. They have also focused on "choice" and emphasized multimodal lifestyles as well as economic factors such as the high cost of auto ownership and the health and environmental benefits of transit, walking, and shared mobility. In addition, they are rallying support around common interests in meeting the needs of the elderly and others who cannot drive.

Funding Commitments

The EU has allocated some €26 billion ($28.1 billion in 2017 dollars) to transportation over the 2014-2020 period.[53] It leverages these funds in a number of ways, including supporting research, deployment projects, planning and regional goal setting. The EU has established a wide range of initiatives, networks, and organizations to support efforts to advance new transportation solutions. These include:

➤ **Horizon 2020** is the biggest EU research and innovation program ever, with nearly €80 billion ($86.7 billion in 2017 dollars) in funding available over seven years (2014 to 2020) in addition to the private investment that these funds are expected to attract. Of that amount, €2.9 billion ($3.1 billion in 2017 dollars) is earmarked for projects related to promoting smart, green, and integrated transportation (sub-categories include Mobility for Growth, Green Vehicles, and Automated Road Transport).

➤ The Horizon 2020-funded **CIVITAS Initiative** helps cities across Europe implement and test innovative and integrated strategies that address energy, transport, and environmental objectives. Since 2002, the initiative has supported some 800 urban transport measures concentrated in 80 European cities. One example is the Empower project, which features a consortium focused on exploring the use of economic incentives, gaming, and a point system to influence travel behavior. The annual CIVITAS Forum also brings together practitioners and elected officials from the CIVITAS cities. The CIVITAS ECCENTRIC program, which is funding several of the Munich projects visited by the study team, is focused on mobility and freight logistics in lower density suburban environments.

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53   European Union, "EU transport policy," n.d. Available at: https://europa.eu/european-union/topics/transport_en.

➤ **European Mobility Week** is an annual conference funded and overseen in part by the EC that focuses on promoting clean, shared, and intelligent mobility. In September 2017, the conference took place in Portugal.

In August 2017, the EC announced it would launch a new and innovative way to finance transport infrastructure projects in Europe. It issued a call for proposals seeking to combine €1 billion ($1.1 billion in 2017 dollars) of grants from the *Connecting Europe Facility – Transport* program with financing from public financial institutions and the private sector to boost investment to fund innovative, sustainable transport infrastructure. The initiative also coincides with the Commission's Strategy for Low-Emission Mobility and supports other investments in sustainable transport.

While shared mobility is not the explicit objective of any of these initiatives, there seems to be a collective vision that it may be part of the solution. These organizations and initiatives can direct activities chiefly through setting goals and directives and otherwise fostering cooperation. While they can do little in the way of actual enforcement, they can encourage and cajole to bring about action.

Source: Pexel

European Public Policy Initiatives

The EU has also established a number of policies and agreements that have helped to spur innovation in shared mobility, including:

➤ **Climate and Energy Policy Framework 2030.** As it relates to transportation, the framework asks for a comprehensive and technology-neutral approach for promoting emissions reduction and energy efficiency in transport, including electric and renewable energy sources for transportation.

➤ **Energy Union Package (Feb. 2015).** The Juncker Commission priorities of the Energy Union,[54] the Digital Single Market[55] and the Jobs, Growth and Investment[56] agenda all contribute to transport and mobility. This initiative calls for gradual transformation of the entire transport system and increased development and deployment of alternative fuels with infrastructure, vehicles, and fuels being rolled out together.

➤ **2013 Urban Mobility Package.** The package aims to provide support to European cities tackling urban mobility challenges by establishing best practices and fostering collaboration, providing targeted financial support, and directing research to find new solutions for urban mobility challenges. It is complemented by a document that sets out the concept for Sustainable Urban Mobility Plans (SUMPs), which help cities improve access to urban areas and provide high-quality and sustainable

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[54] See more at: https://ec.europa.eu/commission/priorities/energy-union-and-climate_en.

[55] See more at: https://ec.europa.eu/commission/priorities/digital-single-market_en.

[56] See more at: https://ec.europa.eu/commission/priorities/jobs-growth-and-investment_en.

mobility and transport. The package offers support to help cities develop SUMPs, including guidelines, a self-assessment tool, and more.

