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Urban Delivery Companies' Needs and Preferences for Green Loading Zones Implementation: A Case Study of NYC

Thomas Maxner,[1] Panagiota Goulianou,[2] Andisheh Ranjbari, Ph.D.,[3] and Anne Goodchild, Ph.D.[4]

[1] Urban Freight Lab, Supply Chain Transportation & Logistics Center, Department of Civil & Environmental Engineering, University of Washington, Seattle, WA, 98195; e-mail: tmaxner@uw.edu
[2] Urban Freight Lab, Supply Chain Transportation & Logistics Center, Department of Civil & Environmental Engineering, University of Washington, Seattle, WA, 98195; e-mail: pgoul@uw.edu
[3] Department of Civil & Environmental Engineering, Pennsylvania State University, University Park, PA 16802, e-mail: ranjbari@psu.edu
[4] Supply Chain Transportation & Logistics Center, Department of Civil & Environmental Engineering, University of Washington, Seattle, WA, 98195; e-mail: annegood@uw.edu

ABSTRACT

Green Loading Zones (GLZs) are curb spaces dedicated to the use of electric or alternative fuel ("green") delivery vehicles. Some U.S. cities have begun piloting GLZs to incentivize companies to purchase and operate more green vehicles. However, there are several questions to be answered prior to a GLZ implementation, including siting, potential users and their willing to pay. We reviewed best practices for GLZs around the world, and surveyed goods delivery companies operating in New York City to collect such information for a future GLZ pilot. The findings suggest the best candidate locations are areas where companies are currently subject to the most parking fines and double parking. Companies expressed willingness to pay for GLZs, as long as deploying green vehicles in the city can offset other cost exposures. Respondents also selected several single-space GLZs spread throughout a neighborhood as the preferred layout.

INTRODUCTION

City agencies have historically focused efforts on reducing greenhouse gas (GHG) emissions from the transportation sector on passenger vehicle travel, but more recently, some cities are also committing to reducing GHG emissions from freight vehicles. There are now multiple electric and alternative fuel van and truck models available to replace fossil fuel vehicles, and new modes of delivery such as electric cargo bikes are gaining more traction. And government agencies are thinking of ways to incentivize the adoption of these low- or zero-emission delivery vehicles. Providing designated curb space access for "green vehicles" (electric or alternative fuel vehicles), especially in urban areas where finding a parking space is a challenge, could be an effective incentive. These zones, called Green Loading Zones (GLZs), could send market signals to companies about the direction the city wishes to go and drive demand for green vehicles up.

To act as a proper incentive though, cities should consider the needs of delivery companies and the benefits a GLZ can offer companies. These perceived benefits – improving driver safety,

reducing cost exposures, and increasing delivery efficiency – could act as stronger incentive to companies than merely achieving a city's or company's internal sustainability goals and should factor in siting, enforcement, and pricing decisions.

The goals of this study were to understand the barriers to and motivations of delivery companies in adopting green vehicles, and to make data-driven recommendations that can guide policy decisions around GLZ implementation. Focusing on the New York City market, information was gathered in three ways: a review of the current best practices around the world, an online survey of NYC delivery companies, and individual interviews with a few companies.

This paper is structured as follows. The next section covers a review of strategies implemented in North America, Europe, and Asia to support the adoption of green freight vehicles, as well as green vehicle strategies discussed in the academic literature. An overview of the data collection processes is provided in following section, succeeded by findings from the online survey and interviews with the parcel carrier and vehicle manufacturer. The final section details recommendations for implementing and managing green loading zones.

LITERATURE REVIEW

Freight policies in U.S. cities. Three U.S. cities have adopted freight-related green initiatives: Santa Monica, CA; Los Angeles, CA; and Washington, DC. Santa Monica has implemented a zero-emission delivery zone, Los Angeles is piloting zero-emission loading spaces at various places in the city, and Washington, DC has indicated intent to create "Eco Loading Zones," but its current loading zone policies can shed light on best GLZ practices. Programs in the three cities are further explained below and all intend to incentivize the adoption of green vehicles by restricting access to the busy curbs for fossil fuel vehicles.

