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The use of bicycle messengers in the logistics chain, concepts further revised

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Abstract

The paper deals with the use of bicycle messengers, also called bike couriers, in the modern logistics chain. In an era where almost every actor - from policy makers to senior managers - is thinking about the environment and sustainability, new innovative concepts are developed worldwide. On the other hand, an abundance of solutions to improve efficiency and overall sustainability of logistics and other related business activities are already available in the market. Reinventing the wheel all over again might not be necessary. One of the methods to deliver parcels in a more sustainable way, is the transport of freight by bike. People on bike deliver and transport post, parcels or freight with a low volume or weight. Bike couriers are proven to be fast and reliable within congested urban areas. These bikers mainly advertised their ability to go fast from one place to another in a city. Sustainability was a selling argument, but speed was of more importance. Also, in Europe some bike courier markets are reasonably well developed. Specific markets seem to exist for transport of freight by bike.

The research question of this paper concerning bicycle messengers is whether these companies can be an economic viable alternative for fossil fuel powered transport, and if so, in what markets these opportunities can be found. The authors draw conclusions about the business model and integrate encountered weaknesses and opportunities. An operational cost calculation is included. A simulation of a round trip delivery scheme in an urban area took place. A van as well as a bike courier solution was compared. To draw some conclusions about the economic feasibility of the round trip by bike courier, the cost per stop is compared and will be discussed.

The paper ends with a conclusion on the observations made, and with a number of recommendations.

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1. Introduction

Bicycle messengers - also known as bike couriers or cycle couriers - are picking up and delivering items by bicycle. These companies are most often found in the central business districts of metropolitan areas. Very likely, they work on a small scale, collecting packages and distribute them quickly throughout the city. The market exists, because of the advantages biking has in urban areas. Compared to, as can be called the conventional van- or truck transport, bikes do suffer less from road congestion problems. It can even be stated that the more urban areas face congestion, the more these have an advantage. Delivery times are to be shorter. Reliability can be offered as bike couriers, compared to the conventional transport, need a more stable period of time to do a certain trajectory which is regardless weather conditions, traffic jams, peak or off-peak times, strikes in public transport similar all year round.

Nowadays bike couriers are observed as transport companies delivering packages, letters, contracts, etc. Shippers are among others advertising agencies, law firms, administrations, etc., which create a time pressure to deliver fast. However, other products are transported by bike too. The distribution of lunches for instance is seen as a common practice.

This paper is looking at bike couriers from the viewpoint of logistics. As indicated, they are seen as transport companies of smaller packages and mail, mainly from A to B in one city centre. It has to be analysed whether bike messengers can be part of a broader logistics network, where transport from one part of the city to another part is a relatively small section. In terms of distance, this first- and last mile stretch is representing a smaller share of the mileage logistics companies are doing, but it is not necessarily neglectable as in terms of costs this first- and last mile is significantly important. Logistics networks are operating on a national, European and in most cases on a worldwide scale. Maybe the bike messengers' with their local focus are seriously in conflict with the modern logistics organisations whilst on the other hand they can become an important local partner for the very big logistics companies

As vans are polluting urban areas and furthermore losing an enormous amount of time and money in congested areas, the issue of the last mile is gaining importance. As such, a shared incentive for privately operating companies and governments (at a national and certainly at local level) can be seen to stimulate alternative transport concepts, ideas of city depots, the use of inland waterways to deliver in city centres, electrically-powered vehicles, shifting to night transport etc. are getting increasing attention. Local governments want to decrease the number of vans and trucks running around in city centres. [1][2]

According to Gevaers et al. (2009) [3], the last mile is, due to its very specific delivery needs, considered as the most expensive part of the supply chain. The last mile, described as the last stretch of a parcel delivery to the final consignee who has to take reception of the goods at home or at a cluster / collection point or at the office, accounts depending on several characteristics, for 13% up to 75% of the total supply chain costs. Related to these high costs are the many inefficiencies in the last mile and the poor environmental performance [3]. What is important in the parcel logistics is, besides the last mile, as well the first mile. Companies do pick up parcels and envelopes at mainly offices. The first mile is seen as the link between the senders location and the place where the shipment enters the logistics network (can be a depot or hub for example). Efficiency gains are possible.

The research question in this paper concerning bicycle messengers is whether these companies can be a viable alternative for fossil fuel powered transport. Economically viable is here interpreted as a full cost per stop when operating routes in an urban area.

To be able to answer this question, a literature review was held. Secondly, Belgian market players were listed. A market study was done. First contacts were made among others with the Belgian bike messenger company Pedal BXL. Subsequently, a meeting with a start-up player named Lunchbutler.be took place. This company will be elaborating a logistics (IT) platform to connect bike couriers and their customers much easier. As a result of both contacts, an open questionnaire was prepared and sent to all

bike couriers active in the region of Flanders and Brussels. (Flanders is a Region in Belgium, and Brussels is the capital). The answers are incorporated in this paper. A round table was organized, implying a representative sample of Flemish and Brussels bike couriers. All bike couriers were invited, of which seven showed up. The results of the questionnaire were used to structure the meeting. Discussions with integrators took place. As last, a cost simulation was made.

