Urban goods movement estimation for public decision support: goals, approaches and applications

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1. Introduction

It is usually considered that urban goods transport proceeds from a complex system (Gonzalez-Feliu and Routhier, 2012). It includes transport system, infrastructures and urban planning, firm's logistic strategies[1]. The main stakes of urban goods movement (UGM) can be considered at different topics and scales: reliability of the different logistic chains, local traffic growth, local traffic congestion, urban centres economic support, environmental nuisances (noise, pollutant emissions), urban logistic centres optimal location, greenhouse gas saving, but also urban spread effects and changes in the consumer behaviour, among others. In order to deal with public authorities planning issues, a lot of varied modelling approaches can be carried out (European Commission, 1998; Dufour and Patier, 1999) and, as we can observe from several works, a standard approach is not yet developed in UGM characterization (Browne et al., 2007), mainly due to cultural and geographic reasons that make difficult to transfer approaches from an area to another (Ambrosini and Routhier, 2004).

Traditionally, public authorities acted on short-term scopes when dealing with UGM (Gonzalez-Feliu, 2008); the actions seem to be carried out to deal with emergencies or short term issues without an aim of integration into city transport plans (Muñuzuri et al., 2005). Moreover, although some countries or regions propose to include urban goods on such plans (CERTU-ADEME, 1998; Spinedi, 2008), this idea still remains more conceptual than really applied, and few cities include systematically urban goods into their plans if there is not an obligation to do it (Lagrange, 2012). On another side, UGM start to be on the main issues of public decision makers, and the need to take into account on systemic transport plans is starting to be accepted by several public authorities, mainly in Germany and France. However, public decision makers have difficulties to define the most suitable tools and methods to carry out the effective integration of UGM in more general transport and land use planning actions.

This chapter aims to be a guide for researchers and practitioners on choosing the most suitable approach to deal with a target or goal in terms of urban goods public decision support, and to integrate them into transport plans. Therefore, this paper is neither a literature review nor a benchmarking framework but to propose a multidisciplinary analysis of schools and points of view for public policy decision support in order to propose a guide to practitioners in terms of approaches for integrating urban goods movement in strategic and/or tactical planning actions and tools. First, an overview of urban goods stakes and goals of public planning actions is proposed, with a special focus on why urban goods is less studied and integrated in public policy actions than people transport. Then, an overview on diagnosis techniques is presented. These techniques can be survey-based or derived from data generation tools. After that, a general framework for scenario simulation and assessment is introduced. Finally, a synthesis will lead into a guide for practitioners to understand and combine these approaches to deal with their expected objectives and targets.

[1] In this category we include transport companies, forwarders and suppliers.

2. Urban goods stakes in public planning actions

Since mid-90's, the public intervention on urban goods regulation and planning was limited to manage the emergencies or to understand urban goods movement. After 1994, several countries, like France, Italy, The Netherlands, Germany or the United Kingdom have developed a local, regional or national legislation that includes in some cases the urban goods traffic flow planning and management as a priority (Zunder and Ibañez, 2004).

In this section we suggest an overview of the main legislative actions that public authorities have developed, relating it to urban goods traffic flows. This section is neither an in-depth literature review on the field nor an analysis of public policy actions, but defines the application fields of policy-oriented urban goods modelling and simulation approaches and motivates its interests.

We will start by underscoring the lack of knowledge concerning urban goods traffic in public authorities. This leads in a restrictive implementation of urban goods movements in planning policies and thus a narrowed assessment capacity during the decision process. An enlightening example is the result of a European survey on urban goods modeling tools in 1999 that stated that 72% of the 43 questioned cities did not use any urban goods modeling tools (Routhier, 2002). Though this example is aged, it is not unlikely that it stayed almost unchanged during all these years (Patier and Routhier, 2009a).

More importantly, we can question the use which can be done of the modeling tools by public authorities. Even if a small portion of cities are willing to use this type of tools, we have no data or means to verify if they are used properly. We can only assume that it is possible that some authorities won't use it at their full potential or out of the range of their primal purpose. Thus, even if more urban decision makers should use modeling and simulations approaches, the positive effects of such an improvement wouldn't be proportional in regard to the number of users. This problem can be seen from two different angles: firstly, the use (in the practice sense) is inappropriate, or secondly, the practice is appropriate, but the tool itself is inappropriate and was unsuitably chosen.

