

THE USE OF RAIL TRANSPORT AS PART OF THE SUPPLY CHAIN IN AN URBAN LOGISTICS CONTEXT

ABSTRACT

In Western Europe, the rail freight industry has been liberalized during recent years. The number of actors multiplies, the network connections of railroad and intermodal logistics companies grow and new actors enter the market. A directive called for separated accounting structures between the network provider and the operational activities. The right to privately operate, at first international and afterwards national freight trains came later. The liberalization had a major impact on the former state-owned monopolistic rail companies (the incumbents) and logistics actors calling at them. New market possibilities arose, but more actors now need to collaborate. This paper explores new logistics concepts in Western Europe, involving rail transport, now being in the trial - or investigation phase.

This paper deals with the use of rail transport as part of the supply chain in an urban logistics context. The link will be made between two research subjects: the economic and ecologic viability of rail or intermodal transport, and the logistics capacity problems in an urban context, the latter of which is a growing research stream.

First, a brief overview of the European railway market will be given. The difference between the European short-distance rail freight organization and American short-haul services will be described. Second, the concept of a new smart supply chain involving rail, developed by Deketele et al., will be given. The theory of the concept was put in to practice in Belgium by Procter and Gamble. This will be highlighted shortly. Afterwards, the concept of the modern supply chain involving rail will be compared to the actual supply chain of the French retail group Monoprix. The Monoprix supply chain will be discussed in the framework developed by Deketele et al. The actual French logistics bottlenecks, modal split, important legislation and

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outcomes will be treated. Results of the Monoprix supply chain will be given. Finally, conclusions will be drawn.

Rail transport is hardly used in supply chains nowadays. In contrast, European governments set policy goals regarding non-road freight transport modes. Making the total supply chain more sustainable means decreasing road transport usage. Rail transport is being looked at as a solution for road traffic congestion problems. The modal share of rail transport in Europe declined the last decades to less than 15%. The authors assume that the results of this project, specifically highlighting best practices, can change the thinking pattern of supply chain executives.

Keywords : innovation in logistics, urban logistics, rail transport, city distribution, intermodal transport

INTRODUCTION

In Western Europe, the rail freight industry has been liberalized during recent years. The number of actors multiplies, the network connections of railroad and intermodal logistics companies grow and new actors enter the market. Rail freight was mainly being liberalized under impulse of the European Commission by the directive 91/440. This directive called for separated accounting structures between the network provider and the operational activities. The right to operate first international and afterwards national freight trains came later. However, different market structures were implemented as national member states were responsible for the implementation of the new legal framework. As a result, some countries had anticipated the liberalization, others delayed as long as possible. The liberalization had a major impact on the former state-owned monopolistic rail companies (the incumbents) and logistics actors calling at them. New market possibilities arose, but more actors now need to collaborate. This paper explores new logistics concepts in Western Europe, involving rail transport, now being in the trial - or investigation phase. (Lewis et al., 2002; Maes et al., 2008)

This paper will deal with the use of rail transport as part of the supply chain in an urban logistics context. The link will be made between two research subjects: the economic and ecologic viability of rail or intermodal transport, and the logistics capacity problems in an urban context, the latter of which is a growing research stream. A part of this paper will build on research conducted among others by Deketele et al (2008).

First, a brief overview of the European railway market will be given. The difference between the European short-distance rail freight organization and American short-haul services will be described. Second, the concept of a new smart supply chain involving rail, developed by Deketele et al., will be given. The theory of the concept was put in to practice in Belgium by the Fast Moving Consumer Goods (FMCG) producer Procter and Gamble. This will be highlighted shortly. Afterwards, the concept of the modern supply chain involving rail will be compared to the actual supply chain of the French retail group Monoprix. The Monoprix supply chain will be discussed in the framework developed by Deketele et al. The actual French logistics bottlenecks, modal split, important legislation and outcomes will be treated. Results of the Monoprix supply chain will be given. Finally, conclusions will be drawn.

1. The European context of rail transport

In the last thirty years, Europe's transport sector has experienced an important growth, but freight growth can principally be attributed to road and sea transport. Both modes displayed large increases of respectively 38% and 35% from 1995 to 2005. According to the European Commission's 2001 White Paper, the dominating trend for the long term future is a continued growth of maritime and road transport. Rail transport and inland waterways will show considerably less growth according to this forecast. (European Commission, 2001)

The high mode share of road transport is posing serious problems regarding environment, congestion and road safety. The European transport sector is responsible for 24% of Europe's CO₂ emissions. Within the total transport emissions, road traffic accounted for the single largest share of 71%. Rail transport accounts for only 0.8%. (European Communities, 2009, p. 210)

As a result, unless major new measures for a more rational use of each transport mode are taken, by 2010 heavy goods vehicle traffic in the EU will increase by nearly 50% over the 1998 level. This means that more congestion is likely to come. (European Commission, 2001)

Table 1 : Freight transport by rail (billion tonne-km)

