3rd VREF Conference on Urban Freight
Designing urban space and managing flows - the importance of freight for liveable cities

Current issues influencing urban freight research
Gothenburg, 17 October 2018

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- **Opening session**
- **Coffee break**
- **Lunch**
- **Poster session**
- **Coffee break**
- **Closing session**
Session 1 (09:15 – 10:30)

1-A Cargo bikes (Chair: Alison Conway)
41 Analysing efficiency and financial viability of cargo bike operations
   Tale Ørving*, Karin Fossheim, Christian Weber, Jardar Andersen
50 Between cargo cycles and delivery vans: size matters!
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96 The drivers for the development of the cargo-bikes-based delivering systems for the small and medium size cities
   Kinga Kijewska, Stanislaw Iwan*, Clemens Weiss, Udo Onnen-Weber, Mariusz Nürnberg

1-B Shared economy and logistics business innovations (Chair: Laetitia Dablanc)
53 A joint demand and supply chain characterization for school canteen urban distribution in Sweden
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44 Green Crowdshipping: a new collaborative economy service for urban logistics
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67 On-Demand Instant Deliveries: New Questions for Cities
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   Reinhold Schodl*, Sandra Eitler*, Bernhard Ennser, Jürgen Schrampf, Gerda Hartmann, Sandro Bell
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1-D FTG modeling (Chair: Carlos Gonzales-Calderon)
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82 An assessment of multiple freight trip generation modelling approaches
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104 Freight Trip Generation: An experience from Indian Cities
   Gopal Patil

1-E Governance (Chair: Giuseppe Luppino)
49 Barriers in governance of construction logistics
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59 Co-creating space for sustainable urban freight services: the case of brown-field development for urban consolidation centers
   Jon Williamsson*, Anders Sandoff
91 Chances for successful transfer – Evaluation Methods for innovative urban freight solutions
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**2-A Business models** (Chair: Walther Ploos van Amstel)

1. New business models for tackling the last-mile problem in central London  

42. Scalable Business Models for Light Electric Freight Vehicles  
   *Martin Boerema*, Walther Ploos van Amstel, Susanne Balm

63. Sustainable business models for urban waterway transport of goods and waste  
   *Martin Svanberg*, Sönke Behrends, Jon Williamsson

**2-B Digitalisation for freight** (Chair: Jonas Flodén)

79. Improving freight efficiency with load matching technology  
   *Seiji Steimetz, Tyler Reeb, Thomas O’Brien*, Ahmed Mohammed

92. Home-Based Delivery Supply Chains: The Digitalization Paradigm  
   *Jean-Paul Rodrigue*

95. Information asymmetry in urban freight transport of dangerous goods  
   *Jonas Flodén*, Johan Woxenius

**2-C Intermodal transportation** (Chair: Peter Hall)

5. A module-based approach to land-use efficiency of urban rail-road freight terminals  
   *Tobias Fumasoli*

51. Where to open maritime containers  
   *Yann Bouchery*, Rickard Bergqvist, Johan Woxenius

60. Governance of port container drayage: a global typology and analysis  
   *Peter Hall*, Tom O’Brien

**2-D Modeling and Simulations** (Chair: Lóri Tavasszy)

19. Agent-based simulation of urban freight flows based on carrier microdata  
   *Michiel de Bok*, Lóri Tavasszy, Mathijs Jacobs

22. An Agent-based Model of Freight Transportation with Emerging Trends in POLARIS  
   *Monique Stinson*, Josh Auld, Abolfazl (Kouros) Mohammadian

94. Truck Lane Modeling and Simulation along a Major Corridor in Metro Manila  
   *Alexis Fillone*

**2-E Planning & policy 1** (Chair: Kelly Pitera)

10. Tools to Facilitate Implementation of Effective Metropolitan Freight Transportation Strategies  
   *Bill Eisele*

46. Mapping deliverability for goods transport. Can the ABC-method be adapted for city logistics?  
   *Yngve Frøyen*, Astrid Bjørgen, Kelly Pitera, Tor Medalen, Odd Andre Hjelkrem

65. Sustainable urban logistics plan: implementation guidelines  
   *Georgia Aifadopoulou, Elpida Xenou*, Maria Rodrigues, Stefano Dondi

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3-A The use of pick-up points for e-commerce (Chair: Ceren Altuntas Vural)

11 Collection and Delivery Points in E-Retailing: A Solution to the Last Mile Delivery Problem
Çağlar Aktepe, Ceren Altuntas Vural*

18 The urban layer of e-commerce deliveries: the proliferation of CDPs
Joris Beckers*

29 How can omnichannel retailers create an attractive and sustainable last mile offer?
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Seckin Ozkul*

89 Strategic Route Planning of Truck Traffic in Metro Manila
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71 Shopping, freight deliveries, and urban form
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Adeline Heitz*

3-D Off-hour deliveries (Chair: Ivan Sanchez-Diaz)

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83 Hybrid Monte Carlo and continuous approximation approach to evaluate Off-Hours Deliveries alternatives in the City of São Paulo, Brazil
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90 The wrong side of the tracks: quantifying barrier effects of transport infrastructure on local accessibility
Job van Eldijk*, Sönke Behrends

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**4-A Final 50 feet (Chair: Barbara Ivanov)**

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   Haena Kim*, Barb Ivanov, Anne Goodchild

25 Understanding the use of the curb space and alley for unloading and loading operations: A Seattle Case Study  
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43 E-grocery in Sweden: energy efficient last mile distribution?  
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87 E-grocery of tomorrow – home delivery of food between profitability, customer acceptance and ecological footprint  
   Christoph von Viebahn, Maik Trott*, Hai Mi Ngo

**4-C Logistics sprawl (Chair: Mathieu Gardrat)**

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3. The need for improved information flow to address safety in urban construction site deliveries  
  Lisa Hannasvik*, Petr Pokorny*, Kelly Pitera*

7. Urban Freight Consolidation and the Public Interest: Understanding Stakeholder Motivations  
  Matthew Reiter*

14. Exploring the application of urban form profiles in freight trip generation  
  Jorge Gil*, Iván Sánchez-Díaz

23. One City - Cargobikes in Rotterdam  
  Robin van der Ree*, Tim Sjouke, Fenno Visser, Fred Hoogendoorn, Rik van Lonkhuizen

27. Assessment of collection points in Gdansk on the availability of mobility alternatives to the car  
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31. An Assessment of Competitiveness of Electric Trucks in City Logistics  
  Ali Gul Qureshi, Eiichi Taniguchi*

47. How cities' policies and changes in demand pattern may affect urban mobility planning  
  Astrid Bjørgen*, Odd Andre Hjelkrem, Kelly Pitera, Yngve Freyen

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61. Vulnerability & Resilience Analysis of Food Truck Distribution Routes in New York City  
  Sandeep Mudigonda, Camille Kamga*, Alison Conway*, Charles Ukegbu, Patricio Vicuna, Rodrigue Tchamna

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  Dan Wan, Camille Kamga*, Alison Conway, Sandeep Mudigonda, Charles Ukegbu, Patricio Vicuna

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  Georgia Ayfadopoulou, Elpida Xenou*, Efthia Nathanail, Lambros Mitropoulos, Leonida Parodos

70. Modelling and urban last-mile pick-up and delivery network for e-commerce  
  Iván Cárdenas*, Iván Sánchez-Díaz

73. Estimating the direct and indirect impacts of off-hours deliveries – Exploratory results from the City of Lyon, France  
  Adrien Beziat*

74. Influence of service trips on the demand for parking space  
  Carlos A. Gonzalez-Calderon, John Jairo Posada-Henao, Diana Patricia Moreno-Palacio, Natalia del Carmen Espitia Pereira, Ricardo Quintero-Giraldo*

75. Freight trips generated by large buildings: an empirical investigation  
  Francisco Javier Maña-Hernández*, Carlos A. Gonzalez-Calderon, John Jairo Posada-Henao

77. Effects of on-line shopping on freight transport in developing countries  
  Natalia Espitia-Pereira, Carlos A. Gonzalez-Calderon*, John Jairo Posada-Henao

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78 Trucks bans in cities due to emissions: are they efficient?  
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85 Contending with the impacts of e-commerce through city logistics strategies  
Miguel Jaller*, Anmol Pahwa

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100 Modeling the last mile delivery: a case study on foods delivery in Paris city  
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101 Estimating the impacts of a sustainable electric cargo-bike implementation in Amsterdam  
Stefan Talen*

103 Freight transport decisions and their considerations in the Southern African Development Community (SADC)  
Abisai Konstantinus*
New business models for tackling the last-mile problem in central London


Purpose
Freight transport currently accounts for just over around 15% of all road vehicle activity in London and is a major consumer of fossil fuels and contributor to CO2 and air pollution. However, the European Commission has a vision of largely CO2-free logistics systems operating in urban centres by 2030. Vans (up to and including 3.5 tonnes gross weight) account for about three-quarters of this road freight vehicle activity in London. Van traffic is forecast to continue to grow by a further 20% in London by 2030 as a result of factors including increasing population, growing demand for online retailing and last-mile delivery services, the rise of the service-based economy, and logistics sprawl with warehouses relocated to the edge of the urban area as a result of rising land values leading to longer vehicle journeys. With these forecast increases in road freight traffic, together with the continued road and kerbside space capacity for freight vehicles in London due to reallocation to bicycles and buses, and the relatively slow uptake of alternatively-fuelled vehicles, more innovative strategies focused on freight and logistics operations are needed to reduce freight vehicle activity and its impacts in London and other British cities.

Research Approach
The project is using central London as its geographical focus for detailed survey work and analysis. The parcel delivery sector has been selected for specific study given the intensity of its operations in central London, and the growth and change in parcel sector operations as a result of its role in providing the last-mile deliveries resulting from the rapid increase in ecommerce and online shopping. This research has made use of a wide range of research techniques for data collection (via surveyor fieldwork, GPS data capture, company operating manifests, and video, interviews, and focus groups).

Findings and Originality
Unlike many other sectors, the freight industry has few barriers to new entrants and is a highly competitive marketplace characterised by low-profit margins and a proliferation of operators. Due to the fierce competition that exists, these carriers traditionally operate in isolation of each other with poor vehicle utilisation rates and delivery rounds that overlap, leading to increased traffic congestion, pollution, and transport energy consumption. As a part of the Freight Traffic Control (FTC) 2050 project (funded by the UK Engineering and Physical Sciences Research Council), we investigate the energy demands of various innovative business models transforming the last-mile urban freight operations. The time horizons being considered range from what can be done now through to longer-term possibilities.

Research Impact
Results from the research into, and data analysis, of novel approaches to vehicle routing, the deployment of walking porters to make final deliveries to commercial and residential
buildings, and operational collaboration between parcel carriers will be presented. Reference will be made to the transport and energy saving and operating cost implications of the various solutions investigated.

**Practical Impact**
The paper will present the scope for new business models based on operational change in last-mile parcel deliveries both within individual parcel carriers, and between these carriers through closer operational collaboration that can offer the potential to reduce urban traffic and energy demand whilst still maintaining customer service levels. The benefits of such approaches to both private companies and city authorities and residents will be considered.

**Keywords**— city logistics, collaboration, energy efficiency, porters, last-mile.
Stakeholders’ viewpoint on the integration of urban distribution centers and freight villages in Palmas, Brazil

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Purpose
We intend to assess the stakeholders’ perception regarding the integration of an urban distribution center (UDC) and a freight village (FV). The location of the UDC is a key factor for the effectiveness of this city logistics solution. Also, we consider that the freight villages have characteristics that make the integration with an UDC desirable, improving the efficiency and efficacy of urban freight transport.

Research Approach
We adopted the qualitative-quantitative approach. We used the Analytic Hierarchy Process (AHP) multicriteria method. The criteria concerns factors that highlight differences among the results achieved from two scenarios: (i) the integration of UDCs with FVs; and (ii) the disperse location and operation of these facilities. The assessment of these scenarios involves the analysis of operational and infrastructure criteria to identify compatibility and requirements aspects, from stakeholders’ viewpoints. The main question is: ‘Despite the increase in distance, does the integration of UDCs and FVs bring positive advantages to the supply chain concerning stakeholders’ perception?’ The criteria are cost, impacts, delivery time, intermodal transport, and service quality. We inquired the opinion of experts (logistics experts and academics in Brazil), carriers (managers of distribution centers and logistics operators in Palmas), and government (municipal and state departments of transportation).

Findings and Originality
The results allow comparing the degree of importance of each criterion from each stakeholder’s viewpoint. Government, carriers, and experts considered the relevance of the criteria for the location of a UDC under different aspects, which are consistent with individual interests identified in the literature. For the government, the impact is the most important attribute. For carriers and experts, the cost is the most important criterion. Additionally, the players did not consider intermodality as an important issue.

Research Impact
Our motivation for this analysis came from Stathopoulos et al. (2011, p. 95): ‘to ensure the performance of freight policy strategies, there is a need to investigate in depth the preferences of various stakeholder types and to relate the findings to the characteristics of the actor, urban context and goods transported’. It is important to highlight that the integration of urban and regional freight transport is neglected in transport surveys, and in regional master planning. Therefore, this paper contributes to future studies that analyze this integration in the Brazilian context. The literature review indicates that, although the assessment of the actual integration of UDCs and FVs has been developed in operational basis,
the integration has not been investigated yet from the stakeholders’ point of view. This paper brings a contribution from the usage of a multicriteria model for this assessment.

Practical Impact

The results reinforce the need for dialogue and participation of the several stakeholders in the decision-making processes of city logistics solutions. Also, if the public government would like to integrate freight villages with UDCs, the location and operational aspects need to be considered in the process. The UDC integrated into a freight village is not simply a good proposal. This solution needs efficiency and feasibility assessment to mitigate urban freight transport externalities and enhance the effectiveness.
3 The need for improved information flow to address safety in urban construction site deliveries

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Purpose
It is challenging to design and operate construction sites within space-constrained urban areas. Construction sites are often located in close proximity to public streets and roads with high traffic volumes, mixed with vulnerable road users. Truck appearances generated by construction sites inject temporary accident risk into the urban areas, as urban roads are not primarily designed for trucks, and the truck drivers might not be familiar with local conditions. This results in safety challenges for the project owner, construction and transport companies, and their drivers. By Norwegian law, project owners and construction companies are obliged to conduct a risk assessment of the site. However, such assessment rarely includes traffic safety outside of the site. Therefore, the objective of this research is to gain a better understanding of the safety considerations associated with deliveries to construction sites. Particularly of interest is the information flow between stakeholders involved in construction site operations, concerning the site-specific access and loading information that truck drivers receive when delivering to construction sites. Based on the findings, recommendations will be suggested to improve the flow of necessary information for improved safety while delivering to sites.

Research approach
The qualitative research approach consists of in-depth interviews. The first set of interviews was conducted with six truck drivers and five company managers. Interviews were audio-recorded and summarized to identify safety problems and barriers in the safety information flow regarding access and on-site driving and loading. Based on the findings from these interviews, several construction site managers and project owners will be interviewed to gather their insights on findings identified in the first set of interviews, as well as to gather more data regarding the information flow.

Findings and originality
The preliminary findings from the first set of interviews show that the drivers rarely receive more information than what and where to deliver, and often with little advanced notice, making it challenging for them to plan their next deliveries. Yet, most drivers stated that the site’s address was sufficient to conduct a safe delivery. Most of the interviewed company managers considered the courses required by law and having a driver’s license as sufficient for the safety. Despite the interviewees’ general agreement that the status quo was “good enough”, areas for improvement were identified. For example, plans showing where to enter and unload at delivery sites was pointed out by drivers as missing and desired information. Additionally, one transport manager highlighted that providing specific safety-related information regarding particular sites and/or routes is beneficial to drivers. However, providing too much information could make it challenging for the drivers to remember specific information.
Research and practical impact
Recommendations regarding the information flow, which address delivery safety, will be suggested, ranging from simple actions feasible at every construction site to more resource demanding measures feasible in larger projects. While the study is focused on urban construction operations, the results could also be applied to other urban delivery operations.
Key attributes for successful user involvement in collaborative urban freight planning

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Purpose
The participation of urban freight stakeholders in transport planning processes has been marginal even though these policy measures often are subject to controversies within the urban community (Lindenau & Böhler-Baederker, 2014). Including relevant industry stakeholders are particularly important in urban freight since their working conditions and the impact of externalities of these activities are influenced by priorities in urban planning. In other words, getting urban freight stakeholders to climb the ladder of citizen participation in urban mobility planning is crucial (Arnstein, 1969). Involvement of stakeholders in planning is often referred to as collaborative planning. This shared decision-making delegates the responsibility for planning directly to stakeholders. To make this an effective model for urban freight planning, working through negotiation phases towards agreed solutions, there is a need to improve the dialog and user participation. The variety of stakeholder groups, the private nature of these activities and the complex societal problems which cities are facing has made the collaborative planning approach important. However, there is limited knowledge on which factors that result in successful processes and the preconditions necessary for a positive outcome (Gunton & Day, 2003). Thus, the purpose of this paper is to identify the key attributes that determine successful user involvement in collaborative urban freight planning.

Research Approach
To answer this, we apply an explanatory sequential mixed method design where quantitative survey data from urban freight stakeholders guides observations in workshops and planning meetings performed in five different Norwegian cities.

Findings and Originality
Combining the empirical data with literature and theories on participation and collaborative planning we contribute with knowledge about involvement and user participation in urban freight planning integrating public and private stakeholders. Preliminary we find that the key determinants for successful collaborative planning are: 1) stakeholder commitment, 2) representation, 3) accountability, 4) policy and planning foundation and 5) management.

Research Impact
These findings enrich planning theory in terms of how to further develop the collaborative planning approach in policy areas with a private nature but where the public sector is a key facilitator. It can also contribute with general knowledge on how to combine different elements and perspectives of urban planning achieving comprehensive and sustainable plans integrating infrastructure investment with land use, transport and mobility.

Practical Impact
The results, on how to perform collaborative and comprehensive planning, will provide valuable insights to public sector on how to organise stakeholder participation when developing sustainable urban freight plans (SULP). This knowledge is valuable as local
authorities often lack knowledge on incorporating urban freight issues in their urban mobility planning.

References


A module-based approach to land-use efficiency of urban rail–road freight terminals

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Purpose
As cities grow denser and larger, governments – local, regional and national – often express an interest in shifting freight to rail. Intermodal freight transport is considered to mitigate some of the problems freight transport contributes to, such as congestion, greenhouse gas emissions and noise.

Freight terminals have a pivotal role in intermodal urban freight transport. Limited land resources and a sensitive urban environment demand high land-use efficiency. Pressure from residential and business developments along railway corridors limits railway access. For urban planners, the performance and dimensions of urban freight terminals pose a problem. Very detailed planning is required to properly dimension a terminal and evaluate its impacts. Most planning departments, however, neither have specialized personnel, nor are willing to bear planning costs for in-depth studies.

While literature offers some key figures to roughly estimate the land-use efficiency of rail–road transhipment in containerized transport, the transhipment of non-containerized (“conventional”) goods is mostly left without. The biggest part of urban freight transport however concerns cargo types other than containers.

The purpose of the project was to create a method providing planners with key figures to estimate the performance and land-use of rail–road freight terminals. This should allow planners to easily assess the suitability of potential terminal areas in early planning stages, limiting planning efforts.

Research Approach
The approach is based on the design of standardized terminal modules. The processes of a range of freight handling devices for different commodities are analysed. Dimensions and performance are calculated from the technical properties of the systems considered. Operational performance is derived through an analogy with container transhipment.

Findings and Originality
Preliminary performance calculations show that annual terminal throughput can reach approximately 160 000 to 250 000 tonnes per hectare for (heavy) dry bulk and 38 000 to 48 000 tonnes per hectare for (palletized) light goods. Assuming total freight generation of approximately 30 tonnes per year per inhabitant, the shift of 5% of freight to rail would require approximately 0.05 to 0.90 square metres of terminal area per inhabitant, depending on commodity and terminal type.

Research Impact
In order to get reliable inputs for the performance calculation, comprehensive studies on conventional freight terminals are needed. Conventional terminals are more diverse and mostly smaller than intermodal container terminals and, in many cases, transhipment is only the “side-product” of other logistics operations (e.g. storage). This makes it difficult to obtain large standardized datasets on transhipment processes.
Practical Impact

The availability of reliable and simple dimensioning guidelines for (urban) freight terminals would undoubtedly facilitate the work of urban planners confronted with the subject. It would also provide policy makers with the basis to legitimate the safeguarding of areas potentially suited for urban freight.
Strategies for managing urban goods movement: striking a balance between sustainability and livability

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Purpose
An emergent global movement is revitalizing downtown urban cores through urban planning. Communities, politicians, practitioners, and academics alike are focused on ways to improve urban life, often reprogramming urban space towards non-automotive uses. These efforts have created places that emphasize urban vitality and facilitate a multitude of roadway and roadside infrastructure uses, however the needs of the freight industry have consistently been left unaccounted for. Additionally, freight planning efforts have not been well coordinated with those of other city and regional processes. In the U.S., the last two federal transportation bills have begun to change this, with the FAST Act mandating freight planning at the regional level (Mica 2012; Davis 2015).

This research identifies urban freight planning strategies and best practices from a global literature review, explores their technical feasibility and political viability, examines the resulting tradeoffs between sustainability and livability goals using conflicts theory and extensive stakeholder interviews, and suggests a new methodology for inclusive freight planning at the regional and local levels.

Research Approach
In a 2004 paper, Godschalk dissected the expectation that contemporary planning deliver both sustainable development and livable communities, building upon work by Campbell (1996).

These six conflicts (development, property, resource, growth management, green cities, and gentrification) provide a backdrop for examining the ways in which certain policies or plans favor one set of actors over another. This research applies the sustainability-livability conflicts framework with a specific focus on urban goods movement programs.

Findings and Originality
Stakeholder interviews demonstrated the existence of sustainability and livability conflicts with respect to urban freight planning, however respondents had difficulty articulating them. Using the ranking methodology (developed as part of the research), respondents were provided with a clear picture of the conflicts trade-offs arising from the application of each strategy. The methodology further identified stakeholder groups that might be adversely or beneficially affected by a strategy, indicating whom to include in the planning processes.

All respondents acknowledged the need for better infrastructure management, and supported more coordinated efforts between the public and private sector. Interestingly, there was marked support for pricing strategies from planners and industry representatives as well; industry representatives favored strategies that raised more funding for roadway maintenance.
Research Impact and Practical Impact

The most recent Federal Highway Administration (FHWA) statistics estimate that medium- and heavy-duty vehicles account for ~9 percent of vehicle-miles traveled, while contributing nearly double that share towards emissions (USDOT 2016). Additionally, due to data aggregation, many smaller delivery vehicles are included with passenger cars in such statistics. Without information on these vehicles, it is hard to know the full extent of impacts from freight movements; as a result it is likely that estimates of vehicle miles-traveled (VMT) and emissions at the national scale are conservative/underestimates.

Lack of publicly available data was a concern shared by all respondents. New methods to collect, process, and analyze data on freight flows—particularly of light-duty vehicles in cities—are needed to delve deeper into the quantitative impacts (e.g., emissions, health outcomes, accessibility, etc.) of different urban goods management strategies; this will require coordination amongst academia, practitioners, the private sector, and communities alike.

References


1For smaller vehicles, FHWA aggregates its statistics by axle length, and as a result many of the smaller delivery vans that increasingly operate within cities are grouped with passenger vehicles, thus omitted from the medium- and heavy-duty vehicle numbers.
Urban Freight Consolidation and the Public Interest: Understanding Stakeholder Motivations

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Purpose
This study seeks to understand when and why localized freight consolidation is an effective strategy to reduce externalities like traffic congestion, noise, air pollution, and safety conflicts. In particular, it considers the collection and delivery point (CDP) strategy, wherein small local deliveries are shipped to a dedicated handling facility. Customers then retrieve items at their convenience, or a small vehicle makes local deliveries on a predictable schedule.

CDP is anticipated to reduce total truck travel, thus reducing traffic congestion and air quality impacts. A number of cities—especially in Europe—have implemented pilot programs that reduced total VMT and overall emissions. Simulation studies have demonstrated similar results; this suggests that consolidation offers significant potential for improved environmental outcomes. However, CDPs have not been widely adopted in the US.

Research Approach
This report examines the interests of different urban freight stakeholders to better understand why conflicts arise and how a CDP might successfully be implemented. An extensive literature review is supplemented by interviews with logistics and facilities management professionals to identify key factors influencing patterns of urban freight flows.

Findings and Originality
Relevant stakeholders and their primary motivations included the following:
- Suppliers and shipping companies optimize delivery schedules according to financial incentives.
- Individual online shoppers value schedule convenience and parcel security when choosing delivery options.
- Local retailers desire predictability of operations, including for their deliveries. They also seek to compete with larger firms’ supply chain capabilities.
- The public sector, including cities and MPOs, works to mitigate negative social impacts and must align incentives for other stakeholders.

All of these actors would benefit from improved freight operations and reduced externalities, but such benefits are unpredictable and widely dispersed, while the costs are likely to be borne by a few stakeholders. Reduced emissions and traffic congestion are valued, but these are not primary motivations.

