



# FINAL REPORT

PROJECT J6

DECEMBER 2023

## Planning for Urban Freight: Putting it Into Practice

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**Noreen McDonald, Ph.D.**, University of North Carolina at Chapel Hill  
**Charles H.W. Edwards, MSc, MBA**, University of North Carolina at Chapel Hill  
**Evan Iacobucci, Ph.D.**, University of North Carolina at Chapel Hill  
**Emma Vinella-Brusher, MPH**, University of North Carolina at Chapel Hill

**STRIDE**

Southeastern Transportation Research,  
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**UF** | Transportation Institute  
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## LIST OF AUTHORS

Lead PI:

*Noreen McDonald, Ph.D.*  
*University of North Carolina at Chapel Hill*  
*noreen@unc.edu*  
*ORCID 0000-0002-4854-7035*

Co-PI:

*Charles H.W. Edwards, MSc, MBA.*  
*University of North Carolina at Chapel Hill*  
*chwedwar@unc.edu*

Additional Researchers:

*Evan Iacobucci, Ph.D.*  
*University of North Carolina at Chapel Hill*  
*evaniaco@unc.edu*  
*ORCID 0000-0001-5813-8895*

*Emma Vinella-Brusher*  
*University of North Carolina at Chapel Hill*  
*evb@unc.edu*  
*ORCID 0000-0001-6416-6892*

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## ABSTRACT

This project applies the results of previous STRIDE research on planning for urban freight by disseminating these results to professional planners and stakeholders, giving them tools to incorporate freight concerns in economic development, transportation, and land use planning. Through a summary infographic, listening session with local North Carolina planners, and listserv email communication, this project shared findings from previous urban freight research and worked with stakeholders to identify opportunities to apply these findings to on-the-ground challenges.

Previous STRIDE research found that freight-related injuries and crashes are rising, particularly on local urban roads and arterials during weekday peak delivery hours. Existing loading zones in urban areas provide insufficient space, leading to substantial parking challenges for delivery drivers and demonstrating the need for policy and infrastructure solutions. We found that local North Carolina planners are experiencing many of these same challenges in their own communities, particularly surrounding limited space in compact urban cores, competition for the curb, illegal parking, and warehousing siting and distribution.

This project helped to identify strategies for local governments to align planning practice with goods movement trends, and increased information sharing across the region about how these issues are unfolding locally.

Keywords:

Urban freight, curb space, last mile, delivery, parking, zoning codes

## EXECUTIVE SUMMARY

This project applies the results of previous STRIDE research on planning for urban freight by disseminating these results to professional planners and stakeholders, giving them tools to incorporate freight concerns in economic development, transportation, and land use planning. Through a summary infographic, listening session with local North Carolina planners, and listserv email communication, this project shared findings from previous urban freight research and worked with stakeholders to identify opportunities to apply these findings to on-the-ground challenges.

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This project helped to identify strategies for local governments to align planning practice with goods movement trends, and increased information sharing across the region about how these issues are unfolding locally. By connecting this recent body of research to professionals, this project has the potential to impact planning efforts across multiple dimensions by bringing urban freight planning concerns—especially relating to ecommerce—into domains of planning that have historically been concerned with personal transportation but relied on market forces to plan for freight needs. This dissemination effort reinforces that this approach has run up against its limits, and that urban freight needs to have a larger role in local and regional planning efforts.

The communications that took place during this project reinforced several domains where continued research is needed, including in improved freight data gathering and sharing, particularly regarding curb space usage and needs, impact of warehouse and distribution siting requirements on last-mile activities, mismatch between designated loading zone placement/sizing and truck orientation needs, freight vehicle design in the U.S., particularly vehicle size and shape, and further examination of existing local government policies related to zoning requirements for freight and curb space allocation.

## 1.0 INTRODUCTION

Previous STRIDE research has documented key findings related to small parcel delivery, freight traffic safety, delivery driver operations and perceptions, and options available to handle the changing landscape of urban freight. McDonald et al. (2019) detailed the changing patterns of freight-related safety issues, particularly the rapid increase in freight injury and fatality rates relative to overall road traffic. Crashes are also increasingly occurring on local roads and arterials and are more likely to occur on weekdays between 6 AM and 4 PM than weekends or evenings. The location and timing of these crashes are especially hazardous for vulnerable road users, particularly in dense urban areas with insufficient space for freight vehicle loading.

