

PRIMER FOR IMPROVED URBAN FREIGHT MOBILITY AND DELIVERY

Operations, Logistics, and Technology Strategies



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16. Abstract This primer is designed to serve as a resource for freight stakeholders seeking to improve urban freight management in their regions. Urban freight management refers to planning, programming, and other efforts to improve freight mobility in urban areas or to minimize its impacts on others. Operations, logistics, and technology strategies represent a set of practices that urban freight managers can apply to the movement of goods and the quality of life of urban residents. This primer documents 17 noteworthy practices to improve urban freight management that have been implemented successfully in both the United States and abroad. The primer also identifies opportunities for freight practitioners to plan for and fund the implementation of freight mobility strategies.			
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Foreword

The economic prosperity and competitiveness of America's cities depends on the reliable and efficient movement of freight through our multimodal freight system. In recent decades, population growth and economic growth in the United States has been concentrated in urban areas, where, according to the U.S. Census, approximately four of five Americans live. This growth, combined with increasing deliveries resulting from the steady rise in e-commerce, is driving increased demand for freight movement in urban areas.

Rising demand for urban freight movement requires innovative, collaborative approaches to accommodate growth while addressing the increased congestion, pollution, and wear and tear on infrastructure that can be caused by increased freight traffic. Cities must also find ways to manage competition for limited curb space and improve the safety of vulnerable road users who share the roads with larger delivery vehicles.

This primer is intended to stimulate collaboration and innovation while serving as a practical resource for both public- and private-sector freight stakeholders seeking to improve freight mobility in urban areas. It identifies 17 noteworthy practices representing operations, logistics, and technology (OLT) strategies and describes how they were successfully implemented. Each noteworthy practice briefly outlines the resources used to implement the practice, the stakeholders involved, and the results. Contact information is provided for readers interested in learning more.

Freight practitioners in public agencies may wish to use this primer to identify and plan for freight projects and strategies that would be eligible for the National Highway Freight Program (NHFP) or other Federal funding for freight projects. The final section describes opportunities for integrating freight mobility strategies into the transportation planning process and lists some Federal programs through which freight projects and strategies may be funded.

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1. Introduction

Purpose

According to the U.S. Census, more than 80 percent of people in America live in metropolitan areas. Urban populations are likely to grow by 20 percent or more over the next 20 years as the country's overall population increases and the movement of people into urbanized areas continues. As urban populations increase and demand for goods rises, moving freight safely, efficiently, and reliably becomes increasingly challenging. To meet this challenge, public- and private-sector freight practitioners are finding ways to work together to plan for and implement solutions that improve the cost-effectiveness of freight movement in urban areas while balancing the needs of other road users, local businesses, and residents.

This primer is designed to serve as a resource for freight stakeholders seeking to improve goods movement in their regions. For the purposes of this document, urban freight management refers to planning, programming, and other strategies to improve freight mobility in urban areas or to minimize its impacts on others. Operations, logistics, and technology (OLT) strategies represent a set of practices that can be applied to improve the movement of goods and the quality of life of urban residents.

This primer can help freight stakeholders understand potential applications of OLT strategies to improve urban freight management and mobility through the sharing of noteworthy practices that have

been implemented successfully. It may also assist freight stakeholders in identifying freight projects that are eligible for funding through Federal freight programs such as the National Highway Freight Program (NHFP) and the Nationally Significant Freight and Highway Projects (NSFHP) program, currently being administered as the Infrastructure for Rebuilding America (INFRA) grants.

Operations, logistics, and technology strategies are defined here as follows:

- **Operations strategies** focus on loading zones, parking, truck routing, and other elements of traffic control and lane management.
- **Logistics strategies** focus on individual supply chains to consider adjustments such as off-peak delivery hours, freight consolidation, or mode shifts.
- **Technology strategies** incorporate intelligent transportation systems (ITS), alternative fuels, and other technological advancements with the potential to improve urban freight movements.

The target audience for this primer are the freight transportation stakeholders who can influence and enact change to improve urban freight mobility in both the public and private sectors. These stakeholders include, but are not limited to, those listed in Table 1 on the next page.

Structure

This primer is part of a set of projects sponsored by the Federal Highway Administration (FHWA) under the umbrella of Innovative Solutions for Improving Freight Movements in Urban Areas. This initiative seeks to:

- Define the benefits of improved freight transport in urban areas.
- Identify tools and strategies for practitioners to improve urban freight mobility.
- Highlight noteworthy practices so that practitioners can benefit from lessons learned in the field.

This primer focuses on OLT strategies that agencies are employing to improve urban freight mobility. This primer is organized in five chapters. The next three chapters of this primer focuses on operations, logistics, and technology strategies, respectively. Each of these chapters features a series of noteworthy practices with key OLT strategy details, as well



Downtown Los Angeles, CA. Source: Getty Images.

as an example of how the strategy has been successfully implemented in the field. The final chapter identifies opportunities to plan for and fund the implementation of OLT strategies. A complementary primer to be published in the future will focus on stakeholder engagement, public outreach, and partnership strategies.

Background

Commercial trucks are the dominant mode of transportation for urban freight. They represent approximately 8 percent of vehicle travel in metropolitan areas. This percentage is likely to increase with the rise of e-commerce and increased globalization of trade. E-commerce

Table 1. Target Primer Audience

Target Stakeholders	Role in Freight and Goods Movement in Urban Areas
Public-sector planners and engineers	Plan and implement OLT strategies to manage urban freight in a city, State, or region.
Regulators, elected officials, and advocacy and community groups	Advocate for and enact policy changes pertaining to urban freight transportation for a city, State, or region.
Shippers, receivers, freight carriers, and logistics professionals	Move freight and coordinate pick-ups and deliveries.
Industry/business associations and economic development organizations	Represent business interests of an industry, sector, city, or region.
Researchers and academics	Lead research efforts to develop solutions to urban freight challenges.

What are Urban Areas?

For the purposes of this primer, “urban areas” include cities and suburbs with a developed, and often multimodal, transportation network. This definition includes major metropolitan areas containing an extensive multimodal transportation network, medium-sized cities with pockets of population and employment activity centers, as well as smaller cities with vibrant main streets. Although cities may vary significantly in their urban form, they all face similar challenges when it comes to the efficient flow of goods.

is increasing demand for freight deliveries to urban residents, while growing international trade is increasing traffic at ports of entry, many of which are located in metropolitan areas.

Effective urban freight systems facilitate goods movement, reducing costs for businesses and improving services for consumers while minimizing unwanted impacts on infrastructure, safety, and the environment. Because freight is typically moved by private-sector entities on infrastructures built and maintained by an array of public and private stakeholders, effective freight mobility strategies usually involve both public and private stakeholders in planning and implementation. In coordination with private-sector partners, State and local transportation agencies can implement strategies to facilitate the movement of freight in metropolitan areas and reduce its impacts on residents and other travelers. Although coordinating with diverse stakeholders across jurisdictions, authorities, and sectors can be challenging, many agencies

have found ways to engage successfully with stakeholders to enhance freight mobility while addressing impacts on other road users and residents.

Benefits of Urban Freight Management

The benefits of urban freight management for cities and local residents and businesses include reduced infrastructure maintenance costs, improved mobility and traffic flow, enhanced information flow that can inform better decisions, reduced traffic incidents, more efficient deliveries, and reduced noise and air pollution. Freight carriers and shippers benefit from increased reliability of pick-ups and deliveries, more seamless truck parking, and new freight delivery technologies.

Infrastructure Preservation

The physical constraints of the urban environment, particularly in older cities, can make it difficult or impossible for larger freight delivery vehicles to use certain routes or access certain neighborhoods. These physical constraints include low overhead clearances, restricted roadway geometry, and weight-restricted bridges. Metropolitan regions may designate truck routes and implement warning systems to help freight vehicle operators



A tractor-trailer traveling an urban street. Source: Getty Images.



A line of construction vehicles waiting in city traffic. Source: Volpe National Transportation Systems Center.

better plan for and adjust their activities as needed. Increasingly, public agencies are using information and communications technologies to keep information on freight routes up-to-date, to provide better communication of information to carriers and providers of routing services, and to monitor and enforce carrier compliance with rules and restrictions. For example, the New York City DOT (NYCDOT) is using weigh-in-motion (WIM) technology to monitor truck activity on bridges and roadways on strategic freight corridors entering the city (see WIM Sensor Installation on page 39).

All vehicles, including trucks, have some impact on road conditions. Enforcement of truck size and weight limitations, as well as of city-specific access and route restrictions, can reduce infrastructure damage while also improving safety for all road users. For example, the City of New Orleans restricted delivery vehicles longer than 36 feet in length from accessing the French Quarter, one of the city's oldest neighborhoods. The French Quarter's historic homes and narrow roadways were at risk of damage from larger vehicles (see Ban on Large Trucks in French Quarter District, New Orleans, LA, on page 19).

Mobility/Traffic Flow

Trucks can increase roadway congestion in dense urban areas, particularly if receivers request deliveries during or near peak traffic times. Planning of local truck routes and access can reduce truck-related congestion. For example, Washington, DC, implemented a loading zone management program to reduce double parking. The effort improved mobility and traffic flow in the District's commercial areas without a substantial disruption of commercial activity (see Commercial Loading Zone Management Program (CLZMP) in Washington, DC, on page 17). Similar planning efforts can improve delivery reliability and reduce instances of carriers missing delivery windows or making additional attempts to deliver a shipment. Improving mobility and traffic flow in urban environments can increase the reliability of freight deliveries, which benefits both the carriers and receivers of goods.

Truck drivers making first- and last-mile freight movements in urban areas sometimes have difficulty finding available loading areas, both on-street and off-street. There can be intense



Downtown Glens Falls, NY. Source: Cambridge Systematics.

competition for the use of curb space in urban areas between loading zones and other uses, such as parking for light-duty vehicles, bus stops, fire hydrants, crosswalks, and bicycle lanes. Cities that provide an adequate supply or enforce proper use of loading zone spaces can improve traffic flow, shorten delivery times, and reduce double parking infractions. For example, the City of Miami Beach implemented a loading zone permitting system to reduce double parking. The effort helped reduce traffic congestion during peak hours as well as noise from freight loading activities during off-hours (see City of Miami Beach Freight/Alley Loading Parking Permit Program on page 15).

Safety

Although urban roadways typically have lower speed limits than rural and suburban routes, these roadways also have higher traffic densities and a diverse mix of road users. As a result, trucks traveling on urban roadways can present more opportunities for conflicts with other road users. In 2015, more than 1,400 people were killed in traffic crashes involving large trucks in urban areas. Approximately nine percent of all fatal crashes in urban areas

involve a large truck. Maintaining lower speed limits and buffering trucks from other road users when possible can help prevent collisions.

It is also important to consider how the design of trucks and other large delivery vehicles affects travel in urban areas. Trucks have higher ground clearances and mechanical limitations to maneuverability that can affect the way trucks interact with infrastructure and other road users in urban areas with mixed traffic. Improvements to truck designs can reduce safety risks to urban travelers. For example, reducing blind spots increases the ability for a truck operator to see all areas of the roadway, particularly in areas near the cab and the rear of the truck. (See Transport for London (TfL) Reducing Truck Blind Spots through Vehicle Redesigns on page 49.)

Inadequate truck stops and rest areas is also an issue in urban areas. Tired truck drivers may continue to drive because they have difficulty finding a safe or desirable place to park for rest. If they are unable to find safe parking, drivers may park in unsafe locations, such as on the shoulder of the road or along exit ramps, in order to comply with Federal hours-of-service



A truck being unloaded at an urban construction site. Source: 123rf.com.

(HOS) regulations. Trucks making urban deliveries prefer parking facilities near large metropolitan areas to time their deliveries or match gate times at ports, terminals, or distribution centers in the metropolitan area. By improving the capacity of loading and parking facilities and getting information about parking availability to carriers, agencies can help to reduce congestion and increase operational safety. For example, the Florida Department of Transportation (FDOT) is installing real-time truck parking sensors at interstate rest areas, welcome centers, and weigh stations to better communicate truck parking availability. The system will help truckers maximize their HOS requirements by reducing the time spent searching for safe, legal parking (see Truck Parking Availability System in Florida on page 35).

Reduced Pollution

Proper planning and regulation of urban freight movement can reduce noise and air pollution impacts on urban residents. Much of the environmental impact of freight transportation stems from emissions of air pollutants from freight vehicles. Newer diesel-powered freight vehicles are cleaner than older models due to more stringent regulations. However, these regulations do not address emissions from the millions of older vehicles and vessels still in operation. To reduce emissions from existing diesel-powered freight fleets, public agencies have developed different programs and policies to accelerate the retirement or repowering of vehicles and vessels. One such initiative is the Clean Trucks Program administered by the Ports of Los Angeles and Long Beach. The first of its kind, this program prohibits drayage trucks with older and more polluting engines

from accessing the ports. The program has been credited with reducing emissions from overall drayage operations by 80 percent (see Clean Trucks Program at Ports of Los Angeles and Long Beach on page 43).

Multiple levels of government also offer financial incentives for fleet owners to switch to alternative fuels such as electricity or natural gas. For example in Houston, Texas, the regional metropolitan planning organization (MPO) has partnered with United Parcel Service (UPS) using funding from the U.S. Department of Energy (DOE) to pilot the use of electric delivery vehicles to deliver packages in the region (see Demonstration of Zero-Emission Delivery Vehicles in the Houston-Galveston Area on page 47). Other public initiatives aim to encourage the use of lower-emitting transport modes or to reduce the unnecessary idling of freight vehicles, vessels, and cargo-handling equipment.

Some communities have identified noise, or unwanted sound, as a concern associated with urban freight movement. Some truck manufacturers offer vehicle modifications that reduce noise, including idle-reduction equipment. Makers of cargo-handling equipment (e.g., rolling cages) have also begun to offer low-noise models. These improvements are especially important to the success of off-hours delivery (OHD) programs, which aim to reduce daytime traffic congestion by shifting some freight activity to the overnight hours. Cities, such as Stockholm, Sweden, have found that well-managed OHD programs can help to address freight mobility issues without disturbing residents (see Off-Peak City Logistics Pilot in Stockholm, Sweden, on page 25).

