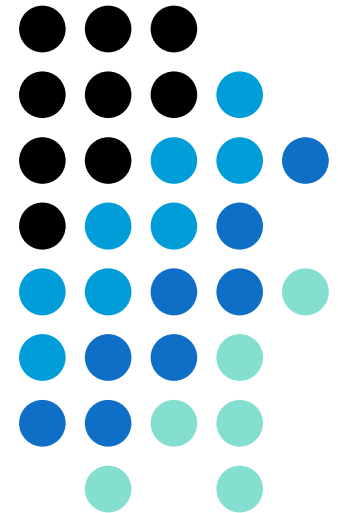


# Estimation of Trip Generation from Residential Area in Bangkok

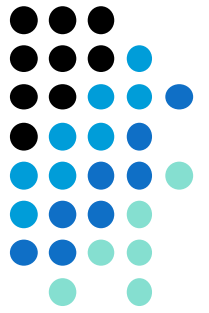
Nihon University

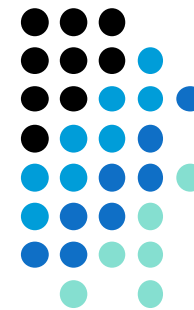
- Matt Srinarawat
- Yuta Ito
- Atsushi Fukuda
- Mikiharu Arimura



# Background

- According to the recent urbanization, even the open spaces reserved for water impound were being developed into residential quarter. Traffic generated from such area has increased beyond the capacity of Soi and became the main cause of traffic congestion in Bangkok.
- In order to find the solution for traffic congestion on the main road, the estimation of generated traffic volume from Soi is essential.





# Background

## Road network in Bangkok

Is combined with sub street that connected to the main Road called "Soi"



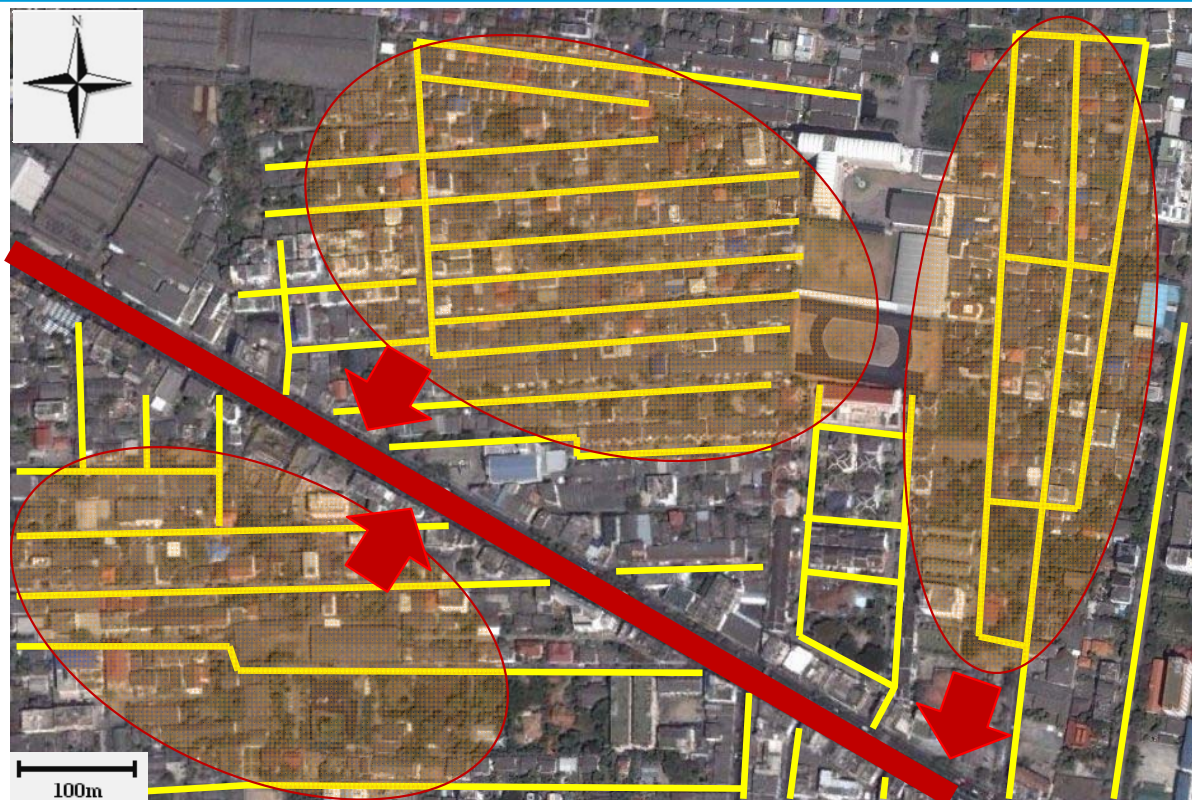
Along with the rise in population, more houses are being developed in "Soi"



Large amount of traffic is generated from "Soi"



Traffic congestion on the main road



Origin: Google map

**Lack of good  
planning**

**A lot of dead-end  
Soi**

**Number of household  
in Soi increased**



**Traffic congestion on  
main road**

# Objective

To be able to understand the Traffic jam problem more clearly in order to find the solution for traffic congestion on the main road, the estimation of generated traffic volume from Soi is essential



The existing statistic data of population, household, vehicle possession, etc. is insufficient to estimate the generated traffic volume



Find the new generated traffic estimation method that does not require statistic data

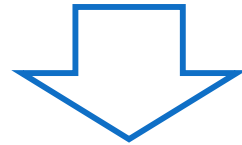


Traffic generated from Soi is estimated by household questionnaire and satellite image

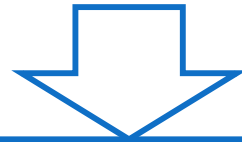
# Existing study on Household



There were an existing research about characteristics of urban structure and vehicle use in Bangkok