➤ **COP21 Agreement (Paris) and Strategy for Low-Emission Mobility.** The strategy adopted by the EC in July 2016 aimed at the need to accelerate efforts to decarbonize transport. The agreement is in line with the Paris commitments (December 2015) and is mutually reinforcing with other initiatives on urban mobility and clean fuels. The agreement's key goal for transport is to reduce greenhouse gas emissions by 60 percent by 2050 through:

- Increasing the efficiency of the transport system by making the most of digital technologies and smart pricing and by encouraging shifts towards lower emission transport modes such as cycling.

- Speeding up the deployment of low emission alternative energy for transport and removing obstacles to the electrification of transport.

- Accelerating the transition towards zero-emission vehicles.

Source: FHWA

Source: Thinkstock

Source: FHWA

05.

OPPORTUNITIES TO APPLY THE STUDY RESULTS IN THE UNITED STATES

Shared mobility continues to evolve at an increasingly rapid pace in Europe, the United States, and other regions and nations around the world. While every development in one region might not be relevant to another, the GBP study team identified several best practices and lessons learned with the potential to benefit the United States experience with shared mobility. Some of these ideas are shared in this chapter.

National

The Federal Government plays an important role in funding research and pilots, controlling policy and regulatory levers, and helping to set the national agenda on transportation-related issues. This section describes approaches that may apply at the national level.

Research

➤ Further research on personalized mobility marketing and its effect on mode shift, exploring successful programs and best practices.

➤ Explore the application of arrangements found with European transportation agencies and P3 structures for spurring shared mobility innovations and then scaling them.

Information Dissemination

➤ Provide information about ways cities and transit agencies can use existing Federal funding streams, such as Congestion Mitigation and Air Quality Improvement Program funds, for shared mobility projects.

- Create a general framework for public and private sector data sharing and integration as it relates to delivering MaaS.

- Provide information about integrated mobility hubs and siting practices around transit stations and large residential developments.

- Provide information to MPOs working to develop multimodal action plans that incorporate shared mobility.

- Draw relationships between shared mobility approaches and performance management/measures.

Technical Assistance

- Consolidate best practices from European cities regarding mobility "brokerage models."

Model Contracts and Agreements

- Create a shared mobility contract "playbook" with sample contracts and agreements from the United States and Europe along with lessons learned and suggested best practices. This could include topics such as public-private partnerships, shared parking, integrating apps, electric utility-agency partnerships, integration of data, fares and apps, and more.

Mobility on Demand

- Conduct pilots on MOD and Maas.

- Launch an international mentor or "exchange" program between U.S. and European shared mobility experts to facilitate knowledge exchange.

- Work with other transportation agencies to create an incubator for shared mobility start-ups.

State

States have an important role to play in the transportation ecosystem, with a purview that includes taxation, vehicle licensing, insurance regulations, and more.

Insurance Regulations

- Opening a dialogue with new shared mobility service providers, along with preexisting and start-up insurance companies exploring the development of on-demand insurance products, could facilitate the modification of insurance regulations in a way that would result in the expansion of shared mobility.

Financial Incentives

- Vehicle miles traveled buy-backs and congestion fees may help support shared, sustainable modes of transport and improve transportation system performance.

- Fee and rebate schemes can be used to discourage "zombie" or zero-occupancy vehicle trips (in autonomous vehicles), single-occupancy commutes, and ride-along ridesourcing trips, while encouraging shared rides in their various forms.

Source: Pexel

Local

Cities and transit agencies will continue to be on the front line of new developments in shared mobility. They can use policies related to street space, parking, and marketing and outreach.

Marketing and Outreach

➤ Conduct transportation agency-led personalized marketing pilots to improve system efficiency.

➤ Co-market transit and shared mobility services, including emphasizing opportunities to transfer between services for first/last mile trips.

Parking Regulations

➤ Charge market prices for all on-street and government-supplied parking.

➤ Require that parking spaces in each new residential building are dedicated for shared-use vehicles.

➤ Eliminate minimum residential private parking requirements.

➤ Increase carshare and bikeshare visibility through on-street parking access.

Shared Infrastructure

➤ Leverage carsharing programs to scale up EV charging infrastructure.

➤ Build mobility hubs at high-capacity transit stations and large residential developments.

