Improving Freight System Performance in Metropolitan Areas

NCFRP Report 33

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New York City Department of Transportation
HDR, Inc.
University of Westminster
Welcome
(José Holguín-Veras)
Acknowledgements

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- The team wants to thank the following individuals and groups:
  - Dr. William Rogers, Project Manager, for his guidance and support
  - The NCFRP 38 Project Panel for the insightful input provided
  - The public and private sector participants of the project workshop for providing suggestions that significantly improved the final products
  - Mr. Michael Franchini and the staff at the Capital District Transportation Committee for their thorough review of the draft Planning Guide
  - The multiple Metropolitan Planning Organizations, State Departments of Transportation, private companies, and individuals that contributed to the cases studies discussed in the Planning Guide.
Outline of Presentation

- Introduction
- Overview of public sector initiatives
- Case studies
- Closing remarks
- Questions and answers
Why do we need this guide?

- **The Good:**
  - Freight is the physical expression of the economy, *impeding freight flows = impeding the economy*
  - Between 5-10% of GDP is related to freight / logistics

- **The Bad:**
  - Freight traffic is a major consumer of resources and a major producer of externalities: pollution, noise, accidents, etc.

- **The Ugly:**
  - **Freight is good, freight traffic creates problems**
  - There are no easy solutions, no Magic Bullets → Multi-prong approaches are needed…
  - The system is complex and not well understood
  - Solutions are complex and involve multiple stakeholders
Products:
Planning Guide, Initiative Selector, and Freight Trip Generation Estimator
Project Products

- Interactive version: http://coe-sufs.org/wordpress/ncfrp33/
- Initiative Selector: http://coe-sufs.org/wordpress/InitiativeSelector/
- FTG Estimator: https://coe-sufs.org/wordpress/ncfrp33/appendix/ftg/
- Links available in the chat box...😊
Initiative Selector

- **Objectives:**
  - To provide suggestions about initiatives to consider
  - To provide a dynamic mechanism to explore the guide
  - To provide a tool that could be expanded over time

- **Limitations:**
  - The Initiative Selector is not a replacement for proper transportation decision making and planning...
  - Due to the lack of a database of documented experiences the search criteria are very general
  - Suggestions may not necessarily apply to local conditions...

- Produced in collaboration with the CoE-SUFS, see: http://coe-sufs.org/wordpress/InitiativeSelector/
Process to create the Initiative Selector

1. Characterized the various initiatives in terms of:
   1. Nature of the Problem: Congestion, Pollution, Noise, Safety
   2. Geographic Scope: Nation, State, City, Area, Corridor, Point
   3. Problem Source: Through Traffic, Urban Deliveries, Large Traffic Generators, Large Trucks...
   4. Investment required: Very High, High, Moderate, Low...
   5. Implementation time: Long, Medium, Short...
   6. Potential for unintended consequences: Very High, High, Moderate, Low, None...

2. It finds initiatives that match the search parameters
   See: http://coe-suks.org/wordpress/initiativeselector/

3. Please help us improve it by providing feedback, sending us references, pictures, etc. etc.
### Initiative 43: Voluntary Off-Hour Delivery Programs

**Description:** Programs that produce a shift of deliveries from regular hours (6:00 a.m. to 7:00 p.m.) to off hours (7:00 p.m. to 6:00 a.m.). As opposed to pricing and regulation schemes, this travel demand management initiative targets receivers as the key decision makers, seeking to convince them to accept deliveries during the less congested off hours through the use of incentives.

**Targeted mode:** Urban deliveries, large traffic generators (LTGs)  
**Geographic scope:** City, area

**Type of initiative:** Freight demand management: voluntary off-hour deliveries (OHD) program  
**Primary objective:** Reduce congestion and pollution

**Expected costs and level of effort to implement:** OHD programs require raising funds to provide incentives to receivers. Potential exists to implement a self-supported freight demand management system that uses the revenues raised by a small toll surcharge to finance the incentives. The implementation of the program—whether self-supported or not—requires a multi-layered, multi-stakeholder, collaborative approach to gain substantial business support and to accomplish a large shift to off hours.