Research Impact
Due to disparate interests among freight stakeholders, action can be difficult to coordinate. This report identifies key characteristics of possible CPD implementations, including whether the facility is:
- Positioned upstream or downstream within the value chain
- Located near or far from the end customer
- Built at a large or small scale
- Oriented toward commercial or residential clients
- Publicly or privately owned and operated
Practical Impact

The emergence of real-time apps, the potential for increased automation of freight handling, as well as the growth of services like Amazon’s Locker Delivery, suggest that the local delivery landscape is likely to evolve rapidly, with important implications for urban livability and environmental sustainability. This research highlights the potential difficulty in coordinating diverse interests and proposes the broad outlines of a potentially viable program. Cities should proactively plan and zone for freight, and should generally commit financial resources as well. This report advocates that cities partner with business improvement districts, as such entities are most likely to see tangible benefits from consolidation. Where feasible, a local university could be in charge of operational data as a way to alleviate businesses’ privacy concerns.
Identifying conflicts and regulations which prevent good solutions for delivery of goods

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Purpose
The purpose of the study is to reveal conflicts and regulations which prevents good solutions for delivery of goods. Today’s city distribution is characterized by different interests, unclear regulations and few comprehensive solutions. By identifying and analyzing conflicts within different kind of urban projects, the paper intends to improve the conditions regarding finding good solutions for delivery of goods in the future.

Research Approach
The paper is a result of both quantitative and qualitative studies, completed in two different parts. The first part included a quantitative review of 15 urban projects by Norconsult AS, where the project group analyzed the development, process and solution of each project, regarding to delivery of goods. The main goal was to identify differences and similarities within the dataset, which may reveal patterns between the projects. In part two, five of these projects were chosen for an extensive and more broader study, where interview was used as a qualitative method.

Findings and Originality
- Most of the studied projects have discussed delivery of goods during the project period, with different priority and focus for each project. The key factors relate to:
  - Using external expertise during the project period
  - Clear ambitions from the project owner
  - Delivery of goods has the same priority as other urban topics, like parking, bicycles and pedestrians.
- Many of the projects struggle to define acceptable and sufficient analysis and/or solutions for delivery of goods, related to what kind of level the project is compiled for. Today’s standards make few connections between level of detail and solution, and its up to each project to interpret this into their work.
- Logistic areas are rarely dealt with in urban plans and are often being displaced to residual spaces outside of the study area as a “quick-fix”. This leads to series of disclaimers handling urban distribution, and the topic falls between two stools.
- There is a lack of compliance between standards referring to urban distribution, often presenting different measurements, values and principles for logistic areas. This makes is harder to agree upon unambiguous solutions.

Research Impact
The research is a part of the City logistics program lead by Statens vegvesen in Norway. The program intends to contribute to more attractive cities, with lower CO2-emissions, more efficient transport and increased quality of life for its inhabitants. This research is an input to the work improving the conditions and regulations which instruct the whole system of city distribution and delivery of goods. By improving the conditions, we will be able to create
common success factors for future projects and by that strengthen the topic in urban planning.

Practical Impact
The study shows that the conflicts and regulations which prevents good solutions for delivery of goods are complex and composed. Although today’s standards differ in some topics, the status of urban distribution within the projects is the main challenge. To improve the conditions for urban distributions, the study refers to two focus areas:

1. Develop unifying and unambiguous standards, which area flexible and easy to use.
2. Change the policy for how urban distribution is priorities, making the topic equal to other urban topics.
10 Tools to Facilitate Implementation of Effective Metropolitan Freight Transportation Strategies

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Purpose
Growing metropolitan areas frequently encounter challenges related to the movement of freight. Freight transportation professionals often seek effective practices and technologies to address top priority freight issues in the metropolitan setting. While research is available regarding metropolitan freight strategies to address these challenges, there is limited research relating to the identification of facilitators, barriers or recommendations to accelerate the implementation of metropolitan freight transportation solutions.

This presentation (no paper) discusses the results of National Cooperative Highway Research Program (NCHRP) Project 08-106 entitled, “Metropolitan Freight Transportation: Implementing Effective Strategies.” By the time of the conference, researchers will have completed this research, and the research deliverables will likely be in press for publication.

Research Approach
NCHRP project 08-106 had the objective to provide practitioners with implementation guidance, by identifying possible strategies for specific user-defined problems, based on adjustable default factor weights of facilitators and barriers, drawn from industry input. For this purpose, the project developed a user-friendly sketch-planning tool that incorporates all this information. The tool outputs fact sheets and citation notes for each selected strategy.

Findings and Originality
This presentation will describe the research and deliverables, which are expected to be available in the near future. The presentation will provide an overview of a number of contributions of the study to the field of metropolitan freight movement, including:

- A state-of-the-practice review of the current challenges and possible solutions;
- An updated taxonomy and definitions of 30 freight strategies, containing several example strategies within, based on the state-of-the-practice (and state-of-the-art) in the field;
- An identified and defined taxonomy of 16 factors, which can be either facilitators (positive) or barriers (negative) for metropolitan freight strategy implementation;
- Practitioner input on the weights of these facilitators and barriers by metropolitan freight strategy;
- A Strategy Resource Matrix (SRM) providing detailed information, by reference, of key characteristics for implementation of the metropolitan freight strategies;
- A sketch-planning tool (UFIT), powered by the SRM, that allows for practitioner assessment of a specific user-defined problem with output of identified strategies for consideration;
- Default weights for the implementation facilitators and barriers built into the UFIT (with a user option to adjust the weights);
- Comprehensive citation notes, available through UFIT, providing practitioners with details of the identified strategies;
- Fact sheets of 30 strategies, including implementation notes and recommendations for implementation, along with other details (and examples) of the strategies; and
• Pilot study investigations, which tested the UFIT performance on real situations.

Practical Impact
The research provides tools for practitioners to identify and implement metropolitan freight transportation strategies for their given problem area.
Multi stakeholder involvement in construction logistics challenges

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Pamela Nolz, AIT Austrian Institute of Technology, Vienna, Austria
Tom van Lier, Vrije Universiteit Brussel, Brussels, Belgium

Purpose
The trend towards more urbanization leads to an increased importance of construction in cities. Nevertheless, there is a lack of research in construction logistics in general and especially regarding stakeholder involvement. MAMCA (Multi-Actor Multi-Criteria Analysis) has been used as a method to facilitate stakeholder involvement in the field of (freight) transport (Macharis et al., 2009). However, construction has particular characteristics, involving temporary supply chains, with many varying actors participating in the construction process. Furthermore, construction generates flows of large and diverse material volumes from and to urban construction sites subject to limited space, noise restrictions and impacted neighbors. In this paper we develop a customized methodology for applying MAMCA in a construction logistics context, step wise refining the methodology along four cases in three different countries.

Research approach
Starting from a literature study of earlier applications in the field of transport, the MAMCA methodology was enhanced to better fit with the construction context. Thereafter, an iterative testing and development process was applied. First, the methodology was tested in Brussels on a tramway infrastructure construction case. Second, on a case of the construction of a new city quarter in Vienna (Aspern Seestadt). Third, on a case of the development of a former harbor area into living quarters in Gothenburg. Fourth and final, it was tested on the case of infrastructure development in the Stockholm region. In each iteration the MAMCA methodology was updated based on lessons learned from each test.

Findings and originality: Based on the learnings from the test in Brussels, predefined criteria groups and three construction logistics alternatives were developed, which were applied in the test in Vienna. The Vienna test provided learnings about the importance of a detailed introduction to the participating stakeholders as some relevant knowledge on construction logistics was missing and this was applied when tested in Gothenburg. Based on the Gothenburg test, further information was added to the alternatives which were applied in Stockholm. Also, for the Stockholm test alternatives had to be adapted to fit the infrastructure context better. Importantly, when applying the methodology, both the local context of the country/city as well as the type of construction taking place have to be considered regarding the choice of participants and alternatives for construction logistics solutions discussed.

Research impact
In this paper, similarities and differences between stakeholders and respectively their criteria, their criteria weights and their preferred alternatives are researched. Factors
impacting the differences and similarities, such as policies and governance level in the
different contexts as well as the complexity of the construction project in question, are
discussed.

Practical impact
The methodology proofed itself to be valuable for two particular purposes. Both as a way to
identify relevant stakeholders and their criteria (as demonstrated in the Brussels test) and as
a way to identify what type of logistics solution is preferred from different stakeholder
perspectives and why (as demonstrated in the Vienna and Swedish tests).

methodology (MAMCA) for the evaluation of transport projects: theory and practice, Journal
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Purpose and approach

Within the NOVELOG project, Gothenburg performs a case study regarding the development of a consolidation service for deliveries of goods to the shopping center Nordstan (located in the city core of Gothenburg). At present, about 500 trucks deliver goods to Nordstan at a daily basis, and the purpose of the research is to develop a framework and enable the implementation of a solution with potential to achieve a substantial decrease in the incoming distribution traffic, in order to decrease congestion, emissions and noise.

Within the preparatory work of the concept, an extensive freight data collection and analysis has been performed among the businesses located in Nordstan. Detailed goods and freight data was gathered from over 200 businesses. Among other things, the following information has been collected:

Deliveries:

- Date and time of delivery
- Inbound or outgoing goods
- Freight packaging (package, pallet, roll-cage etc)
- Goods volumes
- Goods types
- Delivery vehicle type
- Other notes

Businesses and prerequisites:

- Branch of business, key numbers etc.
- Routines for handling goods
- Management and eventual steering of deliveries
- Demands of delivery times
- Goods reception point
- Estimated handling time for goods

Analysis of the material shows a potential for significant decreases in distribution traffic by consolidating small shipments that constitutes a very minor fraction of the total volumes of goods delivered to Nordstan. About one third of the companies have particularly favorable conditions for consolidation.

Findings

The findings include various details regarding the patterns/structure and prerequisites for goods supplies Nordstan. Some main findings are:
• Less than 10% of the companies delivering goods to Nordstan handles two thirds of the goods volumes
• In general very few conditions regarding deliveries set by the end receivers
• A vast majority of the goods volumes delivered to Nordstan is “non-perishable”, and not covered by any specific terms and conditions for delivery except regular delivery
• A vast majority of the companies are positive to participate in a joint solution for consolidation of goods.
• The five owners of the Nordstan galleria have assessed the value of a consolidation service, and granted financing for a first pilot phase

Impact
The work is connected to strategic policies regarding environment, climate and traffic (Gothenburg has a climate strategy, a traffic strategy, and an environmental programme with detailed actions specified). The solution developed within NOVELOG will play a significant role within a near future, due to a number of major infrastructure projects, which will affect the capacity of the infrastructure, as well as the accessibility to the city centre in a large extent.

Similar concepts are being considered in the planning of new city areas, for example in the detailed plans regarding infrastructure and facilities. The knowledge gathered from the Nordstan case study will constitute an important resource when simulating goods flows for other future areas, as well as possible experiences from a c/o address solution would be of big value for future development of similar solutions.
Investigating consumers’ preferences for e-grocery services: an exploratory study

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Purpose
This paper investigates the potential acceptability and adoption of digitalized services connected to groceries (i.e. e-grocery). Cagliano et al. (2014) describe e-grocery as ordering groceries from home in an electronic way and either have it delivered to the house or collect it at pick-up points. A more transport efficient distribution of groceries to the final consumer appears to have a significant potential for reducing the carbon footprint (Wygontik and Goodchild, 2012). The development of e-grocery is likely to be influenced both by the organization of the grocery industry, as well as by consumer preferences for online purchases. In fact, these two elements are strongly interlinked. The share of people buying their groceries on-line will depend on the characteristics of the services offered which, in turn, depend on the size of the market.

Research approach
A preliminary investigation of consumers’ preferences for buying groceries on-line with respect to buying them at the supermarket is here presented. The investigation was carried out in Rome, where University students have been interviewed as early adopters of such innovative concepts. The interviews aimed at: (1) understanding students’ purchase habits (to set their status quo) and attitudes towards e-commerce in general; (2) investigating stated preferences for alternative scenarios of e-grocery with respect to their status quo, i.e. home delivery and click-and-pick; (3) exploring their social network and their attitudes to influence/be influenced by their peers. This last point is very important to infer how e-grocery might be spreading among peers, due to the contagion effect, amplified by the easiness of connections and exchange of information provided by the new technologies.

Findings and Originality
We performed around 240 interviews in two phases following an efficient experimental design approach (Gatta and Marcucci, 2016). Stated preferences for alternative purchase scenarios allow for the estimation of the importance of specific characteristics of the service (e.g. purchasing, transport costs, expected-time-of-arrival, etc.) that might determine the success/failure of e-grocery companies. Besides, results allow for the evaluation of the potential spreading due to social network effects.

Research Impact
These preliminary results represent a starting point for a wider in-depth behavioural analysis investigating the social and economic acceptability of e-grocery. Advanced methods and models, e.g. discrete choice models and agent-based models, will be used to perform a solid and robust economic/behavioural assessment, aimed at analysing: i) the elements needed for the required mental shift and ii) the potential acceptability of e-grocery solutions.
Practical Impact
Since buying groceries is a recurrent activity for any household, the way people will buy groceries will have a substantial impact on how the goods reach the houses, where they are typically consumed, and the environmental consequences on the city. To get a good grasp of all this, one has to investigate the preferences for alternative ways stakeholders will use to buy the things they need. Policy-making should take these new phenomena into due account and develop and deploy policies capable of jointly accommodating consumer preferences while pursuing sustainability.

Keywords: urban freight transport, e-grocery, behavioural analysis, social network

References
Exploring the application of urban form profiles in freight trip generation

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Abstract
Traditional urban and transportation planning processes have limited interaction with freight planning [1, 2], on the one hand disregarding urban freight transportation needs, on the other hand overlooking the impact of urban form on individuals’ and firms’ location and transportation decisions [3, 4].

Purpose
This research aims to incorporate urban form characteristics in freight trip generation (FTG) models [5], and thus enable more interaction between practitioners through integration of their instruments and policies. From this perspective, the research addresses three questions:

- To what extent does the urban form profile of a location influence the freight trip generation patterns of local establishments?
- How much do the urban form profiles relate to the location preference of different types of establishment?
- Can the number of freight trips be estimated for planned locations based on their urban form profile?

Research Approach
The authors employ a hybrid quantitative methodology combining elements from spatial morphology and freight transportation engineering to explore the application of urban form on FTG, using Gothenburg (Sweden) as a case study with data from primary and secondary sources, namely: road network, public transport nodes, population data, comprehensive establishments’ data and a sample of FTG data. The first step is the spatial analysis of urban form on 100m grid cells, measuring location characteristics (i.e. road type, width and length, closeness and betweenness centrality, distance to public transport nodes) [6] and 800m neighbourhood characteristics (i.e. road network connectivity, land use density and mix, residential density) [6, 7]. These disaggregate urban form characteristics are then used to produce location and neighbourhood profiles using statistical clustering [8]. The next step uses establishment-based data and statistical methods to quantify FTG [9, 10]. Finally, statistical models are used to estimate establishment types and totals, and with existing FTG models produce FTG estimates.

Findings and Originality
Preliminary results show that different types of establishment concentrate on specific location and neighbourhood profiles, indicating a preference or requirement for specific urban form characteristics. Location, in turn, also reflects on FTG of some sectors, namely
retail of non-perishable goods. With this knowledge one can estimate freight volumes and types in planned urban areas based on their spatial characteristics.

Research and Practical Impact

The proposed method sits along recent work on classifying and mapping the city as “homogeneous urban zones” [11], as a “freight landscape” of existing freight flows between origins and destinations [12], and as “logistics profiles” of locations [13]. These methods offer decision support instruments that shed light on the relation between urban form and different aspects of freight, support the development of adequate freight policies, and support strategic planning of freight transportation in the city. The main contribution of the present method is to provide a higher resolution spatial analysis with disaggregate variables of urban form. This enables the estimation of FTG at different locations, and is sensitive to transformations of urban form introduced by urban design and development projects, offering an integrated tool for spatial planning of the city.

References

The urban layer of e-commerce deliveries: the proliferation of CDPs

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Purpose

The rise in B2C e-commerce is changing the urban freight landscape. Persisting growth rates of online sales together with the expectation of home deliveries is disturbing the balance between efficient and sustainable delivery systems. Courier, express and parcel companies try to cope with this new situation by adapting their traditional distribution flows (Browne et al., 2014; Hesse, 2002). This resulted in a proliferation of (mostly urban) logistics facilities to cope with the last mile of urban deliveries (Janjevic et al., 2013). One such measure is the introduction of collection and delivery points (CDP) (Morganti et al., 2014; Van Duin et al., 2016). While in a first step being the location to leave failed deliveries, CDPs are becoming an expression of the courier’s service level in today’s highly competitive market. In Belgium, this drove couriers to an aggressive expansion of their networks, resulting in a proliferation of CDPs within the cities. Despite holding the promise of being a more sustainable delivery model, the current evolution is threatening those expectations.

The objective of this paper is twofold. Firstly, it depicts empirically the observed proliferation of CDPs to raise awareness of its uncontrolled growth. Second, it attempts to provide an assessment of the potential of fulfilling the sustainability promise for the different types of CDPs. The first objective is tackled through a geographical analysis of the pick-up point networks of all carriers in Belgium. The second through a set of interviews with policy makers, the retail sector and the main logistics carriers in the county.

Research Approach

This paper applies a mixed method methodology to tackle the questions mentioned above. The qualitative parts result from a combination of interviews with the logistics sector, retailers and local governments; key note lectures and discussions on urban logistics conferences and workshops; and the consultation of grey and academic literature in ongoing research on the topic over the past years. To elaborate on the topic of CDPs, five additional semi-structured interviews were conducted with the representatives responsible for the management of the CDPs in their respective companies specifically for this study. Together, their companies manage 60% of all CDPs in Belgium. In addition, the quantitative parts are executed with data made available by the Belgian Institute for Postal and Parcel Services. The BIPT gathered data on the location and service levels of the 9 carriers operating CDPs in Belgium.

Findings and Originality

A first analysis of the networks of three main carriers already demonstrate the large variety in locations and types of CDPs. The sample showed that only 30% of the CDPs was delivered by more than one carrier. This lack of cooperation increases the kilometers driven to pick-up parcels coming from different carriers and implies negative impacts associated to the (un)loading of the vans at a multitude of locations. In addition, accessibility of the CDPs varied greatly among different networks. These two issues together hamper the attractiveness of using a CDP as the first delivery option, limiting the opportunities of consolidation for the carriers.
Secondly the qualitative analysis results in three groups of requirements (spatial, infrastructure and services). These requirements are used to compare the sustainability potential of six frequently occurring types of CDPs in Belgium.

Practical Impact

Due to high adversity and resulting insular behavior in the sector, the initiative for change lies in the hands of local governments. The inclusion of CDP-zones within spatial plans for example holds potential for consolidation, efficient use of urban infrastructure and various pick-up or drop-off alternatives and fits in the current narrative of sustainable urban logistics planning. This paper serves as guidance for decision makers when assessing CDP locations.
Agent-based simulation of urban freight flows based on carrier microdata

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Purpose
We propose a new agent based simulation model that describes logistic decision making in the context of urban freight planning.

Research Approach
A simulation framework is presented for agent based simulation of freight transport: MASS-GT. The simulation model adopts an agent-, commodity and tour based approach. In doing so, a data-driven simulation framework is created, that is built around an extensive urban freight transport dataset for The Netherlands.

Findings and Originality
The empirical basis for modelling is provided by a large dataset with observed freight transport data for The Netherlands. Part of the data has been collected using an automated procedure to report complete freight trip patterns from the transport management system of carriers at the level of individual trucks. This provides much more dense and complete data compared to conventional surveys. The data provides statistics on shipment attributes (commodity type, weight), truck attributes (vehicle type, loading capacity, appearance) and tour attributes (tour composition, delivery/pick-up order). Although the data is proprietary it can be used as a basis to estimate models, and derive descriptive statistics (e.g. probability density functions) for synthesizing procedures.

The paper describes the design principles for agents, markets and logistic decisions. Next we describe the first baseline prototype of the agent based modeling framework that simulates all urban freight transport patterns for an urban area (in our case the agglomeration of Rotterdam). The prototype has a modular structure: it includes a Shipment synthesizer a Tour formation model. We provide the descriptive statistics that are used in the shipment synthesizer: probability density functions for vehicle type use, time-of-day, or additional stops during tours. We elaborate on the development path of the agent-based simulation system. Outputs of the model are synthetic urban truck tour patterns to/from and within the city of Rotterdam, for ten commodity types.

Research Impact
The project will contribute to the empirical research on descriptive urban freight transport models. Thanks to an advanced data source, we can develop new tools to analyze urban freight transport developments, which include logistic choice behavior at the level of individual agents.

Practical Impact
Urban planners face many challenges in making urban freight transport more sustainable: reduce urban congestion, provide reliable delivery windows, decrease logistic costs, reduce emissions, improve safety. Prediction of policy impacts requires models that incorporate logistics decisions.
An Agent-based Model of Freight Transportation with Emerging Trends in POLARIS

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Purpose
This study summarizes the first stage in the development of an agent-based freight modeling system. The modeling framework is designed in this initial stage. Upon implementation, the model will be used to evaluate the transportation and energy impacts of goods movement across urban and national scales. The freight model will be implemented within POLARIS, an agent-based activity-based modeling and dynamic traffic assignment system that currently models passenger travel. This platform offers an invaluable way to model interactions among consumers, producers, and the transportation system. The objective of the framework development is to design a realistic modeling system that: (a) overcomes existing gaps; (b) accounts for emerging trends; (c) integrates consumer and business activities; and (d) follows an agent-based paradigm using behavioral and simulation methods.

Research Approach
In this conceptual design stage, a qualitative approach was employed using the following methods. First, knowledge of emerging freight trends was amassed. Experience and domain expertise were used to select trends to include in the model. Second, a thorough literature review was conducted to assess existing freight models with respect to: their foundational building blocks; omissions of critical elements; and their ability to address emerging trends of interest. Third, the model flow was designed by mapping a set of agents and other inputs; a logical sequence of agent decisions; and a set of events or outputs. The first two steps informed this task.

Findings and Originality
Preliminary key findings are as follows. First, existing freight models have limited representation of several important elements, including:

- Partnerships between trade establishments and logistics establishments
- Partnerships among establishments (e.g., firms)
- Physical assets of establishments, such as in-house fleets
- Emerging urban trends including micro-distribution centers, crowdshipping and 1-2 hour on-demand delivery services

Second, to the authors’ knowledge, no existing models represent firm strategies, e-commerce, the sharing economy, or interactions between households and businesses in a detailed way. Their inclusion in this framework is a major innovation.

Research Impact
This research extends existing literature in freight modeling systems by providing a more comprehensive representation of agents, their assets, agent interactions, and subsequent transportation outcomes, thereby addressing earlier gaps. A major innovation is designing a logical model stream to incorporate key emerging trends, including e-commerce and the
sharing economy. A second major innovation is the design and incorporation of a method to include economic interactions between households and businesses as they impact goods movement.

**Practical Impact**
The proposed framework provides policy-makers with a way to evaluate the impacts of changes in freight behaviors, such as greater use of express shipments, as well as the impacts of a plethora of infrastructure, policy and operational strategies on the transportation system. Impacts can be assessed in a very detailed way, particularly at the urban level, due to the proposed use of agent-based simulation and dynamic traffic assignment.
Purpose
The increase of deployment for the man-motored vehicles in the Netherlands. With several involved parties to give the research assignment. There is multiple purposes with one goal: stimulating the deployment of the cargobike.

Research Approach
Within the research, there were several stages:
At first literature was consulted to inform about the current status of the cargobike: increase in deployment (for what purposes does the cargobike get deployed?), increase in market (what is the growth in the market, on this subject, in the near future?) and the policies (regional, national and European).
Secondly some reports were consulted from LEFV-Logic. The first report states the current regulation for cargobike in the Netherlands (place on the road, maximum empowerment et cetera). Secondly a research for on-road-action for cargobike users; what do cargobike users want to see improved within the infrastructure.
Thirdly congresses have been attended, hereby the different cargobikes have been filtered. The restrictions have been noted and some other information have been gathered to filter out the demands of the cargo-bike-users from the wishes they have.
Fourthly two steps are taken:
Designing frameworks have been reviewed. In combination with demands for infrastrural changes for cargobike-users, a list of criteria has been settled.

Findings and Originality
There’s a growing market for usage of cargobike. At the same time, more and more companies rise from the ground to deploy the cargobike. There has to be changes, in infrastructure, to not create more bottlenecks. At the same time, the whole infrastructure can’t be adjusted to just the cargobikes. Therefor seven reviewing points have been given as argument (to urban street designers) to make them stimulate the deployment of the cargobike (which is on the same “road” as most European policies) to ban out cars out of city centers.

Research Impact
Several congresses have been given a presentation at. More cities besides Rotterdam use the list of criteria has been reviewed for multiple cities within the Netherlands.
Will Common Carrier Lockers in Public Spaces Ease the E-Commerce Delivery Explosion in Cities?

Haena Kim, Barb Ivanov, Anne Goodchild

Purpose
This research provides evidence of the effectiveness of a new urban goods system strategy: common-carrier locker systems that create delivery density at mini-nodes in public spaces. This research identifies and quantifies the delivery processes with or without the new system. The outcomes of this empirical test provide insights on:

- The Final 50 Feet of last mile delivery,
- Integrating freight in the design of urban space,
- The importance of real estate owners in managing freight flows, and
- Stakeholder collaboration and coordination.

Research Approach
The Urban Freight Lab (UFL) partnered with the Seattle Department of Transportation (SDOT) to pilot test a common-carrier locker system in the Seattle Municipal Tower in 2018. It tested the ability of new mini-distribution centers in cities – such as smart lockers - to create delivery density and reduce the time delivery people spend in urban towers to complete their work.

The Lab tested the pilot’s premise: when delivery trucks can pull into a load/unload space that’s close to a smart locker (that creates delivery density, lots of deliveries in one place), public and private sectors benefit.

The quantitative approach included collecting data before and after the introduction of the locker system.