McDonald & Yuan (2021) found substantial variations in off-street loading zoning requirements across large cities and noted that while on-street spaces exist to supplement, this provision is often ad hoc and based on requests from individual business owners. This indicates localized spatial mismatch between freight loading demand and overall supply under our current zoning systems, leading to congestion delays for both freight and people as well as road safety impacts. Insufficient space increases the likelihood of illegal loading behaviors such as double parking and obstructing bike lanes or sidewalks.

A 2022 report by Iacobucci et al. explored the challenges faced by urban freight delivery drivers that may necessitate such unauthorized or questionable parking practices. The authors found that parking is among the largest challenges faced by drivers in urban areas, and extends the time required to complete delivery routes. Unauthorized parking is generally driven by lack of available parking, safety reasons, and/or for expedience during deliveries. As e-commerce demands continue to rise, curb management policies and freight providers' practices alike will need to adapt. Potential policy and infrastructure solutions are explored in the 2022 "Stemming the Tide" ITE report, which finds that increased enforcement is insufficient to address existing freight parking and loading challenges. These prior studies demonstrate the need to leverage and build upon existing freight solutions when planning in an urban context.

### 1.1 OBJECTIVE

The goal of this project is to apply the results of previous STRIDE research on planning for urban freight to demonstrate the potential for stronger consideration of freight concerns in economic development and land use planning activities. Specifically, this effort focused on disseminating collected research findings to community stakeholders and decisionmakers.

### 1.2 SCOPE

The background literature focuses on recent STRIDE research on the potential and need for stronger consideration of freight concerns in economic development and land use planning activities. The dissemination component of this project produced digestible results from this emerging research, communicated these results and policy options to



stakeholders and decisionmakers through multiple channels, and sought feedback from those parties.

## 2.0 LITERATURE REVIEW

### Increased Urban Freight and Safety Challenges

Over the past decade, the U.S has seen a substantial increase in demand for urban freight deliveries. From 2019 to 2020 alone, the number of small parcel deliveries rose from 14.7 billion to 20.2 billion (Pitney Bowes 2021). The larger volume of freight on the roads has increased conflict between freight vehicles and other road users, leading to substantial safety challenges. While crashes overall have been trending downwards, traffic-related injuries and fatalities involving freight vehicles have risen, particularly in urban areas (McDonald et al. 2019).

As freight-related crashes are increasingly occurring on local urban roads and arterials during weekday peak delivery hours, this is particularly hazardous for pedestrians, cyclists, and other vulnerable road users moving through the dense urban core (Conway et al. 2016). These increased safety concerns and congestion challenges are largely due to the existing mismatch between the supply of freight loading zones and demand for these spaces (McDonald 2021).

### Zoning and Parking Challenges

Zoning ordinances across U.S. cities vary widely in how much off-street loading space they require, and on-street loading zone provision is typically ad-hoc. The result of these processes as they stand is that the overall freight loading supply is typically insufficient to meet demand. While cities generally have some supply both of off-street and on-street loading zones available, these spaces are insufficient to accommodate ever-growing and competing uses of curb space and it is challenging to add to the supply (McDonald & Yuan 2021). Parking is amongst the largest challenges faced by drivers delivering in urban areas, and parking difficulties extend the time required to complete delivery routes while adding to congestion, traffic delay, and safety hazards (Dalla Chiara et al. 2021; Mangiaracina et al. 2019).

While drivers report that they would rather not utilize unauthorized parking, this practice is generally required to complete delivery routes due to timing and safety concerns (Iacobucci et al. 2022; Kawamura et al. 2014). Because off-street loading requirements—even under the best circumstances—only apply to new buildings, while the process for allocating on-street spaces is typically piecemeal, it has been virtually impossible to implement systemic solutions to the imbalance between supply of and demand for loading space (McDonald & Yuan 2021). Clear solutions to these problems elude simple formulation. On one hand, there is need for local policymakers to revisit zoning code loading requirements and proactively increase the supply of both off- and on-street parking in high-demand areas. Nevertheless, dense urban areas that attract the most freight also tend to have the least available space to convert for loading purposes, necessitating the exploration of other, innovative solutions and policies.