As only a limited number of academic papers are available about the specific use of bike messengers in the logistics chain, the focus will be on empirics. Here, in the first section a historical overview is given. Next, an analysis is made of the Flemish and Brussels bike courier market, which in fact is exemplary for quite some European cities. The last section deals with the potential for integration of bike messengers into logistics chains. The focus is on the Belgian context. An operational cost simulation was made.

2. Bike courier services: Positioning the concept

The concept of bike couriers is not new, illustrated by Fig. 1, showing an advertisement by the Cycle Trades of America delivery work dating from the 1920's. In contrast to the current situation, the focus was on speed; sustainability was less an issue at that time. Fig. 2 on the other hand shows the possibly oldest bike based logistics system in the world. Since 1890 Mumbai (India) knows an efficient system to distribute food. Every day, more than 175,000 lunchboxes are transported by 4,500 to 5,000 'Dabbawalas', the couriers. In 2002 Forbes magazine wrote that the reliability of the services is that high that it complies with the six-sigma norm[†][4][5][6].

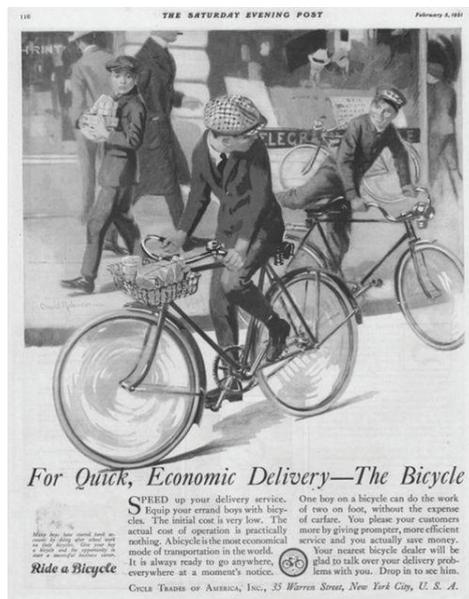


Fig. 1. For quick, economic delivery – The Bicycle



Fig. 2. Dabbawalas in Mumbai

[†] Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defects (errors) and minimizing variability in manufacturing and business processes. It uses a set of quality management methods. [7]

Data on bike courier use in Belgium do not exist yet. However bike use data for Belgian commuter traffic is available. Compared to other EU countries, the Netherlands in particular, Belgium has no culture of using the bike for commuting purposes. The car takes up 68% of work-related trips in Belgium. [8] 30% of the trips of less than 3 km are done by car. Nevertheless, bike use has increased from 6.2 % in 2001 to 8.2% in 2008, however originating entirely from less walking and less public transport use. A comparison: in the Netherlands, biking is responsible for 25% of the work-related trips. In cities, the bike accounts for 27% of the trips by commuters. Although Belgium/Flanders, is well-known for organizing professional cycling races, this seems to have little influence on people to use bikes for work. Maybe, this indicated that decision makers do not see bike couriers as a viable alternative to vans or trucks. [9][10] [11][8]

According to research by fietsdiensten.nl, a bike courier in the Netherlands yearly cycles 10 to 12,000 kilometres and is for 90% active in dense urban areas. Delivered goods are mostly parcels, but fast moving consumer goods gain importance. The weight per parcel - in the Netherlands - is on average 20 to 30 kg. A calculation of total energy use by Dutch vans, later on compared with bikes, was made. In the year 2000, the total use of fuel by vans amounted to 17,000 million litres. A total of 20 billion kilometres was driven. [12][13]

Table 1. Possible emission savings by introducing bicycle messengers in the Netherlands

	Fuel savings (litres)	CO2 reduction (tonnes)
Actual Nijmegen	3100	7,8
Nijmegen Optimal*	85.000	213
The Netherlands Optimal*	8.500.000	21.000

* Calculating with 10% of modal share by bike couriers

When calculating with a 10% mode share for bike couriers, the study calculated a shift of 1 million kilometres per year would be achievable. Calculating with average fuel consumptions, a yearly saving of 85,000 litres would be possible. Less fuel consumption leads to less CO₂ emissions. In this study, a litre of petrol was estimated to emit 2.4 kg of CO₂ per litre and 2.6 kg CO₂ per litre for diesel fuel. LPG was estimated to emit 1.6 kg CO₂ per litre. [14] These assumptions show a possible increase of bike courier related jobs to 10,000 for the Netherlands. [13]

3. The Flemish and Brussels market for bike courier services

At first, a literature review and (internet) search on the Belgian bike courier market and related topics took place. In a second step, a list of Belgian bike courier companies was compiled. These companies, working in Belgium as independent bike couriers or being employed for a logistics company as a bike courier, were contacted. To gain insight into the relatively unknown product of biking messengers, a short questionnaire was sent. Subsequently, a round table discussion was organized to develop some more in-depth knowledge about the Flemish and Brussels market for these services. Weaknesses and opportunities were listed. The next paragraphs deepen out the empirical results achieved during the different research steps. Logistics concepts were distilled, incorporating the knowledge achieved by the first research steps.

