Study on Lifestyle Transformation under the Influence of Rail Transit in Bangkok
-Focusing on Condominium Development along Rail Transit -

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Abstract: This study focuses on condominiums along urban rail transit lines in Bangkok and tries to clarify its residents' lifestyle transformation, particularly change of residential location and transportation behavior. By analyzing of data of questionnaire survey, it is found that substantial number of residents immigrated from outer area and they changed their lifestyle dramatically. The new urban lifestyle, which is to live in condominiums in catchment area of rail transit stations, travel in compact scope and prefer to take public transportation, is spreading in young middle-class population. This new phenomenon is supposed to play a part in restraining urban sprawl and ease transportation problems. It is important to hold this young generation in city center and entrench the new urban lifestyle in the future. Additionally, to attract workplace in city center is essential to foster immigration from suburban area.

Keywords: Urban Rail Transit, Condominiums, Lifestyle, Residential location, Transportation behavior

1. INTRODUCTION

In many large cities in developing and transitional countries, construction of urban rail transit systems is in process or is planned. For example, in Vietnam, Hanoi has plan to develop metro network composed of eight metro lines until 2050 and in Indonesia, Jakarta Mass Rapid Transit is now under construction and its first phase is planned to start to operate in 2016. Ahead of these cities, Bangkok, a capital of Thailand, has network of urban rail transit systems consisting of two lines of Bangkok Transit System's (BTS) elevated train, one line of Mass Rapid Transit's (MRT) Subway and one express line and one local line of Airport Rail Link's (ARL) train which connect Suvarnabhumi International Airport to city center. This network of urban rail transit systems is still on stage of development and extension of BTS's and MRT's line is planned and new MRT's elevated train, called 'purple line', is under construction. This new line connects northern suburbs with city center. (Table 1, Figure 1)

Table 1. Urban Rail Transit Network in Bangkok

	BTS Sukumvit line	BTS Silom line	MRT subway	Airport Link	Purple line
Opening year	1999 Dec.	1999 Dec.	2004 July	2009 Dec.	2014
Length	22.1km	8.5km	21km	28.6km	23km
Number of Stations	22 stations	9 stations	18 stations	8 stations	16 station
Extension plan		2013 5.3km 4 stations	2015 from Bang Sue sta. 13.1km 7 stations from Hua Lamphong sta. 13.9km 6 stations		

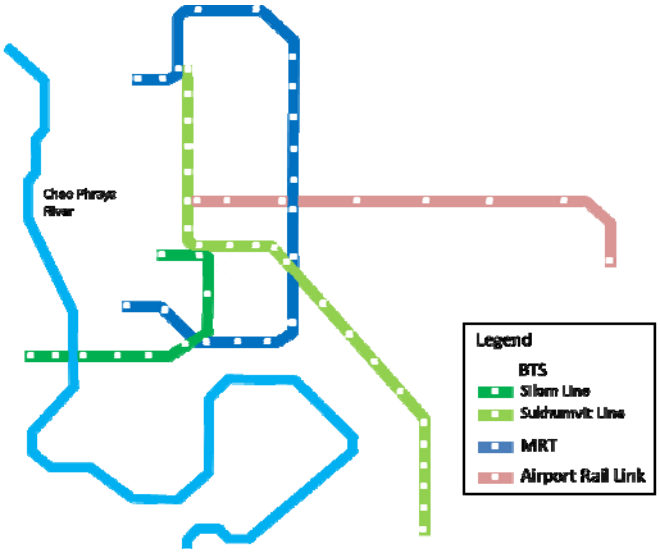

Figure 1. Bangkok Mass Transit Network

This development of urban rail transit network has influence on development on surrounding area. One of the visible influences is accumulation of condominium development along urban rail transit lines. Since around 2005, construction of new condominiums along these urban rail transit lines has been booming. According to Chalermpong et al.(2011), total number of new condominium units within 500 m of BTS and MRT stations and completed after 1999 is 57,803. Recently number of new house unit of condominium is now beyond that of single-family detached house and new condominium within 1000m of transit station has majority of overall condominium development.

