Stemming the Tide: Approaching Urban Freight in the Era of e-Commerce

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Emerging Impacts of Increases in Urban Freight

The relationship between cities and freight is undergoing an unprecedented and tumultuous transition. While e-commerce has long been chipping away at traditional flows of goods, the COVID-19 pandemic caused a massive acceleration of trends, with some experts estimating that 10 years’ worth of e-commerce adoption took place in the space of 3 months.1

This shift has had a profound effect on goods movement, and consequently, the transportation systems on which it depends. The number of small parcels delivered in the United States rose from 14.7 billion in 2019 to 20.2 billion in 2020.2 Crucially, a large portion of these parcels end up at individual residences rather than consolidated at retail locations. At the same time, customers expect goods to arrive faster than ever, often in 2 days or less. This rapid increase in volume, disaggregation, and speed requires a constant flow of delivery vehicles that manifests as urban truck traffic.

More freight vehicles require more places to load and unload, and these activities often take place at the curb. Cities typically require off-street loading zones for some types of new construction, but these requirements vary widely and most freight is accounted for by extant buildings or areas where there is not space for off-street loading.3 Management of on-street loading zones, meanwhile, is complex, with requirements, procedures, and issues varying widely across—and even within—different cities. In short, loading space is often inadequate and it can be exceedingly difficult to reallocate space for loading purposes. Demand for space, therefore, often outrrips supply, which leads to undesirable impacts, including freight vehicles parking illegally or cruising for parking.4

Urban delivery personnel regularly encounter issues resulting from inadequate loading facilities. In a recent study that analyzed online conversations among parcel delivery drivers on Reddit, the social content sharing platform, we found that drivers struggle with parking, traffic, and a host of other issues that slow the completion of their routes. While drivers prefer to park legally, they regularly find themselves engaging in unauthorized parking. Reasons cited include lack of available parking, the time it would take to find legal parking, and crucially, avoiding situations drivers perceived as unsafe.

Increased traffic and curb competition contribute to road safety hazards. While traffic-related injuries and fatalities have recently trended downward, incidents involving freight vehicles—particularly in urban areas—have risen.5 Vulnerable road users (VRU) are particularly at risk, since urban areas that attract the highest concentrations of freight often also attract the highest rates of bicycle and pedestrian activity.6 Adequate provision of commercial vehicle loading zones (CVLZ) is associated with increased VRU safety, since legally parked vehicles are less likely to cause bicyclists and pedestrians to compensate—e.g., by leaving a bicycle lane and dipping into a travel lane.

As e-commerce continues to account for a larger proportion of urban goods flow, cities have an opportunity to set the tone for the future of the last mile of the urban delivery system. For their part, the logistics industry is evolving at breakneck speed to keep up with goods flows and anticipate new directions. For municipalities, a multitude of policy and technology innovations are emerging, but it will be up to cities to be deliberate, nimble, and comprehensive in setting the stage to maximize their effectiveness.

Innovative Practices in Urban Delivery and Curb Management

While cities have lagged in updating their loading space provision practices, tools and initiatives are emerging that could help mitigate the continued surge in freight. No single policy solution or technology presents a magical cure to the complex issues related to freight, but each offers potential as part of a diverse set of actions communities can employ. Here, we describe several of these initiatives, grouping them into those that help manage freight demand, those that help more efficiently manage the curb, and those that directly address safety.

Freight Demand Management Initiatives

Freight demand management (FDM) initiatives alter patterns of freight demand to reduce stress on freight transportation systems and the externalities they impose.7 Common FDM options involve consolidating freight, either onto fewer vehicles and/or to fewer delivery destinations, reducing freight-related trips. They can also involve temporal shifts, allowing deliveries to take place at times when less stress is placed on transportation systems.
• **Urban Consolidation Centers (UCC)** – UCCs are facilities that reduce freight traffic by concentrating deliveries at a localized terminal where they are sorted into optimal loads and delivered by the UCC operator. Primary examples are operated in the Netherlands and in France. They require extensive cooperation and can be difficult to make profitable, drawing opposition from carriers and unions, and often requiring public subsidy.  