The project required collaborative leadership to:
1. Achieve goals that mattered to participating partners:
   - UFL members: UPS, USPS, Nordstrom, and Charlie’s Produce;
   - SDOT;
   - CBRE (building management);
   - Parcel Pending (locker vendor); and
   - Building tenants.
2. Develop locker requirements with delivery firms.
3. Overcome obstacles:
   - Inertia, risk avoidance by parties without directly involvement, but with authority to stop the project;
   - Budget uncertainty due to novel approach.

Findings and Originality
The pilot’s innovative approach is based on the Lab’s:

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2 The Urban Freight Lab is part of the Supply Chain Transportation and Logistics Center at the University of Washington.
• Final 50’ analysis showing that 67% of delivery time in the Tower was spent going floor-to-floor/door-to-door. Lockers, placed as close as possible to the loading bays, could virtually eliminate that.
• New concept of mini-distribution nodes to create delivery density on public space;
• Understanding that although cities won’t allow branded lockers on public property, they will allow common-carrier lockers.

Final findings will be available at the VREF conference.

Research Impact
  o Reducing dwell time, the time a truck is parked in a load/unload space to:
    • Make more efficient use of truck load/unload spaces;
    • Lower costs for delivery firms and potentially for their customers.
  o Reducing failed first delivery attempts to:
    • Lessen traffic congestion, as trucks could make up to 15% fewer trips while completing the same number of deliveries;
    • Increase convenience and security for online shoppers.

Practical Impact
SDOT will use the results to determine which goods trip reduction strategies to offer building managers and developers to reach policy goals in the city’s Freight Mobility Plan.5

4 According to UFL members, up to 15% of first delivery attempts in cities fail; conversation held in 2017.
Understanding the use of the curb space and alley for unloading and loading operations: A Seattle Case Study

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Purpose
The increasing growth of e-commerce has been putting pressure on local governments to rethink how they manage street curb parking and alley operations for trucks and other delivery vehicles. Many studies state that the competition for space among road users and lack of adequate infrastructure force delivery drivers to either search for vacant spaces or park at unsuitable areas; which negatively impacts road capacity and causes inconvenience to other users of the road (Butrina et al. (2017); Dablanc & Beziat (2015); Aiura & Taniguchi (2005)).

However, local governments often lack data about the current usage of the parking infrastructure, which is necessary to make well-informed decisions regarding freight planning especially in dense, constrained urban areas.

For these reasons, the purpose of this research is to address the lack of information regarding the usage of the infrastructure at the public right of way used for freight and parcel load and unload operations.

Research Approach
The approach of this research is quantitative. The SCTL research team developed two independent data collection replicable methods to quantify the usage of (i) curb spaces and (ii) alleys in selected areas of Seattle’s One Center City.

Findings and Originality
This research presents two case studies for selected areas in Seattle’s One Center city area. The first one documents and analyzes the duration and types of curb spaces used by delivery vehicles in the surrounding area of five prototype buildings. We also considered all vehicles occupying on-street commercial vehicle load zones located in the study area. The second case study conducts an alley occupancy survey, looking into all parking activities (including trucks, vans, garbage collection vehicles and passenger vehicles) in seven alleys. The total of twelve survey locations were monitored during 2-3 weekdays and 4-8 hours per day.

Research Impact
This research provides practical step-by-step methods to conduct occupancy studies of public parking for loading and loading operations, which helps to understand the current usage of a key piece of the
infrastructure network. The results provide critical information to make well informed decisions regarding urban freight planning especially in dense, constrained urban areas.

**Practical Impact**
This research describes the steps required to develop an efficient and systematic data collection method to build a database that will provide evidence-based learning to Seattle local officials. By applying these quantitative methods, we provided decision support to pilot-test and potentially adopt solutions to improve the freight parking infrastructure performance.

**References**
Purpose
Recent trends such as the growth of e-commerce and parcel deliveries are stressing freight transportation in dense urban areas. At the same time, a historical lack of integration of the freight transportation system into city planning efforts has left local governments unprepared. Under these circumstances, there is growing need for best practices for freight planning and management at U.S. cities. There is anecdotal evidence that the lack of delivery areas is one of the main causes of inefficient urban freight parking infrastructure, which leads to illegal parking and more congestion. The problem of lack of delivery areas has been studied with a focus on on-street spaces. Meanwhile, the contribution of delivery areas out of the public right of way such as loading bays in buildings has not benefited from research. More importantly, the location and features of private delivery areas are often unknown by local governments due to their private character. For these reasons, this paper aims to answer the following research question: Can cities use data readily available to know the location of off-street freight loading/unloading parking in dense urban areas?

Findings and Originality
This paper presents the first predictive tool to estimate the presence of private truck spaces for delivery and pick-up operations based on observable characteristics of property parcels and their buildings. Our results show that it is possible to estimate the location of private delivery areas in property parcels mainly used for commercial purposes within a reasonable level of error.

Research Approach
This research uses a quantitative approach. The predictive model classifies parcels with and without private delivery areas using random forest, a supervised machine learning algorithm. The model was developed based on a rich geodatabase of private truck load/unload spaces in the City of Seattle and the King County tax parcel database.

Research Impact
This research helps to overcome the lack of data regarding the location of private delivery areas in urban areas. Future research can benefit from this contribution by including private delivery areas in occupancy studies to document and analyze the operations in this facilities. This research would allow to better document the impacts of the lack of delivery areas in urban areas considering both public and private facilities.

Practical Impact
This research allows local governments to estimate the presence of private delivery areas in urban areas using currently available information, which may inform efforts to revise and update delivery operations and regulations of truck parking and loading.
Assessment of collection points in Gdansk on the availability of mobility alternatives to the car

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Purpose
The purpose of the paper is to assess the location of collection points in relation to pedestrian, bicycle, public transport and car infrastructure. The assessment will be presented for two types of collection points: parcel machines and newsstands.

Research Approach
It is an exploratory and cognitive study, as research carried out so far in Poland has not examined the location of parcel collection points relative to the infrastructure of various urban mobility methods. So far, other researches in Poland has confirmed only the location of parcel machines at parking lots and gas stations, which by nature are easily accessible by car. This study was carried out within the administrative boundaries of the city of Gdańsk. The locations of parcel machines and newsstands were found on the shipping operators' websites. The assessment of available infrastructure based on maps of Gdansk and the field study.

Findings and Originality
The starting point of the research was the results of a pilot study carried out in Gdansk in September and October 2017. The study was conducted to demonstrate the impact of e-commerce on the number of private cars in the city’s streets. In the conclusions of the study, it turned out that consumers in Gdansk very often choose parcel machines or newsstand as the preferred method of delivery of on-line ordered purchases. This means that the package most often does not reach the consumer directly, but a customer must move towards the collection point. What matters therefore is how the consumer moves to pick up the package. The pilot study showed that almost 46% of the respondents who choose the parcel machines usually reach them by car, while among respondents picking up orders in newsstands 32% usually arrive there by car. Whereas, 13% of parcel machines users declare to reach them by bicycle, while 39% of newsstands users usually reach them by bicycle. It seems, therefore, that consumers choosing newsstands as a collection point, are less likely to choose a car, and more often a bicycle compared to consumers who pickup orders in parcel machines.

It has been assumed that the choice of the method of reaching the collection point depends on the localization of the collection point. It is significant whether the localization favors more getting there by car or bike or walking. It also depends on the distance from the place of residence/work/school. Because of this assumption, the hypothesis was set that the parcel lockers are usually located near parking lots and are easier to reach by car than newsstands. Newsstands are located most often at tram and bus stops, not necessarily near the parking lots, but on the way to and from work/school. In addition, newsstands are more easily accessible by bicycle.

Research Impact
Describe the impact of your research (if applicable)

Practical Impact
The results of the study can be important for planners, local authorities and companies alike. The study is to draw the attention of various stakeholders to infrastructure as a determinant of mobile behavior of city dwellers. According to this, can be postulate, to support pro-
ecological behaviors of residents the access to maintain the alternative mobility infrastructure is needed.
Exploring charging strategies and services for electric freight vehicles in urban freight transport

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Purpose
Within the context of urban freight transport (UFT), electric vehicles (EVs) in the light-, medium-, and heavy duty vehicle range face an upward battle to achieve profitability, even though the battery and vehicle market is improving and government subsidies are provided (in many areas). In the context of UFT, the role of charging strategies have not yet been well-explored though it is an important approach to improve the attractiveness of EVs. The aim of the paper is to explore the types of charging strategies, as well as discuss their advantages and disadvantages to the freight carriers’ business models. On this basis, the business models of the charging services that can enable the freight carrier’s charging strategies are also identified and discussed.

Research Approach
The development of the charging strategies uses a conceptual development approach, building upon existing charging strategy definitions in literature. Since current definition lacks a systematic treatment and clear conceptual delineation, the paper proposes four main charging strategies depending on the types of triggers to recharge. The conceptual categories are further differentiated, based on the type of charging technology used. Based on the charging strategies, examples of potential or existing charging services are discussed that shed light on the conditions necessary for the charging service market to be configured.

Findings and Originality
The systematic conceptual development defined four charging strategies on the basis of two different types of triggers: per schedule and per battery energy level. Charging strategies triggered primarily by schedule are downtime charging, opportunity charging and intrusive charging. Emergency charging strategy is triggered by a low battery energy level. Existing research literature focus mainly on downtime charging and the use of intrusive charging, which highlights a serious gap in research. Conceptualization of opportunity charging in existing literature remains underdeveloped, although it holds much potential for improving the business case of electric freight vehicles. Based on these charging strategies, charging services are discussed that enable freight carriers to select and use their desired charging strategy. Four charging service providers are described that support the charging strategies. These are the owner-user model, the private space charging station operator, the public charging station operator, and the EV roadside assistance. These are not the only models, and important variations are discussed.

Research Impact
The research provides a complete conceptual development of charging strategies. Existing evaluation studies that do not consider the range of charging strategies that a freight carrier may use undermines the case for electrified urban freight. The work clarifies the concepts and relations between the concepts such as electric vehicle, charging infrastructure, charging services and charging strategies, which supports further research in the area.
How can omnichannel retailers create an attractive and sustainable last mile offer?

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Purpose

Last mile transportation entails the various ways in which products reach their end-destination in the consumer market. It is considered as one of the biggest challenges in online business-to-consumer commerce, because of its high costs, negative environmental impact and importance in customer satisfaction. More efficient and sustainable alternatives to the standard option of next-day delivery at home are being explored. Two solutions are longer delivery terms and alternative delivery addresses where consumers can collect their orders, such as parcel pick-up points and lockers. Within the recently conceptualised omnichannel retail model, also retailers’ stores have become pick-up locations for the last mile. The purpose of this research is to identify how omnichannel retailers can create a last mile transportation offer that is both attractive from a consumer point of view and sustainable from an economic and environmental point of view.

Research Approach

To this end, we set up a survey among a representative sample of Belgian consumers using choice-based conjoint experiments. This method has a long track record in measuring preferences and understanding choices and trade-offs that consumers make. Consumer utility values are calculated, which indicate the relative importance of different product attributes. Accordingly, we identify to what extent an attribute influences the choice for a last mile option and which last mile attributes need to be combined in order to reach sustainability from a ‘planet’ and a ‘profit’ point of view.

Findings and Originality

The results of the survey show that approximately half of consumers take their environment into account when making a purchase and agree that achieving less vehicle kilometres for last mile deliveries is important. The choice-based conjoint analysis demonstrates that delivery price has the greatest impact on the attractiveness of a last mile option (53.47%). The second most important feature is return possibility (20.21%), followed by delivery term (13.67%) and delivery reception (12.64%). Consumers’ preference goes out to free, next-day delivery to an address of choice, on regular office hours during the week and with a free return possibility in a local pick-up point. However, when free delivery is offered, consumers are willing to collect their orders in-store and/or wait longer for their order to arrive. This allows omnichannel retailers to organise their supply chain in a more sustainable way. The research findings contribute to current literature and practice by combining ‘planet’ and ‘profit’ components of sustainability in last mile transportation and applying it in the novel omnichannel environment.

Research Impact

Our findings indicate that consumers are indeed making trade-offs in their choice of last mile transportation options, which contradicts previously made assumptions in literature.
Practical Impact
Our findings are also important for retailers that (plan to) operate an omnichannel model. For omnichannel retailers with a dense store network, the results indicate that consumers accept their store network as pick-up and return locations, allowing retailers to create a more efficient and sustainable supply chain in which their online and offline activities can be combined.
Land suitability assessment for the location of warehouses: the Belo Horizonte context in a metropolitan scale

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Purpose

In this work, we propose a methodological approach to subsidize land suitability assessment for the location of warehouses in urban areas. A case study for the Belo Horizonte Metropolitan Area (BHMA), Brazil was performed. We have proposed a Spatial Multi-Criteria Analysis (SMCA) to determine the areas within the BHMA that are more suitable to host warehouses designed for the urban distribution of goods.

Research Approach

We have developed a representation model regarding land use, demographics, logistics infrastructure, and natural resources. For that, we have structured a multilayer dataset, concerning:

(i) demographic and economic attributes (population density, number of households, average household income, accessibility to education and leisure, industrial and commercial economic production);
(ii) territorial elements and constraints (urban tissue, agricultural activity, mining activity, natural resources); and
(iii) logistics and transportation infrastructure.

City Logistics specialists were inquired to determine weights for each attribute, regarding its relevance on the location decision of warehouses for the urban distribution of goods. From raster layers, and a weighted map algebra was performed to determine the most suitable places for the installation of warehouses.

Findings and Originality

Logistics sprawling has been measured concerning descriptive spatial statistics, resulting in the identification of centrality and dispersion of the spatial structure of the location of logistics facilities. In this work, we propose an alternative analysis for the assessment of warehouse location through a suitability evaluation, considering that the logistic spatial structure in an urban area is an important factor for the development, well-being, and sustainability of regions and people. The location of human activities and natural resources were the frames of reference, and the sustainability of urban places was the main goal of this analysis. The spatial analysis made it possible to draw real conclusions about the status of the BHMA and presented them in a clear graphical form, affordable for anyone who
wants to get acquainted with the results. Except for the study developed by Önden [7], this spatial multi-criteria approach has not yet been considered for the location of logistics facilities.

Research Impact
Our main motivation for this study derives from the space-temporal sprawling analysis of logistics facilities in urban areas [1], [2], [3], [4], [5], [6]. This paper brings a methodological contribution, in addition to the spatial centrality and dispersion measures, since we take into account the usage of SMCA to assess and propose more suitable areas for the location of warehouses in order to support the sustainability of human activities and natural resources.

Practical Impact
The urban livability and the well-being of citizens is deeply impacted by the distribution of goods. Also, the location of logistic facilities is crucial to promote efficiency in the urban freight transport and to mitigate congestion, pollution, and other impacts of this activity. Therefore, location models that relate human activities and natural resources to land use are essential to subsidize public policy for a more equitable and sustainable occupation of the urban territory.

References
An Assessment of Competitiveness of Eclectic Trucks in City Logistics

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Abstract

Keywords: Electric Trucks, Vehicle Routing, Genetic Algorithms, City Logistics

Cities are experiencing increased transportation demand in terms of passengers as well as freight transportation. As most of the urban freight movement is based on road transport, it also contributes to the typical problems related with the urban traffic, such as traffic congestion, noise, and crashes (Ortuzar, and Willumsen, 1995). There has been considerable concerns amongst stakeholders about the environmental footprint of urban freight (Muñuzuri et al., 2010). A relatively recent approach to address environmental issues of the urban logistics is to consider environmentally sustainable vehicles such as electric vehicles (EVs). With low emissions and lower operating costs EVs can provide a plausible solution; however, their relatively high initial cost and limited driving range reduce their attractiveness for freight carriers. Many researchers have tried to evaluate the performance of the electric trucks by comparing them with the conventional diesel trucks (for example. Conrad and Figliozzi (2011), and Muñoz-Villamizar et al., (2017)), however, these researches have either used proxy cost values to approximate routing cost or have based their analysis on hypothetical networks.

In this paper, we have extended the classical vehicle routing and scheduling problem with time windows (VRPTW) to the electric vehicle routing problem with time windows (EVRPTW) by incorporating the limited range constraint on each feasible route. Additional vertices representing charging stations have been added to the VRPTW-related graph, which allow the range constraint to be linked with possibilities of enroute charging, thereby including routes longer than the range limit of the electric truck. As the resulting model is an NP-hard problem, it warrants a heuristics solution approach. Therefore, a genetic algorithm (GA) is developed to solve it.

In order to compare the effectiveness of the electric vehicle, they were compared with the typical conventional delivery vehicles in the urban areas, i.e. diesel trucks (taking it as the base case). The diesel trucks are assumed to have unlimited range. A variety of cases, based on different ranges of electric trucks (110 km, 90 km, 70 km), initiation costs (5 – 8 Million Yen), number and locations of charging stations were tested on a randomly generated test instance on the road network of Yokohama, Japan. It was observed that long range electric trucks (such as 110 km) are very competitive to the conventional vehicles in an urban setting of roughly 10 x 10 km² even without any provision of charging station infrastructure. On the other hand, electric trucks with 90 km range with appropriate charging station infrastructure resulted in even a 2.5% cost saving as compared to the diesel trucks. However, use of electric trucks with only 70 km range in the test instance resulted in cost increase, which could not be balanced by reducing the initial cost of the electric trucks (even...
to the same cost as the conventional trucks). Therefore, it can be concluded that reduced driving range has far worse effect on the competitiveness of the EVs as compared to their higher initial ownership cost. Hence, advancements in battery technologies, quick recharging are very important in the competitiveness of the electric trucks in city logistics.

References

Ex-ante assessment of how an urban consolidation centre affects freight trips to a retail district

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Purpose

Urban freight transport is an outcome of the economic activities that sustain cities. However, it produces negative externalities like traffic congestion and pollution. Policies like delivery time restrictions and Urban Consolidation Centres (UCC) are intended to reduce these impacts. Policy makers in cities are particularly interested in investigating the feasibility of a UCC, which consolidates deliveries entering a busy commercial area. The commercial area of particular interest is a retail district which is a cluster of retail malls and stores. Due to insufficient supply of parking spaces, these large freight generators experience delivery truck queues that at times spill over to surrounding road network. This research develops a mathematical model, informed by real-world data collected in Singapore, to predict how introducing an UCC influences the number of freight trips to a retail district.

Research Approach

Many researchers have quantified impact of UCC schemes mostly using data (Van Duin et al. [2010], Triantafyllou et al. [2014], etc.) or using traffic simulation models ((Van Rooljen and Quak [2010], de Assis Correia et al. [2012], Kin et al. [2016], Janjevic et al. [2016], etc.). Mathematical models informed by data are rarely found in literature. We define freight trip impact ratio---ratio of number of freight trips to a retail district with UCC, to that without UCC---as a measure of UCC impact on traffic congestion in the area. The number of freight trips to a retail district without UCC is defined as the sum of freight trips to all malls in the area. In order to estimate freight trips to each mall, we first develop a freight trip generation model at the retail store level using retailer survey data and loading bay observations. We then aggregate it to trips to a mall considering the possible trip overlap between retail stores.

The main assumption of our model is that the UCC participation decision is made by the retailers and all of a participating retailer’s deliveries will be routed via the UCC. Two possible cases are considered for the location of the UCC – outside and inside the retail district. If the UCC is located outside the retail district, the number of freight trips to this area is found by analyzing the changes in freight trip to the malls. If the UCC is located within the retail district, UCC truck trips are also considered in the analysis. Trips to the UCC are estimated by considering UCC as an additional mall with “virtual” retailers corresponding to each participating retailer.

Findings and Originality

The results show that regardless of UCC location, there exists a critical UCC participation rate for the district to experience fewer freight trips upon the introduction of the UCC. We characterized the critical participation rate analytically for the simple case where only one type of retailer exists, and using simulation for the case where different types of retailer types exist. This approach can be applied in other cities for a similar evaluation by adjusting the model parameters to represent local conditions.
33 Impacts of Joint Delivery Systems with Urban Consolidation Center for Sustainable City Logistics Using Adaptive Dynamic Programming Based Multi-Agent Simulation

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Abstract

Keywords: Joint Delivery Systems, Urban Consolidation Center, Adaptive Dynamic Programming, Multi-Agent System

This paper aims at evaluating the impacts of Joint Delivery Systems (JDS) with Urban Consolidation Center (UCC) for sustainable city logistics using Adaptive Dynamic Programming (ADP) based Reinforcement Learning (RL) within Multi-Agent Simulation (MAS). City logistics systems are dynamic by its nature both due to operating within an uncertain environment and the involvement of multiple agents within the system. Fluctuating demand, uncertain travel time, and parking issues cause the city logistics systems in urban areas is unpredictable which directly affect the operational cost, environmental impacts, as well as the policies. Moreover, the city logistics agents such as freight carriers and UCC operators are interacting and behaving differently to JDS policy based on their specific objectives. However, it is essential to evaluate the policy before it can be efficiently deployed due to its various implications for stakeholders (Taniguchi et al., 2015). Decision support systems (DSS) are needed to help decision-makers in making decisions acceptable for all agents, which mainly based on modeling, optimization, simulation, and evaluation procedures. Previous attempts developed MAS based RL to models the behavior of various stakeholders under the implementation of city logistics policy, but all of them rely on MAS-Q-learning without considering the uncertainty factor in the city logistics systems as previously explained. The previous research experiences conducted by Fagan and Meier, 2014, found that the multi-agent reinforcement learning using the combination of ADP and Actor Critic Reinforcement Learning (ACRL) performs particularly well in the dynamic environment associated with MAS. The MAS-ADP based RL models for freight carriers and UCC operator as the learning agents have been developed and simulated in the hypothetical network for 168 days. MAS-ADP based RL and MAS-Q-learning are compared to understand its performance under uncertain environment. Economic efficiency and environment friendliness, as sustainability criteria, are considered to evaluate the learning models. MAS-ADP based RL performed better on satisfying agent’s objective and suggesting the right action to the learning agents as compared to MAS-Q-learning especially in MAS using 35% of the coefficient of variation of the data. The results proved that the policy of JDS with UCC is efficient by reducing 21% of the total delivery cost for the freight carrier and reducing 36% of the total emissions released to the environment. The MAS-ADP models could be used as a DSS in city logistics measures to achieve better outcomes for the learning agent’s decision.
References

Purpose
The purpose of this research is to identify impacts, effects, and consequences of announced temporary yet long-term capacity reductions on freight transport performance, truck drivers’ perception of traffic systems, and their working conditions. The research is inspired by lack of knowledge of how road works and temporary capacity reductions in urban main road networks impacts the transport systems.
As far as the authors are aware, this question has little coverage in the literature. For instance, Browne et al. (2012) analyze pre-Olympic Games patterns of freight deliveries in London, including measures to reduce negative impacts of road restrictions during the days of the Games and the impacts of the measures. However, the emphasis is on short term restrictions and regulations. Among studies of long-term regulations we found studies of behavioral change due to regulations of large vehicles or emissions zones (Quak & De Koster, 2009; Vieira, Fransoo, & Carvalho, 2015), or on the economic impact on freight transport from capacity reductions only (Masiero & Maggi, 2012). Hence, the purpose of this research is to gain more knowledge on long-term capacity reduction. Tunnel works in Oslo are used as case studies.

Research Approach
Both qualitative (surveys and interviews) and quantitative (traffic counts and travel time) measures are used. Qualitative measures capture the perception of change from truck drivers and transport planners. Quantitative measures capture changes in travel time and congestion and verify user perception. The study covers several years and allows us to identify both short- and long-term implications.

Findings and Originality
Our research confirms that when capacity reductions provide bottlenecks in the urban main road network congestion and travel time increases. For passengers, several changes can be made, like changing mode or frequency of travel. Truck drivers and transport planners however have limited power to change the transport, as this is mainly customer driven. The main changes observed are with respect to departure time and route choice with the objective to avoid the most congested areas. Such changes reduce the experienced effects and consequences.
An interesting finding is that it is not the extra time used, but the implications of increased time use and variability that affect freight traffic the most. This is also highly reflected in increased truck driver stress levels: we find that drivers get stressed both from the prospect of more failed deliveries, increased congestion and more uncertain working day.

6 As a part of the EU regulation to improve tunnel safety ten tunnels on the urban main-road system in Oslo will be upgraded to new European standards in the period 2015-2020. The first three, the Smestad tunnel, the Granfoss tunnel and the Bryns tunnel are the focus of this study.
We also find that when capacity is back to normal, most drivers return to the schedule they had prior to the capacity reduction. However, some drivers and transport planners identified improvements under the capacity reduction which are kept under normal conditions.

Research Impact
Understanding how freight transport is affected by capacity reduction in urban road networks including impacts, effects and consequences is key in urban planning. For instance, increased truck drivers stress level might be a traffic security hazard and should be avoided. Although the extra time use seems to be limited, public planners should also be aware that even small changes might have implications for other parts of the transport chain or delivery route, as reported by the truck drivers. Such implications might have economic and social consequences.
Trusted Vendor Program: A Recognition Program to Encourage Off-Hour Deliveries

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Purpose
Previous research has indicated that having a trusted vendor encourages businesses to accept off-hour delivery (OHD) arrangements more than other incentives (Holguín-Veras et al., 2017). Businesses that conducted Unassisted OHD—as opposed to those performing staffed OHD—were also willing to continue OHD without the incentives. A “trusted vendor” program, endorsed by a trustworthy organization, is postulated to help vendors earn trust from businesses and thus increasing overall participation of OHD. To build the program, an assessment criterion is needed to assess the trustworthiness of the vendor. Ensuring overall stakeholder support for a shift to OHD requires an appropriate evaluation of the criteria set by them (Verlinde et al., 2010).