Noteworthy Practice Success Factors

The noteworthy practices featured in Sections 3, 4, and 5 highlight strategies geared towards improving urban freight mobility through OLT applications. Although each noteworthy practice presents distinct challenges and solutions, several common factors contributed to the success of the program or initiative. The primary success factors for OLT strategies include:

- **Engage stakeholders.** Stakeholder engagement can be critical for understanding local needs and implementing appropriate solutions. The San Francisco Municipal Transportation Agency (SFMTA) actively manages loading zone designations, holding monthly public hearings and rapidly processing requests for new loading zones or changes to existing loading zones. In New Orleans, the French Quarter Management District worked with the City Council to pass legislation banning oversized vehicles from accessing the historic French Quarter neighborhood. The popularity of the oversized vehicle ban among New Orleans residents has led to additional law enforcement hires through the French Quarter Task Force. The Downtown DC Business Improvement District worked closely with the District DOT to implement and evaluate a pilot parking program that led to citywide changes in the management and enforcement of loading zones. This approach fostered partnerships with stakeholders to communicate the intention of the changes to loading zone rules and to achieve mutually beneficial outcomes.
- **Partner with the private sector.** Given the dominant role of the private sector in freight transport, private-sector participation is vital for successful implementation of new urban

freight initiatives. Private-sector stakeholders can offer insights into freight challenges and potential solutions that are based on their “real world” experience operating in urban environments. In many noteworthy practices, program managers collaborated with private-sector freight stakeholders to ensure proper implementation. In the case of the Port Authority of New York and New Jersey, the agency worked with the private sector to develop appropriate commercial design guidelines for the World Trade Center complex and the implementation of the Campus Security Plan. The approach developed has helped to streamline secure deliveries to the complex. The Houston-Galveston Area Council partnered with UPS to pilot a deployment of 18 all-electric delivery vehicles to reduce fuel consumption and emissions. These examples showcase the importance of coordinating with the private sector to achieve successful implementation of an OLT strategy.

- **Partnering with enforcement agencies.** In cases where a public agency implemented a new policy or regulation, ensuring strong enforcement has been critical to their success. When the City of Miami Beach developed its loading zone permitting system, it established a comprehensive enforcement approach to cite both drivers obstructing traffic and businesses accepting deliveries outside loading zone hours. This strategy holds both the vehicle operator and the business receiving the freight accountable for vehicle violations and has led to reduced double parking and helped decrease traffic congestion. Similarly, in New Orleans, efforts to ban large trucks from the French Quarter required additional investment in enforcement to have an effect. Rigorous enforcement of Federal Clean Truck Emissions Standards ensured the success

of the Port of Los Angeles and Port of Long Beach Clean Trucks Program, which reduced emissions from drayage by 80 percent. Strong enforcement is critical to ensuring that an OLT program or policy is successful in meeting its goals for urban freight mobility.

- **Work with port authorities.** Ports in metropolitan areas can be significant sources of commercial truck traffic. A number of the strategies documented in this Primer demonstrate how cities can work with port authorities to reduce emissions, mitigate noise, and preserve infrastructure by changing the way shipments move in and out of ports. The Port of New Orleans has worked to shift some shipments from truck to barge that will save the State of Louisiana significant roadway maintenance costs. The Massachusetts Port Authority (Massport) worked with the City of Boston to develop and build a dedicated freight roadway that removed 900 truck trips per day from local roads in and around Conley Terminal in South Boston.
- **Foster cooperation through sharing information and/or benefits.** Under London’s Construction Logistics Program, developers share information about expected construction traffic with local officials prior to the start of construction, allowing local officials to assess traffic impacts and negotiate reductions in vehicle trips. The New York City WIM project shows an example of agencies at the State, regional, and local levels cooperating to collect and exchange information. These agencies have a common interest in retrieving data from WIM sensors, and by distributing the data to all of the agencies involved in the project, there is a shared benefit.
- **Use pilot and demonstration projects to test and refine potential solutions.** The noteworthy practices include several

Table 2. Urban Freight Success Factors and Primary Benefits

Success Factor	Primary Benefits
Engage stakeholders.	Stakeholder engagement reveals local needs and helps determine appropriate solutions.
Partner with the private sector.	Private-sector stakeholders offer “real-world” perspective that can improve the success rate of new urban freight initiatives.
Partner with enforcement agencies.	Effective enforcement is critical for policy changes to have the intended effects.
Work with port authorities.	Because of the large number of truck trips that ports generate, engaging ports can yield large benefits for communities and for private freight actors (e.g., faster turn times).
Foster cooperation through sharing information and/or benefits.	Leads to early collaboration on solutions and reduce costs of collecting information can be shared by multiple parties.
Use pilot and demonstration projects to test and refine potential solutions.	Implementation of policies or technologies on a small scale limits risk and allows for learning at lower cost.

examples of pilot programs and small initial deployments of OLT strategies. For example, in Washington D.C., the Downtown DC Business Improvement District piloted an approach to loading zones that provided a model for the development of a citywide Commercial Loading Zone Management Program. In some cases the first steps are small due to cost and/or schedule considerations. In other cases, it is due to the fact that some solutions are generally

or locally untested. Taking a trial-and-error or pilot test approach to new solutions can help to limit the risk. If the strategy does not achieve the intended goals, there is typically less monetary or political capital lost relative to a larger system-wide investment. If the strategy succeeds, and public and private sectors realize benefits, the example of that success can facilitate wider adoption of the strategy or other OLT strategies.

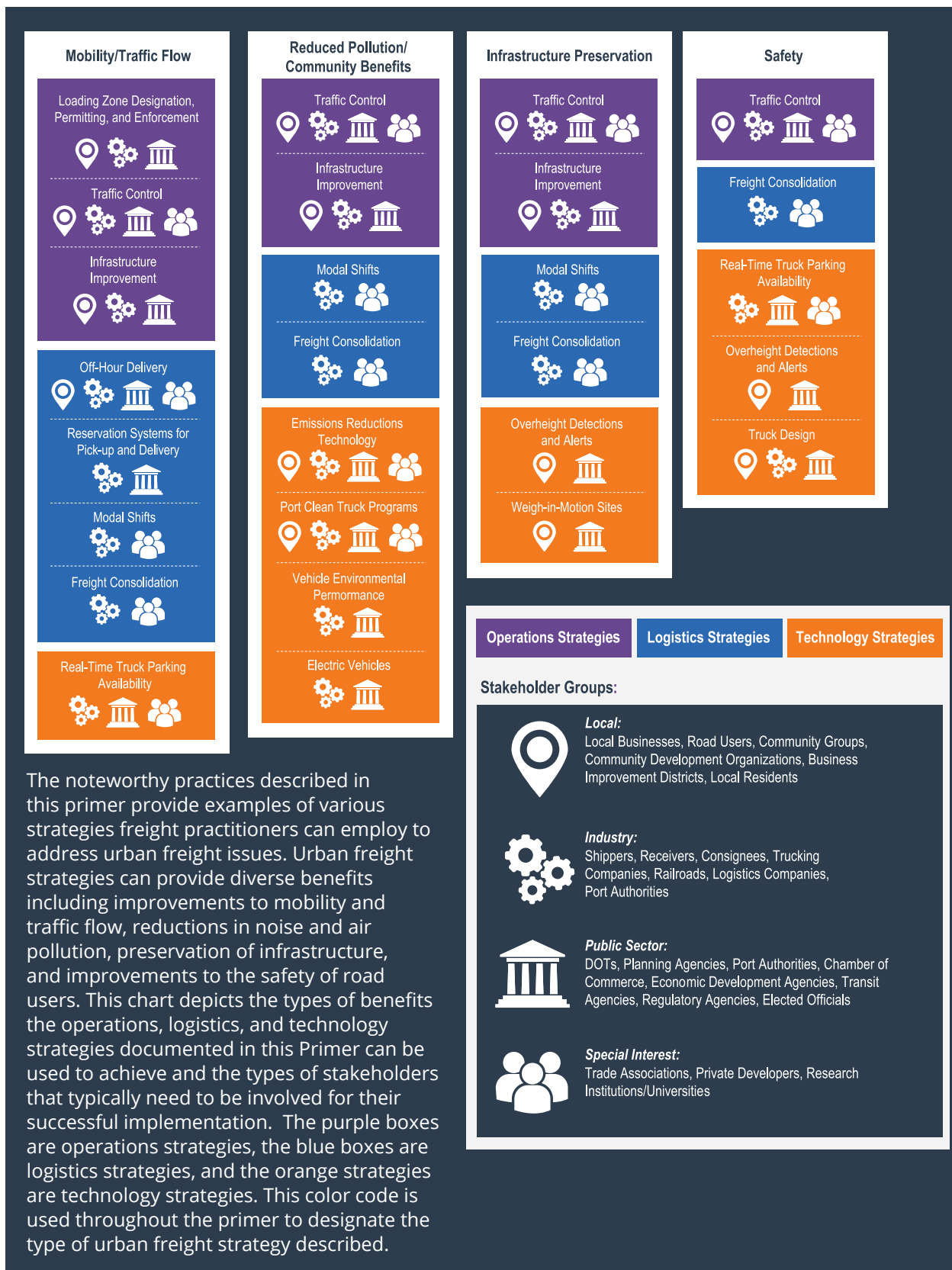


Figure 1. OLT Strategy Roadmap

2. Operations Strategies and Noteworthy Practices



A night-time delivery to an urban restaurant. Source: Chris Eaves, Seattle DOT.

The following section presents five strategies geared towards improving the operation of freight and goods movement in urban areas. Each strategy is profiled as a noteworthy practice, featuring a notable example of the strategy being implemented in the United States or abroad.

Taking steps to better manage curbside loading areas facilitates truck loading and parking, and ultimately improves mobility and traffic flow. Trucks may be required to deliver on a sidewalk when an off-street loading dock or facility is not

available, but when curbside areas are limited, they are often forced to circle or double park. Three strategies that can help improve curbside delivery management are: increasing the supply of loading zone space; implementing permitting systems for loading zones; and improving enforcement of loading zone regulations. These efforts are typically led by the public sector at the local level, but they should be developed and implemented in coordination with shippers, receivers, trucking/logistics companies, and local businesses.

City planners and DOTs can also designate and enforce truck routes to manage the flow of commercial vehicles on specific corridors. Designated truck routes can help keep trucks and other large vehicles out of residential areas and limit the damage on roadways or corridors that are not built to support heavy vehicles. Strategies that can help public-sector agencies implement and manage truck routes include: establishing a truck route network, implementing WIM sites for enforcement and data collection, improving enforcement of truck routes, and monitoring vehicle environmental performance. City planners and DOTs should engage with shippers, trucking/logistics companies, industry groups, community development organizations, and other community groups to ensure that truck routes are appropriately designated and limit negative impacts on local neighborhoods and communities.

Lastly, city agencies can improve traffic control and lane management in urban areas to manage truck access in certain neighborhoods or travel lanes. The main objectives of traffic control strategies are to help protect infrastructure in special districts and increase safety. The objectives of lane management are to preserve infrastructure and improve mobility and traffic flow using truck-only or passenger-only lanes. City planners and DOTs at the city or State levels should engage with public and private stakeholders to ensure there are clear alternatives for freight vehicles to any restrictions that are designed to protect local residents and other road users.

San Francisco Color Curb Program

Primary Objective

In many urban areas, particularly business and commercial districts, parking spaces are limited. In San Francisco, trucks that are loading and unloading often double park, extend onto sidewalks and roadways, or circle city blocks in the hopes of finding a parking space. This can impede traffic flow and result in parking tickets that increase the cost of operations for carriers. Clearly designating when and where freight activities can occur curbside can help manage truck access to designated spaces during peak delivery hours.

The San Francisco Municipal Transportation Agency (SFMTA) manages the “Color Curb” program, which is used to regulate the City’s curbside space. Curbs are painted one of five colors to clearly designate which activities can occur at curbside. Yellow zones designate curbside areas used for active freight loading and unloading by commercial vehicles (those with a commercial license plate) during posted times.

The primary goal of the color curb program is to provide sufficient space for both passenger and freight loading and unloading. When passenger and freight loading occurs in the streets without adequate curbside access, it can often result in traffic slowdowns (particularly public transit), increased congestion, and safety risks to bicycles and pedestrians. This is why SFMTA believes that securing space for loading space is more important than space for parking.

Each yellow loading zone varies in length and time depending on the loading needs of the nearby businesses. However, given

Key Accomplishments

- SFMTA responds to 95 percent of all color curb requests within 30 days of submission, on average.
- SFMTA responds to approximately 80 requests for freight, passenger loading zones, disabled parking, short-term parking, and no-parking zones per month. Of those requests, approximately 5-10 loading zones are established or altered.
- To improve freight mobility, SFMTA is employing creative solutions to support non-traditional deliveries. For example, City Transportation Code allows non-commercial vehicles to make a delivery in a yellow loading zone for fewer than 3 minutes.

San Francisco’s geography, topography, and density, most curbside loading zones cannot accommodate semi-trailers or other large vehicles. Loading zones also have specific posted hours of permitted usage. Hours generally vary, but most end by 6:00 p.m. in order to open to non-commercial vehicle parking.

Implementation Approach

The color curb management has been active and evolving in San Francisco since the 1930s. Over the years, it has been managed by various City agencies, including the Public Works Department, Traffic Engineering Department, San Francisco Police Department, and, since the early 2000s, SFMTA. For non-freight loading zones, SFMTA works closely with personnel



Color curbs in San Francisco. Source: SFMTA.

from other departments within the agency, such as Transit Engineering, to expand lengths of passenger loading zones and hours where appropriate. For freight loading zones, SFMTA relies on businesses to tell them if a loading zone is insufficient. In addition, SFMTA relies on residents and businesses to notify them of unused loading zones that may be better used for parking.

The SFMTA Parking Enforcement Department strongly enforces the color curb regulations, and will often tow or cite non-commercial vehicles parked in yellow loading zones during effective hours. The SFMTA and the Police Department also issues citations for

double-parked vehicles, which is typically considered a “cost of doing business” by carriers. To further improve compliance, SFMTA is looking at other ways to further reduce double-parking.