• **Microhubs** – Microhubs are like UCCs in principle but operate on a smaller, typically neighborhood scale. For example, the Seattle Neighborhood Delivery Hub in Washington, USA allows packages to be delivered at one location before distribution via cargo bicycle to the surrounding neighborhood. The hub also hosts several value-add features, including a neighborhood kitchen and common carrier parcel lockers, which eliminate last-mile delivery entirely. 

• **Pick-Up Points / Lockers** – Another approach is to make delivery at a central location from which recipients collect their deliveries. Varieties include staffed pick-up points (e.g., at a parcel carrier retail location or a partner store) and common carrier lockers. In the latter, multiple carriers can deposit packages into lockers, and recipients receive a code via email or text to access their package. These services eliminate deliveries that fail when recipients are not home or due to package theft. 

• **Shifting Delivery Modes** – Some areas are experimenting with shifting freight to non-truck delivery modes that take up less (or no) space on the street and/or at the curb. 
  - Cargo bikes – Cargo bikes obviate the need for delivery trucks in the last mile in some contexts, alleviating traffic congestion and emissions. These bicycles are often electrically assisted and can be used in concert with other freight initiatives like microhubs.
  - Autonomous vehicles – Several companies are experimenting with self-driving vehicles that bring orders directly to recipients without human escort. These include droids, like FedEx’s Roxo, a small robotic vehicle that uses the sidewalk or roadside, and drones, which airlift small packages short distances for final delivery.

• **Curb Management Initiatives**
  - Curb management initiatives maximize efficient use of limited curb space. These initiatives prioritize curb access by need, minimize the time users spend at the curb, and reduce externalities stemming from excess curb demand, like unauthorized parking.
  - **Contextually specific loading zones** – Some cities have refined their curb zone typologies to accommodate diverse and growing needs. Seattle, a thought leader in urban freight, has four types: Passenger loading zones, loading zones, truck zones, and commercial vehicle loading zones (CVLZ). San Francisco, CA, USA instituted a similar system in which curb sections are painted different colors that indicate permitted uses depending on time of day. These programs allow the curb to be used efficiently for the purposes its location is best suited for, and avoid ambiguity and competition.
  - **Curb reservation systems** – Partnering with technology firms like Coord and curbFlow, which apply computer vision to curb management, some cities are piloting “smart” commercial loading zones that are reserved using an app. Reservations ensure a spot is available when a driver needs it, and monitoring technology aids enforcement of the spaces. Columbus, OH, USA piloted such a program between 2019-2020, and is investigating potential expansion. These programs promise additional features that include 1) Automated enforcement through computer vision, 2) Dynamic curb uses depending on time of day, conditions, etc., and 3) A digital platform to charge users for curb space. Pilot cities with similar programs include Omaha, NE, USA; Washington, DC, USA; and Nashville, TN, USA.
  - **Loading zone pricing** – To promote efficient use of loading zones, some cities charge delivery vehicles to use these spaces, sometimes in conjunction with reservation systems. Time-based fees discourage vehicles from staying longer.

Figure 2. Common carrier lockers, such as Amazon’s Hub lockers, allow many packages to be delivered at one stop.
than they need to and dissuade unauthorized use. Loading zone pricing has been implemented in cities including Washington, DC; Chicago, IL, USA; and Seattle. In Washington, DC, one such initiative saw the number of non-trucks in loading zones and double-parking violations cut by more than 50 percent.

**Safety Initiatives**

Improved safety is a component of each initiative mentioned above and is often included as a goal. Indeed, insofar as poor safety conditions are caused by issues these programs mean to solve, addressing these issues should also improve safety. But specific safety implications are not always made explicit and can be overshadowed by discussion of freight trip reduction, dwell time reduction, or curb use rates, to name some examples. Safety—for drivers and other road users alike—should be an explicit consideration, both as a component of freight mitigation strategies and through specific safety initiatives.