Research Approach
Receiver surveys were developed to identify which market sector highly valued having a “trusted vendor” for the adoption of OHD. Focus groups, with representatives from various industrial sectors in New York City, were organized to discuss various aspects of the program. The topics include key aspects which they value most in their vendors, the mechanic of the program and their willingness to participate.

Findings and Originality
From the surveys and focus group discussions with key partner organizations, the research team was able to identify key criteria and requirements of a “trusted vendor”. The businesses are mainly interested in the vendor’s performance and their ability to meet their expectations. Hence, they are concerned about the vendors’ OHD performance. They are also interested in communicating with the delivery personnel directly, and among others. These insights have incorporated into the development of a Trusted Vendor Program (TVP). TVP is a recognition program that provides businesses with information about “trusted” vendors that can conduct Unassisted OHD in a safe, secure and reliable manner.

Research Impact
Not Applicable

Practical Impact
Trusted Vendor Program is hosted on a website (http://trustedvendorprogram.org/home). The website contains details on the program, such as the history, administrators, benefits of joining the program, ways to join the program, and among others. The website also accepts nominations of “trusted vendors” through an online form. The recognition program aims at encouraging businesses to shift their deliveries to the off hours, thus mitigating congestion and pollution in urban areas.
Urban Economies and Freight Activities

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Purpose
Cities exist because they are efficient markets where citizens and businesses could find economic opportunities, and the supplies and services needed. The resulting trade in supplies and services generate a large volume of flows of supplies, vehicle-trips, and service activities. Freight and service activity (FSA) is pervasive as it takes place in the entire metropolitan area, not only at the most visible generators such as intermodal terminals, large manufacturing sites, and commercial centers. In addition, the impact of urbanization has been undeniable in the development of cities for the past decades. The increase in urban population combined with globalization and the rise of e-commerce have had tremendous impacts on how supply chains have to adapt their deliveries to urban centers. These changes have produced serious impacts on the freight system and land-use patterns in cities. Former manufacturing sites have been repurposed, cities have replaced ports and warehouse areas with residential or commercial establishments. Nonetheless, this does not rule out the fact that freight and service vehicles still need to work to get the economy moving. The presentation will describe economic activity in metropolitan statistical areas (MSAs) and the magnitude and spatial distribution patterns of FSA.

Research Approach
To get a sense of the economic activity that FSA generates, establishment and employment indicators were analyzed by industry sector in two major clusters: freight intensive sectors (FIS) and service intensive sectors (SIS). The FIS are the industry sectors for which the production and consumption of freight is an essential component of their economic activity while the SIS are those industry sectors where the provision of services is their main activity. Ten MSAs in the United States were selected to represent a diversity of urban areas in terms of size and geographic location. The spatial distribution of the FSA were studied in an attempt to understand how the urban structure of an MSA influences the overall FSA.

Findings and Originality
A detailed analysis of the economic activity in terms of employment and number of establishments was developed. Further analysis was developed with respect to the movement of traffic in the cities, where estimates of Freight Trip Generation and Service Trip Attraction were developed and key metrics were calculated per MSA. Results show the bulk of daily freight trips and service daily trips are concentrated in the smaller establishments, regardless of the size of the city. The results also exhibit how industry sectors play a key role in understanding the behavior of the supply chains.
Research/ Practical Impact

The findings not only capture the magnitude of economic activity in urban areas but also shed light on production and consumption points in supply chains. This research provides policy-makers the magnitude of the problem to address the issues related to congestion of commercial activity within the city and implement policies for sustainable urban freight at the city cores with consideration to both freight activities and land-use.
Purpose
Population growth, communications, and technological advancements are bringing new dynamics to the urban and metropolitan economies around the world. Demand for goods and services are also on a rise. These are forces that can transform economies and supply chains and pose disruptions to the current systems. Understanding how the emerging market and technology trends influence the urban freight systems can help mitigate the impact brought by the disruptors and pursue appropriate responses to the new world dynamics.

Research Approach
An extensive review of reports and articles has been conducted to provide a comprehensive understanding of the trends and their implications for freight landscape. The trends are identified and classified into two major groups – market trends and technological trends. Each trend is also analyzed to determine if there is interconnection with other market trends and emerging technologies. An evaluation framework based on decisions of stakeholders is developed to assess the impact of trends. The framework proposed to measure how decisions of a given pair of agents in the supply chain are affected by the trends. In a general supply chain framework, an agent downstream makes a purchase decision in response to its demand, followed by an upstream decision of transport with respect to the purchase decision. Meanwhile, both agents must decide about their location. The land-use indicator includes the level of dispersion (high density / sprawl), land-use mix (homogeneous / heterogeneous), among others. Freight activities include the shipment size, mode of transport, among others.

Findings and Originality
Current findings enable trends to be classified into three categories: economical, societal and environmental trends. Several of them relate to more than one category, but their effect predominates at least one of them. Some can be observed in a global stage while others are urban related. Emerging technologies, which account for the software and/or hardware developed are active across the market trends by either reinforcing them or becoming a result of their aftermath.

Research and Practical Impact
As the ultimate goal of planners is to preserve or enhance the quality of life for the community, understanding the influence of external forces in transforming the economic activities and supply chains within the urban freight system can help the planners account for a more efficient and sustainable land-use and freight transportation system.
Analysing efficiency and financial viability of cargo bike operations

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Purpose
A major parcel distributor kicked off a pilot with cargo bike operations in Oslo in 2017, this was the first attempt to use cargo bikes for commercial distribution in Norway. The company is testing cargo bikes in the centre of Oslo for 1-2 years before deciding on whether to introduce them on a larger scale or not. The city of Oslo helped with space for a micro hub close to the city centre, in which shipments are loaded on the bikes. This paper shows how data from real-world cargo bike operations can be combined with data from Google Maps Distance Matrix (GMDM) to analyse efficiency and financial viability of potential for cargo bike operations.

Research Approach
The research is set to increase the understanding of the experienced and potential efficiency of cargo bike operations in Oslo. This is done by comparing pilot operations with the before situation where all distribution was done by vans. Detailed data from the operations have been made available, allowing analysis of number of stops, time between stops and various measures of efficiency. To shed light on the potential for extended cargo bike operations, mode-specific information from GMDM has been used to compare bike- and car-based travel times between stops.

Findings and Originality
We identify the main success factors for efficiency of cargo bike operations, and show how cargo bikes compare to van deliveries in terms of number of stops required for financial viability. Findings so far show that a van delivers twice as many units as a cargo bike during a day. However, data on number of stops per hour and time spent between stops during an average day (obtained by the use of GMDM) reveal that the cargo bike has a great potential if the customer base and density is high enough within a defined area. The role of the micro hub and the need for public sector in facilitating cargo bike operations is also discussed.

Research Impact
There have been several publications documenting cargo bike operations during the last years (CITYLAB, 2017; Melo & Baptista, 2017; Schliwa et al., 2015; Gruber et al., 2014). Our work builds on past efforts and extends with the analysis of real data on operations and costs, also for the micro hub. The use of GMDM for evaluation has not been widely explored until now.

Practical Impact
Cargo bike operations have not yet come off in Norway. However, later in 2017 also a second distributor started such operations, and they have a plan to extend services to several Norwegian cities. The findings from the research give an indication of the financial viability and the need for supporting measures from the public sector, in particular related to the need to find appropriate centrally located space for micro hubs.
References


Purpose
The purpose of our research is to identify barriers for the scalability of business models with Light Electric Freight Vehicles (LEFVs) and to provide recommendations for further uptake.

Research Approach
A literature study is conducted to identify crucial factors for the scalability of business models, resulting in the ‘scalability model’ (based on Stampfl, Prügl, & Osterloh, 2013). In two expert sessions with 25 logistic professionals, the ‘Scalability Model’ has been applied to eight companies using LEFVs in The Netherlands (LEVV-LOGIC, 2018).

Findings and Originality
The ‘scalability model’ has been selected to review, predict and improve the scalability of business models along five elements: 1) User Orientation, 2) Infrastructure, 3) Legislation, 4) Network Effects and 5) Cost & Revenue Structure. The model helps companies to identify barriers and improve the scalability of their business model. Our main findings are:

- Several companies use LEFVs to be associated with their environmental or innovative reputation.
- Most of the reviewed cases seem to have lack of an urgent market problem at this moment. Once access to cities is (more) restricted for polluting vehicles by Environmental Zones, the scalability of business models with LEFVs will improve.
- A barrier for scalability of startups in LEFVs is that business customers don not want the hassle of system integration with a new logistics partner for the transport to the city centers alone. A way to remove this barrier is the take-over of a startup in LEFVs by a large freight company with a national operation. Advantage: large freight companies already have an existing customer base and the system integration with customers is already in place.
- Businesses that need inner-city freight transport for time critical deliveries are high potential customers of LEFVs. Examples: transport of medicines, food-delivery, gifts, etc.

One of the cases, City Hub, uses LEFVs for last mile deliveries in combination with storage services outside the city center. One of their customers is the outlet store of Nike. Studies are in progress to find out if this business model can be scaled to other customers in other cities.
Research Impact
The use of the ‘Scalability Model’ can improve the insight in the scalability of business models, identify barriers and explore solutions for greater market impact.

Practical Impact
To obtain scalable business models in LEFVs:

- **Large freight companies** can use LEFVs for existing customers by replacing existing vehicles without new system integration with customers.
- Governments can impose **Environmental Zones** for Electric Vehicles Only to enhance the use of LEFVs.
E-grocery in Sweden: energy efficient last mile distribution?

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Purpose
Distribution of e-commerce is interesting from an energy efficiency perspective. E-commerce could lead to more sustainable transport through less car-dependency and substitution of inefficient shopping trips to more efficient freight transport. Procurement trips are a large share of passenger transport, and of these, half correspond to grocery purchases, making efficient last-mile distribution of e-grocery especially interesting. However, the potential for improved energy efficiency related to e-grocery distribution needs to be clarified. Earlier research has shown that distance driven can be reduced when delivering groceries to consumers’ homes, but results regarding emissions are less clear. High customer service could lead to inefficient routes and low utilization of vehicle capacity. Also, various distribution solutions are in use, e.g. unattended and attended home deliveries, pick up at various locations, wide and narrow time slots, which influence the transport efficiency. The purpose of this paper is to structure differences between last mile distribution solutions of e-grocery according to characteristics of relevance to evaluate energy efficiency. This allows comparison with conventional grocery shopping.

Research Approach
Characteristics of relevance to evaluate energy efficiency in last-mile e-grocery distribution are identified from literature and interviews with actors providing e-grocery in Sweden. Characteristics of relevance for comparison with conventional grocery shopping are also identified from literature. Using these characteristics a model for evaluating energy efficiency is constructed. Distribution solutions identified from actors providing e-grocery are used to derive relevant scenarios for calculating energy efficiency.

Findings and Originality
A model structuring last mile distribution of e-grocery in different scenarios is presented. The model shows the complexity of evaluating energy efficiency of last-mile e-grocery distribution, and relevant characteristics are discussed. Issues to consider when evaluating energy efficiency of last-mile e-grocery distribution are picking location, assortment (e.g. full range or complementary shopping), delivery location, distance from picking location, service level, fuel consumed, and customer density. Challenges for energy efficiency in relation to passenger transport and consumer behavior are discussed.

Research Impact
This paper contributes with knowledge regarding energy efficiency of e-grocery offers and distribution solutions. Results can be used as input in future models of energy efficiency that incorporate also passenger trips for grocery shopping. This study focuses on last mile distribution in Swedish urban areas, and thus includes scenarios relevant to a country with relatively low population density and long distances between large cities.
Practical Impact

The model presented in this paper can be used by companies providing e-grocery solutions for evaluation of energy efficiency of offers and distribution solutions. Further, the results can be used as a guideline in the development of new offers and distribution systems. Authorities can use the results as decision basis in the development recommendations aimed at stimulating consumer behavior and policies to facilitate energy efficient deliveries of e-groceries.

Keywords: e-grocery, distribution, last mile, urban transport, energy efficiency
Green Crowdshipping: a new collaborative economy service for urban logistics

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Purpose
Crowdshipping is a new collaborative economy service that foresees delivering goods via the crowd [1]. The adoption of this innovative service does not necessarily imply the expected reduction in CO2 emissions, since dedicated trips can still be performed. In fact, the crowd, to provide the service, can purposely use its own private vehicles and make ad-hoc trips thus contributing disproportionately to polluting emissions when considering the CO2 emitted per km-driven. The paper focuses on green crowdshipping where the last mile delivery service is performed through public transportation. The paper aims at investigating both the willingness to get goods delivered by a crowdshipping service (demand side) and to act as a crowdshipper (supply side) in the case of a last mile B2C e-commerce for pick up/delivery. The final goal is to understand and quantify the effects of this freight transport strategy for e-commerce in an urban context.

Research Approach
The paper proposes a stated preference (SP) survey for both supply and demand side behavioural analysis, adopting a Bayesian D-Optimality efficient design [2]. The attributes considered for the former are: time and cost of the service, parcel tracking, delivery date and time schedule, while for the latter are: delivery booking, location of delivery points (i.e. Automated Parcel Lockers, APL), remuneration and bank credit modes. SP data are analysed via discrete choice models.

Findings and Originality
The paper innovates with respect to other contributions in the literature [3; 4] since it focuses on the use of public transportation to deploy crowd-shipping services to foster sustainability goals in freight transportation, reducing the risk of negative effects [5]. The most important factors for crowdshippers are the proximity of the APLs with respect to the usual trip along the metro line, followed by the amount of remuneration and the method of credit, while crowdshipping users are more sensitive to the possibility to plan the delivery date and its time schedule together with the availability of parcel tracking.

Research Impact
The demand-supply analysis performed represents an innovative contribution to the research in this field. Results show a surplus of potential crowdshippers with respect to the potential demand. Requests for deliveries with crowdshipping service vary between 2500 to 14000 parcels/day. Those values are estimated by setting some characteristics of the service after analysing similar platforms already present in the market. The combined increase in the amount of small volume/low weight/high value packages in the future is linked both to e-commerce, in general, and to the development of high-end e-grocery services offered by the distribution of retail chains. This suggests investigating green crowdshipping in more detail.
Practical Impact
The case study investigated refers to the city of Rome considering people using public transport as a delivery vector. They, on average, impose lower environmental and congestion costs on society [6; 7] and additionally, can deliver freight within the city in a timely and efficient manner without adding any trip to the network. Results, even if preliminary, are encouraging, in fact there is a high confidence in the success of the service (about 48% of the sample) and the estimated number of potential crowdshippers is actually higher than the potential demand.

The research provides a good knowledge base to local policy makers for future implementation of green crowdshipping in the city of Rome, also considering the concomitant opening of the C-metro line in Rome.

References
Purpose
This paper aims at discussing the effects of the urban growth on freight mobility through the analysis of the localisation of urban activities. Thanks to the results of this work, we lay the basics of an original concept that synthetizes logistics sprawl and other localisation dynamics taking into principal consideration the mobility of freight: this concept is called logistics distension.

Research Approach
Through the spatial analysis of the localization of activities and population between 1982 and 2012 in the urban area of Lyon, we show the evolution of the socio-economic morphology of the city thanks to various approaches, including radio-centric methods inspired by Clark and later Bussière. Unlike these studies however, our research is essentially descriptive of the evolution of the freight landscape and we do not try to build an urban growth model. Nevertheless, through freight movements modelling derived from the works on the French urban freight surveys and the Freturb mode, we show the evolution of freight mobility in the conurbation of Lyon with regard to the modifications of the urban fabric.

Findings and Originality
This research shows that logistics sprawl is not the only impact of urban growth on freight mobility and that its effects have to be confronted to the impacts of densification and the sprawl of other activities. Indeed, densification and concentration of freight consuming activities in the centre of the city (shops, HoReCa, offices, services…) opposed to the sprawl of other activities (industry and logistics) has an important effect on the capacity of cities to sustain their own supply. We therefore call this conjugated movement of the localisation of various types of activities “logistics distension” and illustrate the growing dependence of urban territories to their logistics functions.

Research Impact
As an original concept, logistics distension allows discussing the evolution of urban freight mobility through the relative localisation of the entirety of urban activities and widens the discussion on logistics sprawl. This systemic approach seems fundamental in the actual research trends on logistics sprawl and freight landscape, bringing a more systemic and dynamic conceptualisation. This work calls for a generalisation of logistics distension analyses in the international context and its key explanatory factors regarding urban morphologies and public policies.

Practical Impact
By offering a global vision of the key components of freight transport and urban growth (economic activities and population), logistics distension brings decision makers and local authorities to reconsider freight mobility through a broader approach. In this case, commercial, tertiary or residents localisations become as important as logistics facilities. As well as for passenger mobility, freight mobility needs a systemic approach and examination in land use and mobility master plans as all types of human activity generate freight transport. The findings of this work also argues for a better use of long term modelling and decision making tools.
Mapping deliverability for goods transport. Can the ABC-method be adapted for city logistics?

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The purpose of this case study is to develop and test a method aimed at mapping deliverability for goods transport in urban areas. Urbanization, land use conflicts and raising property prices has increased competition for street space, thus impeding the accessibility for freight deliveries in the city centres. The need for delivery spaces in the city centre, as a function of business type and localization, struggles with other urban functions. The interests coincide with urban planning strategies such as infill policies, restrictions on car use, reduction in parking capacity and the aim of zero growth in personal transport. Expanding e-commerce and home delivery changes transport demand, increasing the need for public load and unload spaces, loading docks or internal freight bays at residential developments. This puts pressure on mobility policy, calling for knowledge to manage city logistics both on strategic and practical levels through land use and zoning, seeking to integrate freight in the design of urban space.

Accessibility has been an important concept in transportation planning for decades. One practical adaptation of accessibility has been the Dutch ABC-policy, which coined the phrase «the right business in the right place». The ABC method offered localization advice for businesses and planning guidelines for municipalities based on accessibility mapping covering all modes of transport, with emphasis on environment friendly modes. In Norway, the method was adapted and revised to include areas for manufacturing and storehouses where the need for freight accessibility prevailed (Frøyen, Medalen m.fl. 2012). The objective of this research is to examine the potential to apply the ABC method in an urban freight context, considering deliverability.

“Deliverability” as a term describes conditions for urban freight on at least two levels: the overall accessibility (travel time or distances between terminals and end-user), and the passability in detail (“the final 50 feet”) in proximity of end users or local distribution hubs. The former calls for network datasets comprising restrictions and recommended freight routes. The latter calls for thorough descriptions of transport infrastructure and network. Both the network analysis and the infrastructure details will be based on combining already existing data sources, such as subsets of the Norwegian national roads database (NVDB), supplemented with comprehensive maps from national mapping authorities. We will also use data about businesses, including their localization and industry classification (NACE) to estimate the need for freight access on a given site.

The research aims to develop and validate the methodology, also identifying supplementary data needs. The results of the method will be a compound classification of deliverability, which will be suitable for mapping. The use of this metric can facilitate discussions of city logistics with stakeholders early in development/revision processes. It can also
provide urban planning with a tool, thus raising caution and attention about the requirements and needs of freight handling in urban areas.

References
How cities’ policies and changes in demand pattern may affect urban mobility planning

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Purpose
Mobility for both passengers and goods is a key component in developing sustainable cities which attract people, activities and businesses. In Norway, urban mobility planning strives to lower car share through private car restriction and facilitating public transport, walking and cycling. Integrated land use and transport planning, compact city, mixed use, shared mobility, subsidized public transport, parking restrictions, road tolls, and parking charges are planning principles being used. Within this context of urban mobility planning, policies have mainly focused on passenger transport. Less consideration has been given to urban freight, even though the principles do affect freight issues as well.

Recent studies have shown that the demand pattern for urban freight is closely related to changes in demographical properties. The growing urban population and increasing use of technology are creating new challenges in urban areas and city centres. E-commerce, including online shopping and home delivery or delivery to pick up point, induce changes in the user demand pattern and urban freight. Online shoppers expect the urban freight system to bring them what they want relatively fast, and with that creating a new supply chain for bringing cargo directly from the terminal to the end consumer. This puts pressure on land use policies and mobility planning regarding city centres and residential areas. Hence, urban freight deliveries need to be included in urban planning strategies. The main purpose of this study is to investigate how city centre mobility plans address these issues.

Research approach
The methodology consists of a document study of plans for the city of Trondheim. This includes the city agreement with the state, strategic plan for city development with coordinated land use and transport policy, municipal plan for climate and energy, area zoning plan, street use plan, and the plan for a pilot test of urbanisation of one specific street, Olav Tryggvason street (OTS).

The link between the overall urban developing plan in Trondheim, the zoning plan for the city center and the pilot project in OTS is analyzed. The focuses of these documents regarding urban mobility and expected lack of attention on freight issues will be assessed.

Findings and originality
The common aim for all the documents are how to plan for city development with zero growth of private car travel, and facilitation of an attractive and sustainable city centre. However, preliminary findings show that freight issues are seldom mentioned in the ongoing plans, and that local authorities are not aware of the challenges freight companies are experiencing.
The parameters used to evaluate the pilot of OTS gives attention only to soft travel modes and business turn over. The new street design in OTS is supposed to encourage people to spend time along the street, and thus increasing the demand for shops and restaurants. There is no attention to neither freight deliveries with the new design, or the impact of the new street design have on consumer preferences regarding shopping and culture accessibility in the evaluation. In addition, there are residential areas in the OTS and close by, which will also impact the freight transport due to increasing e-commerce and home delivery. This is not taken into consideration when evaluating the pilot, even though goods which are normally transported as a part of personal travel chains, shift to being transported by commercial actors performing home delivery. Changes on individual level regarding shopping, consuming and travel pattern due to current trends in urban living will increase the volume of traditional urban freight transport and put pressure on land use in the city centre. This in contrast to the aim of zero growth on private cars in cities. Both travel behaviour on individual level and urban logistics need to be considered being able to facilitate for the changes described above and develop sustainable mobility in urban planning.

Research impact
These findings will contribute the local authority with increased knowledge affecting mobility both for passenger and goods, and how to prepare for integrated planning in a sustainable city where involving relevant stakeholders will be a main issue before implementing solutions. With a better understanding of the overall complex situation, involving both public and private stakeholders in freight transport, unwanted effects of new mobility trends may be prevented.

Practical impact
In the pilot test of OTS, we see that emerging trends within urban freight, is rarely taken into consideration in land use or zone plans. To reduce conflicts between different users and to prepare for the struggle of available space in the city centre, there is a need to integrate planning for pedestrians, bicyclists, public transport and urban freight. Increased knowledge and a raised awareness and understanding of urban freight traffic generation within city administrations will help to deal with these challenges. Based on empirical data from several transport companies about the demand pattern for urban freight, the next step will be to discuss how traditional views on mobility planning may change in the ongoing developing of the zoning plan in the city center in Trondheim.
Transport depots and logistics facilities as new challenge in urban planning: A logistic Master plan

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Purpose

A Logistics Master Plan (LMP) is emerging as the most powerful dynamic instrument to support urban planning. Faced with the congestion and pollution, air quality has become a major issue for cities where pollutant emissions are the most concentrated. In many cases, to address this problem, local authorities are starting operations to solve problems rather than to understand the causes. There is a lack of global vision of the city taking into account both its economic structure of the living area, and a need for exchanges between territories and urban changes. Thus, the communities usually put in place experimentations that stop, lack of viability and inappropriate regulations. The challenge of the Logistics Master Plan is to put logistics at the heart of the city’s economic and urban development policies. It is a tool that engages reflection beyond the short term and makes it possible to measure the consequences of a certain number of choices that can be made for the future life of the city.

Research Approach

The case study of Montpellier, French city of 282000 inhabitants (in a metropolis of 450000 inhabitants) that performs a deep urban renovation, allows to describe the methodology set up, the regulatory framework, the results and the effects of long term actions:

• A diagnosis of the movements of goods caused by the economic activities established
• A simulation of future flows linked to the urban transformation (new areas allocated to residential uses or different types of activities), thanks to the FRETURB model.
• The previous results permit to configure a network of urban logistic spaces, of adapted sizes and functionalities to the needs of the different zones
• A feasibility study to transfer part of the freight flows in the trams
• A survey on carriers and big shippers in order to know their logistic practices
• A series of regulatory measures integrating logistics in urban planning and Territorial Coherence schemes

Findings and Originality

The LMP, voted by decree, requires strong political commitment and concerted action. It plans the measures to be implemented and the necessary financing. The process goes well beyond conventional solutions. The agri-food wholesale market destined to leave the city is maintained as an urban planning tool: it is an actor in urban logistics at the local level, limits urban sprawl and land use, is a key element of local development, facilitates supply and boosts local trade in urban and rural areas. New functions with high added value (remote storage for city center shops, rental and maintenance of electric vehicles for the last km, training on urban logistics it is an actor in urban logistics. It limits urban sprawl and land use, facilitates supply and boosts local trade in urban and rural areas. New functions with high added value are developing there: remote storage for the city center shops, rental and maintenance of electric vehicles for the last km, training on urban logistics.
Research Impact
The LMP gives territorial coherence and meets the requirements of sustainable development (economic, efficiency, reduction of environmental nuisances by optimizing logistics organizations and maintaining jobs

Practical Impact
This process fits perfectly into the other pillars of development of the metropolis: crafts and commerce, economic development, agribusiness, digital technology and health. It participates in the commitments made under the "Climate Plan, law 2010 (reducing greenhouse gas emissions by 20% by 2020)
Barriers in governance of construction logistics

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Purpose
Construction is inevitable for cities to grow and to become and remain an attractive place to live, work and enjoy. Construction logistics has an impact on many stakeholders in cities. If not dealt with adequately, unnecessary costs, emissions, noise, congestion, accidents and complaints will result. Construction logistics in cities can only be tackled by focusing on the whole decision making process and all the different stakeholders involved: the governance. The purpose of this paper is to present barriers in governance that constrain the optimization of construction logistics. The research goes beyond the actors of the supply chain, by looking into the role of city planners and land owners as well.

