DEVELOPMENT OF PHILIPPINE TRIP GENERATION RATES

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Abstract: The practice of transportation engineering and planning has employed trip rates to determine the number of trips generated by developments. Trip generation serves as an input to modeling transportation requirements and traffic flows influenced by the development. For example, a condominium may directly impact traffic within a 10 km radius. Meanwhile, a shopping mall can impact an area of over 50 km in radius. These trips generated and attracted are represented by standard rates for trip generation like those published by the Institute of Transportation Engineers. This paper discusses the trip rates used in transportation research and practice in the Philippines. The paper also describes the current efforts in the development of trip rates for various land use types. An assessment of issues and concerns pertaining to local trip and rates are examined, and recommendations for future research directions are also presented.

Keywords: trip generation, traffic analysis

1. BACKGROUND

The practice of transportation engineering and planning has employed trip generation rates to determine the number of trips produced and attracted by developments. Trip generation serves as an input to modeling transportation requirements and traffic flows influenced by the development. For example, a residential condominium will directly impact traffic within a 10 km radius. Meanwhile, a shopping mall can impact an area of over 50 km in radius. Thus, it is expected that most trips generated or attracted by the development would be captured within these influence areas. These trips generated and attracted are represented by standard rates for trip generation such as those published by the Institute of Transportation Engineers (ITE).

This paper discusses the development of trip generation rates for use in transportation practice and research in the Philippines. The country currently does not have a trip generation manual and various sources have been utilized by researchers and practitioners alike. Such a situation breeds much inconsistency in the assessment of traffic impacts since analysis results would significantly vary with different rates used. Thus, this paper includes a review various rates currently used in traffic analysis. Issues and concerns pertaining to local trip rates are discussed in the context of suitability to transportation and traffic analysis.

2. OBJECTIVES

The study has the following objectives:
a) To collect and document data pertaining to trip generation in the Philippines;
b) To review the trip generation rates used by local practitioners and researchers in analysis;
c) To develop methodology for deriving trip generation rates; and
d) To formulate and recommend research directions pertaining to trip generation.

Ultimately, a trip generation manual for the Philippines is desired, similar to what is published and regularly updated by the ITE. Such a manual would allow for a certain degree of uniformity for inputs in analysis.

3. CONTEXT AND STUDY FRAMEWORK

The study is best seen from the context of the following figure, which shows typical development types as nodes and interconnected by various links.

![Figure 1 Trip generation by various development types](image_url)

Trip generation refers to the production and attraction of trips by any type of development. These trips translate into traffic along links connecting the nodes. At the macroscopic level, nodes may airports representing geographical areas (e.g., whole cities, provinces, regions, or countries) while links may be air lanes. In this study nodes would be residential subdivisions and condominiums while links are typical roads.

The Institute of Transportation Engineers (ITE) publishes a manual on Trip Generation (1997) and Trip Generation Handbook (2004). These have served as fundamental reference material for trip generation rates used in transportation engineering and planning practice. They contain trip generation rates for all kinds of land uses and facilities, indicating the parameters on which trip generation are dependent.

The ITE has developed trip generation rates using simple regression models. It regularly requests for additional data from its members to update the trip rates it publishes. Similar
models can be developed in the Philippines considering that ITE rates are based on US samples, reflecting American trip and parking patterns. Such may not necessarily be applicable to Philippine conditions and trip-making behavior, although the ITE recommends a method for incorporating local trip rates to the ITE rates.

Research on traffic impact assessment (2001) has cited trip generation as one of the criteria for requiring impact analysis. Setting thresholds in requiring certain analysis is common for engineering and planning analysis. As such, the parameter (in this case trips generated or attracted) should be reliable. This reliability would eventually be passed unto the analytical process as well since trip generation values would ultimately be used in forecasting and developing scenarios in impact assessment.

4. TRIP GENERATION RATES

Trip generation rates used in traffic studies are the fundamental inputs to determine the impacts of developments on the transportation and traffic along road network within their influence/impact areas. The trip rates are dependent on the intensity of development, where intensity is generally associated with density. As such, high-rise residential condominiums are expected to generally produce and attract significantly different larger number of trips as compared with a residential subdivision comprised of single-detached units.

