



# Why Goods Movement Matters

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Strategies for Moving Goods  
in Metropolitan Areas



Regional Plan Association

### Regional Plan Association

Regional Plan Association is America's most distinguished independent urban research and advocacy organization. RPA improves the New York metropolitan region's economic health, environmental sustainability and quality of life through research, planning and advocacy. Since the 1920s, RPA has produced three landmark plans for the region and is working on a fourth plan that will tackle challenges related to sustained economic growth and opportunity, climate change, infrastructure and the fiscal health of our state and local governments. For more information, please visit [www.rpa.org](http://www.rpa.org).



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The Volvo Research and Educational Foundations inspire, initiate and support research and educational activities promoting sustainable transport for fair access in urban areas, with the aim to nurture processes of change and transformative capacity. Through the Program called "Future Urban Transport – How to deal with complexity" VREF invest in research for the purpose of contributing to new ideas and solutions within the complex structure underlying the design of sustainable transportation systems in cities. The challenge is to find urban transport solutions that will provide accessibility for the masses, while at the same time radically reducing transportation's negative local and global environmental and climate impacts. The Future Urban Transport Program started in 2001 and has created ten Centers of Excellence and a number of projects and events worldwide. The VREF Urban Freight Initiative was launched in 2013 to consider the challenges and opportunities that currently face urban freight transport. The Initiative consists of two Centers of Excellence, MetroFreight and Sustainable Urban Freight Systems, and an additional research center, the Urban Freight Platform.

RPA acknowledges the Volvo Research and Educational Foundations (VREF) and the Editorial Committee for their contributions and guidance throughout this process. The report was researched and written by Richard Barone, RPA's Vice President for Transportation, and Emily Roach, RPA's Research Analyst for Transportation. The report was designed by Ben Oldenburg, RPA's Senior Graphic Designer. The report was copy edited by Pierina Sanchez, RPA's Director for New York, and Rossana Ivanova, RPA's Vice President for Development.

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## About this Brief

*June 2016*

The purpose of this brief is to highlight the importance of the goods movement system and provide an overview of the research the VREF Initiative on Urban Freight centers have completed for policy makers, developers and other key decision makers. Similar to each center's mandate, this brief focuses on urban freight and the challenges faced in metropolitan areas and their urban centers. The wide range of challenges and solutions presented in this report reflects the varying political contexts and experiences of urban areas worldwide. The terms "freight" and "goods movement" are used interchangeably to refer to the complex network of vehicular modes, technological systems and physical structures controlled by people that are responsible for sending and receiving goods.

The brief was produced by Regional Plan Association, in close cooperation with the three research centers and VREF who played an active role as members of the editorial committee. The research and input from each of the research centers is incorporated throughout the brief, with no division of authorship across sections, stressing the coherent network supported by VREF.

# About the VREF Urban Freight Initiative

Unlike passenger transportation, research in the area of goods movement is in its infancy. Transportation professionals and policy-makers lack comprehensive understanding, robust data and common terminologies, all of which have major implications for the management of individual urban freight systems as well as the larger global freight network. The Volvo Research and Educational Foundations (VREF) Initiative on Urban Freight is playing a key role in filling in this critical knowledge gap and in leading efforts to raise the profile of goods movement in planning and policy arenas.

The VREF Initiative on Urban Freight supports targeted research and outreach with the goal of creating a strong international professional network that can influence government and industry decision-making. The initiative originally began at a symposium held in 2012, Urban Freight for Livable Cities, and has since developed into a much broader effort. Following the symposium, VREF launched two international Centers of Excellence (CoEs) in 2013, MetroFreight led by the METRANS Transportation Center in Los Angeles, California, and Sustainable Urban Freight Systems (SUFS) led by Rensselaer Polytechnic Institute in Troy, New York, as well as an additional research platform in 2014, the Urban Freight Platform (UFP) in Gothenburg, Sweden. Each center works with a number of global partners to further their research and professional networks (see map).

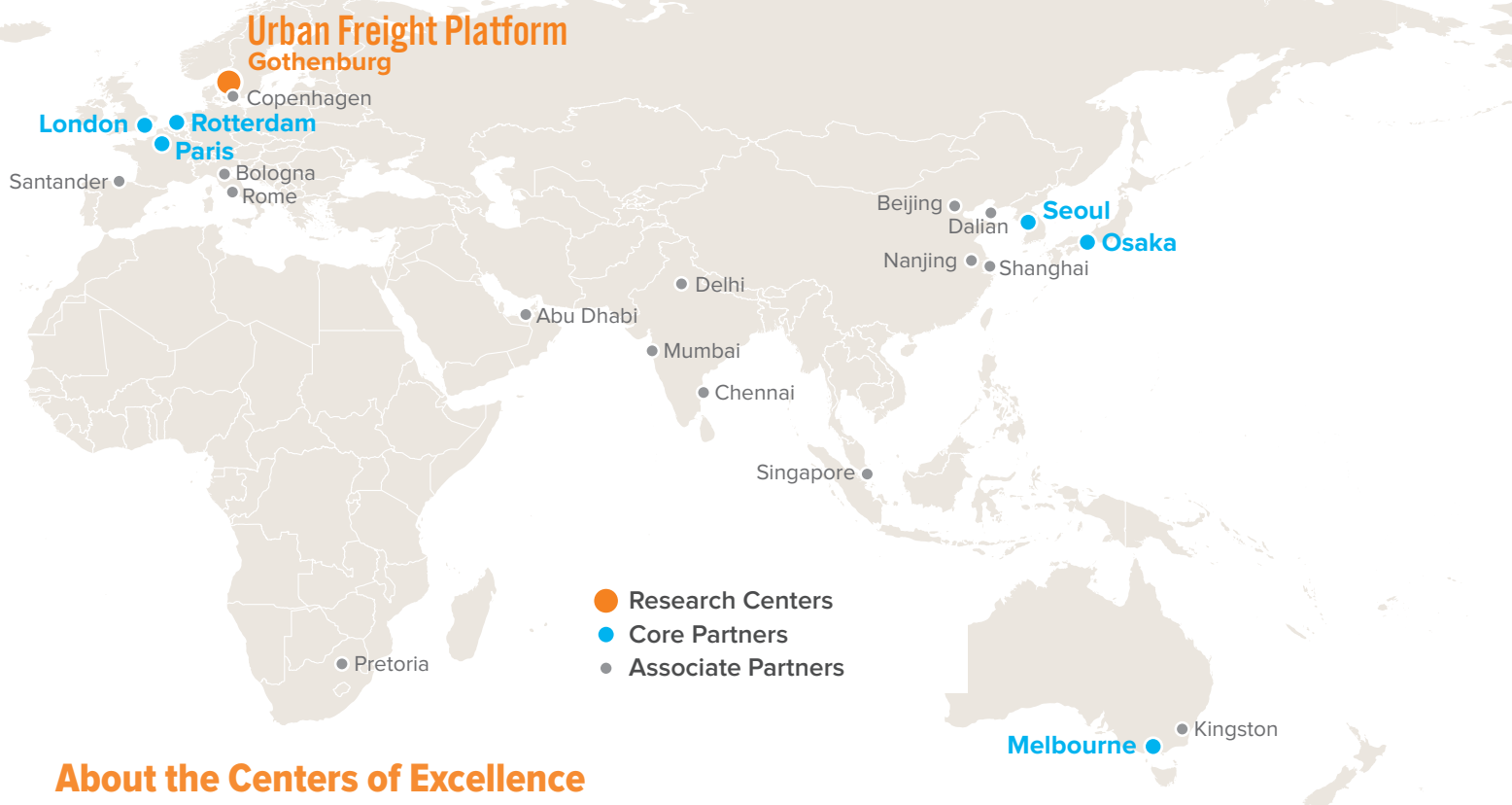
“ It has been very inspirational to work with centers around the world. It has brought a lot of energy and sustainable dialogue and provides international examples of how to engage with stakeholders. ”

— Mike Browne

As delivery patterns and strategies continue to change and evolve, the VREF Initiative on Urban Freight is committed to maintaining a high profile for goods movement and promoting an international exchange of best practices. The research centers synthesize existing information on urban freight through primary and secondary research, assessing and proposing solutions to a wide range of issues facing urban freight including last mile strategies, the improvement of freight and passenger interactions, land use dynamics, freight behavior and decision-making and urban freight systems policy. They have created a global network of scholars, and public and private practitioners by fostering communication between urban freight experts and creating extensive educational materials. Through these synergies, participants share their research and learn from others to facilitate the improvement of urban freight planning and operations management worldwide.







## About the Centers of Excellence

### MetroFreight

*Los Angeles, California, USA*

MetroFreight (MF) is a VREF Center of Excellence led by METRANS Transportation Center (USC, Los Angeles and California State University, Long Beach) in partnership with three key research institutions: the University Transportation Research Center (UTRC) consortium, City College of New York; the French Institute of Science and Technology for Transport, Development and Networks (IFST-TAR), University of Paris-Est; and the Korea Transport Institute (KOTI), Seoul. MF also partners with non-academic industry and government folk in these four key cities, as well as UPS Corporation that provides a global perspective. MF's research addresses five themes: 1) the role of policy from the industry perspective, 2) last mile strategies, 3) the improvement of freight and passenger interactions, 4) land use dynamics, and 5) changing production and consumption. MF also conducts education and outreach to strengthen the global network of scholars, public and private practitioners and the general public.