Bangkok has continued to expand spatially, that is 'sprawl' and its population increased dramatically as well since 1950s. With this urban sprawling in Bangkok, motorization is progressing and Bangkok is becoming even more automobile dependent (Newman, 1996). This progress of motorization causes serious transportation problems, such as traffic jam and air pollution. Though Bangkok's population is still increasing, a new pattern of demographic shift within Bangkok is found out in these decades. It is population outflow from inner area to outer area. Concretely, from 1987 to 2000, population of the inner area of BMR (Bangkok

Metropolitan Region; Bangkok City and five adjacent provinces)) has declined, but the outer area increased. The inner area population density decreased from 15.27 to 11.09 thousand/sq.km. (3.25 to 2.36 million people) while the outer increased from 0.77 to 1.28 thousand/sq.km. (0.67 to 1.12 million people) (Vichiensan, 2008).

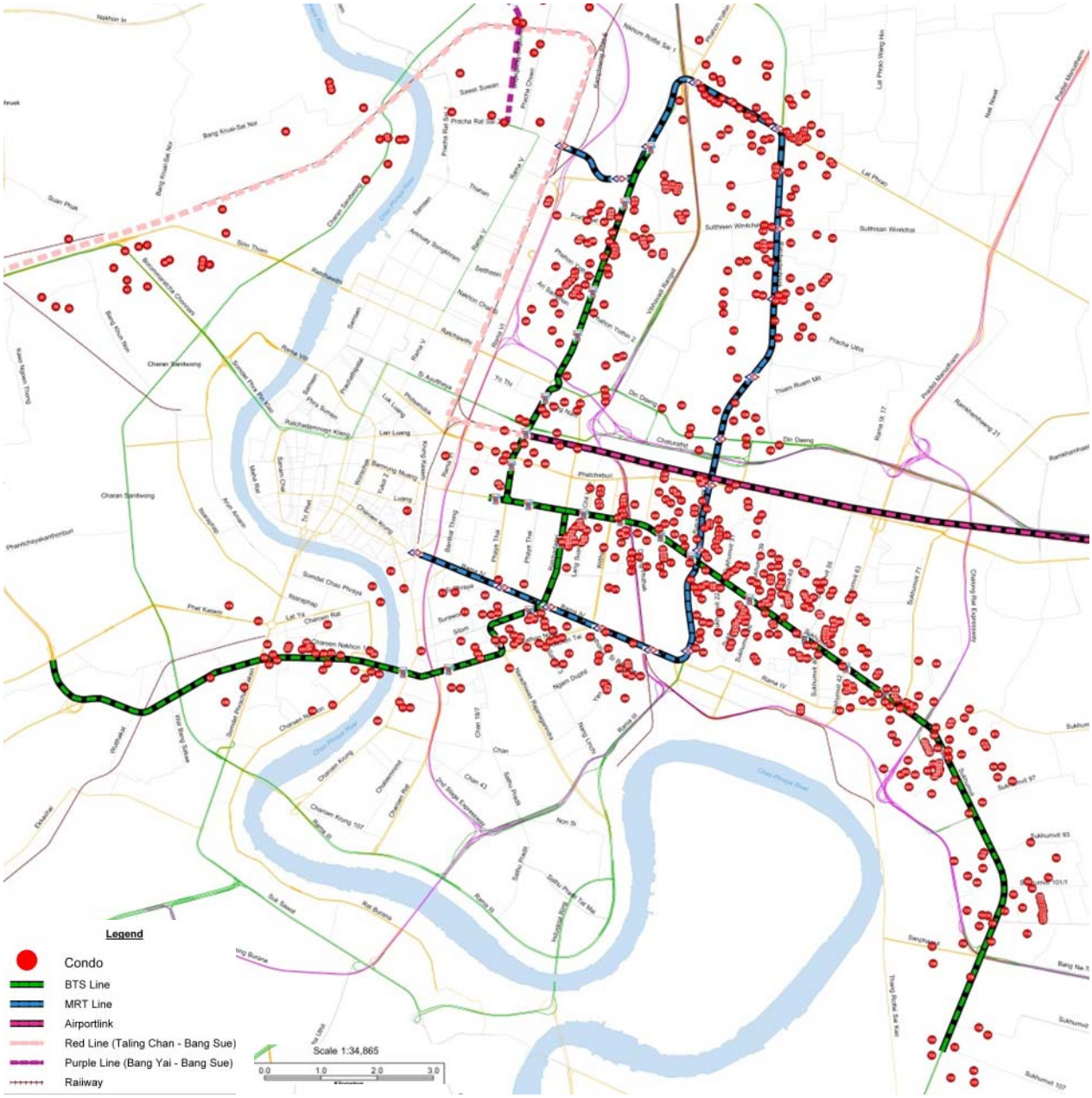

Figure 2. Residential development along BTS/MRT since 1999

As this phenomenon in which development of condominiums accumulates along the urban rail transit lines is in contrast to this Bangkok's urban spatial and demographical transformation pattern, a research question, whether this phenomenon caused by development of urban rail transit is pulling population from outer area into inner area and will ease urban sprawling and people's high automobile-dependent lifestyle in the future or not, are developed. In order to consider this research question, this study aims to clarify (1) where residents of these condominiums come from, inner city or suburban area, (2) how their lifestyle, especially transportation behavior changed due to residential moving to the condominiums, and to

examine (3) policy to ease sprawling and people's high automobile-dependent life style.

