Bestufs WP3 Rome roundtable - Issues Part 4

Integration of urban goods movement into the whole urban transport system

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Urban goods movement is a new and very specific component of the urban transport system. The reason is:

- the wide variety of stakeholders, vehicles and organisations,
- the necessity to abandon the isometry between goods origin-destination and vehicles origin-destination (diversity of trip chain pattern)
- the converse causal relationship between urban goods movement and the other urban components (national freight traffic, individual traffic, purchase trips, land use and road use conflicts).

It is the reason why it is very important to make sure the good integration of urban goods movement data collection and modelling approaches with their environment.
In this paper, we intend to raise some issues relative to the integration of urban data collection and modelling tools but also the interactions between the different stakeholders involved in those actions.

Urban goods and passengers data collection integration

As purchase is the last link from production to consumer, it is important to make possible a simultaneous goods commercial transport and purchasing trips. As shown in the Issue n°3 of the 4th roundtable (methodology for data collection), several experts consider that urban goods data have to be collected by a very specific way: a establishment survey (to make possible the generation of vehicle flows) linked with a driver survey (to offer a description of the different trip chain patterns according to the various types of generators). Carrying out such surveys puts the question of their integration into the current individual trips data collections.
Individual trips are collected by the way of household surveys which are weighted on the place of residence. It is not possible to have a unbiased appraisal of the purchasing trips generation by the trade system. On the other hand, a survey realised on the purchasing trips at the place where they occur could make possible the understanding of the links between the shops logistic behaviour (upstream logistic chain) and the purchasing behaviour (downstream or last link to consumer). It is then possible to integrate home deliveries, emerging ways of delivery.
In the same way, home-work shuttles and business trips (except goods transport) may be a good addition in order to measure the whole traffic generated by economic activity. It is a way to attempt to get a comprehensive understanding of economic, logistic and behavioural characteristics of all the actors.

Urban goods models and passenger models integration

There are more and more opportunities to substitute purchasing trips for home deliveries through e-commerce. In order to measure the impact of the shift between purchase and home deliveries, integration of goods models and passengers models becomes a necessity. Urban Transport models on which we focus are policy-oriented models (data-adjusted model, oriented

towards policy analysis) i.e. to explicitly simulate freight distribution within the urban areas for evaluation, control and design of urban freight transport system. It means that the study area where the data collection and modelling are carried out is generally the town and its suburbs. Current models on purchasing trips are considered as from a household point of view because they are calibrated on data collected from household surveys. It means that trips are observed considered and weighted from the place of residence. It was observed that the estimation of the trips generated at the shops place are biased, so that it is necessary to build a distribution model for the purchasing trips which is calibrated on the shops specificities. This approach was experimented in France.
Another way could be to build a purchasing trips model calibrated on data coming from thorough surveys of the Such surveys are based on interviews of the customers when they leave the shops. They describe the amount of their purchase, the trip and the mode used (car, walk, bus,…). If the sample is representative of the whole of the stores (small and large distribution, according to the location in urban area), it is possible to calibrate such a model. In that case integration of goods commercial models and goods individual trips models is easy because the statistical unit is in both cases the operation of pick-up of goods in the establishments. In the Bestufs review it was not observed such modelling systems.

Space and time connection

Another issue is the interaction between urban goods transport models and current passenger traffic four step models (generation, modal choice, O/D distribution, and assignment). As urban goods transport models are not standard four step models, the integration of them in the global traffic models need some precautions:

- Space connection : the study area and the zoning of analysis for the data aggregation must be compatible (subset of each other). Especially, the network loading zones have to be also compatible).
- Time scales must also be compatible. The rhythm of delivering of an establishment is often the week or (less often) the month, with seasonal swings. In that case, Surveys observe the logistic behaviour and policy oriented models describe the traffic for a week, or a current day. Traffic models are often calibrated on the peak hour (on morning or evening or both), because they use often Wardrop method or micro-simulation for traffic assignment. As peak hours of delivering and of individual traffic are not the same; this approach may be discussed.

Need of traffic simulator ?