**Advantages:**  
- Reduce congestion  
- Increase efficiency  
- Environmental sustainability  
- Improve reliability  
- Enhance livability

**Disadvantages:**  
- Low probability for unintended consequences:  
  - May increase perceived noise impact  
  - Increase operational costs  
- Require fundraising to provide the incentives  
- Require very high/high coordination among multiple stakeholders/jurisdictions

**Examples:**  
- The City of New York OHD Program, New York, New York, United States (Holguín Veras et al. 2013b; Holguín Veras et al. 2014)

![Image of delivery van in a city setting](image-url)

Source: New York City Department of Transportation

**Related alternatives:** 1. Low Noise Delivery Programs/Regulations; 2. Daytime Delivery Restrictions; 3. Daytime Delivery Bans; 4. Recognition Programs; 5. Certification Programs.
The Decision Making Process
Decision Making Process

1. Identify Root Causes of the Problem
2. Define Goals and Objectives
3. Define Performance Measures
4. Identify Potential Initiatives
5. Evaluate and Select Solution
6. Create an Action Plan
7. Implement and Monitor
8. Follow-up, Reassess and Modify
Make sure you have the facts right...
A good place to start...

- NCFRP 19 Freight Trip Generation and Land Use
  - Establishment-level models
  - Economic based models
- Far from perfect, though better than most...
- Use data publicly available (ZIP code business data)
- FTG Software available at: https://coe-sufs.org/wordpress/ncfrp33/appendix/ftg/
## Freight Trip Generation (only Freight Intensive Sectors)

<table>
<thead>
<tr>
<th>NAICS</th>
<th>Description</th>
<th>NY-North NJ-L.Isl.</th>
<th>Palm Bay-Melb...FL</th>
<th>Fargo, ND-MN</th>
<th>Lebanon, PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>44</td>
<td>Retail trade</td>
<td>39.06%</td>
<td>44.19%</td>
<td>34.85%</td>
<td>37.50%</td>
</tr>
<tr>
<td>42</td>
<td>Wholesale Trade</td>
<td>19.41%</td>
<td>11.04%</td>
<td>17.89%</td>
<td>13.57%</td>
</tr>
<tr>
<td>72</td>
<td>Accommodation / Food Services</td>
<td>15.72%</td>
<td>16.87%</td>
<td>13.97%</td>
<td>14.35%</td>
</tr>
<tr>
<td>23</td>
<td>Construction</td>
<td>11.47%</td>
<td>14.35%</td>
<td>16.14%</td>
<td>12.18%</td>
</tr>
<tr>
<td>31</td>
<td>Manufacturing</td>
<td>8.17%</td>
<td>8.80%</td>
<td>8.11%</td>
<td>15.35%</td>
</tr>
<tr>
<td>48</td>
<td>Transportation / Warehousing</td>
<td>6.16%</td>
<td>4.74%</td>
<td>9.03%</td>
<td>7.05%</td>
</tr>
</tbody>
</table>

### Total freight trip generation (FTG) for FIS
- **NY-North NJ-L.Isl.**: 1,024,477
- **Palm Bay-Melb...FL**: 25,682
- **Fargo, ND-MN**: 15,515
- **Lebanon, PA**: 10,285

### Population
- **NY-North NJ-L.Isl.**: 19,949,502
- **Palm Bay-Melb...FL**: 550,823
- **Fargo, ND-MN**: 223,490
- **Lebanon, PA**: 135,486

### Number of establishments (Total)
- **NY-North NJ-L.Isl.**: 545,197
- **Palm Bay-Melb...FL**: 13,597
- **Fargo, ND-MN**: 6,709
- **Lebanon, PA**: 4,272

### Number of establishments (FIS)
- **NY-North NJ-L.Isl.**: 235,325
- **Palm Bay-Melb...FL**: 5,893
- **Fargo, ND-MN**: 3,317
- **Lebanon, PA**: 2,185

### Employment (Total)
- **NY-North NJ-L.Isl.**: 7,568,043
- **Palm Bay-Melb...FL**: 172,925
- **Fargo, ND-MN**: 119,626
- **Lebanon, PA**: 79,543

### Employment (FIS)
- **NY-North NJ-L.Isl.**: 3,061,899
- **Palm Bay-Melb...FL**: 84,821
- **Fargo, ND-MN**: 63,186
- **Lebanon, PA**: 47,164

### Establishments (FIS)/persons
- **NY-North NJ-L.Isl.**: 0.012
- **Palm Bay-Melb...FL**: 0.011
- **Fargo, ND-MN**: 0.015
- **Lebanon, PA**: 0.016