3.1. Employment

A look at the number of bike courier companies active in Belgium shows that the supply side of the market is very small. At the time of the research 14 companies were identified, several of which are one-person firms. Three work in the framework of a larger logistics company, two are part of a non-profit organization and the other ones are small independent companies. A considerable amount of firms has just recently started.

Although employment is far from enormous, bike couriers indicated to easily find employees. This at least is not a hurdle to develop. The reason why a limited number of bike couriers are employed can be found in the fact that companies cannot employ for a longer period as market demand is not stable. Belgian taxes on labour are as well burden to employ new couriers, as one needs a big and stable volume of deliveries to make it profitable. On the other hand, bike couriers have a physically tough job which is causing people to quit the job easier. But as stated, replacement can easily be found.

3.2. Organization

The individual answers indicated that the market organization as well as the organization of the individual companies leaves room for considerable professionalization. But, as most bikers are employed in small companies of max three people in total, and are not connected to the national nor international logistics network, professionalization is hard to achieve.

At the round table, some stressed that being part of the logistics network is the main goal. In contrast, other started with an idealistic viewpoint; whereas others really see it as a business opportunity. The latter ones do efforts to get in contact with logistics players.

In the past, contacts were made between some bike couriers and logistics companies. Often, no interest was shown to co-operate with a small bike courier company. Bike couriers on the contrary are interested in co-operation, but tariffs should be reasonable. These were below their cost level so negotiations ended quickly. Most couriers work independently. Ecopostale is the only having an intense relation with a logistics player. [15][16][17][18]

The majority organizes the tasks (making phone calls, route choice, contacting possible new clients etc.) from the bike itself. The administrative part, mainly invoicing, is done after the working hours. Although companies are small, some express a will to invest in innovative technologies to make everyday work more efficient. First on the list of tools is track-and-trace technology and routing devices. [9][19]

Regarding investments in rolling stock most indicated to further invest in bikes. Some invest in new light-weight cargo bikes that can carry up to 250kg without losing the advantages of biking in the city. Ecopostale uses Cyclocargo, a French cargo bicycle. The company is as well investing in an electric vehicle.

To conclude, one can distinguish two kinds of players. First, there are idealistic bikers offering back-pack services, doing limited volumes. And second there are companies having bigger volumes. These are mainly using cargo cycles. In the city of Brussels, one start-up company is worthwhile to highlight. The logistics company Ecopostale is active since 2010 and is increasing volumes at a rapid pace. The company has a close cooperation with the express operator TNT. The company outsources the shipments for the central zone of the city to Ecopostale. 200 stops per day are reached. Two-third is TNT related, the rest are own volumes. The company uses bicycles, Cargocycles and is considering electric vehicles as well.

3.3. Integration into the logistics network

The individual companies highlighted that bike couriers are hardly connected to the global network. Most operate on a small regional or city scale and pick-up and delivery are limited to one city. One is operating at an international scale but has 89% of its volume at a city level. 10% of packages are sent nationally, only one per cent is international in nature.

The answer to the question whether Flemish and Brussels’ bike couriers are cooperating in the operations of internationally organized integrators like DHL, FedEx, TNT, etc. is negative. Although some hand over packages to have them dispatched internationally, except for the case of Ecopostale real co-operation does not feature. The bike messenger thus is one of the many daily customers. Also the awareness among possible customers, and the general public, about the product ‘bike delivery’ seems to be very low.

3.4. Products offered

As almost all Belgian bike couriers work on a city scale, and price structures are quite similar. Differentiation is mostly made on three characteristics of the shipment: speed, distance and weight.

Most shipments are A to B. Round trips hardly occur. Prices are available depending on delivery speed and volume. Some couriers also offer companies to collect mail and to bring these to the post office. These services do not belong to their core business. Differentiation exists on speed and distance and on the basis of geographical zones. Limitations on package size occur. Having more to cope with increasing volumes instead of increasing weight, for example Pedal BXL for example bought a cargo bike able to carry up to 250 kg.

Last mile deliveries can theoretically be divided in different markets, as shown in Fig. 3. The lowest part of the pyramid is the *mass market*. These markets consist of letters and small parcels delivered by big nationalised companies: known as postal services. Volumes are big, and recurring, the preference for fast delivery and willingness to pay is rather low. The intermediate market is having a bigger time pressure, an average willingness to pay and extra requirements are asked by the customers. So are track-and-trace options standard. A higher security and reliability is asked. Bigger parcels and envelopes are the main shipments.