Public hearings are held monthly at City Hall to discuss the installation of new color curb zones, enabling the public to comment on any proposed changes to City streets. SFMTA processes roughly 80 color curb requests for per month about a dozen of them are related to commercial loading, and regularly makes improvements to existing loading zones to better suit the needs of businesses and residents. SFMTA keeps records of all loading zones, and tracks customer satisfaction and response time to requests for loading zones. SFMTA is also considering altering the yellow loading zone vehicle requirements to accommodate certain non-commercial vehicles, such as those making food deliveries and those carrying smaller packages. Instead of restricting non-commercial vehicles carrying freight, SFMTA actively looks for new techniques to support these deliveries to improve urban freight mobility.

Local Contact

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City of Miami Beach Freight/Alley Loading Parking Permit Program

Primary Objective

The City of Miami Beach implemented a loading zone permitting system in response to issues with double parking, a major contributor to traffic congestion, as well as noise from freight loading activities that was disrupting residents and hotel guests at night. In May 2014, the Mayor and City Commission approved an ordinance establishing new freight loading regulations, which took effect in August 2014.

The City's goal is to facilitate loading activities for carriers and businesses alike. The rules state that vehicles using new and expanded freight loading zones (FLZ) or alley loading (AL) areas require an "FLZ" or "AL" permit, respectively. The vehicle license plate serves as the vehicle's electronic permit, and parking enforcement officers use license-plate recognition readers to confirm validity. Permittees also receive an online account to manage their fleet permits and make revisions to vehicle assignments in real time.

An FLZ is a posted on-street parking area, typically 60 to 100 feet long, for the use of commercial vehicles with a gross vehicle weight exceeding 10,000 lbs. Posted signs provide permitted hours, days, time limits, payment options, and prohibitions. Alleys are city rights-of-way providing "backdoor" access to commercial establishments or residential properties for loading and unloading. An AL permit is granted to vehicles with a gross weight of less than 10,000 lbs., and is intended for the use of smaller vehicles servicing commercial establishments. This approach to loading zone management uses the existing curbside and

Key Accomplishments

- The City of Miami Beach held over 50 meetings with businesses and carriers to discuss concerns and issues surrounding enforcement, and generated strong support from the Mayor, Commission, and Police Department.
- The city expanded its existing loading areas to 35 FLZs totaling 3,500 curbside linear feet (182-percent increase), which equates to a maximum of 8,200+ freight loading 30 and 60 minute intervals in the district.
- Since implementing the FLZ and AL permit programs, the City has observed substantial reductions in double-parking, which has helped decrease traffic congestion. The program's success can be attributed to diligent enforcement and several types of penalties for violators.

alley areas to more efficiently facilitate carrier access to the City's commercial and residential properties.

Implementation Approach

Commercial vehicles exceeding a gross vehicle weight of 10,000 lbs. must attain either a semi-annual or annual permit. Infrequent users do not need to attain a permit and may pay for parking at a pay station or via ParkMobile, a mobile app. The 31 existing loading areas were expanded to 35 FLZs with a total of 3,500 curbside linear feet, an increase of 182 percent.



Traffic moves past a delivery truck in Miami Beach. Source: Pixabay.com.

This equates to 8,200+ freight loading time slots (either 30 or 60 minutes) in the district, assuming an average of two vehicles per freight loading zone during all permitted freight loading hours, six days a week. Delivery hours vary, but are typically from 7 a.m. to 1 p.m. to avoid peak travel times for visitors to the beach or commercial shopping district. FLZ locations, days, and hours are monitored and adjusted accordingly to promote efficient use of curbside parking spaces.

The Mayor and Commission, City Manager's Office, City Attorney's Office, Parking Department, Public Works Department, Transportation Department, Code Enforcement Department, Fire Department, and Police Department endorsed the program to help address traffic congestion. The City also held over 50 meetings with businesses and carriers to discuss concerns and issues surrounding

enforcement. As a result of information gathered from these meetings, the City was able to come up with an effective enforcement approach to ensure compliance. In addition to citations for and towing of non-compliant vehicles, drivers obstructing traffic (double parking) can be issued moving violations (which affect a driver's record) and businesses that accept deliveries outside FLZ hours can be issued city code citations. This holds both the vehicle operator and the business receiving the freight accountable for vehicle violations. Establishing penalties for both carriers and receivers was an essential part of the program's success.

Local Contact

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Commercial Loading Zone Management Program in Washington, DC

Primary Objective

In 2007, the DowntownDC Business Improvement District (BID) in Washington, DC, established a pilot parking program, which helped build momentum for developing the city's Commercial Loading Zone Management Program (CLZMP). Illegal double-parking of delivery vehicles can significantly increase congestion in urban areas. Increasing enforcement efforts can help ensure carriers are aware of loading zone areas and regulations. This strategy can be combined with increasing the availability of designated curbside access for commercial vehicles to both enforce existing regulations and address imbalances in supply and demand for loading zones.



Loading zone sign (bottom) in Washington, DC. Source: DDOT.

Key Accomplishments

- CLZMP resulted in improved use of existing loading zones within the District through enforcement. Data collected from this effort quantified curbside loading demand and location of loading zones, and led to other curbside management pilots, such as the Variable Pricing Pilot in Chinatown.
- Fostered partnerships with stakeholders to communicate the intention of the CLZMP and achieve mutually beneficial outcomes, including independent companies and distributors, carriers, national and State trucking associations, and local BIDs.
- Improved District DOT's collection and management of loading zone data.

The pilot parking program first focused on K Street NW, one of the downtown's busiest commercial thoroughfares. Assisted by the District Department of Transportation and the Golden Triangle BID, the DowntownDC BID collected pre-and post-pilot data on travel times, parking occupancy, curbside uses, parking turnover, and parking violations. Results showed travel times across all modes of travel improved measurably following the pilot's implementation without a substantial disruption of commercial activity. This success eventually led to citywide implementation of the CLZMP in 2015.



A truck is unloaded at the curbside. Source: Volpe National Transportation Systems Center.

Implementation Approach

Communication and engagement were crucial to the successful implementation of the CLZMP. The District of Columbia DOT (DDOT) engaged in comprehensive stakeholder outreach to independent companies and distributors, carriers, national and State trucking associations, and local BIDs. It was critical for District DOT to convey the message that the CLZMP was intended to improve curbside management, not impose another tax on freight. DDOT also distributed literature about the CLZMP through print and online media. Additionally, DDOT coordinated with the City's Public Works and Police Departments to clarify regulations on design and placement of permit decals.

Improved enforcement of the CLZMP is the most important element of its success. To address carrier complaints about passenger vehicles using loading zone spaces, DDOT

increased the fine for unauthorized vehicles from \$50 to \$100. Additionally, DDOT and the Public Works and Police Departments worked together to enforce the new regulations as the program rolled out. According to DDOT, jurisdictions interested in replicating this program should inventory existing loading zones and collect data on their use, coordinate with city police about enforcing loading zone changes, offer multiple methods of payment and investigate new forms of payment as they become available, and engage with carriers, downtown receivers, and local BIDs. Although DDOT did not collect data on loading zones prior to CLZMP, the initiative has resulted in better data on loading zone demand.

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Ban on Large Trucks in French Quarter District, New Orleans, LA

Primary Objective

The French Quarter, one of the oldest neighborhoods in New Orleans, can easily be damaged by the height, width, length and/or weight of a truck or oversize vehicle that is more than 36 feet in length. The streets in the interior of the French Quarter are 22 feet wide. These one way streets have an 8-foot wide parking lane and a 14-foot wide fire lane. A study conducted by the French Quarter Management District (FQMD) found that 90 percent of trucks making deliveries in the French Quarter were shorter than 31 feet in length. However, larger trucks carrying containers to or from the Port of New Orleans would often traverse the neighborhood. The City found that some of these trucks had damaged historic homes, roadway infrastructure, street lights, or other city property.



Oversized truck in French Quarter, New Orleans.
Source: French Quarter Management District.

Key Accomplishments

- With strong support from local residents, businesses, carriers, and the French Quarter Management District, New Orleans City Council enacted an ordinance prohibiting vehicles 36 feet or more in length from traveling in the French Quarter.
- While enforcement has been a challenge, the popularity of the oversized vehicle ban among New Orleans residents and a desire to increase compliance has led to additional law enforcement hires through the French Quarter Task Force.

In an effort to prevent damaged infrastructure and traffic congestion, residents in New Orleans' French Quarter pushed the New Orleans City Council to ban or restrict movement of large trucks and buses. In 2014, New Orleans City Council enacted an ordinance prohibiting vehicles 36 feet or more in length from traveling in the French Quarter of the city, except in certain circumstances and only after the city's issuance of a single-use oversized load permit from the Department of Public Works. It also established penalties of \$500 for a first offense and \$1,000 for subsequent offenses. The ordinance also prohibits trucks from driving or parking on sidewalks or curbs.



Traffic moves past a delivery truck on a street in the French Quarter. Source: 123rf.com.

Implementation Approach

Local residents first raised the issue and were the primary drivers behind getting the legislation passed. The City Council began working on the law in 2012. The French Quarter Management District, which is a political subdivision of the State of Louisiana, also strongly supported the ban and helped generate additional support with other stakeholders, including local businesses and carriers.

In general, businesses and carriers have been supportive of the ban. During the legislative process, a beer/alcohol distribution company offered to pay for protective bollards to be installed in front of certain historic structures. Although this did not come to fruition, it demonstrated the level of commitment of some businesses operating in the French Quarter.

The city posted signage to notify truck drivers of the ban, and FQMD notified the Port of New Orleans and trucking companies of the ban. However, as late as June 2017, the number of incidents involving large trucks in the French Quarter had not decreased noticeably. In July 2017, the New Orleans Convention and Visitors Bureau began providing the FQMD funding to hire off-duty New Orleans Police Department officers to patrol the French Quarter. The duties of these officers includes issuing citations for violations of the oversize vehicle ban. These officers will help the City collect fines and ultimately improve compliance.

Local Contact

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Massport Conley Terminal Dedicated Freight Corridor and Park Project in Boston, MA

Primary Objective

Boston's Paul W. Conley Terminal is located in historic South Boston, adjacent to a dense urban neighborhood. The terminal processed more than 257,000 containers in 2017, its third record-breaking year in a row. The terminal is not served by rail, but it has nearby access to Interstates 90 and 93. The terminal is the source of as many as 900 truck trips per day on local city streets, generating noise, vibration, and congestion impacts on area residents. In 2008, to address these impacts, the Massachusetts Port Authority (Massport) began the planning and land acquisitions necessary to build a dedicated freight roadway to remove container traffic from neighborhood streets. Construction of the Thomas J. Butler Freight Corridor and Memorial Park at Conley Terminal began in 2014.

The 0.6-mile roadway has removed all Conley container trucks from East First Street and Summer Street in South Boston. In addition, the Dedicated Freight Corridor expanded on-terminal truck queuing areas, resolving community concerns over trucks queuing and idling on city streets near residences. The new roadway alignment also facilitates future plans to relocate the terminal's main gate facility and streamline operations, as well as creating a spine for the terminal's underground electrical and telecommunications utility infrastructure. The project includes a 4.5-acre landscaped buffer park along East First Street, which was built on a brownfield industrial property and designed through a community planning process. The linear park features a multi-use path, a dog park, and a series of interpretive

Key Accomplishments

- The Dedicated Freight Corridor removes as many as 900 truck trips per day from local roads in and around Conley Terminal.
- Massport built a 0.6-mile long dedicated freight corridor and 4.5-acre buffer open space as part of community mitigation efforts for the expansion of the Conley container terminal.
- The Memorial Park serves as a landscaped buffer and noise wall, which improves quality of life for residents while still allowing for expansion at the Terminal.

panels about the port and South Boston history, as well as a 16-foot-tall noise wall that separates the park and the neighborhood from the trucking and container terminal activities within the South Boston Designated Port Area to the north.

Removing container trucks from East First Street had been a long-standing desire in the South Boston community and was informally tied to future terminal expansion plans. The project was envisioned after the City of Boston and Massport's Port of Boston Economic Development Plan (1995) confirmed the importance of preserving a container terminal in the Port of Boston and determined that Conley Terminal needed to expand to support growth predictions.



Thomas Butler Dedicated Freight Corridor. Source: Massport.

Implementation Approach

The Dedicated Freight Corridor traverses several former industrial properties including the Exelon Power Plant, a former emergency power plant for the Massachusetts Bay Transportation Authority (MBTA), and the former Coastal Oil petroleum storage facility. It took more than 5 years of advanced planning, land purchases, and legislative changes to transfer land parcels from the MBTA to Massport before construction could begin. Funding for the project came primarily from Massport bond offerings. The \$75 million corridor opened in September 2017.

Establishing community support and a sense of community ownership was critical in all project phases. Beginning in 2009, Massport conducted many community meetings in South Boston to address the overall project. A design advisory committee of local residents and elected officials collaborated with Massport and its consultant design team over approximately

18 months to arrive at the design for the Butler Memorial Park. Massport also worked with a number of municipal, State, and Federal agencies as part of the project planning, that included the U.S. Army Corps of Engineers, U.S. Coast Guard, Boston Transportation Department, the MBTA, and the Massachusetts Environmental Policy Act Office, among others.

Local Contacts

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3. Logistics Strategies and Noteworthy Practices



New York City streetscape. Source: Alison Conway, City University of New York.

The following section presents four strategies geared towards improving the operation of freight and goods movement in urban areas. In the following pages, each strategy is profiled as a noteworthy practice, featuring a notable example of the strategy being implemented in the U.S. or abroad.

The four strategies discussed in this section include off-hours delivery, pick-up/delivery reservation systems, modal shifts, and freight consolidation. These strategies are typically

pursued by private sector stakeholders with the goals of improving their supply chain efficiency and reducing the costs associated with delays, congestion, and ticketing. Logistics strategies also help address issues with mobility and traffic flow, communication between shippers and receivers, and quality of life and community benefits in residential areas. These types of strategies can also lead to new freight delivery technologies that can be applied in a variety of contexts.



Trucks and a bicyclist share a road leading into Seattle.
Source: Chris Eaves, Seattle DOT.

Off-hours delivery strategies can help to reduce freight contributions to traffic congestion and reduce competition for parking. However, these strategies need to address residential concerns regarding noise and must be closely coordinated with receivers. Advance pick up/delivery reservation systems can be used to shorten loading times and provide solutions to parking, congestion, and security issues.

Where feasible, shifting freight off of streets and highways and on to rails or waterways can reduce wear and tear on roadways and improve the efficiency and reliability of freight movements. Consolidating planned freight movements to reduce the number of shipments requires planning and coordination, but can reduce the negative impacts of freight deliveries on traffic and residents.