### Employment (FIS)/persons
- **NY-North NJ-L.Isl.**: 0.153
- **Palm Bay-Melb...FL**: 0.154
- **Fargo, ND-MN**: 0.283
- **Lebanon, PA**: 0.348

### FTG/employees (all sectors)
- **NY-North NJ-L.Isl.**: 0.135
- **Palm Bay-Melb...FL**: 0.149
- **Fargo, ND-MN**: 0.130
- **Lebanon, PA**: 0.129

### FTG/employees (FIS)
- **NY-North NJ-L.Isl.**: 0.335
- **Palm Bay-Melb...FL**: 0.303
- **Fargo, ND-MN**: 0.246
- **Lebanon, PA**: 0.218

### FTG/persons
- **NY-North NJ-L.Isl.**: 0.051
- **Palm Bay-Melb...FL**: 0.047
- **Fargo, ND-MN**: 0.069
- **Lebanon, PA**: 0.076

### Average employment per establishment
- **NY-North NJ-L.Isl.**: 4.353
- **Palm Bay-Melb...FL**: 4.358
- **Fargo, ND-MN**: 4.677
- **Lebanon, PA**: 4.707

### Average employment per establishment
- **NY-North NJ-L.Isl.**: 13.011
- **Palm Bay-Melb...FL**: 14.394
- **Fargo, ND-MN**: 19.049
- **Lebanon, PA**: 21.585

### If deliveries to non-freight intensive sectors and households are included, these numbers would more than double.
FTG vs. Establishment Size

The graph compares the percent of total FTG establishment employment for different regions:
- NY-Northern NJ-Long Island
- Palm Bay-Melbourne-Titusville, FL
- Fargo, ND-MN
- Lebanon, PA
What Could the Public Sector do?
A lot, many initiatives underused, many actors...
Use infrastructure improvements to enhance freight, often necessary due to increases in truck size and traffic.
Infrastructure Management: Major

**MAJOR IMPROVEMENTS**
- Ring Roads
- New and Upgraded Infrastructure, Intermodal Terminals
- Freight Cluster Development (Freight Village)

**MINOR IMPROVEMENTS**
- Acceleration / Deceleration Lanes
- Removal of Geometric Constraints at Intersections
- Ramps for Handcarts and Forklifts

**Atlanta, Georgia DOT Ring**
Source: (Georgia Department of Transportation, 2011a)

**Southern California Intermodal Terminals, California**
Source: (The Port of Los Angeles, 2013)
Infrastructure Management: Minor

MAJOR IMPROVEMENTS
- Ring Roads
- New and Upgraded Infrastructure, Intermodal Terminals
- Freight Cluster Development (Freight Village)

MINOR IMPROVEMENTS
- Acceleration / Deceleration Lanes
- Removal of Geometric Constraints at Intersections
- Ramps for Handcarts and Forklifts

Source: (www.osha.gov)
Parking/Loading Areas Management
(Jeff Wojtowicz)
Parking/Loading Areas Management

ON-STREET PARKING AND LOADING
Freight Parking and Loading Zones
Loading and Parking Restrictions
Peak-Hour Clearways
Vehicle Parking Reservation Systems

OFF-STREET PARKING AND LOADING
Enhanced Building Codes
Timeshare of Parking Space
Upgrade Parking Areas and Loading Docks
Improved Staging Areas
Truck Stops/ Parking Outside of Metropolitan Areas

Improve the way parking is used to reduce: double parking, delivery time, conflicts with other users, etc.
Parking/Loading Area Management: On-Street

ON-STREET PARKING AND LOADING
- Freight Parking and Loading Zones
- Loading and Parking Restrictions
- Peak-Hour Clearways
- Vehicle Parking Reservation Systems

OFF-STREET PARKING AND LOADING
- Enhanced Building Codes
- Timeshare of Parking Space
- Upgrade Parking Areas and Loading Docks
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- Truck Stops/Parking Outside of Metropolitan Areas

CLEARWAYS

**Southbound clearway hours**
- 6.30-9.30am Mon-Fri except Public Holidays
- 3.30-6.30pm Sunday and Public Holidays

**Northbound clearway hours**
- 3.30-6.30pm Mon-Fri except Public Holidays
- 11.30am-2.30pm Saturday
### Parking>Loading Area Management: Off-Street

