Behavior Changes, Technology, and Public-Private-Academic Partnerships to Improve Urban Congestion

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- These are some of the lead contributors:
  - NYC Dep. of Transportation
  - US Dep. of Transportation
  - NY State Energy Research and Development Agency
  - National Univ. of Colombia, Univ. of Sao Paulo, Univ. of Westminster, and the rest of CoE-SUFs partners
  - NY State Restaurant Assoc.
  - Grand Central Partnership
  - Trucking Association of NY
  - Sysco, Dunking Donuts, Duane Read, SETCESP, ANDI, DefenCarga, etc. etc.
Outline

❖ The JHV Principle
❖ The Magnitude of the Challenge and the Limits of Technology
❖ Role of Stakeholders
❖ Off-Hour Delivery (OHD) Programs
  ❖ New York City
  ❖ Sao Paulo, Brazil
  ❖ Bogotá, Colombia
❖ Overall Results
❖ Concluding comments
❖ References
The JHV principle: “Perfect” solutions to complex problems are always wrong...
Corollary #1: Congestion issues are not new...
Corollary #2: Sorry... there are no magic bullets
“On the roads which are in the city of Rome or will be within the area where will be lived joined tightly, no one is allowed after next January 1st to drive or lead a carriage during the day after sunrise and before the tenth hour of the day, except if something will have to be supplied or transported for building temples of the immortal gods or for the implementation of a work for the authorities, or as from the city or from those areas something of those things of which the demolition will be put out to tender by the authorities, will have to be removed on behalf of the authorities, and except for those cases in which it will be according to this law permitted to certain persons for certain reasons to drive or lead a carriage”.
New York City in the 1900s
Potential Solutions...

The Wonder City You
Buildings Half-Mile High and 4-Deck Streets

The amazing pictures on these two pages were drawn from suggestions made by Harvey M. Corbett, president of the Architectural League of New York. They are a vivid, graphic expression of Mr. Corbett’s mental conceptions of the typical American city of the future—the place in which most of us will live within a quarter of a century.

Unlike many other experts, Mr. Corbett does not base his pictures on the “block” or “gridiron” system of urban planning. It is the idea of a large city area that will organize motor and traffic movements. Now, during the coming century, we believe, we of this generation should have time to plan buildings and highways so as to solve the problems of housing, streets and traffic of the future.

The architect undertook the problem of the city for today and tomorrow.

Mr. Corbett says, with humorous seriousness, that the city will consist of four or many levels, respectively for pedestrians, slow motor traffic, fast motor traffic, and electric trains. The arrangement will be called the “four-level city.”

Buildings will be built at a rate of one high or many low buildings, and commercial establishments on the lower levels, and housing and amusement places on the upper. These latter will be marked by street car service and will be supported with pneumatic pipes from the center.

Though Mr. Corbett’s idea of the future city is a sort of Frank Lloyd Wright idea of the modern city of tomorrow, it is in no sense a city of tomorrow. It is inspired by a practical man and a noted architect. His ideas are worthy of a closer study. A picture of the present-day environment, with its air currents and subways, would have seemed scarcely more remarkable 50 years ago than the conception of the modern city is today.

May Live to See
May Solve Congestion Problems

How You May Live and Travel in the City of 1960

Popular Science Monthly, August 1921, p. 344.
The reality in the 1940s...

37th Street and 7th Ave, New York City, 1945
The Magnitude of the Challenge, and the Limits of Technology
Seoul, South Korea, with a generation of deliveries to HHs of 0.20 Deliveries/p-day in 2017

Chief Implication: All signs indicate that with the on-demand Internet economy, freight traffic will continue to increase.
The (Freight) Efficiency Paradox

- Light trucks and medium/ heavy trucks use 32.1% and 22.7% of transport’s energy use
- Between 1970 and 2014 energy use per vehicle-mile decreased annually by 1.4% and 0.3%, respectively, for light and medium/heavy trucks
- During the same period total freight energy used by these vehicles increased annually by 4.0% and 3.1%
- What’s going on?
Role of Stakeholders
History clearly shows that...

The public sector...

The private sector...

The community...

The academia...

...have not been able to unilaterally solve the congestion / environmental problems in urban areas...