	1990	1995	2000	2005	2006	2007	% change 06-07
EU-27	526.3	386.1	403.7	414.1	440.2	452.2	2.7
EU-15	256.5	222.7	257.1	262.9	285.9	296.2	3.6
EU-12	269.8	163.4	146.6	151.3	154.3	156.0	1.1
BELGIUM	8.37	7.30	7.67	8.13	8.57	8.24	-3.9
FRANCE	52.24	48.27	57.73	40.7	40.95	42.62	4.1

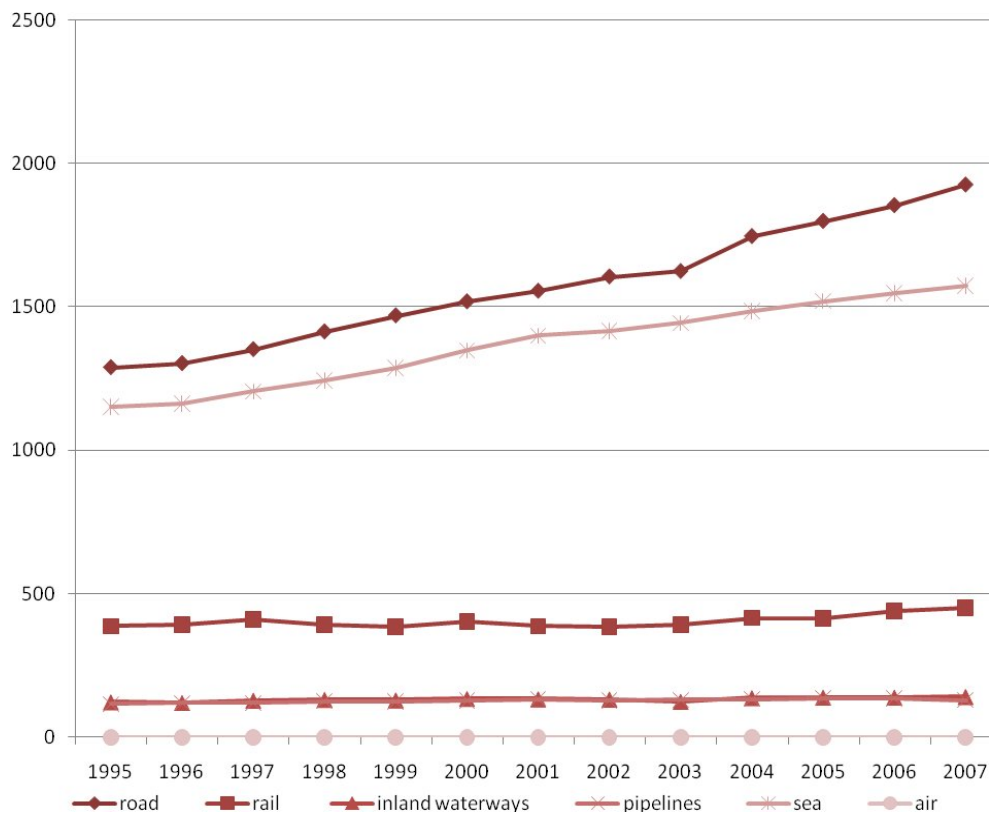
Source : European Communities (2009), EU energy and transport in figures, Statistical Pocketbook 2009, ISBN 978-92-79-10728-3, Brussels

The evolution in European rail transport has been varied, but can be marked with a constant decline in market share. Among the member states, different market situations are present. Till the 90's, national markets, forming the European market, were dominated by state-owned monopolistic companies taking care of national rail transport as well as of infrastructure management. These companies were not working efficiently, hardly showed any market

thinking and were regularly mis-influenced by political influences. As a result, debts grew enormously and as shown by figure 1, rail as a transport mode lost market share year after year. The total traffic of rail freight grew little. (European Communities, 2009)

A reaction of the European commission followed, mainly inspired by the concerns regarding growing road congestion and increasing lack of sustainability of the general European transport sector. Looking at figure 1, market share of rail dropped to 10.7 percent (EU-25 performance by mode measured in tonne/km). Intermodal traffic accounts for 5 percent of all freight traffic carried by land modes (measured in tonne/km). Two-thirds of the traffic is international. The development of intermodal traffic is also a major European policy goal since a number of years. (Debie and Gouvernal, 2006; European Communities, 2009)

Figure 1 : Freight traffic EU-25 per mode (in billions tonne-kms)



Source: European Communities (2009), EU energy and transport in figures, Statistical Pocketbook 2009, ISBN 978-92-79-10728-3, Brussels

The European Commission chose to liberalize the European railway market. Competition was the answer to the bad condition of the rail transport sector. Economists like Baumol (1977) suggested in economic theories (theory of contestability) that the threat of new

entrants was sufficient to assure competition. However, opening up the industry to more competition has been difficult due to the integrated nature of the sector (Debie and Gouvernal, 2006).