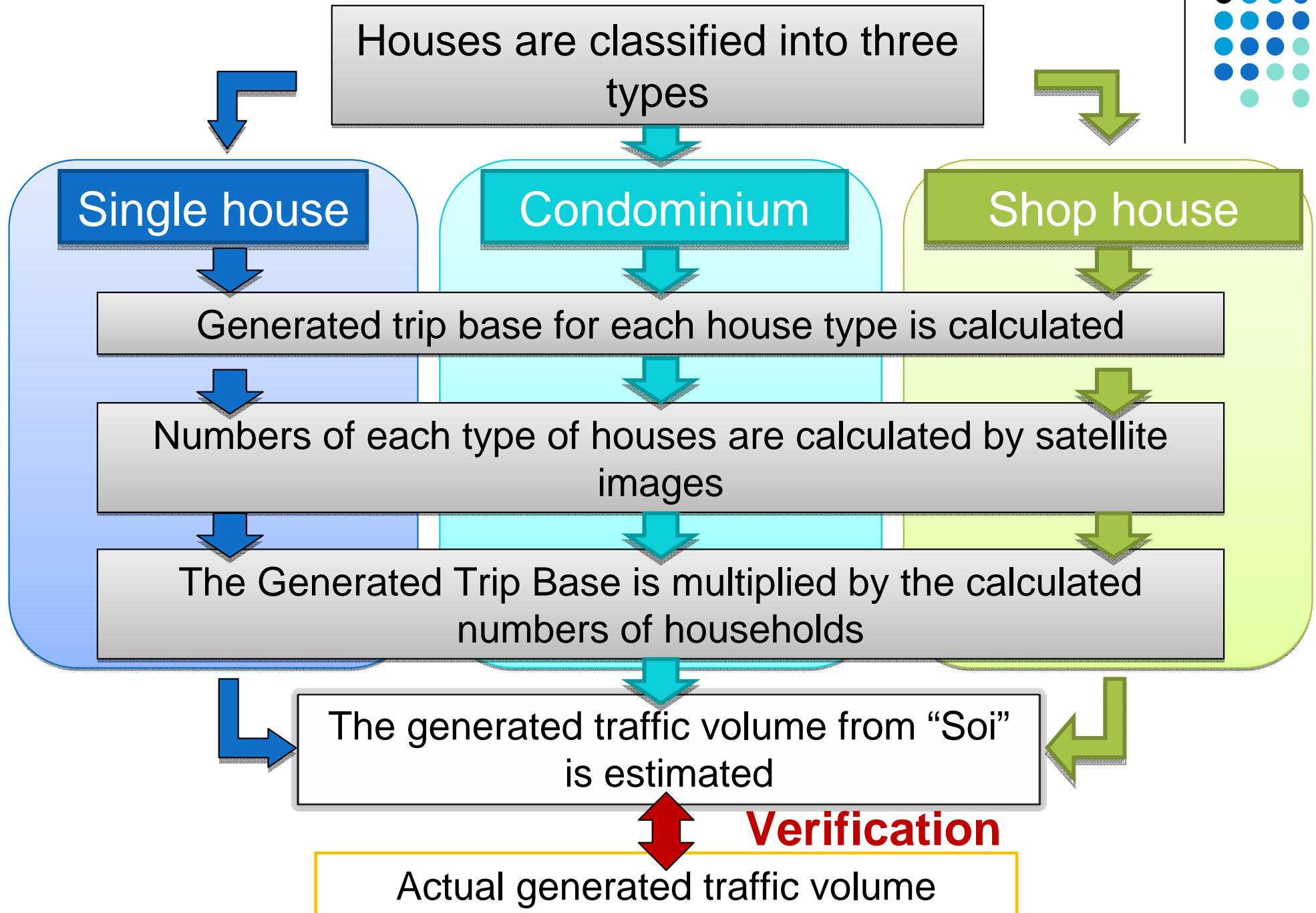
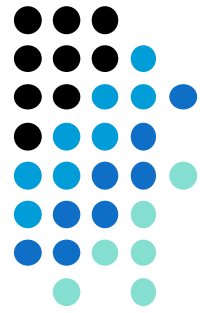


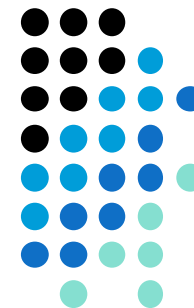
Household configuration, occupation and income are the factors of which vehicle and in what number the household will have in possession



It is considered that there the traffic generated by the different house type varied

# Method of study





# Questionnaire survey

To obtain the Generated Trip Base from each house type, the home visit questionnaire survey was conducted

