Title: The use of alternative transport means in city centers: insights from an observational survey

Authors: Victoria Gitelman, Technion, Israel, trivica@technion.ac.il
Anna Korchatov, Transportation Research Institute, Israel, robyc@technion.ac.il
Roby Carmel, Technion, Israel, grabarn@technion.ac.il
Alfred Shalom Hakkert, Transportation Research Institute, Israel, hakkert@technion.ac.il

Author keywords: Alternative transport means, urban intersections, presence, behaviour

Background
Alternative transport means (ATM) such as e-bicycles, electric scooters, mobility scooters and segways - were designed to improve mobility of individual road users. ATM are suitable for short trips in urban areas, with associated benefits of improved accessibility, reduced traffic congestion, lower energy consumption, etc. However, the urban space is not adapted to incorporate the new means. The ATM use traffic settings built for other road users and not always in accordance with traffic rules, which leads to conflicts between various road users and increases injury. There is a need to characterize the current situation and to consider solutions for the ATM integration into urban space.

Aim
This study collected empirical data aiming to estimate the scope of ATM use in Israeli cities and to characterize their behaviors in interaction with urban settings and other road users.

Method
The data were collected by means of an observational survey at 50 representative urban intersections, in nine cities. The sample included 10 roundabouts, 10 signalized intersections on urban arterials and 30 on collector streets; all in vicinity of city centers. The survey was conducted during the main hours of urban activities, 8 AM-8 PM. Three layers of data were collected: (1) full counting of the ATM entering a junction; (2) periodic sampling of background data – motor vehicles, pedestrians, regular bicycles, from each direction; (3) main characteristics of the ATM users (age group, gender, place of riding, etc.). The data were collected manually, by two trained observers, who stayed 6 hours at each site.

The count data were processed to produce hourly figures, per site and per type of sites. The indicators of presence of various ATM were estimated relative to vehicle and pedestrian traffic. Pearson correlations were examined and statistical models were adjusted to explore the relationships between the presence of various road users. Characteristics of the ATM users were analyzed to create their profiles, at various types of sites.

Results
The average hourly numbers of e-bicycles at signalized intersections were around 50, at roundabouts – 23, but vary widely; at some sites, about 80 e-bicycles were observed, per hour, on sidewalks or on the roadway. The average hourly numbers of other ATM types were lower, in the range of 1-3. The extent of e-bicycle traffic was generally similar to that of regular bicycles. At all types of sites, the presence of regular and e-bicycles was low related to motor vehicle traffic, with average ratios of 0.5%-0.6% for regular bicycles, 0.7%-1.3% for e-bicycles. The presence of both bicycle types was more tangible on sidewalks: related to pedestrian traffic, they constituted about 2% at roundabouts, 6%-8% at signalized intersections on urban arterials and 4% - on collector streets. As found, more e-bikers choose to travel on roadways at roundabouts and on collector streets, while on arterial roads...
they prefer to travel on sidewalks. Also, more mobility scooters were observed at roundabouts than at signalized intersections. Apparently, such results reflect a tendency to choose "safer" travel conditions.

The correlation analysis and the models for predicting the ATM presence showed that regular bicycles, e-bicycles and all ATM together appear at the same sites of the city as motor vehicles and pedestrians, i.e. indicating a direct relation between the presence of “traditional” and new road users. A difference was found for mobility scooters, which mostly appeared at the same sites as pedestrians, but their numbers dropped at sites with higher vehicle traffic. In addition, at sites with higher traffic volumes, more e-bicycles rode on sidewalks.

Among the users of e-bicycles, scooters and segways, children up to 18 presented about a third, while the majority were young adults aged 19-34 (similarly to some European studies). As expected, the age groups of mobility scooter users were different, with the majority being 65+. Most ATM riders did not use helmets, thus increasing injury risk.

Conclusions

The ATM volumes in the cities are not negligible. ATM are used for the same travel destinations as traditional transportation means. For safer ATM integration in the cities, more bicycle facilities and wider sidewalks are needed, together with enforcement and publicity.