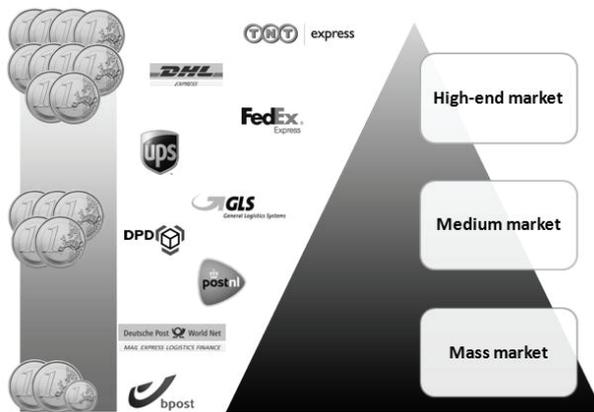


Fig. 3. High end , medium and mass market

The *high-end market* is characterised by a high time pressure, bigger willingness to pay and strict customer requirements. Shipments are fast, reliable and relatively expensive. A global network is needed. The current bicycle messenger services in Belgium are working in the high-end market with tariffs and services of the mass till medium market. A speed and reliability is offered. On the other hand track-and-trace technology, a high security and an international network is lacking. Prices are relatively low. A match between these worlds is possible, as shown by Ecopostale, efforts are necessary [20][17].

3.5. Innovations

The usefulness of handhelds, track and trace, routing, etc. was mentioned to be high if volumes would go up. In the end, making all contacts by phone makes the work inefficient. When volumes go up, the chance of making mistakes goes up equally. Interest in electric scooters or electric vans was expressed by one but got criticized by others. Batteries used to power the vehicles would not be environmentally friendly.

Proposed was for example a logo to stress sustainability to convince companies to use non-petrol powered transport in an urban context. This could prove useful in communication with customers. Ecopostale shows on invoices the emission difference between bike transport and fuel-powered transport. Frequent Ecopostale customers can register on the website to see their avoided emissions.

3.6. Market growth

One conclusion that can definitely be made is that the Belgian market for these services is very small. A turnover figure roughly calculated would be 550,000 Euro (Average estimation for the active companies, employing roughly 14 FTE bike couriers delivering on average 15 to 20 packages a day at an average price of 10 Euro. Estimates are multiplied by 225 working days). Maybe, some addition should be made for the round trips that are made for one customer. These may add a small amount to the turnover, but not a lot. If then this is compared to the overall courier market in Belgium, the numbers are negligible. 4,200 companies are active in the courier business adding up to a total turnover of roughly 1 billion Euro a year [21].

According to the bike couriers themselves, their product is hardly known in Belgium. A lot of possible clients, certainly at senior levels, could be convinced of the efficiency of the product. An awareness campaign might be necessary. Growth is possible as the product offered has considerable advantages.

4. How to integrate bike couriers in the logistics network?

After identifying the market structure, the link is made towards other logistics companies. Is an integration of the services with for example globally active integrators viable? Some interesting insights were gained at a round table discussion. A growth in volume at an affordable rate can be a step towards the real professionalization of services. For bike couriers, extra volumes add up to the income without increasing operational costs considerably. This can be seen in the cost calculation.

Why to integrate the bike services in the logistics network. *First*, bike couriers are very fast in an urban environment. A sustainable fast city logistics alternative is offered. In historical city centres, characterizing Flemish cities, road congestion is increasing. According to [22] Belgian roads are severely congested. The Flemish traffic centre estimates lost hours a year to be between 9 and 10 million. The total cost accounts to 250 million euro. In Brussels, 8,9% of the hours on the road are lost hours due to congestion. In Antwerp, this is estimated at 4,5%, in contrast to the 1,1% for the rest of Flanders. The number of lost hours in car traffic is hence increasing too. [9][23][22] Congestion on a city scale is

difficult to evaluate. New technologies offer possibilities. So is the satellite navigation provider TomTom ranking European cities on congestion, based on anonym data from European TomTom users. Congestion is determined by drivers on a road driving less than 70% of the maximum speed allowed. Belgium's capital, Brussels is the most congested city in Europe. Second comes Warsaw and Wrowlaw. [24]

A *second* reason to use bike couriers is lying in the liveability of cities. Bikes cause fewer conflicts on the limited public space. In this regard a number of influencing factors, besides congestion, are worthwhile mentioning. The city is a natural place for conflicts, so is. city logistics. Inhabitants have other needs and interests than commuters and inner-city companies, retailers or offices. The logistics is influenced by five different variables: environmental, functional, economic, urban and social characteristics. City centres need to be dynamic and need to cope with a changing retail model and logistics environment. Actors need to co-operate to make a city a liveable environment. The transport company, the shipper and the local inhabitants should be involved. [25]

Cities are ranked on reputable annual surveys of living conditions like the Mercer Quality of Living Survey and The Economist's World's Most Liveable Cities. Brussels was the only Belgian city on the list. In 2010, Vienna was ranked first, Zurich 2nd. Brussels ranked 15th. But for underlying factors, like the Eco-City ranking (including: water availability and drinkability, waste removal, sewage, air pollution and congestion) Brussels is only at place 41. Efforts are necessary. [26]

Anyhow, cities and freight transport need to live together. Different strategies and policies to increase viability of cities can be implied to freight transport. For example cities try to increase bundling of flows. Other policies recently try to organize concepts where freight vehicles stop at the outskirts of the city to load goods on to environmentally less damaging vehicles. These can combine flows and do their milk round in the city. Three ideas on how to integrate bike couriers in the logistics network were looked at.