This leads us to extract two important notions of this reflection: the pertinence and the practices of goods movement estimation tools. These two points are fundamental if local authorities want to start an integration of the urban goods movements in their development policies: the methodological and sensible choice of an approach/tool is a key to achieve an efficient policy. Therefore, we can see a high potential in the construction of a methodology which can help public authorities in choosing a modeling or simulation tool, and that can guide its users through good practices.

From the two previous notions we tackled above (pertinence and practices), we could add a last one, which would concern the available resources to implement the chosen solutions. It is indeed not hard to imagine that different cities possess different resources, speaking in terms of financial and human resources (quantity and skills). More restrictive, the resources determine the limits which the local authorities can't cross. We will shortly examine this particular point in the next section.

Defining the situations in which the modeling tools can be used properly is the basis of the approach we want to build. Three types of uses can be mentioned to start with:

- Diagnosis
- Global plans development and verification

- Local plans verification which can in fact be divided in two categories: regulations and urban development

We can effectively see that urban goods traffic estimation, modeling and simulation tools have a wide range of uses during the planning process. Indeed, we can firstly mention the diagnosis possibilities that estimation tools can offer. Here we can mention two types of tools: surveys and modeling tools. Surveys are integrated in the reality and render the facts of a particular situation (though French surveys demonstrated similarities in various cities). Another possibility is the application of modeling tools. In fact, rather than surveying, some public authorities might prefer modeling the urban goods traffic, as it only requires the tool itself and relatively few data to calibrate it. These approaches can also be applied to test and develop global action plans. In this particular case, simulation tools should be adjoined to the diagnosis process. But this kind of tools can also be used for smaller geographical applications in terms of urban design and regulation.

Concerning the urban goods in planning actions, the last years have seen the development of innovative measures (BESTUFS, 2009), carried by the European commission and a few governments and implemented by several cities across the European Union. However, the urban goods movements are still not taken into account by a large majority of cities, but here are a few examples of the urban goods applications in public planning actions. In France, according to the French law, urban trip plans have to include urban goods for cities with more than 100000 inhabitants (CERTU-ADEME, 1998), however this orientation does not insist on a positive organization of the UGM. A methodological work has been carried out in 1998 to integrate more efficiently the UGM in the urban trip plans. Even so, the correct application this methodology is questionable and does not make any consistent references to urban goods modeling tools. In the rest of Europe urban goods is exclusively a matter of concern for cities, and governments are usually not implicated in this subject (Dablanc, 2001). In Italy, a few main cities include the urban goods in their city plan, and the main measures concern cargo consolidation, access regulation and improvement of the vehicle fleet. In Germany, most of the main cities take into account the urban goods movements but there are also national rules concerning vehicle performances (emission standard labeling). The German approach tends to integrate all the stakeholders concerned by urban goods transports in the research of a consensus for the entire urban community. All these approaches are usually carried-out on a large geographical scale (urban areas covering several cities, regions…).Unfortunately it is possible to notice that local regulations can sometimes undermine the positive effects of regional approaches: the urban area is often divided in many different territories, each having its own local authorities (the example of the Ile de France region is the most demonstrative, with more than 1000 towns with many different regulations). Moreover, regulations at a European level tend to vary sensibly: Paris bases its urban goods transports regulations on the surface of the trucks, whereas London is more concerned with the weight, and other cities (Milan, Stockholm, Amsterdam…) with weight and length of the vehicle but with completely different standards (Dablanc, 2001). In this context of heterogeneity, an innovative methodology to determine the best approach for urban goods modeling is a positive initiative that could help building a common and synergic approach of the urban goods transport.

The final goal of this reflection is to help policy makers to choose the proper tool for a given task and use this tool in an appropriate way, according to its resources. But also to raise the awareness of city authorities on a fundamental subject that is urban goods transportation.

3. Diagnosis

In this section, different data collection techniques are described with their advantages and limits. Furthermore we question how simulation tools can be an alternative to traditional data collection methods, with a short description of each simulation model.