The trip generation rates shown in Table 1 were derived from the ITE Trip Generation Manual (1997). Trip rates are stated in vehicle trip ends and given for different land uses for the peak periods including directional distributions and ranges. Peak hour trip rates are identified for the morning, afternoon and typical Saturdays. The ITE manual also contains trip rates stated in terms of typical weekdays, Saturdays, and Sundays. That is, trip generation rate are also given in terms of “trips per day.”

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Peak Period</th>
<th>Average</th>
<th>Range</th>
<th>Standard Deviation</th>
<th>Unit</th>
<th>% In</th>
<th>% Out</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Min</td>
<td>Max</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Density</td>
<td>AM</td>
<td>7.70</td>
<td>3.30</td>
<td>22.70</td>
<td>9.10</td>
<td>/Ha</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>10.20</td>
<td>4.20</td>
<td>29.80</td>
<td>10.50</td>
<td>/Ha</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>Sat Peak</td>
<td>9.40</td>
<td>5.00</td>
<td>17.50</td>
<td>9.90</td>
<td>/Ha</td>
<td>54</td>
</tr>
<tr>
<td>Medium Density</td>
<td>AM</td>
<td>19.25</td>
<td>8.25</td>
<td>56.75</td>
<td>22.75</td>
<td>/Ha</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>25.50</td>
<td>10.50</td>
<td>74.50</td>
<td>26.25</td>
<td>/Ha</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>Sat Peak</td>
<td>23.50</td>
<td>12.50</td>
<td>43.75</td>
<td>24.75</td>
<td>/Ha</td>
<td>54</td>
</tr>
<tr>
<td>High Density</td>
<td>AM</td>
<td>38.50</td>
<td>16.50</td>
<td>113.50</td>
<td>45.50</td>
<td>/Ha</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>51.00</td>
<td>21.00</td>
<td>149.00</td>
<td>52.50</td>
<td>/Ha</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>Sat Peak</td>
<td>47.00</td>
<td>25.00</td>
<td>87.50</td>
<td>49.50</td>
<td>/Ha</td>
<td>54</td>
</tr>
<tr>
<td>Commercial</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Retail</td>
<td>AM</td>
<td>110.87</td>
<td>10.76</td>
<td>974.13</td>
<td>150.69</td>
<td>/Ha GLA</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>402.57</td>
<td>73.19</td>
<td>3150.60</td>
<td>293.85</td>
<td>/Ha GLA</td>
<td>48</td>
</tr>
<tr>
<td></td>
<td>Sat Peak</td>
<td>534.97</td>
<td>157.15</td>
<td>1971.95</td>
<td>334.76</td>
<td>/Ha GLA</td>
<td>52</td>
</tr>
<tr>
<td>Supermarket</td>
<td>AM</td>
<td>349.83</td>
<td>107.64</td>
<td>837.43</td>
<td>334.76</td>
<td>/Ha GLA</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>1238.93</td>
<td>572.64</td>
<td>2184.00</td>
<td>480.07</td>
<td>/Ha GLA</td>
<td>51</td>
</tr>
<tr>
<td></td>
<td>Sat Peak</td>
<td>1318.58</td>
<td>579.10</td>
<td>2432.64</td>
<td>498.37</td>
<td>/Ha GLA</td>
<td>51</td>
</tr>
<tr>
<td>Office/BPO</td>
<td>AM</td>
<td>167.92</td>
<td>64.58</td>
<td>643.68</td>
<td>150.69</td>
<td>/Ha GFA</td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>PM</td>
<td>160.38</td>
<td>52.74</td>
<td>687.81</td>
<td>147.47</td>
<td>/Ha GFA</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Sat Peak</td>
<td>44.13</td>
<td>17.22</td>
<td>168.99</td>
<td>73.19</td>
<td>/Ha GFA</td>
<td>54</td>
</tr>
</tbody>
</table>

Table 1 Peak period trip generation rates, in vehicle trips (ITE, 1997)
Table 1 continued

