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Trip Generation by Transportation Mode of Private School, Semi-private and Public. Case Study in Merida-Venezuela

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Abstract

The trip generation model (TGM) is the first step in transportation forecasting, this is useful for estimating travel demand because it can predict travel from or to a particular land use. Typically, the analysis focuses on residential trip generation as a function of the social and economic attributes of households, but nonresidential land use suggests others variables. Travel generator poles such as Private school, Semi-private, and Public; have not been studied in Venezuela. The TGMs shows by the Institute of Transportation Engineers (ITE), EE.UU, are typically used and could be not appropriate. By using stepwise regression and transformation of data, were found high correlation coefficients and substantial improvements in the variability of data from several schools. The trip generation rates (TGRs) by transportation mode: walking, motorcycle, public transport, and cars, can be compared and be included in the Ibero-American Network of travel attractor poles.

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1. Introduction

The TGRs allow prediction of land-use behavior, specifically in a place with uses of similar characteristics, i.e., allows foreseeing the impact on the adjacent street prior to occupation land and to implement measures that mitigate potential impacts. TGMs allow determining specific accessibility requirements, estimating the future traffic intensity, and supporting proposals of improvements for transportation systems. Among the major limitations found in

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Venezuela and Colombia to make these forecasts is the lack of data for an adequate estimation. As a result, the rates of the Institute of Transportation Engineers (ITE), based on non-local data, are widely used. On the other hand, local adaptation sometimes requires the acquisition of data on existing structures with similar characteristics, which represents a great cost. The Trip Generation Handbook (2001) recommends studies of local TGRs, for this reason, the University of the Andes (Venezuela) in conjunction with Bolivarian Pontifical University (Colombia), have initiated this study to obtain TGRs to different land uses.

A greater effort is required to consolidate a wide database applicable to the local environment and that spans to a large number of land uses and cities. The results show models that can be used to estimate traffic intensity by transportation mode applicable to different schools. Thus, TGRs relative to 32 schools were determinate; 11 private, 10 semi-private, and 11 public schools, all located in Mérida-Venezuela. Surveys were applied to samples of the population in each school, which yielded different models according to the variables used by the ITE. Dataset allows determining the trip intensity generated by each transportation mode according to its distribution percentage. The results could be used to predict trips generated by schools located in similar cities, and it should be done an effort to add new land uses in future works.

Nomenclature

Ti	expected trips by mode i, full students and employees of the school
ti	number of trips by mode i, of the pupils and employees sample
P	population, students and employees of the school
m	sample size, students and employees of the school
TGRi	trip generation rate by model i for school
IV	independent variable associated with the school
TGRi-pond	pondered mean of trip generation rate to the mode i
CarTrips	number of trips in vehicle/hour
S:	number of students (variable used in multiple regression)
E:	number of employees (variable used in multiple regression)
C:	cars
M:	motorcycle
W:	walk
PT:	public transport
PMR:	pondered mean rate
SD:	standard deviation
VC:	variability coefficient

2. Literature Review

It gives continuity to the study of Quintero et al. (2014) who obtained TGRs and TGMs for trips estimation in private and semi-private schools, where the models depend on of the students and employees. For data collection, surveys were applied to a sample of 22 schools and the modal distribution for private and semi-private schools showed that the most used mode was the car followed by public transport. The rates were obtained with the use of total trips by modes such as cars, school vans, and taxis, and the TGMs were obtained by step-wise regression and Box-Cox optimization in the private school case, where students plus employed was explicative variable, while for semi-private schools was only students. Grando et al. (2014) analyzed mobility on the Federal University in Brazil; they carried out a diagnosis of the current situation with regard to transportation modes and entry-exit of the campus. Work was based on origin-destination surveys, where it characterizes the population and the arrival-departure trips. The study showed that the trips were done 56 % in car and 23 % on public transport, followed by walking and cycling mode. They found low efficiency and poor planning of public transport which stimulates car use and motorcycle, and they say that quantify the trips is useful to support improve measures of infrastructure around to the study center and to ensure short-term mobility.

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