

# The freight divide

**Cathy Macharis and Sara Velinde** discuss stakeholder support for two innovative urban freight solutions in Brussels

In July 2013, the Brussels-Capital Region adopted a dedicated strategy for urban freight transport in Brussels aiming to make urban freight flows more efficient and sustainable. The plan identified a list of measures that should be supported that makes Brussels a suitable place to test urban freight solutions.

During those past two years, two innovative measures were tested as part of a European-funded research project called STRAIGHTSOL. TNT Express used a Mobile Depot for its inner city express deliveries and Colruyt shifted some of its supermarket deliveries towards off-peak hours. Both tests received support from the Brussels Capital Region and from the MOBI department of the Vrije Universiteit Brussel.

## MOBILE DEPOT

A Mobile Depot is a trailer fitted with a loading dock, warehousing facilities and an office. In the morning, the trailer is loaded with all inner-city deliveries for that day and is then driven to a central parking location in the city. From there, the final deliveries are carried out by dispatch riders on electrically supported cyclocargos.

TNT Express used a Mobile Depot for a period of three months (28 May 2013-22 August 2013) to undertake



their pick-ups and deliveries in Schaarbeek, Etterbeek and Sint-Joost-ten-Node which are three Brussels municipalities. It is an area of just over 12 square kilometres that is densely populated and highly urbanized. There is no commercial dominance in the area and it was chosen because of its relatively high-drop density of small shipments.

Regular deliveries and pick-ups of parcels and documents in Brussels are carried out by diesel vans from the TNT Express depot at the Brussels freight airport Brucargo. For the duration of the demonstration, TNT Express serviced the demonstration area from their newly

manufactured Mobile Depot. Each morning, the trailer was loaded at the TNT hub with all deliveries for that day and then driven to a predefined central location in the Parc du Cinquantenaire. The park is close to the demonstration area and the depot of the subcontractor doing the cyclocargo deliveries and provides the space that is needed for the Mobile Depot to manoeuvre and for the loading and unloading of the cyclocargos. The Mobile Depot arrived in the park around 9.15 am. From there, the deliveries and pick-ups were carried out by four dispatch riders on electrically driven cyclocargos. During the 12 demonstration



TNT Express Mobile Depot in Parc du Cinquantenaire, Brussels

Source: TNT Express

***“For a period of two weeks, the largest Belgian food retailer, which operates 14 supermarkets in the Brussels-Capital Region, shifted at least one of its daily delivery trips to two selected shops to off-hours”***

weeks, 1292 pick-ups and 5286 deliveries were done and 4534 cyclocargo kilometres and 2544 truck kilometres were driven.

#### OFF-HOUR DELIVERIES

The second innovative solution that was tested in Brussels was a shift to off-hour deliveries. In early 2014, for a period of two weeks, the largest

Belgian food retailer, which operates 14 supermarkets in the Brussels-Capital Region, shifted at least one of its daily delivery trips to two selected shops to off-hours.

The environmental permit of both shops does not allow them to be delivered between 9pm and 10pm and 6am and 7am. However, to facilitate the pilot programme,

the Environmental Agency of the Brussels Capital Region decided to allow a temporary exemption to the rules for a period of one week. The exemption led to a two-part trial. During the first week, from Monday to Friday, at least one early morning delivery (between 6 am and 8 am) and at least one late evening delivery (between 8 pm and 10 pm) were