The process of liberalization took decades. It all started in 1957 by the Treaty of Rome founding the European Economic Community, however the first big step was splitting up the incumbents in 1991. Separated companies arose to control the network and to perform operational activities. Infrastructure managers need to have separated budgets and accounts. Different models were implicated, but transparency is a necessity. The second step was handing out licenses to newcomers. New companies, when complying with European and national rules, can obtain a license to operate rail freight activities. In 2003 and 2006, the market for international freight traffic was liberalized; the national market was liberalized in 2007. Also the international passenger transport will be open for competition starting from January 2010. For the national passenger transport, an agreement isn't made yet. (Corthouts, 2007; Maes et al., 2008)

The actors occupying key positions in rail freight movements are dispersed. In less than 20 years' time, the total sector organization changed. The first level now is the rail track provider. In each national member state, the track provider is a separated company. The degree of separation differs. The second level comprises the railway companies providing traction. However, as indicated above, the principle criterion is the provision of traction. In 2009 large state-owned companies still dominate the market. Some private companies increased their market share rapidly. The third level, according to Debie and Gouvernal (2006), are the intermodal transport operators. It brings together many different types of actors. Many have the status of forwarding agents. These buy traction services from the railway companies (Debie and Gouvernal, 2006). To start up a new service, several parties need to work together closely.

In order to improve their financial performance, most European incumbents have been undergoing major reorganizations over the past 20 years. Often reorganizations bring reductions or disappearance of railway services. At the same time society is largely looking at railway transport as a solution for increasing fossil fuel consumption and climate change. (Dablanc, 2009a)

Dablanc (2009b) highlights these contradictory influences concerning regional and short-

distance rail freight links. On the one hand, this segment of the market is under pressure due to the relatively high costs and low margins. In contrast, these links are seen, certainly by local governments, as a necessary solution to shift freight traffic to rail. Dablanc (2009a) made a comparison between the European, US and Canadian meaning of shortlines. Shortlines in a North-American context are, according to the US surface transport board, seen as Class III railway companies, with operating revenue of less than \$28 million USD, operating independently providing freight traffic to a major railway company (Class 1). In a European context, shortlines are mostly new private railway companies competing with the incumbents on specific, high-margin parts of the market. No integration at all is made. Only the German incumbent DB Schenker, with a long history of regional rail operators, has a dozen of local companies providing traffic to the major carrier. Posner (2009) recently argued that the main feature of the French railway freight situation is a complete lack of local rail entrepreneurship. Since the deregulation, eight operators have obtained French licenses and safety certificates. As they bid for traffic, they hardly cooperate. The newcomers have a strongly competitive attitude, with the result of concurring 10% of the French rail freight market (2008 numbers). However, decreasing relative competitiveness of road transport means that many traditional trucking markets are becoming rail sensitive. (Dablanc, 2009b; Betke, 2006)

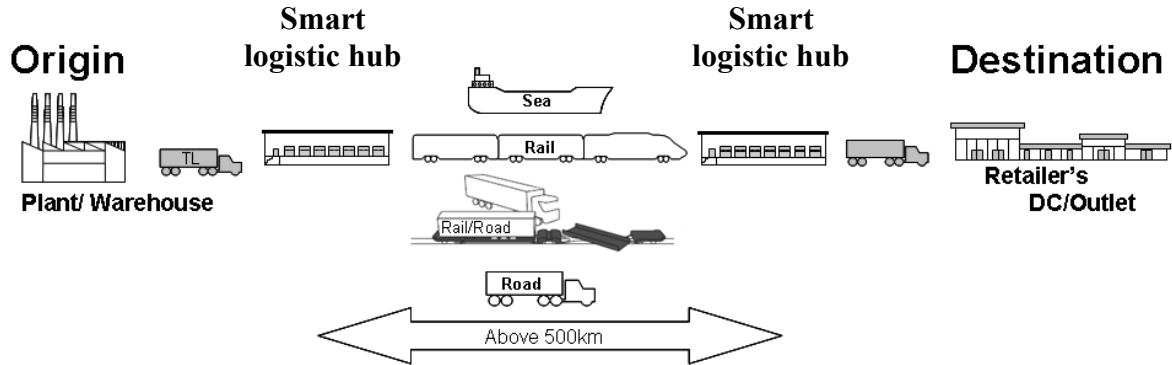
2. A new smart supply chain concept involving rail

Deketele et al. (2008) describe the use of intermodal transport in the context of a new smart supply chain. This concept is built on the rational use of competing transport modes. The specific advantage of each individual mode is valued. A network of smart logistic hubs should be based on geographical factors such as existing transport infrastructures and future opportunities, but also on economic factors like trade flow analysis of prospected major users of these hubs (see figure 2). Per hub, at least two means of transport are available to reach other hubs. This enables a company to anticipate upon crisis situations or reliability issues in transport lanes. These hubs should ideally be operated by one or a few (FMCG) companies and/or retailers with sufficiently large volumes or more probably by an independent logistics provider that can combine flows. By consolidating flows, the economic viability of non-road transportation increases and therefore, large constant volumes of goods can be shipped. Peak transport capacity or occasional express shipments can still be carried by truck. Additionally, when possible, short to medium range outbound traffic should be combined with several suppliers of a retailer DC. This set-up may possibly permit goods to be transported by rail or barge, or at least to load a full truck. In the cases when sufficient volume is