<table>
<thead>
<tr>
<th>Land use</th>
<th>Floor area</th>
<th>Minimum number of bays</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td>General</td>
<td>1/5000 m²</td>
</tr>
<tr>
<td></td>
<td>Minimum</td>
<td>1 LR</td>
</tr>
<tr>
<td>e.g., 5000 m²</td>
<td>1 HR</td>
<td></td>
</tr>
<tr>
<td>e.g., 20000 m²</td>
<td>4 HR</td>
<td></td>
</tr>
<tr>
<td>Shop</td>
<td>General</td>
<td>1/2000 m²</td>
</tr>
<tr>
<td></td>
<td>Minimum</td>
<td>1 LR</td>
</tr>
<tr>
<td>e.g., 2000 m²</td>
<td>1 HR</td>
<td></td>
</tr>
<tr>
<td>e.g., 10000 m²</td>
<td>2 HR + 3 LR</td>
<td></td>
</tr>
<tr>
<td>Supermarket</td>
<td>General</td>
<td>1/1000 m²</td>
</tr>
<tr>
<td></td>
<td>Minimum</td>
<td>1 HR</td>
</tr>
<tr>
<td>e.g., 1000 m²</td>
<td>1 HR</td>
<td></td>
</tr>
<tr>
<td>e.g., 2000 m²</td>
<td>1 A + 1 HR</td>
<td></td>
</tr>
<tr>
<td>e.g., 4000 m²</td>
<td>2 A + 2 HR</td>
<td></td>
</tr>
</tbody>
</table>

**ON-STREET PARKING AND LOADING**
- Freight Parking and Loading Zones
- Loading and Parking Restrictions
- Peak-Hour Clearways
- Vehicle Parking Reservation Systems

**OFF-STREET PARKING AND LOADING**
- Enhanced Building Codes
- Timeshare of Parking Space
- Upgrade Parking Areas and Loading Docks
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Vehicle Related Initiatives
Seek to improve environmental conditions by fostering use of technologies and practices that reduce the negative impacts related to freight vehicles.
Vehicle Related Strategies: Emissions

- Emission Standards
  - Foster the use of vehicles producing less environmental impacts

- Alternative fuels
  - Electric
  - Hybrid/Electric
  - Natural Gas (CNG and LNG)
  - Hydrogen

- Vehicle design and components
  - Stop/start idling systems
  - Aerodynamics of power units and trailers
  - Emission control retrofits
  - Low resistance tires
Vehicle Related Strategies: Noise

Sample Noise Profile of a Delivery Truck

Measured at a distance of 20'

Sound Level (dB(A))

Scrolling cart
Picking up and moving ramp
Moving cart inside
Closing back door
Closing lift

Metal Plate

Time
Vehicle Related Strategies: Noise

- Electric/alternative fuel trucks
- Low noise lift platforms
- Noise absorbing coatings
- Low noise carts
Traffic Management
Traffic Management

Define the conditions under which freight vehicles can circulate in the network

ACCESS AND VEHICLE-RELATED RESTRICTIONS
- Vehicle Size and Weight Restrictions
- Truck Routes
- Engine-Related Restrictions
- Low Emission Zones
- Load Factor Restrictions

TIME ACCESS RESTRICTIONS
- Daytime Delivery Restrictions
- Daytime Delivery Bans
- Nighttime Delivery Bans

TRAFFIC CONTROL AND LANE MANAGEMENT
- Restricted Multi-Use Lanes
- Exclusive Truck Lanes (Dedicated Truck Lanes)
- Traffic Control
Traffic Management: Access & Vehicle-Related Restrictions

- Use restriction(s) to limit access of freight vehicles to target area
- The nature of restrictions varies in terms of:
  - Vehicle: size, weight, load factor, cargo type, engine type
  - Time of travel
- Not well received by carriers, due to operational changes and higher costs
- Research has clearly shown that these restrictions could lead to counter-productive effects in terms of congestion, and pollution
Traffic Management: Access & Vehicle-Related Restrictions

- **ACCESS AND VEHICLE-RELATED RESTRICTIONS**
  - Vehicle Size and Weight Restrictions
  - Truck Routes
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- **TRAFFIC CONTROL AND LANE MANAGEMENT**
  - Restricted Multi-Use Lanes
  - Exclusive Truck Lanes
  - (Dedicated Truck Lanes)
  - Traffic Control