<table>
<thead>
<tr>
<th>Institution</th>
<th>AM</th>
<th>PM</th>
<th>Sat Peak</th>
<th>AM</th>
<th>PM</th>
<th>Sat Peak</th>
<th>AM</th>
<th>PM</th>
<th>AM</th>
<th>PM</th>
<th>Sat Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>College</td>
<td>0.21</td>
<td>0.21</td>
<td>0.26</td>
<td>0.15</td>
<td>0.20</td>
<td>0.26</td>
<td>0.21</td>
<td>0.21</td>
<td>80</td>
<td>20</td>
<td>/Student</td>
</tr>
<tr>
<td>High School</td>
<td>0.13</td>
<td>0.108</td>
<td>0.283</td>
<td>0.26</td>
<td>0.46</td>
<td>0.21</td>
<td>0.21</td>
<td>30</td>
<td>70</td>
<td>/Student</td>
<td></td>
</tr>
<tr>
<td>Church</td>
<td>77.50</td>
<td>71.04</td>
<td>86.11</td>
<td>54.90</td>
<td>22.60</td>
<td>8.61</td>
<td>109.79</td>
<td>230.35</td>
<td>122.71</td>
<td>/Ha GFA</td>
<td></td>
</tr>
<tr>
<td>Village Center</td>
<td>142.08</td>
<td>188.37</td>
<td>134.55</td>
<td>116.25</td>
<td>148.54</td>
<td>223.89</td>
<td>2510.14</td>
<td>72 50</td>
<td>26</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Park</td>
<td>8</td>
<td>-</td>
<td>-</td>
<td>30</td>
<td>-</td>
<td>-</td>
<td>16</td>
<td>-</td>
<td>/Ha</td>
<td>80 20</td>
<td></td>
</tr>
<tr>
<td>Golf Course</td>
<td>2.22</td>
<td>2.74</td>
<td>4.59</td>
<td>1.06</td>
<td>1.67</td>
<td>1.61</td>
<td>4.52</td>
<td>1.48</td>
<td>/Ha</td>
<td>79 21</td>
<td></td>
</tr>
<tr>
<td>Industrial Park</td>
<td>88.26</td>
<td>92.57</td>
<td>37.67</td>
<td>12.92</td>
<td>13.99</td>
<td>33.37</td>
<td>245.42</td>
<td>317.54</td>
<td>64.58</td>
<td>/Ha</td>
<td>86 14</td>
</tr>
</tbody>
</table>

What are actually seen in the ITE Trip Generation manual are figures for different land use types. The figures include ranges of values (minima and maxima), the applicable period for the trip rate (weekday, AM peak hour, PM peak hour, etc.), the independent variable (e.g., GFA, number of students or employees, etc.) used, the number of specimens used to establish the rates, and other pertinent information on the trip generation rates. Examples of trip generation rates and regression models for a typical land use are shown in Figures 2 and 3.

Trip generation rates used in local studies are expressed in person trips. These are converted to equivalent vehicle trips using assumed vehicle occupancy rates. Person trips are first classified into private and public trips. Trips expected to use public transport are further distributed to the different public transport modes (e.g., bus, jeepneys, train) using estimated mode splits. Examples of local trip generation rates are provided in Table 2.

Table 2 Example of local trip generation rates (in person trips)

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Trip Production</th>
<th>Trip Attraction</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Office</td>
<td>0.0027</td>
<td>0.0176</td>
<td>Trips/m² of GFA</td>
</tr>
<tr>
<td>Commercial</td>
<td>0.0576</td>
<td>0.0735</td>
<td>Trips/m² of GFA</td>
</tr>
<tr>
<td>Hotel</td>
<td>2.00</td>
<td>2.55</td>
<td>Trips/hotel room</td>
</tr>
<tr>
<td>Residential</td>
<td>2.42</td>
<td>1.52</td>
<td>Trips/dwelling unit</td>
</tr>
<tr>
<td>Mixed Use</td>
<td>0.0172</td>
<td>0.0243</td>
<td>Trips/m² of GFA</td>
</tr>
</tbody>
</table>

Figure 2 Example of A.M. trip generation rates and equation (ITE, 1997)

In case of some local traffic studies, the trip rates may not be provided in the reports. Rather, only the estimated total trip production and attraction are given for the critical peak periods (i.e., AM and PM peak). Table 3 shows typical information on trips produced and attracted by a major traffic generator, in this case a large shopping mall.