Investigation date

16th – 18th  
December 2009

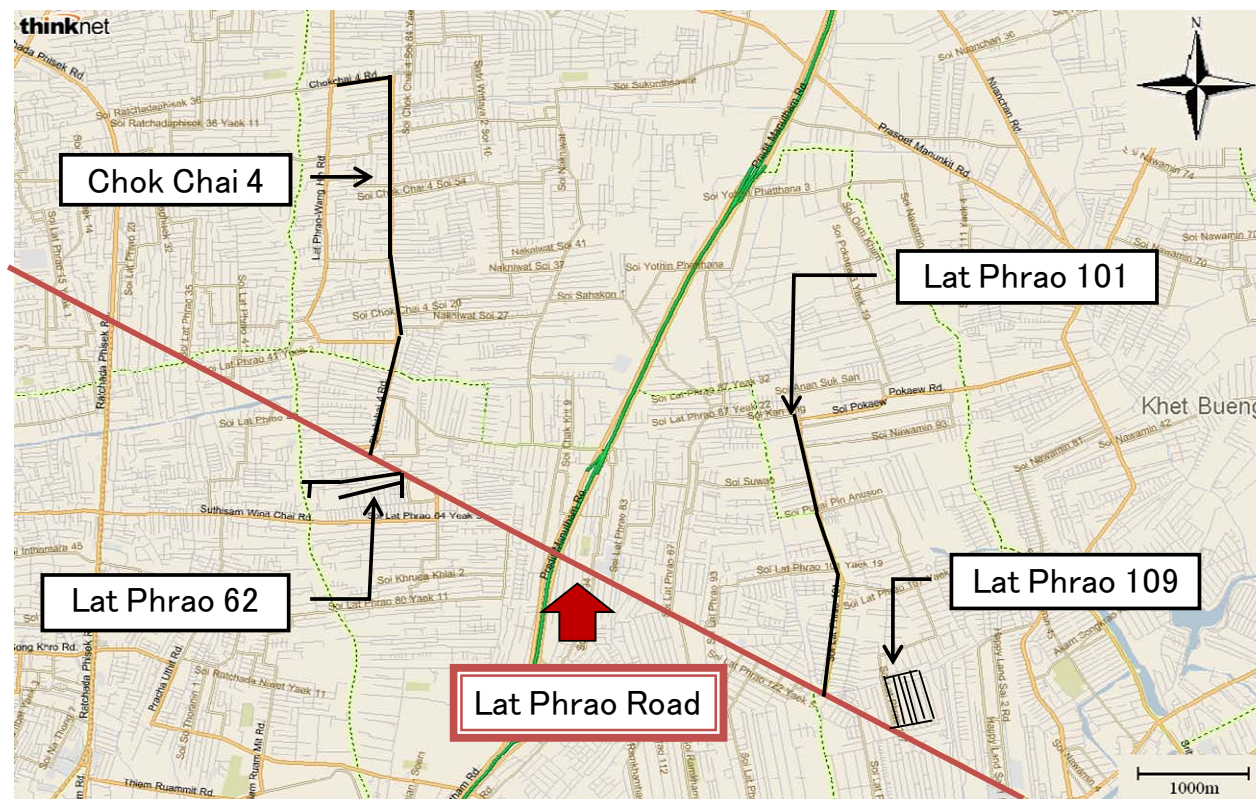
Questions

- Household's composition
- Individual attribute
- Transportation mode

Area with Soi of various scales is selected



The survey was conducted in 4 Sois connected to Lat Prao road, 15 km north east from the centre of Bangkok

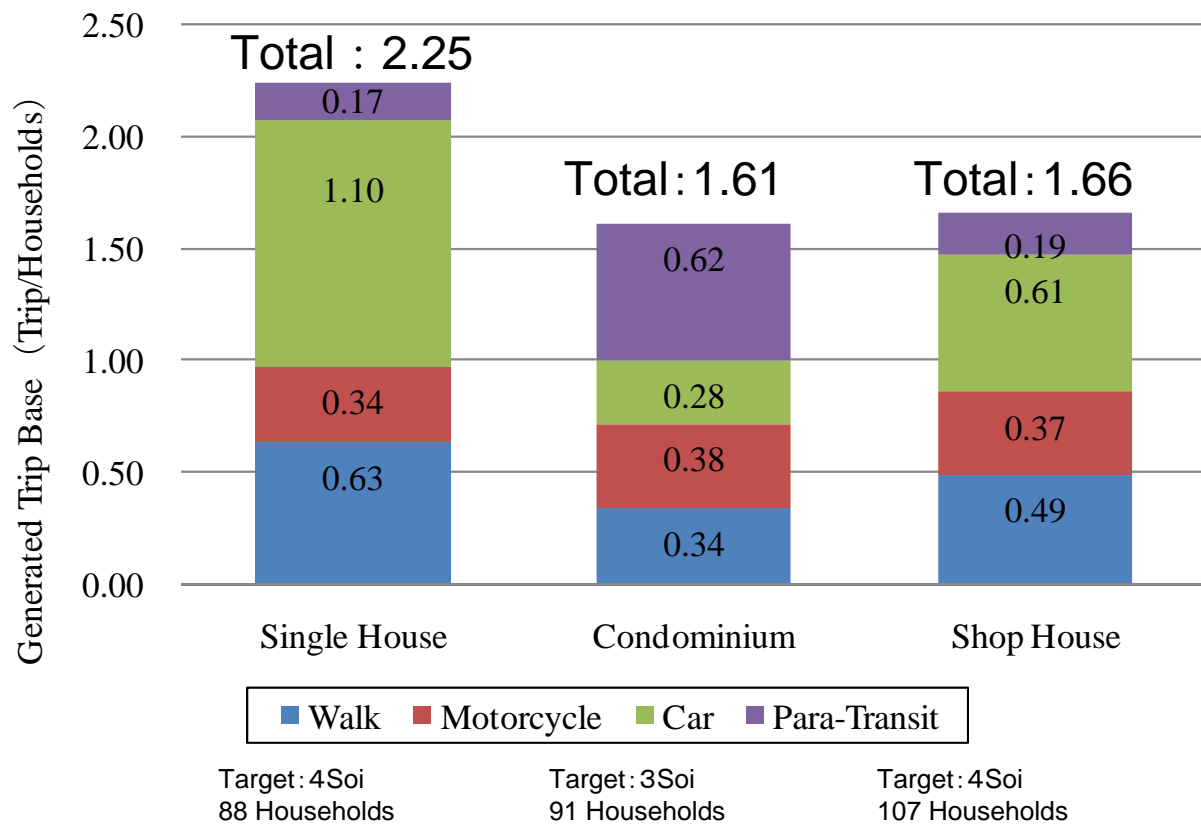


Origin: MapMagic [Bangkok and 7 nearby provinces 2009]

# Calculation of Generated trip base



- Generated trip base is calculated from average value of the traffic generated from each household of each house type in one day

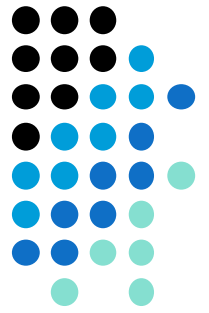


Car generated trip is high for Single house

Car generated trip is low for Condominium

It assumed that most of the condominium residents are students, who don't have a car





# Generated trip estimation model

- The generated traffic came out from “Soi” during the two hours of the morning peak was estimated by using the following mathematic expressions

$$y = \beta \sum_{i=1}^3 \alpha_i x_i$$

$y$  : Generated traffic volume at Soi’s exit during the peak of two hours in morning (trip)

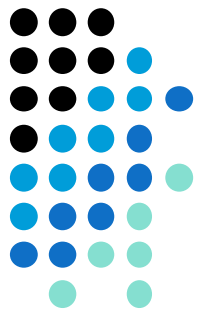
$\beta$  : Peak rate during the peak of two hours in morning

$\alpha_i$  : Generated Trip Base according to house type (Trip / Household)

$x_i$  : Number of household according to house type (household)

$i$  : 1 = Single house 2 = Condominium 3 = Shop house

- The peak rate  $\beta$  is the average value of the Generated trip during 2 hours peak in the morning ( 7:00 – 9:00 am) from all Sois. Therefore  $\beta = 0.63$



# Sois selected for Generated trip estimation

In order to verify the generated trip estimation model's accuracy, another five Sois along Lat Prao Road were selected

