**Working notes on the travel demand survey**

**Overall idea**

The 2013 survey consists of modal split data of all commuting trips to work and school. It is assumed that one either commutes to work or school, and there are no school escort trips. Using the answer to question q14d (whether the respondent is attending school right now), students’ commuting trips are separated from workers and counted as “School” in the travel demand spreadsheet rather than “commuting”.

Most interpolating are based on the “National Households Travel Survey 2020” in South Africa, which is one of the most accurate, up-to-date and comprehensive travel data available in the sub-Saharan African context. The data can be assessed [here](https://microdata.worldbank.org/index.php/catalog/4553/data-dictionary/F3?file_name=nhts-2020-person) and an official report of data [here](https://www.statssa.gov.za/publications/P0320/P03202020.pdf). It is assumed that South Africa and Kenya has similar travel modal split, as well as similar travel purposes.

**1.Number of trips per person per year**

Commute trips

In 2023, there are 105 weekend days and 13 public holidays in Kenya. Total working days is 247 days. Assuming in 2013 the working days are similar, workers commute twice a day, then each worker takes 494 commute trips per year. There are 16440 commuting workers in the survey, and total population is 43892. Thus, the average commuting trips per person per year is 494\*(16440/43892) = 185.031

School trips

According to the latest school calendar in Kenya, it is designated that total term-time in Kenya is 36 weeks annually, and students go to school Monday to Friday. Therefore, there are 180 school days per year, and each student takes 360 trips to/from school. There are 11520 commuting students in total in the survey, and total population is 43892. Thus, the average trips to school per person per year is 360\*(11520/43892) = 94.486

Other trips

In the South African travel survey, 26.3% of total trips are commute trips to workplace. Taking 26.3% as the percentage for commuting trips, total number of trips per person per year in Kenya is 185.031/0.263 = 703.54 trips. The number of all other trips are estimated based on their respective percentage in the South African survey.

Business: “Looking for work” in the SA survey. 3.1%. 21.810 trips.

Long Leisure: “Holiday/Leisure” in the SA survey. 0.5%. 3.518 trips.

Local Leisure: “Religious Institutions” and “Visit friends and relatives” in the SA survey. 12.8%. 90.053 trips

Shop: 14.4%. 101.310 trips.

Personal Business: “Medical services”, “Taking children to school”, and “Welfare offices” in the SA survey. 3.9%. 27.438 trips

Other: 2.1%. 14.774 trips.

**2.Trip modal share**

The approach to interpolate trip modal share is outlined as follows:

1. Calculate the exact modal share of (a) commuting trips and (b) schooling trips based on the 2013 World Bank survey.
2. Drawing from the UN 2022 report (“why infrastructure matters”), estimate an approximate value of total modal share of all trip types in Kenya. This is estimated by taking the average of two baseline scenarios, the “1 million to 5 million population” city scenario and the “below 1 million” city scenario (because the population of Nairobi is over 1 million while all other cities in Kenya has population less than 1 million). Then, 5.1% is deducted from the car modal share due to particular low modal share of car in Kenya. 3% is added to “others” to incorporate the other modes in the survey, 0.5% added to rail, and 0.1% added to air. In the end, the overall modal share is estimated as follows:
   * Walk: 50%
   * Bike: 3%
   * Car: 10.4%
   * Motorbike: 5%
   * Bus (matatu): 25%
   * Bus (regular): 1%
   * Rail: 0.5%
   * Taxi: 2%
   * Air: 0.1%
   * Other: 3%
3. It is assumed that the total percentage of commute and school trips in all trips is 63.1% (based on South African travel survey data). A modal share is almost identically applied to all other travel purposes so that the average can be exactly equal to the overall modal share. For instance, the modal share of walking in commute + school trip is 69%. Then the modal share of walking in all other purpose is x \* 36.9% + 69% \* 63.1% = 50% -> x=17.24%.
4. Lastly, some minor adjustment is made to consider long-distance air and train travels. However, it is ensured that after adjustment, the weighted average in the end is still equal to the assumed overall modal share. Specifically, adjustments will based on the assumptions that:
   * There are no air travel for personal business, shop and local leisure
   * There are no train travel for shop and local leisure
   * There are more air travel and train travel for long-distance leisure. There are no walking for long-distance leisure.

**3.Trip distance**

Trip distance is calculated based on the trip time in the 2013 World Bank survey and a set of assumed speed of each travel mode.

The speed (miles per hour) of different transport modes is assumed as follows:

Walking: 3 mph

Microbus/Matatu: 20 mph

Bodaboda (bicycle taxi): 15 mph

Bicycle: 10 mph

Own vehicle: 30 mph

Bus regular: 20 mph

Taxi (vehicle): 30 mph

Other: 15 mph

The total trip distance of each mode in each trip length bucket is calculated using the 2013 data, but the aggregated length only contains commute and schooling trips. It is assumed that the total percentage of commute and school trips in all trips is 63.1% (based on South African travel survey data). Then, the total trip length is proxied by using each aggregated commute/schooling trip length divided by 63.1%.

For trips that are not reflected in the survey, including train and air, it is assumed that people can take plane if travel distance is greater than 50 miles, and train if distance greater than 10 miles. The same percentage of overall modal split (0.5% for train and 0.1% for air) of population will travel once in each bucket in each year. The mean of each bucket is set as default travel distance of the bucket (i.e., each train/air trip will be 75 miles in the 50–100 miles bucket), and 100 mile as default distance for the >100 bucket.

Notes:

Car users separated into two categories: car drivers and car passengers. It is assumed that half of car user are drivers.

“Others” mode separated into two categories: others private and others public. It is assumed that half of “others” transport mode are private, and half are public.