In 2014, Washington, D.C. published a city-wide mobility action plan, MoveDC, that included a recommendation to create "Eco Loading Zones" for low-emission delivery vehicles (DDOT 2014). While a low-emission zone pilot has not been launched to date, the city did formalize a paid loading zone system at the curb (DDOT 2014). Zones are marked by red "loading zone" signs and the maximum allowable parking time is two hours (DDOT 2020). With the aid of an interactive map displaying available truck loading zones, the District DOT has reduced double parking violations and non-truck parking in loading zones by 50 percent (ITE 2021). Carriers have demonstrated a willingness to pay for access to reliably available loading zones, which both offsets parking fines and improves delivery efficiency (DDOT 2020).

Santa Monica's Zero Emissions Delivery Zone (ZEDZ) pilot, launched in February 2021, is a one-square mile, contiguous region in the downtown core of the city (LACI 2021). It includes 20 curb spaces reserved for zero-emission delivery vehicles as well as scooter and cargo bike deliveries. Reserved spaces are distributed throughout the downtown area and are demarcated by signage (Peters 2021). Zero-emission delivery vehicles can reserve spaces for 10-60 minutes (based on the location), using a mobile application. A few remote-operated delivery robots which share sidewalks with pedestrians to make food and small parcel deliveries also operate in the zone.

In June 2021, the Los Angeles City Council approved an ordinance proposed by the Los Angeles Department of Transportation (LADOT) to create five ZEDZs in the city (City News Service 2021). Locations were selected based on high curb space demand for commercial activity, high commercial or residential density, and environmental justice measures (UML 2021a; OEHHA 2017). LADOT is responsible for evaluating the success of the pilot well as creating a

blueprint for expanding the program throughout the city if it is deemed a success. The zones will be made available to alternative delivery modes like e-cargo bikes and scooters.

International zero-emission vehicle strategies. There are examples of programs supporting the adoption of green vehicles across Western Europe including in the United Kingdom (UK), the Netherlands, and Germany. London's Low Emission Zone (LEZ) was created in February 2003. An LEZ restricts access to a designated area to medium- and heavy-duty vehicles that meet certain emission standards set by EU. Standard thresholds have been increased incrementally up until March 2021, at which time only the lowest emitting vehicles available on the market were permitted entry into the LEZ (Joaquin 2021; TDA 2020; Broaddus et al 2015). London's LEZ, covering the entire city, has resulted in reduced NO_2 and CO_2 emissions (17 and 2 percent, respectively) as well as congestion (Broaddus et al 2015). However, a 2016 study found that while national carriers in the UK changed their fleets to comply with the LEZ, smaller carriers disappeared due to insufficient freight activity (Cruz and Montenon 2016). Additionally, they found that the LEZ led to fewer vehicles in the city, decreased speeds, and increased goods traffic.

Thirteen Dutch municipalities have also created LEZs in 2019 (European Commission 2021; TDA 2020). Vehicles entering the LEZs must display a decal showing compliance to the allowed emission levels designated by signage along every entry point to the zone (Broaddus et al 2015). Similar to London, the Dutch municipalities will incrementally increase the emission standards within the zone until only zero-emission vehicles are allowed (Broaddus et al 2015). Quak et al. (2016) examined the feasibility of using electric freight vehicles in the urban environment in the Netherlands from the carrier's perspective. They found that in Amsterdam, companies operating electric freight vehicles were given exemptions from congestion, parking charges and road taxes. Freight vehicles were also granted access to LEZs, pedestrian zones, bus lanes, and non-loading areas. These strategies reduced cruising time and walking time, increased deliveries during the time-window period, and as a result reduced the number of required delivery vehicles in the city. The authors note that in Rotterdam many delivery companies have opted to open urban distribution centers at the edges of the LEZs and use small electric vans or cargo bikes to make last-mile deliveries.

Bremen, Germany created an Environmental Loading Point (ELP) in 2007 (Pronet 2009). Located near Bremen's pedestrian-only inner-city commercial area, the ELP reserves two loading spaces within a parking lot for vehicles that comply with Germany's green vehicle standards (Dablanc and Montenon 2015). The ELP is the European program is most similar to a GLZ, as it established individual curb spaces reserved for low-emission vehicles rather than designating the entire city a low-emission zone. Germany also has nationally implemented LEZs in major cities. Cruz and Montenon (2016) compared this national governance to municipal governance through the examples of Berlin and London. In Germany, restrictions are applied based on vehicle pollutant emission level, which is signified by a colored decal on the vehicle. According to Cruz and Montenon (2016), these restrictions resulted in freight operators investing in cleaner vehicles, but many companies sold their conventional vehicles to countries without restrictions.