4.1. *Bike couriers operating in the city*

Couriers can transport a variety of items, from things that could not be sent by digital means to things that could easily be emailed or sent without the air of importance attached to an express courier delivery. Technological innovation would significantly reduce the demand for same-day parcel delivery. It was first said when introducing the fax machine that bike couriers would become useless. The same thing happened when e-mailing became popular. Each time bike couriers found new markets.

After the round table, the authors concluded that bike couriers in Belgium mostly perform A-to-B trips in the administrative sphere: legal industry, advertising companies, hospitals and doctors. Furthermore, sandwich bars and flower shops choose bike couriers for delivering lunches or flowers in an environmentally friendly way. The image of young and healthy men offering sustainable deliveries does help as a 'unique selling point'.

With increasing daily volumes, reorganization to a *city hub-and-spoke network* might be necessary. A number of bikers, belonging to one company employing several bikers, could then be assigned a part of the city. Bikers are not active in the entire city, they need a small storage location where packages can be swapped. A shop, or chain of shops, can for example offer a temporary storage space. Now, this swap is sometimes done on street corners. One biker calls the other one to meet at a certain place at a certain time. Most flows are unstructured as bike couriers work on a call basis. Tools (electronic invoicing, track and trace, etc.) are advisable.

4.2. City hubs

Sometimes, cities and/or private parties go further with policy initiatives regarding urban freight transport and invest in city hubs. Warehouses are built at the city outskirts. Transshipment takes place. Furthermore, these can offer added logistics such as labelling, repacking or cross docking. Reverse logistics is taken into account. Binnenstadsservice.nl has developed several branches. As an entire separate research stream is developed on these projects, further details will not be discussed here. On this subject [27] is worthwhile consulting.

From the city depot, a fully loaded truck can leave to the inner city, limiting the number of moves in the city, as well as the related pollution. The concept of bike couriers fits here as well, drawn in Fig. 4. Bike couriers are able to take the smaller packages, meeting the characteristics (small, low weight, time pressure) and distribute them as little ants in the city towards the final destination.

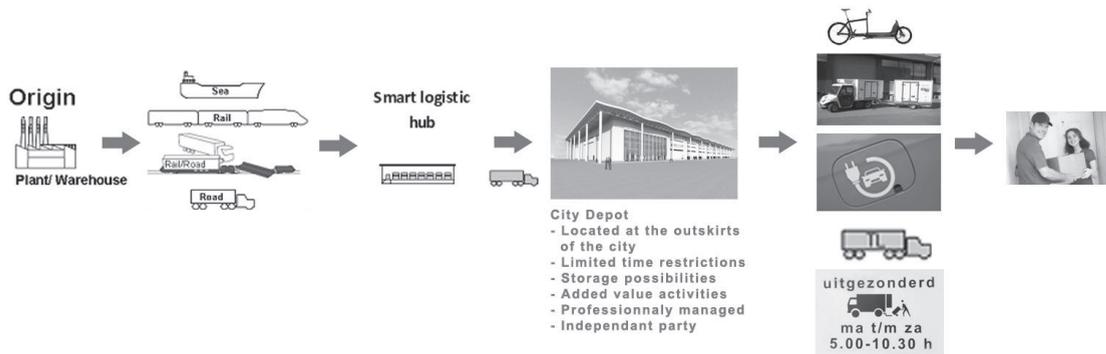


Fig. 4. The logistics chain using a city depot solution

This idea will be supported by local governments as it is lowering vehicle movements and emissions (CO₂, PM and noise) in the urban area, which is resulting in a more liveable city. This support is sometimes expressed in an (initial) investment. When restrictions as delivery time windows apply, exceptions can be given to less polluting vehicles. Bike couriers can play a role in this concept as they are less restricted by limitations, an advantage for the bikers as well as the receivers [28].

4.3. Future concepts and innovations

The future market for A-to-B transport is to be created step by step. A focus on certain sectors is necessary. The future markets were distilled from the round table conclusions and were discussed with the stakeholders. One can distinguish two markets: the A-B market on a local scale, and the round trip market on a city scale. This second market is a niche within the bigger logistics network, where bicycles do the first and/or last mile.