### Sustainable Urban Freight Systems

*Troy, New York, USA*

Sustainable Urban Freight Systems (SUFS) is a VREF Center of Excellence led by the Rensselaer Polytechnic Institute (RPI) in Troy, New York, in collaboration with six core research partners: University of Westminster, University of Gothenburg, Pennsylvania State University, Kyoto University, TNO-Delft University of Technology and the University of Melbourne. The work of the core research partners is complemented by input from twenty three associate research centers, eight core industry partners and eight core city partners worldwide. SUFS focuses its efforts on four themes: 1) characterization and needs assessment to understand the local needs; 2) research to identify suitable solutions to the problems identified; 3) implementation of solutions to improve things in the ground; and 4) education to ensure that all stakeholders are aware of the importance of addressing freight issues.

### Urban Freight Platform

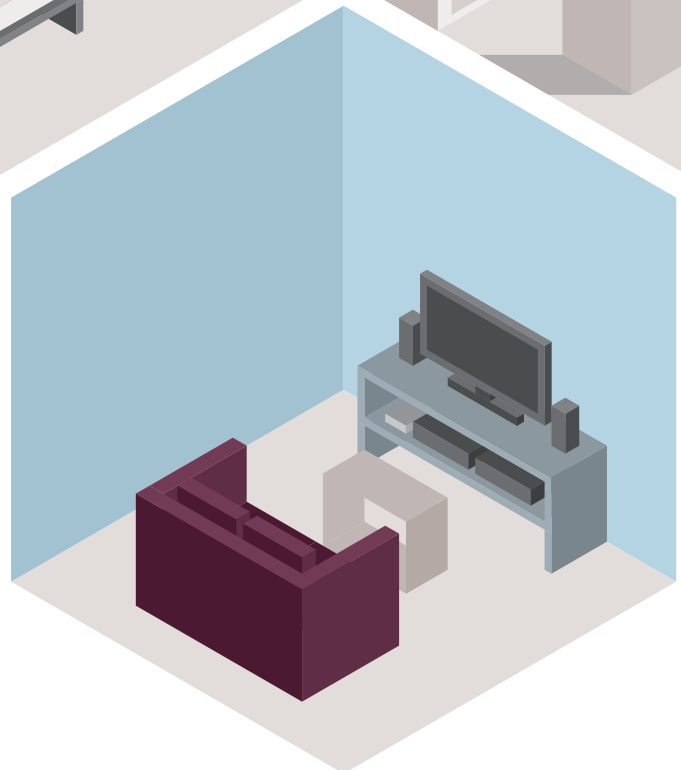
*Gothenburg, Sweden*

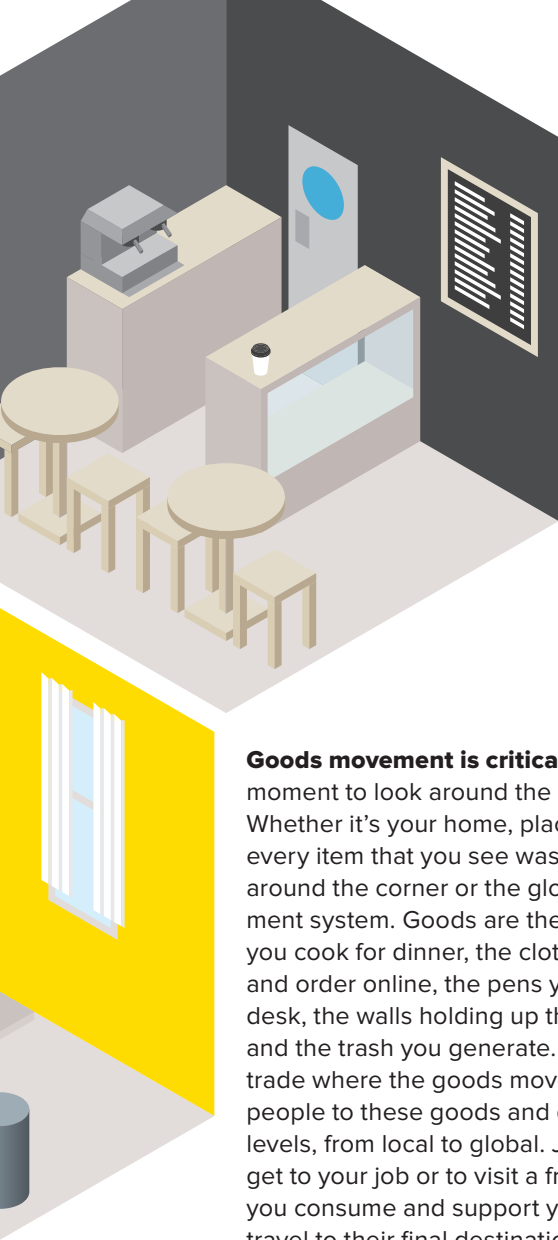
Urban Freight Platform (UFP) brings together researchers at the University of Gothenburg and Chalmers University of Technology. The UFP is comprised of urban freight and logistics researchers conducting leading research in architecture, urban planning and design, vehicle technologies and engineering, transport safety, human behavior and psychology, and the application of a wide range of problem-solving research techniques. The UFP initiates and facilitates research that leads to efficient urban freight distribution practices that are in line with urban livability and sustainability goals. The UFP fosters networking opportunities and provides a platform for collaboration between researchers and experts from multiple disciplines; between stakeholders from the private sector and the public sector; as well as between national and international universities. UFP also leads a number of educational and outreach initiatives.

# Why Goods Movement Matters



“ Take a moment to look around the room you are in right now. Whether it's your home, place of work or favorite cafe, every item that you see was brought here from places around the corner or the globe by the goods movement system. ”





**Goods movement is critical to everyday life.** Take a moment to look around the room you are in right now. Whether it's your home, place of work or favorite cafe, every item that you see was brought here from places around the corner or the globe by the goods movement system. Goods are the meats and vegetables you cook for dinner, the clothes you buy in the store and order online, the pens you write with at your desk, the walls holding up the buildings around you, and the trash you generate. We live in a world built on trade where the goods movement sector connects people to these goods and goods to people on many levels, from local to global. Just as you must travel to get to your job or to visit a friend, all of the goods that you consume and support your daily life must also travel to their final destination.

The majority of industries and economic activities that consumers and producers depend upon – from grocery stores and restaurants to retail shops, office supplies and construction – rely on the distribution of goods. For example, there are 24,000 food establishments in New York City, 18,000 of which are restaurants. Many of these restaurants typically receive three to four deliveries per day for items such as fresh goods, liquor and bulk goods.<sup>1</sup> As a result, this industry alone creates 72,000 to 96,000 daily trips on the streets on New York City. Not only does the industry provide the goods needed to sustain an economy, but it also is a generator of a significant number of direct and indirect jobs.

The efficient delivery of products is critical to the satisfaction of the customer, the success of individual businesses and the urban and global economies. Yet in order to reach the final destination, goods

distributors face significant challenges across urban and metropolitan environments: congested city streets, regional highways and rail networks, and bottlenecked ports and airports. The distribution of goods also contributes to this congestion, increasing emissions and noise on the streets. In the U.S., trucks account of 18% of the cost of congestion although they only represent 7% of urban travel.<sup>2</sup>

**Impeding the movement of goods impedes the economy.** In the extreme situation where the supply chain comes to a standstill in a large metropolitan area, effects will be felt by locals and ripple out across the world. If action is not taken to remedy the situation fast, residents will lose access to basic life necessities. Hospitals would exhaust their critical supplies in just 24 hours, service stations would run out of fuel in 48 hours, and grocery stores would be out of perishables in 72 hours.<sup>3</sup>

**Goods movement must be flexible and able to accommodate rapidly changing environments.** Today there is an immense amount of pressure placed upon the goods movement industry. Online sales are growing three times faster than traditional retail sales<sup>4</sup> and companies have shifted to just-in-time deliveries – receiving goods only as they are needed to reduce inventory cost – requiring more frequent and customized deliveries. Modern societal and technological trends, particularly the rise of consumerism and the service sector, impose even more demand on urban distribution systems that must operate within already dense, congested and strained networks.

For decades, goods movement has existed in an ecosystem that has typically been openly hostile to it or given it a lower priority. Until recently urban freight had been overlooked by urban planners and the government.<sup>5</sup> However, even though goods distribution trips are a part of an industry and system that are invisible to most people, goods movement is absolutely critical to people's lives and must be addressed as a key component of the livability and efficiency of our cities today.

<sup>1</sup> Versocki, J. New York State Restaurant Association. *SUFS Urban Freight Workshop*. September 2015.

<sup>2</sup> 2015 Urban Mobility Scorecard. Texas A&M Transportation Institute. Note: The cost of congestion does not include any value for the goods being transported in the trucks.

<sup>3</sup> U.S. DOT FHWA. "Keeping the Global Supply Chain Moving." Oct 2015. Web. <http://www.ops.fhwa.dot.gov/publications/fhwahop09035/video.htm>.

<sup>4</sup> Holland, C. UPS. "Business to Consumer Impact on Urban Freight." Presented at 2013 I-NUF Conference. [https://www.metrotrans.org/sites/default/files/Chuck\\_Holland\\_Urban\\_Freight\\_Oct\\_\\_9.pdf](https://www.metrotrans.org/sites/default/files/Chuck_Holland_Urban_Freight_Oct__9.pdf).

<sup>5</sup> Rodrigue, J-P. 2013. Chapter 3: Urban Goods Transport. 2013. *MetroFreight Progress Report: Part 2, Article 5*.

# Where Goods Go, Metropolitan Areas

In 2010, for the first time ever, 50% of the world population was living in a metropolitan area; in the United States, Canada and Europe this figure was over 80%.<sup>6</sup> More than 80% of global GDP is generated in cities, urban areas are becoming more attractive and the number of urban residents is expected to increase by 1.5 times by 2045.<sup>7</sup> With more people come higher demand and the need for more deliveries of goods to these areas. It is estimated that close to almost all of global trade originates, traverses through or is destined for a metropolitan area.<sup>8</sup>

As a result, metropolitan areas are the main hubs in the global goods distribution network. They are home to intermodal terminals such as ports, airports and rail yards that serve as the interfaces between the global supply chain and the more local, national and urban supply chain. Goods are both produced and consumed in these places, with some metropolitan areas primarily serving as global manufacturing or trade centers while others mostly serve as consumers of finished products.

