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## Analysing the Role of Rail in Urban Freight Distribution

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# Analysing the Role of Rail in Urban Freight Distribution

Katrien De Langhe

## Abstract

Many different types of goods are transported to and delivered in cities, resulting in some urban freight challenges, such as increased vehicle movements within the city, collection of waste and one-way traffic flows towards the city. The growing urbanisation is expected to generate extra transport movements too. The European Transport White Paper states that national governments should try to implement policies to optimise freight transport in and around the city (European Commission, 2011). One option to do this is by using more sustainable transport modes. In that context, this research examines the potential role of rail in urban freight distribution, which was once important. Firstly, several existing cases of urban freight rail are discussed and compared. This results in the identification of success and failure factors. Secondly, a typology of cities and freight is set up. Thirdly, a conceptual cost model to estimate the potential of rail transport in urban freight distribution is proposed. The approach of this research consists of literature review and an expert meeting amongst academic and industry experts. The findings show that some relevant cases of urban freight rail exist in which different cities are involved. Knowledge of the different city and freight characteristics as well as the main success and failure factors is crucial. An appropriate methodology for assessing the potential of rail for urban freight distribution is a combination of stated and revealed preference and a social cost-benefit analysis.

**Keywords:** urban freight distribution, rail transport, city, social cost-benefit analysis

## 1. Introduction

The objective of this paper is to develop the research strategy for a conceptual model in order to assess the business and/or welfare-economic feasibility of rail transport in urban freight distribution.

Many different types of goods are transported to and delivered in cities, involving different sectors and different types of goods flows. These logistics activities engender benefits such as home-deliveries and the removal of waste from the city. However, they also cause some issues in the urban freight context, such as additional vehicle movements within the city. Hence, the transport of different goods to, away from and within cities results in business, environmental and social costs. Three main trends affect urban freight distribution and thus these three cost categories.

Firstly, forecasts indicate that the transport of goods will even grow in the future (Benjelloun and Crainic, 2008; Taniguchi et al., 2001). Meersman et al. (2013) for example forecast an increase of freight transport in Belgium in ton-km for 2014 based on the anticipated movement of the main macroeconomic figures for Belgium and an increase of more than 3% between 2013 and 2018 based on the Federal Planning Bureau. As a result, the (road transport) issues mentioned here are likely to increase as well, making urban freight distribution an even more interesting research subject, given the challenges ahead.

Secondly, the growing population and urbanisation lead to extra transport movements in cities (Bous, 2001). Since freight transport and passenger mobility interact with each other, these extra passenger movements also affect freight transport to, outside and within cities.

Thirdly, an increased general awareness of the environment exists (Behrends, 2012; Dorner, 2001). The recent European Transport White Paper states that European governments should try to implement policies to optimise freight transport in and around the city (European Commission, 2011). Behrends (2012) and Ruesch (2001) suggest to use more environmentally friendly

transport modes, such as rail transport. In this context, this research examines the potential role of rail in urban freight distribution.

The rest of this paper is organised as follows. Section 2 provides an overview of the use of rail in an urban freight context. Section 3 discusses the crucial city characteristics that have to be taken into account and section 4 gives an overview of different freight types. In section 5, the research strategy for the next research steps is addressed. Ultimately, in section 6 some provisional conclusions are drawn.

## **2. Lessons of urban rail freight distribution cases**

Literature review provides an appropriate terminology and definition to discuss rail transport and urban freight distribution. Urban freight distribution is referred to as the transport of goods towards, from and within urban areas. Rail freight distribution refers to the use of light rail or freight trams (De Langhe, 2013). Within these two rail types, different rail products exist. Aspects such as the configuration of the network, frequency of the service, time of operations, etc. define the specific rail product.

The main existing rail projects in urban freight distribution are carried out in Amsterdam (City Cargo), Barcelona (freight tram scheme), Dresden (CarGo Tram), Paris (Monoprix, TramFret), Rome (multimodal urban distribution centre), Vienna (GüterBim) and Zürich (Cargo Tram, E-Tram). All rail projects have different characteristics and hence, it is useful to investigate these projects more in depth.

