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Future Potential of Transportation and Urban Model Post COVID Era

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# Evaluating Impacts of Teleworking Policy in Jakarta Metropolitan Area by The Analysis of Activity Pattern

Rizky Wahyulinata, Nihon University
Noriyasu Tsumita, Nihon University
Sideney Schreiner, CST Nihon University
Atsushi Fukuda, CST Nihon University

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ATRANS Asian Transportation Research Society
IATSS International Association of Traffic and Safety Sciences

# Background

- The global spread of COVID-19 infections has a significant impact on people's day-to-day activities
- Teleworking policy was recommended, and it is presumed that the adoption of the policy had a significant impact on traffic demand
- It is necessary to appropriately estimate this impact when considering future transportation policies

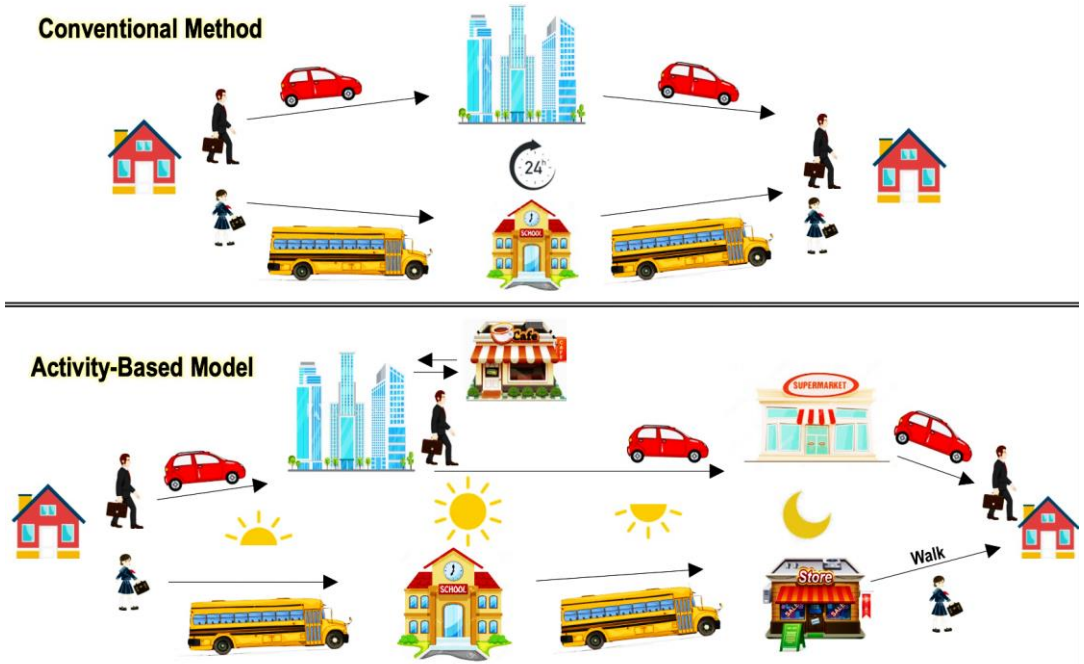
Source: 123RF

# Scope of Study

- However, there is a possibility that the activity pattern itself may have changed significantly
- The impact on traffic demand cannot be estimated by using a simple a trip-based travel demand forecast
- Thus, this study aims to evaluate the impact of the introduction of teleworking policy based on analyzing the changes of activity pattern by ABM in the Jakarta Metropolitan Area (JABODETABEK), Indonesia

# Activity-Based Model (ABM)

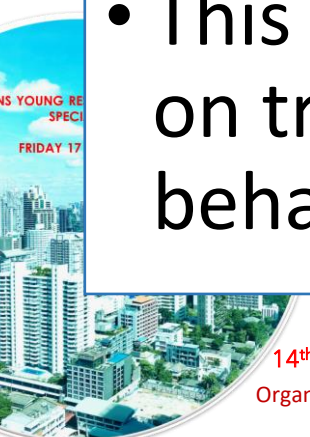
- A trip is just a derived demand from the actual purpose, which is to do an activity (Bhat, 2003)
- Activity-Based Model considers factors such as individual activities, times of activities and the places of activities