As shown in the illustration, the metropolitan goods movement system operates on two scales: 1) goods travelling into and out of a metropolitan area, and 2) goods travelling within a metropolitan area. Once goods arrive at a major gateway – a port, air or rail terminal – they are typically transported to logistics facilities within a metropolitan area – such as warehouses and distribution centers – for processing and then are routed to their final destinations. These destinations may be local (within the same metro area), or regional (to other metro areas). At the same time, metro areas are producers of goods that are exported to other cities and regions. While the entire network is interde-

pendent and must function cohesively, particular attention must be paid to the goods transported and delivered to the growing number of consumers located in complex urban environments.

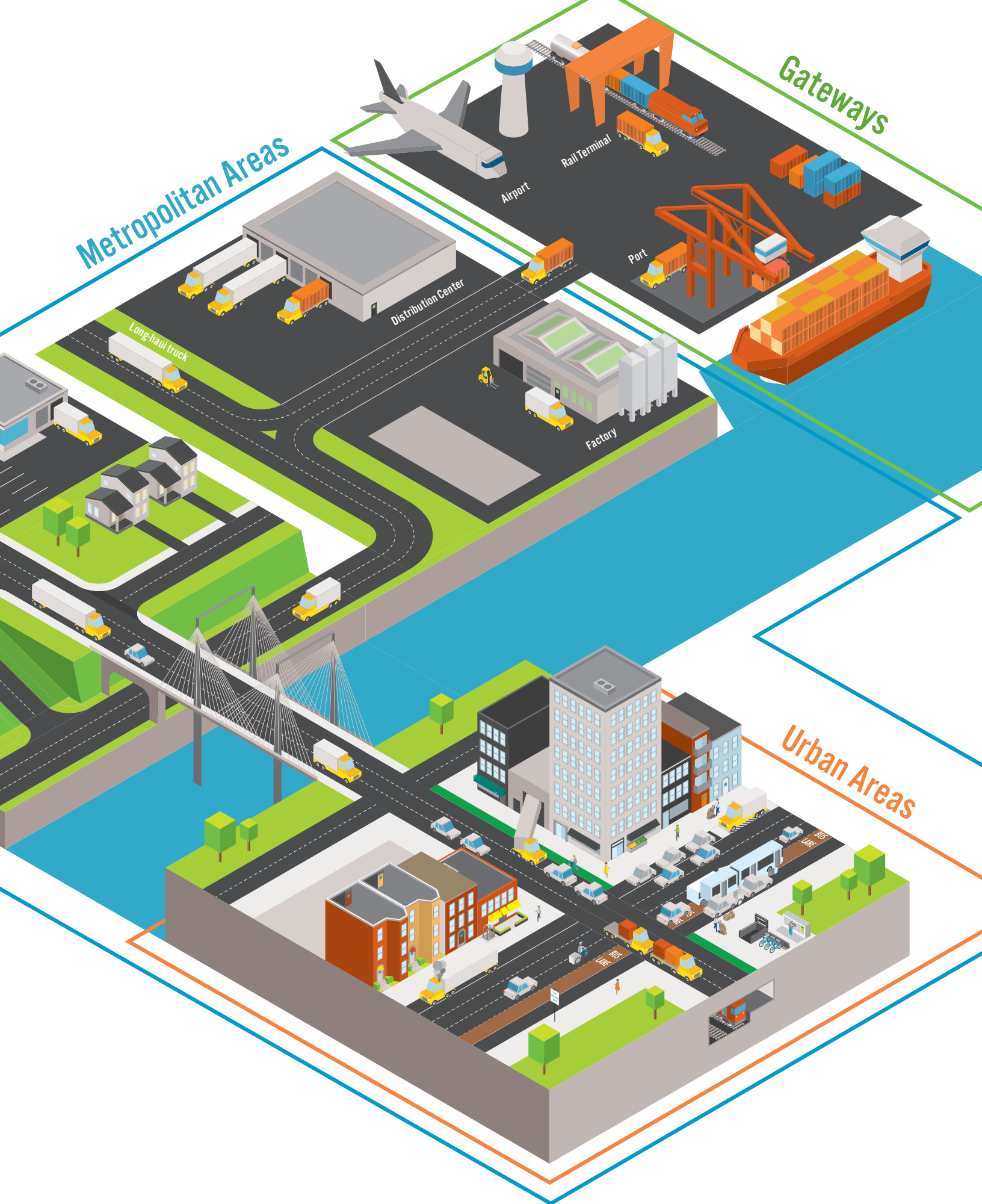


“ It is that last leg of the journey – the transportation and delivery of goods to businesses and residents in cities – that presents one of the major challenges for urban freight operators and city planners. ”

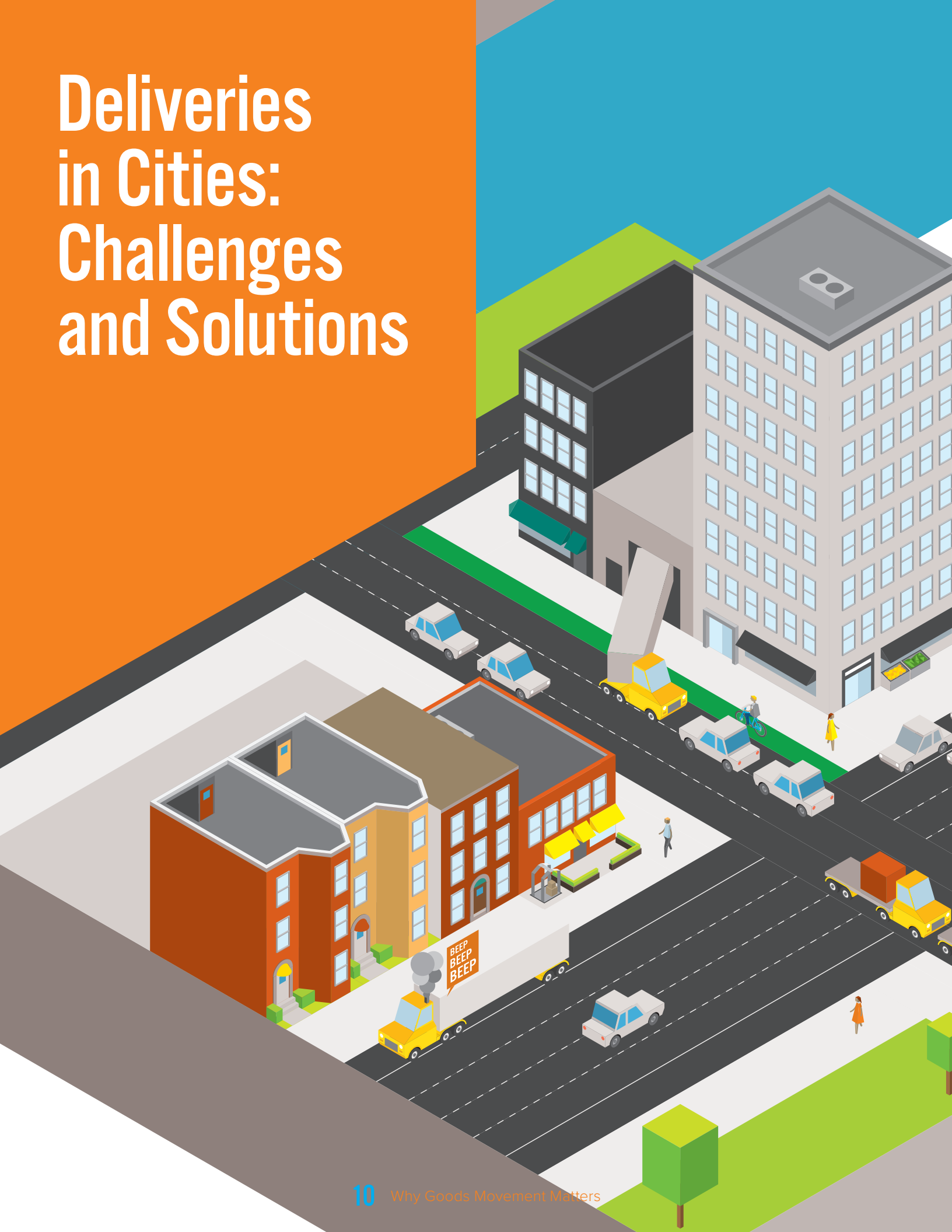
<sup>6</sup> Holguin-Veras, J. “Freight Demand Management and Its Role in the Quest for Sustainability.” 2015. Presentation.

<sup>7</sup> World Bank. “Urban Development Overview.” 2015. Web. <http://www.worldbank.org/en/topic/urbandevelopment/overview>.

<sup>8</sup> Rodrigue 2013. Note: Exact figures are not available.



# Deliveries in Cities: Challenges and Solutions

An isometric illustration of a city street scene. On the left, a large orange wall features the title 'Deliveries in Cities: Challenges and Solutions' in white text. The street is filled with various vehicles: a yellow delivery truck with a crane-like lift, a white delivery truck with a sign that says 'BEEP BEEP BEEP', a yellow taxi, and several white cars. Pedestrians are walking on the sidewalks. Buildings of different heights and colors (orange, grey, black) line the street. A green tree is visible in the bottom right corner. The background is a solid blue sky.



Moving goods within cities is a complex task with mounting challenges. As places compete on the global stage for businesses and residents, they do not always consider the impact of growth on their ability to effectively move goods. More people and commercial activity increases the demand for goods and services, while at the same time increasing competition for scarce road and sidewalk space. Older cities are also struggling with underinvestment and aging infrastructure. Additionally, actions taken by cities to be pleasant living environments can have unintended consequences that impede goods movement.