DATA COLLECTION

To understand the needs and preferences of goods delivery companies, we designed and implemented an online survey, and also scheduled individual interviews with a few companies, all in the New York City (NYC), United States area.

Study area. Freight accounts for 11 percent of New York City's GHG emissions (NYC DOT 2021). Growth in e-commerce, home deliveries, and population can lead to ever increasing urban freight demand and subsequent emissions. NYC has a stated interest in these emissions and one strategy for doing so is implementing GLZs to incentivize green vehicle purchases (NYC DOT 2021). The city is divided into five boroughs: Brooklyn, the Bronx, Manhattan, Queens and Staten Island (**Figure 1)**. Boroughs are subdivided into regions and neighborhoods, of which Lower and Midtown Manhattan are the neighborhoods known to be subject to the most congestion and parking unavailability (See Findings: Parking fines and difficulty in parking).

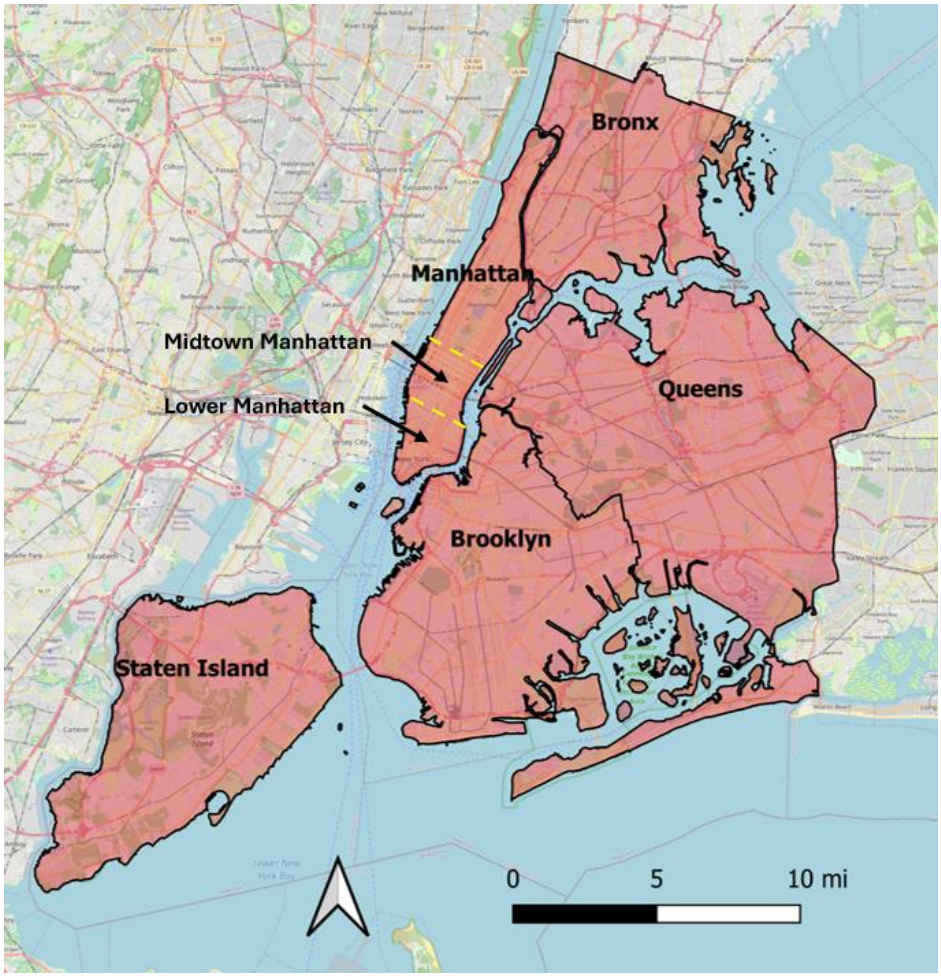

Figure 1: Boroughs of New York City

Online survey. The survey was designed for an audience of manager-level company employees with knowledge of day-to-day fleet operations within NYC and the company's current or planned sustainability efforts. The survey took on average 10-15 minutes to complete. Questions included: type(s) of companies who would utilize GLZs; contextual information such as the size of fleets, boroughs they operate in, parking choices and duration, the company's sustainability goals (if any), challenges to fulfilling those goals, and incentives required to achieve them; the most beneficial location and structure for the GLZs to the company; and companies' willingness to pay for GLZs (hourly, monthly, and annual rates).