## 3.0 METHODOLOGY

### 3.1 Research Dissemination

To ensure findings from prior STRIDE urban freight publications reached key partners, we distilled the information down into tangible deliverables. Using the Canva design platform, we created a PDF infographic that summarized the findings from four publications in a digestible format. This infographic was then shared via listening session, made available on the STRIDE website, and distributed on the NCPlan listserv. We also presented research findings at two conferences and one invited talk. The team worked with partners to identify the best avenues through which to disseminate research findings with those who interface with curb management in the region.

### 3.2 Future Strategy Identification

The materials developed for dissemination also served to identify strategies for communities to align planning practice with goods movement trends. We determined key research needs identified in the prior urban freight publications and identified and curated resources for potential last-mile urban freight policy recommendations. We then facilitated opportunities for practicing planners in the region to provide insight on their on-the-ground experiences. This included a virtual listening session with city and transportation planners from key North Carolina cities during which we collected information on extant strategies and initiatives for local curb management. We also invited practicing planners to respond to our NCPlan listserv message with thoughts and suggestions from their own communities.

## 4.0 RESULTS

Disseminating previous STRIDE urban freight research provided an opportunity to share research findings, verify findings with people working on-the-ground, and generate new research needs. This section describes key findings from the listening session with practicing North Carolina planners.

### 4.1 Challenges in the Urban Core

Prior STRIDE research demonstrates that cities are grappling with how to accommodate substantial growth in urban goods movement in dense neighborhoods and commercial districts. In this project practitioners noted that large trucks have difficulty navigating through smaller spaces such as narrow right of ways and low overpasses, and it is not uncommon for these vehicles to clip corners (sometimes causing property damage) or get stuck under bridges. Oversize vehicle parking is also a challenge, particularly in communities close to the interstate where long-haul operators may hit their hour limits and need to find a place to pull over.

## 4.2 Competition for Curb Space

Older, smaller cities have insufficient space available for loading needs, particularly on-street curb space. Participating practitioners expressed that there are many curb uses competing with freight loading, such as dining patios, passenger drop-off, and private vehicle parking. Cities are also trying to make space for infrastructure such as bike lanes, but this further reduces curb space and parking availability. When possible, planners are building flexible loading zones that attempt to accommodate multiple needs.

## 4.3 Coordination & Data Needs

Prior research noted the need for more consideration of urban freight in long-term planning. Practitioners called for better regional coordination of road design, as well as increased collaboration between industry and local government. This is particularly important when it comes to curb use data, as local planners need more information from the freight industry to make existing loading zones better meet delivery day and time needs. Currently, empirical data detailing curb use patterns, especially at different times of day, is extremely sparse.

## 5.0 CONCLUSION

The urban freight research explored in this project finds that freight-related injuries and fatalities are rising as e-commerce increases; existing off- and on-street loading zones provide insufficient space in dense urban areas; and parking is a primary challenge for delivery drivers as a result. Through disseminating these findings and providing opportunities for practitioners to share on-the-ground perspectives, this project helps to bring these research findings to practitioners and stakeholders who are poised to apply them in on-the-ground planning activities. This dissemination comes at a crucial time in which freight concerns, especially those related to e-commerce, are increasingly relevant in economic development and land use planning activities.

Practicing planners shared challenges related to accommodating substantial urban goods movement growth such as trucks navigating narrow right of ways and low overpasses, as well as oversized vehicle parking. Cities are also grappling with accommodating a variety of competing curb space needs, ranging from freight loading to dining spaces to passenger drop-off. And finally, practitioners called for better coordination both across the region and between industry and local government stakeholders to meet urban freight delivery needs. This project establishes opportunities for further research to develop solutions for these emerging urban parcel delivery challenges.