The VREF Urban Freight Initiative has studied several areas where policy and/or physical interventions could be tailored to address some of the obstacles that impede urban goods movement. In this synthesis paper, RPA has organized this research into four topic areas: livability and streets, buildings, the environment, and people and technology. The following sections focus on each of these areas, detailing the issues, challenges and solutions, including a case study that demonstrates how the research has been applied.

## Key Stakeholders

The success of the urban freight strategies presented in the following sections requires the involvement of a range of key actors and stakeholders. While the public sector is traditionally required to enact a policy, the private sector has taken an increasingly active role in lobbying and implementing such strategies. Prior to implementation, it is also essential to engage and consult with a number of key stakeholders who will be affected by changes in policy, such as local communities and residents, property owners and managers, and commercial establishments. Although exactly who must be involved in what role may vary based on the strategy or political geography, each of the six identified stakeholders is likely to play an important role.

- ▶ Government
- ▶ Communities and Residents
- ▶ Shippers
- ▶ Truckers
- ▶ Distribution and Warehouse Facilities
- ▶ Property Owners and Managers
- ▶ Commercial Establishments



# Livability and Streets

Today most of the street space in cities is used as storage or travel lanes for automobiles. Yet many cities are taking actions to make their streets more livable and to give space back to pedestrians. A livable urban streetscape – roads, curbs and sidewalks – is expected to serve a number of users including pedestrians, cyclists, surface transit and parked vehicles. While these users typically have competing interests and uses for the space, such actions aim to create a more comprehensive, multimodal transportation network for everyone.

Many of the interventions to make cities more livable are warranted and should be welcomed after decades of auto-centric policies. There is no doubt that pedestrians, cyclists and transit users should be given greater preference to improve everyone's urban experience and safety. However, the indifference toward urban freight is a trend that could undermine the city's vitality and its ability to grow in the long term.

In London, 3.8 million parking and loading fines were issued in 2015 totaling millions of dollars in fines each year.

– London Council. Parking enforcement statistics 2014-15.



## Challenges

The urban street network, including the curb, is critical to goods movement. Yet this space is finite in nearly all cities, and there are many competing demands for its use. Advocacy materials produced by some complete streets advocacy groups often do not recognize trucks as a priority user of the street space. For instance, the policy manual for Smart Growth America does acknowledge trucks as a user of the streetscape, but then fails to provide concrete examples of how best to accommodate them. Instead, they focus their efforts almost exclusively on interventions that favor pedestrians, cyclists, and transit users, most of which reduce roadway capacity and further restrict direct truck access to the curb.<sup>9</sup>

This emphasis on “livability” and its components – such as bike lanes, bus stops and bike docking stations – create many challenges for trucks as they attempt to deliver goods. Trucks struggle to find access to the curb to unload their goods, encouraging them to continue to drive and cause even more congestion or forcing them to double-park. In New York’s borough of Manhattan, in 10 out of 43 zip codes the demand for parking delivery trucks today exceeds the linear capacity of the streets.<sup>10</sup> Consequently, trucking companies frequently pay high parking fines: In London, 3.8 million parking and loading fines were issued in 2015 totaling to millions of dollars in fines each year.<sup>11,12</sup> This cost is transferred into the price of goods for the customer. Double parking also forces vehicles and multimodal travelers to travel around a truck that has blocked a moving lane to make its delivery, posing a safety risk for all involved.

Since more street space is allocated to pedestrians, cyclists and transit, city streets are often far narrower than the wider highways that connect them to and serve the surrounding metropolitan area. As a result, urban freight

<sup>9</sup> Smart Growth America. *Complete Streets Local Policy Workbook*. 2013. Web. <http://www.smartgrowthamerica.org/documents/cs/resources/cs-policyworkbook.pdf>.

<sup>10</sup> Jaller, M., Holguin-Veras, J., and Hodge, S. “Parking in the City: Challenges for Freight Traffic.” 2013. Transportation Research Record: *Journal of the Transportation Research Board*, Vol. 2379, pp. 46–56.

<sup>11</sup> London Council. “Parking enforcement statistics 2014-15.” 2015. Web. <http://www.londoncouncils.gov.uk/node/27924>.

<sup>12</sup> London Assembly Transport Committee. “Parking Enforcement in London: Investigation into parking controls and their enforcement in London, Greater London Authority.” 2015.



distribution in cities primarily relies on small trucks that are roughly one-third the size of larger trucks, limiting economies of scale, increasing the number of vehicles on urban streets and exacerbating the inefficiencies in deliveries. In New York City, 80 to 90 percent of freight vehicles are small trucks or delivery vans.<sup>13</sup> Similar situations exist in other cities, including Gothenburg where 74 percent of freight trips are made by light commercial vehicles. Making matters worse, many of these trucks, both large and small, are only partially loaded or, even worse, empty. For example, 30% of truck journeys are empty in the U.K. and in the U.S. trucks generate 20 billion miles each year while driving empty. Empty, or partially loaded, trucks are often a result of shippers responding to market signals that sometimes require trucks to deliver partial loads to/from customers who will not wait, and thus are unavoidable.

## Strategies

Streets are the city's circulatory system, vital to its function and success. Impediments at the curb, streets or alleyways can increase double parking, worsening congestion. These impediments increase receiver/shipper cost, which is then passed to the customer. There are many strategies that can be deployed to address these issues in the new paradigms of livability and complete streets.

- L1 Increase truck parking and loading areas by adapting existing street and loading zone design.**<sup>14</sup> A number of physical changes can be made, including widening sidewalks, eliminating vehicular parking, repurposing curb space for loading zones, using textured pavement to delineate and designate shared use for deliveries (San Francisco, USA), providing longer parking/loading spaces and/or multi-space meters (Washington D.C., USA), and increasing the size of loading zones to 100 feet (30 meters).
- L2 Rethink preferential treatments for transit,** in particular bus lanes and curb access. One strategy is to create a "floating bus lane" instead of a curbside bus lane; this design permits direct curb access for local deliveries (New York City, USA).<sup>15</sup> New types of delivery bays, such as the "Lincoln" and "Half-Lincoln" used in Paris, allow commercial vehicles to park fully or partially on the sidewalk, which creates curbside access that does not interrupt bus traffic.<sup>16</sup>

- L3 Introduce pedestrian and bicycle-friendly means of delivery.** Non-motorized modes of delivery, such as cargo cycles, pose less of a risk for pedestrians and bicyclists than large trucks or delivery vans. Since they travel at slower speeds, produce fewer emissions and generate less noise, they foster a more livable urban environment.

- L4 Construct urban consolidation centers (UCCs).** UCCs are collective receiving points strategically located near or en route to city centers where trucks drop off goods rather than going to each store in the city center. From the UCC, electric vans and cargo cycles can be used for the last mile delivery, thereby reducing congestion, emissions and noise, and improving safety for pedestrians and bicyclists. However, the high cost of urban land typically requires local subsidies and may result in a lack of profitability.<sup>17</sup>



**In New York's borough of Manhattan, there are 10 out of 43 zip codes where the demand for parking delivery trucks today exceeds the linear capacity of the streets.**



— Jaller, M., Holguin-Veras, J., and Hodge, S. "Parking in the City: Challenges for Freight Traffic." 2013.

<sup>13</sup> Wood, R.T. and R. Leighton. Truck Freight in the Tri-State Region. 1969. *Traffic Quarterly*, Vol. 23, No. 3, pp. 323-340.

<sup>14</sup> Holguin-Veras et al. *Improving Freight System Performance in Metropolitan Areas: Planning Guide*. NCFRP-33, Initiative 7. 2015.

<sup>15</sup> Conway, A. Goods Movement in a Manufacturing Supply Chain. 2015. Working paper. (NYC Department of Transportation. "Third Avenue Bus Lane Improvements." May 2014. Presented to Manhattan Community Board 6 Transportation Committee. <http://www.nyc.gov/html/dot/downloads/pdf/2014-05-third-ave-bus-mn-cb6.pdf>.)

<sup>16</sup> Conway. 2015. (Ripert, C. and Browne, M. La Démarche Exempleire de Paris Pour le Transport de Marchandises en Ville. 2009. *Les Cahiers Scientifiques du Transport*, No. 55, p. 39-62.)

<sup>17</sup> INRETS. SUGAR Good Best Practices Analysis, Deliverable 3.3. March 2010.

## Cargo cycles



Photo: City Harvest

Large trucks often face difficulties maneuvering urban streets and finding sufficient curb space to unload goods. Cargo cycles – two or three wheeled vehicles operated solely by human power or with an electric-assist that are designed to carry goods<sup>18</sup> – offer a smaller, more flexible means for making deliveries that can be used across various markets, including mail deliveries, service traffic, courier deliveries, parcel deliveries, home deliveries, internal/own account transport.<sup>19</sup>

Bicycles and tricycles designed to carry freight have been used in western countries since the 1800s; however they have only recently gained traction in modern cities in both Europe and the United States.<sup>20</sup> Cargo cycles are most common and have higher credibility as a competitive mode in Europe; whereas they are typically perceived as a niche environmentally friendly mode in North America.<sup>21</sup> They are used for urban deliveries in a range of European cities, including Berlin, Germany; Paris, France;<sup>22</sup> Cambridge, England;<sup>23</sup> London, England; Utrecht, Netherlands;<sup>24</sup> and Gothenburg, Sweden.<sup>25</sup>

Cargo cycles offer an alternative mode for the last mile leg of a delivery within urban centers. In Gothenburg, *Stadsleveransen* (the City Delivery pool) consolidates deliveries for 500 shops and businesses at an Urban Consolidation Center located near the city center and then uses cargo cycles to distribute the goods to shops within the center. *Stadsleveransen* has successfully reduced the number of deliveries per receiver by 14% on average. As a result, transport companies' delivery tours are up to 10% shorter and 5% faster in the city center.<sup>26</sup>

However, cargo cycles do not realize the same economies of scale as delivery vans or larger trucks. Also, cargo cycle operators can be exposed to harsh weather conditions and other vehicles, which increase the cost of labor. Since the delivery depends primarily upon human energy, the efficiency is directly affected by the driver's physical capabilities.

