Integrating biodiversity and mobility analyses of a metropolitan ecosystem: the case study of Milan

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The ever-changing urban environment of a metropolis is almost exclusively shaped by the needs and the habits of humans. Rapid but long-term land-use changes coupled with the high intricate patterns of population mobility occurring even on very short (i.e. hourly) temporal scales lead to a quite diversified time-varying urban ecosystem. Such an urban ecosystem can interestingly be explored with tools that ecologists typically adopt to analyze biodiversity in a natural environment.

In this study, we considered the city of Milan (Italy) and we integrated beta-diversity indicators, used to compare the land-use mix in the different neighborhoods of the metropolis (Municipi), with human mobility patterns that allowed a better understanding of the intra-metropolitan connections through time. Data on land uses at high spatial resolution for the year 2015 were obtained from the DUSAF database of the Lombardy Region, while human mobility patterns were reconstructed from mobile phone traces available from the largest open multi-source dataset of call detail records (CDRs) released from the '2014 Telecom Italia Big Data Challenge'.

Results consist in Urban Diversity Maps which revealed the existence of complex spatio-temporal patterns overlapping the somehow expected concentric zone structure of the city, due to its historical structure and development. Specifically, it was possible to identify which areas are more similar/dissimilar in terms of land-use composition and which other are linked by human mobility. These outcomes could be important for policy makers and could allow them to improve strategic development plans accounting for the needs of a changing city.