The first action to carry out to include urban goods and commercial transport in policy and planning strategies is to make a diagnosis of the current situation to have a basis for the discussion and development of such strategies. To do this, many policy makers are reliant on urban goods movement surveys (Allen and Browne, 2008), which provides a little insight into relevant factors like the goods and service flows, the specific purpose of commercial vehicle trips, the involved establishment and the supply chain decisions related to these trips, among others (Pluvinet et al., 2012). Traditionally traffic counts are the most common survey method for urban freight policy making support, since policy makers have the habits and experience on these techniques, already popular for people transport policy making. However, the variety of methods in people transport is wider, and in the last years, many urban freight transport studies attempt to go beyond vehicle traffic counts (Allen and Browne, 2008). Moreover, several categories of urban goods and commercial transport surveys have been identified recently (Ambrosini and Routhier, 2004; Allen and Browne, 2008; Patier and Routhier, 2009a; Pluvinet et al., 2012). According to Allen and Browne (2008), Urban Goods Movement (UGM) data can be collected using different techniques, which are mainly the following:

- General surveys:
  - UGM surveys (French surveys on urban goods movements)
  - Commodity flow survey (ECHO, US commodity flow surveys)
  - Commercial transport surveys (MiD and KiD, Germany)
- Stakeholder specific surveys
  - Establishment surveys
  - Shippers survey
  - Service provider survey
  - Freight operator / commercial agent survey
- Vehicle specific surveys
  - Driver survey
  - Vehicle observation survey
  - Vehicle trip diaries
  - GPS survey
- Land use specific surveys
  - Roadside interview survey
  - Parking survey
  - Traffic counts, used in conjunction with the above techniques to give complementary information.

Each category of survey has its specificities, and leads to different application advantages and limits. To compare them and propose a discussion on the suitability and synergies between these techniques, we propose to build a synthesis that shows the potential of each category of survey to collect the main information needed for urban goods and commercial transport diagnosis and public policy decision support. The main aspects that we want to focus on are the following:

- *Quantity and quality of collected data*.
- *Freight related information.*
- *Data sampling*. Whatever survey method used, it is important to ensure a good sampling.

- *Difficulty to respect data sampling.*
- *Costs*.
- *Implementation limits*.

Each survey cannot give all types of information on urban goods transport organization. To understand the specificity of each type of survey, we shall now present a typology of the different data related to UGM:

1. Shipment:
   1.1. Quantity (weight, surface, volume)
   1.2. Packaging
   1.3. Nature of goods
   1.4. Origin
   1.5. Destination
2. Pickup or delivery operation
   2.1. Manutention material
   2.2. Consolidation-deconsolidation
   2.3. Time data (date, hour, frequency)
   2.4. Parking conditions
3. Vehicle:
   3.1. Vehicle characteristics (type, capacity, special equipment, mode)
   3.2. Delivery path (number of stops, duration of stops, travel path, speed, travel time)
4. External elements:
   4.1. Transport network (characteristics, traffic, incidents, …)
   4.2. Other (weather conditions, strikes, …)

The general surveys are the most complete (and complex) surveys of the previous data collection method: they give global data on the freight activity in the cities and sometimes even beyond the urban areas (i.e. the US commodity flow surveys). Every type of data (in the above typology) is collected during these surveys, except from the external elements (category 4). This type of surveys is however the most expensive as it gathers fair amounts of resources (human and material) to survey the entire supply-chain related to urban goods movements. The inconvenient of this type of global survey is usually the lack of accuracy on urban freight operations: for example KiD, and MiD, commodity flow survey are not focused on the urban area but are national surveys (Warmouth et al., 2004). It is also difficult to generate the interest of the stakeholders in participating in such surveys: the involvement of all the participants is a key in building substantial data. New approaches such as the French surveys on the urban goods movements are specifically built for the urban area and therefore the most suitable to understand freight flows and their formation in the urban area (Patier and Routhier, 2009b).

Stakeholders' surveys derive from the previous category as they can in fact be parts of the general surveys. They are the core in understanding the organization of transport and freight operations in the urban environment. As each stakeholder represents a part of the supply-chain, surveying one or the other stakeholder will give different (in quantity and quality) valuable information. The shippers and establishments surveys provide more information on shipment and handling operations, as freight operators and service provider surveys generate more information on the activity of carriers and vehicle operations, while still giving data on shipment and handling operation (maybe with lesser quality and quantity). This sort of surveys mobilizes heavy resources if done thoroughly, but is very accurate. Again, as well as in the previous category, the involvement of the surveyed stakeholders is an additional difficulty, but is fundamental if the goal is to build substantial sets of data.