Yet, despite these challenges, cargo cycles offer a number of benefits for both the efficiency of operations as well as the livability of the city. Two independent services in New York City – City Bakery, a local chain of green bakeries, and City Harvest, a non-profit organization that picks up excess food from the food industry and distributes it to community groups – identified a number of key benefits, including the ability to park in spaces that are inadequate for large trucks, eliminating the need to cruise and pay parking fines; lower upfront, maintenance and operating costs than motor vehicles; more flexibility in their route (as long as policies allow) since they are able to travel on both motor vehicle and bicycle infrastructure and are not restricted to local truck routes; and zero-to-minimal fuel consumption, emissions, noise and lower safety risk that improves compatibility with pedestrians, bicyclists and the general public.<sup>27</sup>

<sup>18</sup> Conway, A. *Final Report: Freight Tricycle Operations in New York City*. Oct 2014. UTRC.

<sup>19</sup> SUFS. *Cargo Cycles for Urban Freight: The European Experience*. June 2015. Webinar. <https://coe-sufs.org/wordpress/peer-to-peer-exchange-program/webinar11/>

<sup>20</sup> Conway 2014.

<sup>21</sup> SUFS. "Cargo Cycles for Urban Delivery: North American Experience." Aug 2015. Webinar. <https://coe-sufs.org/wordpress/peer-to-peer-exchange-program/webinar12/>.

<sup>22</sup> König, M., Conway A. "Biking for goods is good: an assessment of CO2 savings in Paris." July 2014.

<sup>23</sup> Outspoken! Web. <http://www.outspokendelivery.co.uk/cambridge/>.

<sup>24</sup> Cargohopper. Web. <http://www.cargohopper.nl/>.

<sup>25</sup> Stadsleveransen. Web. <http://innerstadengbg.se/innerstaden-goteborg/projekt/stadsleveransen/>.

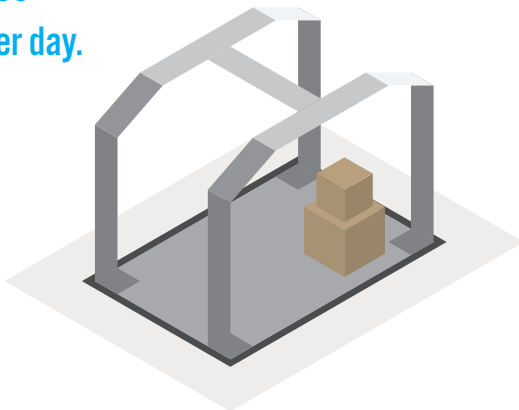
<sup>26</sup> Lars E. "The innovative delivery system transforming Gothenburg's roads." 2015. Web. <http://www.theguardian.com/cities/2015/nov/18/innovative-delivery-system-transforming-gothenburg-roads>.

<sup>27</sup> Conway 2014.

# Buildings

The movement of goods extends beyond the curb. Buildings are the origin and destination of almost every freight trip. The capacity of buildings to effectively accommodate freight has ripple effects on other aspects of urban goods movement. Much of what happens at the building line is physical – the size and number of loading docks, off-hour delivery space and vertical freight (elevator) capacity. Many cities are empowered to mandate specific physical requirements through zoning and building codes or provide other incentives for voluntary action

A large office development can have over 200 deliveries per day.



## Challenges

The configuration of a building to handle freight – having sufficiently sized loading docks, freight elevators, secure off-hour holding areas and on-site storage – can significantly influence the number of trips, when trips occur, the durations of deliveries and their impact on the street network. Many older cities are saddled with buildings that are inadequate to serve the demands placed on them today. In the cases where a building has a loading dock, its facilities are often outmoded, not built to accommodate higher volumes and larger vehicles.

For example, Macy's is a large retailer in the United States with its headquarters located on 34th Street in Manhattan, New York. This department store occupies almost an entire city block with a women's shoe department larger than a football field. It attracts 20 million visitors a year, generating 1 billion dollars in annual sales and selling 15 million pieces of merchandise during the holiday period in December. Yet this 100-year-old building has only five loading docks to receive its goods and three loading bays for construction.

The impact of infill construction and reduction in square footage per employee are also challenging goods movement in older cities as they grow taller and even denser. Over the past decade London has seen an increase in multi-tenanted and mixed use buildings, either through conversion from single-tenant or the construction of new towers, such as the Shard – a 95 story skyscraper located by London Bridge on the south bank of Thames. Multi-tenanted buildings generate far more deliveries than single tenanted ones. For instance, a large office development can have over 200 deliveries per day.

In addition, multi-tenanted buildings such as offices and shopping centers often do not have shared internal logistics staff. This results in drivers delivering goods directly to the receiver, wherever they are located inside the building, rather than leaving the goods with loading bay staff. This increases vehicle dwell time while the delivery takes place, resulting in on-street vehicle queueing for the loading bay, and related noise, pollution and safety impacts for local residents.

## Strategies

As cities continue to grow and replace outmoded buildings, there are opportunities to rethink how new buildings are configured to accommodate freight. Also, the finite capacity of city streets dictates that strategies must be deployed to reduce the number of truck trips or shift them to periods where excess supply exists. Some of these strategies were topics of VREF CoE research, listed below.

- B1 Implement an off-hour delivery program.**<sup>28</sup> Diverting truck trips to overnight hours, which requires receivers to change behavior and, in some cases, reconfigure their buildings to accept deliveries without staff. This program can be voluntary or mandatory required by a municipality.
- B2 Eliminate truck trips for municipal solid waste (MSW).** Strategies to consolidate trips, reduce the volume of MSW and/or divert trips to other ways. One example is pneumatic tubes;<sup>29</sup> however, these would be difficult to retrofit in existing buildings, adding significant cost to new developments.
- B3 Rethink the design of urban buildings to accommodate modern trucks and delivery volumes.**<sup>30</sup> Cities should include the private real estate sector (developers) and public planning and economic development agencies in a process to develop enhanced building codes for off-street parking and loading facilities. Zoning and building codes can be used to incentivize consideration of freight demands in both new construction and redevelopment projects. This is a low-cost approach compared to retro-active upgrades to existing infrastructure.
- B4 Redesign insufficient or outdated loading docks to accommodate modern trucks.**<sup>31</sup> While it is not possible in many cases to retrofit buildings to accommodate changes in truck fleets, there have been instances where it is feasible. Cities should survey buildings with outmoded facilities and determine whether retrofitting is possible, including options for creating adequate setbacks from streets so trucks do not interfere with traffic flow when unloading. Financial incentives to encourage these retrofits are also an option, including property tax rebates, to help defer the costs of the improvements.
- B5 Implement joint procurement and common internal logistics operations in large and multi-tenanted buildings and Delivery and Servicing Plans.** Joint procurement initiatives between tenants, as well as common logistics operations in the loading bay with shared staff able to receive goods on behalf of all tenants, have the potential to reduce the number of suppliers used and

thus vehicle deliveries. A pilot project in Oslo, STRAIGHTSOL, demonstrated how automatic data collection and information sharing could enable more efficient shopping center management.<sup>32</sup> Delivery and Servicing Plans designed to manage the entire building (an approach devised by Transport for London) can also reduce the negative effects of urban freight deliveries at specific buildings.<sup>33,34</sup>

- B6 Require appointment-based systems for deliveries.** Booking systems streamline deliveries to allow for efficient operations of loading docks. A successful example is MobileDOCK, which has been used widely in Sydney and Melbourne.<sup>35</sup> Benefits include reductions in congestion and pollution, improved turnaround times, and transparency for all actors in the supply chain. Such systems are particularly important in dense urban areas, including shopping centers, markets, sports arenas, tourism/cultural sites, and residential towers.
- B7 Promote the accommodation of new types of “logistics hotels” in urban areas.** Sogaris, a real estate development company owned by the municipality of Paris, is currently building a 35,000 sq m logistics multi story terminal within the city boundaries (opening planned for 2017). This building will also accommodate office activities and sport facilities. The new Paris zoning ordinance (2016) identifies land parcels that will be able to accommodate logistics activities in the future.

<sup>28</sup> Holguin-Veras et al. *Improving Freight System Performance in Metropolitan Areas: Planning Guide*. NCFRP-33, Initiative 43. 2015.

<sup>29</sup> Miller, B. “Trucks, Trains, Tugs and Tubes.” June 2015. MetroFreight Center of Excellence.

<sup>30</sup> Holguin-Veras et al. *Improving Freight System Performance in Metropolitan Areas: Planning Guide*. NCFRP-33, Initiative 11. 2015.

<sup>31</sup> Holguin-Veras et al. *Improving Freight System Performance in Metropolitan Areas: Planning Guide*. NCFRP-33, Initiative 13. 2015.

<sup>32</sup> Straightsol. “Overview.” 2016. Web. <http://www.straightsol.eu/overview.htm>.

<sup>33</sup> Leonardi, J., Browne, M., Allen, J., Zunder, T. and Aditjandra, P. “Increase urban freight efficiency with delivery and servicing plan.” 2014. *Research in Transportation Business & Management* 12, pp.73–79.

<sup>34</sup> Transport for London. “Delivery and Servicing Plans.” 2016. Web. <https://tfl.gov.uk/info-for/freight/planning/delivery-and-servicing-plans>.