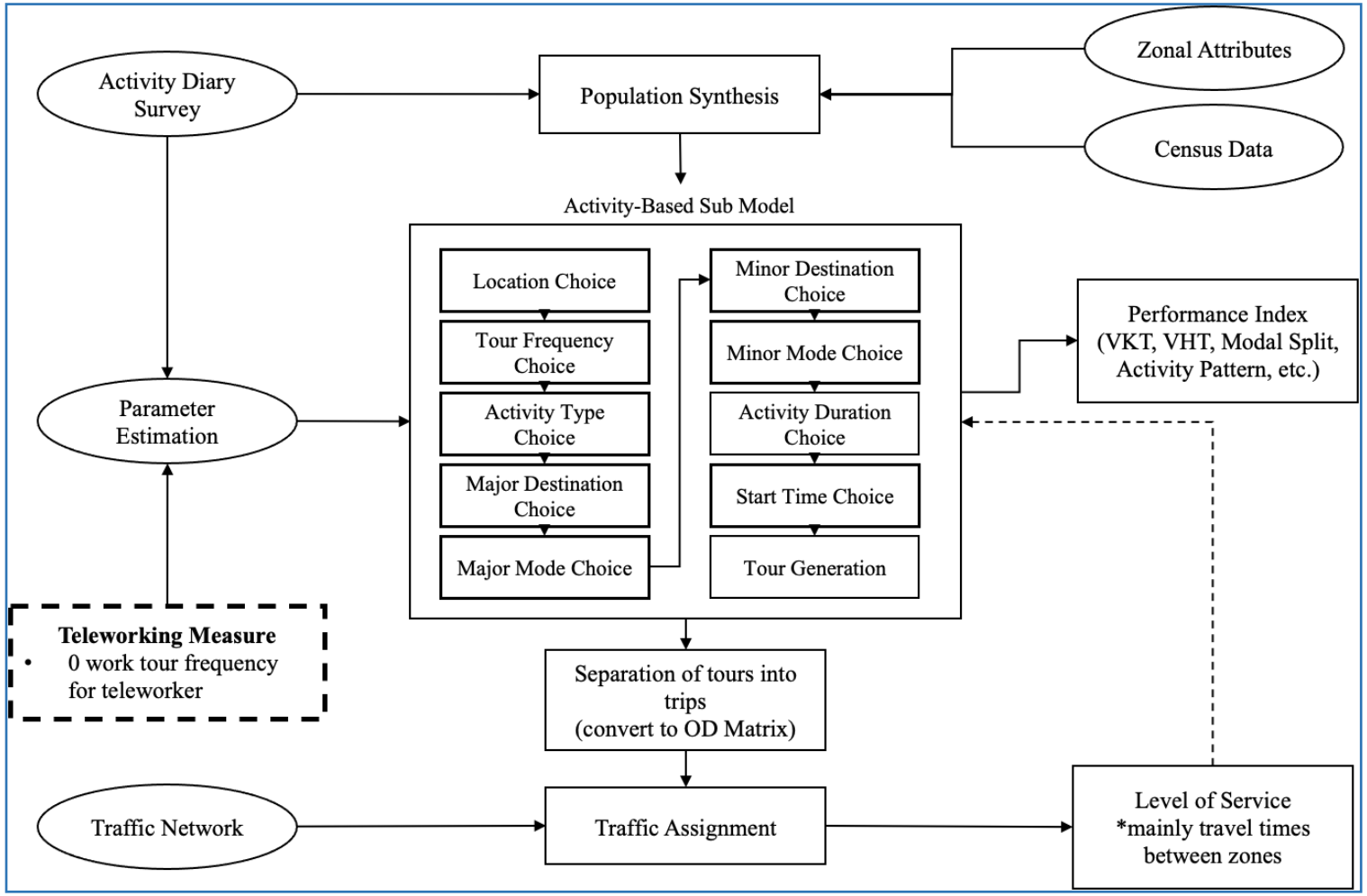

Source: JUTPI 2018

# Teleworking Evaluation Method

- Studies typically adopt one method of the following three (Kim, 2016)
  - Multiplying the telecommuting frequency by the round-trip commute distance
  - Measuring travel changes using quasi-experiments, and
  - Determining the marginal effect of teleworking on travel using econometric analyses
- This study will introduce the idea of analyzing teleworking impact on travel by changes in activity pattern to capture the actual behavior of teleworkers

