INFACT : Integrated Freight Analysis within CiTies

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It is the aim of this project called INFACT, done by BRRC (Belgian Road Research Centre; OCW/CRR; coördinator) and the Universities of Antwerp (UA) and Namur (FUNDP – GRT) to understand better freight traffic organization in urban areas and the impacts of strategies and policies that could be set up in that field. The study examines both sides of inner city freight traffic: the logistic activities performed by general companies for themselves or by professional road hauliers (upstream goods transport) on the one hand and freight traffic conducted by households on the other hand (downstream goods transport). Moreover, the link between both approaches has been considered because both could affect each other. The distribution sector was choosen for this study to investigate the link between both approaches.

1. Inventory of freight studies in Brussels

An inventory of freight studies in Brussels has been made and analysed with specific attention for the used methodology (for the collection of data), the treated contents, the found experiences about applied methodologies but also for the applied definition of freight transport (the transport modes and the activities included in the definition).

Most retrieved studies treat aspects related with the supply side. Those studies are mainly considering the transport of premises' core goods. The downstream approach is often missing, even knowing its great importance in urban surroundings.

Especially heavy goods vehicles are studied whereas vans are often neglected. The same accounts for the transport modes used for the purchases of households (cars, public transport, etc.). It should also be pointed out that the movements of freight vehicles are considered in the retrieved studies, not the movements of freight itself.

2. Downstream urban goods transport

Generally, not a lot of information about urban downstream transport is available. Therefore a survey has been undertaken to describe the purchase behaviour of households. Due to budget (and time) constraints, it was decided to focus the pilot survey on one new innovative method (for the transport domain): namely the "Intercept and Follow" method. Therefore, the goals of the pilot survey tended less towards the comparison of survey techniques or the collection of representative data for general shopping behaviour. By contrast attention has especially been paid to the advantages and drawbacks of this techinique for mobility surveys.

From the pilot exercise can be concluded that:

- the weather conditions play an important role in the survey's success;
- the day of the week impacts on the purchase behaviour of households (and related displacements);
- the period of the year affects the purchase behaviour of households;
- the survey hours have big effects on the characteristics of the customers;
- the advertising around the survey could be better (e.g. by using dedicated clothes for the surveyors or hanging up posters in shops);
- the questionnaire seemed to be too long;
- some questions were bad interpretated (e.g. difference between visit to a shop and purchase in the shop);

- researchers should be aware of possible bias. (e.g. the incentive used could have introduced some bias).
- representativity of each class of the population (relative to age, sex or status) is difficult to obtain. For a real size survey, attention has therefore to be paid to the sampling and weighting procedures.

The stated problems and difficulties (practical issues and problems related with the understanding of the questionnaire itself) can be used to methodologically improve a real size inquiry which is necessary to be able to make conclusions about the shopping behaviour of customers.

3. Upstream urban goods transport

Three logistic conceptions were simulated with a model, mainly based on generalized costs: namely the case of direct transport, indirect transport with an urban distribution centre and indirect transport via cross-docking towards an urban destination (Brussels). For all logistic conceptions, a simulation was made with two types of trucks: a closed truck (deadweight capacity of 7 tons) and a truck with trailer (deadweight capacity of 24 tons).

Each typology results eventually in another (total) cost. Roughly stated, it was argued that logistic costs consist of transport (capital, labor, energy, repair and maintenance, insurance and traffic taxes), store and consolidation costs. Also external costs (congestion, environmental effects, vibrations and atmospheric damage, accidents and road wear) for the three logistic conceptions differ. Therefore external costs were also calculated and integrated in the model.

The modeling of the typologies revealed the notable complexity of urban transport. Each transport firm opts for the least costly logistic organization, which does not always stroke with the social optimum because of the generation of external costs.
The analysis demonstrated that external costs are mainly ascribed to congestion in the city, which triggered the incentive to ban heavy weight transport in the city. An important factor are the consequences of a shift from heavy to light weight transport, which can be retrieved by examining the load factor of these vehicles. This modeling shows e.g. that it is not always the best method (looking at the global welfare) to replace e.g. large goods vehicles by small goods vehicles. A possible (best) outcome may be to only allow full truckloads for the largest goods vehicles

A striking variable concerns the value of time or store costs during transport. Besides time, also the value of the goods matters. This proves that congestion or imposed waiting and high-valued goods transport can influence the logistic costs for the transporter significantly.

The developed model makes it possible to simulate impacts of possible adaptations, improvements and regulations so that anticipation of the possible strategic behaviour of the different market players involved is possible. Sensitivity analyses (made and in the future) can retrieve the change in costs when the value of one or more variables alters. Other variables can also easily be integrated in the developed model.

4. Integration of down- and upstream urban goods transport

The reason why the distribution sector has been studied, is the potential relationship between the upstream part (deliveries to stores) and the downstream part of the supply chain (purchase behaviour of households). The store itselfs acts as an interface between both transport streams. This relationship is quite important because it means that any measure

related to one or the other side of the chain could affect also the other part. Hence, any policy aiming at improving the mobility of the deliveries or the purchase travel behaviour must keep this mutual relationship in mind.

Instruments applicable by authorities (national, federal and local authorities) to limit negative impacts on urban freight transport are e.g.:

- the application of taxes (congestion tax, tax on freight vehicles depending on their load factor, etc.);
- size and weight restrictions for freight vehicles;
- time windows for deliveries;
- restrictions related to the load factor of freight vehicles;
- the obligation to have a minimal stock area;
- the use of a minimum or maximum number of parking spaces (for cars and/or freight vehicles);
- urban prescripts (local legislation like environmental prescripts e.g.).

By consequence a policy measure has a positive (or negative) effect for one part of the transport chain, but also a negative (or positive) one for the other part. The general effect (positive or negative) is not always clear. Policy makers should by consequence consider the influence of a policy measure on both transport flows. A Cost Benefit Analysis could clarify the general effect of a policy measure.

The available surface and the way the local storekeeper is dealing with this surface (for selling goods, stocking goods, providing car parking places and place for loading and unloading operations) can be considered as crucial parameters for the interaction between both transport streams. As long as there is no capacity constraint regarding the available space, no structural link can be distinguished between the delivery of goods to the store and the purchase behaviour of households. In that case there is decoupling between the general mobility and the policy of the storekeeper. The storekeeper can do what he wants. On the other hand when there is a capacity constraint, interaction between both transport flows is present. Knowledge about the surface of stores (and the way he is using it for his different activities) is important to predict the strategy of storekeepers on applied policy measures and to estimate the general effect of applied policy measures.

The surface is not the only variable of importance. Other variables are important to describe the upstream and downstream transport flows. A typology of both sides is needed. Eventually, also a typology of the surrounding is desired due to its great influence on both transport streams. Those data are desired to understand urban transport (related with stores in this case) to a larger extent.