The vehicles surveys can give precious information on the fleets, the characteristics, and delivery paths of the vehicle. It mainly concerns the "behaviours" of the vehicles and fleets in the urban area. While the collected data are mainly concerning the category 3 of the typology, it is also possible to gather precious information in the first and second categories, depending if it is a driver survey (which can give us information on pick-up/delivery operations and shipment) or if it is a GPS survey that can only provide the path taken, but with an extreme accuracy on speeds, accelerations and routes (Pluvinet et al., 2012). Again we observe the importance of communication with the actors of the urban freight transport, if the goal is to obtain extended information. However this category is not necessarily the most expensive of all, because it is (partly) based on the observations of diaries or GPS data, which can be obtained with minimum human resources.

The last category (land use survey), is not fundamental as it does not really give information on freight operations, but helps understanding the environment in which urban goods movements take place. Indeed, the limit of these surveys is that they are quite disconnected from the organization of transport, and only give information on the use of the public road network, and the origin and destination of flows (Patier and Routhier, 2009a). But, it is still useful to complete the previous categories, with an environmental analysis, to understand the influence of external elements on urban freight operations.

We can observe that one type of survey is not enough to understand the system that urban goods movements represent. The combination of several types of surveys is necessary to have an extensive set of data to perform a full diagnosis of the urban goods transport in a city. We can also observe that the most "efficient" methods are also the most expensive and mobilize heavy human and material resources. Indeed, each method presents several limits. We think important to combine them in order to meet the survey targets: GPS-based techniques, more precise data can be obtained about a number of parameters, as routes, speeds, energy consumption, … whereas current mail-out/mail-back and face-to-face surveys give invaluable information about the behaviour of the stakeholders and of the logistics schemes.

As shown above, survey methods are expensive and policy makers do not always have the resources to carry out them with the detail level needed to ensure a minimum quantity and quality of results. To deal with this limit, a small group of tools are today available to assist policy makers. These tools are in general depending on a regional or national context and are not present in all countries.

In the mid of the 80's, Sonntag (1985) developed a simulation tool for commercial traffic diagnosis, WIVER (Sonntag, 1985) based on German surveys carried out at nearly 9000 premises (Berlin, Hamburg and Munich) and specific surveys of drivers on their traffic behaviour (Ambrosini et al., 2008). The complexity of interactions explaining the generation of traffic required considerable data collection work. The determination of traffic O/D is obtained in four stages, in each area by: the calculation of the round origins, the selection of destinations in comparison with the origins, the connection between origins and destinations, and (4) route construction. These calculations made it possible to obtain the share of the commercial traffic in the total traffic (in terms of vehicle flows) and the map of O/D commercial traffic flows between different areas, becoming a diagnosis tool for commercial traffic as well as a quantification of urban platform impacts. Lohse (2004) transferred the WIVER model to a general framework backed up by a system theory and included in the software program VISEVA, which nowadays is integrated on the PTV traffic simulation tool VISSUM.

Also in Germany, Janssen and Vollmer (2005) included a "goods and special transports" model in IVV Aachen urban transport planning software VENUS. That approach derives clearly from personal traffic modelling frameworks (Ortuzar and Willumsen, 2001) using a classic 4-steps model (trip generation, gravitation-based trip distribution, modal split and traffic assignment). The tool can differentiate flows by vehicle types but the differentiation of the trip reasons is based on "trip purposes" e.g. industry-trade connections, trade-end user. Available time budgets, daily courses, distribution of stop time lengths and number of stops are used for the generation of trip chains.