<sup>35</sup> Bestrane. MobileDOCK. 2016. Web. <http://bestrane.com.au/products/bestrane-mobiledock/>.



# Off-hour deliveries



Off-hour deliveries (OHD) between 7pm and 6am offer an effective means for managing freight demand in urban centers. Since the receiver is the one that typically demands daytime deliveries, OHD requires them to change this behavior. A pilot test of OHD in New York City implemented by Rensselaer Polytechnic Institute (RPI), a VREF CoE, in collaboration with NYC Department of Transportation proved the success of this strategy. Cities of different sizes could also benefit from the efficiency of this system; such is the case in São Paulo, Brazil where Universidade de São Paulo (USP) Centro de Inovação em Sistemas Logísticos (CISLog), São Paulo Traffic Authority introduced a pilot project and now the city is implementing OHD as a permanent policy, and Bogota, Colombia where a pilot test of this initiative showed promising results.

In the case of New York City, stakeholder engagement and financial incentives were used to encourage receivers to take part in the strategy. There were two types of receivers: those who staffed OHD and those who did not. The pilot test found that a one-time incentive could encourage receivers to voluntarily opt for unassisted OHD going forward. However, those who required additional staff during OHD were more likely to return to regular hours. OHD also necessitates adequate space in buildings to store inventories overnight and, in instances where

deliveries were unassisted, that building owners modify their facilities for secure carrier access to the storage areas.

OHD result in a number of benefits for the carriers, shippers, receivers and overall urban environment. By decreasing the number of freight vehicles on the road during the day, OHD reduces conflicts with passenger vehicles, pedestrians and bicyclists – particularly at the curb where there may be bike lanes or enhanced walkways. OHD also reduces congestion during peak hour traffic and air pollution.<sup>36</sup> Shorter travel times and fewer parking fines increase the economic productivity of deliveries; the estimated economic savings of carriers, shippers and receivers is \$100 to \$200 thousand per year.

Today, more than 400 establishments in NYC, mostly in the restaurant sector, have realized the benefits of OHD and switched over from daytime deliveries. However, the need for some receivers to hire OHD staff and increase labor costs may limit how widely this strategy will be adopted. There also is a misconception that freight demand strategies are only applicable to large cities like NYC; yet, the study suggests this is due to faulty estimates of freight traffic and undercounting of small delivery vans.

<sup>36</sup> Average fuel consumption rates and total emissions rates have also been found to be significantly lower during off-hours.

# Environment

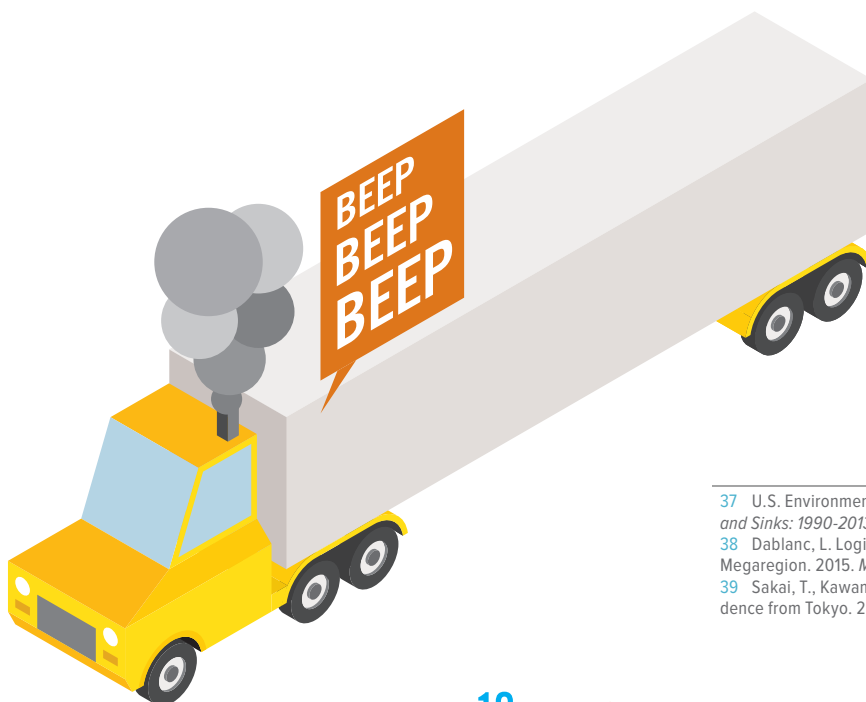
Moving goods, similar to transporting passengers, can produce noxious emissions and noise. These environmental impacts are felt more acutely in cities with dense populations because residents directly experience the high volumes of goods that must be moved. While many cities have made major strides in improving air quality over the past fifty years, operators and policy makers must consider how to further reduce emissions and mitigate the environmental impacts caused by sprawling warehouse and distribution facilities and competing requirements of a more diverse mix of land uses.

## Challenges

The freight industry produces a significant portion of greenhouse gas emissions, which is increasing at a faster rate than passenger vehicle emissions. Diesel trucks, the dominant truck type for heavier and larger loads, generate four to ten times the amount of NOx as similarly sized gasoline-powered trucks.

In the U.S., all freight modes produce approximately 10% of greenhouse gas emissions, and the total figure is expected to triple by 2050.<sup>37</sup> In Europe, trucks are responsible for 47% of NOx emitted, and in Paris they emit 40 to 50% of the fine particulates – a leading cause of upper-respiratory conditions like asthma. Stop and go traffic in cities also reduces the performance of freight vehicles; a truck that stops five times over a distance of 10 km (6.2 miles) increases its fuel consumption by 140%. Making matters worse, urban goods vehicles are, on average, older than private cars and have fewer modern pollution controls and lower fuel consumption performance.

Another major concern is the shift in siting of warehouse and distribution facilities. The growth in warehousing and distribution activity due to globalization and economic restructuring, increasing scale economies in the industry, and rapidly increasing land prices in major cities, creates “push” and “pull” factors that shift warehouse and distribution towards the periphery of metropolitan areas. As these facilities move further from the markets they serve, truck trips and miles traveled are both likely to increase. Evidence of decentralization has been found for large cities in the U.S., U.K., France (Paris<sup>38</sup>) and Japan.<sup>39</sup> Public officials have experimented with subsidized in-city warehouses, short-haul rail, and water barges to reduce truck trips and vehicle miles travelled (VMT).



**In the US, all freight modes produce approximately 10% of greenhouse gas emissions, and the total figure is expected to triple by 2050.**

– U.S. Environmental Protection Agency.  
Inventory of U.S. Greenhouse Gas  
Emissions and Sinks: 1990-2013. 2015

<sup>37</sup> U.S. Environmental Protection Agency. *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2013*. 2015.

<sup>38</sup> Dablanc, L. Logistics Spatial Patterns in Paris: The Rise of The Paris Basin as a Logistics Megaregion. 2015. *MetroFreight Final Report*: 14-4.1d.

<sup>39</sup> Sakai, T., Kawamura, K., & Hyodo, T. Locational dynamics of logistics facilities: Evidence from Tokyo. 2015. *Journal of Transport Geography*, 46, pp. 10-19.

Regulatory constraints like the rise of mixed-use neighborhoods (enabled by zoning) and curfews present further challenges for goods movement. As city dwellers are focusing on quality of life more than ever, freight noise is a primary complaint. Noise is generated by the truck itself, by the operation of lift gates to remove goods from the truck, by the driver (e.g. using a radio or slamming doors), and by the movement of the goods across the sidewalk to its final point of delivery. Unloading a retail delivery can take up to two hours, often during late night or early morning hours when nearby residents would prefer quiet. As cities grow more heterogeneous, mixing commercial and residential uses, it will become increasingly difficult for deliveries to take place during off-hours and for freight-dependent businesses to co-exist with residential developments.

## Strategies

Reduced environmental impacts are essential if cities are going to grow and be able to serve the corresponding increase in demand for goods and services. Pricing the external costs of the freight industry is, in theory, a very efficient and fair approach to altering behavior to mitigate the negative impacts associated with urban goods movement. However, this mechanism often faces many political hurdles that limit its effectiveness. Thus, VREF CoEs have explored a number of other strategies to further reduce emissions, rethink land use and shift freight to more environmentally friendly modes.

- E1 Adopt strict national (central government) emission and fuel efficiency standards.** One of the most effective strategies for reducing truck emissions is national emissions and fuel efficiency standards. In the U.S., California has led the nation in establishing GHG reduction targets; these include a requirement that heavy duty truck emissions be reduced 70% by 2031. California is also considering a regulation to require all “last mile” vehicles to be zero emission by 2050.<sup>40</sup> National standards impose the same costs on everyone, thus avoiding the potential negative competitive effects of local regulations such as LEZs.
- E2 Consider low emission zones in dense urban centers.** Tougher restrictions on vehicular emissions have resulted in a reduction of truck trips.<sup>41</sup>
- E3 Separate noxious freight activity from conflicting land uses whenever possible.** Zoning could consider the impacts of some of these uses and create buffers

between residential/commercial and industrial activities. For example, Chicago’s planned manufacturing districts prohibit residential development.<sup>42</sup>

- E4 Transition to alternatively fueled vehicles.** Electric vehicles could offer a promising means for improving the efficiency and performance of the urban freight system, especially in conjunction with urban consolidation centers.<sup>43</sup> A successful example that has helped to replace and improve the emissions of older diesel trucks is the Hunts Point Clean Trucks Program in the South Bronx in New York City. This program offers rebate incentives for truck owners to use advanced transportation technologies and alternative fuels.<sup>44</sup>
- E5 Evaluate non-road modes for deliveries.** Although marine and rail options won’t replace the last mile delivery, they bring goods closer to the urban core and could help to reduce longer-haul truck trips throughout the metropolitan area. Researchers are exploring the potential role that urban railway hubs could play in last mile logistics in London<sup>45</sup> and how much freight could be shifted from truck to rail in Los Angeles.<sup>46</sup>
- E6 Implement anti-idling programs.**<sup>47</sup> A number of programs have been implemented in the U.S. to reduce pollution and noise produced by idling. These programs utilize a combination of technologies, economic incentives, regulations, and education.
- E7 Require comprehensive environmental impact mitigation programs at major freight hubs.** For example, the Clean Air Action Plan at the Ports of Los Angeles and Long Beach included a requirement to phase in drayage trucks with the cleanest available technology. The turnover of the fleet was the major factor in reducing PM emissions by 75% in a period of four years.<sup>48</sup>

<sup>40</sup> California Air Resources Board. Mobile Source Strategy, Discussion Draft. 2015. Sacramento, CA: California Environmental Protection Agency.