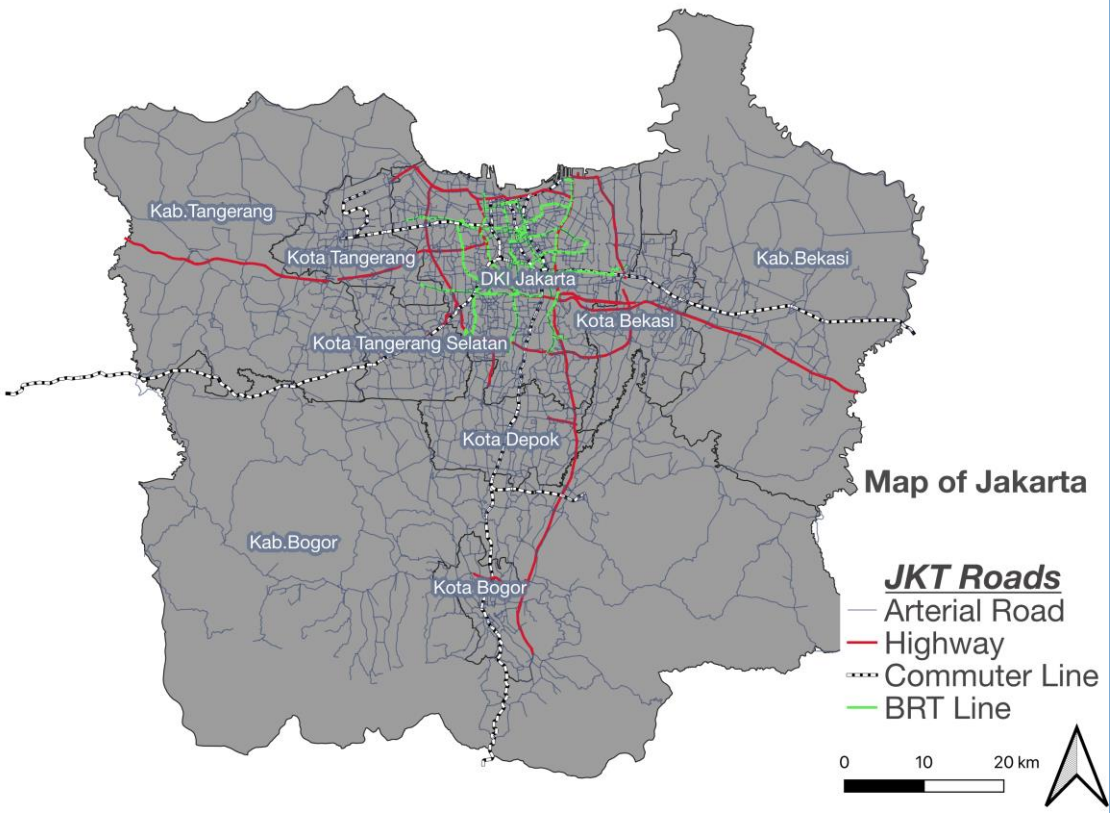


# Framework of Study (Methodology)




# Study Area

- Jakarta Metropolitan Area (Jabodetabek) was chosen as a study area
- With population of more than 30,000,000 people
- Difficulty in managing traffic congestion




# Dataset for Population Synthesis

- JICA (JUTPI2):
  - GIS dataset (Network and Zones)
  - Activity Diary Survey
  - Screen line survey
- Statistics Indonesia (Census):
  - Population data
  - Household data
  - Population distributions by age, gender, regions etc.

# ABM Calculation

The ABM are calculated by doing a set of discrete choice models

- $x_i$ = person attributes
- $\beta_{A,i}$ = corresponding parameters
- A = alternative
- The utility $u_A$ of an alternative A is calculated as follows:

$$u_A = \sum i \, \beta_{A,i} \cdot x_i$$

- To the choice probabilities $p_A$ of alternative *A*, the following applies:

$$p_A = \frac{\exp(u_A)}{\sum i \exp(u_{A,i})}$$

# Policy Scenario

Tour frequency choice model for teleworking policy

- The parameter $\beta_6$ in the utility for making "0" trip for work was increased to express teleworking policy response

