# Developing Volume-Delay-Functions Used in Transport Studies in Metro Manila

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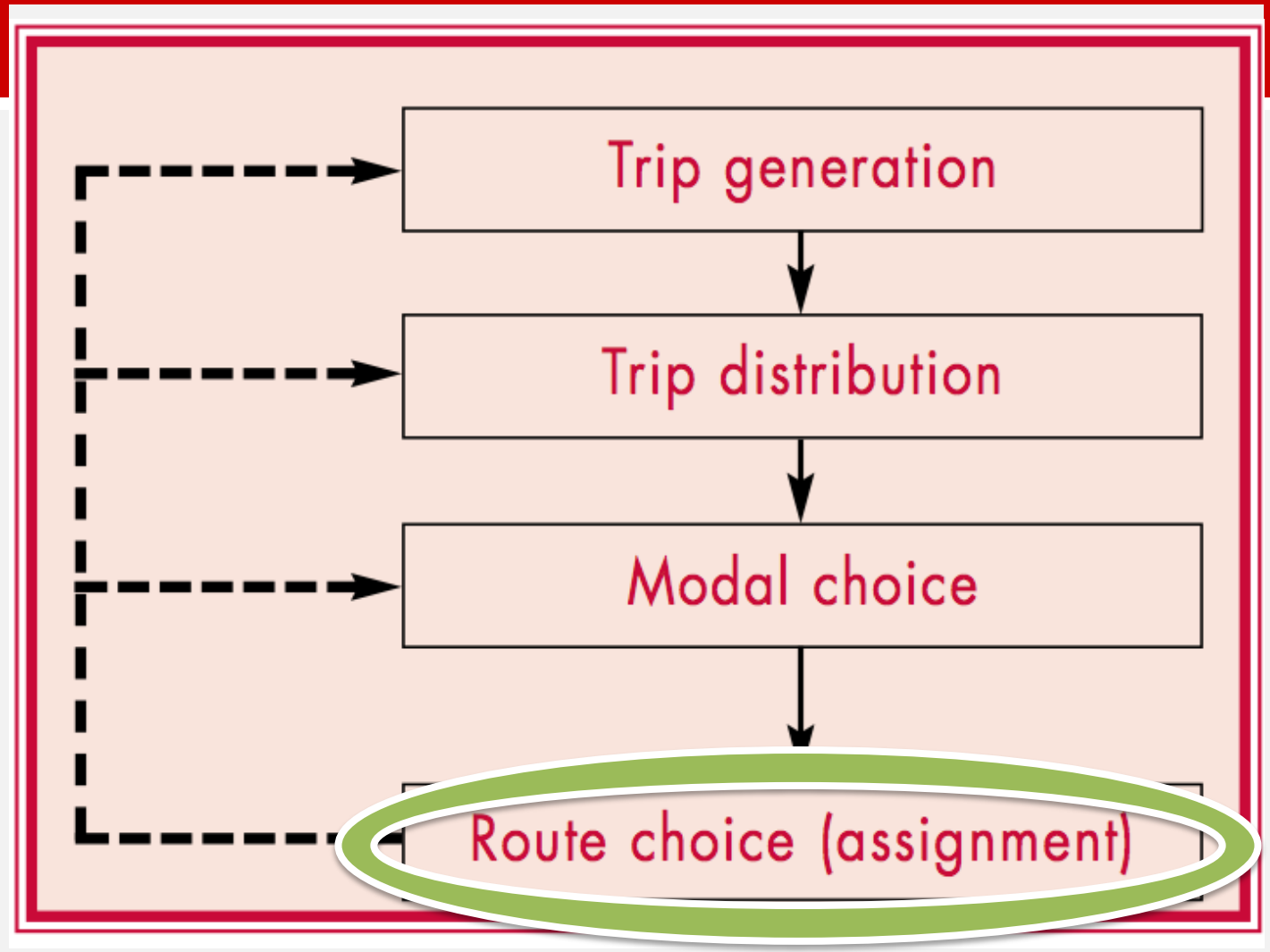
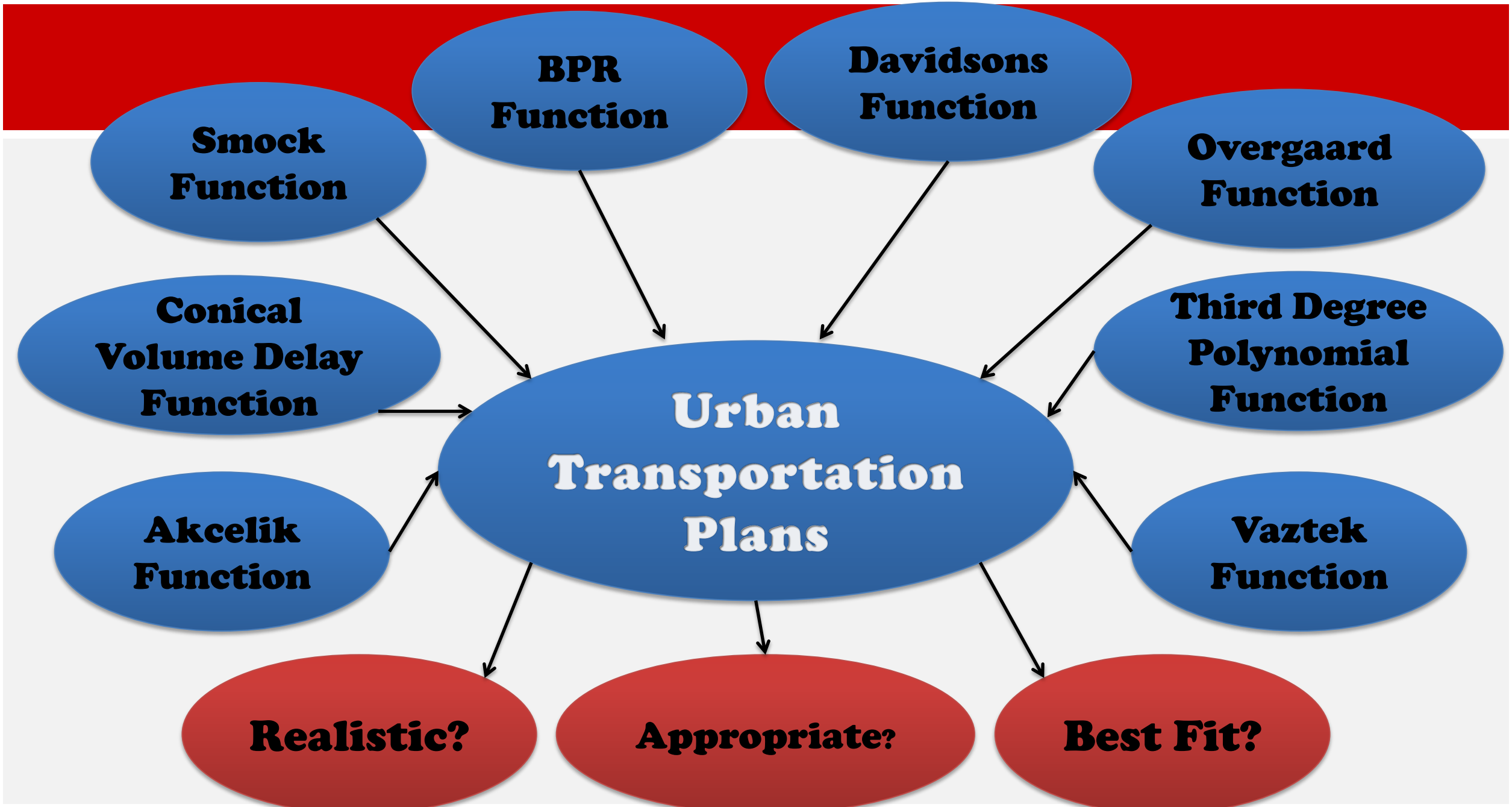
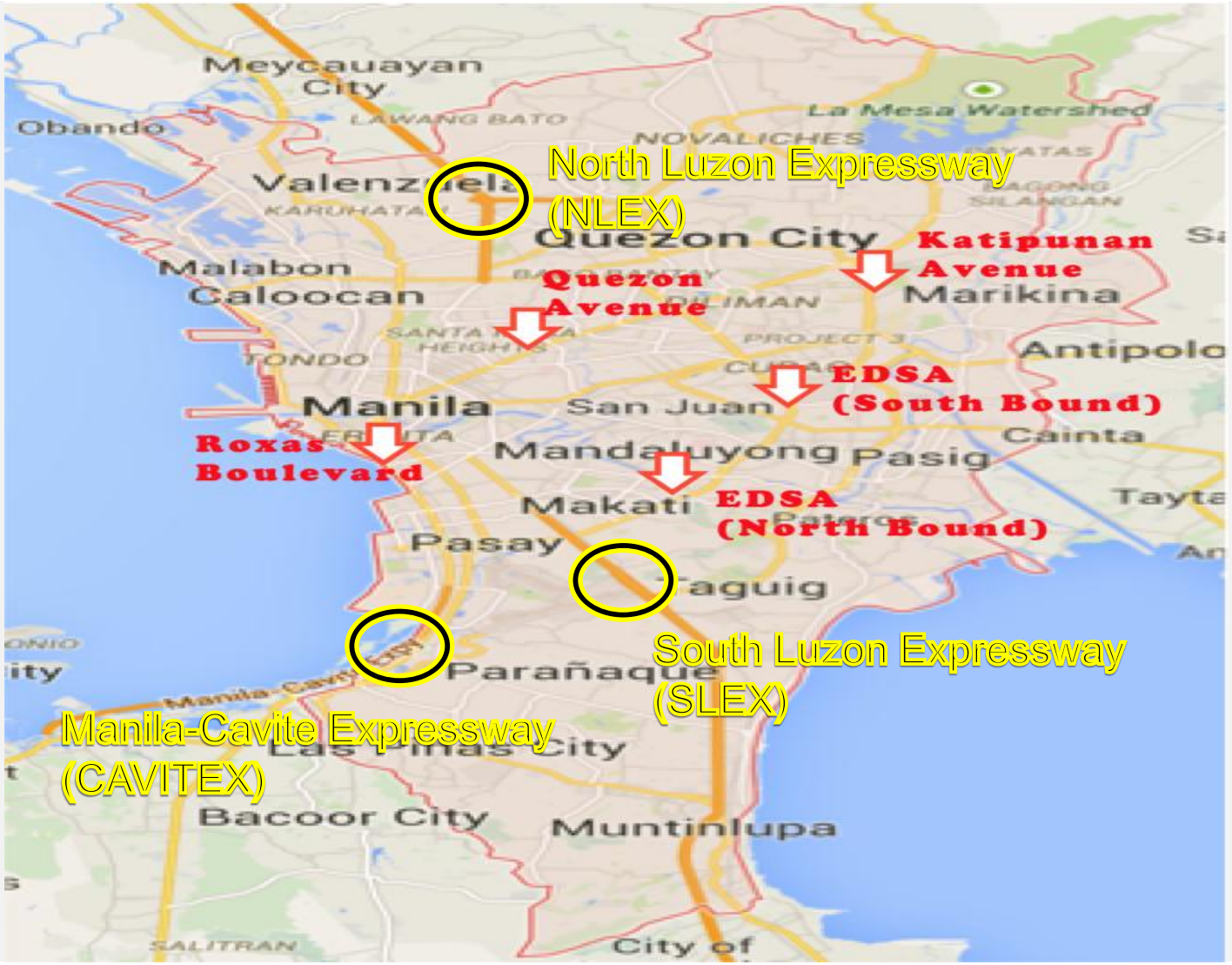