<sup>41</sup> Montonen, Antoine. “Impacts of Environmental Access Restrictions on Freight Delivery Activities, the Example of Low Emission Zones in Europe.” 2014. MetroFreight Center of Excellence.

<sup>42</sup> Conway 2015. (Federal Highway Administration. *Freight and Land Use Handbook*. 2012. Web. <http://www.ops.fhwa.dot.gov/publications/fhwahop12006/>.

<sup>43</sup> Browne, M., Allen, J. and Leonardi, J. “Evaluating the use of an urban consolidation centre and electric vehicles in central London.” 2011. *International Association of Traffic and Safety Sciences (IATSS) Research*, 35 (1) pp.1-6.

<sup>44</sup> McSherry, S. and Simon, M. NYDOT. Hunts Point Clean Truck Program. 2016.

<sup>45</sup> Woodburn, A., Browne, M. and Allen, J. “Urban Railway Hub Freight Expansion Feasibility Study – Final Report,” report to Cross River Partnership, University of Westminster. 2015.

<sup>46</sup> Dessouky, M. and L. Fu. Integrating Management of Truck and Rail Systems in LA. 2015. *MetroFreight Final Report*: 3.1a.

<sup>47</sup> Holguin-Veras et al. *Improving Freight System Performance in Metropolitan Areas: Planning Guide*. NCFRP-33, Initiative 41. 2015.

<sup>48</sup> Giuliano, G. and A. Linder. “Motivations for voluntary regulation: The Clean Air Action Plan.” 2013. *Energy Policy*, 59, 513-522.



# Low Emission Zones



Photo: EURIST e.V. (flickr)

Low Emission Zones (LEZ) are geographically limited zones located in the core of metropolitan areas where vehicles that emit greater amounts of GHGs or other pollutants are either banned or required to pay a toll that varies based on ambient air quality to enter. Enforcement typically comes in two forms, video cameras that read license plate numbers, or visual surveillance with the use of stickers. LEZ can address atmospheric pollution, help reduce noise, improve the quality of urban life and decrease traffic congestion.

The VREF CoEs' research has shown that while LEZ can be disruptive to the market in which urban carriers operate, in most cases, their introduction has led to the modernization of the freight and logistics sector and the consolidation of truck trips – both positive outcomes. There are various examples of this in cities across Europe where there are approximately 200 LEZ in ten different countries. Stockholm saw a 15% reduction in all commercial traffic after the introduction of LEZ. This was predominately the result of trip consolidation, not a reduction in demand for freight. Consolidation in Milan was even more dramatic, declining from 13,040 freight trips in 2008 to 9,521 trips in 2010 or 27% fewer vehicles.<sup>49</sup> The industry also dramatically upgraded its fleet to alternative fuel and zero emission vehicles, which increased from 92 in 2008 to 1,089 just two years later. The results were similar in London and Berlin, which have very high compliance rates with their LEZ. Very old delivery vehicles are almost nonexistent in these two cities today.

In cases where smaller and medium size firms do not have the financial resources to completely replace their fleets, LEZ have forced them to improve their efficiency and optimize their vehicle routing. This has been accomplished using specialized software that is typically reserved for larger logistics firms. One of those larger firms, UPS, benefited from routing and management efficiencies it was forced to introduce to adapt to and remain profitable in London. LEZ policies have also been shown to create a competitive advantage for firms that are already committed to green practices, which promote policies to reduce pollution, over conventional freight carriers.

The outcomes of LEZ are not all positive. In Milan, researchers found that the freight sector saved €1.3 million as a result of reduced journey times and improvements in reliability but lost €10.8 million in tolls and investment in new vehicles (net loss of €9.5 million). The city and public were the big winners, but such one-sided gains are not sustainable. Berlin saw a significant drop in the number of transport and logistics firms and a loss of 15,000 related jobs during the three-year period after the introduction of its LEZ. London also experienced a similar decline. Most cities that have enacted LEZ have seen 15% to 30% reductions in the number of transport and logistic firms.

Yet, LEZ have forced the industry to modernize and search for efficiencies in order to stay profitable and competitive. In many cases this has meant streamlining operations and shedding non-essential jobs; it has also resulted in firms merging to better compete. Most of LEZ in Europe have been met with success; they have lowered air pollution while also reducing congestion, noise and improving the quality of life for many of the cities where they've been implemented.<sup>50</sup>

<sup>49</sup> The reduction in the number of trips may have partially been driven by the financial crisis.

<sup>50</sup> Dablanc, L. et A. Montonen. Impacts of Environmental Access Restrictions on Freight Delivery Activities, the Example of Low Emission Zones in Europe. 2014. Centre d'excellence MetroFreight



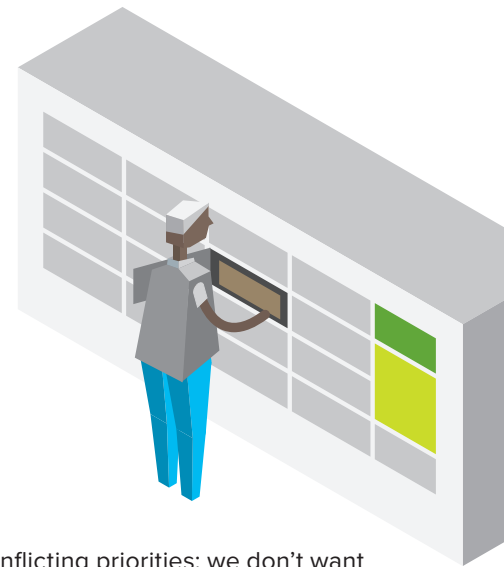
# People and Technology

The advent of e-commerce – the ability to purchase goods online via laptop, tablet or smartphone – has radically changed how consumers interact with retailers. They want their goods to arrive frequently and quickly and expect the ability to check for a nearby product’s availability. This trend will only continue to rise; e-commerce accounted for 7.3% of global retail sales in 2015 and is expected to grow to 12.4% by 2019.<sup>51</sup>

Advances in technology have also made just-in-time deliveries the norm for many commercial establishments. Retailers, restaurants and hotels in urban centers typically are pressured by high rents and the desire to maximize the revenue generating square footage. This results in less space to store goods, which requires a need for more frequent deliveries; establishments have completely eliminated their inventories in some cases.

**In the U.K. Missed deliveries were estimated to cost £850 million in 2012.**

– Vissor, Nemoto & Browne. Home Delivery and the Impacts on Urban Freight Transport: A Review. 2014.



## Challenges

We are grappling with conflicting priorities: we don’t want trucks on our streets; we don’t want to hear them or sit behind them in traffic. But technology has enabled us to demand more goods and, at the same time, request increasingly more rapid (shorter windows for) deliveries. Consequently, these innovations have exacerbated constraints that our goods movement system has been experiencing for decades and has led to an increase in the number of residential and commercial deliveries.

Today, there are few incentives for residents or commercial establishments to reduce the number of deliveries they receive. Human behavior and decision making is sensitive to pricing signals; yet neither group is charged any more or less if they receive two or ten deliveries per day or week. As a result, both expect their deliveries to arrive directly at their front door in a timely manner.

Although technology has enabled more orders to be placed, it has not yet effectively streamlined the delivery system. There are inefficiencies on both the shipper and receiver end. For instance, a survey conducted by Transport for London’s (TfL) found that each of the three cafeterias at their headquarters ordered separate milk deliveries. By consolidating deliveries going forward, they were able to reduce traffic to the building by 20%.<sup>52</sup> On the shipper side, deliveries are often widespread and could be better coordinated to avoid circuitous delivery routes and multiple deliveries to the same area.

Furthermore, residential deliveries are often not successfully delivered on the first attempt. In the U.K., 12% of deliveries have to be delivered a second time, adding congestion to the roads and costs for the shippers. Missed deliveries were estimated to cost £850 million in 2012.<sup>53</sup> If e-commerce continues to rise and consumer expectations do not change, both congestion and unnecessary costs will continue to increase.

<sup>51</sup> Linder, M. “Global e-commerce sales set to grow 25% in 2015.” Web. <https://www.internetretailer.com/2015/07/29/global-e-commerce-set-grow-25-2015>.

<sup>52</sup> Transport for London. A Pilot Delivery Servicing Plan for TfL’s Palestra Offices in Southwark: A Case Study. Sept 2009.