A general observation is that only three of the projects are (still) operational, being the CarGo Tram in Dresden, the Cargo- and E-Tram in Zürich and the Monoprix train in Paris. The other projects either stopped after a pilot period (City Cargo in Amsterdam and GüterBim in Vienna), are still in the pilot stage (TramFret in Paris), or are only hypothetical projects (Freight tram scheme in Barcelona and MUDC scheme in Rome) (De Langhe, 2013).

Analysis of the success and failure factors of the existing projects (see Table 1) learns that the most common failure factor is the interference with passenger traffic (Dresden, Zürich, Amsterdam, Vienna, Paris). Resistance from different actors (Dresden, Zürich, Amsterdam, Vienna), the initial investment needed (Dresden, Amsterdam, Barcelona), as well as the commitment of different stakeholders (Amsterdam, Vienna, Barcelona) are also crucial. Furthermore, politics (Vienna, Barcelona) and limitations of the technology can result in a failure of the project. The main success factors are the effects of the positive marketing (Dresden, Paris), new measures making road transport more expensive (Paris), cheaper, faster and cleaner rail transport (Zürich) and the transport of a low-value, non-time sensitive commodities (Zürich).

These findings are similar to what is stated by several authors. Arvidsson and Browne (2013) indicate conflicting objectives amongst stakeholders, interference with passenger traffic, radius of action, scale of the project and stakeholder involvement as the main barriers for freight trams. Regué and Bristow (2013) state that a freight tram is only potentially feasible in case economies of scale are exploited, a minimum demand is served and urban consolidation centres work efficiently, or in case niche markets are used in which the operational costs are currently high and only limited extra infrastructure is needed.

Comi et al. (2014) concluded that the involvement of stakeholders and financial implications such as who is paying and the division of costs and benefits amongst the stakeholders, are crucial variables. Other important factors mentioned are the existence of marketing benefits and the fact that rail transport is always part of a chain, i.e. pre and/or post-haulage is needed.

In order to get a more detailed insight in the projects, several criteria have been examined (see Figure 1).

Failure factors	Success factors
Interference with passenger traffic (Amsterdam, Dresden, Paris, Vienna, Zürich)	Positive marketing (Dresden, Paris)
Resistance to try something new (Amsterdam, Dresden, Vienna, Zürich)	New measures that make road transport more expensive (Paris)
Acquire adequate finance, high investment costs (Amsterdam, Barcelona, Dresden, Vienna)	Cheaper, faster and cleaner than traditional lorries (Zürich)
Conflicting objectives amongst stakeholders (Amsterdam, Barcelona, Vienna)	Non-time sensitive and low value commodity (Zürich)
Politics (Amsterdam, Barcelona, Vienna)	
Technology limitations (Amsterdam)	

Tab. 1: Success and failure factors appearing from main urban rail freight projects, Own composition based on Alessandrini et al. (2012), Arvidsson and Browne (2013), Janjevic et al. (2013), Levifve (2012), Madden (2011), Monoprix (2007), Regué and Bristow (2013)

Two main conclusions can be drawn from the analysis of these variables. Firstly, the characteristics of a city are a crucial parameter, which needs to be examined. Depending on these characteristics, a certain project is feasible in one city, but not in another one. Cities of the same size may have totally different economic functions and vice versa (Clark, 1982). Parr (2007) confirms that a general definition of a city that can be used for all purposes does not exist. The author highlights that an appropriate definition should be chosen according to the specific problem that is examined. As Behrends (2012) also highlights the importance of the urban context, a first logical step in the further research is therefore to make a typology of cities. This idea is confirmed by

Added value	Just-in-time transport, technology and potential security systems at the establishment/vehicle
Budget	Provided budget and costs
Concession	Concession period
Investment	Who is financing/funding the project
Operational aspects	Tram running time, current and maximum future frequency, number of routes, number of stops, trip length and potential limited timeframe
Stakeholders involved	Project owner, number and type of customers
Savings by adopting the project	Saved road transport (in km and movements), saved running-times, diesel, particle air pollution and other externalities
Transfer	Features of the transfer point, such as the (un)loading time and location and the equipment used
Transport unit	Current and future number of trams, length of the tram and tram capacity
Type of goods	Goods that are transported by the project as well as waste and reverse logistics
Use of rail infrastructure	Distance travelled on the existing tramways, use of public tramways and use of extra tramways

Fig. 1: Evaluation criteria for different projects, Own composition based on De Langhe (2013)

Aridsson and Browne (2013), who indicate that the logistics solution for urban freight distribution does not exist and thus contextual factors have to be integrated in the analysis.

