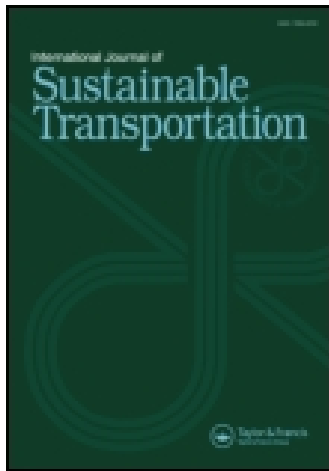


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Introduction Shared-Use Vehicle Services for Sustainable Transportation: Carsharing, Bikesharing, and Personal Vehicle Sharing across the Globe

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Introduction

Shared-Use Vehicle Services for Sustainable Transportation: Carsharing, Bikesharing, and Personal Vehicle Sharing across the Globe

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This special issue of the *International Journal of Sustainable Transportation* highlights developments in shared-use vehicle research, in particular carsharing, public bike-sharing, and personal vehicle sharing. Since the mid-1980s, shared-use vehicle services have gained momentum across the world. Developments include a range of operational models—private, non-profit, and governmental ventures; advanced technology; worldwide entry and growth; collaboration and competition; and increased activity by auto rental companies and automakers.

This compendium contributes to the growing body of shared-use vehicle literature in highlighting a variety of methodological approaches and case studies. Methodologies include microsimulation, probability, and regression models, as well as carsharing member, regional travel, and expert opinion surveys. Topics address the status of worldwide carsharing and personal vehicle sharing, estimation of carsharing demand, carsharing travel behavior impacts, factors that affect carsharing vehicle usage/availability, and bikesharing system design and operations.

Carsharing (or short-term auto use) became popularized in Switzerland and Germany in the mid-1980s, although the concept had been in existence in Europe since the 1940s. It spread to Asia and North America in the 1990s. As of October 2010, approximately 1.25 million individuals were sharing over 31,660 vehicles. Continued growth in carsharing is forecast (including one-way rentals—vehicles can be returned to different locations), along with notable developments in personal vehicle sharing.

Personal vehicle sharing is one of the latest additions to shared-use vehicle services. It entails sharing of privately-owned vehicles. While programs launched as early as

2001 in Boulder, Colorado; New York City; and Germany, it became more prominent in the late-2000s—with the most notable growth in organizations occurring after 2010. As of May 2012, there were 33 personal vehicle sharing operators worldwide, with 10 active or in pilot phase, three planned, and four defunct in North America. Programs are located in 10 countries: Australia, Canada, France, Germany, The Netherlands, Slovenia, Spain, Sweden, United Kingdom, and the United States.

Public bikesharing got its start in the Netherlands in 1965. While “free public bike” systems represented a notable innovation, they failed soon after launching due to theft and vandalism. Since then, public bikesharing has evolved to incorporate advanced information technologies for reservations, pick-up, drop-off, and information tracking, as well as innovative techniques for redistributing bikes (e.g., on-board computers in trucks to assess which stations are crowded or short on bicycles) and docking them (e.g., solar-powered, mobile stations). As of May 2012, there were an estimated 184 public bikesharing programs in approximately 204 cities around the world with over 369,020 bicycles at over 13,650 stations on five continents and 36 countries.

Four of the five articles included in this issue are focused on carsharing. The first presents an overview of developments in worldwide carsharing use and personal vehicle services. The next two articles provide case studies of Commuauto in Montréal, Canada. The first applies a regression model to identify factors that affect carsharing use. The second examines how carsharing impacts the overall travel behavior of households, based on two survey studies. In the final carsharing article, the authors employ an activity- and agent-based microsimulation model to estimate carsharing demand.

In “Carsharing and Personal Vehicle Services: Worldwide Market Developments and Emerging Trends,” Shaheen and Cohen provide an overview of current carsharing developments from across the globe. Carsharing operates in approximately 1,100 cities around the world, in 26 nations, and five continents. Another eight nations are exploring carsharing. In this article, the authors contrast worldwide carsharing expert survey results from 2006, 2008, and 2010. Twenty-five experts, representing 26 carsharing countries, participated in the 2010 survey. Personal vehicle sharing and one-way carsharing updates are also included. Continued growth is forecast, along with the multi-nationalization and mainstreaming of services. Ongoing expansion of traditional rental car providers and auto manufacturers into carsharing is also predicted, along with increased linkages among mobility options (e.g., carsharing and bikesharing).

