BIKE-SHARING STATIONS IN URBAN AREAS AND PROXIMITY: A MULTI-CRITERIA APPROACH

Michele Rabasco,[1] **Caterina Malandri,**[2] **Roberto Patuelli,**[3]
Aura Reggiani,[4] **Rebecca Rossetti**[5]

ABSTRACT

Bike-sharing systems are attracting considerable interest in the literature for their potential key role in encouraging the transition from car-based private transport to more sustainable mobility, particularly in the urban context. The success rate of bike-sharing schemes depends on many factors, including demographics, morphology, and service design. When designing a bike-sharing service, one of the first issues that arise is where to locate the bike stations.

This paper aims to propose a new location model for bike stations, based not only on spatial economic factors but also on factors related to the robustness of the urban public transport network. Such a model can be applied to a set of feasible alternative sites to install bike-sharing docks. The hypothesis behind this choice is that, given the complementarity between public and shared transport, implementing bike-sharing stations near public transport stops would increase the integration between the two modes.

Our aim is to guide decision-makers in ranking these alternative sites. Since this is an optimization problem, we use the Analytic Hierarchy Process (AHP) within a multi-criteria analysis (MCA) to identify the most suitable locations for new bike-sharing stations. AHP is a method grounded in mathematical and psychological principles that offers a systematic approach to handling intricate decision-making scenarios through pairwise comparisons (Saaty, 2008).

In particular, we perform our analysis by considering the following criteria (derived from the literature): a) proximity of bike-sharing stations to points of interest/amenities; b) socio-demographic characteristics and pollution rates of the surrounding areas; and c) network-based features to explore the robustness of public transport networks.

Concerning the proximity criteria, we adopted four (quantitative) measures: proximity to green areas, proximity to sports/entertainment centres, proximity to schools, and proximity to tourism areas.

[1] *Department of Economics, University of Bologna, Italy. E-mail: michele.rabasco2@unibo.it*
[2] *Department of Economics, University of Bologna, Italy. E-mail: caterina.malandri2@unibo.it*
[3] *Department of Economics, University of Bologna, Italy. E-mail: roberto.patuelli@unibo.it*
[4] *Department of Economics, University of Bologna, Italy. E-mail: aura.reggiani@unibo.it*
[5] *Department of Economics, University of Bologna, Italy. E-mail: rebecca.rossetti2@unibo.it*

It should be noted that the weights of all the criteria are based on the answers from a questionnaire addressed to a group of experts on sustainable mobility. These expert opinions allow us to establish different scenarios, and, consequently, the hierarchical importance of the alternatives ensuring, by means of AHP, a comprehensive and balanced evaluation.

This approach will be applied to the transport stations of selected European cities. It can be considered a prototype model for further applications in urban areas.

References

Saaty, T. L. (2008). Decision-making with the analytic hierarchy process. *International journal of services sciences*, *1*(1), 83-98.

Keywords: *Bike-sharing, Public Transport**, Multi-criteria Analysis, Proximity, Urban Areas*