The quest for congestion and sustainability are *Coordination Problems*, where unilateral actions not accompanied with complementary actions from others will sooner or later fail, e.g., road expansions.
Challenges To Be Overcome:

- Lack of ... trust among stakeholders
- ... of tradition of multi-stakeholder cooperation
- ... stability in public policy (political imperatives can clash with long-term collaboration)
- ... knowledge about how to change the behavior of supply chains
- ... established technical procedures to address freight related issues
- ... Decision Support Tools to quantify freight activity and estimate the effects of public sector policy
To Lift this Massive Weight We Need ...

- Public sector
- Private sector
- Research universities
- Communities
What Could Be Done?
From NCFRP Report 33 “Improving Freight System Performance in Metropolitan Areas”
Off-Hour Delivery Programs
Off-Hour Delivery Programs

GOAL: Shift to deliveries made during off-hours (7PM to 6AM)
The Prevailing Wisdom Before the Research

- Public sector view → "This is a private sector decision, we do not need to get involved"
- Private sector view → "OHD are a good idea won’t happen because the public sector won’t support it’ ... thus we should not waste our time pursuing it...
- "OHD are not workable..."
- Food/restaurant/retail sectors → "the worst candidates for OHD..."
- "Unions will be against OHD..."
- "Drivers will be against because of safety issues..."
OHD Programs Discussed

NYC, USA

Bogotá, Colombia

Sao Paulo, Brazil
CO₂ Emissions: (Day) Delivery Truck #1
The New York City OHD Experience
Key Research Findings

- The receivers are the key decision maker
- **OHD are feasible** if receivers are engaged
- Food/restaurant/retail → the most inclined to OHD
- Unions are not necessarily against... they participated
- Drivers feel safer doing OHD... (lower overall risk)
- Incentives, financial or otherwise, are needed
- About one third of receivers have Trusted Vendors
- Low noise delivery technologies / practices are needed
**Key Stakeholders...**

**Research universities** that: provide novel solutions to freight issues and a safe space for innovation; serve as a custodian of private sector confidential data, honest broker, and arbiter

**A public sector** with the power and willingness to: innovate, convene and coordinate, engage private sector, facilitate pilot testing, set the foundation for long-term collaboration

The **communities** that understand the need for behavior changes to foster sustainability of supply chains

The **private sector** that designs and operates the supply chains, provides honest input to policy makers, willing to share expertise and data to address freight issues
The Pilot Test Succeeded…

TIME magazine listed the OHD project as a “Top 10 Ideas” March 25th, 2013
Impacts
More than twice as fast
Average Service Times

More than three times as fast
Key participants (+400 companies):

- 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

These numbers represent 4% of the establishments in the accommodation/food sector in Manhattan

The plan is to reach 900 establishments ...
CO$_2$ Emissions for NYC

The graph illustrates the CO$_2$ emissions in grams as a function of distance in kilometers, with Hudson River crossings as a reference point. The graph distinguishes between different routes: OHD (Other Hudson Directions) and RHD (Riverside Hudson Directions). Each route is represented by a different line color and marker.

- **OHD routes** are shown in blue and green.
- **RHD routes** are shown in red.

The graph indicates that CO$_2$ emissions increase as the distance increases, with different trajectories for each route. The Hudson River crossings are marked at various points along the distance axis.
Impacts Beyond NYC

- FHWA created a program to foster OHD in other cities
- Successful pilot tests have taken place in several world cities, with support of academic partners:
  - London, England (University of Westminster)
  - Sao Paulo, Brazil (University of Sao Paulo)
  - Bogota, Cali, Medellin, Bucaramanga, ... Colombia (National University of Colombia)
  - Brussels, Belgium (Free University of Brussels)
  - Stockholm, Sweden (Royal Institute of Technology)
  and the list keeps growing...
International Experiences
To Foster OHD

- The CoE-SUFS partners organized workshops in different cities and countries

- Main intent:
  - To bring the public and private sector together
  - To show both sides what could be accomplished by public-private-academic collaboration
  - To discuss their perspectives about the issues
  - Quite frequently, the workshops were the first time public and private sectors met to constructively discuss issues
Workshops

Sao Paulo, Brazil

Bogotá, Colombia

Bogotá, Colombia
Sao Paulo, Brazil

Slides courtesy of Professor Hugo Yoshizaki, CISLOG, University of Sao Paulo
São Paulo Off-hour Deliveries (OHD) Project

- Pilot test area – 11km²
  - Inside truck ban cordon
  - Mixed land use
  - Some large traffic generators

- Receivers
  - All volunteer companies
  - 11 companies, 45 stores
  - 60+ delivery route shadowing's