Four-Stage Transportation Model (Paulley, 2001)


BPR Function
Davidsons Function
Smock Function
Overgaard Function
Conical Volume Delay Function
Third Degree Polynomial Function
Urban Transportation Plans
Akcelik Function
Vaztek Function
Realistic?
Appropriate?
Best Fit?

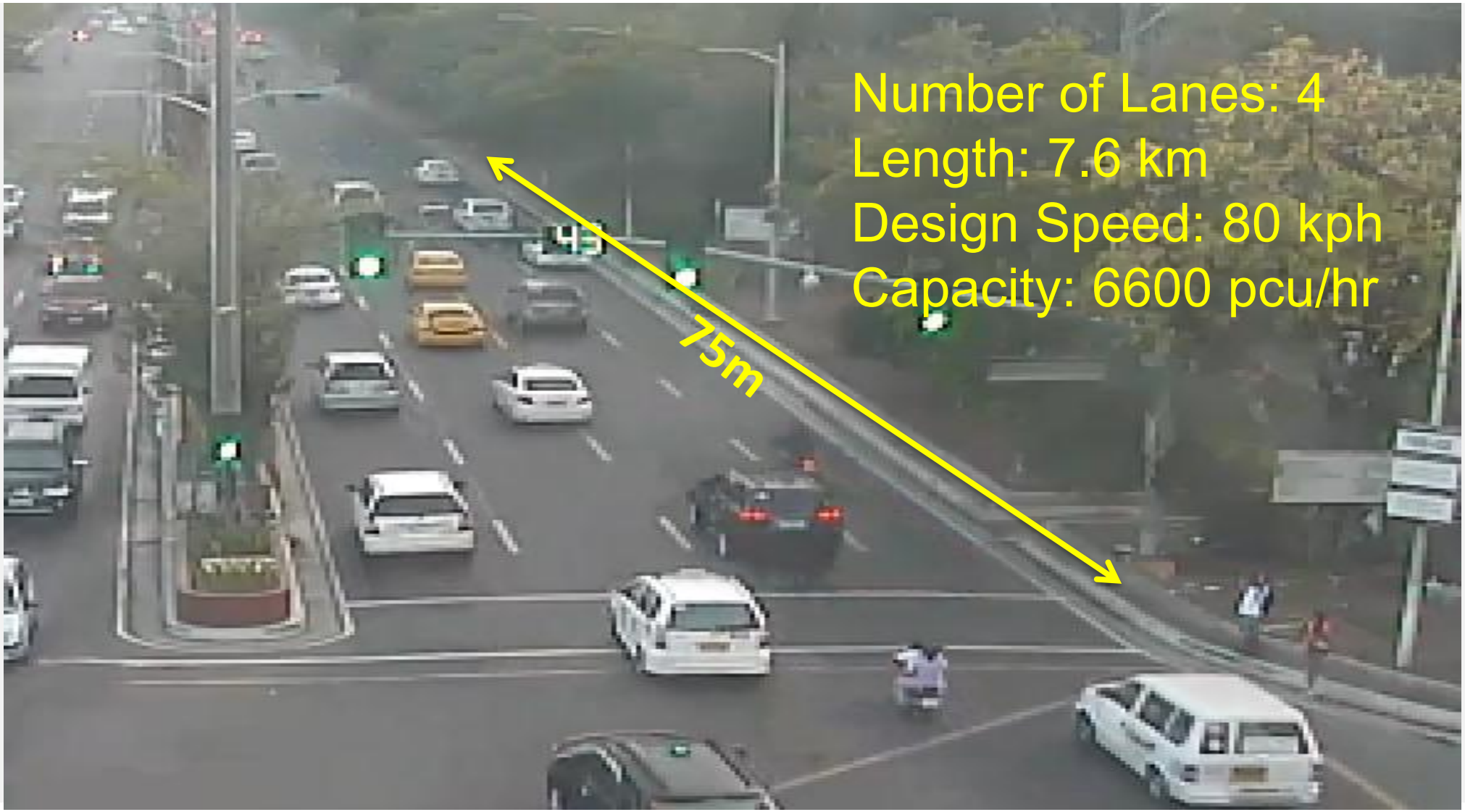
# Study Area



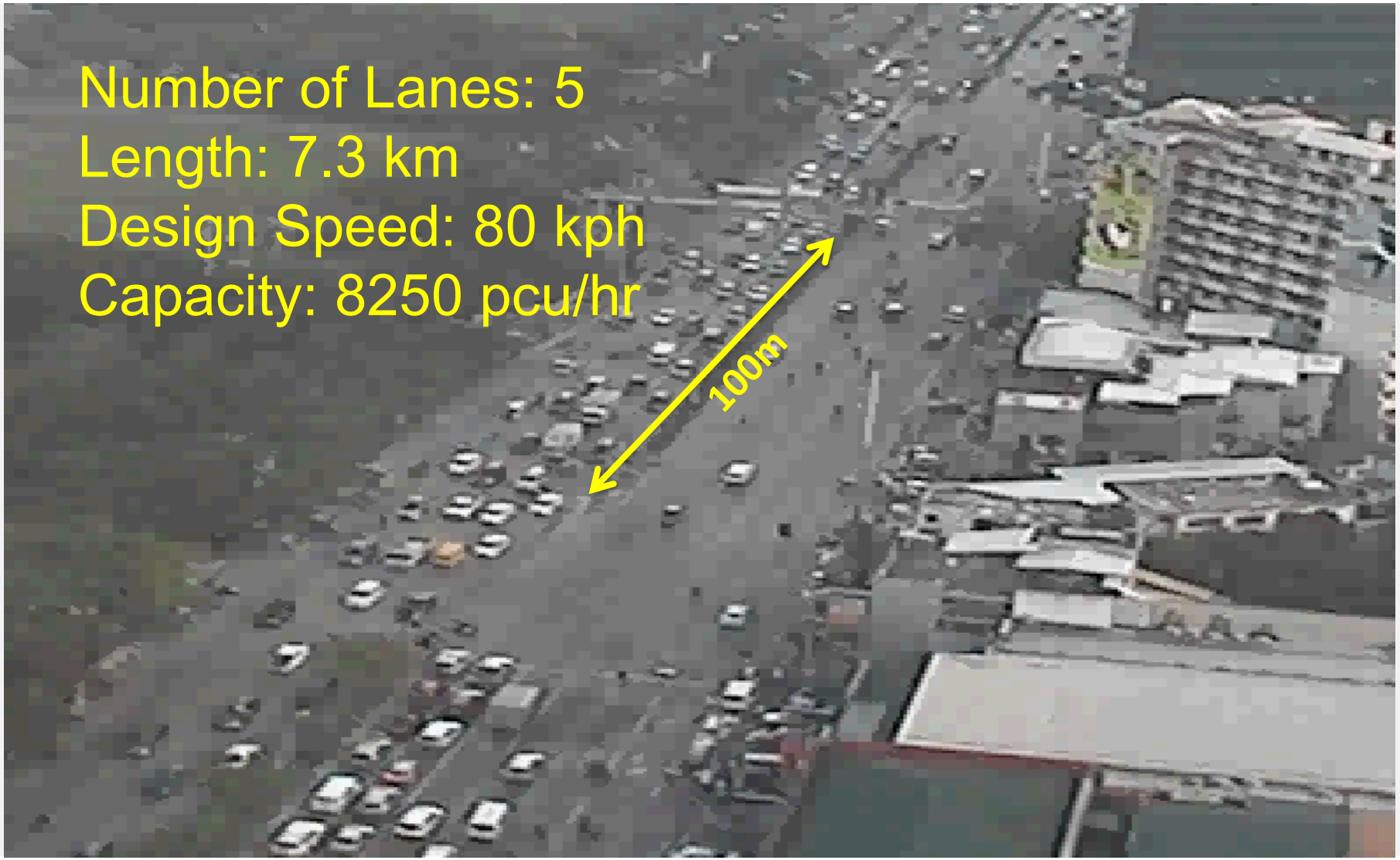

by: https://**maps.google**.com/

