Name: Héctor Andrés López Ospina
Institution: Universidad de Chile
Title of the work: Dynamic and Hierarchical Microeconomic Models of Transport and land use: Analysis based on human behaviour and the theory of complex systems.
Overall project: Risk Habitat Megacity
Supervisors: Dr. Francisco Martínez, Dr. Cristián Cortés
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My PhD research consists on developing a dynamic equilibrium urban models, based in the integrated equilibrium static model and the role of the market of the land use and transport, using the body of tool developed in system dynamics literature. The principal goal is to innovate on the capability of urban models to analyze the long term sustainability of the public policies in the urban context, specially about limited and non-renewable resources (space, air, energy, time, etc.). Current models don't work adequately the non-linearity that is obtained by the consideration of all constrains in the long term, since they only estimate the equilibrium associated with future scenarios and then social benefits/costs according to the long term social rate are discounted.
The hypothesis of the research is that the microeconomic models of urban equilibrium can be extended to dynamic models, based on the structure of complex system, typical of the urban system by its hierarchical organization, with a large number and variety of agents (individuals, firms, schools, etc.) with independent choice and interactions that inducing nonlinear relationships. The urban system is also a large scale problem because of the large number of spatial options that make choice alternatives differentiable generating a large set where options are feasible. The number of consumption goods and services is also large and diverse, which can be consumed as activities. Additionally, this system is characterized by variables that stochastic changes at a very different speed, from the slow change on residential and job choices to the fast change on transport route or modes. All these elements are common to other ecological systems from where the system dynamic literature has built tools to model the long term path of the system.

Some restrictions and requirements of the dynamic models as described below.

1. Analysis of time and space scales. Micro and macro scales. Hierarchies: The agents or activities of the urban system have different scales of time or space (Example: slow changes in the choice of housing or space, choice of routes or means of transport), so it's necessary to describe and analyze the influence of various levels in temporary stability and sustainability.
2. Dynamic between the levels of the same scale. Dynamics between different scales.
3. Randomness inherent in each scale (shocks, externalities and random behavior).
4. Memory. (The urban system should be taken as a value-added memory and learning pass experiences.)
5. Inter-temporal equilibrium: the equilibrium of agents and balances system
6. Other features of the urban system that must be considered are: Factors that contribute to the long-term sustainability and its evaluation on the proposed models. Influence of regulations and policies. Dynamic interaction between societies and ecosystems. Changes of complex adaptive systems.

The objective of the communication in the RHM conference is submit a first draft of a microeconomic model of activities on a time multi-scale system, with the next consirations:

Let it be two time scales where activities take place, a macro (long run) level and a micro (short run) level. The decisions of the activities in the macro level may be residential location, work and study. For other hand, shopping, leisure and buying groceries are defined in the micro scale. A more precise definition of the set of activities in a given scale is one associated with the amount of resources committed, be them time and income; long term activities include those that require a large amount of available resources. In this context, a long term activity involves allocation of time and a destination choice made in the macro scale, while travel decisions, like mode and route choices, are made in the micro scale. The scale also defines the range of adjustments on choices that can be performed, because resources are limited at each scale.

The results to be presented are the analysis of the value of time, the evaluation of the model with restrictions of non-renewable resources (space, air, energy, time, etc.). Furthermore, some comments are shown on the inclusion in the model of elements as externalities and agents interaction.