Research Approach
For the Amsterdam case we conducted exploratory research including:

1. A literature review on (collaborative) governance
2. 20 interviews with professionals from public authorities, contractors and builders.
3. A workshop with 20 professionals discussing problems faced as well as barriers and potential solutions for more efficient construction logistics

Findings and Originality
In earlier research the focus has been mainly on the barriers in the production phase of construction (SUCCESS 2018) and more in general, in supply chain management (Richey e.a. 2010; Sundquist e.a. 2017; Aronsson & Brodin 2006). Some research focused on tendering and sustainable construction logistics (Lambropoulos, 2013). Our research focuses on the governance: the art of overcoming barriers to action in a multi-actor context (Moser 2009). We have identified several main barriers and will identify incentives to overcome these for stimulating more collaborative governance (Macharis et.al., 2016; Emerson e.a. 2011; Ansall and Gash 2007).

1. City planning: a lack of vision. A general vision on what good construction logistics entails is absent and there is no endorsement in policies.
2. Area planning: a lack of coordination, as there is no insight in the construction flows per area and the limited requirements for construction logistics within the land agreement.
3. Tender phase: a lack of incentives for the supply chain partners to optimize construction logistics, as the tendering client often does not set specific requirements for construction logistics.
4. Production phase: a lack of awareness on the benefits and the required redistribution of costs of logistics solutions.
Research Impact
Innovative logistic solutions are available, but are not yet common practice in the construction sector (Janne 2016; Dubois & Gadde 2002; Merrienboer, 2013). Innovation in construction logistics is often approached from a supply chain or engineering’s perspective (Sundquist e.a. 2017). This research identifies which aspects in the collaboration and governance process between public and private actors hinder the implementation of construction logistics solutions.

Practical Impact
The outcome of this research is input for a handbook for policy-makers and professionals (public and private). We have been working in close cooperation with the City of Amsterdam, to create a sense of urgency on a strategic level. Our aim is to test the lessons learned from this explorative research through collaborative actions (experiments) with the government.

References
Between cargo cycles and delivery vans: size matters!

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Purpose
Due to current developments concerning clean air in cities (EU directive 2008/50/EC) parcel service providers are more than ever forced to find economically viable solutions for sustainable emission-free last mile distribution. Since electrified vans are scarcely available on the market and currently available cargo cycles exhibit limitations in loading capacity multiple initiatives can be observed all over Europe creating vehicles which are designed to meet the requirements of parcel providers by exploiting the best of both worlds: legally being a bike in order to use bicycle infrastructure and avoid parking regulations, but still having enough loading room for a large amount of parcels allowing viable business. The concepts by TRETBOX and RYTLE are representatives of these concepts. Lenz & Riehle (2013) and Gruber & Rudolph (2016) show the challenges to conduct economic viable business with cargo cycles. A prerequisite for successful implementation of new vehicle concepts in last mile deliveries seem urban consolidation centers (Browne, Allen & Leonardi, 2011; Dablanc, 2012; Kin, Verlinde, van Lier, & Macharis, 2016). New requirements from the customer like speed deliveries (within 60 min after fulfilment of the online purchase) even require urban depots (Kirchhoff, 2016; zur Nedden, 2016).

Research Approach
In order to investigate the market potential of these new vehicle concepts we developed a simple macroscopic model for strategic assessment of different vehicle concepts. In contrast to a microscopic simulation which requires much more data and resources with the risk of producing less robust results (in case the input data is not 100% reliable and/or traceable), the presented simplified macroscopic model provides robust results. Sensitivity analyses are easily to conduct.

Based on the simplified aspatial model SEAM introduced by Rudolph et al. (2018) which compares only available cargo cycles, delivery vans with and without urban consolidation centers we investigate in this paper the optimum size regarding loading capacity and vehicle type. Different catchment sizes for urban consolidation centers and route lengths are being investigated to find the ideal vehicle size.

Findings and Originality
The paper ends with recommendations showing the optimum size for the loading capacity of new distribution vehicle concepts and accordingly the size of the corresponding catchment
area and the number of served customers. Herewith, the paper gives practical advice for designers and parcel service providers for the design of an optimal distribution vehicle. It also gives recommendations for urban planners regarding the requirements of the infrastructure accommodating these vehicle concepts.
51  Where to open maritime containers?

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Purpose

A basic principle of unit loads is to load cargo as early as possible in the transport chain and
unload it as close to the consignee as possible to benefit from the low cost of transshipment
and transport and good cargo protection. Just a few years ago, the landlord Port of
Gothenburg emphasised the development of a rail container shuttle system for servicing the
hinterland but this has shifted towards a strategy to increase the flow through the port by
establishing warehouses in the port vicinity. This contribution aims at analyzing the most
suitable location of stripping import containers by defining the geographical options and
developing a model to assess the performance of those options for different commodities.
Additionally, we discuss the pros and cons of opening maritime containers in the port vicinity or
further into the hinterland.

Research Approach

The empirical context is Sweden characterised by large road vehicles and Port of Gothenburg
with a comparatively large share of hinterland rail transport. We assume that after containers
are stripped, goods are transported to the nearest terminal of the biggest transport service
providers in the area, according to market share. We compare a few different locations for
the container stripping, e.g. GBG by the port, just outside city limits, Borås, Falköping,
Jönköping, Örebro. A mix of qualitative analysis and quantitative modelling is used to assess
the ton.km generated and related costs.

Findings and Originality

A hypothesis is that there is a variety of arguments for locating container stripping and that a
pattern along commodities and distribution channels can be distinguished. Our analysis
enables drawing some insights on “where to inject the air” into distribution chains.

Research Impact

It adds to the research fields of port-centric logistics and geography of logistics facilities, often
using the term logistics sprawl. For recent articles in a Gothenburg context, see Heitz et al.
(2018) and Monios et al. (2018). This research additionally aims at reconciling maritime/port
logistics with city logistics.

Practical Impact

The location of stuffing and stripping operations greatly affect vehicle flows in port cities and
the efficiency of transport chains and the research is likely to catch interest from city and
traffic planners, warehouse developers as well as logistics managers.

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Rethinking the delivery area model: what opportunities to better combine uses in time and space?

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Purpose

Urban freight in cities strongly relies on delivery areas schemes. For several decades, many researches have studied this issue to identify ways of improving their performance. As Beziat (2017) shows in his literature review, the challenge has been to better estimate their quantity, location (Habib & Crowley, 1976) and their size (Christiansen, 1978).

Consulting firm specialized in urban logistics, our feedback from 20 years of local authorities support bring us to the following observation: the delivery area model is less and less adapted to the contemporary challenges of last mile deliveries.

o Firstly, these areas are rarely positioned in the right place or correctly sized (in our diagnoses, around 75% generally appear undersized and without appropriate signage);

o Secondly, deliveries are regularly made directly on the roadside, notably because delivery areas are nonexistent or occupied by private vehicles. Urban traffic is thus impacted, contributing to congestion during peak hours;

o Thirdly, parking plans regularly reveal unused infrastructure potential during specific time slots of the day.

The solutions tested to address these issues take into account parking spaces or road sharing (eg shared bus lanes in Paris and Barcelona) but rarely both in an integrated way.

Several questions can therefore be asked: Is the delivery area model still relevant to address last mile delivery practices? How an integrated and dynamic sharing of parking spaces and roads can answer to the demand for deliveries, while preserving urban traffic fluidity? What are the levers and conditions (urban planning, regulation, technologies) to optimize public space use?

Research Approach

Our approach will be articulated in several stages:

1. State of the art of scientific literature and feedbacks on public space sharing solutions in France and in Europe;
2. Operational feedbacks on last mile delivery uses challenges (from our expertise, on-field observations and interviews with local authorities and freight professionals);
3. Consolidation of a new delivery area model and sharing concept;
4. Evaluation, with on-field experimentation if possible.

Findings and Originality

The following results are expected:

- Definition of a new delivery area model.
- Demonstration of the interest in considering parking and road as an integrated shared system, and conditions to ensure its efficiency.
Research Impact
Our work will permit to consolidate the knowledge on expected evolution of last-mile delivery practices and associated challenges.
A joint demand and supply chain characterization for school canteen urban distribution in Sweden

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Purpose
Appropriate food distribution systems allow bringing into cities enough food supplies—that due to globalization are often produced kilometers away from their place of consumption—to satisfy the demand, with minimum waste and generating as few impacts as possible on the environment. The aim of this research is to understand urban food distribution in school canteens, and to analyze the drivers and impacts of current distribution systems. This paper uses the school canteens in Kungsbacka municipality (Sweden) as a case study. The first part characterizes the canteens’ demand; the second part describes the distribution system in place to fulfill this demand, and the third part analyzes the drivers and impacts of the current distribution system.

Research approach
The methodology used combines both qualitative and quantitative data and analyses, and is organized in two phases:

- Data collection includes primary and secondary data. A literature review allowed defining the specification of school canteen system in urban food distribution. Then, a documentary analysis (with both scientific and technical/legislation documents) is made to present the case context. To characterize the demand and supply chain structure, secondary data is complemented with primary information collected through semi-structured interviews with the Swedish stakeholders of the school canteens.
- Data assessment, which includes demand estimation and forecasting integrating the characteristics of the freight. Then a freight generation (FG) model is proposed to relate the monthly quantities (and frequencies) and the number of students/meals concerned.

Findings and originality
The main findings are the characterization of the Swedish canteen urban distribution system and its links to freight demand generation using evidence from Kungsbacka municipality. The urban distribution system deals with over 15,000 daily meals and contains four logistics echelons: producers, an Urban Consolidation Center, a network of 12 central kitchens and 89 school canteens.
Two types of flows were identified, a flow for fresh food (which does not pass through the central kitchens and uses therefore a two-stage transport system) and a flow for transformed food (which uses a three-stage transport system and a transformation at central kitchens). Each of these flows is a consequence of a demand for different products at different locations, thus the demand for the following goods is studied separately:

- Fruits and vegetables quantities at school canteens.
- Fruits and vegetables to be transformed at central kitchens.
- Other foods to be transformed at central kitchen.
- Prepared meals to be distributed to each school canteen.

A freight generation model is estimated to describe the relationship between the number of students served and the freight demand at each of the echelons in the distribution system. Understanding this relationship is an important insight for the design of new school canteen distribution systems or the re-design of current systems. Moreover, the definition of the overall transportation and distribution system as well as the transport management and vehicle load strategies will have an impact on the identification of both economic and environmental impacts of the distribution chain.

The originality of the work resides on the following issues. First, the characterization of school canteens remains still little explored; moreover, to understand school canteen demand, it is necessary to analyze its logistics organization. Second, the present work identified a specific demand structure that needs to divide the whole demand in two segments of flows and to define the freight generation model for the four goods (which correspond respectively to final and intermediary demand, i.e. at transformation point, for each segment). Third, the quantification of this demand allows completing supply chain characterization and improves the understanding of the whole distribution system.

Research impacts
The characterization of the canteen distribution system allowed us to define both the demand structure and the hierarchic transport system (which combines a two-stage and a three-stage transport systems with a common set of points at central kitchens). The demand generation and the definition of those systems adds knowledge on the complex organization of school canteen distribution and gives a set of opportunities in research related to design and optimization of such systems (interaction between demand generation and vehicle routing, complex multi-echelon vehicle routing systems, design and assessment of new distribution systems).

Practical implications
Main practical implications are related to decision support in terms of institutional catering. The proposed methodology can be used, combined with existing decision support systems (Palacios-Argüello et al., 2018), to assess the relevance of implementing new distribution systems or modify the current ones (for example, in the case of Kungsbacka, using two UCCs instead of one, or changing the number of central kitchens of the assignment of school canteens to them). Moreover, the methodology can be transferred to other countries (if data inputs are available) having similar needs (e.g. Paris which examined the potential of UCCs for institutional catering or Bogota who aims to implement a new school canteen distribution system).
References


Analysis of the productivity and spatial potential of using rapid urban railway in last mile freight in the Metropolitan Area Gdańsk Gdynia Sopot

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Purpose
The aim of the study is to analyze the productivity and spatial potential of adapting the areas within existing urban railway infrastructure to the needs of last mile logistics in the Gdańsk-Gdynia-Sopot Metropolitan Area. Determining the existence of this potential and its value will be the answer to the question of whether an existing urban railway can be efficiently used for urban freight within the cities of the entire Metropolitan Area.

Research Approach
It is an exploratory and cognitive study. It concerns the recognition of the productivity and spatial potential of the existing infrastructure resources of the urban rail. The analysis of the productivity potential of the urban railway utilizes knowledge of the current daily use of existing infrastructure and rolling stock in people mobility and the infrastructure which is used only occasionally.

Findings and Originality
The network of urban railway is well developed and covers the entire Gdansk-Gdynia-Sopot Metropolitan Area. It effectively ensures the mobility of residents of the whole agglomeration, but it is not used for freight purposes. Currently, however, there is a positive climate for the development of alternative solutions for urban freight. Some voices have also appeared in the public discussion to include the urban railway in the last mile logistics of the agglomeration. Preliminary results of the study confirm the possibility of including the existing urban railway in the freight system of Gdańsk-Gdynia-Sopot Metropolitan Area, especially in the context of the emerging Logistic Valley in Gdynia and neighboring communes.

Research Impact
The research aims to stimulate further discussions on the use of the existing metropolitan railway network for freight transport and contribute to investment in this area.

Practical Impact
The results of the study can be important for Polish Railways Group, planners, local authorities and local business. Main lessons of this work could be used to define a new urban planning strategy, more adapted to the current and expected demand.

Practical Impact
The issues addressed concern local authorities, which have a role to play in the development and monitoring of parking and traffic patterns, and freight operators and other road users, directly concerned by new public space organizations. Studying technological tools as facilitators is also of great interest to the last mile delivery professionals.
Sustainable city logistics: Evaluation of pooling practices in various urban contexts

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Purpose
Freight pooling appears as one of the most efficient practices to improve the sustainability of city logistics. It may reduce both the daily number of pick-ups and deliveries occurring in cities and the number of vehicles involved in freight transport (Montreuil 2011). Consolidation of flows is also a way to improve the loading rate of vehicles and to avoid empty trips. Despite its environmental benefits, this solution is difficult to implement for several reasons such as:

• The lack of space in downtown stores leading retailers to split their supplies;
• Carriers want to keep the control of their cargo for competition reasons;
• Some shippers don’t want to share the same vehicle with their competitors;
• Different types of goods and packaging cannot be carried out in the same vehicle.

In order to define political measures in favor of pooling practices, the French Ministry of Transport asked to identify the different types of pooling, to evaluate their effects in various urban contexts and to suggest actions to support such practices.

Research Approach
A panel of experts in goods transportation and urban planning developed scenarios for 2030. They combine pooling strategies (implementation of consolidation centers, elimination of own account transport in favor of third party transport, development of cargo trams), urban contexts (population and activities location and structure: segregation vs mixing) and energy policies (diesel/electric/CNG vehicles). For simulation requirements, each scenario has been tested on the same urban area: Bordeaux (pop 1.2 million). Simulations are made through a modeling approach based on the Freturb-Silogues (Routhier and Toilier 2007; Battaïa et al. 2016) model platform which produces many indicators such as number of pick-ups and deliveries, trips length, parking duration, pollutant emissions. This model is built from the results of the French urban goods movement surveys (1994-97, 2010-2014)(Patier et Routhier 2009; Bonnafous et al. 2016).

2 scenarios of urban contexts and 2 scenarios of pooling practices were compared:

1. Urban sprawl and segregation of population and activities without pooling (1a) / with pooling (1b)
2. Rail station oriented urban development (TOD) + population and activity mixing without pooling (2a) / with pooling (2b)

Findings and Originality
The comparison of the 4 scenarios results on urban freight shows that the effect of the urban context is much more important than the effect of pooling.

The urban sprawl scenario leads to an increase of greenhouse gases emissions (even if cleaner vehicles are used) because of an important growth of distances covered by vehicles to pick-up or deliver goods. The mixing scenario reduces the average distance of trips and limits the growth of GHG emissions. Pooling practices increase the number of pick-ups and deliveries (additional bulk breaking), but reduce the distance growth and the GHG emissions in both scenarios.
Research Impact
Pooling strategies are necessary but are far from sufficient to improve the environmental quality of urban freight. Policies for sustainable pick-ups and deliveries must act on: locations in order to bring production and consumption closer together, technological innovations for cleaner vehicles and optimized organizations, regulation in favor of third party account, etc.

Practical Impact
According to the simulation results, recommendations have been done to promote sustainable freight policies.
NYC Clear Curbs: Implications for Goods Movement

Alison Conway

Purpose
In April 2018, New York City began pilot testing of the Congestion Action Plan, which consists of a number of initiatives, including “clear curbs” – which restrict parking and loading on both sides of the street during peak travel hours (7-10 AM and 4-7 PM), essentially banning all delivery activity. The plan is being implemented with a goal to increase travel speeds across the study areas. However, it is unclear how these initiatives will affect the movement of goods.

“Little Brazil Street” is a single block on W 46th St between the Avenue of the Americas and 5th Avenue, one of 4 blocks included in the Manhattan clear curbs pilot area. This block is home to a number of restaurants and bars as well as hotels, retail stores, and commercial offices. While generally occupied by mid-rise buildings, it is also home to a 44-story office tower with a large underground loading dock. “Little Brazil Street” is located one block west of Times Square, and one block south of the Diamond District. A variety of types of goods movements occur on the block. Before implementation of the new regulations, the north side of the block was primarily regulated as a “No Standing” zone from 7 AM to 6 PM with a single signed hotel loading area; the south side of the street was regulated primarily as commercial metered parking from 7 AM to 6 PM, with about a third of the block regularly occupied by food trucks and small areas dedicated for hotel parking and for diplomat parking for the nearby Philippine consulate. After the change in regulation, the south side was also designated as a “No Standing” zone from 7 AM to 10 AM, with commercial metered parking permitted only after 10 AM. This presentation will detail findings from a before-after analysis of the morning and mid-day delivery activity on “Little Brazil Street.”

Research Approach
Both traffic camera data and parking field observation data were collected in the winter and spring of 2018 to characterize delivery and other curbside activity occurring on the block as well as enforcement activity. Variables of interest include carriers, vehicle types, commodities moved, and curbside distribution models (e.g. single delivery vs. neighborhood-wide distribution). Informal observations and stakeholders inputs were also recorded to provide insights on the specific impacts of the change in regulation on carriers and businesses.

Findings
Statistical analysis is being conducted to identify and quantify changes in delivery activity (or lack thereof) due to implementation of the new regulations. Qualitative observations also identify sector-specific impacts and changes in parking behavior.

Research Impact
This study takes advantage of a rare opportunity for a natural experiment to compare before-after curbside operations and characterize response to a new policy.

Practical Impact
This study provides insights on the effectiveness of a delivery ban at a local scale to shift different types of commercial operations, and provides recommendations to improve curb regulation and delivery management.
Co-creating space for sustainable urban freight services: the case of brown-field development for urban consolidation centers

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Purpose
Urban Consolidation Centers (UCC) have been tried in a range of settings with mixed results. Due to the difficulty of finding financially viable business models, private operators see little profit in operating UCCs, meaning that public actors often foot the bill. Without an operating model that is viable in the long run, publicly operated UCCs become dependent on fickle sources such as project funding, or subsidies. Such sources carry a political risk which means that they may dwindle if the political majority changes. By reducing negative externalities from urban freight, UCCs generate public benefits to the local community but local stakeholders are not necessarily contributing financially to the UCC. For example, property developers, tenants and visitors tend to reap secondary benefits such as higher property prices, cleaner air and less congestion, while not necessarily paying anything towards the upkeep of the UCC. In Gothenburg the municipality has envisioned a collaborative effort, bringing the private sector and local stakeholders together, to establish a UCC for a brownfield development project. The purpose of the study is to explore how UCC-related free-rider problems can be addressed through a combination of public governance and stakeholder-oriented business model innovation.

Research Approach
The paper builds on a case study of the early stage development of an UCC in a brownfield area of Gothenburg. Primary data was gathered through the participation in workshops on the development of the UCC, stakeholder meetings on issues related to the UCC, and interviews with established stakeholders. Secondary data, in the form of policy documents and business contracts, were analyzed and discussed with the stakeholders.

Findings and Originality
The paper elaborates on the collaborative effort of private and public sectors to find a governance model for the UCC that facilitated the integration of its operations with actors established in the urban freight value chain. It also identifies the conflicting monetary interests of key stakeholders linked to the management of public space (i.e. roads, parking areas and the UCC) that had to be addressed during the construction of the governance model. The endeavor can thus be described as a co-creation of the physical and financial “space” which is supposed to facilitate sustainable urban freight services through the establishment of the UCC:

Research Impact
The paper adds to the body of knowledge on UCC and governance of urban freight initiatives by exploring the underdeveloped area of collaborative business model innovation.

Practical Impact
Several of the stakeholders had been involved in two independently operated UCCs. Their experience from those projects colored the expectations on the new UCC and on the other
parties that were involved. This shows the difficulty of handling stakeholder interaction in early stages of cooperation since representatives may have strong biases towards specific solutions or against certain groups of stakeholders.
Governance of port container drayage: a global typology and analysis

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Purpose
Port container drayage may be defined as the transportation by motor truck of containers to and from marine terminals over relatively short distances. Typically, drayage occurs within the metropolitan region hosting both the port facility and the inland point of origin / destination, whether the latter is a warehouse, distribution centre, storage yard, or an intermodal rail terminal. Efficient truck operations are important for marine terminal efficiency, especially given the increasing average ship size in the container fleet and the consolidation of loads. Port trucking is also a flashpoint for conflict between community and government stakeholders, and marine carrier and terminal operators over the negative externalities (which are typically spatially concentrated) associated with truck operations. Port trucking is also vulnerable to disruption due to labour disputes, lack of equipment and unrelated disruptions in the surface transportation network. We ask: what is the range and type of port container trucking industry interventions that seek to reduce negative externalities and related use conflicts; how are these interventions and practices organized into overarching governance models; how have these governance models diffused among ports around the world?

Research Approach
This is exploratory research in which we have collected - from a variety of secondary sources, including technical reports, web sites and media - quantitative and qualitative indicators, and narrative descriptions, of port container trucking disruptions, interventions and governance arrangements.

Findings and Originality
For 100 major container ports, with representation on every continent, we have identified almost 1,000 instances of port drayage disruption and governance interventions. These data have then been used to describe patterns of port container trucking interventions, and create a typology of these that define an initial set of governance models. Our preliminary findings indicate that port drayage interventions are often closely related to disruptions, that they have diffused more rapidly in wealthy urban contexts, and that they involve a range of stakeholders reaching well beyond the port-terminal-drayage industries. These findings speak to the need for new governance arrangements that involve collaboration between port and urban authorities. The decentralized and highly competitive market structure of drayage trucking, as well as its poorly understood status amongst decision-makers and their publics, is a barrier to effective interventions that may internalize the negative externalities. Nevertheless, the list of experimental interventions is growing; these range from licensing, appointments/reservations systems, and application of information systems, equipment upgrades, time-based pricing strategies to shift demand, changes to employment arrangements, infrastructural solutions, to planning-based approaches.

Research Impact
While the various interventions have been subject to separate evaluation of their impacts on emissions, efficiency and related performance metrics, the overarching governance models of the port drayage sector have not been studied in a global and comparative perspective. Filling this gap is the goal of this research.
Practical Impact
To identify what interventions, practices and governance models are being used to address conflicts and disruptions associated with port container trucking.
Vulnerability & Resilience Analysis of Food Truck Distribution Routes in New York City

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Purpose
Access to sufficient and fresh food supplies is one of the important factors determining the quality of life in a neighborhood. Given the perishable nature of fresh food and limited space an average retailer in New York City (NYC) can store fresh food for only 4-5 days. [1] Aside from the stocking, the access to food depends on the reliability of delivery routes. Particularly during extreme disruptions (e.g., hurricanes, flooding, etc.) or even normal and planned disruptions (e.g., special events, traffic incidents), reliable food delivery routes help provide food resilience to the neighborhoods. Hunts Point Food Distribution Center (HPFDC) is the largest fresh food distribution center in the United States of America. It is the source of 60% of the food distribution in the New York Metropolitan area. [2] Many retailers, restaurants and small stores get their food supply from the HPFDC. The daily food distribution in the NYC area is primarily by truck from HPFDC. Approximately 95 percent of the city’s food travels into New York City through bridges and tunnels. HPFDC is the origin or destination of almost 15,000 truck movements every day. [3] The reliability of travel on the food truck distribution routes play a very critical role in ensuring food resilience in NYC.

Research Approach
In this study, we analyze food distribution network (FDN) resilience using automated vehicle location (AVL) food truck data based off HPFDC. The extensive AVL data obtained using GPS-equipped trucks spanning one year with about 10 million location observations provides spatiotemporal (latitude, longitude, time stamp, speed) data. The AVL data are being used to build the FDN in terms of the spatial distribution of routes bound to different NYC neighborhoods and their travel time for different times, days and months. The spatiotemporal FDN data will be layered with on land use, number and type of grocery stores and demographics (income, racial composition, etc.) of the destination neighborhood by comparing the travel time reliability of the routes based on the day of week, special events, etc.