# Quezon Avenue

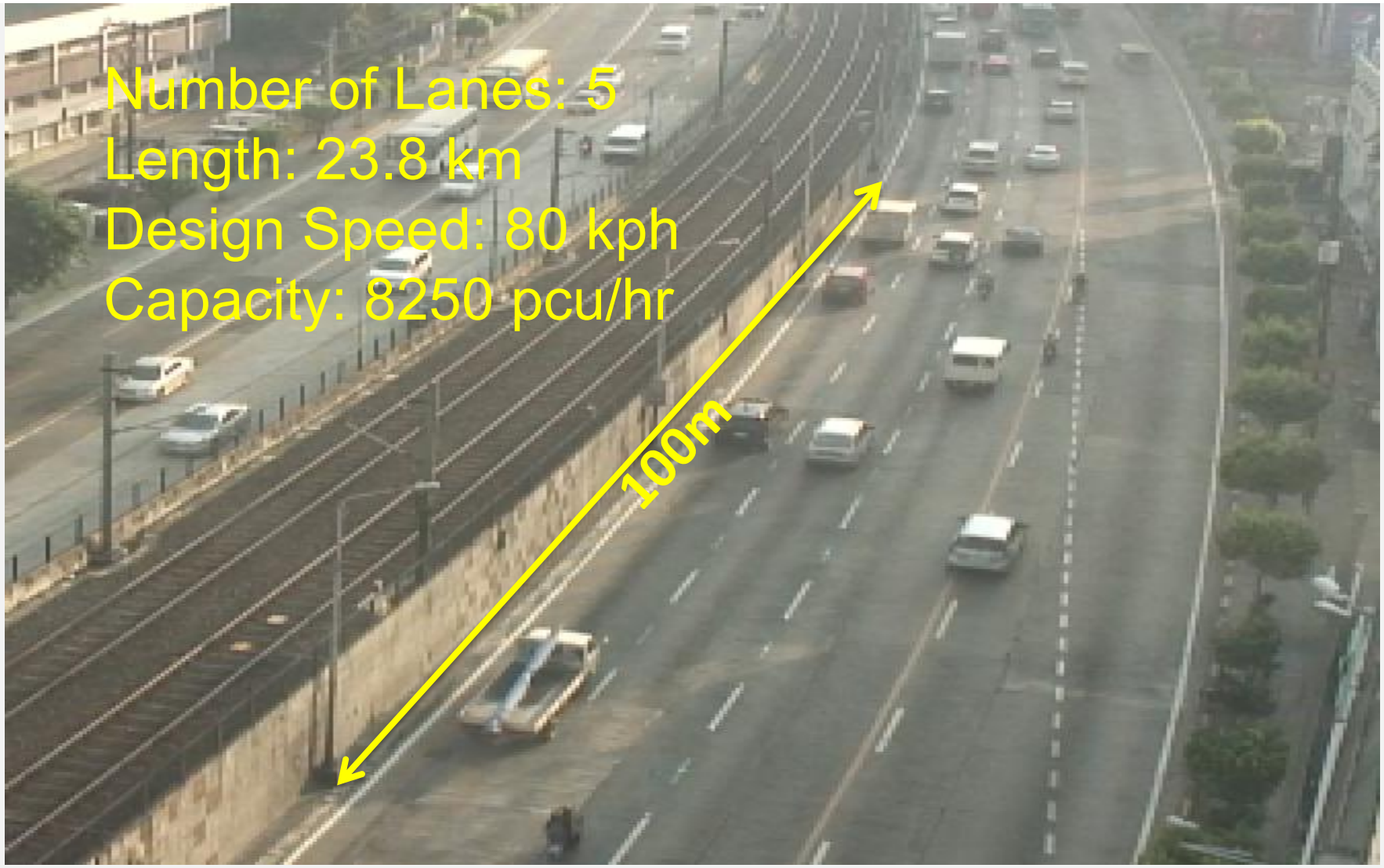
# Roxas Boulevard



# Katipunan Avenue



# EDSA (North Bound)



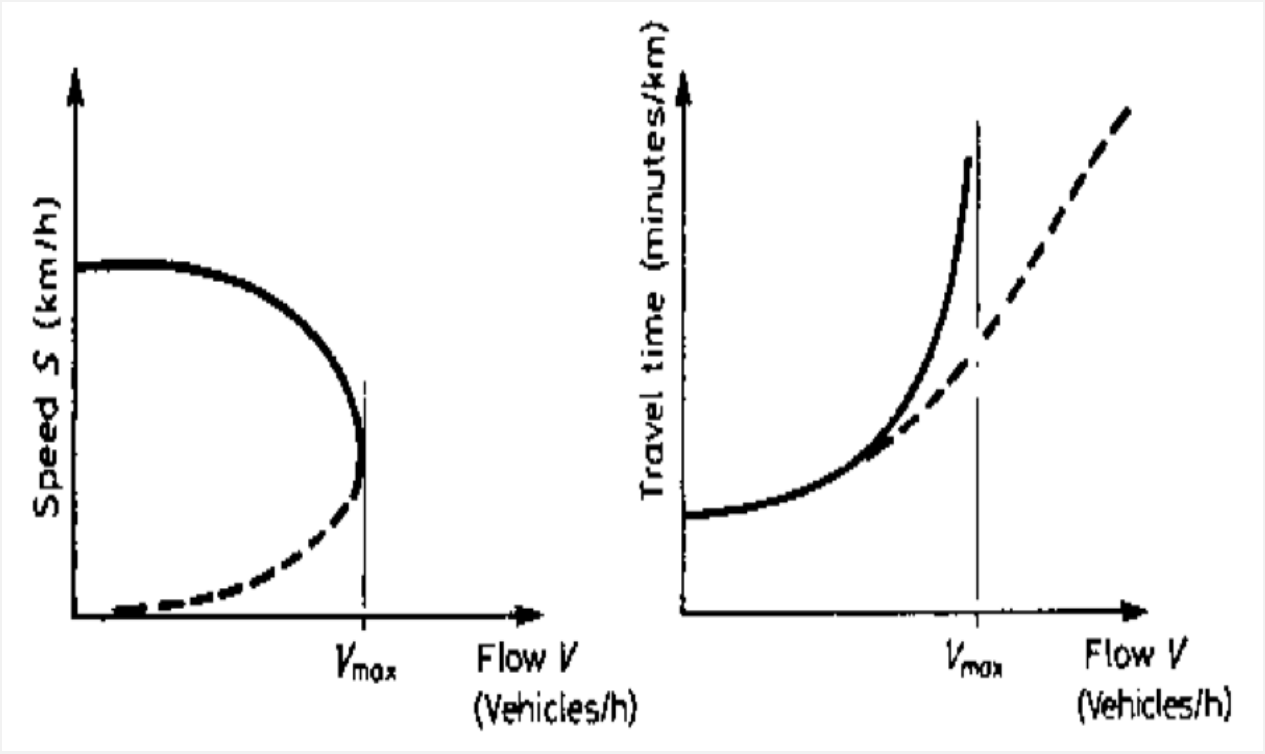
# EDSA (South Bound)