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consolidated, shared truck transports could go directly to retailer outlets, by-passing the retailer DC. (Deketele et al., 2008)

Figure 2 : Future state of a FMCG company supply chain: including “smart logistic hubs and spokes”



Source : Deketele, L., Coelho, P., Grosso, M., Lynce, A-R., (2008), Moving From 80% Road To 80% Non Road - Implementing Modal Shift In A Fast Moving Consumer Goods Supply Chain, TransportNET project

The key idea in the Deketele et al. (2008) paper is bundling of transport flows via a hub-and-spoke network. Bundling flows delivers economies of scale by using low-cost transshipment points. Therefore, the nodes between modes, the smart logistics hubs, are obliged to operate cost-efficiently and -effective. These smart logistic hubs can be similar to the concept of new-generation (NG) terminals described in Kreuzberger (1999). Kreuzberger, performing research in the field of smart logistics rail networks looked at complex bundling concepts. The main reason to be competitive is to have qualitative terminals. Performance requirements are fulfilled when working with new-generation terminals. These are intelligent, compact and create synergetic operations for transshipment, storage and internal transport. As such cost-to-quality ratios go up. Similarities can be seen between the smart logistics hubs and new-generation terminals. The nodes in Deketele et al. (2008) can be seen as a smaller version of/or part of new-generation terminals. Both are cost efficient en fast. (Kreuzberger, 1999; Deketele et al., 2008; Trip and Bontekoning, 2002)

A new smart supply chain concept involving rail, as used by Procter and Gamble

As a result of this first study, the concept in figure 3 is nowadays used in Belgium by the FMCG company Procter and Gamble (P&G). The supply chain involving rail is as in figure 3. P&G ships batteries, chips and washing products, produced in Mechelen (Belgium) by train to the UK. This way, 5,000 truckloads a year are kept from the roads and CO2 emissions are lowered by 350 tonnes a year. (Debacker and Verbeeck, 2009)

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Figure 3 : A FMCG company supply chain: From P&G Mechelen towards the UK



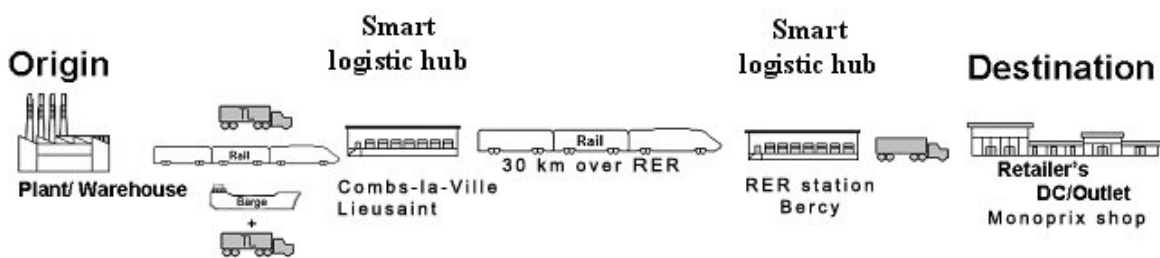
Source : Based on : Deketele, L., Coelho, P., Grosso, M., Lynce, A-R., (2008), Moving From 80% Road To 80% Non Road - Implementing Modal Shift In A Fast Moving Consumer Goods Supply Chain, TransportNET project

3. A new smart supply chain concept involving rail, as used by Monoprix

Starting from the smart logistics hub-and-spoke concept by Deketele et al (2008), the concept is broadened. The possibilities to integrate rail transport in the modern supply chain are described. Specifically, urban transport is looked at.

The use of rail transport on a relatively short distance is possible, as stated by P&G. This paper analyzes the possibility to expand the concept elaborated above. Monoprix, an innovative French retail group owning 300 shops with an annual turnover of 3,575 million EUR in 2007, uses since December 2007 rail freight in an urban distribution context. An innovative concept, almost never seen before in a European context, is used. Therefore, the research for this paper was based on the Monoprix case. Specifically, Monoprix ships by rail to a downtown logistics centre over a very short distance (30 km). Hence, road congestion is now hardly influencing the supply chain, in contrast to the former supply chain organization.

Figure 4 : Concept of supply chain used by Monoprix in France



Source : Based on : Deketele, L., Coelho, P., Grosso, M., Lynce, A-R., (2008), Moving From 80% Road To 80% Non Road - Implementing Modal Shift In A Fast Moving Consumer Goods Supply Chain, TransportNET project

From the Paris located transshipment centre, more than 80 shops located downtown Paris are connected. From a sustainable point of view, the last mile is done by natural gas powered vehicles. Furthermore, these are equipped with noise reducing techniques. To summarize: the trains use the tracks of the public transport lines (Paris RER); 30% of the total supply

chain at Monoprix Paris is oriented to this concept (120,000 tonnes or 210,000 pallets a year); and the total emissions of CO₂ are lowered by 337 tonnes per year. On the other hand, only non-alcoholic beverages and heavy-weight goods were selected. These goods are taking up much storage space and are heavy weighted. The concept is shown in figure 4.

