SILOGUES: A simulation based methodology to estimate urban goods movements under various city planning strategies.

Despite all the efforts made to understand how a city may evolve under various urban planning strategies, some crucial issues still lack in an appropriated knowledge. Concerning urban logistics,public decision makers are,most of the time, hardly aware of the way how goods flows are organized in the city. As a consequence, actionsundertaken to improve this system are most of the time based on pseudo-arguments that may result in counterproductive measures. However, a certain level of predictability does exist even in such a complex system.

To address the problem of predicting the amount of goods that will have to be mobilized in the coming 10 to 20 years and the way this organization will be adapted to city planning policies, we propose a simulation approach. We present here the design of a decision support platform called SILOGUES that is based on a modular architecture. This platform makes use of tools that have been previously developed to predict the fluxes of goods in the urban area both at the B2B (Inter Establishment Movement or IEM) and B2C (End Consumers Movements or ECM) levels.It also incorporates recent worksthat attempt to predict how those indicators will evolve in response to various scenarios of urban development.

After a brief description of the requirements of IEM and ECM models, we will focus on two modules that give the user the ability to simulate a variety of scenarios of demographic and economic development. Then,we present further modulesthat deal withthe evolutions in urban logisticsand in shopping tripsbehaviours in response to new kinds of demand and new constrains.

IEM and ECM models

The IEM estimation is based on economic indicators. The FRETURB model[1], that performs this estimation, was built in conjunction with a set of surveys. That allowed the movement estimation to bebased on a description of the establishments according to their nature, activity (NACE code) and size (number of employees).Those data are available, for French cities, from the SIRENE file, yearly produced by INSEE. These indicators were used to build a 116strata classification of the establishments according to their behaviourboth in terms of urban goods flows generation and logistics means requirements.

The ECM estimation is based on both economic and socio-demographic indicators.The STG-SIM model[2] that performs this estimationmakes use,on each zone of the city, of a description of the retailing activity on the one hand and of the resident population on the other. Classic indicators for this second category aretotal population, employmentand motorization rate.

Both IEM and ECM models produce an estimation of road occupancy that usesthe passenger car equivalent as a common unit. To perform an estimation of this indicator the traveled distanceshave to be converted in time spent on road during both moving and standstill phases. This operation typically requires structural indicators of urban morphology such as density.

Growth and mutation of the socio-economic environment

In order to use these operational tools in a foresight purpose, ones has to embed them into a procedure that is able predict how the required indicators will evolve as a response to urban development. Thus, the relation of these core models(i.e. IEM & ECM estimations) to their input data (or indicators)needs to be as fundamental as possible. Only then, the relation depicted by the model will observe minimal, and hopefully negligible, variation through time. The set of indicators used by the core models is said,in this simulation approach, to refer to the socio-economic environment.To simulate how it will evolve through time, we use a two steps forecast.

Thefirst step is dedicated toforecasting a set of key variables. These key variables have to be chosen regarding to:

1. The availability of the data both at a fine scale and with a sufficient anteriority,
2. An acceptable level of predictability that can be used as a frame for a “business-as-usual” scenario,
3. Their ability to be usedin a robust way for the secondstep.

For these reasons it was chosen to concentrate on population, employment and density. Other variables that would not fulfill for example point 1 or 2 may be taken into account by expressing an explicit hypothesis on its evolution. Variables such as GDP or energy price typically belong to this category.

The second step aims at predicting the whole set of economic indicators needed by the core models thanks to the selected key variables.The SIMÉTAB model[3]is used to achieve this goal. It is based on a preliminary analysis performed on the whole set of French municipalities. According to economic and physical criteria related to the municipalities themselves and to their position into the urban area, a*n* class typology is realized. Then a regression model basedon the key variables is defined for each class. This model realize the prediction the economic indicators of a given municipality that would belong to this particular class.

A set of scenarios have been simulated to investigate the way how good movements may evolve under various assumptions of urban growth referring to different choicesin the development of the economic activity.

Evolutions in urban logistics and in shopping trip behaviors

Based on interviews with some of the major stakeholders of urban logistics[4], a panel of possible evolutions has been drawn. Their perceptionsof the evolution in this sector have been confronted. It was then used to identify the elements that may be integrated into coherent policies.

Different levels of decision are considered.They ultimately constitute different modules of the platform.

- A first level concerns decisions taken by the stakeholders themselves and refer to their logistics organization. It addresses questions such as fleet renewal or subcontracting.
- Another level concerns the decisions taken by the public authority. They can affect urban logistics whether directly (e.g. allow night delivery) or indirectly (e.g. Zero or Low Emission Zones).
- Between this two, an intermediate level concerns the way how different stakeholders may organize themselves in collaborative schemes. Scenarios such as logistics sharing and pooling typically belong to this category.
- Finally, a fourth level concerns decisions taken by the end consumers and deals with shopping trip behaviour evolutions.Amongst others, the questions about shifts ingoods transportationinduced by the generalization of e-commerce are addressed.

References

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