<table>
<thead>
<tr>
<th>Generated/Attracted Trips</th>
<th>AM Peak</th>
<th>PM Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>IN</td>
<td>OUT</td>
</tr>
<tr>
<td>Person Trips</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private Mode</td>
<td>2,099</td>
<td>1,042</td>
</tr>
<tr>
<td>Public Mode</td>
<td>4,898</td>
<td>2,431</td>
</tr>
<tr>
<td>Equivalent Private Car Trips (pcu/hr)</td>
<td>1,050</td>
<td>521</td>
</tr>
</tbody>
</table>

5. OBSERVATIONS AND IMPLICATIONS

5.1 Issues and Concerns

The rates shown in this paper are representative and illustrative of the trip generation parameters employed by local transportation engineers and planners. These were culled from established references (i.e., ITE manuals) and consultants’ study reports. In the former case, ITE publications are commercially available but not locally (in the Philippines). As such, ITE manuals are usually expensive to acquire, often only availed by the larger firms and university libraries. Few firms would have the latest edition; with some relying on editions published in
the 1980’s. It should be noted that newer editions have been heavily updated and would contain trip and parking rates that are significantly different from those in the old versions. The revisions were made following trends in the field of transportation as well as progress in design and analytical concepts and tools.

In the latter case of consultants’ study reports, an observation of particular concern is the lack of proper referencing for parameters used in trip and parking generation. For parking, studies would usually point to the minimum requirements stipulated in the Philippine National Building Code and, if applicable, the guidelines of associations like the Makati Commercial Estate Association (MACEA) in the Makati CBD of Metro Manila. While following the code is only logical and may not be easily disputed, it has been established that minimum requirements are usually insufficient, especially for large trip generators (Shoup, 1999). Then there are also other situations that may be taken into consideration. Among these are instances of residential condominiums where although there are enough parking spaces provided (minimum or more), they are not occupied due to prohibitive cost of a slot.

Few reports refer to the ITE trip generation rates. Often, trip rates used in analysis are claimed to be locally developed values. Yet, there is no mention of their origin or basis. The client, reviewer or researcher is left in the dark as to who developed the rates. Again, such practice is problematic since there is no way to ascertain the validity of “local” parameters.

A comparison of local rates used in local traffic studies would be futile if the origins of these rates are not established. Note the tendencies of local consultants of borrowing or copying rates used by other consultants in their projects. Such practice perpetuates the possibility of using inappropriate trip generation rates as even clients including reputable firms or developers would even insist that the consultants they engaged use rates found in their archive of projects.

5.2 Availability of Trip Generation Data for Analysis

Government agencies like the Metro Manila Development Authority (MMDA) do not have copies of the traffic studies undertaken for major traffic generators. As such, they generally do not have information on trip rates, making it impossible for them to assess the validity of input parameters to traffic analysis undertaken to establish traffic management schemes for the traffic generators.

The Environmental Management Bureau (EMB) may not necessarily be equipped with the capacity to evaluate trip rates. However, under the Philippine EIA process, it is the EMB that would require major developments to undertake traffic impact studies for specific developments or projects. Reports submitted to the EMB for evaluation are not generally made available to the public though they are technically for public consumption due to the nature of the reports (e.g., public interest).

Similar to the EMB is the Laguna Lake Development Authority (LLDA), although their area of responsibility is limited by the catchments of Laguna Lake, the largest body of freshwater in the Philippines, which includes Metro Manila and provinces to its south. Like the EMB, the LLDA may require TIA’s and would be another source of trip rates in cases where the agency has primacy over the EMB.
Research on trip generation may also have to rely on the generosity and cooperation of consultants and similar entities for information on trip and parking generation parameters. This given, it is generally difficult to solicit such information especially if the trip rates are to be derived from sensitive projects (e.g., large traffic generators).