Secondly, different freight types are involved in rail projects. In Barcelona, Paris and Vienna, retail products are considered, while in Amsterdam, Barcelona, Vienna and Zürich, waste is transported by rail. Besides, drinks and textile are considered in Amsterdam and Paris. Other specific freight types are automotive

parts (Dresden), beauty products (Paris), fish (Rome), goods for hospitals (Vienna) and hobby and housing products (Paris). These different freight types show that a classification of freight is a second important step in the further research (De Langhe, 2013).

### **3. Definition of an urban area**

Urban areas are important for freight distribution. Christaller (1933) and Loopmans et al. (2011) argue that cities are interesting places for suppliers because of the high population density. Hesse (2008) pointed out the crucial role of cities for the exchange of goods. In later research, this author added that cities have always been connected to trade and are thus by definition central places and gateways to transfer goods and services to the hinterland (Hesse, 2013). Allen, Browne and Cherrett (2012) add that goods are often transported towards an urban area and from there to maximum a few final destinations.

De Langhe (2014) chose the terminology “urban area” and defines an urban area as "a (nearly) continuous compact area, with a certain minimal population density, of which a large proportion consists of commercial activities such as retail activities". An urban area in this research can as well be a small area with a high concentration of shops, as a large area with a lower concentration and this area does not necessarily equal the legal city boundaries.

After defining the urban area, a typology of different urban areas can be set up. Urban areas are distinct from each other with respect to several parameters. Figure 2 shows the parameters that are derived and applied to cities in which rail was used or is still being used for urban freight distribution.

In a next step, the potential role of rail for urban freight distribution will be examined for the northern part of Belgium, i.e. Flanders. Therefore, at least one urban area has to be determined that includes a concentration of retail activities. Retailers are the receivers of goods and producers of waste and as a consequence, they account for goods transport flows. The geographical scale



of an urban area can vary between a group of retail activities, a whole Flemish city, a region in which several cities are located or Flanders as a whole.

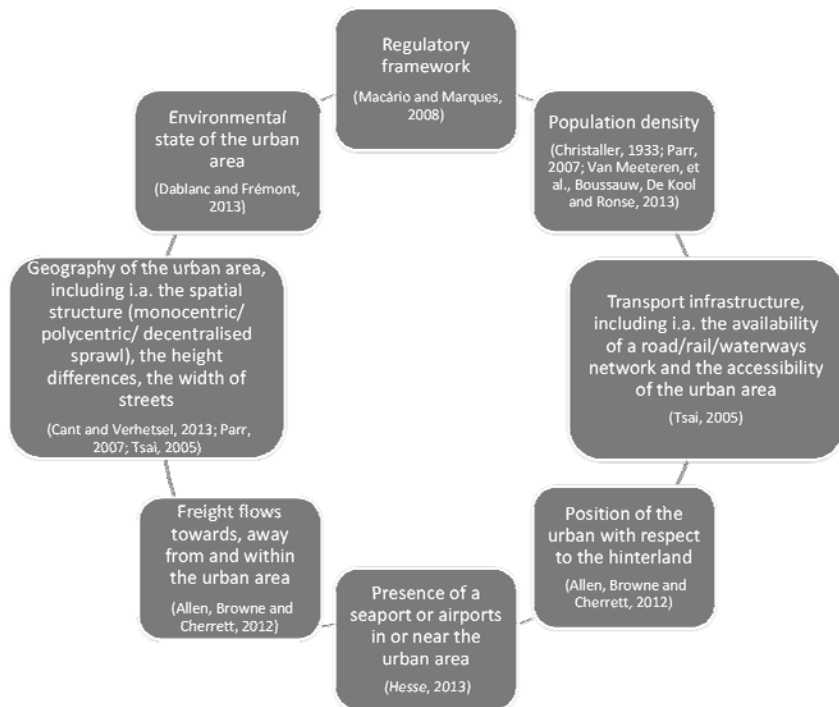


Fig. 2: Urban area parameters, Own composition based on De Langhe (2014)

Figure 3 gives an overview of the different city types in Flanders. It shows that Flanders is a dense area of cities. Two additions to this figure have to be made. Firstly, the terminology “city” corresponds to what Loopmans et al. (2011) see as a “city” and not to the legal definition of a city. Secondly, Figure 3 excludes Brussels, i.e. the white spot on the map, since it does not belong to Flanders from a political point of view. However, Brussels is a main node in the Belgian rail network, strongly connected to the Flemish rail network (see Figure 4). This

rail network is mainly concentrated between Antwerp, Brussels and Leuven. As a result, Brussels is not excluded from the economic analysis.