Private sector stakeholders that pursue logistics strategies to better adapt to urban areas should engage with not only shippers, receivers, trucking/logistics companies, and other industry stakeholders, but also with local and public sector stakeholders that may be either positively or negatively impacted by any changes to a supply chain or delivery method. The end goal for all stakeholders is to minimize external conflicts while maximizing cost savings and efficiency.

Off-Peak City Logistics Pilot in Stockholm, Sweden

Primary Objective

The City of Stockholm, Sweden initiated an off-peak delivery pilot project in 2014 to better organize urban freight transport and reduce traffic congestion. The goals were threefold: 1) make deliveries more flexible; 2) urge transport companies to invest in newer, quieter, and more environmentally friendly trucks; and 3) increase efficiency for all transportation modes to improve the safety and livability of the city for its inhabitants. In addition, the city anticipated that off-peak deliveries could improve working conditions for drivers, since there would be less congestion, greater travel time reliability, and less anxiety.

The goal of voluntary off-peak or off-hour delivery programs is to reduce congestion and pollution from truck traffic by providing incentives to urban receivers to shift daytime deliveries to “off” hours. However, in Stockholm there are regulations prohibiting deliveries between the hours of 10:00 p.m. and 6:00 a.m. due to concerns about noise. To explore



Off-peak delivery in downtown Stockholm, Sweden.
Source: Stockholm Off-Peak City Logistics Project.

Key Accomplishments

- Despite regulations prohibiting deliveries between the hours of 10:00 p.m. and 6:00 a.m., the City of Stockholm permitted two companies to participate in the Off-Peak City Logistics Pilot to determine whether off-hour delivery programs could reduce congestion and pollution from truck traffic.
- Truck drivers participating in the pilot reported increased efficiency, shorter travel and delivery times, higher productivity both for carriers and receivers, less environmental impacts and fuel cost savings, as well as better working conditions when trucks are moved from rush hours to off-peak hours.
- Driving speeds for off-peak deliveries were 31 percent higher than driving speeds for deliveries made during the morning peak.
- The results of the pilot suggested that off-peak deliveries could work well in the Stockholm region and a follow-up study is being considered.

the benefits of lifting this ban, the Stockholm pilot permitted two companies to operate one vehicle each for off-hour deliveries. The project team tested nighttime distribution using a hybrid electric vehicle and a biogas vehicle for delivering goods to three retail establishments and to a variety of hotels and restaurants. The results of the pilot suggested that off-peak deliveries could work well in the Stockholm



One of the pilot vehicles traveling through Stockholm at night. Source: Stockholm Off-Peak City Logistics Project.

region and a follow-up study is being considered. From the city's perspective, the most important remaining challenges are noise measurements, surveillance (e.g., permitted vehicles, fuel type, and emission levels), and additional costs of potential infrastructural changes.

Implementation Approach

Although the City of Stockholm initiated the project and provided organizational support throughout the pilot, KTH Royal Institute of Technology actually managed the project. The pilot test occurred over a 2-year period from 2015 to 2016. The outcomes were analyzed for transport efficiency, environmental impacts of noise, and policy measures and stakeholders' perspectives.

Several different stakeholders made important contributions to the pilot. Two major producers of heavy trucks provided two state-of-the-art, environmentally-friendly distribution trucks. A company specializing in silent systems for distribution (e.g., rolling cages) provided the necessary equipment. Two of the biggest logistics companies in Sweden participated by delivering goods during nighttime hours to

their customers. In addition, an international retail company operating in off-peak hours in other countries volunteered to test the model in Stockholm.

The study team found that the benefits of off-peak deliveries exceeded the costs.

Furthermore, all participants in the pilot were pleased with the improvements in freight mobility in downtown Stockholm. Given the small scale of the pilot, it is difficult to make broad conclusions about the potential benefits of more widespread application of off-peak deliveries. KTH Royal Institute of Technology is eager to conduct another pilot project to build off the success of the first pilot study.

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Trusted Access Program and Vehicle Security and Scheduling System at New York City's World Trade Center

Primary Objective

Few locations in American cities are as secure and guarded as New York City's World Trade Center (WTC). The reconstruction of the WTC complex after the attack of September 11, 2001, emphasized safety and security of the site and its workers and visitors. As such, the capacity to control access to the complex and to screen vehicles for potential threats had to be built into the reconstruction.

The WTC features a Transportation Hub that connects the Port Authority Trans Hudson trains to and from New York and New Jersey with several New York City Transit Subway lines, commercial office towers One, 2, 3, 4, and ultimately 5 WTC, the One World Observatory, the National September 11th Memorial and Museum, and Liberty Park, as well as hundreds of thousands of square feet of retail space and pedestrian plazas. The WTC is a restricted access campus that is owned by the Port Authority of New York and New Jersey. It is protected by multiple security agencies, including the New York City Police Department, two Port Authority Police divisions, and multiple private security companies. There is a constant police presence and command station on-site.

Access for delivery vehicles is facilitated using a Trusted Access Program (TAP) that features a Vehicle Security and Scheduling System (VS3). The TAP and VS3 systems provide security and control access to the complex. They also used the system to assist in managing utilization of loading dock space. Use of the system in this manner reduced inefficiencies that many businesses experience when truck drivers

Key Accomplishments

- Developed an efficient system for managing vehicle and driver information, allowing law enforcement and stakeholders to know who is traveling onto the WTC complex and for what purposes.
- Implemented a screening process that can accommodate daily demand without delays or queuing of trucks.
- Turned critics into supporters by offering a superior level of service with more reliability than "traditional" urban delivery.

have to search for an open loading dock or a curbside place to make deliveries. Managing deliveries through a reservation system, with or without the security element, is applicable in other urban environments in the U.S.

Implementation Approach

In developing the WTC complex, the Port Authority, New York City, and other on-site stakeholders collaborated on the development of commercial design guidelines for the WTC. The guidelines included specifications for streets, sidewalks, signage, street furniture, and other aspects of the site design. Additionally, the Port Authority and New York City collaborated in the development and implementation of a WTC Campus Security Plan to delegate roles and responsibilities governing access and security. The Port Authority also visited and interviewed managers of other large urban campuses in New York City, including the

Jacob Javits Convention Center and Rockefeller Center, to learn about best practices while developing and implementing the TAP and VS3 systems.

The VS3 system is a database of driver and vehicle information, associating site tenants with the companies that deliver to them. The VS3 system also manages delivery schedules and loading dock utilization. Each building has its own loading docks and a manager who establishes rules for delivering to their docks, such as length of delivery window and length of registration validity, among others. Using the VS3 system, building tenants schedule deliveries and loading dock managers approve the delivery requests.

The VS3 system is used to pre-register all vehicles and drivers that require access to the WTC complex, including delivery vehicles, black cars, and employees' personal vehicles. When drivers enroll in the VS3 system, they provide information about the company, driver, vehicle plate, and vehicle identification number (VIN). Rather than generate a unique driver ID card, the system manages driver records using driver's license numbers. This requires less data and equipment management on the part of the system managers and drivers.

When entering the WTC, every vehicle undergoes a certain level of screening depending on where it is making a delivery onsite. Delivery vehicles headed below-ground receive a full x-ray, personal vehicles are screened by canine service dogs, and street-level delivery vehicles are physically inspected and weighed. The security process for delivery vehicles takes approximately 15-20 minutes from start to end. On average, over 1,000 trucks per week are processed with no delays or backups at the screening checkpoints.

The system is expected to efficiently process upwards of 800 trucks, 500 private automobiles, and hundreds of livery vehicles per day once the complex is fully built out.

Each property owner and manager at the WTC, including the Port Authority, Silverstein Properties, The Durst Organization, Westfield Corp, and the National September 11 Memorial & Museum, shares in the cost of operating the Vehicle Security Center that processes all the vehicles going to below-ground loading docks and parking areas. The payments help recoup the cost of VS3 System and gantry scanners, but the cost of staffing both guards and canine service dogs is a large and ongoing expense.

The Port Authority meets monthly with Trusted Access Program stakeholders to review performance statistics and discuss feedback on any issues or concerns. The partnership is highly collaborative, and all parties agree that while security is critically important, businesses need to be able to thrive as well. Prior to implementing the VS3 system, some businesses were concerned that the system would be too onerous and could negatively impact business. However, businesses continue to flourish at the WTC, and the VS3 and TAP systems work effectively, and often even more reliably than typical urban deliveries outside the WTC Complex.

Local Contacts

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U.S. Maritime Administration Grant to Support Container-on-Barge Service between Ports of Greater Baton Rouge and New Orleans

Primary Objective

In response to a booming chemical industry in Louisiana, the Ports of New Orleans and Greater Baton Rouge, SEACOR AMH, and Ports America began operating container-on-barge shuttle service in July 2016 between Baton Rouge and New Orleans to support the transportation of petrochemicals via inland waterway transportation. Container-on-barge is a type of intermodal freight transport where containers are moved by barge instead of by truck. The service repositions empty containers from Memphis, where there is a surplus, to Baton Rouge. From there, empty containers are filled with plastic resins and then shipped again via barge to New Orleans, where they are loaded onto container ships bound for international destinations. The service currently runs between seven and nine hopper barges per week, providing exporters with a waterway alternative for repositioning containers that would otherwise move by truck or rail.

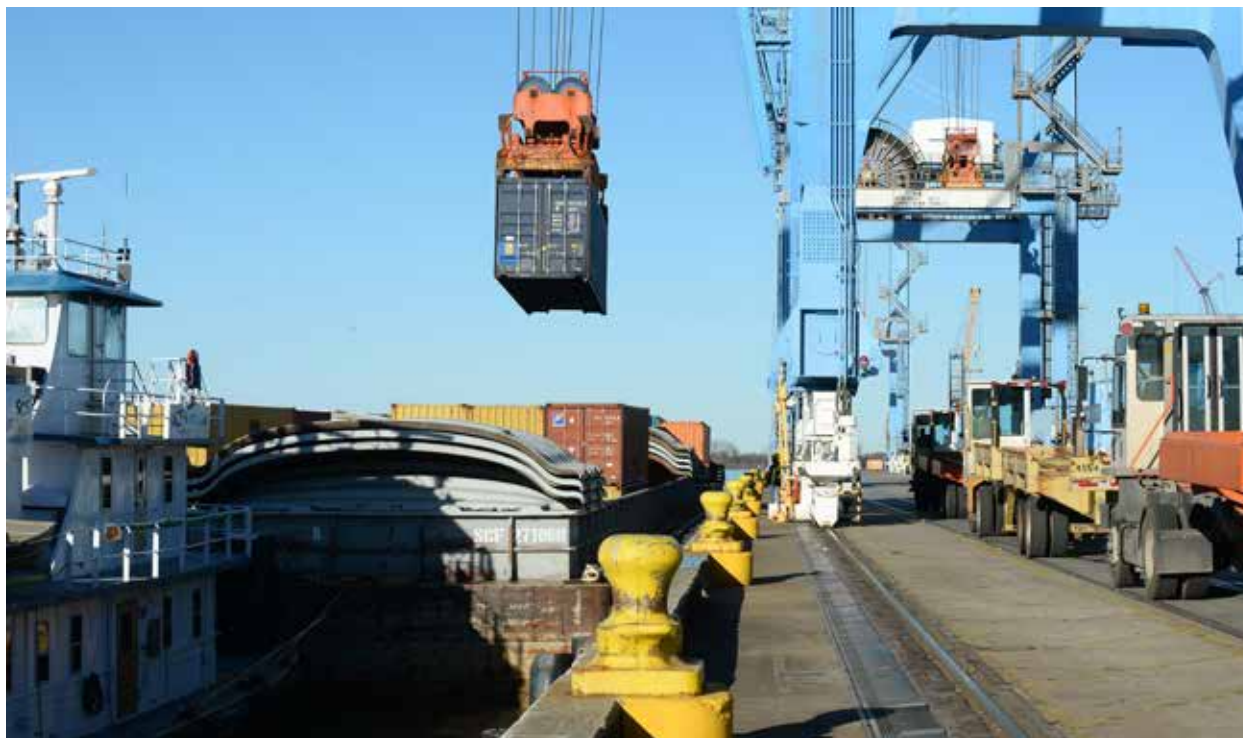
According to data from a U.S. DOT study, the State of Louisiana has the potential to recoup \$118 million in roadway maintenance savings by moving a 40-foot container round trip between New Orleans and Baton Rouge by barge rather than over the road. At nine barges per week, the container-on-barge shuttle service has the potential to eliminate up to 22,500 truck trips per year and save approximately \$1.3 million annually in roadway maintenance costs.

Key Accomplishments

- Partnership between the Ports of New Orleans and Greater Baton Rouge, SEACOR AMH, and Ports America established container-on-barge service between Memphis, Baton Rouge, and New Orleans.
- Partners jointly received a \$1.75 million grant from U.S. Maritime Administration to purchase equipment to expedite processing.
- Container-on-barge shuttle service runs 7-9 hopper barges per week, with the potential to eliminate between 336 and 432 truck trips per week (up to about 22,500 truck trips per year).
- State of Louisiana has the potential to recoup \$118 in roadway maintenance savings by moving a 40-foot container round trip between New Orleans and Baton Rouge by barge rather than over the road.

Implementation Approach

The Port of New Orleans and SEACOR have been in talks since 2014 about ways to utilize inland water transportation to support Louisiana's petrochemical production. In October 2016, the U.S. Maritime Administration (MARAD) jointly awarded SEACOR (operator and developer of container-on-barge shuttle service), the Ports of New Orleans and Greater Baton Rouge, and Ports America (terminal operator of both ports) a grant of \$1.75 million



Container-on-barge activity at the Port of New Orleans, Louisiana. Source: Port of New Orleans.

to acquire specialized container loading equipment for the container-on-barge shuttle service to increase the processing speed of loading and unloading containers onto the hopper barges. SEACOR will provide a 20 percent match for the Port of New Orleans equipment, and the Port of Baton Rouge will provide a 20 percent match for its equipment. One set of equipment will be at SEACOR's Memphis terminal owned by the Port of New Orleans, and the second set of equipment will be at SEACOR's Baton Rouge terminal owned by the Port of Greater Baton Rouge. SEACOR will lease the equipment from each port for a nominal fee.