There are some studies on influence of urban rail transit systems on surrounding area of Bangkok. Vichiensan et al. (2007) showed remarkable increase of land price along BTS line after its opening. Chalermpong (2007) showed that premium of transit accessibility is approximately $10 for every meter closer to a station. Additionally, Vichiensan et al. (2010) examined influence of rail transit on house value. Additionally, regarding with its impact on transportation behavior, Sanit et al.(2012) examined condominium residents' BTS ridership and its affecting factors. Besides Bangkok, there are some studies on influence of urban rail transit systems on land use, such as Dueker et al. (1999) in Portland, Topalovic et al. (2012) in Hamilton, Cervero(2013) in San Diego and Pacheco-Raguz(2010) in Manila and all of them examine impact of urban rail transit on land value. Regarding with impact on transportation behavior, Dueker et al. (1999) examines its effect on automobile ownership and mode share in Portland. However there is no research which examines population movement and change of transportation behavior accompanying with it, focusing on new development along urban rail transit. They are essential information to predict future urban spatial transformation and sustainability.

2. METHODOLOGY

In this study, change of residential location and transportation behavior of residents of condominiums completed after 1999 will be analyzed. The data was collected by questionnaire survey.

2.1 Area Division of Bangkok

In order to analyze data of the questionnaire survey, area of BMR is divided into three areas in this study.

At first, Bangkok city is divided into the following six areas according to land use plan of 'Bangkok General Plan 2006'; (1) Urban commercial & business area, (2) Urban high density residential area, (3) Urban-suburban middle density residential area, (4) Suburban low density residential area, (5)Sub centers and (6)Green and agricultural area (Figure 3). This division of area is called 'BMA-area' in this paper.

Then, these six areas of Bangkok city and five adjacent provinces is divided into three areas (Figure 4 and Table 2). This division of area is called 'BMR-area' in this study. In the following chapters, results of the questionnaire survey are analyzed based on these area divisions.

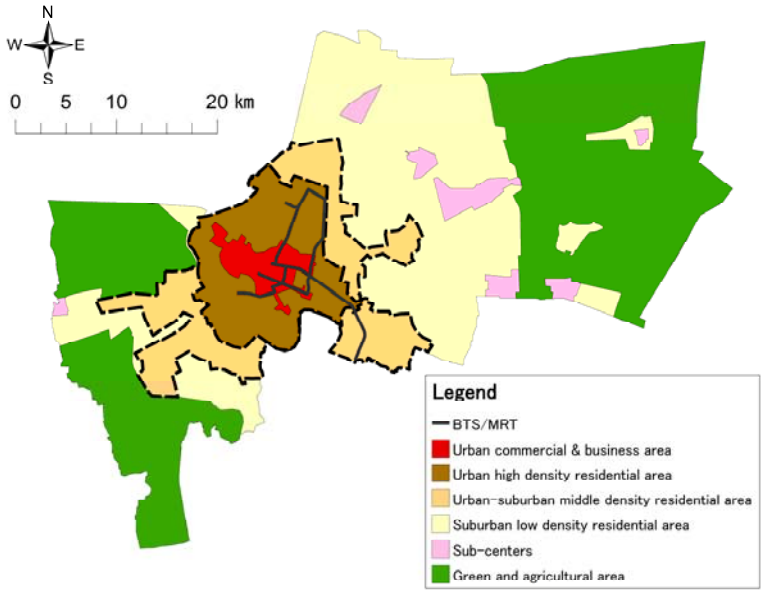

Figure 3. Area division of Bangkok City (BMA-area)