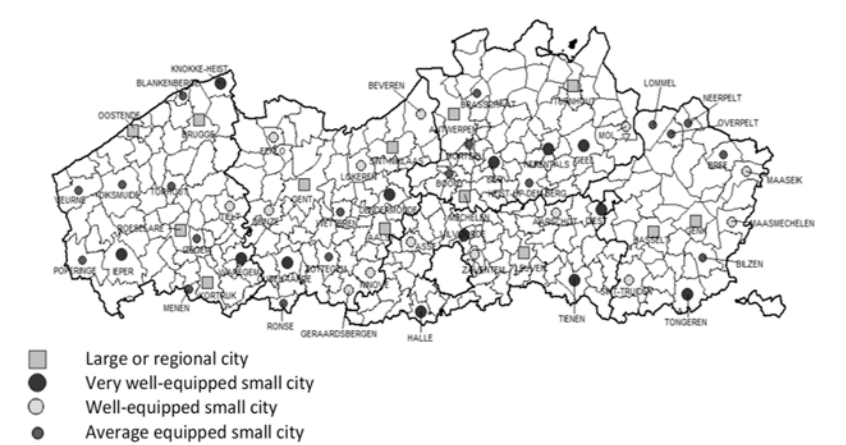


Fig. 3: Hierarchy of Flemish cities, Loopmans et al. (2011, p.145)

Besides considering Flanders as a whole as one urban area, a specific part of Flanders can be chosen. Depuydt & Van Daele (2012) placed the RER-network of Paris on the map of Flanders (see Figure 5). The Paris' RER-network covers about one third of the Flemish area and thus, a city such as Paris may have some similar characteristics as the central part of Flanders.



Fig. 4: Part of the Belgian rail network, Infrabel (2014)

This central part corresponds roughly to the Flemish Diamond, which is the area between Antwerp, Leuven, Brussels and Ghent and is considered to be the economic centre of Flanders. Given the fact that also the rail network is the densest in this area, the Flemish diamond has potential to be the most appropriate urban area in Flanders to examine the potential of rail in urban freight distribution.

At a lower geographical level, a distinction of several urban areas can be made within Flanders. Loopmans et al. (2011, pp. 107–109) mapped different functions of the Flemish municipalities. One of these functions is the retail function. This function is important for this research, since the retail activities are one of the characteristics that determine whether a certain area is an urban area or not (see definition urban area). In order to include different sectors in the analysis, a division is made based on the NACE-code. Depending on the number of sectors represented in each municipality, the number of shops and the number of different sectors present in each municipality, a total score was calculated. With respect to this function, Antwerp is the biggest city of Flanders (De Langhe, 2013).



Fig. 5: The RER-network of Paris on the map of Flanders, Depuydt and Van Daele (2012)

## **4. Different freight typologies**

Transport flows towards, from and within cities have some different characteristics. Allen et al. (2012) state that trips within urban areas are likely to contain more low-volume freight than trips towards urban areas. Furthermore, trips away from urban areas include more empty trips and lower load factors than trips towards urban areas. Many urban areas are net importers of goods. The same authors studied 14 urban areas within the UK and found that only two of them are net exporters. Important to note is the fact that these two cities are port-cities. Another observation is that flows within urban areas have a shorter distance than the flows to and from urban areas.

Not only the difference between intra- and inter-urban freight flows is important. Existing examples of rail in urban freight distribution show that different types of goods can be transported in this context. Depending on these freight types, the transport conditions and requirements are different. Some goods have temperature restrictions, some goods are transported in low volumes to small shops, while other goods are transported in high volumes to large shops. Depending on the type of goods, the rail transport has to be organised in a different way (Comi et al., 2014). Therefore, different subdivisions of goods are given in the next paragraphs.

