

## Transportation Systems Analysis

Fall 2017/18

### *Trip Generation for MyCity*

The 250,000 residents of MyCity will on an average weekday make about 1 million one-way trips. Since trips are an intermediate good, each one-way trip will be for one of 3 possible purposes: work, school, shop/dine/recreation/other. Trips are also classified as “home-based” if they are produced at home and attracted to the location that gives rise to the trip’s purpose; or “non-home-based” when they are part of a linked trip in which the trip is produced at one purpose location and attracted to another purpose location. For the purpose of **Trip Generation** we prefer to talk in terms of production and attraction because person trips tend to be “produced” at home and attracted to particular activities (work, shop, etc.). A substantial portion of these home based trips tend to be followed later in the day with a reverse trip home. Non-home-based trips are linked trips between activities that don’t involve the home and aren’t necessarily followed by a return trip. For home-based trips, the home (the production end) is the trip origin for the outbound trip and the destination for the mirrored return trip; (the attraction end is the destination of the outbound trip and the origin of the mirrored return trip). For non-home-based trips, the production end is always the origin and the attraction end is always the destination.

Residents of MyCity are of 4 types:

1. Under 5 years old: they aren’t counted as trip makers (they just sometimes go along for the ride)
2. 5-20 year olds: Assume an average value for the number of trips each makes per day, say 4. Their typical daily travel behavior is: they all go to school on this typical day and 30% of them make a home-based non-school trip after they come home from school. Assume that all outbound school trips go directly to school, but only 60% of the return school trips go directly back home.
3. 21-66 year old workers: Assume an average value for the number of trips each makes per day, say 4.5. Their typical daily travel behavior is: they all go to work on this day and 50 % of them make a home-based non-work round trip after they come back from work. Tied to these home-based trips are two non-home based trips. Assume that all outbound work trips go directly to work, but only 50% of the return work trips go directly back home.
4. 21-66 year old non-workers and everyone over 66: Assume an average value for the number of trips each makes per day, say 4.5. Their typical daily travel behavior is: they make on average 1.5 outbound home-based non-work-non-school trips. This implies that they make 1.5 inbound home-based non-work-non-school trips and the remainder are non- home-based non-work-non-school trips.

For your city the percentage distribution of trips between home-based and non-home based by trip purpose will be the following:

Type	Productions per zone	Attractions per zone
Outbound Home-based Work	# of workers	# of jobs
Outbound Home-based School	# of 5-20 year olds (school kids)	School enrollment
Outbound Home-based Shop & recreate	1.5 * (# 21-66 non-work + # Over 66) + 0.3* School kids + 0.5* workers	Uniform distribution of (Shop + Recreate) Attractions = Sum of Productions
Inbound Home-based Work	50% of Outbound	50% of Outbound
Inbound Home-based School	70% of Outbound	70% of Outbound
Inbound Home-based Shop & recreate	50% of Outbound	50% of Outbound
Work-based Non-home	50% of jobs	Uniform distribution of (Shop + Recreate) Attractions = Sum of Productions
School based Non-home	40% of enrollment	Uniform distribution of (Shop + Recreate) Attractions = Sum of Productions
Non-home based Shop + Recreate	Remainder of Shop + Recreate	Remainder of Shop + Recreate

Total # of production = Total # of attractions = Total # of average day one-way trips

### ***Trip Distribution for MyCity***

Trip distribution is based on the relative attractiveness of Attractions to Productions. We will use a simple measure of Attractiveness: as Attractions divided by the square of the Distance between a Production and Attraction. Distance will be measured as 1.2 \* the Cartesian distance between the zone centroids (or the square root of the area for intra zonal situations). You will need to generate Trip arrays based on appropriate Production and Attraction vectors for:

- Outbound Home-based Work
- Outbound Home-based School
- Outbound Home-based Shop & Recreate
- Work-based Non-home
- School based Non-home
- Non-home based Shop + Recreate

Inbound Home-based Work, Inbound Home-based School and Inbound Home-based Shop & recreate will simply be the appropriate percentages of the transpose of the corresponding Outbound Trip Array.

The Total Trip Array is simply the sum of the above 9 arrays. It's elements should sum to the sum of the daily trips made by each resident type.