The survey was distributed to potential respondents via multiple methods: it was posted on NYC DOT and University of Washington's Urban Freight Lab (UFL)'s social media channels, emailed to the UFL industry partners who operated in NYC, and sent to NYC DOT's industry listservs, as well as New York State Messenger Courier Association (NYSMCA) and Customized Logistics and Delivery Association (CLDA) listservs.

The survey was open for 1.5 months from mid-September to early November 2021, during which period several reminders were sent out to the above listservs and the survey link was reposted on the aforementioned social media channels. Upon closing of the survey, a total of 30 responses were collected. After cleaning and processing the data, 13 responses were deemed valid. The valid responses include companies with a variety of vehicle types and representing a wide range of fleet sizes, as presented in **Table 1.**

Table 1: Respondent Companies and their Corresponding Fleet Compositions

Company Type (No. in the sample)	Cargo Vans	Medium-Duty Step Vans	Medium-Duty Box Trucks	Heavy-Duty Trucks	TOTAL (all vehicles)	Cargo Bikes	EV share of fleet
Large shipping companies (2)	200-293	600-3,500	455-500	0-2,200	1,347-6,400	0-1	0-1%
Small shipping companies (3)	0-15	0-32	None	0-8	0-40	0-250	None
Freight Distributors (2)	0-1	None	5-50	15-100	21-150	None	0-2%
E-commerce company (1)	2,000	400	200	None	2,600	DNR	None
Retailer (1)	5	None	35	None	40	None	10%
Logistics Company (1)	8	None	26	None	34	55	25%
Truck dealer (1)	5	None	10	None	15	None	None
Liquid Fuel Company (1)	10	1	5	1	17	None	None
Logistics Association (1)	100+	100+	100+	100+	400+	None	None

Shipping companies include parcel carriers and prepared food or grocery delivery services. Generally, these deliveries are smaller in volume and lighter in weight than palletized freight, which would be carried by the freight distributors. The e-commerce company is differentiated from the retailer in that their sales are primarily completed online, and the goods are not located at any

point in a store. A logistics company is one that may specialize in other markets, i.e., parking or infrastructure, but that offers delivery service in some capacity. Truck dealers operate delivery vehicles to move parts and tools as well as to provide service to vehicles. The logistics association is an industry group that answered the survey on behalf of some of its member companies.

Individual interviews. In order to learn more about the needs of industry stakeholders, two online interviews with a parcel carrier and an EV manufacturer were also conducted. Each interview took about an hour, and included questions about the company's visions and goals with respect to the use of EVs, experience with EVs (operations, fleet composition, geographic coverage or focus, etc.), and challenges with regard to using EVs including technological, financial, and policy-related obstacles. Guiding questions were provided to interviewees in advance and interviews were structured in a way that allowed participants to openly discuss the proposed pilot program framework. Guiding questions are listed below.

FINDINGS

Fleet information. Respondents were asked if their fleet size and make-up will change in the next ten years. Most companies (10 out of 13) anticipate growth in overall fleet sizes. Two -- a large shipper and a distributor -- projected no change to their overall fleet size, while one small shipper expects a decrease. The larger shipper and distributor, however, expect an increase in EVs and alternative fuel vehicles. The large shipper also plans to expand its cargo bike fleet. Of the ten companies expecting fleet growth, one is exclusively a cargo bike delivery company, which expects to add more bikes to its fleet, but not any other vehicle type. Eight of the nine remaining companies expect to add electric vehicles to their fleets in the next ten years. Five of nine expect to purchase alternative fuel vehicles in addition to electric vehicles. Notably these companies tend to have larger fleets (100+ vehicles) than companies that do anticipate adding alternative fuel vehicles. Six companies anticipate increasing the number of cargo bikes used; these are the same five companies currently using cargo bikes plus one large shipping company. The interviewed carrier plans to purchase 10,000 EVs for deployment throughout the U.S. in the next four years. Deployment in New York City is possible, although the company stated they are focused on Southwestern states first.