- Administration: The promising administrative freight flows most often consist of letters and small parcels under time pressure. Although letters are sent by post and a digitalization of information flows is to be expected.
- Advertisement sector: An important sector, certainly in the Brussels region, is the advertisement sector. Companies see bike couriers as a fast and reliable service for sending very urgent packages. The sustainable and sportive image helps.

- Medical sector: Doctors, pharmacists and bike couriers could be working together to collect prescriptions from and deliver to of elderly people. The flows are matching important characteristics: parcels are small, delivery speed is of high importance and the value is high which means that the tariff of the courier is a small percentage of the total sales price. More and more pharmacists sell prescription-free medicines online, easily to deliver at home or work by a bike courier.
- Lunches: A growing sector for bike couriers is the delivery of lunches. The idea of the website Lunchbutler.be is a result of this trend. Consumers can order online a lunch at the website. The lunch is delivered by the bike courier, a fast and reliable alternative to sandwich bars delivering by van. The sustainable characteristics can be of large importance to market the services.
- Flowers: A last and promising sector is the delivery of flowers. These shops can send flowers by bike couriers as a present. The image helps to increase the experience.

The newly to be established links with for example integrators can be developed in different ways. A conceptual overview of strategies will be defined. Each individual strategy can be responsible for a part of/or the total volume:

- Only difficult locations are outsourced. A first step that can be taken is to integrate bike couriers. Locations that can be reached rather easily by motorised transport, only with great difficulties can be handed over to the bike transport. Here, one can think of zones in the urban area where traffic congestion arises more than on average. Also zones where no parking space is available are interesting to consider. Savings are possible, on parking fines, fuel and time;
- A part of the volume with destination central business district is sorted out for the bike courier. The bike courier can be responsible for the pick-up as well as the deliveries. Possible if integrators adapt the sorting system;
- Only the time-sensitive deliveries are outsourced to bike couriers. The deliveries are certainly time-sensitive. The hours where deliveries take place are conflicting with the peak periods on the road network. The advantage of bike couriers can be maximized. After the deliveries, the bikers can focus further on A-to-B transport;
- A last option for integrating bike couriers is green transport marketing. In several ways, integrators and other logistics companies offer an optional surcharge for green transport. Either the company invests the surcharge paid by the customer in compensation systems, and/or the integrator really delivers in a more sustainable way. The latter can be not using air transport, using electric vehicles or transporting with a bike courier. Here, bike transport can play a role.

4.4. Limitations by policies

Different strategies can be identified. An overall policy goal in Belgian cities can be categorized as limiting the free circulation of private motorized transport. As well the European white paper sets this goal stricter. By 2050 no diesel or petrol powered vehicles will be allowed in city centres. [29] This is affecting passenger flows, but the focus is in most cases on freight vehicles. Here, we focus on possible effects on the bike couriers markets. Dablanc (2009) [30] indicates the awareness of local governments on freight circulation policies but states that most of them don't know how to implement them. Conclusion is that the policies are scarce and/or out of date.

In short, cities are limiting vehicle access for certain streets or zones in following ways.

- Limitations can be based on weight and can be combined with time slots. These are called time windows where cities allow vehicles to enter the defined areas or streets. This is definitely affecting bike couriers as they are not influenced by the measure. The bikers are not only gaining delivery speed, but can pick up and deliver all day long. Although these measures are implemented, one should take

into account that limiting the free circulation of vehicles can have a negative effect on load factors, as optimizing routes will be hindered. A second comment: to reach the policy goals, zones should be implemented and enforced without an abundance of exemptions.

- Limitations are also imposed on environmental characteristics. In this line, certain polluting vehicles are banned from streets, zones or entire cities. Mostly, limitations are based on the Euro type of the vehicle. For electric, hybrid and other low emission vehicles, exemptions are given. Bike couriers are not influenced by the limitations and are competing with motorized couriers;
- Another measure widely taken is limiting the traffic by a toll system. A toll system like among others the city of London implemented with the congestion charge is not implemented yet in Belgium. If a charge would be levied, the fossil-powered vehicles will be affected, increasing the competitiveness of bike couriers.

5. Cost simulation

To be able to draw some conclusions about the economic and environmental sustainability of a bike courier delivery scheme, a simulation was made. By simulating the operational costs of van vs bike, the authors set the first step in researching the economics behind bike couriers.

The framework that was worked in is as follows. The van as well as the bike solution pick up and deliver parcels in an urban area. The starting point of the calculation is from the depot. The authors assume that for a route in the urban area, the costs for the depot are comparable. The case is : a logistics operator that decides to outsource the last-mile delivery to a company, shown in Fig. 5. As was concluded by discussions with logistics operators in Belgium, this is a realistic starting point. As far as last mile deliveries of integrators in Belgium are concerned, the majority of routes is outsourced. The biggest part of outsourced activities goes to SME’s operating a limited number of vans and/or trucks. For the simulations, obviously, a different capacity is set for the van and the bike. For the bike a simulation is made with a Cyclocargo. This type of cargo bike is in use in a Belgian case and is able to carry a limited volume or a max payload of 250kg.