In France, the National Program on Urban Goods Transport financed the joint development of three wide surveys and the development of a diagnosis tool, FRETURB, to understand and simulate the impacts of urban goods traffic (Routhier et al., 2001). This approach introduces the vehicle movement as the statistical unit for urban goods movement characterisation (Routhier and Aubert, 1999). The vehicle movement is defined as a delivery or a pickup associated to a given establishment, a vehicle size, a mode of management and logistic behaviour). The software tool presents several modules. The "inter-establishment generation model" estimates the number of movements generated by each establishment of an area, and estimates the associated impacts in terms of travelled distances, running road occupancy rates and parking road occupancy rates (Routhier and Toilier, 2007). The module's mathematical framework derives from empirical and statistical analyses carried out from the French surveys carried out on Bordeaux, Dijon and Marseille (Patier and Routhier, 2009b). A second module ("flow distribution estimation") allows estimating O/D matrices that can then be used for traffic assignment. These matrices allow distinguishing five types of vehicles, mainly related to their dimensions. Other modules that will allow simulating scenarios, taking into account end-consumers flows and estimating the environmental impacts are being tested (Gonzalez-Feliu et al., 2012). This tool requires a local establishment database and general demographic information as input data but no large local surveys are required. Available as software since 2000, this module is nowadays used in more than 20 French urban communities (including most of the main French cities like Paris, Lyon or Lille, among others).

CITY GOODS is the urban freight demand model based on the framework of Gentile and Vigo (2006), developed for the Emilia-Romagna Region in Italy. According to the authors, the model deals with two main questions. The first takes place when a given activity (a fortiori a given zone) generates movements belonging to different supply chains, and the second when a vehicle performs many deliveries or pick-ups in a tour. The goal of CITY GOODS is to estimate the number of goods-related operations generated by each zone. To do this, a simultaneous data collection methodology and the modelling architecture processes have been carried out, as on the French experience (Rosini, 2005). Then, a tree-based typology of economic activities has been identified (Gentile and Vigo, 2006). The mathematical framework follows a four-step model, but the used unit is not the trip (Janssen and Vollmer, 2005) but a mix of movement (Routhier and Aubert, 1999) and the quantity of goods. The finished software tool is internal to Emilia Romagna region, but can be applied to any Italian city.

Although only four operational tools can be found nowadays, we can find several modelling approaches in scientific literature that have not lead on a user-friendly tool (for recent surveys on these approaches, see Ambrosini et al., 2008; Anand et al., 2012; Comi et al., 2012 and Gonzalez-Feliu and Routhier, 2012). Some of these approaches have been applied to real situations and have been used for public support (Eriksson, 1997; Hunt and Stefan, 2008). We aim not to propose a deep review on such models but a quick classification seems necessary to understand the variety of approaches and the difficulties to produce a unified tool for urban goods diagnosis. The classification proposed below derives from that of Gonzalez-Feliu et al. (2012) and distinguishes four main types of models:

- *Four-step derived models* propose to estimate the urban goods movement phenomena by analogy to personal trip or interurban transport, by sequential models inspired on the classical four-step modelling framework (Ortuzar and Willumsen, 2001). Although many models can be included on this category, we observe several sub-categories, which are:
    - Trip-based models (Eriksson, 1996; Janssen and Vollmer, 2005) are less used on UGM than on interurban transport, due to the fact that urban trips are included on multi-destination routes (Gentile and Vigo, 2006) but we find one commercial tool still used by practitioners derived from these frameworks, the VENUS software. These models are direct applications of a four-step model to freight trips and need specific survey data to be calibrated and censorial information to define explicative variables.
    - Commodity-based models, the most popular of the present category. These models use classical trip generation techniques and propose gravity approaches (Boerkamps and van Binsbergen, 1999) or discrete choice frameworks (Russo and Comi, 2010) for trip distribution and modal choice.
    - Delivery-based models (Gentile and Vigo, 2006; Muñuzuri et al., 2010; Nuzzolo et al., 2010) estimate O/D matrix similarly to trip-based models, but using the delivery as the modelling unit (Comi et al., 2012).
- Multi-agent simulations models (Wisejindawaat and Sano, 2003) use concepts derived from artificial intelligence and multi-agent modelling to represent the behaviour of the involved stakeholders.
- Tour-based or chain-based models (Sonntag, 1985; Hunt and Stefan, 2007; Holguín-Veras and Patil, 2008) are generation-route construction models generating the entire route then decomposing it in a set of trips. First, the number of tours or trip chains generated by each zone is estimated. In the tour generation phase, the origin location and the number of destinations or each tour are defined. Second, a route-construction algorithm or an origin/destination synthesis method is used to assign each tour origin to its destination locations.
- Bottom-up statistical behavioural models (Routhier and Aubert, 1999; Routhier and Toilier, 2007), built in parallel to data collection for a better explanation of the chosen explained variable. In these models, a typology of establishments is proposed, and the number of movements (defined as pickup and/or delivery operations) is estimated for each establishment using a generation function. They do not produce directly O/D pairs but estimate the impacts of goods trips in terms of road occupancy rated within a section, zone or the entire area of study.

