Submission ID: 105

iCSC International Cycling Safety Conference

Designing safe e-scooter sharing services: a spatial approach

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Keywords: micromobility, GIS, surrogate safety measures

In the last few years, new micromobility shared services, such as e-scooters sharing, are spreading all over the world as smart mobility services that allow users to travel short to medium distances with low human effort, due to their electric powered vehicles.
Their spreading and regulation vary a lot across different parts of the world. In Italy, e-scooters have become legal only very recently, and the debate around their regulation is very lively.
In this respect, safety is an open issue: dedicated and/or allowed infrastructures are not well-defined, demand is not well-known, there are poor statistics on accidents (due to their recent spread), and interaction with other road users is still not regulated. A further issue relates to the safe parking of vehicles: the free-floating feature, which is one of the peculiarities of these services, often generates unsafe and unproper behaviours by users who leave vehicles in spaces where they could interfere with other road users, and create problems of urban area degradation. Besides, even if e-scooters sharing do not generally have physical stations for users to park the vehicles after their use, the service can be designed with some pick-up points where the vehicles are relocated by the operator, in order to guarantee a good coverage of the service. These pick-up points are likely to be good points of origins of demand, so the location problem becomes an important issue, together with a deep analysis of the design features for dedicated infrastructures able to respond to safety needs.
Based on this premise, the purpose of this study is to present a multi criteria spatial approach to design an e-scooter sharing service based on a spatial analysis including safety issues, in the context of a middle size Italian city. The methodology will provide with an indicator to evaluate the most compatible routes and itineraries for such an innovative service. This will be done by taking into account surrogate safety information related to motorized traffic volumes and speeds, socio-economic characteristic, presence of points of interest and transport nodes, morphological characteristics (e.g. slopes) and the pleasantness of the surrounding environment. The location-allocation of e-scooter stations will follow a logic based on proximity to attraction poles and main nodes of public transport, and population distribution. The methodology will be applied to the case study of Catania, a medium-size city located in the south of Italy, with poor no-motorized dedicated infrastructure facilities, and a fast spreading of private e-scooters, so it can be considered as a breeding ground for implementing such an innovative shared mobility solution.