Image courtesy of Courtesy of TfL
Traffic Management: Time Access Restrictions

- Impose restriction(s) on the times at which freight activity can take place

- **Intent:** reduce freight traffic during the congested times of the day in specific sections of a city

- Building owners and receivers *also* impose delivery time restrictions
  - Relaxation of such delivery windows can reduce congestion spreading peak truck traffic
Examples:
Beijing, Shenzhen, and Changsha in China, and Rome, Italy

ACCESS AND VEHICLE-RELATED RESTRICTIONS
Vehicle Size and Weight Restrictions
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TRAFFIC CONTROL AND LANE MANAGEMENT
Restricted Multi-Use Lanes
Exclusive Truck Lanes
(Dedicated Truck Lanes)
Traffic Control

HOURS FOR CONTRACTORS AND MOVERS
8:30 AM - 5:00 PM
MONDAY - FRIDAY
NO HOLIDAYS
NOTE ALL CONTRACTORS ETC... MUST HAVE PROPER INSURANCE

FREIGHT ELEVATOR HOURS:
MON - FRI
8 AM - 5 PM
CLOSED FOR LUNCH
12 NOON - 1 PM
Traffic Management: Traffic Control and Lane Management

- Promote effective use of available road capacity
- Try to optimize the allocation of lane right-of-ways
- Often used to improve lane utilization, mobility, safety,
- Could reduce travel delays and improve reliability
Traffic Management: Traffic Control and Lane Management

ACCESS AND VEHICLE-RELATED RESTRICTIONS
- Vehicle Size
- Weight Restrictions
- Truck Routes
- Engine-Related Restrictions
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TRAFFIC CONTROL AND LANE MANAGEMENT
- Restricted Multi-Use Lanes
- Exclusive Truck Lanes
  (Dedicated Truck Lanes)
- Traffic Control
Pricing, Incentives, and Taxation
(José Holguín-Veras)
Use monetary signals to achieve public goals
The Fleet Operator Recognition Scheme (FORS) is a free, voluntary scheme operated by TfL. It encourages sustainable best practice for road freight operators who deliver in, and service, London or who intend to do so. FORS promotes safe working practices, legal compliance and safety of road freight operations in London.
Logistical Management
Logistical Management

Focuses on altering the way deliveries are made, from the logistical point of view

CARGO CONSOLIDATION
Urban Consolidation Centers

INTELLIGENT TRANSPORTATION SYSTEMS (ITS)
Real-Time Information Systems
Dynamic Routing
Vertical Height Detection Systems

LAST MILE DELIVERY PRACTICES
Time Slotting of Pick-Ups & Deliveries at Large Traffic Generators
Driver Training Programs
Anti-Idling Programs
Pick-up/Delivery to Alternate Locations
Logistical Management: Cargo Consolidation

Appealing concept…
though not fail-proof…
out of more than 150 trials, less than 20 are in operation
Logistical Management: ITS

Source: Iowa Department of Transportation, 2014

CARGO CONSOLIDATION
Urban Consolidation Centers

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Vertical Height Detection Systems

LAST MILE DELIVERY PRACTICES
Time Slotting of Pick-Ups & Deliveries at Large Traffic Generators
Driver Training Programs
Anti-idling Programs
Pick-up/Delivery to Alternate Locations

Source: Traffic Tech Group, 2013)
Logistical Management: Last Mile Delivery

CARGO CONSOLIDATION
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Time Slotting of Pick-Ups & Deliveries at Large Traffic Generators
Driver Training Programs
Anti-Idling Programs
Pick-up/Delivery to Alternate Locations

Source: Hong Kong Environmental Protection Department, 2011
Source: FREILOT, 2010
Demand/Land Use Management
Focuses on modifying the demand, instead of logistical activities or the traffic
Voluntary Off-Hour Delivery Program
Basic Concept

- To induce a shift to deliveries made during the off-hours (7PM to 6AM), by providing incentives to receivers for their commitment to accept off-hours deliveries (OHD)
- Purpose: reduce congestion and pollution during daytime hours

Examples:
- PierPass Program, California
- OHD, New York City
Current Status…

- More than 400 participants (+4% of food sector):
  - Sysco: 31 OHD routes/week (18% of their routes, 171) delivering to 140 unassisted off-hour delivery customers
  - Wakefern: 5 OHD routes/day (25% of their total)
  - Duane Reade: Approximately 120 of their 160 Manhattan stores receive OHD on a regular basis
  - Dunkin Donuts: 72 stores out of 121 in Manhattan
  - Beverage Works (Red Bull) has approximately 130 routes in the NY Metro, 22% are OHD
  - Waldorf Astoria