Finally, we aim to highlight that subcontracting urban goods diagnosis to researchers is a practice that seems more developed in North-America and Asia than in Europe, but can be a valid alternative to carrying out high cost surveys of buying a software tool for a single use. Another alternative is that of asking to a specialised consulting agency that will either use an existing tool or make adequate surveys. In this case, the costs remain also the discriminating variable, and the quality and quantity of the services are in general related to the price the public decision makers are disposed to pay for them.

4. Simulation

In order to include the particularities of urban goods movement in a long-term analysis, we suggest a methodological framework for the scenario construction. The main interest for using scenarios is that it allows decision makers to be pro-active in the planning process. This framework corresponds to the first phase of backcasting and will take into account the consequent actions to undertake at the politics and policy levels following the directions suggested by these scenarios. For this, Figure 1 sums up into a chart the main decision process in urban logistics long-term planning.

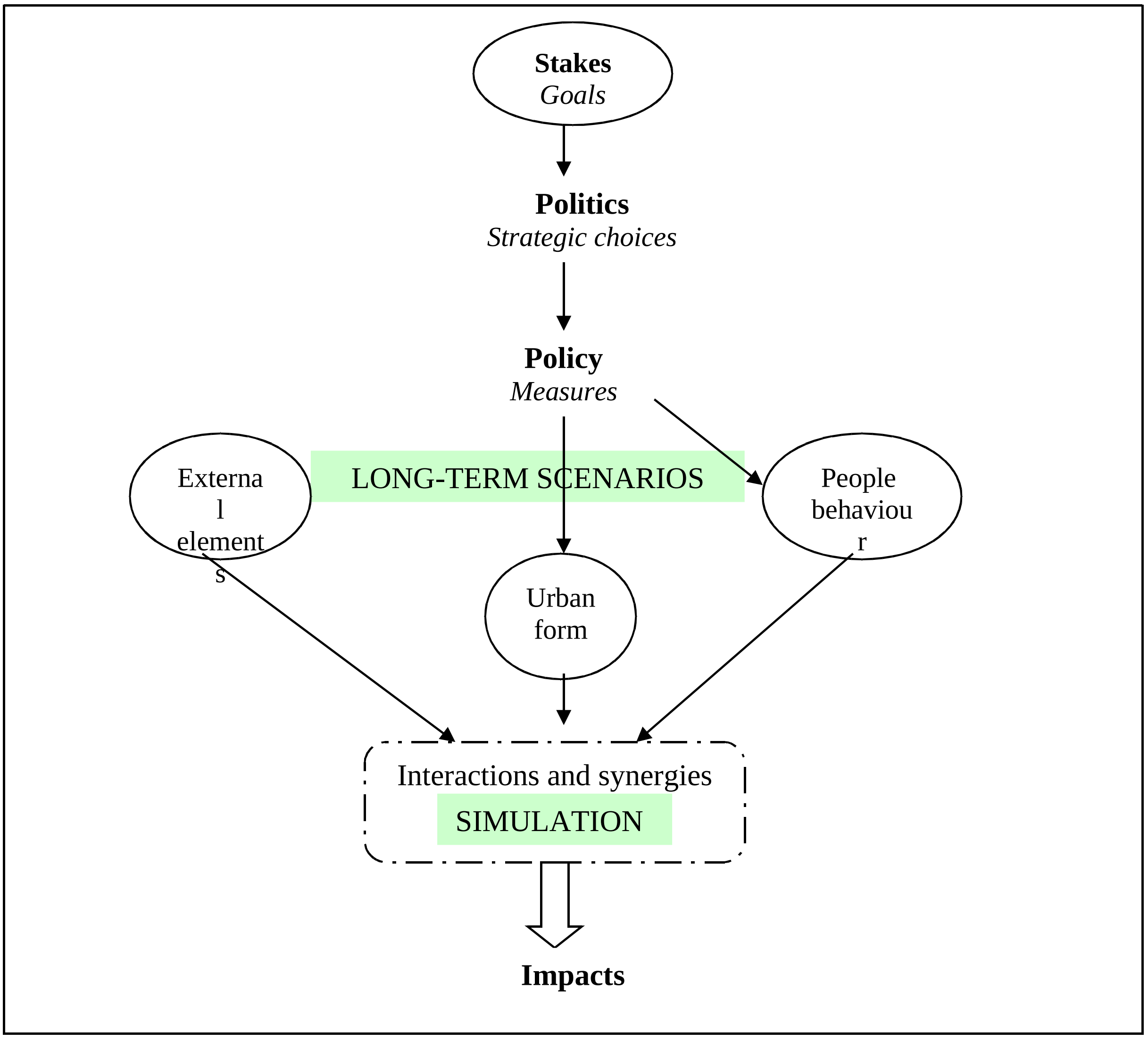

Figure 1 – Chart of the proposed simulation methodology

The stakes will define the main goals of the long-term analysis. To meet the established target, several strategic choices are possible (Politics). These choices become the main expected objectives that can be implemented through the appropriate policies. The most usual policies are related to:

- the action on the land use (location of the warehouses, platforms, hyper and supermarkets and generally all type of industry), the effects of the high density;
- the optimisation of the goods management (co-operation and consolidation, bin packing, full trucks, routing etc.) including the new logistics places and with the help of the new technologies;
- the regulation by the public authorities (congestion charging and road pricing, incitements towards green behaviour);
- the development of the e-commerce, home deliveries and relay points deliveries;
- the development of clean vehicles with zero emission.

External elements are those that will interact with the policies and measures, of which the impact cannot be directly controlled by public authorities. The most important external elements are the economic and the social contexts, at all scales (world-range, continental, national, regional, local, urban, suburban, etc.) and their trends can be hypothesised but not always correctly estimated. In the economic context, the petrol price fluctuations, the economic crisis and the new economies impacts have changed the established trends and have to be taken into account carefully because of this prediction difficulty.

The social context and more precisely the reactions of the inhabitants and the professionals to the changes proposed by the new policies have also to be studied. In any case, these elements become important in the analysis phases and in the scenario construction, where they are taken as facts. Moreover, the changes in the people behaviour have to be also taken into account, as the people practice of the city has an influence on the interactions of the urban system.