A.

appendix

BACKGROUND ON EUROPEAN SITE VISIT CITIES

Munich

Munich, Bavaria's capital and the third largest city in Germany with a population of 1.4 million, has been rated one of the most livable cities in Europe due in part to its walkability, multitude of public transportation options, and long history of transit oriented design.[57] Munich boasts a large number of public transportation providers, from shared taxis to trams, and the transit agency is collaboratively operated by Stadtwerke München (SWM), Munich's electric utility. This cooperation has yielded large investments in electro-mobility, including an establishment of a municipal charging network that is coordinated within the region (Bavaria/ Saxony) and funded through the Federal Ministry of Transport.[58] Additionally, Munich's downtown has been a low-emission zone since 2008,[59] and the city is the site of multiple European Union demonstration projects, including the CIVITAS ECCENTRIC Project and the Smarter Together collaborative.

Munich is a leader in carsharing, with eight providers currently operating in the city providing a range of services, including one-way, free-floating, round-trip, all-electric, and peer-to-peer carsharing. Munich is home to headquarters of BMW and several mobility pilots and services from other automakers such as Daimler. BMW carsharing service DriveNow has a fleet of more than 700 vehicles in Munich, and STATTAUTO, the leading round-trip provider, has a fleet of 430 vehicles at 110 stations, as well as a zone-based carsharing pilot called STATTAUTO flexy.[60] Munich is also one of the six German municipalities with an integrated mobility hub, which features carshare, bikeshare, transit, and electric charging stations. The Munich Transport Corporation (MVG), Munich's transit agency, has developed a variety of innovative programs, including the transit-run integrated payment app MVG More, which provides seamless travel planning across four carsharing providers and the city's free-floating bikeshare system (MVG-Rad).

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[57] Oliver Smith, "Revealed: The world's best (and worst) cities to live in," *The Telegraph*, April 16, 2017. Available at: http://www.telegraph.co.uk/travel/news/liveable-cities-2017-economist-intelligence/.

[58] Stadtwerke München, "Förderung der Elektromobilität in München," n.d. Available at: https://www.swm.de/privatkunden/m-mobilitaet/elektromobilitaet.html.

[59] City of Munich, "Munich Low emission Zone," n.d. Available at: https://www.muenchen.de/rathaus/home_en/Environment-and-Health/Low_emission_zone.html.

[60] Statt Auto, "How the CarSharing System works," n.d. Available at: https://www.stattauto-muenchen.de/en/english-how-the-carsharing-system-works/.

Munich's urban development has been largely conducive to supporting a transit-reliant, car-lite population, especially in the inner ring of the city. Approximately 45 percent of Munich households are car-less. And with high-frequency trains running every two minutes in the city core, using public transit is very convenient for residents. According to a study conducted by MVG in 2015, more than two-thirds of residents use transit at least once every week, and 38 percent are daily transit users. With more than 50,000 parking spaces for bikes at transit stops, cycling accounts for 15 percent of the city's modal share.[61]

The city has a growing population with 100 new residents arriving every day. Policies established in 1990 have resulted in 90 percent of the urban growth occurring in locations close to tram stops, and new residential buildings are encouraged to promote multimodal lifestyles through providing limited parking, free transit passes, and on-site mobility hubs. Public transportation in Munich is well-linked within the larger region, and Bavarian intercity rail is robust and continues to expand. Bavaria receives a national subsidy of €1 billion ($1.1 billion in 2017 dollars) each year for public transportation, and saw an 88 percent increase in transit service and 36 percent more ridership (a 14 percent increase per capita) between 1990 and 2015, in part due to the integrated regional ticket, the Bayern-Ticket.[62]

Paris

Paris, France, a city of 2.2 million, with over 12 million inhabitants in the Greater Paris region, has long been an innovator in shared mobility. Paris has a legacy of ambitious public transit initiatives: in 2007 the City of Paris launched Velib', the first major bikesharing system in the world, and in 2011, launched the first all-electric carsharing program, Autolib'. The city has continued to set lofty goals, and by 2020 plans to raise the price of parking across the city, ban diesel cars in the urban core, and significantly expand the city's network of bike lanes.[63] Its chief public transit network, Metro, is heralded as one of the best in the world, and has plans to expand further through an initiative called the "Grand Paris Express," a €30 billion ($32.5 billion in 2017 dollars) project which will add 68 stations across the regional network by 2030.[64]