First large collaboration project between the traffic authority and private sector regarding freight transportation: SETCESP carrier syndicate and IDV (institute for development of retail).
Travel Speeds

Hourly speeds - October/2014
km/h

3 x faster

2 x faster

Source: CISLOG 2015
Bogotá, Colombia

Slides courtesy of Professor Wilson Adarme, Grupo SEPRO, National University of Colombia
Background

Why were the zones (UPZ) chosen

1. Commercial and industrial concentration

2. Public space invasion

3. Congested roads

4. Unrestricted vehicle circulation as well as loading/unloading activities

5. Variety of the type of establishments and supply chains

2,100 establishments
54% commerce
17% services
11% industry
18% Others

6,236 establishments
43% commerce
23% services
20% industry
14% Others

* Cargo vehicle attraction rate/day in commercial establishments.

* UPZ PUENTE ARANDA

* UPZ ZONA INDUSTRIAL

TASA_DIA

0.096558 - 0.984000
0.984001 - 1.914850
1.914851 - 3.112390
3.112391 - 4.493398
4.493399 - 6.383091
6.383092 - 8.290467
8.290468 - 13.234639
13.234637 - 18.965056
18.965057 - 26.490800
26.490801 - 40.146940
40.146941 - 53.557307
53.557308 - 75.022871
75.022872 - 112.061074
112.061075 - 181.850728
181.850729 - 314.555605
Participants

Convenience sample

The pilot was implemented by:

Voluntary participation

17 participants: generators, receivers and freight carriers

- More than 3 workshops with companies in the sector
- Bulk mail to 690 companies
- Personalized letters delivered by certified mail to 20 strategic enterprises
- More than 20 scheduled visits to companies in the UPZ Puente Aranda.
Example of vehicle tracking

Measurement equipment: GPS
Night tour 21:00-03:00
The average savings on travel costs was **32%** by comparing daytime vs. night-time operations.
Overall Results
## Emission and Cost Reductions

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<th>City\Pollutant</th>
<th>ROG</th>
<th>TOG</th>
<th>CO</th>
<th>CO2</th>
<th>NOX</th>
<th>PM10</th>
<th>PM25</th>
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<tbody>
<tr>
<td>Bogotá</td>
<td>13.49%</td>
<td>13.49%</td>
<td>13.50%</td>
<td>13.12%</td>
<td>12.70%</td>
<td>13.41%</td>
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<tr>
<td>Sao Paulo</td>
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<td>42.52%</td>
<td>44.64%</td>
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**Partial OHD (6PM to 10PM)**

**In addition, cost reductions in the range of 30-55%**

**Full OHD (7PM to 6AM)**
Global Impacts
Lessons Learned
Lesson #1: Multi-Stakeholder Collaboration is Critical
- Without the participation of all, the project falls apart
- Academic institutions are essential as arbiters, honest brokers, that could bridge the existing divides between public and private sector
- Both public and private sector recognize the role of academic institutions

Lesson #2: Patience is Needed
- Not possible to rush things...
- Need to move forward at the speed of the slowest partner...
- Be ready for setbacks... keep moving
About the Impacts

Lesson #3: Similarities between pilots
- Public and private sector attitude toward OHD (before pilot)
- The role of inertia in the system
- Cost savings in the range of 30-55%
- Public and private sector attitude toward OHD (after pilot)

Lesson #4: Sophisticated freight policies are not exclusive to developed countries
- Many professionals assumed that OHD would only work in developed countries → The “exceptionalism” of NYC
- Sao Paulo’s and Bogotá’s efforts shattered this idea

Lesson #5: Successful pilots create momentum
- In all these cities, OHD has grown on its own (though not as fast as we want...) keep pushing...
Lesson #6: Implementing OHD is getting easier and easier... the power of example

- The first NYC OHD pilot in 2009 (35 participants) took two years of very hard effort ... The second NYC round involved 400 participants in about the same time (2 years)
- Sao Paulo and Bogotá, in a matter of months, put together pilots of similar size to the initial effort in NYC
- Successful pilots conducted in four other Colombian cities
- Constancy of efforts pays off...

Lesson #7: OHD without incentives have limits...

- Sao Paulo and Bogotá demonstrated that it is possible to induce OHD without incentives → however, there is a limit
- Exploiting the full potential of OHD requires the use of incentives and/or complementary policies to foster change
References
About Freight Trip Generation
Urban Freight Policy and Management

- 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/
Thanks!

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