- **Vehicle Design Changes** – Many urban freight vehicles are heavy and high off the ground, presenting a hazard to other road users. Vehicle design changes can mitigate or eliminate many of these concerns. Reducing vehicle cab heights, adding peep windows, and/or sloped hood or cab-over designs increase driver vision and reduce reaction times. For example, in the United Kingdom, London is requiring such changes through the Direct Vision Standard (DVS). Moreover, reductions in vehicle size are possible, in many cases, with little to no loss of capacity. Reduced vehicle size allows for smaller turning radii and increased maneuverability, which are compatible with street designs that are safer for VRUs.

- **Street Design Changes** – Streets designed to accommodate freight and those that protect VRUs have traditionally been at odds. Wide streets and curb geometry that accommodates large turning radii are favored for freight vehicles. Rethinking freight vehicles that serve cities, including implementing alternatives to trucks, will allow design changes that improve safety, like narrower lanes, tight corner radii, frequent pedestrian islands and stopping points, diverters, and mini roundabouts, all of which reduce traffic hazards and prioritize VRUs.

- **Vision Zero and Freight** – Vision Zero, an international project working toward eliminating fatalities and injuries involving road traffic, is a central force in promoting road safety, with 52 U.S. cities taking part to date. Vision Zero plans may benefit from increased emphasis on freight, which remains an opportunity for some. While New York City, NY, USA’s Vision Zero effort, for example, recently created a Truck Safety Task Force, many Vision Zero plans do not address freight at all.

**Challenges and the Future**

While these initiatives offer promise, questions remain about future implementation and scaling. Many initiatives have been implemented as small pilots without concrete plans for expansion or remain proposed alternatives to status quo delivery systems and street designs. Innovative solutions, like smart loading zones and the Seattle microhub, largely remain proofs-of-concept.

Larger players in the freight space are unlikely to change their procedures—for instance having their drivers use a third-party app to reserve spaces—without strong incentive or policy that requires it. UCCs provide a cautionary tale: Without broad carrier participation—required to generate self-sustaining revenue—most UCCs have failed in absence of subsidy. Moreover, regulation that would mandate the use of UCCs is a challenge. This difficulty in recruiting participants may foreshadow implementation of other initiatives: Only 10 percent of users of the Columbus smart loading zones pilot consisted of larger shipping carriers like UPS, FedEx, or Amazon, as these companies were reticent to change procedure for eight spaces in one area of the city. A systemic approach is needed.

Cities, however, do not appear to be approaching these issues systemically. Failing to get ahead of the situation will have substantial traffic, safety, and quality of life impacts as freight growth continues to accelerate. To stem the tide of urban freight—and avoid its worst emerging effects—cities must both leverage innovative solutions and consider holistic policy that systemically approaches freight and maximizes the potential for new tools to help. A first step is a vision for an urban future that explicitly considers freight, the curb, and vulnerable road users, and this means more conversations taking place between planners and freight industry professionals.
While planners often advocate for walkability and complete streets, they have historically allowed market forces to handle urban freight. This approach is reaching its limits and planning for safer, better streets should include planning for freight. Moreover, planning around status quo last-mile delivery patterns, relying almost exclusively on trucks, gives little incentive to change streets and adopt innovative solutions. Planning for streets that favor people and smaller vehicles, however, will create market conditions in which freight innovations will be demanded and thrive.  

Freight providers may resist changes that require new investments, but streets that focus less on cars and dedicate space to freight vehicles can make deliveries faster, more efficient, and safer. Cities should cultivate conditions that maximize the potential that novel freight solutions will take hold. These interventions present costs to shipping companies, but these costs become worthwhile investments when they present the best, most efficient solutions to the problems of urban freight.

Finally, context is also crucial. Solutions appropriate for the challenges faced by large, dense cities may not apply to smaller, less spatially constrained areas. For example, congestion may be too temporally and spatially focused in smaller cities to necessitate wholesale changes. Nevertheless, big problems precipitate change, and for many cities, problems surrounding urban freight are set only to become larger. itej

References

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