### **4.1 Catchment area and threshold value**

Porta et al. (2012) make a distinction between primary and secondary activities in an urban area. Primary activities have “a larger-than-local market or catchment area, they are typically highly skilled, larger or more specialised economic activities such as wholesale, industry and those not related to the public or not mainly serving the end-users and their location choice is more likely to be driven by a formal top-down decision-making process” (Porta et al., 2012, pp.1477–1479). Secondary activities have “a local market or catchment area and they are typically retail and services that respond to the ordinary

needs of a general public on a daily or regular basis” (Porta et al., 2012, p.1479).

Similar to this reasoning, a ranking of goods can be made based on the threshold value, or the minimum turnover needed to be profitable (Christaller, 1933). Goods and services with a high threshold value are typically expensive and infrequently purchased items. Lower on the ranking, goods and services with a lower value appear, which are more frequently used. Ultimately, at the bottom of the ranking low value products can be found that are consumed on a daily basis (Clark, 1982). Tannier et al. (2012) distinguish two types of shops and services, depending on the potential user frequency. Daily frequented shops or service centres are bakers, butchers, newsagents, schools and supermarkets/hypermarkets. Weekly frequented shops or service centres are cafés, doctors, hypermarkets/supermarkets/minimarkets, pharmacists and post offices.

Table 2 gives some examples of goods ranked by threshold value. High threshold value products are only available in the largest urban areas of a region, while low threshold value products are also available in small urban areas.

Threshold value	Examples
High	Housing products, television
Medium	Pharmaceutical products, hobby products
Low	Groceries, food, catering industry

Tab. 2: Goods typology based on the threshold value, Own composition based on Clark (1982), De Langhe (2014), Tannier et al. (2011) and Wood and Roberts (2011)

Dablanc and Frémont (2013) state that retailers have a weekly delivery frequency of 4-8 times per FTE employee. Small independent retailer and hotels and restaurants have a weekly frequency delivery of 5-15 times. Chain

retailers and shopping centres have less frequent deliveries per m<sup>2</sup> and their deliveries are more consolidated and transported in vehicles with a higher load factor.

## 4.2 The supply chain

Routhier et al. (2001) estimated that 150-200 types of supply chains exist in the city of Paris. This figure corresponds to the number of economic sectors. Dablanc and Frémont (2013) state that these supply chains differ from each other with respect to the operating times, operators and vehicles used. Gevaers (2013) also distinguishes different supply chains, based on a typology made by Boyer et al. (2005) and Figliozzi (2007). The latter author distinguishes three types of supply chains: low value and less time-sensitive products, low value and high time-sensitive products and high value and high time-sensitive products. Gevaers (2013) states that different logistics approaches are needed for different product types, i.e. a typology of last-mile subflows is needed corresponding with different freight types.

More specifically, a distinction can be made between fast and slow moving goods. Fast moving goods are too expensive to be stored decentralised. As a consequence, they are often transported directly to their final destination without intermediate stop. Distribution centres are used for cross docking purposes, not for storage. On the other hand, slow moving goods are transported to distribution centres near the final destination of the goods, in which they are stored together with goods from other companies (Tsolakis and Naudé, 2008).

Furthermore, time-sensitive freight can be divided into courier and express freight. According to Sirikijpanichkul and Ferreira (2006), courier freight consists of “door-to-door and fixed schedule delivery services mainly in inner city areas” and includes important documents, office support and technical services. Express freight is associated with “a time-definite delivery of freights – usually on the basis of the overnight priority, same day, next day, and international services – which involves a process of pick-up, consolidation, deconsolidation

and delivery to final destination". Examples of express freight are fashion products, just-in-time products, perishable goods, priority items and retail products (Sirikijpanichkul and Ferreira, 2006).

### **4.3 Weight-driven versus volume-driven freight**

Tsolakis and Naudé (2008) developed a typology of freight, consisting of bulk and non-bulk goods. Bulk goods comprise primary goods such as coals, mining and ores, and agriculture and forestry, such as grain and timber. These bulk goods are considered to be non-urban, while the non-bulk goods are assumed to be urban flows.