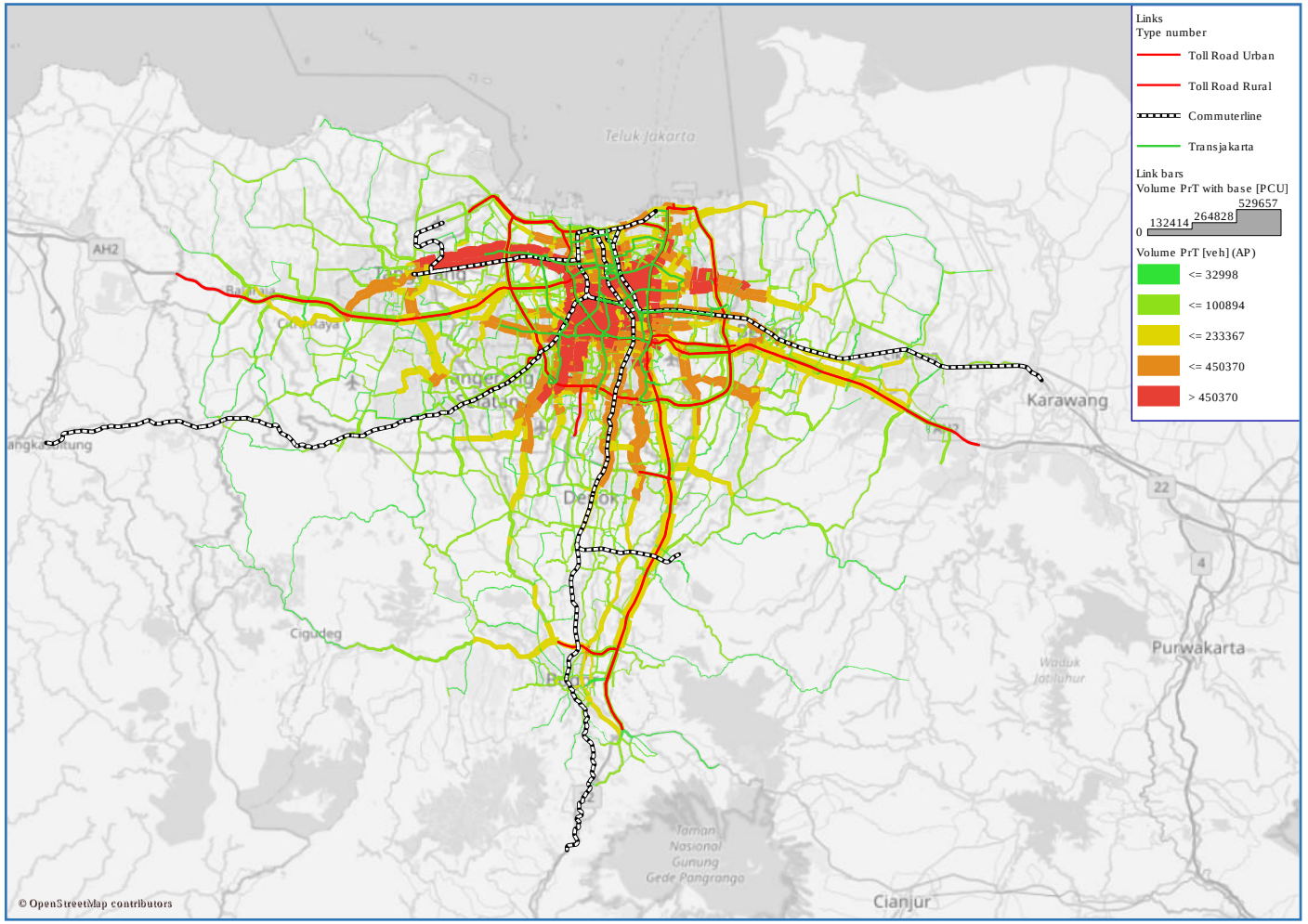
$$U_{TFWork\,(0,1,2,3)} = (\beta_1 \cdot Empl_{pct}) + (\beta_2 \cdot Age_{cat}) + (\beta_3 \cdot Has_{child}) + (\beta_4 \cdot Car_{dist_{work}}) + (\beta_5 \cdot Constant_{value}) + (\beta_6 \cdot Teleworking)$$