Number of Lanes: 5
Length: 23.8 km
Design Speed: 80 kph
Capacity: 8250 pcu/hr

# Speed-Flow-Density Relationship
$q = u\,k$

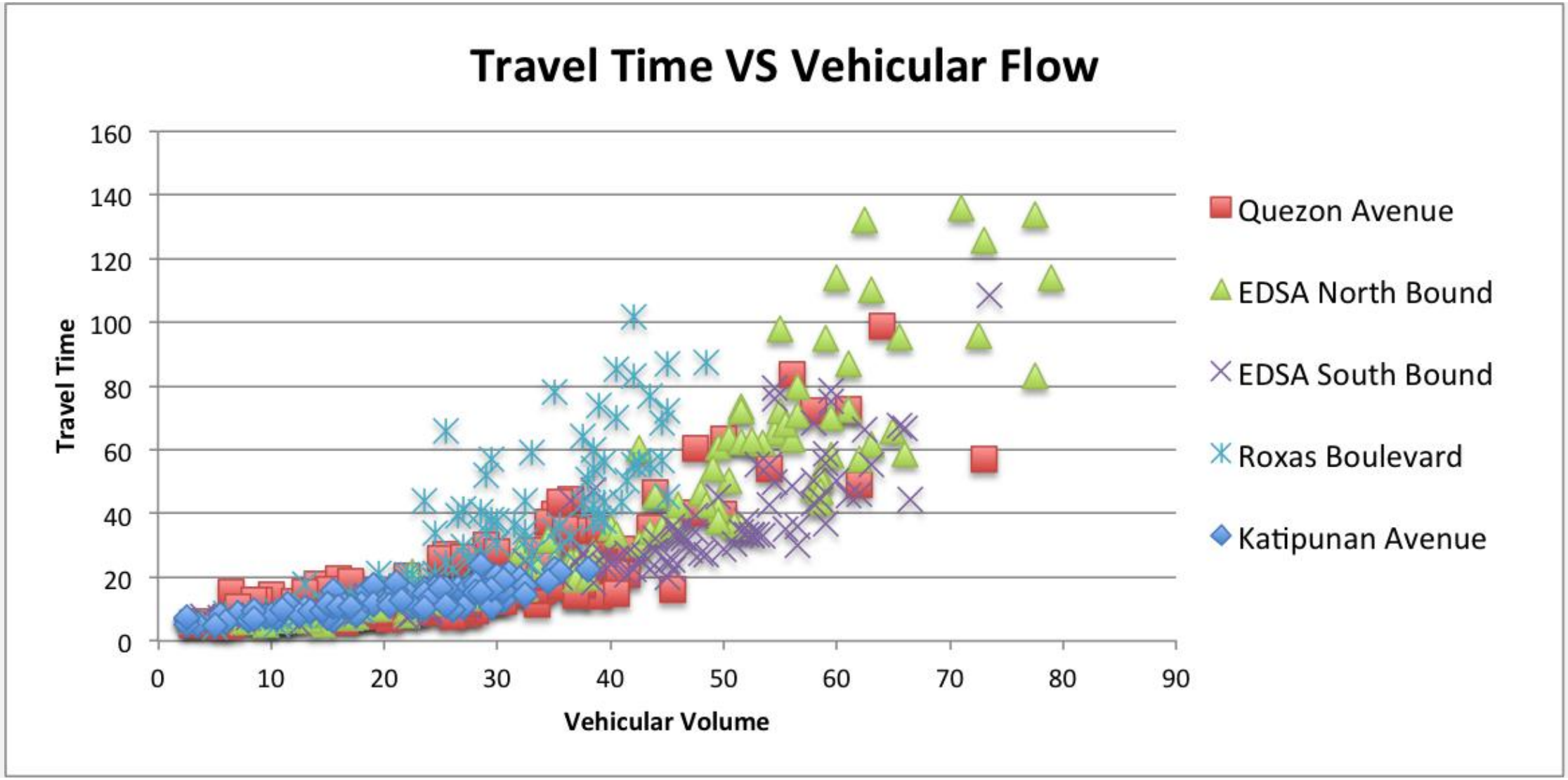
## Basic Volume Delay Function

$$t(v) = t_0 \times f\left(\frac{V}{C}\right)$$

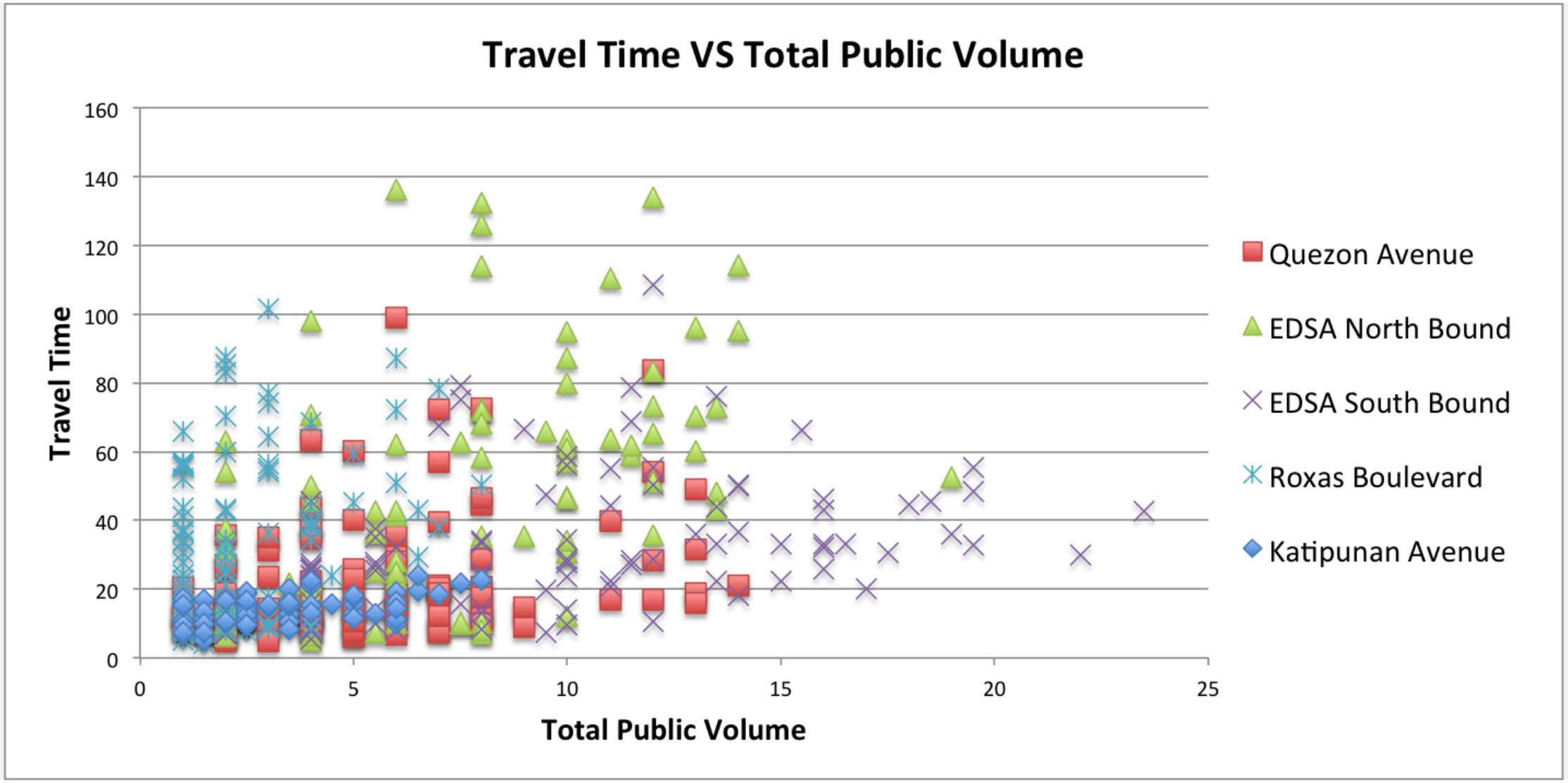



Basic Speed-Flow and Cost-Flow Relationship (Ort &Willumsen, 2011)