- Has led to successful pilots all over the world: Sao Paulo, Copenhagen, Brussels, with more pilots being planned: Washington, Orlando, Sydney, Stockholm…
Delivery and Servicing Plans (DSPs)

- A framework to manage freight / service trips
- Movement to and from individual buildings (including retail shops, offices etc.)
- Focus on the receivers in the supply chain
- DSPs developed in London and used in planning for the 2012 Olympic Games
- 20% reduction in freight trips!
Would it work in the US?

- Survey collected data from 248 receivers (Manhattan), and inquired about the interest on “asking your vendors to reduce the number of individual deliveries that your company receives through consolidation”

Notes: (1) NAICS 72: Accommodation / food services; NAICS 42: Wholesale trade; NAICS 44-45: Retail trade; NAICS 81: Other services; NAICS 31-33: Manufacturing; NAICS 71: Arts / entertainment / recreation; NAICS 48-49: Transportation / warehousing; NAICS 52: Finance / insurance; and, NAICS 62: Healthcare / social assistance. (2) Percentages under the NAICS code indicate the proportion in the sample.
Stakeholder Engagement (Dan Haake)
Successful implementation requires active involvement and participation of key stakeholders.
Freight Policy

- Successful implementation requires:
  - Understanding freight activity and commerce
  - Engaging private sector
  - Educating decision makers on freight logistics
  - Disseminating best practices
  - Defining an implementation path considering the concerns of all stakeholders

STAKEHOLDER ENGAGEMENT
Designate a ‘Freight-Person’ at Key Agencies
Create a Freight Advisory Committee (FAC)
Educate Elected Officials
Create a Technical Advisory Committee (TAC)
Create a Freight Quality Partnership (FQP)
Case Studies Presented in NCFRP 33

Seattle, Washington
- Freight quality partnerships
- Upgraded infrastructure
- Real-time information systems

Toledo, Ohio
- Freight quality partnerships
- Upgraded infrastructure

Los Angeles, California
- Freight quality partnerships
- Truck routes
- Upgraded infrastructure

Kansas City Region
- Freight quality partnerships
- Upgraded infrastructure

New York City, New York
- Freight parking and loading zones
- Loading and parking restrictions
- Removal of intersection constraints
- Truck routes

Atlanta, Georgia
- Daytime delivery bans
- Truck routes
Case Study #1: Toledo’s Airline Yard
Proactive Partnership and Infrastructure

- Toledo Region
- Joint Intermodal Task Force
- Reverse Public/Private Partnership
- Doubled Capacity
Case Study #2: FAST Corridor
Long-Term Success Story

- 20+ year partnership
- Versatility
- ISTEA/TEA-21
  - Changing funding environment
- Regional Thinking
- 20 of 25 projects completed
Closing Remarks
(José Holguín-Veras)
Final Thoughts

- Improving freight system performance is important
- There is a wide range of initiatives
  - There are no magic bullets, multi-prong approaches are key
  - The history is clear, traditional approaches have not reduced congestion, why do we keep using them?
  - Every situation is different, local conditions matter...
- Some under-utilized initiatives have great transformative potential, e.g., freight demand management
- The NCFRP 33 materials are an entry point...
  - Research and experimentation are needed
  - Technical training is needed to foster widespread changes
We Need to …

- Undertake a holistic transformation of supply chains, inducing changes in receivers behavior
- Manage freight demand
- Obtain fine-level detail on freight activity at the block and neighborhood level to find appropriate solutions
- Embrace collaborative approaches involving all key stakeholders, there is a space for collaboration
- Transform existing freight policy and embrace innovation in urban freight
Thanks!
Questions?

Reference Materials:
Planning Guide: PDF version
Planning Guide: Interactive version
http://coe-sufs.org/wordpress/ncfrp33/
Initiative Selector:
http://coe-sufs.org/wordpress/InitiativeSelector/
Freight Trip Generation Estimator:
https://coe-sufs.org/wordpress/ncfrp33/appendix/ftg/
Improving Freight System Performance in Metropolitan Areas
NCFRP Report 33

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