Within the non-bulk goods, urban heavy freight and urban light freight can be distinguished, in which heavy freight can be considered to be weight-driven and light-freight to be volume-driven. The urban heavy freight consists of industry supplies, infrastructure construction materials, residential building materials and household removals, waste removal and recycling and wholesale and retail supplies. The urban light freight includes household waste removal, mail, office and residential maintenance, office supplies, service delivery trips and small scale retail deliveries. Most light freight activities take place in an urban context and are thus urban flows. Some of the main characteristics of urban light freight are its time sensitive nature, which is even increasing over time, the use of light commercial vehicles and the small volumes to be transported (Tsolakis and Naudé, 2008). Urban light freight is a growing segment (Janjevic, Kaminsky and Ballé Ndiaye, 2013) which contributes to a large amount of total urban freight, expressed in number of deliveries and vehicle trips. In Liège, a city in the southern part of Belgium, three quarter of all deliveries in the city centre are parcels and 79% is transported by means of light commercial vehicles in 2004 (Debauche, 2007).

Light commercial vehicles are defined by Tsolakis and Naudé (2008) as "motor vehicles constructed for the carriage of goods and which are less than or equal to 3.5 tonnes". This definition includes cab-chassis, goods carrying vans, panel vans and utilities. When Janjevic et al. (2013) describe the classification of

vehicles made by Debauche (2007), they count private cars, vans and estate cars as light commercial vehicles.

For this study, the classification of Tsolakis and Naudé (2008) is especially useful and leads to the hypothesis that mainly non-bulk weight-driven as well as volume-driven freight qualify for a potential use of rail transport in an urban context. This reasoning comes from the fact that both examples of transport of weigh-driven freight (e.g. Dresden, Paris) and volume-driven freight (e.g. Zürich, Rome) by rail exist. In general, B2B flows are considered, since B2C flows are too fine-grained for rail transport. However, B2C flows cannot be left completely out of the analysis given the increasing importance of e-commerce (Comi et al., 2014).

## **5. Developing the research strategy**

A next step in the analysis is to determine an appropriate methodology to investigate the potential role of rail in urban freight distribution.

Table 3 displays different research methods used by different authors in order to assess urban rail freight distribution projects. An often-applied method is the combination of interviews or observations to forecast freight flows and to collect additional data and the conduction of a social cost-benefit analysis and the application to a case study. This method has been applied for both light rail (Alessandrini et al., 2012; Dinwoodie, 2006; Filippi, 2014; Gonzalez-Feliu, 2014; Nuzzolo, Crisalli and Comi, 2007; Nuzzolo, 2014) and tramways (Regué and Bristow, 2013).

De Langhe (2014) gives an overview of the main social and private cost/benefit variables. This overview is based on the classification of costs and benefits made by Blauwens, De Baere and Van de Voorde (2012), who distinguish investment and operational expenses on the cost side and consumer surplus and operational income on the benefit side. Since the role of rail in urban freight distribution is in the present research examined from both a business-economic and a welfare point of view, costs and benefits can be subdivided in social and



private costs/benefits. The social costs/benefits consist of emissions and other externalities, while the private costs/benefits include into operating costs, investment costs and handling costs. Blauwens et al. (2012) do not make a distinction between operational and handling costs/benefits. This distinction is relevant for the present research, since it allows getting a separate insight in the road/rail operations and the handling operations.

From the analysis of the existing literature displayed in Table 3 it can be deduced that not all authors measure all cost/benefit components and not one component is measured by all authors. This might be due to a lack of data for the specific case that is examined, or because some cost/benefit components are irrelevant in some specific cases.

In order to get an in-depth insight in the actual and potential future freight demand, total freight flows and rail freight flows have to be estimated. Knowledge about these flows makes it possible to estimate the demand curve. This in turn leads to an estimation of the benefits, which equal the surface below the demand curve. This is best done based on a combination of stated and revealed preference. The rail freight demand for urban freight distribution is difficult to capture by revealed preference, since it comprises a potential and not an existing demand.

Thus, rail freight flows are estimated based on stated preference. With respect to the supply, an analysis of the existing railway and tramway infrastructure, rolling stock and services is made based on a market analysis and interviews. The combination of these two sides is in a further stage input for the social cost-benefit analysis. Additional factors, such as a potential new tramway/railway, are implemented in the model by conducting several sensitivity tests. After having applied the analysis to a specific case study, extension to other cases is facilitated by using the transferability theory (Macário and Marques, 2008) for which the different urban area and freight characteristics are input.