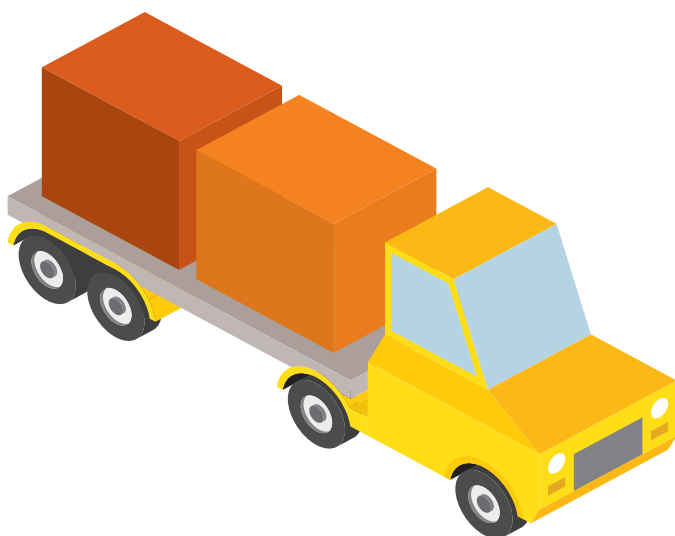
<sup>53</sup> Vissor, Nemoto & Browne. Home Delivery and the Impacts on Urban Freight Transport: A Review. 2014.

Changes in inventory systems that have resulted from just-in-time deliveries have dramatically altered the way freight is handled, substantially reducing the need for warehousing space per unit of sales by tracking inventories and point of sale information to predict the needs of retailers and customers. However, the total amount of warehousing activity is increasing. In the U.S. from 2003 – 2013, warehousing, measured either as establishments or employment, has grown faster than the overall employment growth rate.

## Strategies

Both new technologies and behavioral shifts can be applied to accommodate changing consumer expectations. A range of strategies has been identified:

- T1 Consolidate home deliveries by encouraging alternate residential delivery sites.**<sup>54</sup> Home deliveries are inefficient; small packages are delivered one-by-one to homes and apartments. Establishing neighborhood pickup points (PPs) or automated parcel systems (APS) – locker banks in public locations – can reduce truck trips by delivering to fewer destinations and avoiding missed deliveries.
- T2 Educate businesses on receiver-led delivery consolidation programs,** providing examples on how it could be structured and the financial benefits that would accrue to their businesses.<sup>55</sup> Shippers can combine their deliveries at the receiver's request: one supplier delivers goods to another supplier who will make the final delivery.



- T3 Enact proactive Freight Demand Management (FDM) strategies.** The receivers of deliveries directly influence when and how deliveries are made. FDM initiatives seek to change the behavior of goods recipients, modifying demand at commercial establishments and households by altering the frequency, timing and mode of deliveries.<sup>56</sup> Strategies include off-hour delivery programs, staggered pick-up/deliver programs and receiver-led consolidation programs.
- T4 Facilitate the development of new tools to assist the consolidation of shipments and more efficient use of urban streets.** By openly sharing data and holding application design competitions, emerging applications have enabled on-demand requests for larger scale shipments. For instance, Cargomatic is an app that matches shippers to carriers with available space on a truck, improving truck load utilization factors and reducing extra miles travelled and empty trips.<sup>57</sup>
- T5 Encourage “on-demand” passenger for-hire-vehicle services to include goods movement.** Many of these vehicles are already on the road and have idle cargo capacity that could be used to eliminate existing trips. UberRush and Zipments are examples of two services that have simplified the process of requesting these on-demand movements.<sup>58</sup>
- T6 Introduce a receiver charge for deliveries.** This will encourage receivers to decrease the number of trips generated by goods movement and increase their store space to house larger inventories.<sup>59</sup>
- T7 Raise the profile of goods movement by engaging freight partnerships and networks.**<sup>60</sup> Long-term partnerships between representatives from the public and private sectors are invaluable to solving urban freight problems. Partnerships provide an opportunity for knowledge sharing and bringing together varying perspectives.

<sup>54</sup> Dablanc, Morganti and Fortin. Alternatives to home deliveries. 2015. *MetroFreight Final Report* 14-5.2a.

<sup>55</sup> Holguin-Veras et al. *Improving Freight System Performance in Metropolitan Areas: Planning Guide*. NCFRP-33, Initiative 45. 2015.

<sup>56</sup> Holguin-Veras, J., Sanchez-Diaz, I. Freight Demand Management and the Potential of Receiver-Led Consolidation programs. 2015. Working paper.

<sup>57</sup> Conway. 2015.

<sup>58</sup> Conway. 2015.

<sup>59</sup> Holguin-Veras et al. *Improving Freight System Performance in Metropolitan Areas: Planning Guide*. NCFRP-33, Initiative 43. 2015.

<sup>60</sup> Lindholm, M., Browne, M. Organising and Managing Urban Freight Partnerships. *VREF Research Brief* 4.

## Alternate Delivery Sites



Home deliveries are on the rise, but they are not necessarily the most convenient, efficient or cost effective option. Two alternatives to home deliveries are pick-up point networks (PPs) and automated parcel systems (APs) that make deliveries available 24 hours a day.

Pick-up points are typically offered at local shops such as dry cleaners, florists, gas stations, bars, etc. where consumers can receive and return deliveries. This model provides more flexible timing options for consumers who may miss deliveries while they are not home. These points also allow shippers to consolidate their deliveries, saving both time and money.

PP networks are most common in European countries. In France, PP networks are well-established – the number of PPs increased by 67% between 2008 and 2012 from 10,900 to 18,200 pickup points.<sup>61</sup> More than 20% of internet deliveries are delivered at a PP rather than at a home. There are four competing PP network providers across urban, suburban and rural areas of France – Mondial Relay, Relais Colis, Kiala and Okcup Services. The well-established, extensive network provides access to a pickup point in less than ten minutes by car or on foot to 90% of the French population.

APs, or locker banks, are typically found in shopping centers, gas stations, train stations or on the street. In London, several grocery retailers and locker bank providers (including Amazon and InPost) offer online shopping collection services in a number of Transport for London station parking lots.<sup>62</sup> All of the London Underground stations that offer these services are based in outer London so customers can collect their goods on their way home in the late afternoon or evening.

PPs and APSs could provide a more efficient means of delivery worldwide, but their success relies on a few key factors. PPs and APs depend upon customer willingness to give up the convenience of home deliveries and shift their expectations, which could be incentivized through pricing. PPs also require local shops to offer some of their space up for this program. Also, APs may necessitate additional facility costs. However, the cost may not be very significant since the consolidation of deliveries will lower costs for the shippers.

<sup>61</sup> Morganti, E., Dabanc, L., Fortin, F. (2014) Final deliveries for online shopping: the deployment of pickup point networks in urban and suburban areas. *Research in Transportation Business & Management*, vol 11, pp. 23-31.

<sup>62</sup> Transport for London. "TfL expands Click and Collect services." September 2014. Web. <http://www.tfl.gov.uk/info-for/media/press-releases/2014/september/tfl-expands-click-and-collect-services>.



# Striking a Balance: Moving Goods and People

Cities cannot survive without an effective urban goods movement system. The health of the city's economy is dependent on its ability to accommodate the movement and delivery of goods. Furthermore, the livability that most cities are striving for is directly affected by the congestion and environmental impacts of trucks, the backbone of urban freight system. To this end, cities can no longer afford to ignore freight and how it interacts with the built environment. The work conducted by the VREF Urban Freight Initiative takes a significant step towards painting a comprehensive picture of the underlying challenges cities face and developing a set of strategies to address these challenges.





- ▶ If **streets** are to be truly livable they must include space to accommodate trucks at the curb and/or on the street, and rationalize routes that match supply (truck capacity) with demand (delivery volumes). Streets have to safely serve both trucks and other users; other modes should also be considered. This includes non-motorized delivery options like cargo bikes and using technology to leverage for-hire-vehicle on-demand services like Uber.
- ▶ City zoning and **building** codes must be rethought in light of their overarching goals to reduce truck trips and congestion, improve efficiency and reduce the disruptions caused by deliveries throughout the day.
- ▶ Improving the **environment** and livability of cities requires stricter emissions standards in urban centers, a proven technique, and the exploration of other modes for deliveries. Zoning codes might also bear some scrutiny; the rise of more mixed-used neighborhoods have resulted in conflicts between established commercial and industrial uses and new residents – thoughtful changes to zoning or other mitigation measures to reduce the impact of noise and light should be explored.
- ▶ Continued innovations in **technology** should be leveraged to further increase the efficiency of urban freight systems, which will require cities and professionals to maintain flexibility so they can accommodate these rapidly developing innovations into their policies. Opportunities that technology creates for governments and industry to increase their knowledge of how goods move must be pursued in tandem with traditional evaluation tools.
- ▶ Perhaps the toughest thing to change will be **people's** behavior, especially when it requires charging them more. Pricing the frequency of customer deliveries to reflect their impact on a city's infrastructure, environment and overall livability will be very unpopular. While pricing changes will likely be resisted by leaders and the public alike, this does not mean that cities should not pursue mechanisms like congestion pricing, VMT tolling, carbon taxes, and other possible fees. Public sector participation and engagement of stakeholders, especially private sector and major institutions, can move these policies forward.

These strategies all attempt to mitigate the impacts of trucks on the urban environment or introduce more sustainable forms of goods movement. Actions that will allow trucks to shift to off-hours deliveries will reduce their numbers during the day. Strategies that increase emissions standards, encourage non-motorized deliveries, leverage technology and price our streets will reduce truck trips and truck VMT, and divert trips to other modes, all else equal. Interventions at the streets, curbs, and buildings will reduce truck delivery conflicts and their impacts on other street users.

The goods movement industry is the backbone of society; it cannot and will not disappear. No matter what, people need to receive goods to sustain their daily lifestyles. Rather than dwell on the negative externalities produced by goods movement, we need to minimize the harmful and undesirable aspects of the industry and maximize its benefits. Through a combination of rationalizing truck trips, addressing delivery costs in the price of goods and services, and rethinking the form of urban freight, a balance between moving goods and people can be found.

“ The goods movement industry is the backbone of society; it cannot and will not disappear. ”

# Summary of Strategies