To exclude unwanted traffic, only dead-end Sois were selected



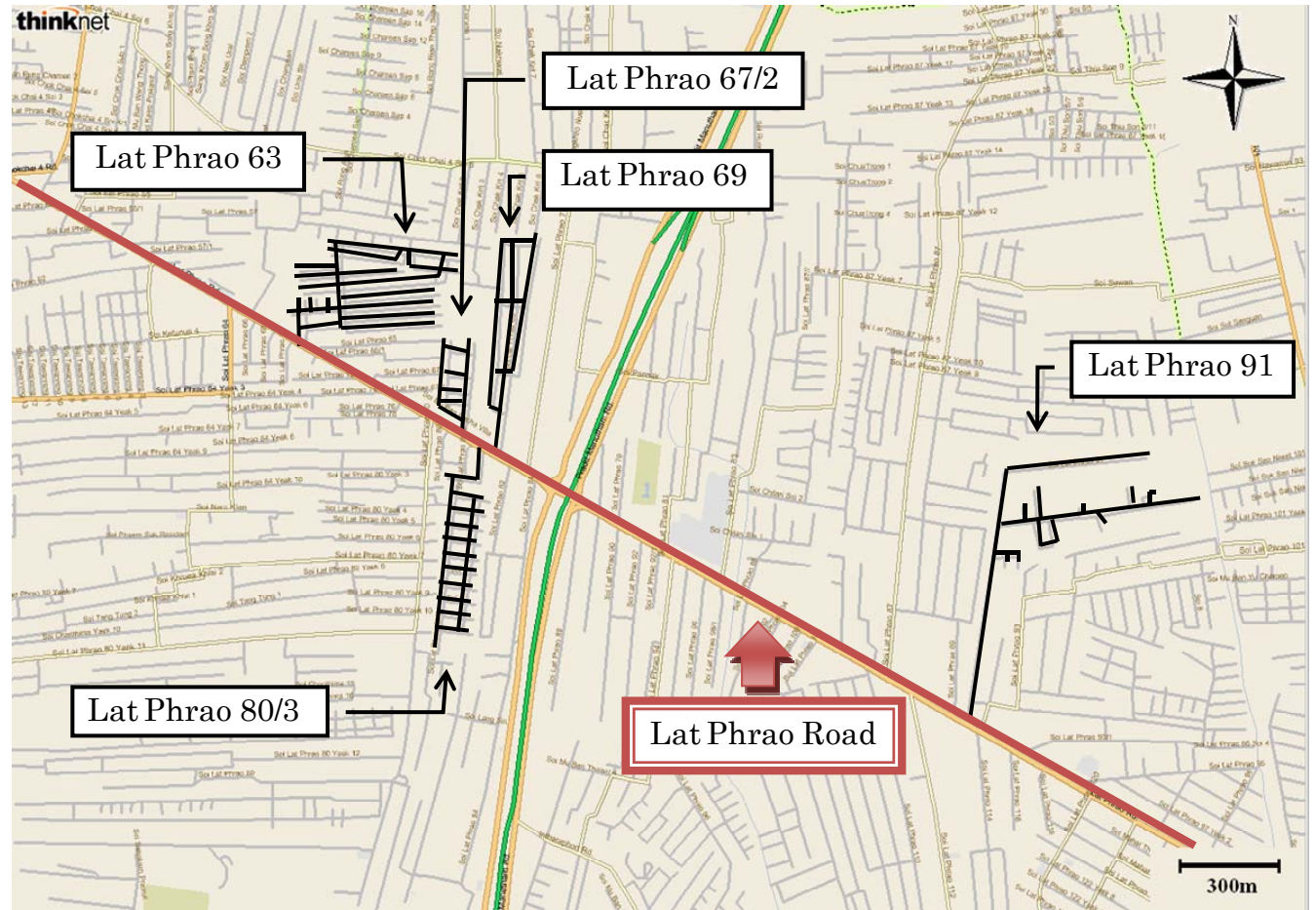
The numbers of household in each Soi is calculated



Generated trip is estimated



The estimated value is compared with the actual measured value for verification



Origin: MapMagic [Bangkok and 7 nearby provinces 2009]

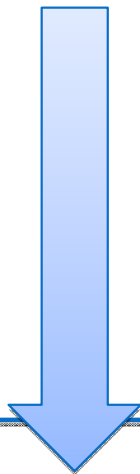
# Household calculation

- Calculation method

Single house



Counted lot by lot  
using satellite image



Condominium  
Shop house



The building's area is divided  
by average lot area

House Type	Average Lot Area (m <sup>2</sup> )	Sample (Buildings)	Standard Deviation ( m <sup>2</sup> )
Condominium	29.44	11	4.98
Shop House	57.39	5	9.02

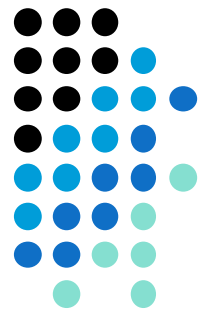


For condominium, multiplied by  
number of floors



The numbers of household of each house type in Soi

# Traffic Volume Survey



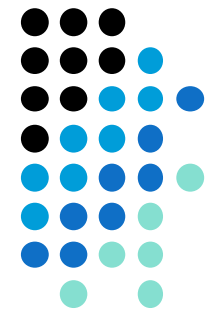
In order to verify the Generated trip estimation model, the traffic volume survey was conducted in five dead-end Soi connected to Lat Prao Road that were used in generated trip estimation. The reason that only dead-end Sois are selected is because the traffic measured at dead-end Soi's entrance will be the actual traffic generated from that particular Soi.