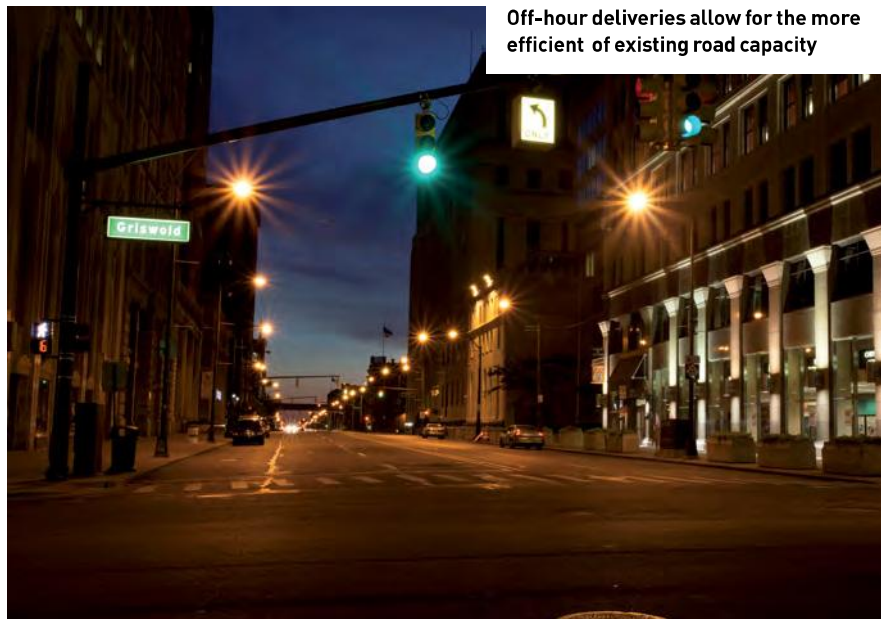
carried out. During the second pilot week, from Monday to Friday, one of the deliveries that usually take place during the day (between 8 am and 8 pm) was shifted to night (between 10 pm and 6 am). On Saturday, there was at least one early morning delivery during the first week and at least one night time delivery during the second week.

The participating retailer took several measures to minimise the noise nuisance for local residents varying from an indoor delivery area or covered unloading quay to the quietest possible diesel trucks (Euro 6) as well as quiet trailers with more rubber and fewer steel components. Each shop was also equipped with a silent hand pallet truck, and each driver was provided special training on silent deliveries.

### MEASURED IMPACT OF THE TWO SOLUTIONS

Demonstrating these two innovative solutions in Brussels was part of a European research project called STRAIGHTSOL. Apart from demonstrating solutions, STRAIGHTSOL also had a mission to develop an evaluation framework for urban freight transport solutions. The framework was developed by the MOBI department from the Vrije Universiteit Brussel and TNO from the Netherlands. Applying this framework to the demonstrations allowed a thorough evaluation and revealed how the solutions change the environmental, societal and economic impact of certain urban freight flows.

During the Mobile Depot demonstration, punctuality of deliveries and pick-ups dropped by 7 per cent. According to TNT Express, this can partly be attributed to the fact that this was a demonstration project and both TNT Express and its subcontractor had to adjust their operations to the new way of working. The demonstration also revealed that the use of a Mobile Depot doubled operating



Off-hour deliveries allow for the more efficient of existing road capacity

costs and required high investments to develop and manufacture the trailer while operating revenues remained the same as before.

Despite the fact that total costs increased by 3 per cent during the demonstration, there is a more reachable business case for shifting supermarket deliveries to off-hours. Business case analysis of a scaled scenario in which all supermarkets of the participating retailer that are located in Brussels would be partly delivered during off-hours revealed cost savings of about 8 per cent. These savings can primarily be attributed to reduced operational costs linked to higher average speeds and lower fuel consumption. During the night trips, the average speed increased by 48 per cent. However, during the night, it takes a driver an average 9 minutes or 17 per cent longer than during the day to unload his vehicle which can be explained by the fact that no members of staff were present to open the door and help the driver to unload. Average fuel consumption decreased by 11 per cent.

Both demonstrations were too small-scale to measure any impact on air quality or climate change. In

case of the Mobile Depot, the change in number of diesel vehicle kilometres was used to calculate impact on emission of pollutants. By applying STREAM emission factors on the number of kilometres driven, calculations revealed that during the demonstration, TNT Express emitted 24 per cent less CO<sub>2</sub> to carry out these deliveries and pick-ups. Using a Mobile Depot also has a positive impact on the air quality: the emission of fine particles (with a diameter of 2.5 micrometres or less) dropped by 59 per cent.