Challenges to green vehicle adoption. Companies were also asked to select operational constraints to using electric vehicles specifically. The top constraints reported by respondents are listed below along with the number of companies that selected each option in parentheses. In addition to those listed below, the interviewed carrier listed local climate, poor roadway conditions, and the expected duty cycle of a vehicle in a given city as constraints to EV deployment. The interviewed EV manufacturer is focusing on light- and medium-duty vehicle platforms because of the limitations of battery technology in terms of payload and range, but also cited a lack of on- and off-street charging infrastructure as a barrier to EV adoption.

- Competition in the EV market: demand is higher than supply (3);
- Lack of access to additional electrical capacity at vehicle depot (2);
- Available purchase incentives do not offset the cost difference between EVs and fossil fuel vehicles (2);
- Lack of incentives to reduce EV life cycle cost (lower toll or parking rates, etc.) (2);

- Lack of public charging stations (1);
- EV range compared to fossil fuel vehicles (1).

Respondents were also asked to select policies that would incentivize their company to add electric fleets. These findings are listed below. During the interviews, the carrier indicated they would consider deploying EVs to New York City if EV-only loading spaces are created. They noted local purchasing incentives as another incentive for deployment, which is why California in particular is their preferred market currently. This sentiment was echoed by the EV manufacturer who stated financial incentives are needed at the point of sale to enable more companies to purchase EVs.

- Increase government purchasing incentives (9);
- Reduced toll or parking rates for EVs (8);
- NYC congestion pricing (6);
- Charge lower electricity rates for EV charging (6);
- Provide EV-only loading spaces (5);
- Stricter enforcement of anti-idling (5);
- Publicly available charging stations (4);
- Allow EVs to reserve curb space (4).

Delivery times. The survey revealed that the busiest time windows for loading and unloading operations are 9am-12pm (8 respondents), 12pm-4pm (7 respondents), and 4pm-7pm (6 respondents). Four companies stated that they have the largest need for loading/unloading in NYC during the time window 6am-9am. These companies include a large shipping company, the liquid fuel company, the logistics association (reporting for the members of the association), and the logistics company.

Desired GLZ layout. Survey takers were given three options for potential GLZ layouts: several spaces spread out over multiple blocks, a multi-block GLZ with access restricted to non-green vehicles, or multiple single-block GLZs. The options are depicted in **Figure 2**. The majority (7 of 13) of companies preferred several spaces spread out over multiple blocks (Option A). Four other respondents selected a multi-block GLZ (Option B). This layout is similar to Santa Monica's ZEDZ, but access restricted to green vehicles. Option C, multiple single-block GLZs, was not selected by any of the respondents.

Parking costs and willingness to pay. Companies were asked how much they paid for parking in NYC in the past; although only two companies responded to this question: the logistics company and a large shipping company. The stated average cost of parking during COVID-19 (April 2020 to April 2021) was $1.23 per vehicle per day for the logistics company, and $2.13 per vehicle per day for a large shipping company. The large shipping company stated that their parking cost in the previous year (January 1 to December 31, 2019) was higher, at an average of $2.44 per vehicle per day. Another respondent (a freight distributor) mentioned that the cost of parking tickets exceeded the base parking fees during the COVID-19 period but did not provide cost information for 2019.

We also asked respondents how much they were willingness to pay for GLZs. Three survey respondents answered that they are willing to pay $10 per vehicle per hour for the GLZ access. This closely corresponds to the current commercial vehicle parking rates in NYC's Midtown and

Figure 2: GLZ Layout Options Presented in the Survey (Option A: Several spaces spread out over multiple blocks; Option B: multi-block GLZ; Option C: multiple single-block GLZ)

Lower Manhattan, and was also backed by the interviewed carrier who stated they are willing to pay a "fair market value" for dedicated green vehicle spaces. They also mentioned that paying for a monthly, quarterly or annual permit would be ideal to them for minimizing cost exposures. Another survey respondent stated they are willing to pay a modest amount higher than existing rates, but did not specify a value. Two respondents were unwilling to pay for GLZ access.