Investigation date

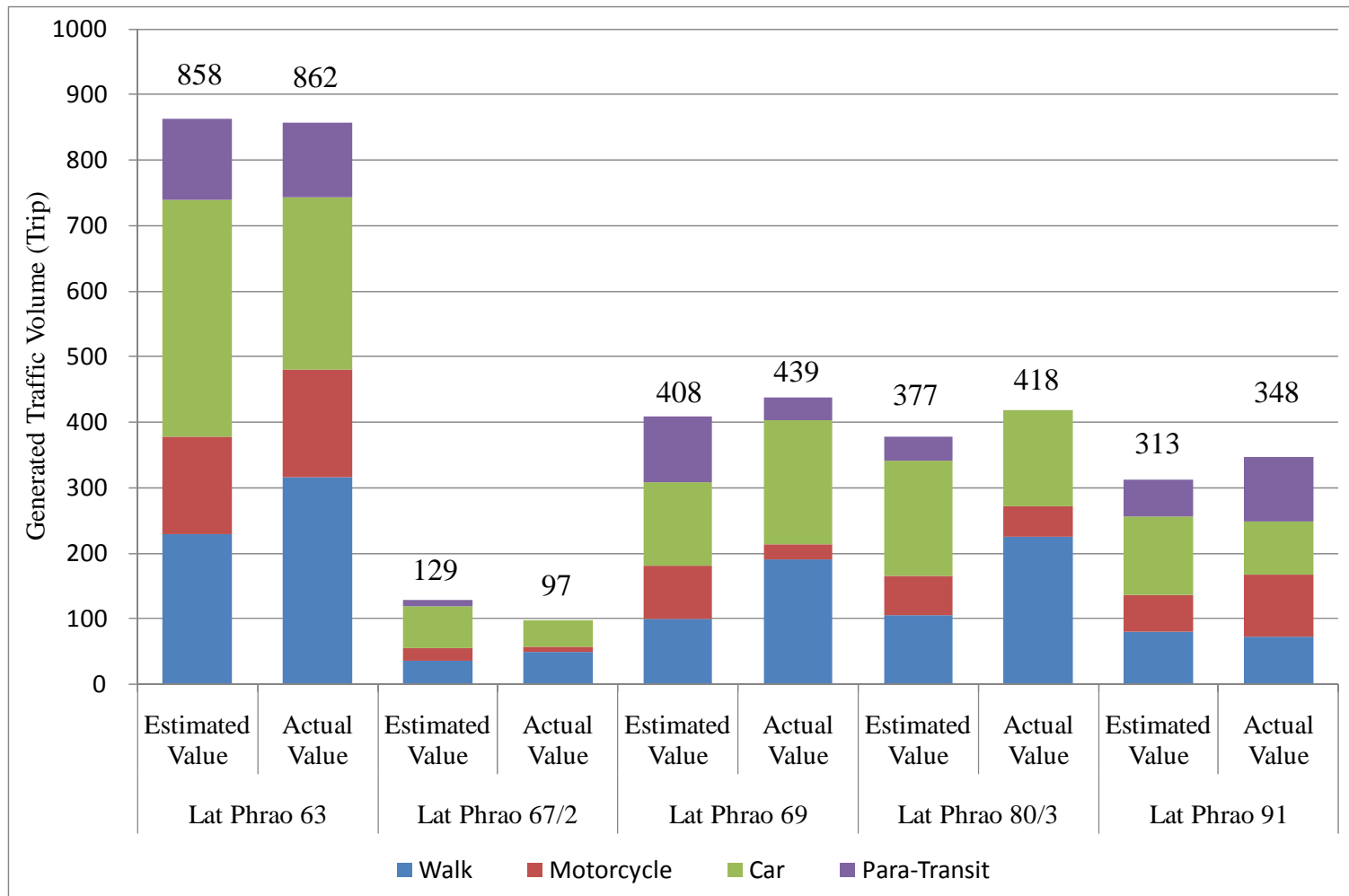
During 16<sup>th</sup> – 18<sup>th</sup> December 2009  
7:00~9:00

	Walk (Trips)	Motorcycle (Trips)	Para-Transit (Trips)	Car (Trips)	Total (Trips)
Lat Phrao 63	317	163	115	263	858
Lat Phrao 67/2	50	8	0	39	97
Lat Phrao 69	66	23	36	190	315
Lat Phrao 80/3	225	47	0	146	418
Lat Phrao 91	73	95	100	80	348

# Estimation Results & Verification



- The estimated generated trip during two hours peak and the actual measured generated trip are verified