## 6.0 RECOMMENDATIONS

### Further Research

This project disseminated results of and corroborated urban freight research findings with the experiences of practicing planners on the ground. As a result, these activities highlight several continued research needs, including:

- Improved freight data gathering and sharing, particularly regarding curb space usage and needs
- The impact of warehouse and distribution siting requirements on last-mile activities
- The impact of warehousing and fulfillment centers on surrounding communities, including traffic, safety, and illegal truck parking requirements
- Mismatch between designated loading zone placement and truck orientation needs, such as loading ramp location
- The future of freight vehicle design in the U.S., particularly vehicle size and shape
- An examination of existing local government policies related to freight zoning and curb space and where oversight exists

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## 8.0 APPENDICES

### 8.1 Appendix A – Planning for Urban Freight Summary Infographic



**PLANNING FOR URBAN FREIGHT: PUTTING IT INTO PRACTICE**

Researchers at The University of North Carolina Department of City & Regional Planning are studying how increased small package delivery has impacted transportation and land use planning. These studies have demonstrated the potential and need for stronger consideration of freight concerns in economic development and land use planning activities. This infographic summarizes the key findings.



**Freight-related injuries and fatalities are rising**  
Crashes involving freight vehicles are rising more rapidly than crashes overall, and are increasingly occurring on local urban roads and arterials during weekday peak delivery hours. The location and timing of these crashes are particularly hazardous for pedestrians and bicyclists.

**Existing loading zones provide insufficient space**  
Urban areas have limited space zoned for freight loading, leading to increased illegal parking behaviors that impact safety and congestion. Varying zoning requirements for new builds and fragmented change processes for curb space allocation make it difficult to increase availability.






**Parking is a primary challenge for delivery drivers**  
Drivers would prefer not to use unauthorized parking, but this is often necessary in urban areas in order to complete deliveries on time, safely, and without conflict. Curb management policies and freight providers' practices alike will need to adapt in the face of rising e-commerce demands.

**Substantial policy and infrastructure solutions are needed**  
As urban goods movement continues to grow, cities have an opportunity to set the stage for an improved future of the last mile of the urban delivery system. Demand management strategies such as Urban Consolidation Centers, curb management tools such as reservation systems, and safety initiatives such as freight vehicle design changes offer promise, but are yet to be implemented on a large scale. This research demonstrates the need to leverage and build upon existing freight solutions when planning in an urban context.



 COLLEGE OF ARTS AND SCIENCES  
City and Regional Planning

Evan Iacobucci, [evaniaco@unc.edu](mailto:evaniaco@unc.edu)  
Emma Vinella-Brusher, [evb@unc.edu](mailto:evb@unc.edu)  
Noreen McDonald, [noreen@unc.edu](mailto:noreen@unc.edu)

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**STRIDE** | Southeastern Transportation Research, Innovation, Development and Education Center

## 8.2 Appendix B – Summary of Accomplishments

Date	Type of Accomplishment	Detailed Description
08/2022	Publication	Iacobucci, E., McDonald, N., Edwards, C. H. W., Steiner, R., & Griffith, J. (2022). Stemming the Tide: Approaching Urban Freight in the Era of e-Commerce. <i>Institute of Transportation Engineers. ITE Journal</i> , 92(8), 27–32.
11/2022	Conference Presentation	<b>Iacobucci, E., N. McDonald, C.H.W. Edwards, R. Steiner.</b> “Using Social Media to Understand Challenges Faced by US Urban Parcel Delivery Drivers: Reports from the Curb.” Association of Collegiate Schools of Planning Conference, Toronto, CA, November.
01/2023	Conference Presentation	<b>Iacobucci, E., N. McDonald, C.H.W. Edwards, R. Steiner.</b> “Reports from the Battle for the Curb: Using Social Media to Understand Challenges Faced by US Urban Parcel Delivery Drivers.” Transportation Research Board 102 <sup>nd</sup> Annual Meeting, Washington, D.C., January.
02/2023	Other	<b>Invited talk: “Reports from the Battle for the Curb: Addressing Planning Challenges Stemming from the Rise of E-Commerce.”</b> Department of Community and Regional Planning, East Carolina University. February 9, 2023.
03/2023	Publication	<b>Iacobucci, E., N. McDonald, R. Naumann, and K. Kucera. (2023).</b> “Examining Injury Trends in Parcel Delivery Drivers in the United States: Challenges and Opportunities.” <i>American Journal of Industrial Medicine</i> . <a href="https://onlinelibrary.wiley.com/doi/abs/10.1002/ajim.23473">https://onlinelibrary.wiley.com/doi/abs/10.1002/ajim.23473</a>