The Port of New Orleans equipment will be acquired once the Port identifies and selects a U.S.-based manufacturer. The Port of Greater Baton Rouge will acquire its container handler equipment once it is approved for a waiver from a Buy America requirement that the equipment be purchased from a U.S.-based manufacturer. This type of equipment is not currently produced domestically.

Local Contact

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London's Construction Logistics Program and Construction Consolidation Centers

Primary Objective

In recent years, the city of London has experienced a boom in construction, resulting in a significant number of construction-related truck trips in the city each day. According to Transport for London (TfL), the city's transportation agency, the construction industry generates 35 percent of London's daytime truck traffic and 38 percent of all traffic during the morning rush hour. To reduce the volume and impacts of construction-related vehicle movements, TfL has developed a multi-faceted construction logistics program, which focuses on the safety risks posed by construction vehicles traveling on city streets. Two elements of the program, construction logistics plans (CLPs) and construction consolidation centers (CCCs), focus on the traffic impacts of construction logistics.

Construction Logistics Plans

The City of London and many of the boroughs that make up greater London require that proposals for certain types of construction must be accompanied by a construction logistics plan (CLP). A CLP must include details on the expected levels of construction traffic that will be generated by the project, the routes that traffic will use, and measures the developer will take to reduce traffic impacts during construction of the project.

TfL has published guidance so that planning authorities and developers have a mutual understanding of what a high-quality CLP should include. This guide describes a menu of "planned measures," which are specific

Key Accomplishments

- TfL published guidance on CLPs and developed a two-day training course.
- Since May 2017, more than 200 individuals have taken the TfL course on construction logistics planning.
- TfL published a directory and map of CCCs in or near London.
- The number of CCCs operating in London has grown from 9 in 2015 to 12 as of fall 2016.

techniques for reducing or otherwise managing construction-related trips that developers commit to use during the planning permission process. TfL has also developed a two-day training course in construction logistics planning. This training brings together all of the key stakeholders involved in the drafting, approval, and implementation of a CLP and educates them about the range of planned measures that are available.

One of the benefits that TfL has seen from the use of CLPs is that planning authorities can better assess the potential cumulative traffic impacts of multiple construction projects being proposed for a particular part of the city. Another benefit of CLPs is that it generates discussion of potential traffic impacts of a project at the time that developers are seeking legal permission to build. It is at this time that developers are most willing to agree to take steps to reduce vehicle trips.

U.S. cities typically require developers of larger projects to prepare transport control plans.



Cover of the TfL directory of CCCs. Source: TfL.

These plans typically elaborate how a developer will manage the flow of traffic around the construction site. The plans also identify the routes that vehicles will take to and from the site. However, they differ from CLPs in that they generally do not require a developer to consider ways to reduce the number of vehicle trips generated by a construction project.

Promotion of CCCs

CCCs are one of the planned measures or management techniques promoted by TfL. Consolidation centers are facilities where the freight shipments that are destined for a facility, site, or limited geographical area are collected and then delivered as consolidated loads. The purpose of adding a consolidation center into the freight distribution network is to reduce the number of “last-mile” vehicle trips by different carriers to the target destination. In the case of CCCs, the freight in question is building material, and the target destinations are construction sites.

In addition to consolidating shipments, CCCs can offer a number of additional services

to builders, such as short-term storage of materials, pre-fabrication of building components, security screening, and reverse logistics (i.e., management of waste). CCCs can also serve as a queuing area for vehicles that are already fully loaded, which is helpful in cases in which there is a shortage of space for vehicles to wait near the construction site.

London and other cities in Europe have used or considered temporary CCCs for specific large development projects. In London, CCCs were used successfully for construction at Heathrow Airport and for preparations for the 2012 London Olympics. However, unlike in other European cities, London now has numerous CCCs that are operating on an ongoing basis without public subsidies. According to TfL staff, London’s CCCs generally receive their revenue from the developers and the costs amount to roughly two percent of the cost of the development. However, the cost depends on the exact mix of services provided by the CCC.

To promote the use of these facilities, TfL published its first directory of CCCs in 2015. That first edition identified nine CCCs operating in or near London. Updated in fall 2016, the directory now lists 12 CCCs. The TfL directory provides details on each CCC, including capacity, location, and contact details. It also includes a map that shows the areas of London that are within a 30-minute drive of a CCC. TfL hopes that by showing the geographic reach of CCCs, the directory will spur greater usage of them. The map also shows the market potential in parts of the city not currently within a half-hour’s drive of an existing CCC.

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4. Technology Strategies and Noteworthy Practices



A container ship is unloaded at the Middle Harbor Terminal at the Port of Long Beach, California. In the midst of modernization, this terminal will be highly automated and will use electrification and other technologies to reduce air emissions significantly. An expanded on-dock rail yard will reduce the traffic impacts from the terminal's expanded capacity. Source: Port of Long Beach.

The following section presents seven strategies geared towards improving technology solutions pertaining to freight and goods movement in urban areas. In the following pages, each strategy is profiled as a noteworthy practice, featuring a description of the Technology strategy, its primary objective, and a notable example of the strategy being implemented in the U.S. or abroad. The strategies are organized into three groups: real-time information systems, safety technologies, and environment and energy technologies.

Technology solutions to urban freight and mobility issues have the potential to be implemented by both public and private sector stakeholders. Investing in real-time information systems to communicate truck parking availability and to manage truck parking spaces can help improve mobility and traffic flow, communications, and safety conditions in urban areas. A lack of truck parking near urban areas, which tend to have high concentrations of freight generators such as ports or distribution centers, can lead to higher instances of truck

crashes as a result of illegal parking. Truck drivers require adequate truck parking facilities to comply with HOS regulations, and may be forced to park illegally when legal parking is not available or the location of available parking is not known. Real-time information systems at public and private parking facilities can help communicate information to drivers on where it is safe and legal to park near urban areas. Developers of these facilities – whether in the public- or private-sector – can use feedback from truck drivers, carriers, and industry groups to better understand where there is a demand for truck parking, and determine whether more truck parking or real-time availability systems would be most beneficial.

A primary concern for public transportation agencies is roadway safety. This is especially true in congested urban areas where numerous conflicts between modes are present. Technology strategies can also help enhance the safety of urban goods movement in urban areas. Safety-oriented technologies, such as truck design and detection and alerts, can in turn help preserve infrastructure and enhance the communication of potential risks to safety, particularly in high-traffic areas or residential neighborhoods. Truck design enhancements can include expanded mirror and lens systems, truck side guards to reduce bicycle and pedestrian fatalities, and high-visibility cabs. Detection and alert technologies include camera systems, over-height detection systems to prevent crashes and infrastructure damage, advanced blind-spot awareness and warning systems, and external alert systems to warn bicyclists and pedestrians who are near the turning path of the truck. Safety technologies can involve both public-sector stakeholders such as DOTs, as well as trucking and logistics companies who invest and implement these technology solutions.

Lastly, environment and energy technologies can be used to help cities meet emissions-reduction goals to improve quality of life in urban communities. The vehicles and vessels used to transport freight are a significant source of air pollutants. Emissions from diesel engines, especially PM_{2.5}, NO_x, and other air toxics can contribute to significant health problems. However, vehicle technologies that produce fewer emissions and/or use alternative fuels can go a long way towards improving air quality. Strategies to spur investment in these areas include anti-idling regulations, clean truck programs at U.S. ports, and financial incentives for freight carriers to upgrade old equipment. These efforts typically require coordination between public sector agencies and trucking/logistics companies, frequently with input from local residents, community groups, and other institutions with an interest in environmental justice and green technology.

Truck Parking Availability System in Florida

Primary Objective

In Florida, the limited availability of truck parking spaces causes overcrowding and overflow at existing truck parking spots. At times, truck drivers turn to parking on the interstate mainline, ramp shoulders, or in vacant lots. These practices are hazardous and prohibited, and can leave drivers vulnerable to cargo theft. The shortage of truck parking affects the flow of goods moving to and from shippers and receivers, particularly in and around urban areas.

To address the issue, the Florida Department of Transportation (FDOT) is installing a Truck Parking Availability System (TPAS) along I-4, I-10, I-75 and I-95 at welcome centers, weigh

Key Accomplishments

- After two successful test project deployments in Leon and St. John's Counties, FDOT applied for and received a \$1 million Accelerated Innovation Deployment grant and a \$10.7 million FASTLANE grant for statewide deployment of TPAS.
- FDOT is deploying TPAS throughout the entire Florida interstate system public parking areas (welcome centers, rest areas and weigh stations) between 2017 and 2019.
- TPAS is helping truck drivers maximize their HOS requirements by lowering the amount of time spent to find parking spaces.



Installation of TPAS technology. Source: FDOT.

stations, and rest areas. This system will help truckers find available truck parking spaces. To detect the availability of parking, TPAS uses in-ground sensors in the truck areas at interstate rest areas/welcome centers, and entryway and exit counts at weigh stations. The information will then be shown on roadside embedded dynamic message signs as well as the State's FL511 site and app for drivers to access, and will be available for use in third-party applications.

TPAS will help truck drivers maximize their hours-of-service requirements by lowering the quantity of time spent to find parking spaces, permitting them to focus on the movement of products. TPAS will allow drivers to see the number of spaces that are currently available at a common location.



Tractor-trailers parked at a truck stop. Source: 123rf.com.

Implementation Approach

To address the imbalance of truck parking capacity due to the lack of parking information, FDOT submitted and was awarded an FHWA Accelerated Innovation Deployment grant of \$1 million in 2015. The Federal grant, along with FDOT funding, will be used to deploy the TPAS at seven public parking sites located along I-4 and I-95 in FDOT District 5. In 2016, FDOT also received a Federal FASTLANE grant of \$10.7 million to support the full deployment of TPAS. The total cost of deployment is \$24 million, half of which will come from State funds. The project in FDOT District 5 is the first of a number of installations across the State. Additional sites across the State are being installed in phases throughout 2017.

The biggest challenge of the statewide TPAS deployment was coordination with FDOT's six districts involved in the program. FDOT project managers met with each district individually to promote the project and gain support, which

was an effective engagement strategy. FDOT engaged with shippers and carriers to garner further support of the program. In addition, during subsequent phases of the program, FDOT expects to coordinate with third-party vendors to integrate private parking facilities into TPAS and to provide availability and predictive analysis at every truck parking site statewide.

TPAS will be deployed by each FDOT district between 2017 and 2019. As statistically sufficient data is aggregated, algorithms will predict parking availability based on trends in parking utilization. FDOT plans to make this information available through data feeds, thus enabling motor carrier operators to make more informed trip plans.

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Gregson Street Bridge Overheight Detection and Alert System

Primary Objective

A rail bridge passes just 11 feet 8 inches above South Gregson Street in downtown Durham, NC. Due to the low clearance under the bridge, South Gregson Street is not a truck route, and most professional truck drivers avoid the area. However, over time, numerous truck drivers have collided with the bridge. The bridge has even gained social media fame from online videos showing trucks and other types of vehicles striking it. To reduce the frequency of vehicle collisions with the bridge, the North Carolina Department of Transportation (NCDOT) installed a warning system that detects overheight vehicles and warns the drivers in real time that they cannot fit under the bridge and advises them to use an alternative route. The system also triggers a red light at the intersection immediately before the bridge to give drivers more time to observe the warning signal.

According to NCDOT, prior to installation of the warning system, there were an average of 1.4 bridge strikes per month. In most cases, the drivers who collide with the bridge are not professional truck drivers. Most professional



A truck approaches the Gregson Street bridge in August 2017. Source: Jürgen Henn – 11foot8.com.

Key Accomplishments

- NCDOT successfully applied State and Federal safety funds to implement a relatively low-cost solution aimed at reducing the frequency and severity of truck-bridge collisions.
- According to preliminary data, crash frequency has fallen from an average of 1.4 to 0.4 crashes per month.
- Anecdotal evidence suggests the severity and cost of damage associated with crashes at this location have diminished since the new detection and warning system was installed.

truck drivers use truck-specific navigation systems, and they are aware of the vertical clearance needed to accommodate the vehicles they drive. Instead, many of the drivers who collide with the bridge are individuals who are driving rented vehicles such as moving trucks. Many of these drivers are unsure of the height of the vehicle they are driving, or they erroneously assume that the vehicle they are driving will be able to fit beneath the bridge.

Implementation Approach

In the mid-2000s, NCDOT's Division 5 installed an overheight detection system before the Gregson Street bridge that used a laser to detect high objects (including trucks) approaching the bridge. The system then activated a flashing sign to warn the driver of the low-clearance bridge ahead. This system also included signage to direct drivers to a truck detour route. This system had flaws, however. Many of the drivers



The Gregson Street Bridge with the previous overheight detection and warning system. Source: Washuotaku, Wikimedia Commons, licensed under the Creative Commons Attribution-Share Alike 4.0 International license.

who collided with the bridge after this system was installed claimed that they did not see the signal or were not sure that the signal was directed toward them.

In 2016, NCDOT installed a new system. When an overheight vehicle is detected, the new system triggers a newer, larger warning sign, which reads “OVERHEIGHT, MUST TURN.” The system also triggers the traffic light at the intersection immediately before the bridge to turn red and stop traffic. By stopping traffic at the intersection, the new system provides a better opportunity for the truck driver to observe the warning sign and decide to turn and avoid a collision. In addition, if the truck driver ignores the warning and proceeds when the light turns green, it is moving at a slower speed than if it had been passing through at the posted speed limit of 25 miles per hour, thus reducing the severity of crashes that occur.

The new system was funded with both State and Federal Highway Safety Improvement Program funds, which were awarded through a statewide competitive application process. The NCDOT’s Division 5 office submitted the application, and NCDOT Headquarters selected the project for

funding due to the frequency of collisions in this location. The project cost approximately \$150,000 and included treatments to ensure context-sensitivity in the downtown environment. According to NCDOT, the cost of installing a similar system cost could be lower in an environment where such treatments are not necessary.

Since the project was completed in 2016, preliminary data collected by NCDOT indicates that collisions have declined significantly, from 1.4 per month to less than 0.4 per month.

Soon, NCDOT will perform a comprehensive review of the data to determine the long-term reductions in the number of collisions, crash severity, and costs. However, the project appears to have been successful in reducing the frequency and severity of crashes at this location. NCDOT division offices, as well as other State DOTs, have been in contact with NCDOT Division 5 to acquire additional information about this project.

