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POLICY BRIEF

Curbside Management Is Critical for Minimizing Emissions and Congestion

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Issue

The curbside is valuable real estate in cities, providing private vehicle parking, pick-up/drop-off areas, public transit stops, freight loading/unloading zones, and space for pedestrians and bicyclists. The growing adoption of ride-hailing services, the rise of e-commerce with its residential deliveries, and the increase in micro-mobility services have compounded the pressure on this already-saturated element of the transportation system. Moreover, the advent of automated and connected vehicles will require, in most cases, access to the curb for pick-up and drop-off activities. Shortages and poor management of curb space can cause congestion and increased emissions due to vehicles searching for parking and can create unsafe conditions from vehicles double parking.

Traditional curbside planning strategies have relied on land use–based demand estimates to allocate access priority to the curb, such as pedestrian and transit in residential areas and commercial vehicles in commercial and industrial zones. Recently, pilots in San Francisco, Washington, D.C., and elsewhere have used new technologies to provide information to users about space availability or dynamically price the curb. The SFpark pilot program showed that innovations in curb management significantly reduced energy consumption by reducing cruising time and parking distance by more than 10%. Other locales have explored flexible curbside management strategies but lack the systems to gather and analyze data and optimally and dynamically allocate space to the different users and needs. These innovative techniques will be needed as curbside demand grows ever more complex in the future.

Researchers at the University of California, Davis conducted a review of practices in curbside management, and they conducted simulations to evaluate the impact of different management and design strategies on travel time, congestion, vehicle travel, and emissions in residential, commercial, and mixed-use neighborhoods in San Francisco.

Key Research Findings

A range of strategies have been explored to efficiently utilize the curb. Strategies to maximize parking availability and reduce the amount of time cars are searching for parking include demand-based parking, time limits, time-of-day restrictions, reduced occupancy targets, provision of off-street options, and priority parking programs. In addition, Complete Streets strategies have addressed how curb space is prioritized. Complete Streets is a transportation design and policy approach aimed at providing safe travel and access for all users, including pedestrians, bicyclists, motorists, and transit riders of all ages and abilities.

New methods of monitoring and modeling curbside demand are less expensive and more comprehensive than traditional methods. New technologies such as computer vision and machine learning algorithms have shown promise for efficiently and cost-effectively collecting data on curbside activity to inform planning. Advances in data collection methodologies provide opportunities to develop tools for the dynamic management of curb space that account for the complex demand patterns and variability of users and uses.

Assessment of curbside management strategies has been limited to date. Very few studies have analyzed how different strategies impact energy and emissions or safety.

Simulations show that information on the availability of off-street parking reduces searching for parking and the associated vehicle travel and emissions, particularly in commercial areas. Information about off-street parking availability reduced emissions by almost 40% in commercial neighborhoods in the most extreme scenario. Impacts were far more modest in the residential and mixed-use areas.

Simulation results also support the potential benefits of Complete Streets and flexible curbside management strategies. An understanding of the disaggregate demands of the system by time of day allows for the optimal allocation of space. For example, setting longer parking time limits during the morning peak can reduce travel time and emissions. But during other times of day, those same long time limits can reduce throughput and negatively impact the system.

Designated passenger and freight loading and unloading areas are more important in commercial areas than in mixed-use and residential areas. The presence of loading and unloading areas reduced emissions by up to 10% in commercial areas in the simulations (Figure 1), but resulted in negative outcomes in residential and mixed-use areas. In all cases, negative impacts were more significant once more than 30% of the parking spaces were allocated as loading and unloading areas.

Policy Implications

While several jurisdictions have guidelines that provide general curb-use priorities depending on the land use, these guidelines are mostly static and do not maximize the use of this public good. This study shows that the efficient allocation of curb space requires policies and guidelines to 1) collect curbside user and use data; 2) process the data to detect, recognize, classify, and track curb activity; 3) dynamically optimize the allocation of the curb space to different uses and priorities; 4) use curb space allocation to manage demand to mitigate the environmental, economic, social and safety impact of competing needs; and 5) develop and implement new designs such as flexible use by time of day.

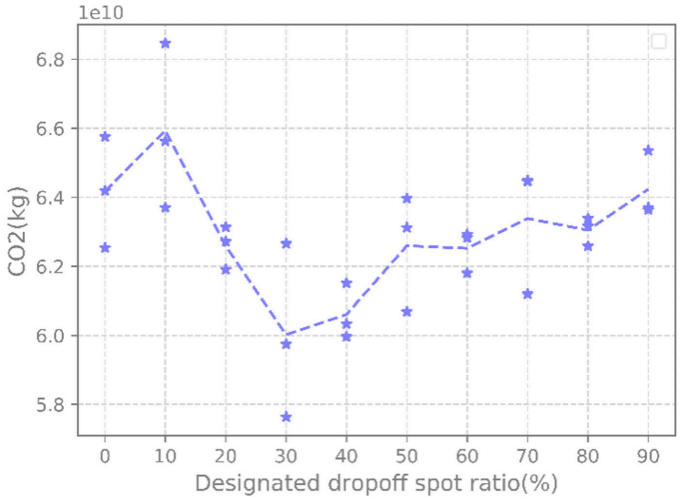

Figure 1. An example of greenhouse gas emissions for a simulation scenario based on the percentage of parking spots in a commercial area designated for loading and unloading

More Information

This policy brief is drawn from "Fighting for Curb Space: Parking, Ride-Hailing, Urban Freight Deliveries, and Other Users," a report from the National Center for Sustainable Transportation, authored by Miguel Jaller, Caroline Rodier, Michael Zhang, Huachao Lin, and Kathryn Lewis of the University of California, Davis. The full report can be found on the NCST website at https://ncst.ucdavis.edu/project/fighting-curb-space-parking-bike-sharing-urban-freight-deliveries-ride-hailing-and-others.

For more information about the findings presented in this brief, please contact Miguel Jaller at mjaller@ucdavis.edu.

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