This concept of Monoprix's supply chain can be linked to the framework described by Deketele et al. (2008), as some conditions are fulfilled. The new smart supply chain of Deketele et al. (2008) can be summarized by: "the use of each individual mode where most advantageous". Monoprix has not totally canceled road freight, but the supply chain is focused on other modes. Trucks will be used as little as possible. Monoprix's research took into account the geographical and economic factors. At the nodes (at Combs-la-Ville/Lieusaint and Bercy) transshipment is done as fast and low-cost as possible. The flows coming to Combs-la-Ville/Lieusaint also have a multi-modal nature. At Lieusaint, 6 or 7 rail wagons a day arrive (mainly bottled drinks). The rest arrives via truck. Some goods arrive in France per barge, and are then loaded on to trucks to the warehouses. From the warehouse, goods go to Paris by rail (30% of the flows), the rest is going by truck. From the warehouse, also other French shops are supplied. In that case, only trucks are used. From the node in Bercy, goods are transported by low-noise and low-emission gas-powered trucks. The supply chain is controlled by Monoprix's 100% subsidiary Samada. Transport-related activities were outsourced to among others Geodis or GT location. Combining transport activities with other suppliers is not advantageous, as the flows are big enough. Monoprix, as a 50% subsidiary of Casino and 50% by Groupe Galleries Lafayette (two French retail groups) is working together on a negotiation level towards suppliers, but not on an operational or logistics level. The concept is proved to be efficient and also flexible. In summertime for example, demand for non-alcoholic beverages can explode. In that case, the rail link is used to the maximum and three or even four delivery rounds can be done by the delivery trucks. (Samson, 2009)

History of the concept

In 2004, Monoprix participated in a research project launched by several local governments and the French railway infrastructure manager (RFF). Objective of this project was to start up an experiment in 2007. The research and economic analysis was done in 2004-2005. In May 2006, a public tender was launched which resulted in the selection of Fret SNCF by December 2006. A year later, the first train left the Monoprix logistics center in Combs-la-Ville/Lieusaint. The implementation was done in three steps. In November 2007, 27 shops were included. By January 2008, 8 new shops were selected. Another 20 followed in

February, and 16 in April and 14 in June which totaled the number of shops included to almost 90 now. (Samson, 2009; Monoprix, 2007)

Table 2 : Road congestion in France (in thousands of hour-kilometers)

	95	96	97	98	99	00	01	02	03	04	05
Paris region national network	420	396	479	533	492	557	586	607	568	593	497
Paris ring motorway	262	220	262	268	225	273	308	302	298	254	243
Total Paris region	682	616	742	802	717	830	894	909	865	848	740
National network, provinces	123	134	121	76	94	99	147	153	170	154	183
Whole of France	805	750	863	878	811	929	1,041	1,062	1,036	1,002	923
of which Paris ring motorway	33%	29%	30%	31%	28%	29%	30%	28%	29%	25%	26%
of which greater Paris region + Paris ring motorway	85%	82%	86%	91%	88%	89%	86%	86%	84%	85%	80%

Source : Union Routière de France, (2006), PHYSICAL DATA ON TRANSPORT : Road traffic, Online on : http://www.urf.asso.fr/index.php?id=1039#physical_data

The motivation to set up a totally new concept for supplying Paris-based shops lies in the growing road congestion problems in and around Paris (see table 2). When looking at French congestion data, a stabilizing trend can be seen. A combination of a slight increase in traffic, and an elimination of certain bottlenecks gave a constant number of lost hours. Although road congestion stabilized during the last years, a continuous increase can be seen since the 1990's. Commercial vehicles drove 25 billion vehicle kilometers in 1969. This amounted to 120 billion by 2005. The growth in total traffic comes mainly from passenger cars (going from 125 to 400 billion vehicle kilometers in 40 years' time). (Union Routière de France, 2006)

A deeper look at the Paris city center logistics problems is necessary. According to a study by Cuenca (2008), a total of 32 million tonnes of freight is transported in the Paris inner city region (Paris intra-muros). Trucks are dominant with 28.5 million tonnes. 2.5 million tonnes are transported by barge. The rest, only 1 million tonnes (less than 4%) is transported by rail. The freight vehicles in Paris intra-muros represent only between 9 and 15% of the total traffic. In contrast, the occupation or road-lane capacity is accounted for 25% of freight

vehicles. In the historical centre, occupation of road lanes reaches even 62%. Longer stops and double parking problems create bottlenecks on the road network. As a result, the number of accidents involving a freight vehicle increased by 25%, and even by 50% for heavy freight traffic. City logistics in France accounts for 40% of the total French greenhouse gas emissions from transport operations. A last negative influence of the increasing freight traffic is an increase in noise emissions. As people living in the city centre are also (potential) customers for retailers, this issue gets increasing attention. (Cuenca, 2008; Peignard, 2007a)