The FDN built using the AVL data will also be analyzed from a network design standpoint: (a) its vulnerability to flooding of certain roadways during extreme inclement weather, (b) resilience using alternate routes and associated travel times in terms of providing adaptive capacity. The flooding information will be obtained from the National Flood Hazard Maps.
developed by the Federal Emergency Management Agency (FEMA) [4] and Sea, Lake and Overland Surges from Hurricanes (SLOSH) maps developed by the National Hurricane Center (NHC) of the National Oceanic and Atmospheric Administration (NOAA). [5] These maps provided detailed estimates of flooding caused by events of varying severity such as category 1-4 storms and floods. Specific measures to characterize vulnerability of routes such as network reliability index [6], vulnerability indices [7,8], and recovery & resilience such as friability [9], $\Delta$travel time/$\Delta$time [10] – to cite a few – to different neighborhoods will be estimated to compare and contrast the neighborhoods.

**Expected Findings**

Based on the distance from HPFDC, Staten Island has longest route and passing through greater number of potential flooding zones. Hence, Staten Island is expected to be one of the neighborhood with high vulnerability, low resilience and travel time reliability. Other neighborhoods such as Coney Island, Rockaways, East Harlem, etc., located in the 100-year floodplain maps are also expected to have low food resilience. These neighborhoods are also house population in the low income group.

**Research/Practical Impact**

The study of neighborhood-based FDN vulnerability provides a measure to analyze the equity of food availability across different neighborhoods in NYC. Recovery and resilience measures are useful in determining how soon or how slowly certain neighborhood can have reliable food distribution back to normal operation. These measures can help city planners on offering alternative means/options such as better local storage facilities, alternate truck routes, etc. for neighborhoods that are less resilient.

**References**


Sustainable business models for urban waterway transport of goods and waste

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Purpose
Due to urbanization, there is an increased amount of goods and people transported on urban infrastructure, resulting in congestion as well as emissions of noise and greenhouse gases. To mitigate these negative effects, it is in many cities possible to some extent use urban waterways for the transport of both goods and waste. Worldwide, there is comparatively little use of urban waterways for these purposes. For a private actor to offer transport services on urban waterways today there is a need for a business model that can work with the existing transport system. Therefore, the purpose of this paper is to identify critical barriers to the development and implementation of sustainable business models for the transport of goods and waste on urban waterways.

Research Approach
This paper is based on a case study of a two-week long transport demonstration conducted in a downtown brown field area in Gothenburg. To explore the feasibility of urban waterways as a means for urban freight for the planned area, the demonstration was conducted in cooperation with key stakeholders. Data was collected through interviews with involved actors both before and after the demonstration; from investigations performed before and notes from the project meetings in designing the demonstrations; and from observations during the demonstration as well as a techno-economic analysis after the demonstration. Based on this data, a scenario-based analysis was performed to identify viable business models.

Findings and Originality
Both the business model review and the techno-economic analysis showed that urban waterway transport was not cost competitive. Barge transport is relatively slow which causes high transport cost. Also, there was a strong dependency on other actors to present a viable value proposition. For future implementation, the municipality need to develop suitable keys for loading, while 3PL companies and last mile transporters, needed to make adaptations of operations and equipment. Consequently, the results indicated the necessity of improving both the value proposition and the cost-efficiency of the business model.

Research Impact
Due to the high costs and uncertain appeal of the value proposition policy measures are likely needed to facilitate the establishment of urban waterways services. In Sweden municipalities are most suited to support the development such services since municipalities have decisive power over the local traffic environment and stand to win the most if such services are adopted. Since municipalities both plan and manage transport infrastructure they can facilitate urban waterways by, for example, taking it into consideration early on in the city planning process or stipulate a minimum share of transports to be conducted on waterways.

Practical Impact
This paper demonstrates that it is feasible with urban waterway transport from several perspectives, but cost remains a major challenge. Also, several actors in terms of municipalities, shippers, 3PL companies, city developers and barge operators must adapt their operations to make transport services on urban waterways feasible.
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Purpose
Today, there is a constantly growing significance of UFT, mainly related to the population and economic growth in urban areas (Campagna et al., 2016). In Europe, almost 80% of the population lives in urban areas (Foltynski, 2016). This makes sustainable urban logistics planning a very demanding and challenging process, thus requiring specific elements for successful implementation. One of these elements considered to be the stakeholders’ collaboration, whose behavior affects the results of city logistics measures (Taniguchi et al., 2015). Stakeholders have strong opinions regarding the results of a UFT measure implementation based on practical assumptions and usually underestimate results of quantification methods including simulation models.

Research approach
This paper describes tools and techniques used in an iterative process with industrial stakeholders of Urban Freight Transport of Athens agglomeration for cooperative city logistics measures selection & implementation. The research focuses on analyzing quantitative as well as qualitative data gathered by both public and private stakeholders and the use of simulation techniques for estimating the impact of the proposed measures and creating the arguments for stakeholders’ agreement on collaborative measures. In addition, success factors and obstacles hampering the potential stakeholders’ collaboration are discussed as well as the appraisal of the experts on simulated results. The final overall evaluation parameters used to measure the potential environmental impacts of the collaborative UFT schemes to the Athens area are presented and discussed.

Findings and originality
The research findings show correlation between stakeholder collaboration and delivery vehicles load factor increase. The comparison of the experts estimates and the model result regarding the impact of the collaboration to the city UFT is also presented and discussed.

Research Impact
Comprehensive combination of expert and model results and of quantified and non-quantified data and methods in assessing impact of industry collaboration for sustainable UFT measures. This combination provides solution to the non-availability of data for implementing detailed modelling and enumeration techniques.

**Practical Impact**

The research shows that the implementation of stakeholder collaboration on the last mile distribution in Athens city may lead in significant increase of the load factor and consequently decrease of the number of trucks entering the city and improve quality of environment. Moreover, implications regarding the regulatory logistics framework in Athens are also discussed, trying to alleviate the city’s congestion and safety problems.

Keywords: quantitative techniques for UFT impact assessment, qualitative approach for impact estimation, simulation, urban logistics planning (SULP), stakeholder collaboration, urban freight transport (UFT), environmental impact, last mile distribution.
Purpose

Managing the change towards effective, cooperative & sustainable city logistics solutions of the future, is a challenge. Many cities have developed detailed strategies focused on urban mobility problems related to transport challenges. These strategies defined as Sustainable Urban Mobility Plans (SUMPs), aim to improve the life quality of citizens by satisfying mobility needs of people mainly and businesses. Although SUMPs have been adopted by many European cities, little attention has been paid to the issue of sustainable distribution of goods in the cities. This paper aims on filling this gap by presenting specific guidelines for cities on how to integrate Urban Freight Transport (UFT) measures and policies with their existing SUMPs as well as to develop appropriate business models for the UFT solutions. These guidelines lead to specifications for developing a Sustainable Urban Logistics Plan (SULP).

Research approach

The process of developing a SULP differentiates from a SUMP approach. More industrial stakeholders needed to be engaged and their reasoning in decision making is focused mainly on activities’ profitability and efficiency. The parameters describing future vision, objectives and priorities of a plan for sustainable UF distribution are different than those used for passenger mobility plan. Finally, the level of collaboration required is usually difficult to be achieved due to transport and logistics industry fragmentation.

The research approach was initially based on State of the Art analysis & bibliography review for identifying and selecting the parameters able to efficiently describe UFT city characteristics and the main influencing factors. By correlating these parameters, and by applying grid methodologies for categorizing cities UFT and measures, a six-step approach was followed in order to:
1) facilitate stakeholder’s consensus in defining current UFT status and future vision for urban freight distribution and 2) associate UFT measures to the achievement of the city’s future UFT vision.

The methodologies used and the results of the methodology’s’ implementation in 12 European cities are presented and discussed in this paper. The horizontal comparative analysis of the overall results provides the basis for generalizing SULPs guidelines. Finally success parameters are also presented and discussed mainly focusing on stakeholder’s collaboration and on dedicated collaborative business models for UFT implementation.
Findings and originality
The paper suggests an integrated city logistics planning process including methods and tools for easy implementation. Adapting ELTIS SUMP methodology for dedicated city logistics planning (SULP) is an important contemporary and challenging planning issue to which the paper responds.

Research Impact
This paper aims to generate knowledge on the field of UFT. It also provides evidence on how methodologies and techniques usually used in other fields may be implemented in UFT Planning domain. In this context experts’ opinion management methodologies (i.e. DELPHI & PROMETHEE) are used for managing multi-stakeholder’s governance platform for UFT. Similarly, Business models Canvas technique is applied for defining collaborative business models for UFT measures implementation.

Practical Impact
The paper provides guidance for facilitating the policy formulation for the city’s sustainable UFT planning.

Keywords: urban logistics, decision making support, guidance, stakeholders governance platform, sustainable urban logistics plan (SULP), urban freight transport (UFT)

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Neila Saidi, Diana Diziain, Laetitia Dablanc

**Purpose**
The present study aims at a typology of urban buildings and spaces dedicated to logistics operations (loading/unloading, sortation, storage, picking, packaging and order preparation). The research looks at how these logistics activities take place in cities, and which are the differences and commonalities between various cities in this regard. Finally, the study aims at providing technical recommendations regarding the size, design, and functions of the terminals, in order to facilitate their integration into urban planning processes.

**Research approach**
The study is based on a detailed collection of actual examples from French and other European cities, that show the diversity of urban logistics buildings and places, from very small ones (lockers, logistics micro-hubs) to quite large facilities (urban warehouses, logistics hotels). The work is based on the analysis of more than twenty projects. It included on-site visits as well as interviews with investors, developers and users (logistics operators). Several workshops were organized where the point of view of the logistics real estate industry was expressed. In particular, members of Afilog, a logisticians’ and real estate developers’ business group, were active contributors through the workshops.

**Key findings**
The results of the research are the following.
An urban logistics real estate is emerging in European cities and elsewhere (Asia). It is a niche market for the real estate industry, but it is addressing the demands of economic sectors that are currently growing, such as e-commerce and express deliveries (24 hour deliveries, same day deliveries, ‘instant’ deliveries).
This new market is designed both as providing operational tools for freight and logistics providers, as well as an investment product for investors specializing in logistics real estate.
The study shows that a specific architecture is emerging for city logistics. The paper provides specific examples that are illustrative of the trends, providing details on size, design and functions of the buildings that have been identified. It also provides information on challenges and limits (technological, economical, regulatory) when building a logistics facility in a dense urban area.

**Impacts**
This research contributes to raising awareness of local governments towards the need to accommodate logistics buildings in the best environmental way possible. Architectural and design standards proposed in the paper for urban logistics facilities can be adopted in freight planning processes at the municipal level.

**References**


Purpose
This proposed presentation contributes to a new body of research that investigates the potential of digital market places to disrupt city logistics. “Instant delivery” services provide deliveries within one or two hours after order, operated by self-contracted couriers on bicycles connected to freight demand via smartphone apps. Large companies (Amazon Prime Now) are involved together with start-ups, some of which grew into medium size companies (Deliveroo). These services disrupt the urban freight routine in many ways (business models, labour conditions, environmental performance, vehicle choice, road safety, delivery routes) (Dablanc et al., 2017). Our objective is to identify and specify these key issues, with a special focus on:
- labor and legal (work contract) issues, as instant deliveries are made in many cases by self-employed workers (“gig” economy);
- traffic management, road safety, and urban planning issues for municipal governments faced with an increase in delivery trips.

Research approach
In this proposal, we used three sources of data collection and analysis.
1. We present a comparative analysis of the results of two original surveys made in the city of Paris, one in Oct-Dec 2016 among 96 instant delivery couriers (Dablanc & Saidi, 2017), another one carried out in Jan-March 2018. The data was collected through face-to-face or email interviews based on a detailed questionnaire. 35 questions were included, under three categories: the worker’s personal situation (age, training, place of living); the facts of the job (which platforms, how many hours, what revenue); and the worker’s perception of the job’s benefits and challenges.
2. An update of a previous analysis of the instant delivery industry worldwide (Dablanc et al., 2017) was also made from specialized press, literature, websites and additional interviews with managers.
3. Finally, interviews with city managers in Paris were carried out to identify their awareness of the issues as well as the way they cope with increasing instant delivery activity in Paris.

Key findings
The results of the research are the following.
- Socio-economic and educational background of instant delivery couriers: some of them are students working part time, enthusiast bicycle users, living in Paris; others, on the contrary, live in poor suburban areas (and have more difficulty getting to work in Paris with their bicycles), have no high school education, and work full time.
- Challenges for municipalities are growing, especially for the need for data and knowledge, zoning and planning, urban warehouses, traffic regulation, road safety,
with an increase in street use conflicts between motorized traffic and delivery bicycles.

**Impacts and perspectives**
Demand for instant deliveries is likely to keep growing. Supply of services is abundant but unstable, and business models constantly need to adapt as consumers are increasingly reluctant to pay for express delivery services. Access to investors is becoming more difficult. Partnerships with large shippers (Stuart with La Poste group; recent agreement between Postmates and Amazon) may become increasingly important for instant delivery companies if they want to survive in a very competitive market.
From the workers’ side, legal challenges are increasing (self-employed willing to be requalified as employees; or regular freight delivery operators willing to challenge the legal basis for digital platform based delivery businesses). Some couriers are organizing collective groups to claim more benefits and protection from companies. Another potential impact is an increase in opportunities for research in this area.

**References**

Purpose

An urban logistics micro hub is a point for storage and distribution in the city close to recipients of deliveries (Janjevic/Ndianye 2014). The close proximity to recipients allows for last-mile delivery with environmentally friendly means of transport, such as cargo bikes or pedestrian transport, and deliveries at precise times desired by customers (Taniguchi 2016). This research focuses on micro hubs on manned premises, such as parcel shops, which facilitate not just storage and distribution, but also transshipment, customer pickup and a variety of customer-oriented services. Despite operational and environmental advantages (Browne et al. 2012), at present, such micro hubs are usually not run as economically sustainable businesses by CEP providers. Thus, the purpose of this research is to define new services which allow economical operation of urban logistics micro hubs.

Research Approach

The research is done by an interdisciplinary project team and comprises four essential steps. First, design thinking (Plattner et al. 2009) with potential customers of urban logistics micro-hubs was employed to create new ideas for future services in a structured way. The KJ method (Terninko 1997) was used to identify problems in regard to existing logistical services as a basis for possible future services. Second, identified ideas were structured according to core areas of opportunity. These areas of opportunity were assessed by potential customers in terms of frequency and importance by means of a quantitative online survey. Third, prioritized areas of opportunity were evaluated with respect to strategy and feasibility by experts from the CEP industry. In a final step, innovative services of urban logistics micro hubs are conceptualized and evaluated. This step includes service engineering (Luczak et al. 2004) and multi-criterial evaluation and is not completed yet.

Findings and Originality

As the research project is still ongoing, results are preliminary. 14 areas of opportunity were identified and evaluated. Results indicate everyday problems with the delivery of parcels, like inconvenient pickup of deposited parcels, are most frequent and most important to address. Therefore, CEP providers should not neglect to meet basic customer requirements. At the same time, however, they should develop innovative services that will ensure long-term market success. Both can potentially be achieved with innovative services for urban logistics micro hubs. Prioritized areas of opportunity include, amongst others, flexible pickup and delivery services and various forms of storage solutions. Several research works deal with urban logistics micro hubs; however, to our best knowledge, innovative services for micro hubs in manned premises have not been addressed yet.
Research and Practical Impact

The CEP market is characterized by intense competition and undergoing a period of transition (MRU 2015). This paper illustrates an approach for CEP providers to create added value through a combination of the concept urban micro hub with innovative services. This helps CEP companies to operate urban logistics micro hubs in an economically sustainable way. Moreover, promoting urban micro hubs supports the use of ecological means of transport and efficient freight mobility through bundling effects, thus leading to more environmentally sustainable logistics operations.

Acknowledgements

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References


MODELLING AN URBAN LAST-MILE PICK-UP AND DELIVERY NETWORK FOR E-COMMERCE

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Introduction
E-commerce growth poses a number of challenges to urban logistics. Research on e-commerce home deliveries has mainly addressed the impacts of delivery points (DP) (i.e. pickup points, drop-off points, lockers) in terms of the total number of vehicle kilometres travelled (VKT) and reduction of failed deliveries. It is common to see studies that consider DP as an occasional solution. However, during the last years, logistics providers are building denser networks of DP and integrating the location of these points into their strategic planning. Therefore, considering DP as an extra tier of the supply chain may be a more realistic approach. Moreover, the decision of location and catchment area of a DP has implications on the net VKT and it is not exclusively interesting for logistics providers but also to the environment and the service level of e-shoppers.

Purpose
Since the outcomes on the environment are a consequence of the decisions of different stakeholders the purpose of this paper is to explore the interests, relations and consequences of the decision process of the different stakeholders interacting with a DP network.

Research approach
This paper follows a quantitative approach, modelling the different decision processes for the stakeholders and then, calibrating the model using data from a realistic case study in Belgium.

Findings and Originality:
The primary findings show that the outcomes for sustainability do not depend exclusively on the decision made by the logistics providers. It rather is a consequence of the expectations and behaviours of the customers towards a particular design of DP network. This shows that there is potential for proposing a network design which can optimally manage the trade-offs and provide benefits to all the stakeholders.

Research Impact:
In this paper, a novel modelling approach for the mile last is considered. The characteristics of this modelling can be generalized for analysing a different context on urban logistic last-mile problems.

Practical Impact:
The main contribution of this paper is on shedding light about the implications of the different trade-offs co-existing in the e-commerce last mile. For public authorities and managerial decision of companies, the results of this paper help to better understand the sustainable premises related to delivery points in e-commerce.
PURPOSE:
The purpose of this paper is to explore the relationship between household shopping behavior, freight deliveries, and urban form. We explore shopping behavior as an indirect means for understanding the associated freight deliveries. In previous work we have argued that density, a proxy for urban form, affects the behavior of both households and firms (Rodrigue, Dablanc, and Giuliano, 2017; Giuliano, Kang, and Yuan, 2015). Firms economize on space by allocating less space per worker, minimizing storage space, and other strategies. In the case of retailing, high land values necessitates more revenue per square foot, more rapid turnover of product, and less space devoted to storage, compared to retail activities in lower density environments.

Households also economize on space in response to high land values. Dwelling units are smaller and inventory capacity is limited. More shopping trips are taken by walking or public transit, constraining the amount of goods that can be carried home. This suggests that controlling for demographic characteristics, households in high density areas will shop more frequently. The effect of shopping in smaller lots on freight deliveries is uncertain, because for the retailer the critical trade-off is between inventory holding and revenue generating space.

If shopping is inconvenient, there is more incentive to shop online. More online shopping would clearly lead to more home deliveries and more freight trips. A third factor is the effect of substituting between activities inside and outside the home. With small dwelling units, households may socialize more frequently at restaurants or coffee shops. Business meetings may more frequently be held at food or drink establishments. This suggests more overall out of home consumption of goods and services per household, which again would imply that freight deliveries increase with density.

RESEARCH APPROACH AND DATA
Our main hypothesis is that shopping behavior is related to urban density. More specifically, we expect that: 1) online shopping frequency is positively associated with urban density; 2) in store shopping frequency is positively associated with urban density, and 3) out of home consumption activity is positively associated with urban density. The effect of these relationships is to increase the per capita rate of freight deliveries, which helps to explain the greater concentration of freight deliveries in central city cores.
We use the 2017 National Household Travel Survey, a national survey that includes a one-day travel diary for every member of the household over the age of 5 years. The survey is a stratified, clustered random sample of the US, with additional observations from local “add on” surveys. The total sample is 129,000 households and 264,000 persons. We begin with simple descriptive statistics and cross tabulations to provide a general description of online and in store shopping patterns. We then estimate models of the likelihood to shop as a function of demographics and spatial opportunities. We evaluate the results and discuss implications for urban freight deliveries.

FINDINGS AND ORIGINALITY
We have only begun our analysis with some preliminary descriptive information. With regard to shopping trips for goods, services and meals, we find that trip frequency declines with density, contrary to expectations. We do not yet know whether this pattern will persist when controlling for demographic characteristics. Shopping trip distance declines with increasing density, as would be expected. The rate of online shopping increases with density, as expected. We have not yet segmented shopping purposes to examine how out of home consumption activities may vary with density.

RESEARCH IMPACT
Metrofreight researchers have been developing a conceptual framework for urban freight over the past five years. Our goal is to understand the underlying forces that generate urban freight. We observe that freight problems are more intense in the central areas of metropolitan areas, but we do not have a comprehensive model or theory of why this is the case. The lack of freight data imposes serious constraints on addressing this research problem. This paper is another step in using indirect relationships to build our understanding of urban freight dynamics.

PRACTICAL IMPACT
In contributing to a better understanding of urban freight dynamics, our research will help to inform development of more effective freight management policies.

References

Leverage effect of a mega-event on logistics facilities’ development in the Paris Metro Area: urban renewal and “logistics gentrification”

Adeline Heitz, Université Paris-Est, Ecole d’Urbanisme de Paris

Purpose: State the purpose of your research

It has become commonplace for public stakeholders to take advantage of hosting mega-events, such as the Olympic and Paralympic Games, to develop or regenerate their cities (Andranovich et al., 2001; Coaffee, 2007; Augustine, 2008, and Roult et al., 2010). Public policies take advantage of those mega-events to gentrify neighborhoods in metro areas and mega-events appear as urban laboratories for logistics experiments. The Olympic Games in London in 2012 happened to be a good opportunity to experiment new policies for freight such as night deliveries, pedestrian deliveries, new traffic plan (Transport For London, 2011, 2012, 2013, Freight Transport Association, 2011, 2012, Olympic delivery authority, 2010; Browne ....). The metropolitan region of Paris will host the Olympic and Paralympic Games in 2024. Inspired by the London case, Paris intends to benefit from these events to develop and transform the metro area. In a prospective research, the aim of this paper is to analyze the impacts of planning and programming for a mega-event such as the Olympic Games and the effect of urban renewal induced by mega-events infrastructures on logistics facilities and goods flows in the Paris metropolitan areas.

Located in the close suburbs of Paris, the département of Seine-Saint-Denis hosts a share of the Paris’ logistics real estate. But logistics sprawl (Heitz, Dablanc, 2015) and the development of modern big facilities in wider suburbs have contributed to depreciate the aging logistics facilities located in this close suburb (Heitz, 2017). Seine-Saint-Denis is a former industrial area, which concentrates a large unemployed population and faces important challenges regarding deindustrialization. The Olympic Games represent a lever for urban transformations, allowing for the reorganization of the location of logistics facilities in dense urban areas, and the improvement of the management of freight flows during and after the Games. By planning a traffic plan and new logistics facilities such as distribution platforms, “logistics hotels” and urban distribution centers, public stakeholders intend to benefit from the Olympic Games to regenerates logistics in Seine-Saint-Denis.

Research Approach: Describe the research approach (e.g., qualitative, quantitative, exploratory) and method adopted

This prospective study aims to demonstrate that the planning and programming of logistics facilities for the Olympic Games won’t prevent logistics sprawl but rather strengthen this dynamic in Seine-Saint-Denis. Moreover, the new logistics facilities will compete with aging, small and traditional logistics facilities accelerating their relocation or disappearance. First, by using a specific database that census all logistics facilities in the Paris Region (Heitz, Launay, Beziat, 2017) and field work observations, we propose to describe the logistics real estate in the département of Seine-Saint-Denis. By using several interviews with public authorities, logistics real estate stakeholders (such as Sogaris) we propose to analyze the new logistics real estate’s offer developed by public and semi-public stakeholders for the Olympic Games in 2024.
In the end, we propose to analyze the impact of these new facilities on the land prices for logistics and the risk of a foreclosure effect to the detriment of the rest of the logistics real estate. We use field works and data on land prices in the Paris Region.

Findings and Originality: Describe the key findings of your research (findings can be preliminary)
The main findings are:
- The logistics facilities in the département of Seine-Saint-Denis are aging, dilapidated, vacant, small, less and less used for the benefits of remote areas. But their existence generates lower prices for the logistics real estate market. If they disappear because of urban renewal, the prices will rise.
- Planning documents’ objectives are to maintain logistics facilities in dense areas to promote social and functional diversity, but also, to limit potential gentrification effect.
- The planning of logistics facilities in Seine-Saint-Denis for the Olympic Games ignores existing facilities but focuses on building new ones, more fitting with urban logistics principles.
- These new facilities increase logistics facilities' prices and land prices and contribute in the end to the logistics sprawl by the relocation or disappearance of the rest of the logistics facilities.

Research Impact: Describe the impact of your research
By analogy with a gentrification dynamic measured in metro areas because of urban renewal process promoted for the Olympic Games, we observe a “logistics gentrification” in dense part of the Paris Metro Area, in Seine-Saint-Denis.

Practical Impact: Discuss the policy/managerial implications of your research
This research explores a new logistics spatial dynamic, “logistics gentrification”, which contributes to the debate on logistics sprawl. It also provides new insights on the pricing mechanisms for logistics facilities. Finally, this communication could contribute to the debate on the legacies of mega-events such as Olympic Games and their impacts on the location of logistics facilities, through the development and promotion of logistics experiments.