Parking fines and difficulty in parking. To find the most beneficial location(s) for GLZs to delivery companies, respondents were asked where in the city, 1) it was most difficult to find parking, and 2) they were subject to the most parking fines. Responses were collected at a neighborhood level, with companies listing up to three neighborhoods for each question. Two companies replied that the entire boroughs of Manhattan and Brooklyn are difficult to park in, and one extended that to the boroughs of Queens and The Bronx. The rest were more specific. Almost 40 percent of companies have the most difficulty parking in commercial areas of Lower and Midtown Manhattan. Neighborhoods in which companies were subject to the most parking violations also reflected Lower and Midtown. Outside Manhattan, only one neighborhood in Queens was provided, by a single respondent.

DISCUSSION AND RECOMMENDATIONS

The information collected in the survey and during interviews can inform policy decisions by city officials seeking to design or implement a GLZ program. In the following, we have primarily focused our recommendations based on the survey and interview findings, which were influenced by input from delivery companies. However, we would like to note that while the input from potential GLZ users is important, it is not the only factor municipalities should consider. Certain

neighborhoods could benefit more than others from the placement of GLZs; for instance, environmental justice zones can benefit immediately from GLZs through reducing the number of fossil fuel delivery vehicles within these neighborhoods and the associated air (and noise) pollutants. Land use is also another important consideration. Major single destination, mixed-use neighborhoods, or primarily commercial zones could variably benefit from the pilot.

Potential GLZ users. As demonstrated by low-emission zones in Europe, cities can incentivize the adoption of green vehicles through restricting access by fossil fuel vehicles or providing incentives to companies. Offering designated curb space to green vehicles may act as such an incentive, as it will alleviate issues with finding parking spots. Regardless of size or type of the company, the majority of survey respondents indicated they plan to deploy green vehicles, and that programs like GLZs would help them achieve that goal.

Cities should not limit their GLZs to electric vehicles' use though. EV models are not available for every vehicle type, and 46 percent of survey respondents plan to introduce alternative fuel vehicles to their fleets in the next ten years. Rather, a city should consider including alternative fuel vehicles and other sustainable modes such cargo bikes or scooters in their definition of green vehicles. Five surveyed cargo bike operators reported parking on sidewalks regularly, which implies providing GLZ space for cargo bikes could remove those bikes from sidewalks.

Siting and demarcation. To site GLZs, cities may consider locations in the city with the highest commercial vehicle demand for curb space and highest incidence of parking violations (parking violations, and consequently parking fines, could be an indicator of insufficient parking availability). They should also consider communicating with delivery companies to determine the locations where the companies could benefit most from dedicated parking spaces. The survey findings indicate the Lower Manhattan and the commercial areas of Midtown Manhattan are the best locations for the GLZ pilot from the companies' perspective. These areas correspond to high commercial building density, much like the locations in Santa Monica and Los Angeles.

Siting of GLZs should not depend solely on the benefits to delivery companies. Special consideration should be given to environmental justice areas subject to multiple air quality issues. Additionally, cities should consider the metrics they will use to evaluate the effectiveness of the GLZ pilot. Residential customer density and proximity to high commercial density locations could have an impact on utilization rates and the number of companies making use of GLZs.

The literature suggests it is common practice to issue vehicle decals and install special signage (e.g., Santa Monica, CA; Bremen, Germany; and Paris, France), but survey respondents and interviewees did not express a preference for either. Santa Monica and Los Angeles both use signage to differentiate zero-emission loading zones from other loading zones. These signs clearly designate the types of vehicles the spaces are restricted to and the corresponding time limit. Not only do signs aid in enforcement, but they can deter other road users from using the designated areas. Traditional parking enforcement officers can monitor the spaces, but technologies are available to automate enforcement. Video license-plate recognition or transponders are two options, the former demonstrated in London's LEZ and the latter in Bremen's ELP.

GLZ layout. Companies showed a clear preference for GLZ spaces spread throughout a neighborhood to access the most individual addresses. There was no discernable difference between cargo-bike only and vehicle-only delivery companies' selections. All four companies currently operating EVs selected several spaces spread out over multiple blocks. This suggests

neither design benefits one type of company over others. Such a layout is useful for companies with short stop times (e.g., food delivery services), but it also benefits parcel carriers who make many stops lasting over an hour throughout the day. This layout can reduce parking violation risk by spreading available parking further than the limits of a multi-block loading zone.