City logistics is a case of conflicts of interests. Inhabitants have other needs than commuters and inner-city located companies or offices. Inhabitants are on one moment willing to buy commodities but tend to forget when standing in a traffic jam that shops need to be supplied in order to make that possible. The inner city supply chain influences 5 different variables. These are from an environmental, functional, economic, urban and social nature. Local governments are responsible for limitations concerning noise pollution and emissions. City centers need to be dynamic with respect for open spaces and need to cope with a new retail and logistics environment. Three different actors need to cooperate to make a city a livable environment. The transport company, the shipper and the local inhabitants are involved. The circle actually starts at the consumer. Consumers these days, especially in vibrant international cities, have a different way of consuming. So are, smaller in-city shops becoming more popular. E-commerce is the source of new logistics problems, as the number of trucks and small vans entering city centers increases drastically. (Peignard, 2007)

As legislation concerning urban logistics is not present or not adapted to the current situation, the mayor of Paris took the initiative to set up a charter to decrease urban logistics problems. The process took several years to be completed. France has an innovative strategy concerning urban logistics. In 1993 the program “Le programme national Marchandises en Ville” was created by ADEME¹, EDF, GART and Prédit. This group is facilitating research in urban distribution and is operating as a knowledge base. The program was also the basis of several innovative experiments. In 2005 “l'Association Centre Ville en Mouvement” was created by different partners, going from local and federal governments to researchers. (Ministère de l'Écologie, de l'Énergie, du Développement durable et de la Mer, 2007) The most practical result, as introduced above, was the “charte de bonnes pratiques des transports et livraison de marchandise dans Paris”. Signed on the 28th of June by the mayor of Paris and 46 professional partners and institutions, official targets were set. By complying with the rules stipulated in the contract, the logistics companies involved are allowed to use

specially-designed unloading areas in Paris' city centre. The charter treats the incoming and outgoing flows as well as the waste and reverse logistics. Legislation regarding urban logistics was simplified. Low-emission vehicles can stay longer in the city centre and can enjoy wider time windows. Vehicles equipped by electricity, gas, hybrid or engines, and complying with the latest EURO2 legislation can deliver 24 hours a day. (Peignard, 2007a)

Furthermore, some other targets were set. The French president Sarkozy fixed some ambitious policy goals. By 2012, 25% increase from non-road modes is expected. The 2004 Paris climate plan also wants to limit greenhouse gas emissions in the Paris region with 25% by 2020. The region Île-de-France, comprising Paris and having more than 11 million inhabitants, supports these strategies. (Monoprix, 2004)

The French railway market

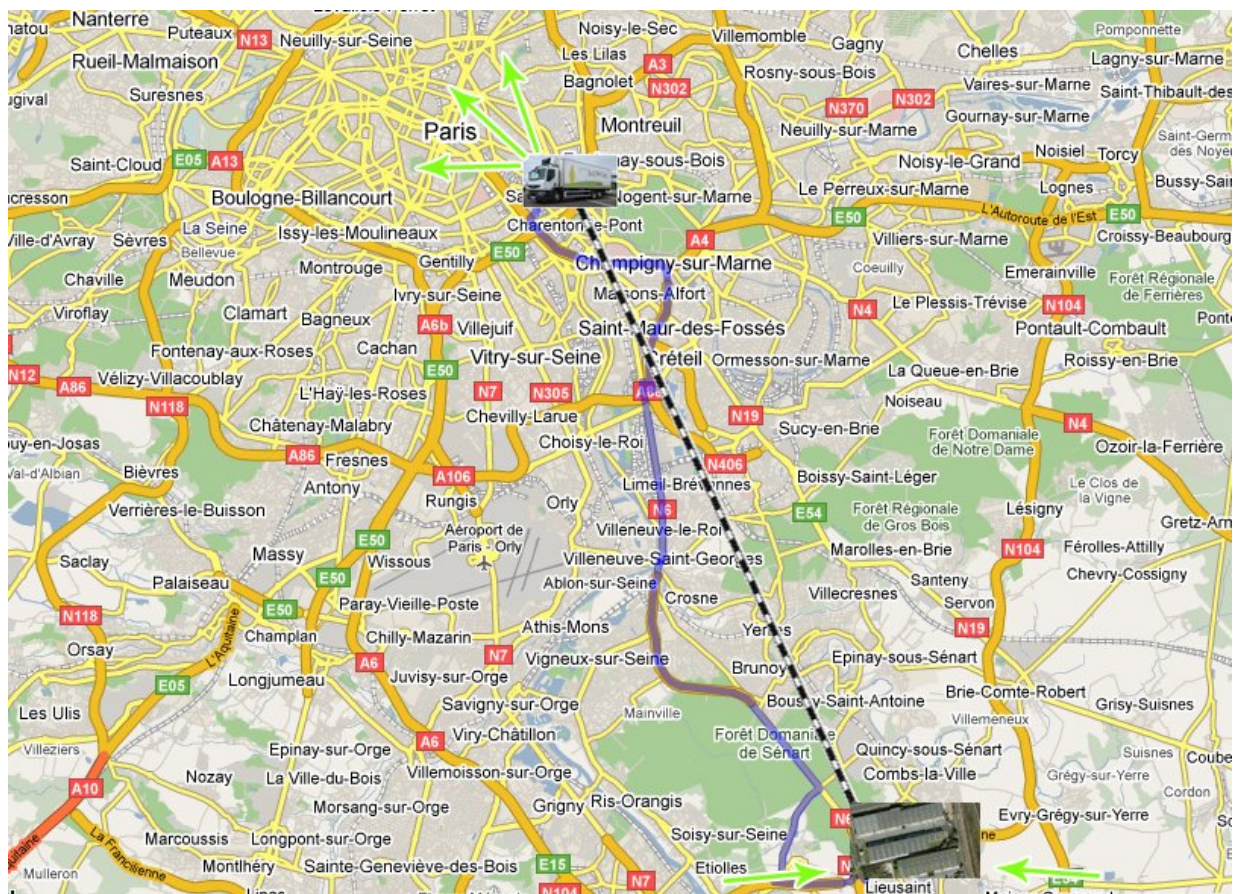
A small description of the French railway market is necessary to understand the current situation. The French railway infrastructure is managed by the RFF (Réseau Ferré de France). SNCF was formed as a separated body. SNCF is mainly a passenger and freight rail operator. SNCF Fret is the division for freight traffic. TGV, Thalys, Eurostar, TER, Transilien and other brands are used for (high speed) passenger transport. Other participations in transport related sectors are held. As RFF does not have the skilled personnel or experience to maintain the national rail network, the majority of tasks are outsourced to SNCF. As such, questions arise about the non-discriminatory nature of RFF. Complaints concerning this issue usually come from the new entrants competing with SNCF on the rail freight market. Aside SNCF, 8 other companies have a French license, being Veolia Cargo, Rail4Chem, Euro Cargo Rail, B-Cargo, CFL Cargo, Colas Rail, Europorte 2 and VFLI (a 100% private subsidiary of SNCF Group). Fret SNCF is following the integration example of German competitor DB Schenker. SNCF is investing in rail operations as well as in logistics side activities. Beginning September 2009, SCNF acquired the non-French activities of Veolia Cargo. The French activities were bought by Europorte 2, being groupe Eurotunnel. When writing this paper, this transaction is still to be approved by the European Commission. SNCF Fret, and SNCF Group both are loss-making. The first semester, a loss 2009 of 496 million EUR was made. (Dablanc, 2009a; Massy-Beresford, 2009)