5.3 The need for the development of local trip generation rates

In the succeeding sections, a methodology is presented for the development of trip generation rates for the Philippines. The methodology is to capture all types of trips and would not be limited to those utilizing private transport. As such, a more robust approach to the development of suitable trip rates is provided including emphasis for cooperation among entities especially government agencies.

Since the development of trip generation rates can be an immense undertaking, it is necessary also to initiate the endeavor by focusing resources on simpler or single use development types. In this case, residential developments, particularly villages with single, detached units are considered.

6. METHODOLOGY

6.1 Data collection

Primary data collection will follow the step-by-step procedure outlined by the ITE (2004). The trip generation study design includes the following components:

- Identification of land use to be surveyed;
- Determination of sample size (i.e., number of survey sites);
- Determination of appropriate sites;
- Selection of independent variable data to be compiled;
- Development of traffic counting methodology; and
- Determination of survey period.

Residential land uses have already been identified as the focus of this study for the initial stage. These include residential subdivisions. These developments are regarded as relatively simpler than other types of developments (e.g., industrial, school, commercial, office, etc.), thus allowing for a less complicated application of established methodology adapted for local conditions.

The sample size for trip generation studies need not be large. The minimum number of sites required for establishing and validating trip generation rates is three, for linear regression to be valid at the least. It is, however, preferable to have data on five sites (ITE, 2004). Note, however, that sites also need to be classified and for this study, the basic classifications were two: open and gated. It would also be possible for sub-categories to be identified but these would be dependent on the availability of data as well as cooperation from respondents.

All the target five sites are gated subdivisions that are closed to through traffic. It is also preferred that all subdivisions should be developments of at least 30 hectares and have at least 200 occupied single-detached or town house units. The latter criteria are based on the current
policy of the Housing and Land Use Regulatory Board (HLURB) that requires residential subdivisions with areas of greater 30 hectares to submit a TIA.

Both private and public trips were considered in the study. Trips will be measured in terms of the number of vehicles and persons entering and exiting a residential development. Private trip generation may be estimated by counting private vehicle entries and exits over 24-hour periods and surveying vehicle occupancy. Public trip generation will be estimated by measuring person trips entering and exiting the development using public transport. It is expected that private vehicle trip generation will be high for upper and middle class subdivisions/villages while public trips would be higher for middle to lower class areas.

Data forms for the surveys will be Philippine adaptations of the forms recommended by the ITE. The forms include all data necessary for the survey and their use will ensure standardization of data collection. This standardization will also allow for the data to be included in the existing ITE database. Figures 4 and 5 show typical survey forms used in the surveys.

Field surveys in subsequent phases of the study (i.e., for other land use or development types) will employ the same instruments. The use of these forms for data collection for all land use types is intended for establishing standard forms.

Secondary data collection entails the compilation and review of trip generation rates related to residential developments. The primary source for such data would be the Environmental Management Bureau (EMB) of the Department of Environment and Natural Resources (DENR). Environmental Impact Assessment (EIA) reports are submitted for developments requiring an Environmental Compliance Certificate (ECC).
Secondary data collection would consist of book and journal reviews as well as compilation of published and circulated materials from pertinent agencies (e.g., HLURB, EMB, MMDA, and LLDA). Materials relevant to this research would especially include Environmental Impact Assessment (EIA) reports that contain transportation and traffic components, or annexed reports containing transportation or traffic studies.

6.2 Development of trip rates

Characterizing primary and secondary data

The methodology for estimating trip generation rates for residential developments closely follow established methodology developed by the ITE. Data forms for field surveys are readily available from the ITE Trip Generation Handbook and will be adapted to Philippine conditions. The guiding principles for estimating trip generation are provided by the ITE Handbook. These recommend the development of local rates should the established rates be insufficient due to lack of data samples or obvious and significant differences in conditions between the locality and the established ITE land use classes.

