2. Development of Microsimulation Model in VISSIM

Study Area: Katipunan Avenue
- 2.6 km section—part of major urban highway traversing N-S of Metro Manila
- 5 lanes per direction
- 4 signalized intersections
- High share of private vehicles at peak hour (64% cars, 16% motorcycles)
- Public transport available:
  - Jeepneys (24 px capacity)
  - Tricycle / 3-wheelers (3 px capacity)

Baseline Model: “Without BRT”
- Road geometry based on Google Earth satellite image
- Considered peak hour traffic volume from survey data
- Used actual traffic signal timing settings

Model Calibration
- Driving behavior parameters are calibrated based on previous research on microsimulation of mixed vehicle traffic in Asian cities similar to that in Metro Manila

![Map of study area with location of interest](image1.png)

Model Validation
1) Comparison of hourly traffic volumes by GEH statistic
   \[ GEH = \frac{2(M - C)^2}{M + C} \]
   - Average GEH: 2.75 (acceptance target: < 5)
   - GEH < 5 for 82% (14 out of 17) of compared flows

2) Comparison of travel time in both directions

<table>
<thead>
<tr>
<th>Direction</th>
<th>Survey Result (min)</th>
<th>Model Result (min)</th>
<th>Diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>NB</td>
<td>12.00</td>
<td>12.46</td>
<td>4.54</td>
</tr>
<tr>
<td>SB</td>
<td>11.00</td>
<td>11.25</td>
<td>3.54</td>
</tr>
</tbody>
</table>

3. Simulation of “With BRT” Scenario

Basic BRT Design/Operation Considerations and Assumptions
- One dedicated lane per direction at median
- Operational speed: 40-45 km/h
- 85 px capacity per bus unit
- Dwell time at stations: 10-15 sec
- Fixed time schedule
- All jeepney users that serve Katipunan Avenue are shifted to BRT
- Vehicles not passing through the considered section are not shifted
- Trucks are not shifted to BRT

Shifting of Users to BRT
- The percentage shift of private vehicle users (cars and motorcycles) and tricycle users to BRT is controlled progressively in each scenario
- The total shifted users to BRT for 1% shift:
  \[ BRT\text{-users} = (100\% - \%)(Vol_{car} + Vol_{motor}) + (Vol_{mot} + Vol_{tricycle}) + \]  
  \[ + (Vol_{tricycle} + Vol_{car}) + (Vol_{motor} + Vol_{tricycle}) \]

4. Results of Simulation
- The results show that as percentage shift to BRT increase, the travel time and queue length of vehicles decrease in both directions, as expected. A steep descent is seen from the 20 to 40% percentage shift.
- As the shift to BRT increases, the bus frequency also increases up to a point that it can no longer meet the demand (at 65% shift for NB, 50% for SB) given no changes in bus service parameters (passenger capacity, operational speed). In the same way queueing of buses increase indicating bus bunching, which causes more delay to passengers.