The next two articles are based on case studies of Commuauto. Commuauto is a for-profit carsharing operator, which operates a shared-use vehicle service in four cities in Quebec: Montréal, Quebec City, Gatineau, and Sherbrooke. The company also provides carsharing services in Ottawa, under the name VRTUCAR. Commuauto was founded in 1994 and was the first carsharing organization to launch in North America. As of January 2012, it had 24,680 users who shared a fleet of approximately 1154 vehicles.

In Lorimer and El-Geneidy’s “Understanding Factors Affecting Vehicle Usage and Availability in Carsharing Networks: A Case Study of Commuauto Carsharing System from Montréal, Quebec,” the authors seek to determine key factors that

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affect vehicle usage and availability in the Communauto carsharing network. A multi-regression model was developed to focus on vehicle availability. The analysis revealed that a number of factors impact availability or usage including: (1) the number of vehicles parked at a station has the greatest impact on vehicle availability; (2) average vehicle use impacts vehicle age; and (3) vehicle usage is influenced by member concentration in the station vicinity.

In Siou et al.'s "How Carsharing Affects Travel Behavior of Households: A Case Study of Montréal, Canada," the authors focus on how carsharing impacts the overall travel behavior of households in the region. The article presents and contrasts results from two surveys: (1) a web-based survey of carsharing users and (2) a regional large-scale household travel survey. The analysis revealed a significant difference in the car use (or modal split) of carsharing members in contrast to typical Montréal residents across household types and carsharing use. Not surprisingly, carsharing members never reached the level of vehicle usage observed in the general population.

While the final carsharing article is focused mainly on an innovative model for estimating carsharing demand, the authors employ data from Mobility CarSharing in Zurich, Switzerland, to validate the results. Mobility CarSharing was founded in May 1997 through a merger of two existing Swiss carsharing operators: ShareCom and AutoTeilet Genossenschaft (ATG). Mobility CarSharing is one of the oldest carsharing operators in the world and the only operator in Switzerland. At the time of this writing, the company had 2,600 vehicles at 1,340 stations throughout Switzerland.

In Ciari et al.'s "Estimation of Carsharing Demand Using An Activity-Based Microsimulation Approach: Model Discussion and Some Results," the authors estimate carsharing travel demand. They note that this topic has been addressed infrequently in the carsharing literature. The article presents a new methodological approach—involving activity- and agent-based microsimulation—that builds on an open source project, called "MATSim." The analysis focuses on two key carsharing aspects: vehicle access and time-dependent fee structures for use. Both are critical to estimating carsharing demand. In the future, this modeling tool could also be applied to evaluate other innovative transportation modes or services. Scenario results from approximately 160,000 agents, representing the urban area of Zurich, are presented and contrasted to customer data from Mobility CarSharing's Zurich operations. The findings were shown to be realistic in terms of overall carsharing use, vehicle access, and fee structures.

In the final article of this issue, one of the most widely known public bikesharing systems, Vélib' (located in Paris, France), is highlighted. To date, Vélib' operates with over 20,000 bicycles and 1,800 bicycle stations available every 300 meters. Nair et al.'s article, "Large-Scale Vehicle Sharing Systems: Analysis of Vélib'," focuses on system operations, particularly fleet management strategies to address flow asymmetry. Vélib' accounts for as many as 120,000 trips per day. Building on prior work, the authors employ a "chance constrained" model to provide a probabilistic characterization of the system. Reliability metrics are applied to assess key performance measures and to help identify stations with capacity bottlenecks. The study focuses on the importance of system characteristics, usage patterns, public transit and bikesharing connections, and flow imbalances. The authors found that the close

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coupling of bikesharing to public transit leads to higher use. Thus, policies that emphasize the integration of bikesharing and transit could be profitable, such as seamless smartcards and preferential fares for public transit users.

We hope this special issue provides transportation practitioners, students, and researchers with an assortment of topics, methodological approaches, and case studies that can aid them in understanding and answering questions related to the ongoing evolution of shared-use vehicle systems.