Generated trip estimation



Only few error



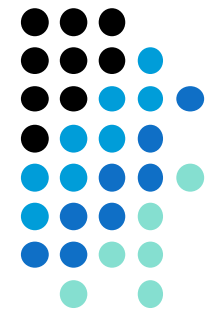
Estimation is reliable

Generated trip estimation for each transport mode

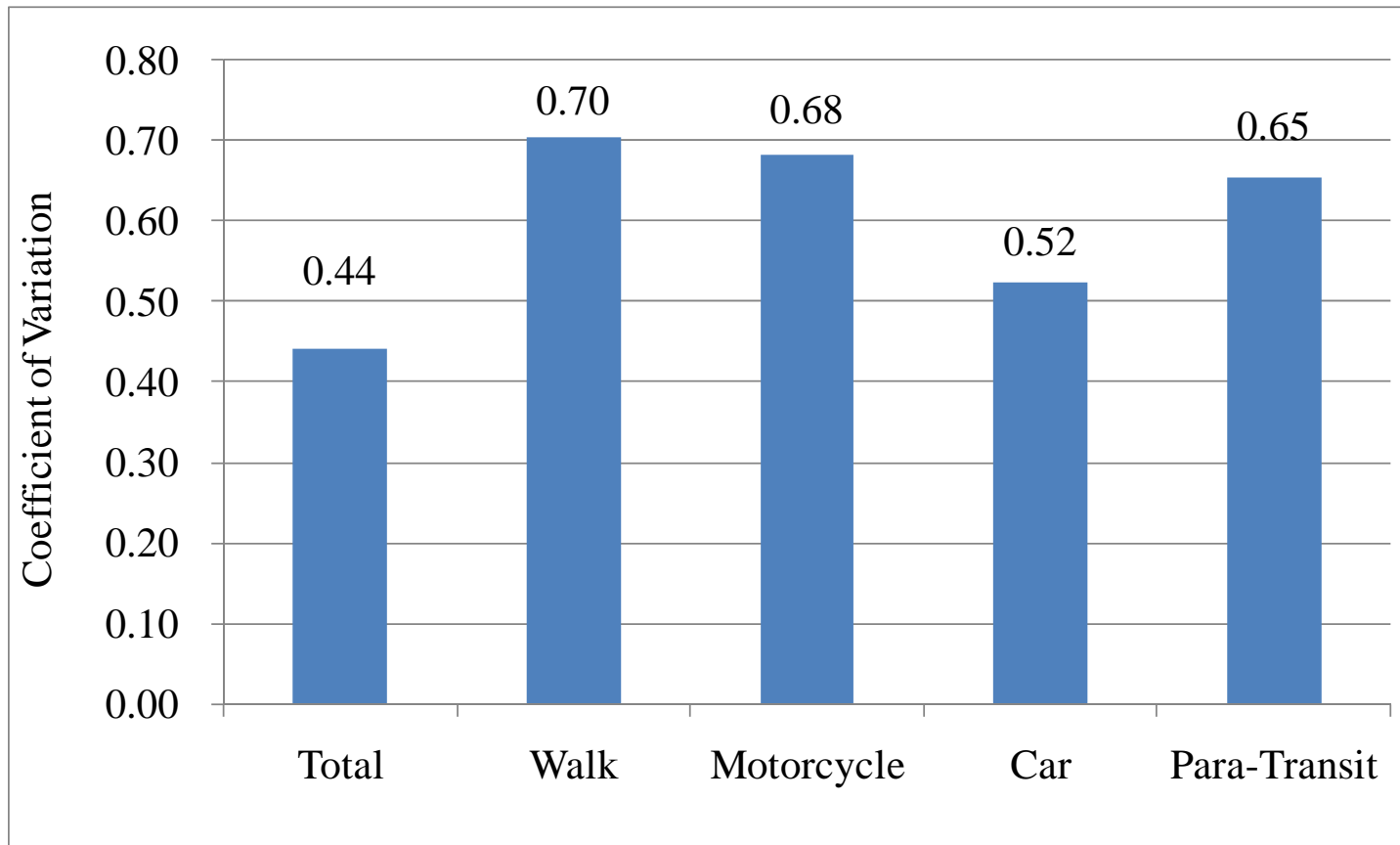


Error margin is high

# Estimation Results & Verification



- Error margin of estimated value from generated trip during two hours peak and the actual measured generated trip



Generated trip estimation



Only few error



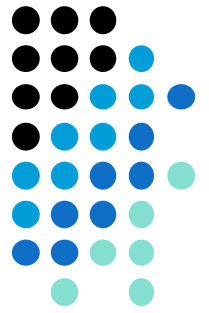
Estimation is reliable

Generated trip estimation for each transport mode



Error margin is high

# Results of this study



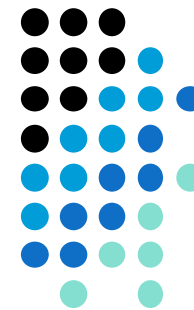
- The compared results of the estimated value and the actual measured value clarified that all transport modes generated traffic volume estimation is possible.
- After the generated trip base for each house type was calculated, more understanding about tendency of each house type is achieved.

# Future issues

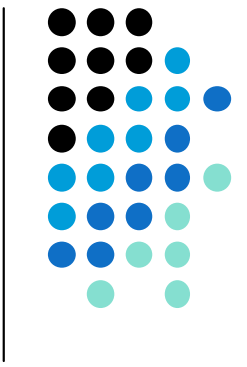


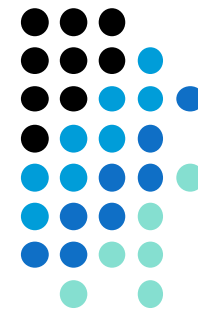
- In order to improve the accuracy of the estimation, it is important to cross investigate the shape and structure of Soi and how and in what modes people prefer to transport in Soi.
- It is important to validate whether that the generated trip base estimation model can be use to estimates traffic in Bangkok's other area.