# Activity Pattern Analysis

**Activity Patterns in Jabodetabek**

| Target | No. | Activity Pattern | Abbreviation |
|---|---|---|---|
| Workers | 1 | Home → Work → Home | HWH |
| | 2 | Home → Work → Shopping → Home | HWSH |
| | 3 | Home → Work → Private → Home | HWPH |
| Students | 4 | Home → Education → Home | HEH |
| | 5 | Home → Education → Private → Home | HEPH |
| Others | 6 | Home → Shopping → Home | HSH |
| | 7 | Home → Private → Home | HPH |
| | 8 | Home → Shopping → Private → Home | HSPH |
| | 9 | Home → Private → Shopping → Home | HPSH |
| | 10 | Home → Private → Private → Home | HPPH |
| All | 11 | Home/Work From Home | H |

# ABM Simulation Results (PTV VISUM)




# Evaluation Results by Activity Patterns

**Activity Patterns in Jabodetabek**

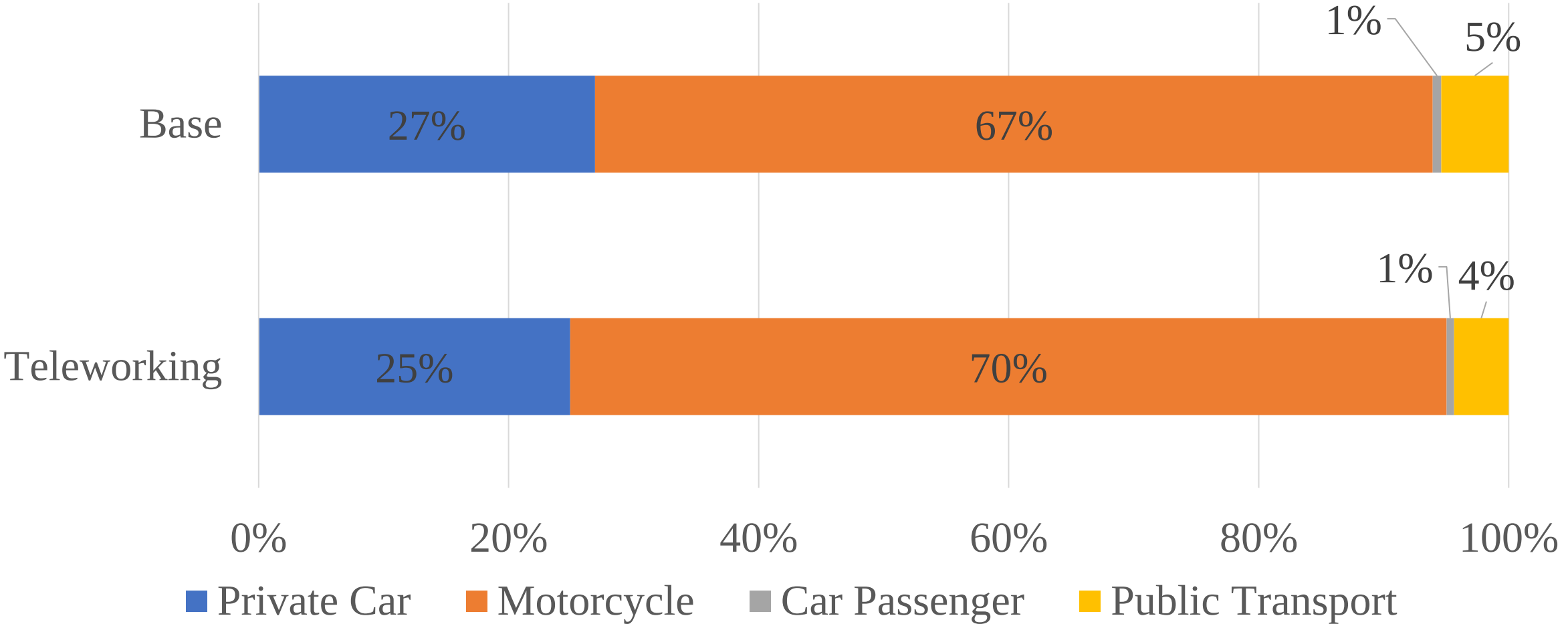
| Target | No. | Activity Pattern | Base | Teleworking Impact |
|---|---|---|---|---|
| Workers | 1 | HWH | 7939206 | 3112758 |
| | 2 | HWSH | 890703 | 414216 |
| | 3 | HWPH | 1218789 | 582813 |
| Students | 4 | HEH | 1361250 | 1361250 |
| | 5 | HEPH | 366300 | 366258 |
| Others | 6 | HSH | 515790 | 439659 |
| | 7 | HPH | 1470150 | 1263735 |
| | 8 | HSPH | 2623698 | 2036232 |
| | 9 | HPSH | 2842587 | 2251359 |
| | 10 | HPPH | 4992570 | 4060386 |
| All | 11 | H/WFH | 43037676 | 62086662 |