All these efforts have resulted in a very multimodal population. More than half of Parisian households (55 percent) are car-free. Since 2002, Paris has seen a 30 percent mode shift away from driving to other modes, and 83 percent of Paris trips occur by foot, public transit, or bicycle.[65] Yet the Greater Paris region remains car dominant, with most commuters into Paris (65 percent) traveling in single-occupancy vehicles. The regional transit agency, Île-de-France Mobilités (formerly STIF), is leading a variety of new multimodal initiatives to combat high levels of car ownership and usage, including expanding the

61 Munich Transport Corporation, "Munich Transport Corporation (MVG) Sustainability Report 2014/2015," 2015. Available at: https://www.mvg.de/dam/mvg/ueber/nachhaltigkeit/mvg-nachhaltigkeitsbericht-eng.pdf.

62 Buehler, R., Pucher, J., & Dümmler, O. (2018): "Verkehrsverbund: The evolution and spread of fully integrated regional public transport in Germany, Austria, and Switzerland," International Journal of Sustainable Transportation, DOI: 10.1080/15568318.2018.1431821.

63 "Why Paris will be the first post-car metropolis," Financial Times, September 6, 2017. Available (with subscription) at: https://www.ft.com/content/1b785f3e-9299-11e7-a9e6-11d2f0ebb7f0.

64 "Bicycles and bans are reshaping the city," The Economist, September 14, 2017. Available at: https://www.economist.com/news/europe/21728997-motorists-denounce-hipster-takeover-bicycles-and-bans-are-reshaping-city.

65 Epomm, "TEMS – the Epomm modal split tool," 2008, http://www.epomm.eu/tems/result_city.phtml?city=201&map=1.

integrated payment app and smartcard "Navigo pass," which works across all public transit in the region as well as for the bikeshare and carshare systems.

On the private sector side as well, Paris has been a magnet for innovation in shared mobility. Peer-to-peer carsharing operators OuiShare and Drivy are highly popular, with Drivy attracting more than 1 million registered users and both Drivy and OuiShare hosting approximately 30,000 vehicles on their platforms. A tough regulatory environment for ride-hailing providers, including the intermittent banning of Uber, has resulted in encouraging the growth of some smaller start-ups offering similar services, such as the wildly successful carpool provider BlaBlaCar, which now offers "BlaBlaLines" for short carpool trips, in addition to its long-distance model. Other smaller providers include Ouihop and Karo. New mobility options such as demand-responsive shuttles (Padam and Via) and scooter sharing (CityScoot and Gogoro) are also growing in the city, and new innovations are being tested regularly, such as shared light commercial electric cargo vehicles, included a refrigerated cargo van.[66]

Source: FHWA

Brussels

Belgium has long been a progressive leader in shared mobility. Brussels, officially called the Brussels-Capital Region (population 1.1 million), was rebuilt as a more auto-centric region following World War II. Due in part to its urban design as well as its prominence as "Europe's capital," the city faces significant problems related to traffic congestion and pollution. These challenges have pushed Brussels toward strong support for shared mobility, especially carsharing, to address transportation sustainability issues. As a result, the city has become a test site of many innovative initiatives with significant buy-in and participation by the public sector, including the De Lijn and STIB transit agencies. In neighboring Ghent, the nonprofit organization TaxiStop has helped to pioneer carsharing and transportation demand management programs, including Cambio carshare, the long-standing Villo! bikeshare system, and initiatives such as the "Basic Mobility Law," which established people's right to the basic provision of public transit.

In the past decade, forward thinking policy and political leaders have turned the emphasis back toward pedestrian, bicycle, and transit-oriented design, and many tunnels and flyovers for highways have been built to improve walkability. The city has also constrained much of the parking supply in the city, and built the second largest pedestrian zone in Europe in the downtown.[67] Additionally, Brussels has funded major public transit renovations, built a new underground rail line, and constructed 12,000 park-and-ride spaces in its outskirts. Villo! Bikeshare has more than 40,000 users, and has

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66   F. Guaspare and T. Mourey, "Commercial in confidence," *Thinking Cities* 4(1), May 2017, pp. 20-22. Available at: https://www.polisnetwork.eu/uploads/Modules/PublicDocuments/tc8lo.pdf.

67   Alexander Saeedy, "Brussels extends pedestrian zone, Europe's second largest," *Reuters*, June 29, 2015, Available at: http://www.reuters.com/article/belgium-brussels-transportation/brussels-extends-pedestrian-zone-europes-second-largest-idUSL5N0ZF36Z20150629.