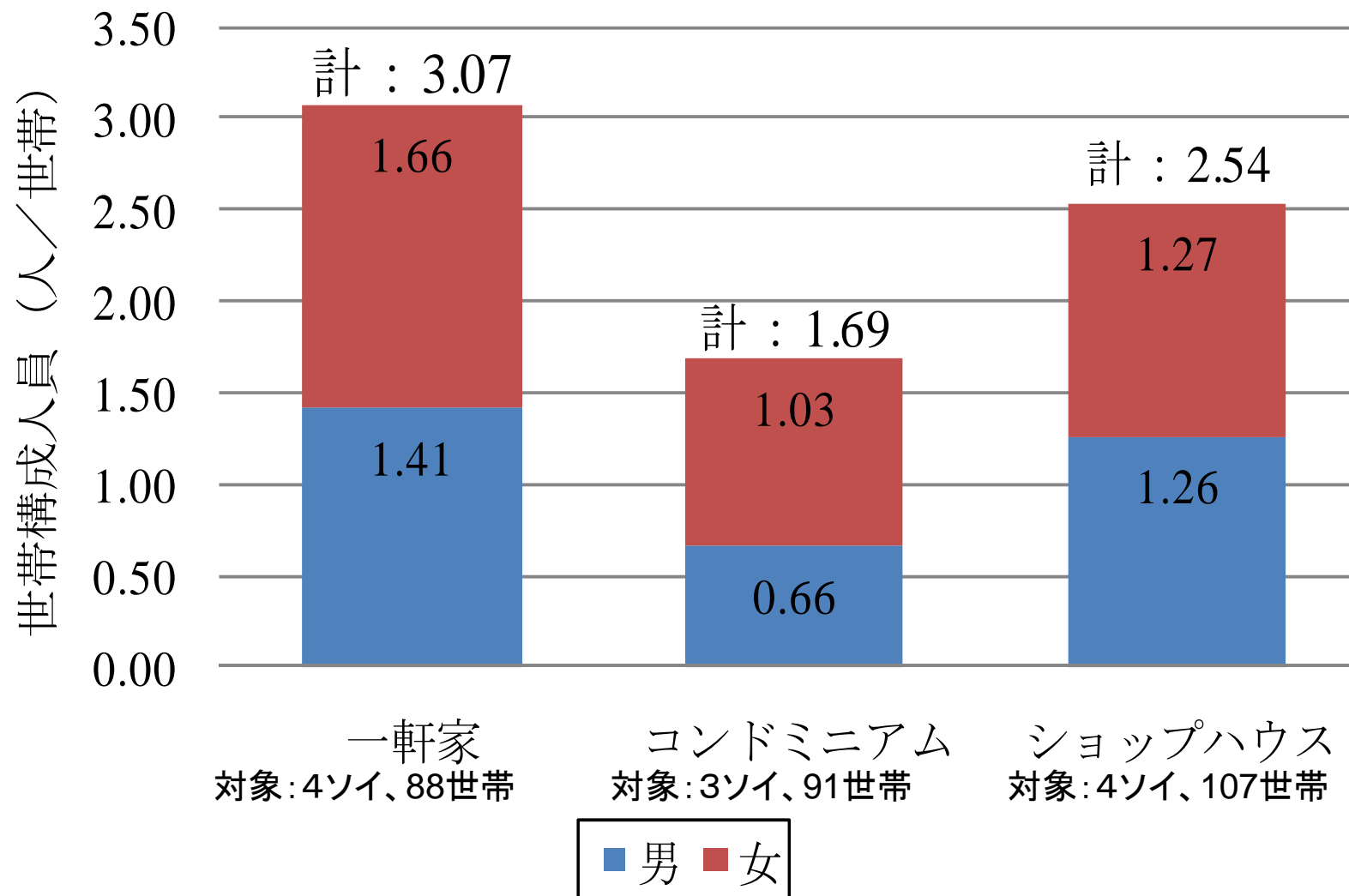


Thank you for your valuable time

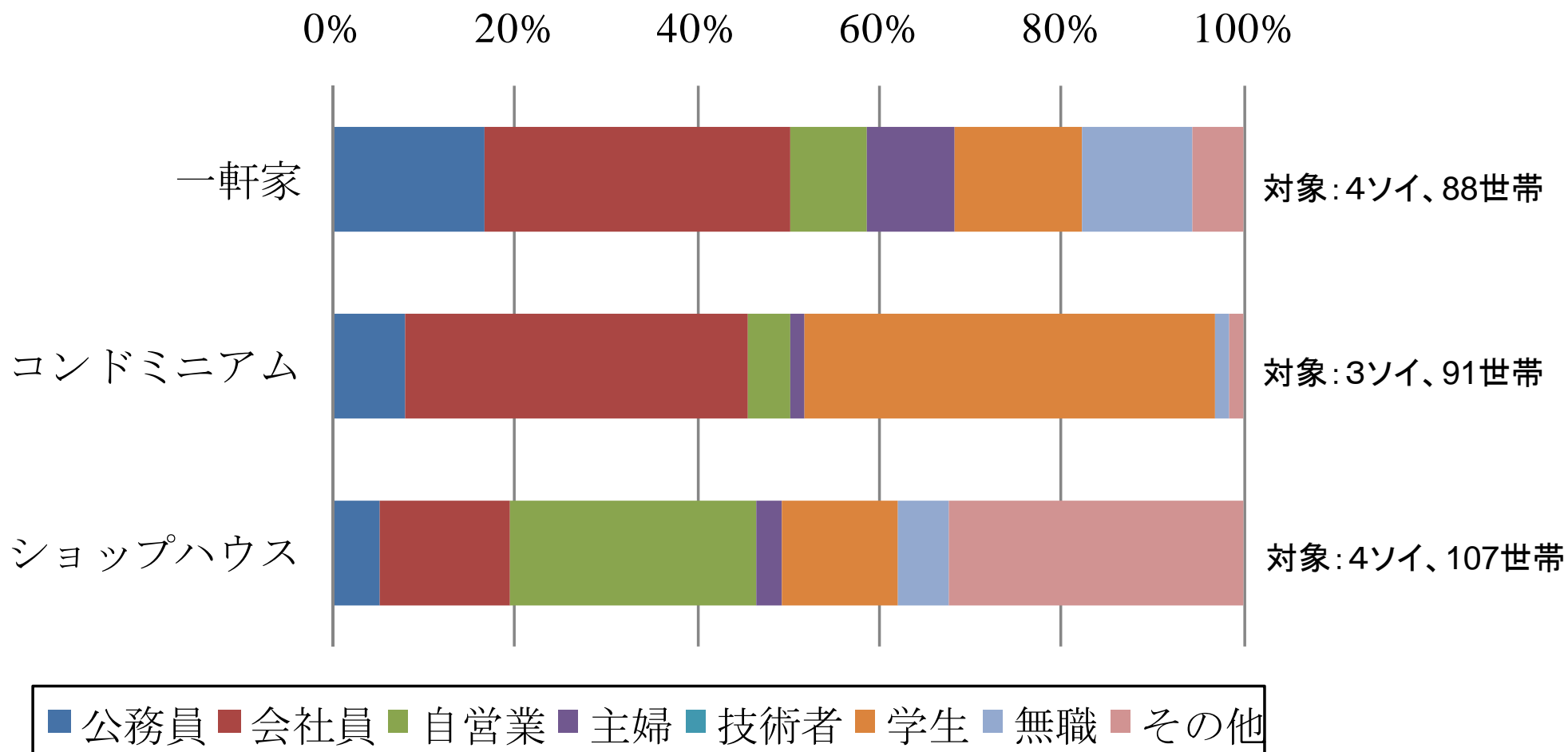
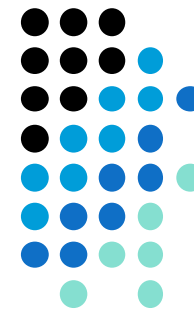




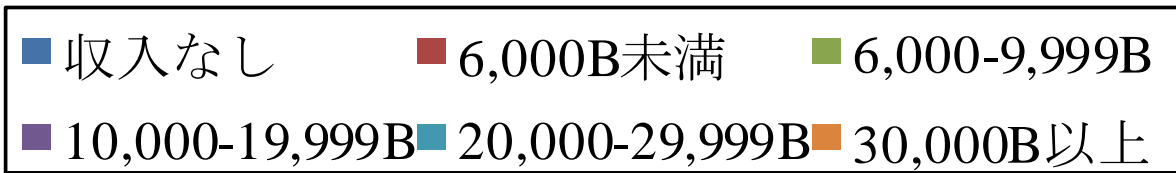
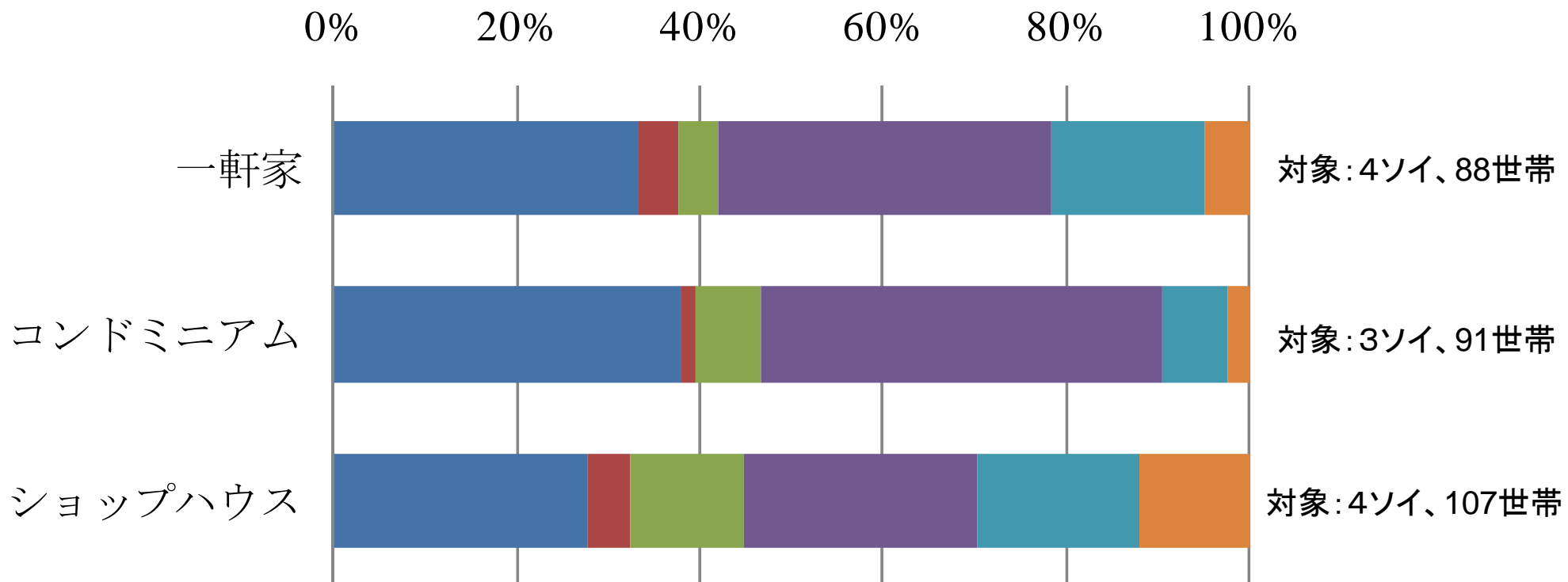
# 住宅タイプの世帯構成人員