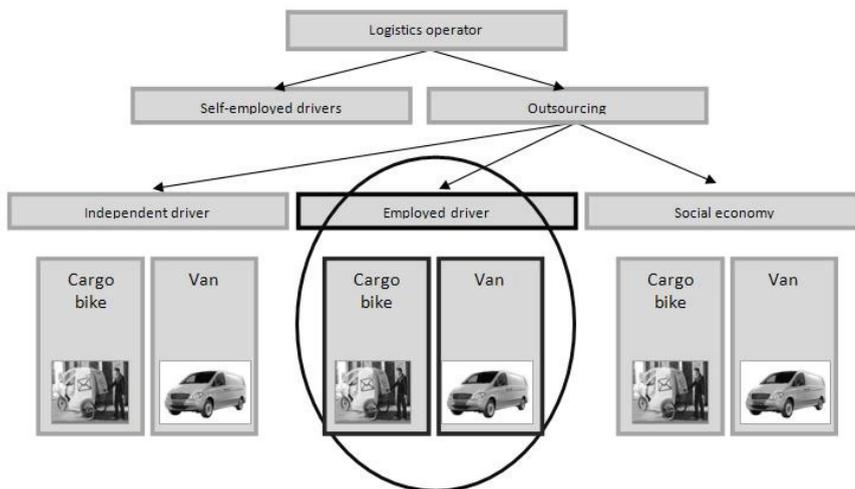


Fig. 5. Setting of the simulation

Belgian social and fiscal laws are considered. For the rolling material, leasing is used. The outsourced company employs people under normal Belgian fiscal regime (PC 140.03). For the van simulation, a fully leased standard van is used. For the actual routing, some extra hypotheses are made. The authors It is assumed that regarding service criteria, outsourcing the delivery of parcels is not making any difference compared to the fully owned van drivers. As outsourcing of these activities is mostly done to small van operating companies, small cargo bike operators are considered to be able to deliver the same service.

Taking into account the cost variables, a graph can be made of the cost per stop on a route. The capacity for a bike courier is set arbitrarily lower than the van capacity. To be able to handle a certain amount of parcels, taking into account the restrictions on volume and weight, drivers were added. The cost per stop is fluctuating when operating low volumes. Higher volumes lead to an estimated average cost per stop of around 4.5 Euro, comparable for bike as well as van transport. This cost simulation exercise was discussed with relevant stakeholders and was approved to be realistic. More important than the actual cost, which is indicative, is the cost by higher volumes and the influence future developments will have on this cost shown on the Y-axis in Fig. 6.

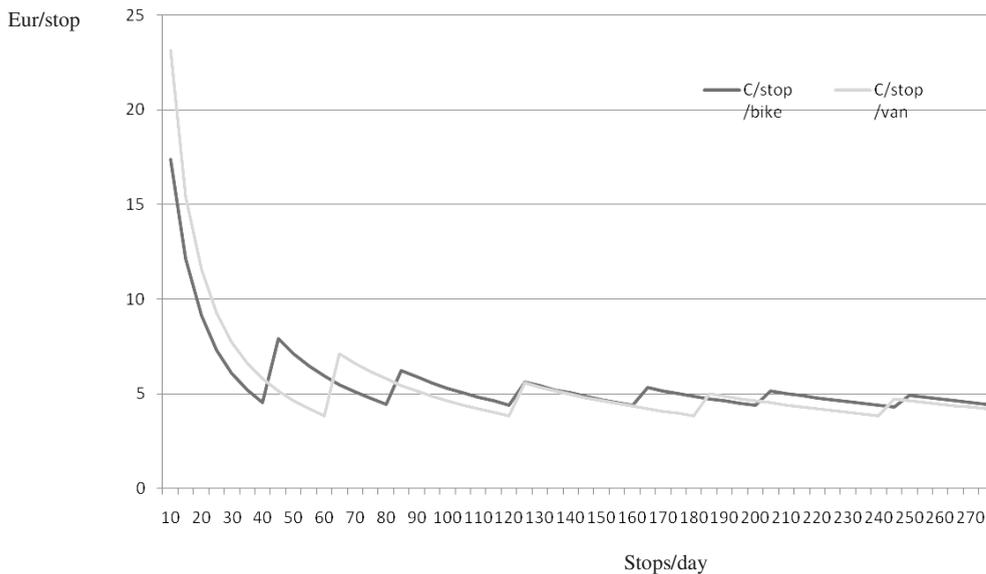


Fig. 6. Cost simulation results

On the X-axis, the number of total pick-up and delivery stops per round trip is shown. What was not taken into account is the routing problem from depot to city. A new problem is created if the depot location is far from the city centre. The cargo bike will be slower compared to the van that is able to use highways. Also the capacity of a van is bigger, and is as such less influenced by the depot location. A solution could be to have the depot in the city outskirts. As Dablanc (2007) [30] concluded, a city is a complex costly and constrained place that is only used for loading and unloading. Freight has no location in the city, as other location factors are more important.