Local Contact

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Weigh-in-Motion (WIM) Sensor Installation in New York City

Primary Objective

New York City DOT (NYCDOT) uses WIM technology to monitor truck activity on bridges and roadways. Overweight trucks can accelerate the deterioration of pavement and bridge structures, and overheight trucks can strike bridges and overpasses, damaging infrastructure and causing traffic delays from strike incidents. In addition, without monitoring and enforcing weight limits, carriers who operate overweight vehicles gain an unfair advantage over carriers who comply.

The WIM sensors weigh each truck that travels over them and transfers data electronically to NYCDOT staff for analysis. Data are used to develop assessments of the number of overweight trucks and to monitor trends, giving NYCDOT valuable information to quantify problems, target information and enforcement activities, and rally other agencies and stakeholders toward implementing solutions. The WIM data also provides valuable information on truck travel patterns and



Installation of a WIM site in New York City. Source: NYCDOT.

Key Accomplishments

- Developed a network of planned WIM sites to monitor truck weights on key corridors and gateways, and installed 3 sensors between 2014 and 2016.
- Collaborated with multiple agencies to incorporate WIM into a major bridge rehabilitation project.
- NYCDOT is using WIM data to inform its citywide Smart Truck Management Plan and other city initiatives.
- After installing first WIM sensor on Alexander Hamilton Bridge, NYCDOT determined that almost 7 percent of the trucks using the bridge daily were overweight. This level of non-compliance was not only surprisingly high, but also it has serious implications for bridge and highway conditions.

is being used to support truck route, asset management, and other policy decisions. NYCDOT is deploying WIM sensors at strategic locations along major truck routes entering and exiting the city. The first deployment was on I-95 at the Alexander Hamilton Bridge in July 2014. About 50 percent of all trucks entering the city travel on this highway segment. Installing WIM at the bridge provided an opportunity to gather data on a large portion of the truck traffic traveling into and out of the city.

WIM is not used for enforcement, as State law currently does not allow this method of



Location of WIM devices. Source: NYCDOT

enforcement, and NYCDOT would like to further calibrate and improve the accuracy of the WIM before seeking the authority to use the technology for enforcement purposes.

Implementation Approach

This initiative was led by NYCDOT in cooperation with New York State DOT and the Port Authority of New York & New Jersey. NYCDOT recognized an opportunity to coordinate with New York State DOT in advance of a planned \$415 million rehabilitation project on the Alexander Hamilton Bridge. WIM allows New York State DOT to monitor truck activity on its asset, I-95, and allows the Port Authority to monitor truck activity on this approach to one of its nearby assets, the George Washington Bridge.

Using a mix of Federal Surface Transportation Program and local funds, NYCDOT secured funding for the installation of the single load cell WIM sensor in 2014. State DOT installed gantries, cameras, and license plate readers to capture license plate and USDOT numbers. In 2016, NYCDOT installed two more WIM sites in Queens to collect and analyze truck

weight data for planning applications. Future WIM sites are envisioned along the truck route network at cordon points near borders with neighboring jurisdictions. Through multi-agency collaboration platforms, such as the Goods Movement Action Program, NYCDOT hopes to leverage an array of funding sources and to develop and/or support competitive grant applications that demonstrate multi-agency support and cooperation.

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Ohio's Diesel Emissions Reduction Grant Program

Primary Objective

In the State of Ohio, 38 of 88 counties are currently or have previously been designated as nonattainment or maintenance areas for the air pollutants ozone or PM_{2.5}. These counties include the cities of Columbus, Cleveland, and Cincinnati. The State of Ohio administers a statewide grant program to help reduce emissions of air pollutants from mobile sources in these counties. This program, known as the Diesel Emissions Reduction Grant (DERG) program, provides funding to replace, repower, or retrofit older diesel-powered vehicles and vessels, including freight vehicles. It also helps pay for the installation of idle-reduction equipment.

Since its inception in 2008, the DERG program has awarded more than \$47.2 million for clean-diesel projects and leveraged another \$20.4 million in local matching funds. Another \$8.8 million of project selections are currently under development. With annual funding of about \$10 million, the DERG program is one of the largest statewide clean-diesel programs funded by the Federal Congestion Mitigation and Air Quality Improvement (CMAQ) program.

Implementation Approach

The Federal CMAQ program is a flexible funding source for transportation projects and programs that help improve air quality and reduce congestion. Since 2008, the State of Ohio has dedicated a significant portion of its CMAQ funding to its DERG program. Eligible fleets include on-road vehicles and some construction vehicles, as well as certain locomotives and marine vessels. Other eligible vehicle types include school and transit buses.

Key Accomplishments

- Since its inception in 2008, the DERG program awarded more than \$47.2 million for clean-diesel projects and leveraged another \$20.4 million in matching funds.
- The DERG program estimates that the 40 projects funded in State fiscal year 2016 will reduce air emissions by 148 tons of NO_x and 6 tons of PM_{2.5} annually.

Participating fleets can be either publicly or privately owned, but, in keeping with Federal CMAQ regulations, private-sector applicants must have a public agency sponsor. Of the \$12.8 million awarded in 2016, \$3.4 million (27 percent) went to private fleet owners. Project selections included the replacement of 73 diesel-powered trucks and the repowering of two tugboats operating on the Ohio River. The largest award, at nearly \$1 million, went to a Class I railroad for equipment to reduce engine idling by 35 locomotives operating at five rail yards in the Cleveland, Columbus, and Toledo areas.

Funding recipients must provide at least a 20-percent funding match and must use technology that has been verified to reduce emissions. In addition, the fleet owner must operate the equipment purchased or modified with DERG funding at least 65 percent of the time within Ohio's CMAQ-eligible counties. Recipients must also adhere to other Federal requirements for recipients of CMAQ funds, including following public procurement processes.



The DERG program provided funding to repower this switching locomotive, which operates near Cincinnati, OH. The locomotive's existing single diesel engine was replaced with three generator-set diesel engines, each of which runs only when its power is needed. Source: Ohio Rail Development Commission.

Ohio's DERG program has benefited from effective interagency collaboration. The Ohio Environmental Protection Agency (Ohio EPA) is the lead agency, but the Ohio Department of Transportation (Ohio DOT) is the formal conduit for the CMAQ funds and is extensively involved in the program's operation. The two agencies have worked out complementary roles that make the most of their respective areas of expertise. The Ohio EPA conducts outreach for the program and assists applicants in preparing their proposals. Ohio EPA also coordinates the activities of the DERG program with other clean-diesel programs that it administers. Ohio DOT helps funding recipients understand and comply with the requirements for the proper use of CMAQ funds.

A committee with staff from both agencies reviews and scores grant applications. The primary criterion for project selection is the cost-effectiveness of the projected reductions in emissions of PM_{2.5} and nitrogen oxides (NO_x), a precursor to ground-level ozone. However, the geographic and transportation modal distribution of awards is also a factor in the project selection process. As a further

demonstration of Ohio interagency cooperation, two additional State entities, the Ohio Rail Development Commission and the Ohio Air Quality Development Authority, serve as public agency sponsors for many of the private-sector entities that receive DERG funding. The Ohio Division Office of the FHWA provides ongoing assistance in determining project eligibility, as well as in processing Buy America waivers and sole-source procurement requests.

Recent program improvements include the use of an online, interactive application form beginning with the 2016 grant cycle. According to Ohio DOT staff, the online version has been well received and has made the review of applications much easier.

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Clean Trucks Program at Ports of Los Angeles and Long Beach

Primary Objective

In the early 2000s, container trade at the Port of Los Angeles (POLA) and Port of Long Beach (POLB) was growing rapidly. Between 2000 and 2007, the number of containers handled by POLB increased by 59 percent, and the number of containers handled by POLA increased by 71 percent. This significant growth in activity meant more truck activity in the neighborhoods surrounding the ports, which greatly concerned residents. At the time, the drayage trucks serving the ports were more likely to be older, higher-emissions vehicles than in other sectors of the trucking industry. In response to concerns about truck traffic and pollution, the ports looked for ways to mitigate the negative impacts of its operations on the surrounding community. To reduce air emissions from the drayage fleet, the ports jointly implemented a Clean Truck Program as part of the Clean Air Action Plan. The program prohibits trucks with older and more polluting engines from accessing the Ports. However, the program offers financial assistance in the replacement or repowering of older trucks.

The objectives of the Clean Trucks Program are to:

- Rapidly advance the improvement of air quality at the Port.
- Establish performance criteria for providers of drayage services that promote the Port's business objectives.
- Ensure sufficient supply of drayage services and drivers that promote the Port's business objectives.
- Enhance Port security and safety.
- Reduce negative impacts that port drayage inflicts on the local community.

Key Accomplishments

- As of January 2012, 100 percent of the cargo moved at port terminals is by trucks meeting the 2007 Federal Clean Truck Emissions Standards. This achievement allowed the Ports to meet their 2012 goal to reduce emissions from overall drayage operations by 80 percent.
- When the program was fully implemented in 2012, the Clean Trucks Program reduced the rate of truck emissions at the POLA by more than 80 percent, and at the POLB by more than 90 percent.
- As part of the latest update to their Clean Air Action Plan, the two ports are proposing to update the Clean Trucks Program to phase out older trucks and transition to zero-emissions trucks by 2035.

In its first year at the POLA, the program reduced the rate of truck emissions at the port by an estimated 70 percent. When the program was fully implemented in 2012, port truck emissions were reduced by more than 80 percent. At the POLB, port truck emissions decreased by more than 90 percent when the Clean Trucks Program was fully implemented in 2012. As of June 2017, the number of trucks in the Port Drayage Truck Registry that have access to the Port of Los Angeles or Long Beach terminals is over 17,000, the majority of which are independent truck owner-operators.

Implementation Approach

In developing the Clean Air Action Plan, the ports organized a stakeholder committee that included representatives from environmental groups, public agencies, the maritime industry, and cargo owners. The ports held dozens of outreach meetings with trucking companies to discuss topics of concern to truck owner-operators. To track compliant trucks, the ports developed the Drayage Truck Registry, which functions as a shared data system for both ports. In addition to tracking truck movements in real-time at both ports, the Registry allows drivers to register trucks and pay access fees online by credit card or check.

Although the Clean Truck Programs at both ports have the same goals and objectives, the POLA implemented a concession program, while the POLB implemented a registration program. The POLA's concession program requires drivers to enter into a 5-year contract with the Port, register in the Port Drayage Truck Registry, and maintain certain insurance and safety standards. The POLA program only requires drivers to enter the registry, which includes a \$250 registration fee and an annual fee of \$100 per truck per port. Motor carriers must also acquire a radio frequency identification (RFID) tag to access each Port's terminals. For trucks that are not included in the registry, day passes can be purchased for \$30 per day.

Under the Clean Truck Program, terminals at the Ports of Los Angeles and Long Beach issued incremental bans on older truck models. The first ban in October 2008 included all pre-1989 truck models. In January 2010, the Ports banned trucks manufactured between 1989 and 1993. During this time, trucks manufactured between 1994 and 2003 were allowed to continue doing business at the ports if they were equipped

with exhaust filters that significantly cut their emissions. In January 2012, the program banned all trucks that did not meet the 2007 Federal Clean Truck Emissions Standards. The Clean Truck Program was highly successful in helping the Ports of Los Angeles and Long Beach meet their emissions-reductions goals. However, a program this complex may not be required at all U.S. ports. Lower-volume ports may be able to manage a similar program through a simpler approach, such as a vehicle information number (VIN) check or license plate database. Ultimately, it is important for ports interested in implementing a Clean Truck Program to develop a cost-effective data system that best meets their goals.

The ports helped finance clean vehicles for some truck drivers. The POLA provided \$44 million in payments to licensed motor carriers to incentivize their purchase of 2,200 cleaner truck models in 2008. The POLB helped finance 750 clean trucks, 700 of which were liquefied natural gas (LNG)-powered vehicles.

The two ports are currently working on an update to their Clean Air Action Plan, which is expected to be finalized by the end of 2017. The 2017 update contains 14 strategies to reduce emissions, invest in zero-emissions infrastructure, encourage freight efficiency, and address energy resources. The ports are proposing to update the Clean Trucks Program to phase out older trucks and transition to zero-emissions trucks by 2035.

Local Contacts

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The European Commission's Freight Electric Vehicles in Urban Europe (FREVIEW) Project

Primary Objective

European governments at all levels have set ambitious targets for reducing emissions of air pollutants and carbon dioxide from vehicles in cities. The use of all-electric vehicles for freight and passenger transport is widely recognized as a primary strategy for eliminating tailpipe emissions. The European Commission funded the Freight Electric Vehicles in Urban Europe (FREVIEW) project to test the suitability of the newest generation of electric vehicles for last-mile deliveries in urban areas. The FREVIEW project, which ran from 2013 to 2017, exposed more than 80 all-electric freight vehicles to the day-to-day rigors of the urban logistics environment.

Implementation Approach

The FREVIEW project was conducted by a team of 17 industry partners, nine public-sector bodies, and six research organizations. The project deployed all-electric vehicles in eight major European cities: Amsterdam, Lisbon, London, Madrid, Milan, Oslo, Rotterdam, and Stockholm. Each of the FREVIEW demonstrations varied in the types of vehicles they deployed, the types



An Amoss 20-ton (18.5-tonne) all-electric truck deployed for the FREVIEW pilot in Rotterdam, Netherlands. Source: FREVIEW.

Key Accomplishments

- The project deployed 80 all-electric vehicles in real-world urban logistics operations and collected data from 470,000 miles (757,000 km) of driving.
- The project showed that all-electric freight vehicles are well-suited to inner-city freight operations and that the range of vehicles currently available on the market is sufficient for most operations.
- Most industry partners have, based on their FREVIEW experience, moved forward and procured more all-electric vehicles on their own or with the help of other funding sources.

of goods that were delivered, and the logistics models that were tested. The project had three main phases:

1. Assessment and Information and Communications Technology (ICT) Framework: The researchers developed data protocols, data handling procedures, and an assessment framework for the eight demonstrations.
2. Demonstrations: The FREVIEW team deployed the electric freight vehicles, charging infrastructure, and ICT management systems at the eight project sites.
3. Analysis: The researchers evaluated the data from the demonstrations and developed guidelines and recommendations for the different key

stakeholders in urban logistics. The analyses included:

- Assessment of the technical suitability of the vehicles for urban logistics.
- Economic analysis of the total cost of ownership of the different vehicle types compared to conventionally fueled vehicles.
- Impact of a range of policies on the economic case for the logistics operators to deploy all-electric vehicles.
- Environmental analysis of emissions reductions achieved and analysis of the potential impacts of wider-scale deployment on air quality, congestion, and the electricity grid.
- Attitudinal survey of the different stakeholders involved in the demonstrations.

