PhD in Civil and Environmental Engineering

Research Title: Urban mobility simulation and planning

Funded by	Energy Center Lab (EC-LAB) of Politecnico di Torino

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Context of the research activity	How can we provide our communities with an even greener and more secure energy supply? Which are the key energy technologies and infrastructure to develop or consolidate? Which are the characteristics of the city of future to become a more and more sustainable one? A new multidisciplinary laboratory will bring together the required skills to develop models and scenarios for the new energy transition, with the aim to design more interconnected energy systems, and to foresee their behavior and impact on different spatial and temporal scales. The economic and environmental impact of the technologies and energy infrastructures used, and the role of the user in the management of energy flows will be an integral part of the activities carried out. Urban energy planning and transition is the starting focus of the EC-Lab. Overcoming the challenges of high population growth, increasing urbanization rates and the resulting increase in energy demand and pollution in urban areas requires a clear understanding of demand diversity and its association with the daily activities of the urban population at particular times and locations. Urban mobility simulation and planning is a key activity to undertake in the above-described framework. According to EU statistics, urban mobility accounts for 40% of all CO_2 emissions of road transport and up to 70% of atmospheric pollutants from transport.

Objectives	The key objective is to develop a simulation platform that will enable the evaluation of sustainable urban mobility scenarios. The simulated scenarios will enable to identify policy measures that can alleviate traffic congestion, overall CO_2 emissions from the urban transport sector, and improve air quality through the reduction of atmospheric pollutants networks. The study will encompass

	passenger' cars as well as (public) mass transit modes. Energetic and environmental assessment of emerging and breakthrough mobility services (carpooling, car sharing, autonomous driving) and their impact on urban mobility will be performed. Further research activities are detailed below: • Study of the interactions between human activity, urban energy demand and the environment. This objective will require an extensive work on data collection and conditioning about urban mobility modes, patterns and paths (data will be acquired via sensors, available databases and surveys). • Development of predictive tools incorporating human behavior and mobility activity, for supporting effective energy reduction and air quality policies in urban areas. • Study of sustainable mobility modes and related infrastructure and their impact on the energy use and the environment in collaboration with the EC-LAB activities. • Early implementation of modelling tools supporting sustainable mobility schemes and policies at the urban level, in collaboration with the municipality of Torino.

Skills and competencies for the development of the activity	• Solid background in the areas of energy, environment and social sciences. • Previous experience in energy systems modelling, air pollutants dispersion modelling, programming, and GIS-based elaborations. • Prior experience with multi-disciplinary team-working.