One can conclude that a van can be replaced by two bikers. An increase of employment is seen, with no cost increase per parcel. The emissions saved can roughly be calculated as saving 6 ton of CO₂ per

avoided van on a yearly basis. Not enormous, but relevant as the emissions take place in an already congested densely built area where people are more vulnerable for emissions.

6. Conclusion

The paper focused on the question whether bicycle couriers can be a viable alternative for fossil-powered transport. The markets where these companies can play a role were looked after.

First, the advantages and weaknesses of bicycle couriers were listed. The companies can deliver reliable and fast services at a reasonable price. These can play a role in urban transport, although being limited to a certain region or city. Bicycle messengers can help countries to meet the CO₂ emission requirements, albeit not being a miraculous solution. A Dutch study estimated the possible fuel savings for the Netherlands to 8,500,000 litres, meaning 21,000 tonnes of CO₂. [13]

Secondly, it turns out that the employment possibilities, at least in the short run, seem to be limited. Most companies are small one or two-person firms. Links with logistics companies are rare. The organization of the market leaves room for optimisation. Companies highlighted that bike couriers are hardly connected to the global network. Most products offered are on a same-day delivery principle. The focus is regional or local. Weight and volume restrictions are possible, though some invest in cargo bikes. The usefulness of handhelds, track and trace, routing, etc. was mentioned to be high if volumes would go up. Two markets were seen, the A-B and the round trips. Two kind of players exist in Belgium : the backpack cyclists and the logistics players with cargo cycles.

Some policy initiatives could help stimulate the bike courier market. The implementation of an awareness campaign might be a policy initiative to boost the market volume. A logo stressing sustainability can be an option to convince companies to use non-petrol powered transport for the urban transport. Lowering the VAT on services is believed not to make a big difference as customers are most often companies. But if the focus is broadened, to the Business to Consumer market, this might be worthwhile considering.

After identifying the market structure in the second section, the link was made towards other logistics companies. Is an integration of the services with bigger companies possible? Here, the example of worldwide integrators is used. Some interesting insights were gained at a round table discussion: a growth in volume at an affordable rate can be a step towards the real professionalization of services. For bike couriers, extra volumes add up to the income without increasing operational costs considerably.

As cities and freight transport need to live together, different policies to increase viability of cities are imposed on freight transport. Cities among others can try to increase bundling of freight flows. By combining smaller freight flows, optimization takes place. Governments try to organize concepts where freight vehicles stop at the outskirts of the city to unload goods to environmentally less damaging vehicles.

Three conceptual ideas of how to integrate bike couriers in the logistics network were looked at. In the A-to-B transport market which bike couriers in Belgium mostly do, clients are found in the administrative sphere, legal industry, advertising companies, hospitals and doctors. Furthermore, sandwich bars and flower shops are also interested. Market growth should be possible if action is taken to increase awareness about the product 'bike delivery'.

Sometimes, cities and private parties go a step further with policy initiatives regarding urban freight transport and invest in city hubs. Bike couriers can play a role in this concept as they are not restricted by limitations like low emission zones, maximum weights, time windows etc. Doubts occur on the long-term economic sustainability. Income is to be generated by the value-added services and storage possibilities. It is to be seen if this can be economically viable. Brown, *et al* (2005) [27] gives a rather pessimistic view on the economic viability of this concept.

The future market possibilities focused on new markets opportunities for A-to-B transport and more importantly on establishing links with integrators. This market of the round trips cannot be ignored. A conceptual overview was given where first and last mile transport is organised by bikes. Four strategies were identified. Only difficult locations are outsourced, part of the volume with the zone central business district is sorted out or only time-sensitive flows are concerned. The fourth option is that bike transport can be used when the customer chooses so. The advantage of bike couriers can be maximized. The arguments listed above will be taken into account to structure the further research steps. Little is written about policy decisions that eventually will change the framework where bikers work in. If governments change the accessibility of the city centres for motorized transport, a change is expected in bicycle use.

As last, costs were simulated under some stringent hypotheses. Under Belgian fiscal law, bike that couriers can deliver at a similar price, compared to the conventional transport. Be it logistics companies do not have a warehouse in the city, which means than an extra changeover of mode needs to take place. Extra costs will occur. One can conclude that savings in emissions are limited, but might be important as these take place in a densely built area. Employment numbers benefits of the modal shift to bikes.

The overall conclusion is that a specific market for bike couriers exists, though some doubts about the professionalization and linkages with the logistical network are correct. The simulation gave an insight in the bike's operational costs. The Belgian scale, at which these companies operate, is very small. It is a chicken-or-the-egg story. To professionalise, bike couriers need bigger volumes. To work with the bikers logistics companies ask for a professionalization before handing over the volumes. A look at examples in other European countries will be necessary to discover opportunities and threats. Close contacts with the bike courier market in Belgium will be retained.

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