The economic analysis showed that for small electric freight vehicles (≤ 3.9 tons) that are driven at least 37 miles (60 km) a day, the total cost of ownership comparison can be favorable within about five years. For medium-sized vehicles (between 3.9 and 8.3 tons), it is more challenging but still possible to find a positive business case. For the largest vehicles (> 8.3 tons), the analysis did not find a positive business case for all-electric technology, even with currently available subsidies and a long depreciation period.

However, the economic analysis noted that the business case can be affected by public policies such as exemption from congestion charges, a fee charged in some European cities for entering the city center during peak hours. The analysis also looked at how future reductions in the cost of batteries would affect the business case. The difference between the cost of electricity and diesel (or gasoline) is also a key



Renault Kangoo ZE and ZE Maxi all-electric vans deployed by the Portuguese national postal service for the FREVUE pilot in Lisbon, Portugal. Source: FREVUE.

driver in the total cost of ownership.

The environmental analysis estimated that the FREVUE project led to reductions of nitrogen oxide emissions of up to 4,400 lbs. (2,000 kg) and reductions in particulate matter savings of more than 150 lbs. (70 kg). The analysis estimated the reduction in total environmental greenhouse gas emissions of 190 to 210 tons of carbon dioxide equivalent. This equates to a 45-percent savings by switching to electricity from diesel or gasoline, but the savings from each demonstration site varied considerably based on the local mix of electricity sources.

For other agencies planning a similar demonstration project, FREVUE project managers recommend that extra attention be paid to the process of monitoring vehicle performance and collecting vehicle data. FREVUE researchers received vehicle data from different types of monitoring devices, and the data files did not always use the same parameters. This made it more difficult to make comparisons across vehicles.

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Demonstration of Zero-Emission Delivery Vehicles in the Houston-Galveston Area

Primary Objective

The Houston-Galveston Area Council (H-GAC) is partnering with the parcel carrier UPS to acquire and test the performance of 18 all-electric delivery vehicles in real-world operations. This is just one of many initiatives by H-GAC, the region's MPO, to improve air quality in the greater Houston region. A Federal Department of Energy (DOE) was provided to reduce emissions, and to provide detailed information about the market viability of all-electric delivery vehicles and the emissions benefits from using them.

Implementation Approach

Eight counties in the Houston-Galveston area of Texas are designated as a nonattainment area for ground-level ozone, an air pollutant that can trigger a variety of health problems. Conventionally fueled motor vehicles, including freight delivery vehicles, are significant sources of NOx and volatile organic compounds, which are precursors to ground-level ozone. Therefore, these vehicles are an important focus of efforts to reduce ozone concentrations.

H-GAC has had a long history of working to replace older diesel vehicles with either alternative-fuel vehicles or with newer, conventionally fueled vehicles that produce lower emissions. Therefore, it was not surprising for the agency to apply for a DOE grant that offered Federal resources to promote zero-emission cargo transport in areas of severe air quality nonattainment and severe traffic congestion. H-GAC saw the grant as an opportunity to demonstrate to local stakeholders and others that all-electric delivery vehicles can

Key Accomplishments

- The project team completed the manufacture and deployment of 18 all-electric delivery vehicles in November 2016.
- Through June 2017, the test vehicles had driven nearly 70,000 miles, reducing diesel consumption by almost 12,500 gallons.
- Estimated reductions in NOx emissions over the same time period totaled about 94 pounds, and reductions in carbon dioxide emissions came to nearly 280,000 pounds.

operate successfully in the Houston-Galveston region and are a viable solution for owners of freight delivery fleets that wish to reduce emissions.

H-GAC was awarded a \$2 million DOE grant in 2012. In the spring of 2014, H-GAC issued a call for projects inviting applications from fleet or vehicle operators in the Houston region. Respondents were required to submit a response in partnership with a certified original equipment manufacturer or supplier of all-electric delivery vehicles. Later in 2014, H-GAC selected the application from UPS, which proposed to acquire and deploy 18 all-electric step vans built by Workhorse Group (known at the time as AMP Electric Vehicles). The vehicles were designed for local parcel delivery in high-density, urban settings. The fully electric trucks operate with electric motors and rechargeable batteries that provide a range of up to 70 miles per day.

The first of the demonstration vehicles reached UPS in the fall of 2015. As they were delivered, UPS put the vehicles into operation at three different distribution centers. The last of the vehicles was placed into operations by UPS in November 2016. Presently, the project is in the middle of a two-year performance monitoring period that will end in late 2018. H-GAC, UPS, and Workhorse Group are working through technical issues to ensure that the vehicles remain operational and are utilized by UPS to the greatest extent possible. H-GAC and UPS are also currently working to improve the transfer of operational and utilization data about the vehicles to the MPO.

Through June 2017, the demonstration vehicles had driven nearly 70,000 miles, reducing diesel consumption by almost 12,500 gallons. NOx reductions over the same time period totaled about 94 pounds, and reductions in carbon dioxide emissions came to nearly 280,000 pounds.

H-GAC and its partners have overcome several challenges to get the project to its present state. The first challenge for H-GAC was that the vehicle manufacturer with which they had applied for the DOE grant was no longer in business by the time the grant award was announced. Therefore, H-GAC had to work with DOE to restructure the grant agreement. The agreement was modified to allow participating fleet owners to partner with an OEM or vehicle supplier of their own choosing.

H-GAC also faced challenges in recruiting additional fleets to participate in the demonstration. The MPO continued to recruit fleets to deploy another 12 all-electric vehicles, but it was ultimately unable to sign on any other fleets with the right operating characteristics. According to H-GAC staff, other delivery fleets

expressed interest in participating in the project, but their routes were either too long or otherwise unsuited to the current capabilities of all-electric vehicles. Recruitment was also hindered by “range anxiety,” the concern that an all-electric vehicle’s batteries will be depleted before the vehicle can return to its base of operations. Some potential participants proposed using vehicles with “range extenders,” which are small gasoline engines that can recharge the vehicle’s battery when necessary. However, this option was deemed inconsistent with the “zero-emission” aspect of the DOE grant.

Initially, identifying matching funds for the Federal grant was also a challenge. H-GAC had hoped to use funds from a State air quality program known as the Texas Emissions Reduction Plan. However, the MPO determined that it would not be possible to use both Texas Emissions Reduction Plan funding and the DOE grant for the project. UPS is providing the required matching funds.

For other agencies engaging in demonstrations of new vehicle technologies, H-GAC staff recommend including a driver education component to make sure the vehicles are used correctly. In addition, they suggest that it is important for vehicle makers to have ready access to replacement parts so that demonstration vehicles are not sidelined for long periods of time.

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Transport for London Reducing Truck Blind Spots through Vehicle Redesigns

Primary Objective

In 2015, London began enforcing regulations that prohibit lorries (i.e., trucks and other heavy goods vehicles) that lack certain safety equipment from driving on London's roads. The regulations are particularly geared towards construction vehicles, which have been involved in a disproportionate number of fatal collisions involving cyclists and pedestrians. According to TfL, heavy goods vehicles accounted for less than 4 percent of the total miles driven in London, but they were involved in 78 percent of cyclist fatalities and 20 percent of pedestrian fatalities in 2015. The Safer Lorry Scheme, as the regulatory program is called, is one component of a wider set of initiatives to reduce the number of people killed or seriously injured on London's roads.

Implementation Approach

Development and implementation of the Safer Lorry Scheme was led by Transport for London (TfL), which is an integrated transport authority that manages most of London's main roads and public transport network. At the request of London's mayor, TfL conducted a feasibility study to consider various ways of improving truck safety in London. The study confirmed that certain heavy goods vehicles were permitted to operate without certain safety equipment such as side guards and some types of mirrors. The study concluded that such equipment would have made a substantial difference in the outcomes of recent collisions between cyclists and trucks. The study found that construction vehicles were particularly dangerous, because although they are designed

Key Accomplishments

- Since the launch of the Safer Lorry Scheme in 2015, the compliance rates of trucks operating in greater London is approximately 98 percent.
- The number of serious injuries (for all road users) involving heavy goods vehicles in greater London decreased by 17 percent from 2015 to 2016.
- TfL leveraged the relationships fostered from the Freight Forum, a pre-existing freight stakeholder body, to highlight safety concerns with heavy goods vehicles and build consensus for the Safer Lorry Scheme.

for heavy-duty functioning on work sites and not on-the-road driving, in reality they spend more than 90 percent of the time on the road with other road users.

These findings led TfL to proceed with implementing the Safer Lorry Scheme. It took approximately 18 months from the conclusion of the feasibility study in 2014 until regulations went into effect in September 2015. The scheme operates across London, 24 hours a day, seven days a week, covering most of greater London. The area covered by the Safer Lorry Scheme is the same as for the city's pre-existing Low Emission Zone. Owners of vehicles over 3.5 metric tons that are currently exempt from national requirements for basic safety equipment are now required to:



Signs like this one mark the boundary of London's Safer Heavy Goods Vehicle (HGV) Zone. Source: TfL.

- Install Class V and Class VI mirrors to give the driver a better view of cyclists and pedestrians around their vehicles.
- Install side guards to protect cyclists from being caught under the wheels in the event of a collision.

To build consensus and ensure program success, TfL worked with a variety of stakeholder groups through its Freight Forum, a stakeholder group that was established during the 2012 Olympics to ensure continuity of freight operations during the games. The Forum is made up of the London boroughs (which manage the majority of roads in London), London Councils, truck operators, rail freight groups, and other industry stakeholders. The

Safer Lorry Scheme was also the subject of a full public, statutory consultation.

Enforcement is an important component of the Safer Lorry Scheme's success. The scheme is enforced by the Metropolitan Police Service, City of London Police, and the Driver and Vehicle Standards Agency. Drivers found to be operating a non-compliant vehicle may be issued a fine of £50 (about \$66), and the offense also carries a potential fine of £1,000 (about \$1,300) at Magistrate's court. The Traffic Commissioner, who has the power to modify or suspend operator licenses, is also notified of companies operating vehicles in breach of the scheme.

The success of the Safer Lorry Scheme has prompted TfL to engage in other efforts to reduce road dangers for vulnerable road users (i.e., pedestrians, cyclists, and motorcyclists). For example, TfL is working with vehicle manufacturers, fleet operators, and others to change the overall designs of heavy goods vehicles to increase drivers' direct vision. According to TfL, its research shows that drivers react more quickly when they can see cyclists and pedestrians directly rather than by use of mirrors or other equipment. The agency has also developed a Direct Vision Standard, which is a star rating system for heavy goods vehicles based on how much a driver can see of the area of greatest risk to vulnerable road users. TfL is also continuing to work with the construction industry to encourage behavior changes that reduce the road dangers associated with construction logistics.

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5. Planning and Funding OLT Strategies

Implementing OLT strategies in urban areas involves two key actions: planning for and documenting the problem, and securing funding to solve it. Documents produced as part of the broader transportation planning process – Long-Range Statewide Transportation Plan and the Metropolitan Transportation Plan – may have sections dedicated to freight concerns. State Freight Plans and Regional or City Freight

Plans can assess urban freight mobility needs, and define freight planning activities and investments to address those needs. These plans can help identify OLT strategies that may be eligible for funding through Federal formula and grant programs. Figure 2 illustrates how planning for, documenting, and securing funding for OLT strategies is embedded in the existing transportation planning process.

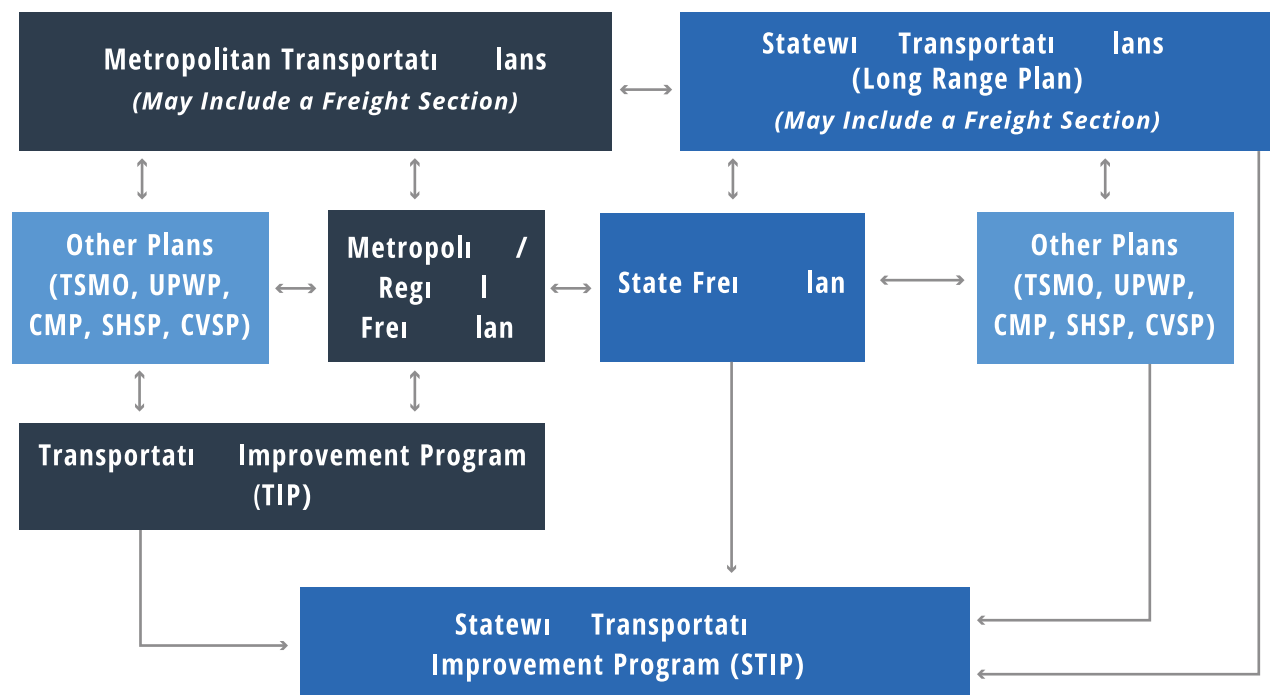


Figure 2. Integrating Freight into the Transportation Planning Process

Planning for Freight Projects

The transportation planning process led by State DOTs and MPOs provides an opportunity for funding and coordinating OLT strategies. State DOTs and MPOs can use planning funds for freight planning, and can dedicate funds for implementation of freight projects. This section highlights components of established transportation planning and programming processes that can be used to further freight and goods movement mobility in urban areas.