Author(s)	Year	Methodology
Dinwoodie	2006	Disaggregate spreadsheet cost simulations, semi-structured interviews
Nuzzolo, Crisalli, Comi	2007	Traffic counts, driver surveys, retailer surveys, O/D freight demand matrices, cost analysis
Alessandrini, Delle Site, Filippi and Salucci	2012	Monitoring of vehicles, scenarios, social and private cost analysis
Regué and Bristow	2013	Cost-benefit analysis, scenarios, face-to-face establishment survey, observational vehicle count
Filippi	2014	On-board vehicle computers, interviews, surveys
Gonzalez-Feliu	2014	Interviews, social cost-benefit analysis
Nuzzolo and Comi	2014	Stated and revealed preference, (mixed) logit model, nested model

Tab. 3: Overview of applied methodologies, Own composition

## 6. Conclusions

This paper offers a research strategy to develop a conceptual model in order to assess the business and/or welfare-economic feasibility of rail transport in urban freight distribution. Three main conclusions can be drawn.

A first conclusion is that the main parameters of urban areas are the geography of the urban area, the population density, the transport infrastructure, the hinterland, the presence of a seaport or airports in or nearby the urban area, the freight flows towards, away from and within the urban area, the regulatory framework and the environmental state of the urban area. Another main aspect that has to be taken into account in this research is the presence of retail

activities. With respect to Flanders, three urban areas appear to be relevant for this research, being Flanders as a whole, the Flemish diamond and Antwerp.

A second conclusion concerns the freight types that could be transported by rail transport. Different existing cases and a classification of freight show that both non-bulk heavy as well as light freight can be taken into account. For the transport by rail, mainly B2B flows are considered.

A third conclusion is made with respect to the research strategy for this study. A combination of stated and revealed preference is needed as input for a social cost-benefit analysis. This social cost-benefit analysis consists of both social and private costs and benefits. The main social costs/benefits are emissions and other externalities, while the main private costs/benefits are operational, capital and handling costs/benefits.

In further research, the social cost-benefit analysis will be carried out, applied to at least one case in Flanders. The results of this case will lead to the development of a conceptual cost-model to assess the potential role of rail in urban freight distribution.

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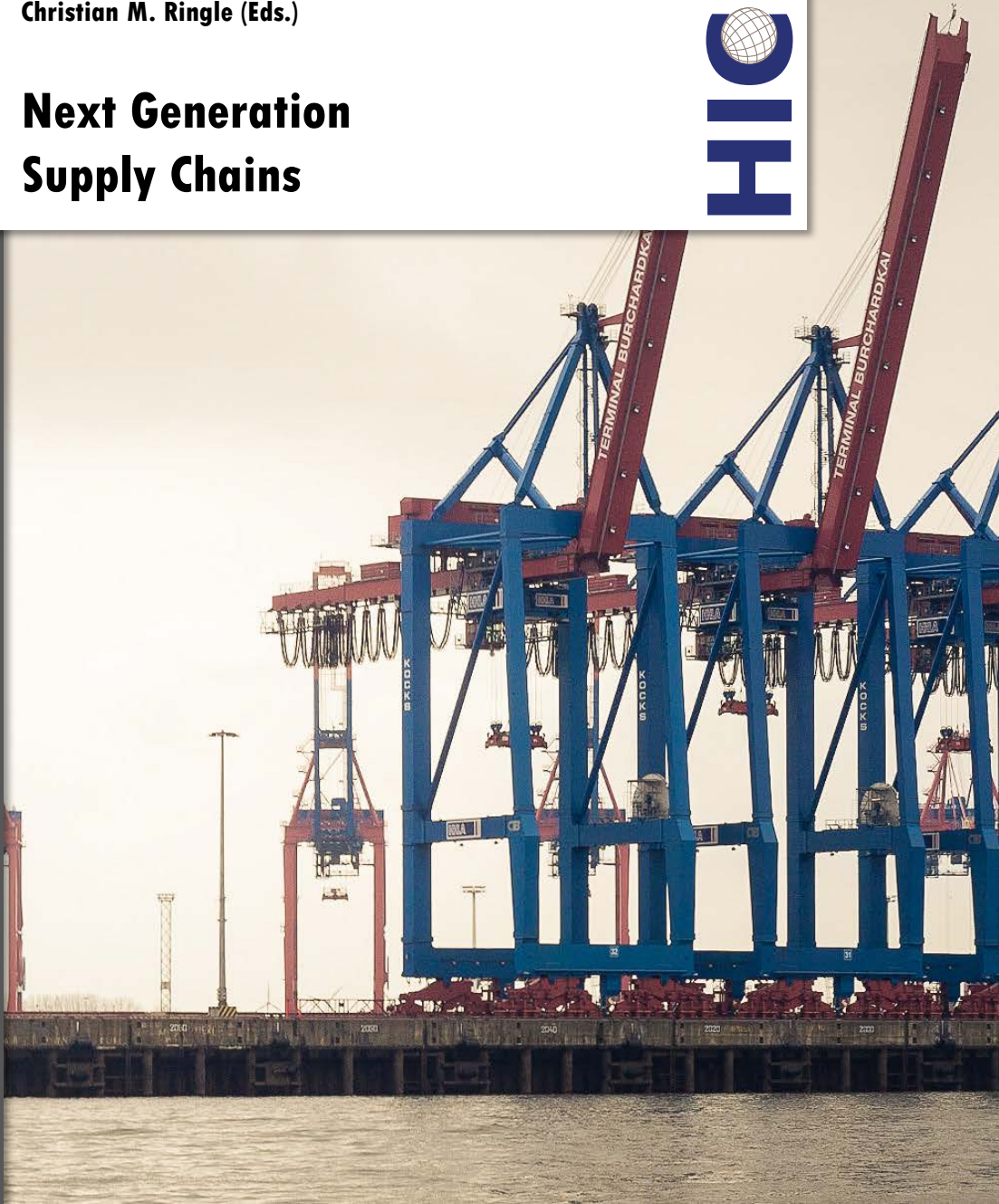
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**Wolfgang Kersten, Thorsten Blecker and  
Christian M. Ringle (Eds.)**