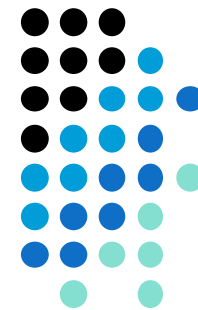


# 住宅タイプの職業構成

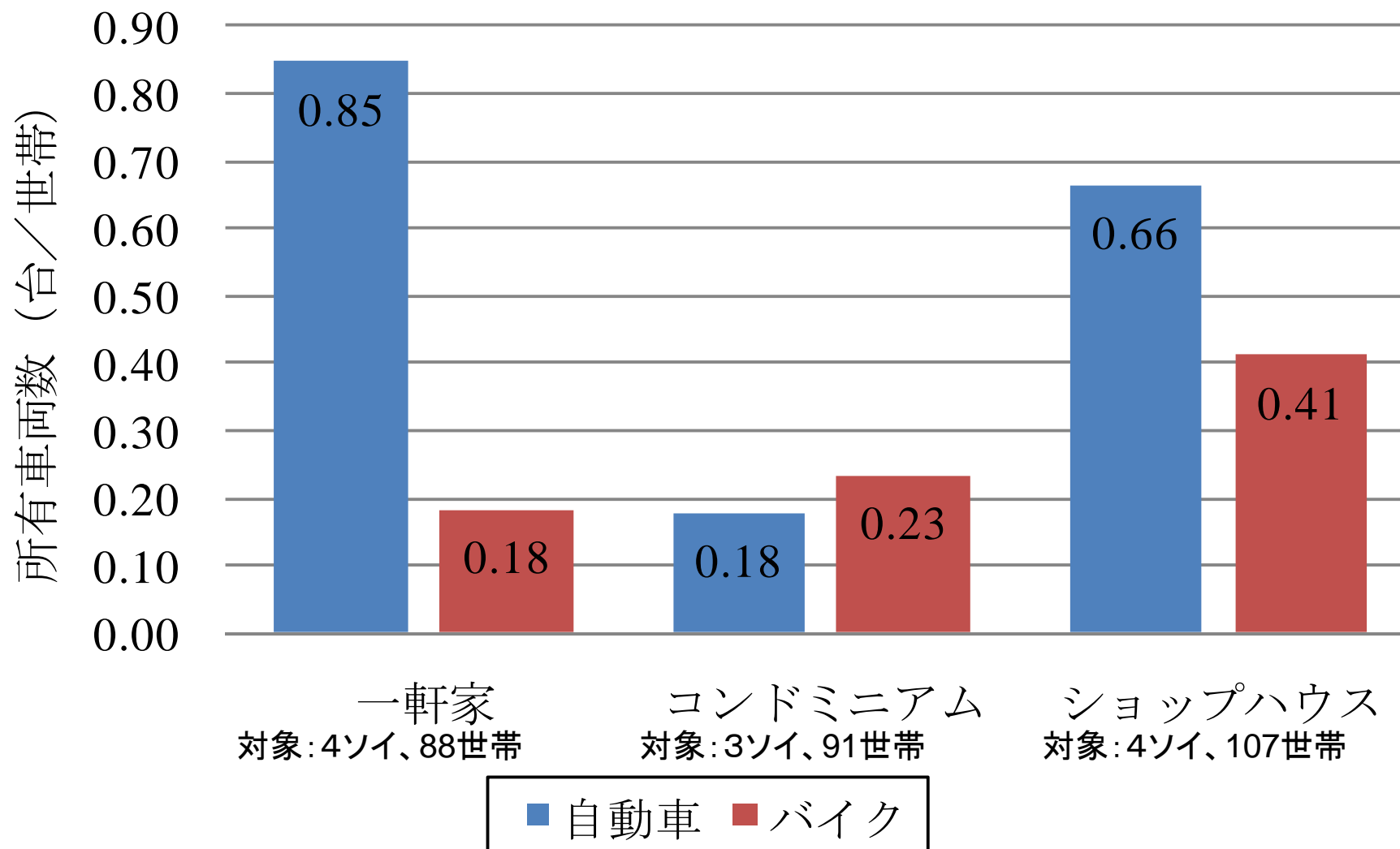


# 住宅タイプの収入構成





# 各住宅タイプの所有車両数



# 各ソイのピーク率



Soi Number	Peak Rate	Average	Standard Deviation
Lat Phrao 63	0.62	0.63	0.08
Lat Phrao 67/2	0.47		
Lat Phrao 69	0.67		
Lat Phrao 80/3	0.69		
Lat Phrao 91	0.70		