The supply chain in detail

As briefly discussed above. Monoprix uses a rail link in the modern supply chain. The first train was loaded on the 28th of November 2007. The warehouse located in Combs-la-

Ville/Lieusaint, 40 kms out of Paris' city centre, is supplied by truck or rail. In this logistics centre, pallets are prepared for the shops located downtown, Paris between 6h00 and 16h00. The rail track siding the warehouse allows direct transshipment to the rail wagons. These are charged between 13h00 and 18h30. The train leaves every weekday at 20h00; and arrives one hour later at the city-located warehouse (Bercy). The transshipment is made to gas-powered trucks. The day after, the trucks deliver 90 Paris located shops in minimum two rounds. A minority is supplied in the weekend. As the volume is not big enough, this is still done by truck.

Figure 4 : Concept Monoprix



Source : Own adaptation of Google maps

RESULTS

The results of Monoprix are promising. By 12,000 trucks not entering Paris city centre, 70,000 liters of fuel have been saved which results in a decline of 340,000 tonnes of CO₂ and 25 tonnes of NO_x. (Validated by ADEME and supervised by consultants of Lyon

Interface Transport) The most problematic issues concerning freight traffic in the Paris region, more specifically Paris intra-muros, are dealt with. (Samson, 2009; Monoprix, 2007) First, a reduction in vehicle-kilometers is obtained. This lowers traffic congestion problems on the road network surrounding Paris. Secondly, this concept lowers greenhouse gas emissions drastically. As stated above, a significant decrease of CO₂ and NO_x emissions is a fact. Thirdly, the last mile issue is dealt with as the last part of the supply chain is rethought. The trucks involved in the Paris last mile traffic are, on top of the liquid gas powered engines, equipped by noise reduction measures. Automatic gearboxes were chosen. Trucks are, according to Paris's limitations, less than 29 m² on ground. This limitation has a positive impact on safety issues and turning circle problems in the narrow streets of the historical centre. On the other hand, one must take in to account that smaller vehicles create a need for more roundtrips.

The results show a clear profit for society. Noise, emissions and congestion are pushed back. Looking at the Monoprix case, questions can be asked about the internal costs of the project. Is logistics profiting from these results? An interview was organized with Claude Samson, Monoprix subsidiary company Samada logistics CEO.