The urban form is the configuration of the urban area as a result of the politics and policy phases, and consists of the following elements:

- energy sources and motorization technologies;
- demographic and socio-economic characteristics of the population;
- demographic and socio-economic characteristics of the economic activities;
- organisation and management of the city operations.

From the elements listed above, different scenarios should be simulated. Obviously, interactions and synergies among the main elements of the urban form are expected. The simulation tools in long term issues for urban goods movement are in general mesoscopic models that are more detailed than macroeconomic models, and can be adapted to an urban area in order to estimate the main trends in a long-term horizon without long and difficult calculation processes. The simulation results can be progressively improved through an iterative feedback procedure.

5. How to choose the most pertinent method/tool for given objectives and resources?

A first conclusion of the proposed overview on methods and tools for policy making support can be that there is a wide variety of approaches, as well as it is for objectives and goals of policy makers. Moreover, the culture and specificities of each city increase the difficulty of proposing a unified and standard method (Ambrosini and Routhier, 2004) to deal with these objectives. In this section we propose to unify not the approaches for UGM planning decision support but a meta-method to choose the most suitable ones for a given target.

To choose the best method for a given objective, a policy maker has to take into account the following elements: the initial goals, the scope of application, the available data, the potential acceptability of stakeholders for a survey or interview, the cost and the aims of transferability of the researched method. Concerning the decision maker's goals, they will influence directly the type of method used and its granularity. For example, if the goal is to support a planning strategy, the and scope of application, a macroscopic prediction tool seems the most adapted, whereas to understand the potential breaks to the development of a new infrastructure a more microscopic method accompanied with data collection and analysis will be more suitable. Moreover, the scope of application has to be adapted to the nature of the entities to be studied in two dimensions, in space and time. For example, the goal of a town planner is to study road and rail transport infrastructures, the construction of logistic platforms, traffic management in existing structures or, lastly, congestion and the measurement of greenhouse gas emissions. On another hand, the goals of private carriers and other stakeholders like real estate companies are more related to profit and cost optimization, although the environmental component starts to be main stake also in the private sector.