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Abstract:
Freight vehicles make up an important share of road traffic. In French agglomerations, freight transport accounts for up to 15% of vehicles’ trips, 25% of “passenger cars equivalents” vkms, and about 25% of time losses due to congestion. As a result, numerous city logistics public policies focus on reducing the number of kilometers travelled by freight vehicles, especially during the peak hours. This has been the aim of many off-hour delivery pilot projects. There is an extensive literature on the relevance of off-hour delivery schemes: they can have positive impacts in terms of congestion and emissions, as freight tours can be optimized. Furthermore, savings in travel-times translate to more efficient transport operations and have beneficial impacts on carriers’ costs.
However, while the direct impacts of off-hour deliveries have been analyzed in depth in the context of specific pilot projects, there are few analyses which deal with the simulation of direct impacts of large scale shifts of freight operations to the off-hour, at the level of an agglomeration. Moreover, there are no studies, to the author’s knowledge, on the potential indirect impacts of off-hour deliveries. Indeed, freight traffic should be analyzed in the broader context of urban traffic. Since freight and passenger traffic rely on the same road infrastructure, a significant reduction of freight traffic could result, in the short or medium term, in an increase in passenger road transportation, thus producing indirect negative externalities which should be taken into account.

The aim of this paper is to simulate the direct and indirect impacts of a partial shift of freight operations to the off-peak hours. The case study for this analysis is the Lyon urban area. We propose a quantitative analysis in the form of environmental assessments (carbon footprint and local pollutants) of two situations: a business-as-usual scenario, and a shift to off-hours for a portion of freight operations. Two main tools are used to estimate these direct and indirect impacts: the Freturb-Silogues model, which estimates the impacts of a shift to off-hour deliveries on logistics organizations; and the SIMBAD model, which is a LUTI model (Land-Use Transport Interactions), designed specifically for the Lyon urban area. The SIMBAD model is used to determine the indirect impacts (passenger modal shifts in favor of cars) of the improvement in road accessibility which is caused by the shift of freight traffic to the off-hours.

To the author’s knowledge, no previous paper has attempted to analyze the impacts of off-hour delivery schemes by taking into account urban traffic as a whole. This type of analysis (combining freight and passenger transportation) is relatively scarce in the existing literature. Our paper addresses this gap. Failing to take into account this broader urban context may lead to unintended and undesired consequences (such as a modal shift in favor of road passenger transportation). Therefore, this paper has, in our view, important practical implications as well and may help design and implement more comprehensive transport policies.

Key-words: Off-hour deliveries; environmental assessment; direct and indirect impacts; combined freight and passenger traffic; Lyon urban area
Purpose
When people talk about commercial activities, traffic congestion and negative externalities, one of the first thinking is freight transportation. However, service trips are other vital vehicular activity in commerce which have gone by without much attention. Service trips can be defined as trips that arrive at a specific place to carry out a particular service, and that usually generated by some commercial entity. Instances of such are: Industrial, financial, insurance and education services; health care and social assistance; among many others.

It should be borne in mind that even though most service trips are scheduled, some others are unplanned. Although, service trips could be scheduled, in some cases are not necessarily periodic. In addition, these are usually door to door services that have been becoming an issue for the availability of parking zones. It is due to the particular characteristics of the place in which the vehicle must be parked, and the variation of time to do the corresponding service. Moreover, a lot of service vehicles are required to occupy a parking space that is not planned for such activities (e.g., cells reserved for visitors or designed for loading and unloading).

Overall, this research purpose is to analyze the effects that service trips have on traffic congestion and the use of parking lots in urban areas which every year raise their population.

Research Approach
This research approach is quantitative. The information was obtained through surveys applied in households in a sector of the Metropolitan Area of Valle de Aburrá, Colombia. This allowed the authors to estimate the number of service trips generated by household demand, frequency, parking times and parking places. Furthermore, the type of vehicle used to provide each service trip.

Findings and Originality
Considering service trips as an important portion of the daily trips. It is possible to think that they contribute to traffic jams while affecting mobility of the cities. These service trips must share streets with other transportation system and require parking zones that could be used by other vehicles types.
Research Impact
Until last years, service trips have gone generally unnoticed. This research is a way to make visible the service trips concept especially with regard to the use of parking space. The paper analyzes a case study in the Metropolitan Area of Valle de Aburrá, Colombia. The research allows to contrast planning parking spaces for freight trips against parking spaces needed that include ones for service trips. Currently the variable of service trips parking spaces is not considered at moment of plan urban areas.

Practical Impact
The results of the study will contribute to the search of initiatives and the design of public policies to improve problems caused by service trips mostly ignored by the planning entities.
Purpose
This study estimates freight trips generated by large urban freight generators LTGs (e.g., malls, large buildings, hospitals). The LTGs can be understood as a spot of reception and delivery of a large number of freight trips in an urban area. This study distinguishes different types of LTGs proposes new definitions for freight transport.

Research Approach
To conduct this research, the authors estimate econometric models to obtain the variables that explain production and attraction of freight trips generated by LTGs. The research has a quantitative approach, which looks for statistically significant and conceptually valid variables (e.g., employment, areas of establishment, load produced), using secondary and primary information obtained in a freight study in Medellin, Colombia.

Findings and Originality
The paper estimates freight generation models for different large traffic generators including Malls, Hospitals, Universities, large buildings, among others. Moreover, definitions are provided to clarify the approaches of further studies of LTGs, loading zones and zonal freight generators.

Research Impact
The study aims to help to understand the variables associated with the generation of trips by different types of LTGs, by offering a modeling tool that serves as support in other areas like: valuation of congestion in LTGs, road capacity studies in the vicinity of LTGs and the relationship between the freight transportation analyses zones, freight vehicles and LTGs.

Practical Impact
The research provides a useful tool for freight mobility guidelines in urban areas and freight transportation initiatives (e.g., infrastructure management, traffic management) that seek to reduce the negative externalities of transport associated with LTGs like congestion and noise.
Effects of on-line shopping on freight transport in developing countries

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Purpose
Nowadays e-commerce has changed the way in which consumers and commercial establishments interact with each other. Online sales are growing three times faster than retail sales. Meanwhile customers demand an increment of the number of deliveries and a reduction on delivery times. Thus, freight transportation requires flexibility and adaptation capabilities. This research seeks to analyze the effect that on-line purchases generate on freight transport in developing countries. It is an issue that is at the beginning of the investigation and of which there are no figures that show the problem. Then, the purpose of this research is to analyze the effects (e.g., increase in emissions) that on-line shopping has on freight in developing countries, based on a case study.

Research Approach
This research considers a mixed approach since it seeks to identify the causes that generate the problem together with the causality relationships between the variables identified based on data provided by stated preferences surveys about on-line shopping.

Findings and Originality
At the moment it has been identified that there are few studies that have been conducted on the subject. However, it is a subject that generates great interest in the freight community due to the impact it can have on the business scheme that currently dominates. Surveys are being conducted in the city of Medellin. So far, we have identified that the e-commerce has risen in Medellin in a great percentage in the last decade.

Research Impact
Given the infrastructure of the cities, the distribution of urban freight transport is done in small delivery trucks that are partially loaded to respond timely to the needs of a customer or, worse, empty when they return from a service. Increasing the number of vehicles on the streets shows that the transport of cargo also contributes to traffic congestion and, therefore, increases emissions and noise. Currently the process of distributing the commodities purchased online is unknown and therefore, the effects that this mode can generate on transport and cities.

Practical Impact
Once the problem and the variables related to it have been identified, the purpose of the research to expose the effect and propose solution strategies. Although it will be studied for the Medellin case, the investigation will be done in such a way that it is generally applicable, especially in developing countries.
Purpose
This research analyzes truck bans in cities due to emissions. With the aim to reduce/mitigate the negative externalities due to freight transportation, sometimes the circulation of trucks is banned in some cities. Some of these restrictions and bans are applied without having technical support. Thus, it is necessary to analyze how convenient are these restrictions and how efficient they really are. This is analyzed in a case study (Medellin, Colombia).

Research approach
At the beginning of 2017, the air quality in Medellin became critical. After three consecutive days of high pollution in the city (orange alert), the worst situation in terms of contamination (red alert) was declared by the Government. For this reason, the city authorities decided to implement a series of restrictions on the circulation of private and cargo vehicles. The restriction consisted in the prohibition of the circulation of 60% of the vehicles (450,000 vehicles per day, based on the last number of the license plate) between 7AM and 7PM for three days. Besides this, trucks could only circulate between 10AM and 5PM. However, the restrictions were a political decision where no technical studies were conducted to support these decisions. Based on these facts, the authors decided to assess the effectiveness of the truck restriction. To this effect, we considered the amount of emissions (especially PM2.5 because they are directly related with human health impacts) produced with and without restriction to analyze the efficiency of the trucking ban. In doing so, the authors used regression analyses to develop an emission model relating pollutants with Vehicles Miles Traveled (VMT) for both cases. This allows the evaluation of the restrictions (providing a comparison point to support/oppose it) and proposing new alternatives that could help in the reduction of emissions produced by trucks in the city.

Findings and originality
In terms of environment, a strategy that at first hand appears to be a good decision, could not be one in the long term. For this reason, it is necessary to have a technical support and prevent undesired effects to the city.

Research impact
In this research the authors developed a tool that allows to assess the effectiveness of freight transportation policies in terms of the environmental impacts reduction/mitigation.

Practical impact
The assessment of the restriction made in this research agrees to propose different alternatives and policies more efficient in the reduction of the emissions due to the trucks in urban areas.
Improving Freight Efficiency with Load Matching Technology

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Purpose
Load-matching technology for truckers and shippers helps an inefficient and often fragmented local trucking market by eliminating non-revenue-generating trips. The basic idea is to provide a real-time, online, GPS-based connection between shippers and carriers, somewhat similar to how Uber and Lyft connect drivers and passengers. There is reason to believe that the market for this kind of service will only grow; however, expansion will depend upon a combination of economic and political factors. The roll-out of load-matching services in Los Angeles will provide useful lessons for their adoption in other locations.

Approach
Our research investigates the role that data-driven analytics can play in improving goods-movement efficiency through load-matching technology. We have secured access to one company’s data for analyzing factors that influence the supply of load-matched carriers in short-haul trucking operations. This company uses load matching technology to connect over 400 businesses with more than 700 owner-operators in New York, Los Angeles, and the San Francisco Bay Area. We

1. Obtain and export data on acceptance rates and shipment characteristics (including prices).
2. Prepare data for statistical analysis.
3. Develop an econometric (discrete-choice) model relating acceptance rates to shipment characteristics.
4. Determine how those characteristics influence acceptance rates. For example, determine how a one-percent increase in price affects the probability of acceptance.
5. Identify institutional and political barriers to adoption, and provide recommendations for improving acceptance rates.

Findings
This project might generally be described as a “feasibility study”. But its potential gains are substantial relative to its cost. For example, analyzing the tradeoffs that shippers make between prices and delivery times might reveal pricing strategies that improve adoption. As a result, fewer truck trips would be generated, thereby reducing highway congestion and pollutant emissions. Furthermore, it may be possible to determine the number of truck trips removed, thereby making it possible to estimate the magnitudes of those congestion and emissions reductions.

While this project focuses on load-matching operations in Los Angeles, we anticipate that its findings will readily generalize. Moreover, they will provide a unique, analytical perspective on how to implement load-matching technology in untapped markets, thereby expanding
the potential for that technology to improve the efficiency of goods movement nationwide. The research will be completed by the time of the October conference.

**Research Impact**
Load-matching is still a nascent technology, and there is still much to learn about how it can be improved to further reap its efficiency gains. Our approach allows us to examine the availability and condition of the data generated by load-matching operations. This includes information on pricing, transit times, service reliability, lead and turnaround times, and characteristics of shippers and operators.

**Practical Impact**
The general benefits of load-matching services are somewhat obvious. Full trucks mean fewer trucks, resulting in less highway congestion and reduced truck pollution.
Florida struggles with a serious imbalance between inbound and outbound freight. With the third largest population in the US, the state offers a large and attractive consumer market. Statistics from the Federal Highway Administration (FHWA) reveal that the total freight tonnage entering Florida is nearly double the tonnage leaving it. This imbalance suggests that many ships, containers, rail cars, and trucks leave the state empty or only partially loaded, which raises the cost for shippers and reduces the effectiveness of freight movements. Also, the literature review revealed that Florida is not alone in facing this problem; multiple states and countries are concerned about empty backhauling. One solution to this problem is for Florida seaports to secure a higher percentage of shipments bound for Florida markets. To assess this problem, different databases, including the federally-updated FAF, TRANSEARCH and PIERS database were used to analyze freight flow data to obtain an overview of the flow of domestic and international goods to and from Florida, including the modes of transportation and types of commodities moved. Based on the analysis, six major ports such as Ports of Savannah, New York/New Jersey, Mobile, etc. were identified as they are top trading partners with Florida, accounting for more than 60% of all goods moved to Florida. Then, the data is used in a commercial transportation optimization tool (Mercury Gate Mojo TMS) to evaluate the logistics efficiency and effectiveness gains for shippers by changing shipments from competing ports to Florida ports. In addition, face-to-face interviews were conducted with major shippers such as manufacturers, retailers, freight forwarders, and distributors as well as carriers that operate both in and out of Florida to understand/analyze their decision-making criteria for optimizing profit on shipments for the east/west coasts of the U.S. and to identify key factors for their port choice. After qualitative analysis of the interviews, a quantitative analysis was performed using NVivo software to identify key factors for shippers’ choice. Results showed that by altering even a small percentage of goods transported to Florida instead of the Port of Savannah and/or the Port of NY/NJ, the number of trucks leaving Florida half-empty/empty (less-than-truckload [LTL]) is substantially reduced. Overall, this study showed that Florida has significant potential to attract freight shipments from competing ports and can be the U.S. port of entry for many freight shipments that are destined to Florida and beyond (e.g., Atlanta, Mobile, etc.). Along with the findings, an action plan was developed (with 10 items) to alleviate Florida’s inbound and outbound freight imbalance. The results of this project along with the action plan developed can have a high impact in policy making in the state of Florida in order to alleviate the empty backhauling issue the state is faced with.

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Abstract:

Although freight demand models also use the traditional four-step modelling framework used for modelling passenger demand, the underlying decision-making process is very different. The variation in trip making behaviour is not high among individuals whereas it is significant in case of establishments owing to the differences arising from the commodities establishments handle. Also, in passenger transport a person can choose any vehicle that is available for use. In freight transport commodity type, volume and weight dictates the vehicle type to be chosen. Different vehicle types are used for transporting different commodities with varying volumes and weights.

Trip generation is the first step of the four-step modelling framework. Freight trip generation models are generally estimated using ordinary least squares (OLS) based linear regression. The variation in the freight trip generation explained by these models are only of the order of 10-30% [1, 2, 3] necessitating an understanding of the reasons behind this poor fit. A possible reason could be that freight trips generated is count data type and are non-negative integers. OLS linear regression assumes the dependent variable is continuous and does not restrict them to non-negative values. Further, OLS regression models fail to incorporate the correlation among the trips generated by different vehicle types and the spatial correlation among the establishments. Other reasons that may cause poorer fit are failure to consider all the variables affecting freight trip generation, and failure to understand the freight trip generation process itself.

Freight trip generation data characteristics, if considered in modelling, may possibly improve the fit. Different models account for different characteristics of the freight trip generation data. The Poisson model and Negative binomial model consider the data is of count data type, while the Tobit model eliminates negative trip rates. Zero Inflated Poisson (ZIP) and Zero Inflated Negative Binomial (ZINB) models consider both count data type and non-negative trip rates. To account for correlation between the error terms of the freight trips by different vehicle types, Seemingly Unrelated Regression Equations (SURE) models can be used. Spatial correlation between establishments can be modelled either using spatial measure variables such as road density near the establishment or spatial regression in which the spatial correlation is considered to explain a part of the variation in dependent variable (also known as spatial lag model). This latter spatial dependency can be incorporated into SURE models, Tobit Models, ZIP models and ZINB models.

In this study, all the above different types of models are estimated and compared in terms of significant variables and fit. The superior model among all the tested models is identified by comparing the Akaike Information Criterion (AIC) and coefficient of determination ($R^2$). Even
though advanced models improve the fit over the regression models, the improvement is still not substantial. This research points to the need for considering alternative frameworks that consider the decisions of the agents involved in the freight generation process.

**Key Words:** Trip generation, Ordinary least squares models, Tobit models, Zero-inflated poisson models, Zero-inflated negative binomial models, seemingly unrelated regression models, Spatial correlation.

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Hybrid Monte Carlo and continuous approximation approach to evaluate Off-Hours Deliveries alternatives in the City of São Paulo, Brazil

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Purpose
Using data and real-life results from a pilot project in the city of São Paulo, Brazil, we expand previous analyses performed by Cunha and Yoshizaki (2017, 2018) with the aim to evaluate the operational impacts of different patterns of uncertainty on delivery times, expressed by different functions of probability distribution for Off-Hours Deliveries (OHD).

Research Approach
Based on real data obtained from the successful OHD pilot project in the city of São Paulo (Cunha and Yoshizaki, 2017), we further explore an analytical approach to evaluate the potential benefits of OHD for several distinct scenarios. These new scenarios comprise different customer densities, line haul distances (i.e. distances between the depot from where the vehicles originate and the delivery area), and drop sizes, and also incorporating stochastic aspects. The incorporation of distinct stochastic behavior on traditional continuous approximation by Daganzo (1984) is based on Monte Carlo simulation, in which several probability distributions are considered: exponential, Erlang, lognormal and Weibull, in addition to the normal distribution, whose results were presented in Cunha and Yoshizaki (2018). We considered the same operational input parameters (expected value and variance) used in order to compare these new results with the deterministic and normal distributions that had been previously reported in Cunha and Yoshizaki (2017, 2018).
Using such approach, we computed the fleet size required for different percentages of deliveries that are switched to off-hours, ranging from 0% to 100% (with steps of 5%), based on real-world data regarding day and night operations such as vehicle speeds, service time, additional distance traveled for parking, as well other operational parameters such as number of stops, vehicle capacity, journey length, drop size, etc.
A strong correlation was observed in all cases (above 95%) indicating the general tendency of having the stochastic parameter as good as the deterministic estimation.

Findings and Originality
The originality comes from the utilization of a hybrid approach with Monte Carlo simulation to explore the impacts of stochasticity on the continuous approximation models in vehicle routing for urban settings. An analysis was conducted to identify what probability distribution could be considered as “optimistic”, and what could be deemed “pessimistic”. The results show that the exponential distribution yields to the upper bound of the allocation, while the Weibull distribution for the lower bound. The average gap reaches approximately 14%, with a maximum of 44% fleet size as difference. These findings indicate
that the pattern of delivery can truly interfere on the fleet size, even for the same mean and variance values. This is an ongoing research project, and findings are still preliminary.

Research Impact
To our knowledge, there is no continuous approximation model that considers the impact of stochasticity from an operational point of view to evaluate fleet size, total costs, and other characteristics of urban delivery activities.

Practical Impact
The proposed approach may be used to evaluate different operational characteristics and their impact on the performance of different urban distribution systems in a more realistic ways, as deterministic approximation models have optimistic results, underestimating required fleet size and logistics cost.

References


Purpose
Increasing population of European cities and the trend of fragmented passenger trips and freight transport shipments generates transport growth and causes numerous negative effects on population, economy and environment. Sustainable transport of passengers and goods has therefore become a major concern of policy makers worldwide. Whereby passengers transport has been on the agenda of mobility planning documents for decades, freight transport has been often neglected. The purpose of this article is to make an overview of the existing strategic policy planning document in Europe in order to understand their level of maturity in the field of urban freight transport.

Research Approach
The methodology for comprehensive mapping and benchmarking of strategic policy documents and measures have been developed and applied to a panel of 129 European cities. The first step was to identify information sources of relevant strategic urban transport planning documents. Special focus was devoted to Sustainable Urban Mobility Plans (SUMPs) and Sustainable Urban Logistics plans (SULPs). In the second step, maturity level of the identified planning documents has been analyzed, with specific focus on inclusion of urban freight measures. In the final step, policies and measures have been categorized to compare their direct and indirect impact on urban freight mobility.

Findings and Originality
The desktop analysis shows an extremely heterogeneous situation of logistics and mobility planning policies and documents adopted in Europe. Cities are mainly opting for soft measures with high impact on savings. They are trying to achieve efficiency with adequate regulation system and measures supporting the introduction of new services. Brussels and Paris are the most advanced among all the analyzed cities. Cities are mainly planning to implement Urban Consolidation Centers, clean fuels/vehicles and cargo bikes.

Research Impact
This article presents the first comprehensive overview and benchmark of the sustainable city logistics policy documents implemented in the European cities. The most difficult part of the research was related to identification of planning policies and measures because documents containing this kind of information are very versatile and fragmented. The proposed methodology is based on bottom up approach and seems feasible for this kind of studies. Complexity of identification process is expected to decrease with growing number of SUMPs and SULPs implemented in European cities, which are the result of many EU sponsored projects.
Practical Impact

Case studies of different European cities have shown that well selected measures and/or their optimal combination can substantially decrease the energy consumption and CO2 footprint. Single measures can bring on average about 20-30% savings, their optimal combination could result even in about 60-70% saving. With optimal combination of measures, cities can contribute to gradual realization of the EU Commission’s aim of CO2 free city. Standardization of approaches in the cities as well as on the functional urban areas level is needed and recommended.
Contending with the impacts of e-commerce through city logistics strategies

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Purpose  
The world has witnessed the rise of e-commerce companies, such as Amazon, E-bay, Alibaba, and others, as well as the increased online presence of traditional retailers through omni-channel strategies. Consequently, there has been a growth of e-commerce in business-to-business, business-to-consumer, and consumer-to-consumer transactions. However, the sheer magnitude of products purchased online require more and more trucks and other vehicles coming to the cities to deliver them, than ever before. In the US, online retailing only represents between 8-9% of retail sales, though it is growing at double-digits year-after-year (U.S. Census Bureau, 2017). This continuous growth in last mile operations, especially deliveries to residential areas, brings along negative externalities related to transportation. This research develops an analytical modeling framework to assess the economic and environmental impacts of e-commerce, and evaluates different city logistics strategies to mitigate those impacts.

Research approach  
Considering the complexity to explicitly model the e-commerce implications, the analytical framework uses continuous approximation techniques (Daganzo, 1984a, 1984b). These have been extensively implemented in strategic and tactical logistics applications (Estrada and Roca-Riu, 2016; Tipagornwong and Figliozzi, 2014; Jaller, 2011). The authors conduct empirical analyses for a number of distribution strategy scenarios, and the implementation of system level city logistics strategies (e.g., cargo consolidation, zero-emission vehicles, cargo bikes) (Holguin-Veras et al, 2015; Jaller et al., 2016; Jaller et a., 2017).

Findings and Originality  
Various factors affect the sustainability of e-commerce last mile distribution. For example, one of the main difficulties in last mile deliveries are the strict and small time-windows of operation, which are largely due to receiver’s unavailability, or imposed by the offered levels of service (e.g., same-day, one or two-hour). To comply with these constraints, companies have to locate closer to the customers (where possible), or send more vehicles leading to poor load utilization of the fleet. More trucks entering the city bring along more externalities such as congestion, air and noise pollution, and energy consumption. The authors show the empirical results for the various cases to assess the impact of e-commerce, through the comprehensive framework. The authors adapted continuous approximation techniques and developed novel approximation to account for the various modeled scenarios.
Research and Practical Impacts
E-commerce has become an integral part of our cities and lives, influencing our needs and decisions. Today, more trucks enter the city than ever before. To achieve a sustainable transportation system, one needs to consider the requirements of various stakeholders. Shippers and carriers, for instance, are profit driven, while, local authorities and the community in general have voiced their concerns for livable cities. Consequently, the research discusses the findings of the implementation of the various city logistics strategies (e.g., zero emission vehicles, cargo bikes, relocation of traffic generators, urban consolidation centers) to improve the last mile distribution. The results from the research can be used by authorities to educate or inform the communities they serve, develop campaigns to foster behavioral change, and develop or improve strategies to effectively manage the transportation system.

References
E-grocery of tomorrow – home delivery of food between profitability, customer acceptance and ecological footprint

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Purpose
In the fast-growing e-grocery market, competitors are struggling between profitability, market coverage and the environmental footprint, especially in the EU and Switzerland due to strict regulations. For this reason, the classical trade and various e-grocery concepts are compared and evaluated. The concepts considered include shop picking, food fulfillment centers and the classical stationary food retail. By using a city simulation model, the agent based approach compares the different variables of the scenarios, in particular emissions and costs. The approach is used to compare use cases for upcoming projects in Hanover (Germany) and Bern (Switzerland). The research framework includes the project initiative USEfUL for a livable Hanover.

Research Approach
By simulating individual shopping patterns as well as home delivery routes, the driven mileage and the emitted amount of e.g. carbon dioxide is quantified. The comparison of different scenarios allows to evaluate the impact of different business models.

Findings and Originality
Depending on the particular scenario, home delivery can contribute to reduce traffic and emissions in an urban environment. Current business models fluctuate between the need for low market entry barriers and the difficulty of providing additional services without charging additional service fees.

Research Impact
The simulation of changes in traffic caused by modified consumer behaviour is a novel application for agent based modelling approaches. Using AnyLogic the logistical processes are modelled in detail including the operating states of the light commercial vehicle used for the delivery.

Practical Impact
The need for optimised pick-pack-ship-processes result in establishing specialised logistical facilities for e-grocery (food fulfillment center). Instead of being shipped on a short distance from a nearby market, the food is shipped out of one or few specialised e-commerce sites within an urban agglomeration. Here, logistical profitability rivals environmental command variables.
Purpose

In competition with the emission and a livable city, many major European cities are trying to solve the logistical challenges of the 21st century. Currently driven especially by regulations on air purity or the "diesel scandal". To cope with the challenges, many concepts are available for the cities under the terms smart city, urban logistics or logistics 4.0, which can not be easily assessed or even implemented. In order to reduce cost and effort over many years of test runs, IT simulation offers a possibility to evaluate which logistics concepts are especially suitable for cities. Here, the complexity of micro- and macroscopic systems and processes has to be considered in order to assess not only the logistical concepts but also the environment, among other emissions and traffic. For this purpose, in the following essay, a 2-layer-concept is presented which combines the results of a traffic simulation (Tool: MATSim) and a logistics simulation (Tool: AnyLogic) to compare and evaluate logistical concepts. The concept is presented on an exemplary logistics concept and for a district of the city of Hanover. The research framework includes the project initiative USEfUL for a livable Hanover.