Data from the field surveys will serve as inputs to the development of regression models. These models would be employed in deriving appropriate trip production and attraction rates based on a suitable independent variable describing trip generation characteristics. Descriptive statistics would also be generated by the field data, yielding maximum, minimum, and average trip rates along with standard deviations and other pertinent information regarding variation of rates.

Trip generation rates developed from the field surveys would be compared with those derived from secondary sources. Such will allow for an assessment of what rates would be appropriate local use. This will also validate the perception that trip generation in the Philippines is generally higher for specific developments especially residential facilities.
Development of regression models

Information generated from surveys and secondary data collection would be used as inputs to the development of trip generation equations. These equations are simple linear regression models involving one dependent variable and one independent variable. The independent variable is a suitable parameter with logical relation to the trip production and attraction characteristics of the development.

Residential subdivision trip generation is usually associated with the number of dwelling units in the subdivision. The number of dwelling units is also the independent variable for condominiums. Rates, however, are expected to vary according to subdivision or condominium density, car ownership, income classes, and other factors that may require sub-categorization of trip rates. Separate models would be developed for these sub-classifications. For acceptance, the equation should have at least four data points with a computed $R^2$ of at least 0.75.

Trip rates will be derived according to the format of information as shown in the ITE Trip Generation manual. Trip generation rates should be listed in terms of the following:

- Average rates,
- Minimum and maximum values,
- Standard deviation,
- Directional distribution
- Time of day (e.g., AM Peak, PM Peak)
- Day of the week (e.g., weekday, Saturday, Sunday),
- Others

Validation of trip generation rates and equations would be undertaken by first using established rates developed by the ITE. Rates for locally surveyed sites should fall within one standard deviation of ITE rates or fall within the scatter of points shown in ITE trip generation data plots. Should these not fall within the criteria of validation within established ITE rates, the locally developed rates and equations would be considered as unique to the locality (or country). As such, documentation should be provided to state conditions or situations under which the rates were derived. The ITE recommends that rates, equations and supporting documentation should be considered for submission to ITE for use in subsequent editions of its Trip Generation publication. The ITE also provides separate methodology for combining local rates with established ones.

7. CONCLUSIONS AND RECOMMENDATIONS

This paper reviewed the trip generation rates currently in use in the Philippines. These rates were found to be unsuitable due to various reasons including the fact that their origins cannot be traced. Such is often true with the exception of studies that explicitly cite the use of ITE trip generation rates. Accordingly, the development of local trip rates was proposed and methodology adapting the ITE approach was presented. Both primary and secondary data collection strategies were discussed thoroughly and such can be implemented immediately. A test case is proposed using residential development as an initial consideration.

Local trip rates may be too general for specific development projects. In the previous Table 2, general land uses are mentioned and disregard possible variations in development density.
Residential developments, for example, would have varying trip generation characteristics that cannot be addressed by the rates in Table 2. The inappropriateness of general trip generation rates is very evident from the perspective of undertaking traffic impact assessment (TIA) and where such trip rates fail to consider freight trip generation, as in the case of industrial and commercial land uses.

The ITE manuals and similar materials present more realistic and practical trip generation rates for use in traffic analysis. These were developed with the thinking that the established rates might be expanded to take into consideration variations due to local traffic characteristics and conditions. More importantly, the ITE formulated the methodology for deriving and establishing local trip rates that would be consistent as well as supplementary to those that are already published. The methodology was developed in recognition of the fact that local traffic characteristics and conditions need to be factored in the formulation of suitable trip generation rates for local use.

It is obvious from the findings of this study that the next step would be to apply the established methodology to local conditions using local data and then compare and combine derived rates to established values. Such is a necessary step to confirm a valid set of trip generation rates for Philippine use. However, it is also necessary to point out that trip generation field methodology must incorporate public transport trips and not be limited to “vehicle trips” that are interpreted as private trips. In retrospect, trip generation should be expressed in terms of person trips rather than vehicle trips. Subsequent analysis to determine the mode split based on travelers’ characteristics and preferences would be passed on to the succeeding stages of assessment thereby yielding more realistic and practical impact assessment that is not at all biased towards private transport.

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