According to the reference paper of H. Sonntag, we can consider two main approaches for freight transport modelling: Operational Research (OR) models and statistical and probabilistic models (SP). Both are considered as macro-economic models, in order to calculate the global impacts of UGM on congestion.
Another approach is promising. It is micro-simulation modelling. The latter make possible to consider the behaviour of each establishment, include the interactions between the different freight agents (shippers, hauliers, customers), micro-simulate the movement of shipments through the behaviour of each establishment. So, the description of the logistic practices of each agent may be simulated.
Usually, traffic simulators take into account the behaviour of each goods vehicles in tours inside the whole traffic on a theoretical network. That way, it is possible to show the fine reality of the behaviour of each vehicle and of each generator of movements along the day. But, in order to implement it on the whole urban area, its needs a thorough knowledge of the

behaviour of each type of agent (generators and transport operators), what is difficult and costly to gather in a comprehensive way. So, traffic simulators are used as a general rule in local or theoretical cases to simulate changes to improve the efficiency of the transport system (objectives for round optimisation, time and cost saving, energy consumption and local environment improvement) all things being equal. Macro models are efficient for the description of UGM traffic generation in the whole urban area. Micro-simulation make possible to be closer to the reality of the behaviours of agents. Integration of macro UGM models and micro simulation models should be a promising and useful track for improvement of modelling.

Land use and transport modelling

The location of industry activity (especially shops and great distribution location, warehouses and platforms location) and household location (final consumers) are very important in the traffic generation. That is the reason why integration of land use models and goods traffic models is extremely important. The inertia of land use compared to the speed of changes of logistic and transport system limit the room for manoeuvre of transport policy measures. Land availability, land cost, population density, need of space for each activity type, are conditions for the possible changes of urban pattern. It is important to estimate the impacts of land use policy on the goods vehicle traffic and also car traffic for purchasing (length of trips, speed, congestion). Urban goods Transport and land use models have to be integrated in order to make an efficient simulation of the future towards the sustainability of the city.

Compatibility of optimisation of sustainability and optimisation of firm

Is there a gap between the external effects of policy and the results of the firm's micro-economy optimisation? If a measure leads to time saving for the transport operators but also leads to more long trips, the environmental effect may become negative. In other words, can we consider a win-win strategy towards sustainable development? The simulation tools have to provide a large range of indicators which make possible the comparison of impacts of the various measures and scenarios (micro and macro-economy, social issues, environment).

Need of case studies about modelling

Too few put in practice of models => no comprehensive comparison and evaluation of models and results. In the third roundtable, we made the statement that there is a lack of case uses of UGM models, and also of results of surveys.

The data collection methods are scarcely described, the results are often partial. The statistical unit, the scale of space and time of the indicators provided are different a case study one another. That is the reason why it is difficult to compare the different results.

Nevertheless, it is possible to propose an outline of rules towards a harmonisation of the data collection:

- in terms of method of data collection (which statistical units, which survey method for which objectives)
- in terms of scale (what to include inside the town area?, which flows to take into account?
- a list of indicators to estimate according to the objectives,

In order to evaluate UGM model, it is necessary to have a good description of the input data we need to feed and calibrate each model, to have a thorough description of the method for modelling and to know the conditions and the results of its implementation on one or several city (including comparison of the results of the model with actual situation). The comparison of models is difficult, because the different case uses are generally not similar: modelling methods are different, data are different, cities are different). Only an implementation of

models in the same city may be a promising action to compare their efficiency, their measurability and their ability for prediction.

Timing :

Short term solutions are required by policy makers but modelling takes time and is costly. More widely, there is a gap between the concerns of the decision makers and the ability of the modellers to answer them. Data collection, implementation of the model, discussion about the objectives, and about the ability of the model to answer these objectives take time and often don't fit into the schedule and the term of the proposal.
Short term solutions are sometimes opposite with long term effects. It is possible to change a local situation thanks to a new infrastructure or a new regulation, but it is difficult to estimate the impact of the latter on the whole land use and transport system. For example, in order to limit congestion of goods traffic, a new road infrastructure is efficient in the short term, but as it serves to a lot of road users, it improves the accessibility of the whole transport system and favour in the long term urban sprawl (involving traffic increase and congestion). Do the models integrate such contradictions?
Part of answer of the issue of short term and long term concerns may be also in solving the interaction between users and builders of models.

Interaction between user and builder of models

Models are often considered by decision makers as black boxes, difficult to implement and which output are difficult to interpret or don't fit the objectives. To propose a model of Urban goods movement do not escape from this opinion. Some rules may make integration more easy:

- To integrate the objectives of users in the input and output of the model;
- To describe the flows on a good scale, in the usual unit, with the usual segmentation of activity, vehicles, …);
- Input data and output results have to be in accordance with the culture of the users, not in the modeller's language.
- To explain step by step the process of calculation for a better understanding of the way to obtain the results.
- To integrate UGM models into the global urban traffic models (truck O/D matrix integrated in a traffic assignment model).
- To make easy the simulation process, integrated into the decision making process.
- To integrate the user's constraints into the simulation process.

Every issue presented above may become a topic of thought. Some of them could be gathered into two main topics:

- Integration of UGM modelling into a global land use and transport interaction model
- Integration of UGM into a process of simulation from the short term to the long term decision making towards sustainability.