Source: FHWA

plans to eventually move entirely to electric-assist cycles to make cycling easier on the city's many steep inclines.[68] DriveNow, which launched in Brussels in September 2016, had more than 16,000 members as of mid-2017 according to the city's transport minister. All public transportation in the region is integrated through the "MOBIB" Brussels Mobility Card, which was introduced in 2007 and includes payment integration for bikesharing, carsharing, shared taxis, shared parking, and several Belgian railways.

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[68] Polis, "Free floating bikes arrive at Brussels," August 29, 2017, https://www.polisnetwork.eu/publicnews/1466/45/Free-floating-bikes-arrive-to-Brussels.

B.

appendix

SUCCESSES IN THE UNITED STATES

The United States has also had some notable successes in advancing shared mobility approaches. Limited regulation on ride-hailing services in the U.S. has led to their huge expansion, while European governments have often curtailed such expansion. For example, Germany's passenger transportation law is comparatively strict and requires licensed professional drivers. As a result, the personal vehicle–centered "UberX" model common in the United States does not exist in Germany. Instead, Uber only operates much like a limousine or professional livery service. Uber drivers are also not allowed to pick up passengers in a chain (A to B to C) but instead must return to their garage or call center between trips. In September 2017, Uber lost its license to operate in London, and had to completely suspend operations there as a result.

In addition to allowing the general growth in ride-hailing, the United States has had many notable successes in encouraging innovation in urban mobility in recent years, and has made comparative advances in some areas over Europe as a whole. These include:

➤ **Ride-hailing partnerships.** While European cities have attempted to strictly regulate new transportation network companies such as Uber and Lyft, with several cities banning them altogether, in the United States some transit agencies have begun limited pilot partnerships with ride-hailing services. This is especially true of agencies in midsize and smaller cities. These pilots include subsidized first/last mile services, promotional partnerships, limited provision of paratransit services, and Guaranteed Ride Home programs for carpool users.

➤ **Carpooling.** Perhaps because the mode split favors single-occupancy vehicles so heavily in most of the United States, the Nation has led in many ways regarding developing new solutions related to carpooling and ridesharing. Cities such as Washington, D.C., and San Francisco have long supported successful informal single-trip carpooling or "slugging." Innovations such as high-occupancy vehicle lanes and free use of high-occupancy toll lanes for ridesharing have helped to support carpools and are now fairly extensive in regions such as California's Bay Area, but are largely absent in Europe.

Source: SFPark

➤ **Parking pricing.** The United States has also led the way in developing new mechanisms for managing and pricing parking. In San Francisco, the SFpark pilot was one of the first to use "smart" parking meters that allow for prices to fluctuate according to location, date and time of day, adjusting meter and garage pricing up and down to match demand and help achieve sufficient parking availability at all times, and to send price signals when parking is most constrained and thereby encourage alternative transportation access.

➤ **Accessibility and equity.** Every transit agency in the United States operates with the basic premise that all services should be provided to everyone. Because of the Americans with Disabilities Act (ADA) and Title VI of the Civil Rights Act of 1964, however, the United States does much more on the federal and local level to ensure equity of service for disabled users than is typical in Europe.

Source: Thinkstock

➤ **Automated vehicle testing.** Spurred onward by its sizable technology and auto industries, the United States clearly leads in the area of autonomous vehicle testing. In California alone, more than 40 companies have secured permits to test driverless cars on public roads.[69] More than 20 states have passed legislation related to autonomous vehicles.[70] The more centralized, controlled nature of many European governments along with perhaps differences in philosophy have resulted in less of such activity in Europe. Several European cities have started testing autonomous transit shuttles, but on a much smaller scale compared with activity in the United States.

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[69]   State of California, Department of Motor Vehicles, "Testing Autonomous Vehicles with a Driver," n.d., https://www.dmv.ca.gov/portal/dmv/detail/vr/autonomous/testing/

[70]   National Conference of State Legislatures, Autonomous Vehicles Self-Driving Vehicles Enacted Legislation, "Autonomous Vehicles," March 26, 2018, http://www.ncsl.org/research/transportation/autonomous-vehicles-self-driving-vehicles-enacted-legislation.aspx

U.S. Department of Transportation
Federal Highway Administration