# **Next Generation Supply Chains**





Prof. Dr. Dr. h. c. Wolfgang Kersten  
Prof. Dr. Thorsten Blecker  
Prof. Dr. Christian M. Ringle  
*(Editors)*

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Trends and Opportunities

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## Preface

Today's business environment is undergoing significant changes. Demand patterns constantly claim for greener products from more sustainable supply chains. Handling these customer needs, embedded in a sophisticated and complex supply chain environment, are putting the players under a constant pressure: Ecological and social issues arise additionally to challenges like technology management and efficiency enhancement. Concurrently each of these holds incredible opportunities to separate from competitors, yet also increases chain complexity and risks.

This book addresses the hot spots of discussion for future supply chain solutions. It contains manuscripts by international authors providing comprehensive insights into topics like sustainability, supply chain risk management and provides future outlooks to the field of supply chain management. All manuscripts contribute to theory development and verification in their respective area of research.

We would like to thank the authors for their excellent contributions, which advance the logistics research progress. Without their support and hard work, the creation of this volume would not have been possible. We would also like to thank Sara Kheiravar, Tabea Tressin, Matthias Ehni and Niels Hackius for their efforts to prepare, structure and finalize this book.

Hamburg, August 2014

Prof. Dr. Dr. h. c. Wolfgang Kersten  
Prof. Dr. Thorsten Blecker  
Prof. Dr. Christian Ringle

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## **About HICL**

Since 2006 the annual conference Hamburg International Conference of Logistics (HICL) at Hamburg University of Technology (TUHH) is dedicated to facilitate the exchange of ideas and contribute to the improved understanding and practice of Logistics and SCM. HICL creates a creative environment which attracts researchers, practitioners, and industry thinkers from all around the world.



Innovation is increasingly considered as an enabler of business competitive advantage. More and more organizations focus on satisfying their consumer's demand of innovative and qualitative products and services by applying both technology-supported and non technology-supported innovative methods in their supply chain practices. Due to its very characteristic i.e. novelty, innovation is double-edged sword; capturing value from innovative methods in supply chain practices has been one of the important topics among practitioners as well as researchers of the field.

This volume, edited by Thorsten Blecker, Wolfgang Kersten and Christian Ringle, provides valuable insights into:

- Innovative and technology-based solutions
- Supply chain security management
- Cooperation and performance practices in supply chain management

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