However, due to the use of a truck-trailer combination instead of multiple vans, the emission of nitrogen oxides increased by 48 per cent. During the off-hour deliveries demonstration, distance driven and vehicle type remained the same and there only was a shift to another time of day. The main effect impacting emissions was a decrease of the number of congested kilometres, which positively impacted the emission of pollutants. Measurements by an independent acoustic engineering company showed that the noise produced during both the manoeuvring and the loading and unloading operations can hardly be discerned

## Applying an evaluation framework to the demonstrations allowed a thorough evaluation and revealed how the solutions change the environmental, societal and economic impact of certain urban freight flows

from the ambient noise when measured next to the closest housing unit. The threshold of 66 dBA, which by law cannot be exceeded more than 10 times in one night time hour, was exceeded twice at the pilot site with an uncovered loading bay and never at the site with a covered loading bay. However, the average noise levels produced during the manoeuvring towards the loading bays and parking in front of the loading bays exceeded the 42 dBA maximum which would make it impossible to carry out night deliveries under current laws.

### STAKEHOLDER SUPPORT FOR GENERAL IMPLEMENTATION?

The scale of both demonstrations was rather limited which makes it difficult to assess stakeholder support for implementing the measures on a larger scale. That is why the STRAIGHTSOL evaluation framework also consists of applying Multi Actor Multi Criteria Analysis (MAMCA) which is an evaluation tool that explicitly includes the goals and objectives of all stakeholders and was developed at the MOBI department of the Vrije Universiteit Brussel.


The Mobile Depot MAMCA revealed that the objectives of the economic stakeholders (i.e. TNT Express, shippers and receivers) are fairly well addressed by business as usual while the objectives of the societal stakeholders (i.e. citizens and local authorities) are better addressed by the different Mobile Depot scenarios. The scenarios in which a toll is charged when freight vehicles enter the city address the combined

objectives of all stakeholders the most. The scenario with the best chance of a consensus, however, is the scenario where nothing is changed to the demonstration except for the used capacity of the Mobile Depot (from 40 per cent during the demonstration to 90 per cent).

A further analysis of the individual stakeholders shows that the viability of investment and profitable operations criteria of TNT Express have to be met better for the MD concept to become really interesting. The analysis of the scenarios shows that this can be done by using the Mobile Depot at full capacity and by increasing the drop density. The MAMCA also showed that when using the Mobile Depot, TNT Express does create benefits for the other stakeholders for which it is not compensated. Internalising the external costs could overcome that for example. Based on our results, it would be interesting to further test the Mobile Depot under these new conditions.

A first conclusion of the off-hour deliveries MAMCA is that a shift to off-hour deliveries to supermarkets in Brussels should be capable of receiving overall stakeholder support. All stakeholders ranked the different scenarios more or less the same, and there were no scenarios that scored very high for one stakeholder and very low for another.

Scenarios with a high proportion of night deliveries are considered better by all stakeholders. The retailer prefers the scenario with the even spread throughout the day, while the other two stakeholders (citizens and

local authorities) prefer more morning deliveries. The mono-actor views of the citizens and local authorities revealed that the noise that is produced remains an important aspect if more deliveries will be shifted to the night. The mono-actor view for the retailers revealed that a shift to night deliveries is only interesting for the retailer when he can do it on a large scale. Overall, the main lesson is that there is good potential to shift some deliveries to supermarkets to off-hours. 

### FYI

**Cathy Macharis** is Professor at the Vrije Universiteit Brussel. Her research group MOBI (Mobility, Logistics and Automotive Technology) is an interdisciplinary group focusing on sustainable logistics, electric and hybrid vehicles and urban mobility. She focuses on how to include stakeholders within decision and evaluation processes in the field of logistics and mobility. [cathy.macharis@vub.ac.be](mailto:cathy.macharis@vub.ac.be)

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