Research Approach

By combining different simulation tools, innovative logistics concepts for cities or neighborhoods can be considered in their entirety and evaluated better. Thus, in addition to emissions, the influence of logistic traffic on the individual traffic in cities can also be assessed.

Findings and Originality

Depending on the application, different stakeholders, primarily cities and commune, can use the concept as the first basis for a multi-dimensional evaluation of logistics concepts. In more concrete terms, the results of this publication support the USEfUL project in the development of an evaluation tool for the city of Hanover.

Research Impact

The combination of different simulation levels and simulation tools for the evaluation of logistics concepts is a new territory in the field of urban logistics and represents a decision support for cities and municipalities. The combination of micro-level insights on a macro-level, and vice versa, leads to a detailed and at the same time wider viewing space.
Practical Impact

An adequate and versatile evaluation of different logistics concepts enables communities to make more informed decisions about logistics concepts that do not neglect traffic flow or general traffic systems. The consideration can also help companies such as vehicle manufacturers to adapt their developments to logistics trends. Furthermore, the results support the decision-makers in the city of Hannover in their orientation towards a city worth living.
Strategic Route Planning of Truck Traffic in Metro Manila

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Purpose
The main purpose of this study is to assess the existing truck routes and truck behaviour that affect urban travel movement in Metro Manila for the enhancement of policies affecting the truck industry and goods movement as well as urban travel in general.

Research Approach
The study’s main consideration are the major routes available to truck traffic including routes affected by the truck ban policy as well as other alternate truck routes in Metro Manila. This study is a quantitative research that will employ mathematical models for route planning concerning truck traffic. Interview questionnaire will be used in the Origin-Destination survey and Trucking industry survey. GPS data logger will be installed in the sample truck vehicle to track the behaviour and movement of trucks and which routes they are using from their origin to their destination. The study will employ transportation software (EMME4) to show the travel demand of trucks and simulate their movement (traffic flow) considering congestion and restriction policies such as truck ban and one truck lane policy.

Findings and Originality
There is a significant increase of truck volume observed in circumferential and radial road in Metro Manila for the past 5 years. Based on the trucking survey, most of the truck current trips are less than 100 km. The average travel time from origin to destination is 4-5 hours with an average speed of 50-60 kph. Most of the truck drivers perceived that mixed traffic post safety hazard and they want to have a separate lane for trucks. They want that truck ban will be implemented during morning peak hours. Moreover, they have pre-defined route before they travel and mostly, they do not change route even there were traffic problems along the route. Most of the issues and problems identified in trucking operations are the truck ban, traffic congestion, and truck lane.

Research Impact
The study will provide information that will impart government agencies, trucking companies and other stakeholders concerning problems and strategies or solutions in truck movements and operations in the Metro Manila.

Practical Impact
The study will give insight if there is a need to provide truck parking, depot, or waiting area. It will give recommendation if there is a need to open new truck routes or construct new road infrastructure. The output of the study will be used for the formulation of policy concerning truck management in Metro Manila.
Purpose
Transport infrastructure such as motorways and railways create highly effective connections for interregional transport flows, but can at the same time form mental and physical barriers in local mobility networks. These barriers can have negative effects on e.g. social cohesion, public health and on the possibilities of reducing CO2 emissions by increasing the modal share of pedestrian and bicycle transport. Furthermore, they can reduce connectivity and resilience in movement networks which can imply a reduced efficiency for e.g. urban freight distribution, emergency services and public transport.

To ensure that investments in transport infrastructure offer maximum benefit for society, decisions concerning infrastructure projects are based on cost-benefit analyses (CBA), in which the costs of a project are related to its benefits. In these CBA commonly, many effects are included (e.g. climate change, air pollution, noise, accidents, congestion), but for the measurement of barrier effects there only qualitative methods are used, which leads to substantial societal costs being excluded in the assessment of infrastructure projects, to the detriment of urban life and the functionality of urban systems.

In reaction to this, the purpose of this paper is to formulate a framework of quantitative morphological indicators for barrier effects and to test its potential in a case study.

Research Approach
These indicators are developed in a three-step approach. As a first step the barrier effects are identified in a literature review and synthesised in a list of main categories of effects. For each category, in a second step, a concise literature review is performed, related to how the effects relate to morphological features in the build environment, such as network distance and connectivity. As a final step, a suitable method of assessing these morphological features is selected (e.g. Reach and Route Directness).

Together the indicators form a framework, which is tested in a case study in Gothenburg, Sweden, where a four-lane motorway and railway tracks form substantial restrictions on the urban renewal of a former harbour area in the city centre. These barriers negatively affect accessibility to public and private services for residents, catchment areas for commercial enterprises, the possibility for social contacts between people and the efficiency of local transport and freight services. In this way the barriers prevent the surrounding urban areas from benefiting from the extensive investments in the urban renewal project.

In the case study three scenarios are analysed with the framework of quantitative indicators:
1). Barriers unchanged (barriers as they are today), 2). Barriers reduced (a number of new bridges and tunnels are constructed over and under the barriers), 3). Barriers removed (tunnels are constructed for the motorway and railway).
Findings and Originality
The analysis shows the great potential of the framework of indicators in quantifying barriers effects. This paper is part of an effort to develop a method for quantifying barrier effects of transport infrastructure.

Practical Impact
Discuss the policy/managerial implications of your research (if applicable)
This method could complement existing CBA methods and make external cost analyses more applicable and relevant in an urban context and could provide local stakeholders, such as municipalities and local communities, with objective arguments in negotiations about infrastructure projects.
Chances for successful transfer – Evaluation Methods for innovative urban freight solutions

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Purpose
Many good solutions for the cost-effective and sustainable organization of urban freight last mile distribution have been tested and implemented. But mostly, the solutions are implemented in the context of one respective pioneer city. In the Horizon 2020 CIVITAS City Logistics in Living Laboratories project (CITYLAB) seven innovative urban freight distribution concepts were implemented and analysed in seven pioneer cities:

a) New distribution models and deployment of clean vehicles
b) Floating depot and deployment of clean vehicles
c) Increasing vehicle loading by utilising spare capacity
d) Joint procurement and consolidation for large public institutions
e) Common logistics functions for shopping centres
f) Integration of direct and reverse logistics flows
g) Logistics hotels to counter logistics sprawl

The present paper examines the question, to which extend these solutions can be implemented in other cities.

Research Approach
The analysis consists in a first step of a transferability analysis and a multi-actor multi-criteria analysis (MAMCA). This is complemented in a second step by an ex-ante behavioural analysis. The transferability analysis explores to which extend the economical, political, and spatial conditions in an adopter city (defined as a city potentially adopting a solution previously tested in another city) fulfil the requirements of a certain solution. This component of the transferability analysis is based on a comparison of the importance of success factors identified by the stakeholders in the pioneer city, and the support of success factors in a potential adopter city. The second component – the MAMCA approach – was adopted to get a view on overall stakeholder support for the solutions and on why a certain alternative was liked or disliked by stakeholder groups.

Based on the results of the transferability analysis and the stakeholder analysis, a behavioural analysis was carried out to reveal the acceptance of the most promising solutions in potential adopter cities among stakeholders. For this, expert interviews have been conducted.

Findings and Originality
The transferability analysis revealed a wide range of success factors which have effects on different solutions in different cities. Outstanding success factors are (i) the need to obtain appropriate locations for consolidation centres and (ii) the availability of refuelling/recharging networks. Local stakeholder meetings (MAMCA workshops) revealed that in general most professional stakeholders do not attach great value to the criterion ‘positive effect on society’.
They are focused on providing the required service-level to their clients at reasonable costs which is why they tend to support solutions that can deliver that. It appeared that they expect authorities to make choices and to create a level playing field for all players on the market by means of regulations that reflect the preferences of society. In complement to the first step analysis, the behavioural analysis identified the need of available land for locations for the solution, easy accessible locations and the possibility to save time as crucial factors. Most complaints are about the lack of information on the solutions and its purpose.

**Practical Impact**

The presented analyses can be used in order to estimate the potential for successful roll-out and up-scaling of innovative urban freight solutions. The applied methods are able to point out which solutions have high chances to be successfully implemented in a certain city and – if this is not the case – where support on success factors can be improved and how stakeholders’ support can be stimulated.
Purpose: In North America, several major retailers are facing bankruptcy while other are significantly curtailing their footprint. Although there are several factors behind this trend, it represents a turning point in the diffusion of ecommerce and home deliveries. The paper investigates the causes of the current retail paradigm shift by looking at the emerging distributional strategies and practices of ecommerce firms, including the changing landscape of city logistics.

Research Approach: The paper combines two approaches. One is conceptual where the current trend of the digitalization of retail supply chains are discussed. The second is empirical, based on a long-term survey of home deliveries in a large residential apartment building that tracks daily parcel deliveries by carrier. The objective is use the empirical evidence to substantiate retail digitalization trends.

Findings and Originality: The impacts of the digitalization of retail through ecommerce have resulted in changes in the distribution pattern with the growth of home deliveries (survey directly underlines the temporal growth trends). This is also linked with a corresponding decline of the real estate footprint and the development of dedicated logistical facilities, both in a city logistics and peri-urban setting (survey could not directly measure such trend). Further, major online retailers are undertaking vertical integration strategies, such as having their own delivery arrangements (survey measured the shift in the relative share of carriers used for home deliveries).

Research Impact: A better understanding of the supply chain impacts, many of which unintended, of the digitalization of retailing, backed by detailed empirical evidence of home deliveries over several years.

Practical Impact: In addition to the above stated impacts, the survey provided concrete trends in terms of temporal frequency of deliveries, number of deliveries per demographic or household units that can used for freight generation models.
Purpose
The main purpose of this study is to model the movement of trucks along a defined lane in a major corridor in Metro Manila in order to assess its impact on other vehicles using the highway corridor and to recommend traffic management measures and specific infrastructural improvements to improve the movement of vehicles along the corridor.

Research Approach
Inventory of the geometric characteristics of the highway corridor, traffic signal design used on all intersections, vehicular counts along important segments and intersections, as well as travel time study using a test car along the highway corridor used by trucks were conducted in order to gather important truck and other vehicular traffic characteristics as they traverse the highway. Public transport routes serving the corridor including buses and jeepneys and their corresponding stop locations were also plotted as part of the users of the road. Along this highway, commonly known as Circumferential Road 5 (C-5), a truck lane was designated in both directions of the road. The designated truck lane is the 2nd lane from the center for a mostly 4-lane C-5 road. The truck movement and that of other vehicles were simulated using a dynamic traffic assignment (DTA) software, Dynameq 4, to determine the baseline condition and scenarios were further developed. One is to determine whether moving the truck lane to the 3rd lane from the center would be better while another one is creating a local road for use by accessing and egressing vehicles as well as local public transport service. Such measures as queue length and average waiting time at signalized intersections, average travel speed and travel time from entry and exit points were assessed and compared between scenarios. Recommendations were then provided as to which specific scenario with corresponding traffic management measures and infrastructural improvements could make travel more efficient.

Findings and Originality
The designated truck lane in an urban area of a developing country is a unique one given the mixture of vehicles using the road during any time of the day. Simulating the movement of trucks using DTA is also new given the geometric condition and traffic mixture present. Initial findings found that moving the truck lane to the 3rd lane from the center, could improve the flow of other vehicle users in terms of average travel speed but there are predefined condition present such as public transport service should be confined to the outermost lane of the road.

Research Impact
Dynamic simulation of traffic flow is the best approach to model the truck movement together with other vehicle along this highway corridor. Scenario modeling using the Dynameq 4 software would be able to capture the lane-based behavior of vehicles and assess the impact of the travel characteristics of both trucks and other vehicles to the general flow of traffic.

Practical Impact
Several scenarios can be tested and refined including changing the lane used by trucks, introducing a local road along the whole stretch to segregate long haul vehicles from local
vehicle traffic including adjusting the geometry of the road to accommodate the movement of trucks before finally choosing the best approach for implementation in the field.
Information asymmetry in urban freight transport of dangerous goods

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Purpose
Dangerous goods includes any type of goods that could cause harm in case of an accident or release of the goods, such as flammable, explosive or toxic goods. The proper management of dangerous goods transport is particularly important in an urban setting due to the potentially high impacts of an accident in an urban area, but it is rarely addressed in urban freight research. The flows through urban areas are mainly related to distribution of fuel, but it also includes chemicals to retail outlets. The aim is to investigate how the information asymmetry between providers of physical transport of dangerous goods in an urban setting (such as road hauliers) and city stakeholders (such as municipalities and planning authorities) affects how the transport of dangerous goods is conducted and planned in an urban setting.

Research Approach
A number of semi-structured interviews have been performed with shippers, transport operators, logistics service providers and city authorities.

Findings and Originality
An information asymmetry exist between the transport and city stakeholders. The transport providers are mainly interested in short term operational information at the time for the transport, while city stakeholders are interested in aggregated information by type of goods, link, area etc., for long term planning. The transport providers hold this operational information, but it is fragmented among several actors and is not aggregated and made available for city actors. City actors are forced to make decisions affecting the transport actors based on poor or non-existent data. Further, an information asymmetry also exists on the impact of dangerous goods transport on the city, where the city actors holds more information and knowledge than the transport actors. The reasoning and assumptions behind the city decisions are not apparent for the transport actors. The information asymmetry causes the management of dangerous goods transport in an urban setting to be potential inefficient.

Research Impact
The paper provides insight into the rarely researched area of dangerous goods transport in an urban setting. To our knowledge, the information asymmetry in this setting has not been studied previously

Practical Impact
The paper provides practical impact for city actors involved in the planning process related to transport of dangerous goods. It highlights shortcomings with the current information flow and information sharing among the actors.
The drivers for the development of the cargo-bikes-based delivering systems for the small and medium size cities

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Purpose
The negative environmental impacts from urban freight transport to a large extent are derived from the fact that conventionally fuelled vehicles are mainly used for transporting goods. Many countries have implemented regulations aimed at setting high technical parameters for conventionally fuelled vehicles in order to reduce their negative impacts, however, in the long term it seems to be insufficient. This leads to the need to develop the alternative forms of delivering systems, mostly based on alternative engines. One of them is the concept of applying the cargo bicycles. However, due to its limited range and capacity as well as the weather sensitivity, it is important to find the efficient business model, which will help to develop them efficiently. The major aim of the paper is to introduce the results of the pilot experiments realized under the project named Low Carbon Logistics. Two experiments have been realized: the first, focused on the CEP deliveries in small size city Bad Doberan (Germany) and second, focused on consolidated deliveries for municipal entities in medium size city Stargard (Poland). Based on both experiments the analysis of the pros and cons will be prepared. Finally, the drivers and expectations for the development of this kind delivering systems will be introduced in the paper.

Research Approach
The research process will be based on the deductive approach, enabling to make specific conclusions for the selected studied area, applying generalized premises in the field of cargo-bikes-based urban delivering systems. Starting from the state-of-the-art analysis, the participatory observation method will be used, which allows making analyses from the participant’s perspective. The main advantage of this method is its immediacy and the fact that it allows to study the behaviour while it is being shown.

Findings and Originality
The major findings of the paper will be related to the advantages and barriers of the implementation of cargo-bikes for deliveries in small and medium cities. The general strength of the paper will be the results based on the experiments realized in real environment and focused on the real delivering activities. Moreover, the paper will introduce the drivers for the efficient development of cargo-bikes-based delivering systems in the context of the management, technological, infrastructural and legislation expectations, based on Poland and Germany example.
Research Impact
The paper will introduce the methodology of the experiments on utilization of cargo-bikes, which could be helpful for the development of the similar analysis in other cities and regions. Moreover, it deliver some inputs for the general analysis of the efficiency of cargo-bikes-based delivering systems.

Practical Impact
From practical point of view the paper will help to develop the cargo-bikes system in the different cities on the basis of realistic expectations and taking to the account the local needs and conditions. Also it will be helpful for the city and regional decision makers for the policy establishments and strategical planning.
The assumptions, conditions and barriers of the development of the Urban Consolidation Centre for Municipal Entities (UCC-ME)

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Purpose
The Urban Consolidation Centres are not new and well known city logistics measure. Many advantages of them have been described in the papers and reports. However, the practical implementation and development of this concept seems to be still challenging for both business and municipal partners. The major barrier is the lack of the cooperation between different market actors as well as low acceptance for the participation in the costs of the UCC functioning. The paper will be focused on the concept of special type of consolidation centre - UCC-ME (Urban Consolidation Centre for Municipal Entities). The major difference is that the proposed concept is focused on the municipal entities only. The research include the analysis of the possibilities of development of the consolidated deliveries for municipal entities in medium size city Stargard (Poland). Based on them, the assumptions and expectations for the efficient implementation and functioning of UCC-ME will be established. Finally, the drivers for the development of this kind of measure will be introduced in the paper.

Research Approach
The starting point for the research will be the documentation method focused on a critical analysis of the literature and documents as well as legal acts and other sources of factual knowledge, important from the point of view of the adopted research objective. The state-of-the-art analysis will allow to get to know the mechanism and the cause-effect relationships of the consolidated goods distribution currently operating in the studied area. Further methods of factual studies involve questionnaires, which should cover the structure of the deliveries for the analysed entities. Their subject will include comprehensive analysis of the current functioning of delivering system. Based on this the methods established under Low Carbon Logistics project will be used to prepare the business model of UCC-ME. Finally, the general business model canvas (BMC) will be introduced.

Findings and Originality
The major findings of the paper will be related to the advantages and barriers of the implementation of urban consolidation centres in medium size cities, based on Stargard example. The general strength of the paper will be the concept of special type of UCC, focused on the deliveries for the municipal entities. Moreover, the paper will introduce the drivers for the development of this kind of measure in the context of the management, technological, infrastructural and legislation expectations, based on Poland example. The original element of the paper will BMC of UCC-ME.
Research Impact
The paper will introduce the analysis of the advantages and barriers of development of UCC in medium size cities. Also the general BMC for UCC-ME will be introduced.

Practical Impact
From practical point of view the paper will support the analysis related to the implementation of the UCC taking to the account the local needs and conditions.
Revitalization of urban space and managing freight flows for liveable cities in Indian context

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Purpose
The purpose of this study is to revitalize the use of existing urban space to the extent possible and plan the city’s future expansion so as to reduce the overall impact of the freight vehicle in commuter traffic.

Research Approach
A study focusing on the entire freight flow network is an exploratory research with no past studies available in this field. The present study is carried out in the city of Surat located in the western part of India. Textiles happens to be the biggest industry in the city contributing almost half of the entire freight vehicles movement, the study is focused to textiles freight flows in the city. To understand the implication of the textile freight movement on the overall traffic flow of the city, volume study, OD study and driver interviews of goods vehicles were conducted at various locations. With the help of historical data, geographical spread of textile industry is compared against the urban sprawl of the city to estimate changes in the overall trip lengths. Personal interviews of raw cloth manufacturers, value addition units, traders and transporters were also taken for better insights. Aggregate information about the industry was obtained from the Municipal bodies and industry association for understanding the overall impact and future implications by the existence and growth of the textile industry in the city.

Findings and Originality
It is found that the semi-finished goods makes at least 5-6 trips among the various production facilities, thereby increasing the overall vehicle-km in the city. Freight trips are among the powerloom or other weaving units, processing units or mills, embroidery units and textile trading markets. In many cases freight vehicle is parked on-street and it takes 1.5 - 3 hours for loading/unloading. Same road width is shared among all the road users making it very difficult for smooth traffic flow. Stop and go and congestion are quite often observed in the areas with presence of textile activities.

Research Impact
Study aims to quantify the impact on urban freight movement due to per establishment trip generation, thereby providing a ready reckoner for sustainable planning of urban transport infrastructure. A systematic planning approach for revitalizing the textile industry and restructure its future growth so as to benefit the stakeholders involved and the society. With beforehand estimate of the freight trips generated from a given textile unit and the overall trips from a given textile park or hub, it would definitely help the decision makers in framing the policies and guidelines for sustainable urban infrastructure development in the cities with predominant presence of textile industries. Abstract Number: 99
Impact mitigation of urban construction logistics: solutions and strategies in Europe

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Purpose

Our research was conducted in the framework of EU-funded project “Sustainable Urban Consolidation CentrES for construction” under the H2020 programme. It aimed to improve knowledge and understanding of freight distribution and service trips for the construction sector, demonstrating the impacts in terms of transport and environmental efficiency.

The paper focuses on solutions to improve Supply Chain Management, their transferability and policy implications. Good practices in construction logistics were collected and extensive work was carried out to investigate the extent to which Construction Consolidation Centres (CCCs) can address problems in the construction supply chains. Authorities are naturally part of the cooperation that must support the introduction of new measures, so our work included a study on the transferability of the solutions found, where we analysed the context and the approach to construction logistics of 12 EU cities.

Research Approach

To quantify the possible benefits of introducing a CCC, we performed a simulation assessing the impact of the deliveries of materials to four urban construction sites in big EU cities (Paris, Luxembourg, Valencia and Verona). After an on-site data collection, a simulation based on mathematical programming was created to investigate the effects of CCCs through simulation of different scenarios, namely with or without CCC. A set of KPIs was used to measure congestion, safety improvements, and decrease of air pollution emission. The CCC’s economic sustainability in the selected sites was assessed through a cost-benefit analysis.

The study method to assess the transferability of the solutions consisted in desk research, a series of structured workshops and one-to-one interviews with a panel of 12 large- and medium-sized European cities (Antwerp, Brussels, Durres, Koper, Graz, Genoa / Liguria, Limassol, London, Rome, Rijeka, Trieste, Turin).
Findings and Originality

The introduction of innovative measures such as the CCC can bring about clear and important social and environmental advantages in the optimization of the supply chain. We found that the number of trips could be reduced up to 60%, with much savings in distance travelled (-44%), time spent travelling (-36%) and pollutants emissions. The economic sustainability should be considered on a project-basis to define the viability of CCC implementation.

The implementation of a CCC will request a new type of collaboration between all the partners of a construction project and a new way to manage contracts between stakeholders. It is therefore important to understand the role that authorities should or could play, and our research suggests that different awareness levels exist in Europe with regards to construction logistics. We identified: a) Cities delivering or committed to deliver construction logistics actions; b) Cities that consider construction logistics a potential topic in their future plans; c) Cities starting to be engaged in urban freight initiatives.

Practical Impact

Urban freight transport is currently not yet sufficiently integrated in urban planning. There is huge potential for optimization of the construction supply chain in urban areas, and especially through the consolidation of deliveries by means of CCCs. The implications of our findings are discussed to provide new insights for future improved policies on construction logistics.

References


Estimating the impacts of a sustainable electric cargo-bike implementation in Amsterdam

Stefan Talen

Purpose
Zero-emission vehicles do not contribute to emissions and noise, but still contribute to congestion and other traffic problems. The Dutch postal company PostNL introduced the use of electric cargo-bikes in their operations by using existing micro-hubs. A micro-hub is a small depot from where the electric bikes start its deliveries. The operation was formerly executed by diesel vans from the large depot outside the city. PostNL reported several benefits related to travel time, distance, delivery efficiency and costs. The purpose of this research is to estimate and quantify the impacts of electric cargo-bike implementations on the environment and operational costs.

Approach
This research approach contains three steps to estimate the impact and generalize the results:

1. **Data collection** – PostNL is monitoring the operations by several Key Performance Indicators (KPI). These KPIs are focused on daily operational averages. The first step considers interviews and discussions with PostNL to collect and understand the KPIs and the operational variables. KPIs are collected for both the former operations and the new implementation. Next to the KPIs, also situational variables about the network and city of Amsterdam were collected.

2. **Data analysis and impact assessment** – By combining the KPIs with situational variables regarding Amsterdam, upscaling from operation to strategic level has been achieved.

3. **Generalizing the results for upscaling** – Based on the results for Amsterdam, the potential for upscaling this implementation was identified. This enables application of the results to other cities and estimate their potential impact of electric cargo-bikes and micro-hubs.

Findings and originality
In the city of Amsterdam, PostNL is using 45 electric cargo-bikes and 6 micro-hubs. The micro-hubs are supplied by trucks. About 2200 daily orders are handled by bike while the remaining 1300 are still handled by van for various reasons. This operational KPIs show that the cargo-bikes are able to generate operational benefits in terms of travel time and distance in congested cities like Amsterdam. The time, required to find a parking place becomes that low that cargo-bikes are able to handle more orders per hour. Also it is more easy to find a shortcut when using a bike instead of a van. Also from an economic perspective this implementations shows promising results, mainly because of lower vehicle and running costs and lower expenses on wages of the drivers. The implementation is estimated to reduce the daily operation costs by about 1kEURO. Environmental savings are about 220kg of CO₂. Generalization of the results show that CO₂ savings becomes less significant for smaller cities because the relative share of additional CO₂ emissions, caused by the supply of micro-hubs by trucks, is increasing.
Research impact

The findings of this research show that a shift from van to cargo bike can have positive outcomes in terms of both economic and environmental perspective.

Practical impact

This study can assist cities and governments to identify whether their city is suited for cargo-bike city logistics via micro-hubs.

Reference:

- Citylab D5.3, chapter on the Amsterdam implementation.