Assignment 5.2 – User's Guide to the Passenger Transportation Model

Within the workbook, you will find two spreadsheets: (1) one year snapshot, and (2) 25-year outlook. They use the same basic structure and numbers in calculating emissions, and differ primarily in their time frame.

One year snapshot
In both of the models, we examine the implications of different mode splits among non-motorized transportation (NMT – i.e. biking and walking), Metro, bus, colectivos (also known as combis and microbuses), taxis and private autos. You can use any mode share combination (as long as they sum to 100%) by making changes to the percentages in the yellow box under “MODE SPLIT.” You do not need to make any changes in the middle box, which shows number of trips, trip length, passenger kilometers traveled (PKT), vehicle kilometers traveled (VKT), etc.

To the right of the “MODE SPLIT” box, is a blue box for “EMISSIONS” which will show total emissions from passenger transportation for that year, given the modal split you have chosen. Directly above that, however, you have the emissions divided into the different modes. You can use this information to track the impact of changes to mode share on emissions for each mode. Additionally, the emissions factors are highlighted in blue font to indicate that you can change these factors to test the effect of cleaner vehicles on emissions. As stated in the assignment, a reasonable range could be around 10% to 25% for improvements in emissions factors.

25 year outlook
This model builds off the same structure of the one-year model, but allows for changes to be phased in over time. In the three yellow boxes in columns B-D, you are able to change growth rates in population, economic growth measured as GDP/capita, as well as the elasticity of trip making to changes in income levels.

The first box, highlighted in yellow, represents the shift in passengers between the Metro and road-based forms of public transportation. For an annual increase in passenger trips on the Metro, those “lost” passenger trips come from taxis, buses and colectivos. For an annual loss in Metro trips, those will also be distributed over taxis, buses and colectivos. Your numbers should range between –0.4% and 1.1% to avoid getting negative mode shares.

Further to the right, are the inputs for testing the impact of increases or decreases in the private auto’s share of trip demand. The auto can gain (as well as lose) trips, which are lost (or gained) by the other modes in different proportions. For example, for a total number of trips lost by the auto, those trips are shifted to other modes – the Metro, buses and colectivos – which might gain 25%, 60% and 15% of those trips. With the spreadsheet, you can change both the growth or decline in private auto use, with a variety of impacts on the other modes.
The rest of the mechanics of the model, are similar to the one year snapshot, except that they are projected over a 25 year time period. Therefore, you can also look at changes in overall mobility, in terms of number of daily trips and average passenger kilometers traveled per mode. You should be careful to check that in Column L, the total mode share is 100%. It should sum to 100% automatically, but it is good to double check.

As in the first model, the results are returned at the aggregate level in the blue box. These are the emissions for the year 2025. However, you might want to look in more detail at the sources of emissions, to see which modes dominate the emissions profile. You can also change the emissions factors for each mode and for different pollutants, again, within the realm of the technically possible. Keep in mind the dynamics of introducing technologies with improved emissions performance, and that each mode needs a certain amount of time for the fleet to turnover.

Please ask if you have any questions about the spreadsheet.