From a company point of view, positive implications can be recognized. In the past, when the supply chain was mainly focused on road transport, congestion had a major impact on scheduling truck rides. Time was lost, efficiency went down, costs rose. This concept, now in use for 30% of Monoprix Paris supply chain, has positive impacts on this issue. In contrast to SNCF Fret's reputation, in almost two years time, no train was delayed. Even in periods of rail strikes, the daily train left on time. This can be almost totally being attributed to SNCF's operational organization. SNCF's subsidiary VFLI is responsible for the Monoprix train. VFLI, a 100% subsidiary of SNCF works by different private sector contracts. This resulted in a more flexible, customer-oriented and price-competitive company. As these issues were critical for Monoprix to set up a rail connection, SNCF was chosen as operator. Concerning rail freight wagons, a special compromise was made. 25 wagons were awarded to the Monoprix group by the SNCF group. As such, capacity problems will not arise. As a last step, very progressive for an incumbent, penalties were written in the contract. If quality problems arise, compensations can be asked. (Samson, 2009; Peignard, 2007b; Rencontres de l'éco mobilité, 2009)

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As given by table 3, when only looking to the logistics cost per pallet, the supply chain involving rail is slightly more expensive. The rail part is increasing the total cost from 13.25 eur per pallet to 17.61 eur per pallet. Samson (2009) indicated that Samada and Monoprix see this cost increase as a rather short term disadvantage. Looking at the future, taking in to account variables as fuel prices and road pricing the balance can change quite fast. Recently, the French law concerning «éco-redevance sur les poids lourds» (Road Pricing for heavy loaded trucks) was adopted. A fixed price or date was not agreed. But according to this French regulation, starting from 2011, road pricing can be implemented. France is now charging a third of all freight vehicle kilometers, however an increase of 30% of charged vehicle kilometers is expected. (Samson, 2009; Peyrache, 2008)

Table 3 : Comparison of 100% road supply chain and new concept involving rail

	EUR	EUR/pallet
SNCF traction	1 770 000	8,43
Warehouse Bercy	459 000	2,19
Total SNCF	2 229 000	10,61
Distribution city centre	1 470 000	7,00
Total RAIL	3 699 000	17,61
100 % ROAD	2 782 500	13,25

Source : Samson, C., (2009), Interview with Claude Samson by Jochen Maes and Thierry Vanelslander, ceo Samada, 25th of August, 4 Rue du Courson, 94320 THIAIS

Looking at the positive effects, the trail phase is now over. Monoprix uses the supply chain on a daily basis. An increase of the use of non-road modes is expected. As far as the rail connection between Combs-la-Ville/Lieusaint and Bercy is concerned, Samson (2009) even regrets to have chosen the smallest part of the Bercy located warehouse. Monoprix/Samada chose to rent 3700 m² of the 10 000 m² warehouse, which is now proven to be rather small. The transshipment quay can be used for the full 200m length, as the company occupying the other part is not using rail transport. (Samson, 2009; Naaman, 2009; Rencontres de l'eco mobilité, 2009)

TO CONCLUDE

To conclude, the concept of a smart logistics supply chain, used in the first part of this paper, was expanded in this paper. Since the Monoprix case proves to deliver positive results, the use of rail transport for city distribution purposes should be possible. Nevertheless, the context is of large importance. The current supply chains, now dominated by road transport, will have to be rethought and reorganized.

As discussed above, positive results coming out of the Monoprix test case highlight the most important variables why setting up a rail connection can work. From a society point of view, a reduction in vehicle kilometers can limit road congestion. The road network surrounding Paris is congested, and this concept is one of the solutions. Secondly, by lowering the greenhouse gas emissions, the supply chain is more sustainable. Also noise is taken into account as an emission, which can increase the attractiveness of the city centers. From a logistics company point of view, these reductions in emissions and congestion can lean the supply chain. Planning deliveries becomes more easy and efficient. As the diesel prices are likely to increase, the cost of transport per pallet will go up, if road transport will not be decreased. The current cost-benefit balance for Monoprix is negative, expressed in Euros. But the increasing supply chain efficiency should be taken into account. Keeping in mind a possible road charging scheme in France (and Europe), increasing limitations to urban logistics, increasing fuel prices and increasing road congestion the concept can be profitable in the nearby future. Monoprix in this case is counting on the first mover advantage. By taking a leap to competitors, knowledge is created and set up problems are resolved.

In Europe, rail transport is hardly used in supply chains nowadays. The mode share of rail transport in Europe declined the last decades to less than 15%. The authors think that the results of this project, highlighting best practices, can change the thinking pattern of supply chain executives. In a European context, rail transport can be a solution to current road transport problems. In theory, this is proved. However, awareness of practical and organizational problems in the railway sector exists.

Further research is possible. As highlighted shortly, Procter and Gamble is using rail transport as a part of the supply chain. A reasonable amount of emissions was declined. Further research can look at the broader context of shipping goods by rail. A link between the Procter and Gamble supply chain, using rail, and the Monoprix warehouses (connected to

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the rail network) can be made. As such, the increase in road congestion can be limited and sustainability of the total supply chain can be increased. Also quantifying this first introduction of rail freight in an urban logistics context is worthwhile considering.

As last, a comparison of American or Canadian short-lines and European short-distance rail transport can be made. Best practices of cooperation between shortlines and long distance operators are likely to be an example for European market organization problems.

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NOTES

- 1 ADEME is the French Environment and Energy Management Agency.
- 2 EURO (European emission standards) define the acceptable limits for exhaust emissions of new vehicles sold in EU member states.