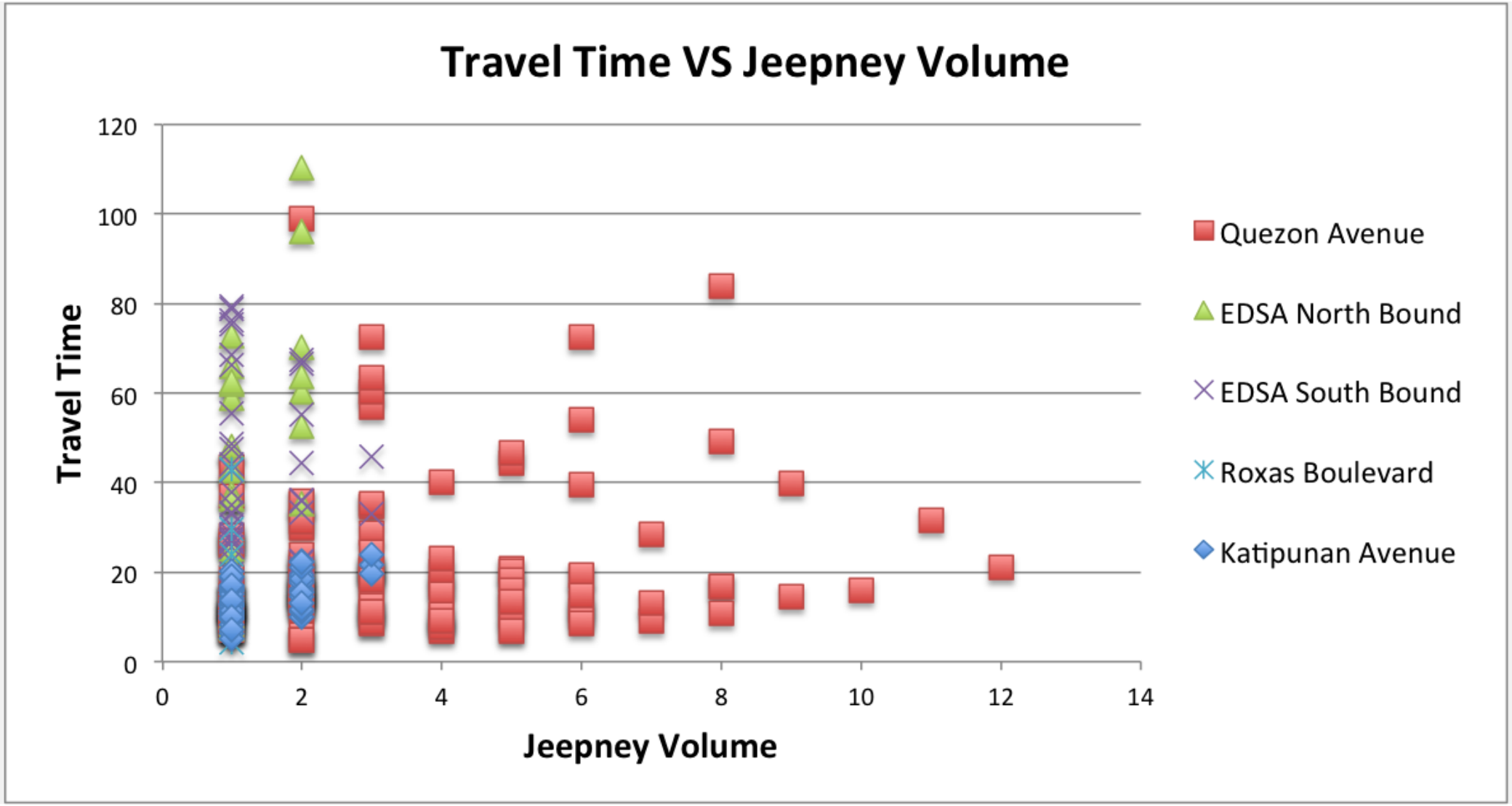
# Comparison of Five Different Links



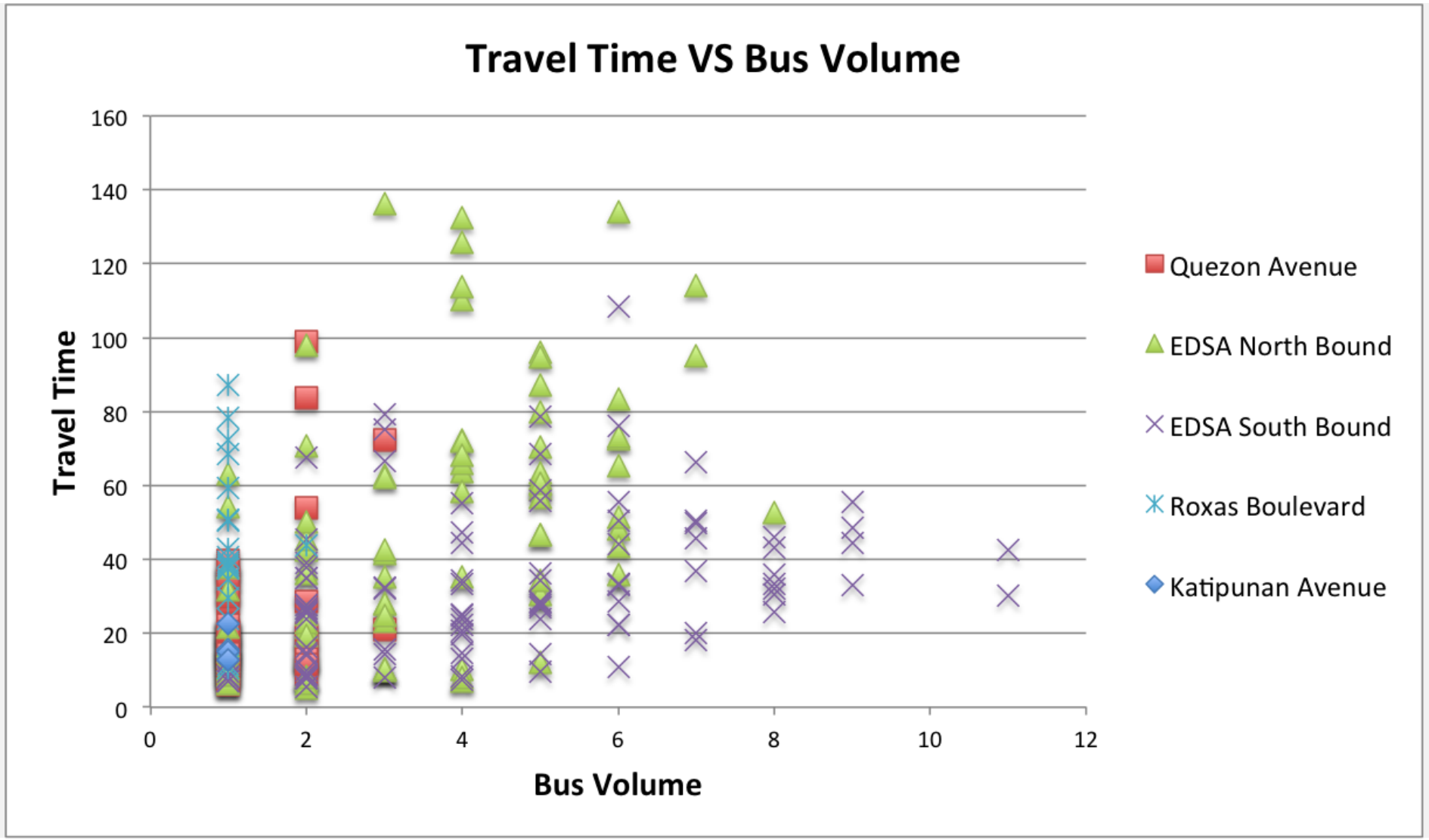
# Public Transportation Volume



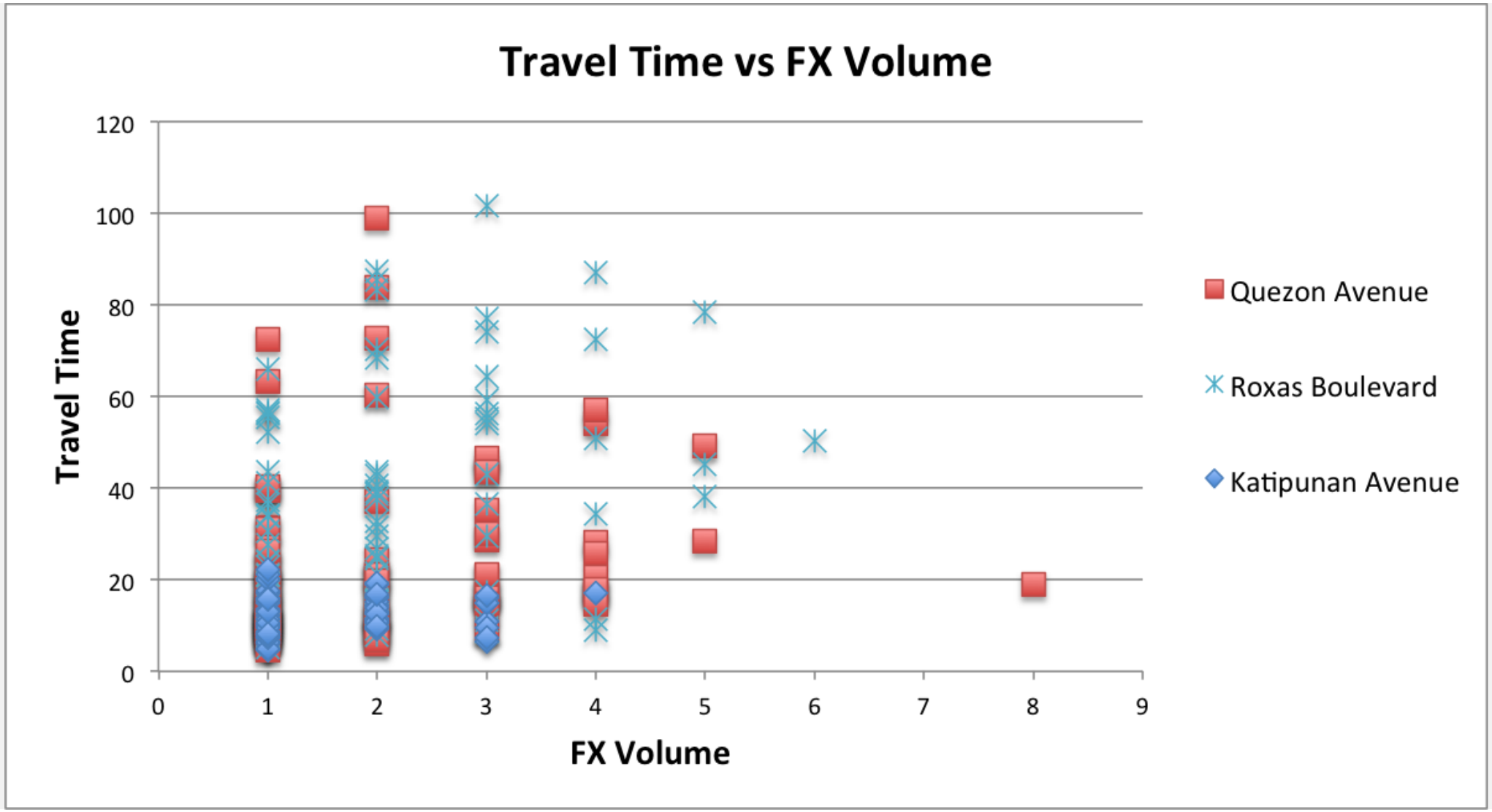
# Jeepney Volume



# Bus Volume


Travel Time VS Bus Volume
Travel Time
160
140
120
100
80
60
40
20
0
0
2
4
6
8
10
12
Bus Volume
Quezon Avenue
EDSA North Bound
EDSA South Bound
Roxas Boulevard
Katipunan Avenue

# Shared Taxi (FX) Volume



# (He & Zhao, 2013)

$$t = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \alpha_3 x_3 + \alpha_4 x_4 + \ldots + \alpha_n \left(\frac{Q}{C}\right)^{\beta}$$

$$= t_0 + \alpha_n \left(\frac{Q}{C}\right)^{\beta}$$

$$= t_0 \left[1 + \alpha \left(\frac{Q}{C}\right)^{\beta}\right]$$

# Proposed Models

EDSA North Bound

$$T = T_o\left(1 + 2.27x10^{-9}\left(\frac{V}{C}\right)^{01.55}\right)$$

EDSA South Bound

$$T = T_o\left(1 + 7.69x10^{-5}\left(\frac{V}{C}\right)^{0.99}\right)$$

Quezon Avenue

$$T = T_o\left(1 + 5.50x10^{-3}\left(\frac{V}{C}\right)^{0.95}\right)$$

Katipunan Avenue

$$T = T_o\left(1 + 6.05x10^{-7}\left(\frac{V}{C}\right)^{1.75}\right)$$

Roxas Boulevard

$$T = T_o\left(1 + 52.05\left(\frac{V}{C}\right)^{0.43}\right)$$

# Conclusion

- The study produced alternative volume delay functions for the Philippine setting.
- Public transportation on a road segment has a significant effect on travel time.
- Presence of public transportations may vary for each road, thus volume delay functions can be grouped.

# Recommendation

- Functions are still road dependent
  - Prevent the need to calibrate functions
- Obtain real time data using advance technologies
  - Categorize road sections
- Combine other travel time factors into the volume delay function.

# THANK YOU!