# Evaluation Results by Traffic Indices

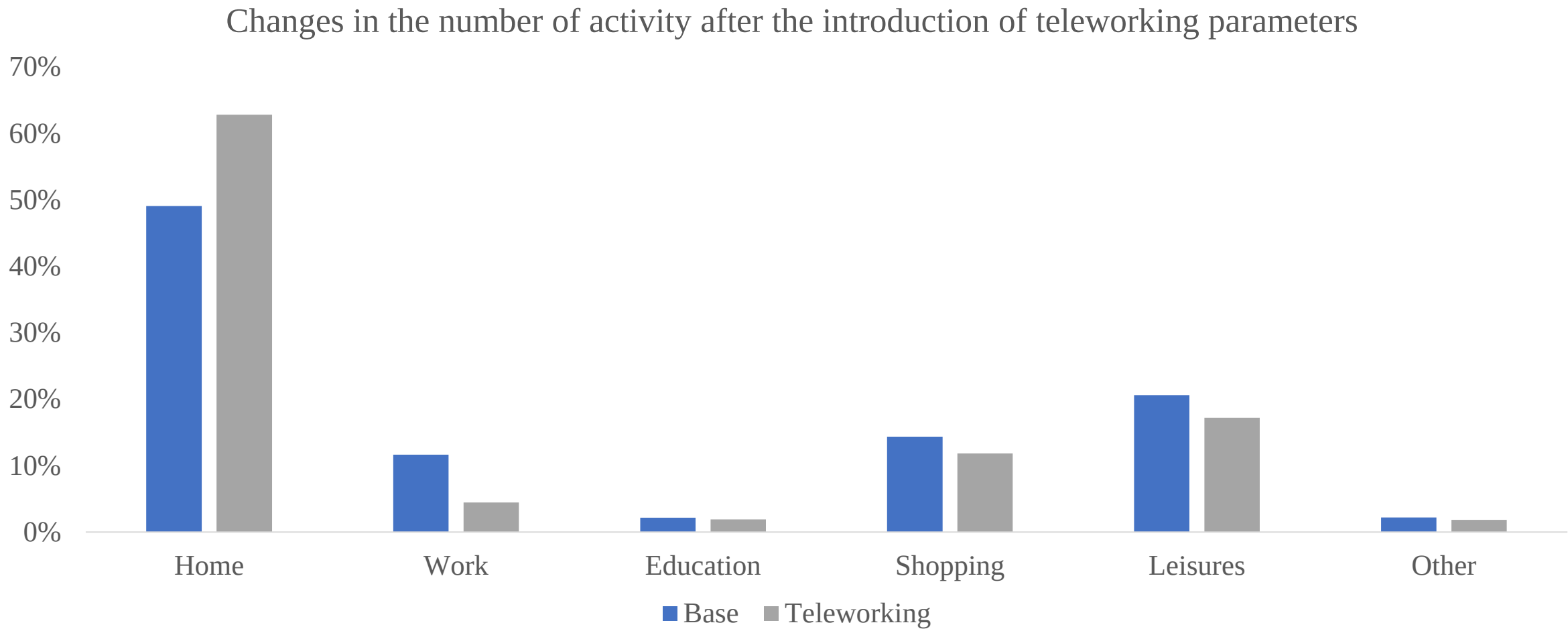
## ABM Results

| 33,918,000 people | Base Scenario Results | Teleworking Scenario Results |
|---|---|---|
| VKT in Kilometers | 867,053,377 | 645,267,426 |
| VHT in Hours | 37,293,510 | 22,267,710 |

# Evaluation Results by Modal Split




# Evaluation Results by Activity Conducted



# Conclusion

- This study organized the development of teleworking policy evaluation method by analyzing activity patterns
- Key findings
  - Population synthesis plays an integral part in ABM calculation
  - The result of activity pattern analysis has shown the increased numbers of home activities due to the policy
  - It is essential to include this information when trying to apply policies such as teleworking
- Thus, the impact of teleworking policy should be evaluated based on the result of ABM

# Thank you for your attention