Whatever the approach chosen, once the objective has been set, it is first necessary to define the variable to be observed and modeled; in other words, in our field this means identifying the factors generating mobility. For example, regarding the transport of persons, the object of observation used for decades has been the transport of an individual. It could also be the departure of each individual from their home or each motive for movement. Each of these choices has a certain number of advantages although results in a series of approximations that have be taken into account. In relation with the elements presented above, another important aspect to be taken into account is the granularity of the proposed method. The granularity of a model is essential to make the complexity of the phenomena to be modeled understandable without degrading the explanatory capacity of these data. More specifically, it appears important to avoid reducing the explanatory capacity of the data by over-aggregating or desegregating them, as long as the modeling method and the samples allow this. Regarding this, and according to the model, we observe three levels of data aggregation as a function of the model's objectives. Three approaches are predominant in literature: aggregated models, desegregated models and segmented models. Aggregated models are those that use data in an aggregated form, mainly to define O/D couples. Desegregated models are those that use much desegregated data, individuating elemental generation units like the establishment. Segmented models are those that are between the two other categories, using a zonal approach and activity clusters. Finally, micro-simulation produces desegregated data that allows traffic assignment.

The granularity of the chosen method is also related to the computational capacity of the hardware available and/or the cost of implementing coherent surveys to feed the databases. For example, a multi-agent model is disaggregated, so it needs more memory allocation and sometimes more parallel computing structures than an Econometric aggregated model does. Moreover, a Land-Use and Transportation Interaction (LUTI) model can require specific GIS software and graphic tools that require high computational power. To implement these tools a huge quantity of data is needed, which means expensive and complex surveys. A more macroscopic approach, or a very specific and local intervention will then need a low quantity of data, and specific surveys or macroscopic diagnosis tools will be enough and less expensive to meet the decision makers' goals. These aspects have to be taken into account when developing a model.

Last but not least, transferability and applicability is an important subject to think about. Local specific action will not be aimed to be transferred, but strategic and tactical actions will justify the investment on a general tool and an internal formation of the employees. For example, the French land development department has bought standard surveys and simulation tools and asks each regional office to have a figure able to use them. Then, they can produce studies and expertise support to local authorities in their planning processes.

To summarize those issues and propose a guide to practitioners on how using the presented approaches, we propose a non-exhaustive table as show below:

Table 1. Several examples of public policy objective and suggested tools to integrate UGM in decision making and planning actions

Objectives	Scale	Current tools
Understand the relations between demand and supply	Establishment, zone, urban area	Bottom-up models, Quantitative surveys
Prediction of traffic to enhance traffic flows	Streets at peak or off-peak hours	4-step models, ODS models, Tour based models
Estimate running road occupancy and environmental effects	Street, zone, urban area	Any model + conversion procedures
Estimate road occupancy impacts of stopped vehicles	Section, zone / temporal	Bottom-up models, vehicle counting
Understand the relations between pickups-deliveries and shopping trips	Zone, urban area	Discrete choice model or catchment area model combined with UGM model, specific surveys
Simulate urban development scenarios	Zone, urban area	None (Work in Progress)

6. Conclusions

This chapter explored the possible approaches that can support public policy decisions to integrate urban goods movement into strategic and tactical planning actions. Through an overview of methods and techniques we provide a set of advice and support elements to helps public policy makers in their choices concerning urban goods movement diagnosis and simulation. As shown in this chapter, the wide variety of methods and a lack of unification related to the different cultural and local contexts made the synthesis difficult and challenging. For these reasons, the non-exhaustive synthetic table proposed above will be a first step in decision support clarification, but we believe several further improvements can be still made.

The mixing of several techniques is a promising approach. However that needs to consider new challenges: to develop interaction procedures between each model in space, period and time, to develop data collection fitting with the global problem and to make possible the exchange between the various schools and languages of the stakeholders involved in the project. Moreover, the integration of new technologies and information sciences is fundamental to reduce costs and increase accuracy in urban goods diagnosis and simulation. Finally, few approaches are connected to GIS or other graphic interfaces. We believe that developing a tool that produces graphical results, mainly geo-located; will help public authorities on integrating urban goods in transport plans and to take conscience of the stakes and potential issues of this field.

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