Transportation planning is a cooperative process designed to foster involvement by all users of the system, such as the business community, community groups, environmental organizations, the traveling public, freight operators, and the general public, through a proactive public participation process. State DOTs and MPOs are responsible for making sure that freight movement is considered in the transportation planning process.

Key components of the transportation planning process for freight stakeholders are described in Table 3 on the next page.

State or Regional Freight Plans are designed to help address planning activities and investments, both immediate and long-term. Within a statewide or metropolitan freight plan, State and MPOs can identify OLT needs and use this process to document specific opportunities for funding and implementation of OLT strategies.

The National Highway Freight Program (NHFP) is a formula grant program that distributes \$6.3 billion in formula funding to States over five years from fiscal year (FY) 2016 to FY 2020. To obligate funding under the NHFP, each State

is required by the Fixing America's Surface Transportation (FAST) Act to develop a State freight plan, which must comprehensively address the State's freight planning activities and investments (both immediate and long-range). A State may develop its freight plan either separately from, or incorporated within, its statewide strategic long-range transportation plan. Among other requirements, a State freight plan must:

- Cover a five-year forecast period.
- Include a "freight investment plan" with a list of priority projects and be fiscally constrained.
- Describe how the State will invest and match its NHFP funds.

The State must update its freight plan at least every five years, and may update its freight investment plan more frequently than the overall freight plan.

The FAST Act requires the U.S. DOT to encourage each State to establish a **freight advisory committee** consisting of a representative cross-section of public and private freight stakeholders. The role of a State freight advisory committee is to:

- Advise the State on freight-related priorities, issues, projects, and funding needs.
- Serve as a forum for discussion for State transportation decisions affecting freight mobility.
- Communicate and coordinate regional priorities with other organizations.
- Promote the sharing of information between the private and public sectors on freight issues.
- Participate in the development of the freight plan of the State.

Table 3. Freight Opportunities in the Transportation Planning Processes

Planning Product	Who Develops?	Time Horizon	Freight-Related Content
Long-Range Statewide Transportation Plan	State DOT	20+ years	The State's long-range planning process must address several freight-related factors, such as economic vitality, accessibility and mobility of freight, system preservation, and intermodal connectivity. Plans must set targets for Federal freight performance measures and report on progress made with respect to performance targets. The long-range plan may incorporate State freight plan.
State Freight Plan	State DOT	5 years	Identification of significant freight system trends, needs, and issues in the State; an inventory of facilities with freight mobility issues; freight investment plan with a list of priority projects; description of how the State will invest and match Federal NHFP funds. Typically informed by freight advisory committee.
State Transportation Improvement Program (STIP)	State DOT	4 years	Identifies statewide priorities for transportation projects throughout the State. Lists projects to be funded with Federal transportation funds or needing certain Federal approvals.
Long-Range Metropolitan Transportation Plan	MPO	20+ years	Includes long-range and short-range program strategies and action that lead to the development of an integrated intermodal system in a region. Addresses a range of issues relevant to freight mobility including: economic vitality, accessibility and mobility of people and freight, system preservation, and intermodal connectivity. Sets targets for Federal freight performance measures and report on progress made with respect to performance targets.
Regional or City Freight Plan	MPO (regional) or city DOT (city)	No Federal requirement	Varies by plan, but usually includes: an inventory of freight facilities; data on historical freight activity; forecast of future freight activity; and identification of needed freight investments, policies, and strategies. Typically informed by freight advisory committee.
Transportation Improvement Program (TIP)	MPO	4 years	Identifies transportation projects and strategies the MPO plans to undertake over the next four years. Project receiving Federal funding must be in the TIP.
Unified Planning Work Program (UPWP)	FHWA/FTA/MPO	1 or 2 years	Lists transportation studies and tasks to be completed by MPO staff or a member agency, including freight planning studies or plans for collection and analysis of freight data.
Congestion Management Process (CMP)	MPOs with population >\$200K	Be consistent with update cycle for long-range plan & TIP.	Determines causes of congestion and identifies operational and trip-reduction strategies for managing congestion. These actions and strategies can be freight-specific.
Transportation Systems Management & Operations (TSMO) Plan	MPO (not required as stand-alone plan)	No Federal requirement	Operations objectives, performance measures, operations strategies, and potential projects or programs. Can be used to identify operations goals and strategies that benefit freight mobility.

Federal statute requires each MPO to develop a **Transportation Improvement Program (TIP)**, which is a fiscally constrained list of upcoming transportation projects covering a period of at least four years. In the TIP, an MPO could identify infrastructure maintenance or rehabilitation projects that might involve OLT strategies before, during, or after project implementation. Similarly, States are required to develop a **State Transportation Improvement Program (STIP)**, which is designed to leverage MPOs and other local entities to develop a statewide project list covering a four-year period. States could use STIPs to identify and fund large-scale OLT initiatives that could benefit urban freight movement at the State level.

The **Unified Planning Work Program (UPWP)** identifies planning priorities and activities for metropolitan planning areas over a one- to two-year period. The UPWP typically identifies planning data collection and analysis tasks, public outreach activities, and planning studies to be conducted. MPOs could use a UPWP to help set the stage for implementing OLT strategies by including the following:

- A description of overall goals or objectives for the freight system, which provide context for later decision-making on freight strategy implementation, including OLT strategies.
- A description of needs for OLT strategies at a high level.
- An overview or update of initiatives, programs, or projects that involve OLT strategy implementation.
- Identification of action steps that might lead to further study of, recommendations for, or application of OLT strategies.

A **Congestion Management Process (CMP)** is an approach for managing congestion

at a regional or MPO level. The CMP uses a number of analytic tools to define and identify congestion within a region, corridor, and activity center or project area, and to develop and select appropriate strategies to reduce congestion or mitigate the impacts of congestion. A CMP is required in metropolitan areas with population exceeding 200,000, known as transportation management areas (TMAs). MPOs may use a CMP to:

- Collect, analyze, and report on data related to urban freight mobility that provide a foundation for future OLT strategy decision-making.
- Identify and describe urban freight projects that involve OLT strategies after implementation.
- Foster partnerships with key urban freight stakeholders involved in OLT strategy decision-making and implementation.

A **Transportation Systems Management and Operations (TSMO) Plan** is often used as an addendum or complement to the metropolitan transportation plan and provides input on operations goals, objectives, performance measures, strategies, and projects or programs. The projects identified in a TSMO plan can be applied to freight at the regional, corridor, and/or project level. In developing a TSMO plan, management and operations stakeholders and planners work together to define a common vision, develop operations objectives, and identify performance measures. Participants also develop strategies and potential projects or programs to reach those objectives, then seek out resources by working within the region's planning and programming processes.

Federal Funding Opportunities for Freight

Funding for OLT strategies can come from a number of sources, including Federal and State governments, special authorities, public or private tolls, local assessment districts, local property and sales taxes, and fee-based funding sources such as revenues from loading zone meters, truck tickets, and oversize/overweight permitting. Federal-aid transportation programs are typically the primary public funding source for capital investment projects. Most Federal-aid highway funding programs are administered by State DOTs and MPOs, who allocate money based on State, regional, and local priorities. As such, a strong working relationship between State DOTs, MPOs, and localities is critical to ensure that adequate funding is allocated towards implementing OLT strategies in urban areas.

There are several notable Federal funding programs available that can provide States and MPOs funding that agencies can use to implement OLT strategies:

- The **Surface Transportation Block Grant (STBG) Program** is one of the most flexible funding sources among all Federal-aid highway programs, promoting flexibility in State and local transportation decisions to best address State and local transportation needs, including freight and goods movement needs. Eligible projects include a wide range of surface transportation planning, design, and construction actions.
- **National Highway Freight Program (NHFP)** funds can be used for a variety of traditional infrastructure and OLT strategies, including intelligent transportation systems (ITS), real-time traffic, truck parking, roadway condition, and multimodal transportation information systems, electronic screening and credentialing systems for vehicles, and diesel retrofit or alternative fuel projects for Class 8 vehicles (e.g., tractor-trailers). The NHFP has multimodal eligibility.
- **Competitive grant programs** represent another potential funding source for implementing OLT projects. These include competitive Federal grant programs such as the NSFHP program (currently being administered as INFRA grants) and Transportation Investment Generating Economic Recovery (TIGER) grants. These types of programs can provide financial assistance to both large- and small-scale freight and highway projects. Florida DOT received an \$11 million grant to deploy a truck parking availability system to provide information to truck drivers on the availability of parking spaces at facilities along Florida's primary interstate corridors.
- The **Congestion Mitigation and Air Quality (CMAQ) Program** provides funding for transportation projects and programs that reduce congestion and improve air quality for areas that do not meet the National Ambient Air Quality Standards for ozone, carbon monoxide, or particulate matter, known as nonattainment areas, and for former nonattainment areas that are now in compliance, known as maintenance areas. Although project eligibilities remain largely the same as before the FAST Act was enacted, the new law places increased emphasis on diesel engine retrofits, port-related landside equipment, and alternative fuel infrastructure.
- The **National Clean Diesel Campaign** of U.S. EPA offers grants, rebates, and other types of support for projects that protect human health and improve air quality by reducing emissions from diesel engines. Grant funds may be used for clean diesel projects that support OLT strategies, including EPA-verified technologies or certified

engine configurations, idle-reduction technologies, and early engine or equipment replacements. Eligible diesel vehicles, engines, and equipment include heavy-duty highway vehicles, locomotive engines, marine engines, and non-road engines, equipment, or vehicles used in handling of cargo, including at ports or airports.

- The **Clean Cities Program** of the U.S. Department of Energy has awarded nearly \$400 million to States, MPOs, and local governments for hundreds of projects that

reduce petroleum use in transportation. These project awards contribute to the program's primary goal of reducing petroleum use in the U.S. by 2.5 billion gallons per year by 2020. Funded projects have included the installation of idle-reduction equipment on tractor-trailers, the introduction of all-electric and hybrid-electric vehicles into public and private fleets, the conversion of conventional vehicles to run on natural gas and propane, and the installation of refueling infrastructure for alternative fuels.

Table 4. Federal Funding Sources for Freight Projects

Funding Source	Eligible Freight Uses
Surface Transportation Block Grant (STBG) Program	Broad range of surface transportation capital needs, including several freight-related uses such as truck parking facilities, border infrastructure, and infrastructure modifications to facilitate direct intermodal interchange, transfer, and access into and out of a port terminal.
National Highway Freight Program (NHFP)	Eligible activities include construction, operational improvements, freight planning, and performance measurement. NHFP funds must contribute to the efficient movement of freight on the National Highway Freight Network and be identified in a freight investment plan included in a State's freight plan. Up to 10 percent of a State's NHFP funds may be used for public or private freight rail, water facilities (including ports), and intermodal facilities.
Congestion Mitigation and Air Quality Improvement (CMAQ)	Transportation projects and programs that reduce congestion and improve air quality or areas that do not meet the National Ambient Air Quality Standards for ozone, carbon monoxide, or particulate matter (nonattainment areas) and for former nonattainment areas that are now in compliance (maintenance areas). Freight-related project types include diesel retrofits, idle-reduction equipment, and conversions of fleets to alternative fuels.
U.S. DOT Competitive Grant	Eligibility varies by program, but freight-focused projects typically compete for funding with non-freight projects. Multimodal freight projects may be prioritized. Examples include: Infrastructure For Rebuilding America (INFRA) and Transportation Investment Generating Economic Recovery (TIGER).
U.S. EPA National Clean Diesel Campaign	Grants, rebates, and other types of support for projects that reduce emissions from older diesel engines, including those in freight vehicles, vessels, and locomotives.

Acronyms

AL	Alley loading
BID	Business Improvement District
CCC	Construction consolidation center
CLP	Construction logistics plan
CLZMP	Commercial Loading Zone Management Program
CMAQ	Congestion Mitigation and Air Quality Improvement
CMP	Congestion management process
DDOT	District of Columbia Department of Transportation
DERG	Diesel Emissions Reduction Grant
EPA	Environmental Protection Agency
FAST Act	Fixing America's Surface Transportation Act
FASTLANE	Fostering Advancements in Shipping and Transportation for the Long-Term Achievement of National Efficiencies
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
FLZ	Freight loading zone
FQMD	French Quarter Management District
FREVUE	Freight Electric Vehicles in Urban Europe
H-GAC	Houston-Galveston Area Council
HOS	Hours of service regulations
ITS	Intelligent transportation systems
INFRA	Infrastructure for Rebuilding America Grants
MARAD	Maritime Administration
Massport	Massachusetts Port Authority
MPO	Metropolitan planning organization
NCDOT	North Carolina Department of Transportation
NHFN	National Highway Freight Network
NHFP	National Highway Freight Program
NYCDOT	New York City Department of Transportation
OHD	Off-hour delivery
OLT	Operations, Logistics, and Technology strategies that can be used to improve freight mobility in urban areas
PM2.5	Fine particulate matter
POLA	Port of Los Angeles
POLB	Port of Long Beach
STBG	Surface Transportation Block Grant Program
STIP	State Transportation Improvement Program
TAP	Trusted Access Program
TfL	Transport for London
TIGER	Transportation Investment Generating Economic Recovery Grants
TIP	Transportation Improvement Program
TMA	Transportation management area

TPAS	Truck Parking Availability System
TSMO	Transportation Systems Management and Operations Plan
UPWP	Unified Planning Work Program
VIN	Vehicle identification number
VS3	Vehicle Security and Scheduling System
WIM	Weigh-in-motion
WTC	World Trade Center



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