The density or distance between these spaces could not be derived from the survey findings. Anecdotally, parcel carriers walk between 220 and 475 feet per customer, or an average of 568 feet per stop (roundtrip to and from vehicle) (Allen et al 2018). As indicated by the survey findings, though, parcel carriers are not the only potential GLZ users. Considerations should be made for freight distributors with heavier or bulky deliveries that cannot walk as far as parcel carriers.

A case can be made for the multi-block GLZ. The structure may motivate companies to purchase green vehicles because they will lose access to the zone or will be forced to walk farther to make deliveries, reducing efficiency. However, those same factors could also disenfranchise companies and consumers within the zone. Smaller companies (who may not have many green vehicles in their fleet) and those delivering heavy or bulky goods (for whom there are limited available EV models) could find the zone a barrier to their operations. Likewise, if operators are unwilling or unable to enter the zone, it would cause challenges to consumers.

Time limits. GLZs should be designed to accommodate the most likely time of day companies make deliveries and their dwell time. The survey revealed service times can vary from the morning peak period to late at night. It is important for cities considering GLZs to gather this information before applying the time-of-day use restrictions to GLZs. Los Angeles' Zero-Emission Delivery Zones are only restricted to zero-emission vehicles between 7:00AM and 6:00PM (UML 2021b), which was selected based on LADOT study of commercial vehicle demand throughout the day.

Vehicle dwell time can be used to determine the appropriate size for the GLZ. Based on the survey responses, large companies (200+ vehicles) have dwell times of longer than 60 minutes. Drivers are likely making multiple deliveries during each stop and walking to multiple destinations. Smaller companies, those that are making single deliveries per stop (such as furniture, prepared food, or beverage distributors), and those that rely primarily on cargo bikes reported spending less than 15 minutes per stop at the curb with one exception of 15-30 minutes. Depending on a city's goals, GLZs could be sized large enough to accommodate multiple large carriers with concurrent stop times (i.e., one vehicle arrives during the dwell time of another vehicle), plus one or two short-term deliveries. Smaller zones could be used to minimize unoccupied time.

Pricing. Setting prices for GLZs can be considered two different ways. The carrier interview and maximum single use or hourly rates provided by surveyed companies reflect the existing commercial vehicle parking rates. One way to go about this is to apply existing rates to a GLZ and assume the restrictions to fossil fuel vehicles will be enough an incentive for companies to adopt green vehicles. Another way to approach this is to assume companies are willing to pay up to the cost of parking violations avoided by adopting green vehicles. Four companies responded to the survey stating their parking fines exceed the amount they pay in hourly parking rates. While this could be a result of operational practices, it could also indicate a lack of available parking, which can cause drivers to park illegally. Companies with smaller fleet sizes tended to respond with lower parking and GLZ permit rates than the large carriers. Cities should be aware of the higher burden of parking rates to these companies when deciding on the GLZ parking rates.

Fines for double parking and other violations can only be offset if a city can guarantee GLZ availability. Santa Monica and Washington, DC both have web-based applications available to

drivers to reserve spaces in advance or view which spaces are available. Both the survey respondents and the interviewed carrier emphasized the need for parking enforcement in the GLZ pilot. One survey respondent pointed out that reservations were only worthwhile if the city could ensure the space would be available (i.e. unoccupied). Printed tickets and video enforcement cannot accomplish this in a pilot timeframe. To guarantee availability, a city must consider constant monitoring of the GLZ and appropriate enforcement measures.

CONCLUSIONS

In this study, we use feedback from NYC delivery companies to make recommendations about the siting, layout, time limits, and cost of a Green Loading Zone pilot, as well as to determine likely users of GLZs. The findings from surveying and interviewing companies suggest that the densest parts of a city – in NYC's case Lower and Midtown Manhattan – are the best places to site GLZs. We also found that companies are willing to pay for access to these dedicated spaces, in most cases up to the same cost of access to traditional commercial vehicle parking spaces. From the range of companies that responded to the survey, we know parking times and even operational time of day can vary widely. We can recommend that other cities determine what companies are interested in participating in similar projects before determining time limits and size of GLZs. The approach of using stakeholder feedback could increase the likelihood that programs similar to NYC DOT's Green Loading Zone pilot incentivize green vehicle purchases as the program is intended to do.

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