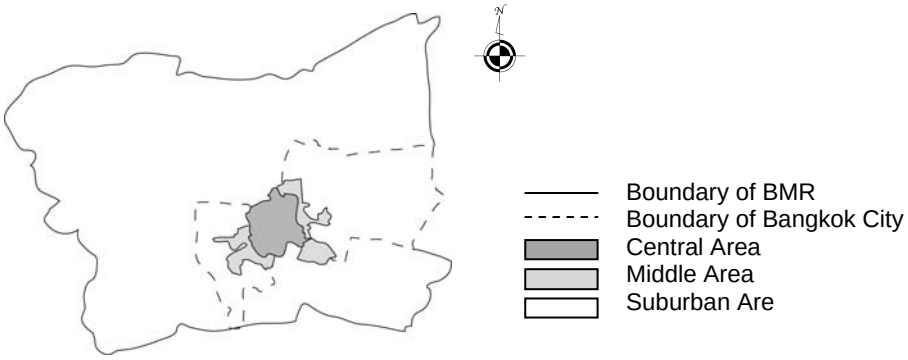

Figure 4. Area division of BMR (BMR-area)

Table 2. Area division of BMR (BMR-area)

BMR-area	BMA-area
Central area	(1) Urban commercial & business area (2) Urban high density residential area
Middle area	(3) Urban-suburban middle density residential area
Suburban area	(3) Suburban low density residential area (4) Sub centers (5) Green and agricultural area +Five adjacent provinces

2.2 Data Collection

At first, letters to request for permission to conduct the questionnaire survey to residents were sent to justice offices of about 50 condominiums which locate within 1km radius from BTS and MRT stations and were completed after 1999. Finally 31 condominiums gave permission of the survey. Location of the 31 condominiums is shown in Figure 5 and number

of samples in each BMA-area is shown in Table 3.

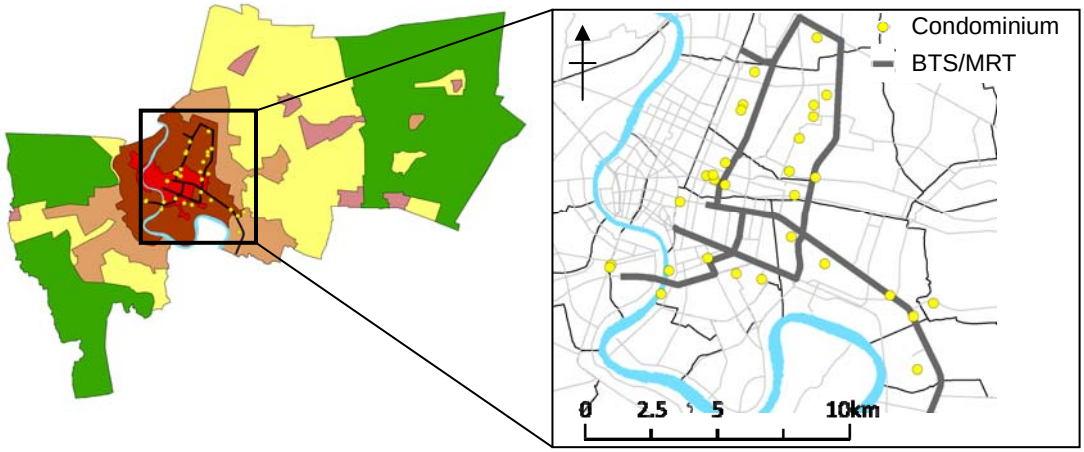

Figure 5. Location of condominiums

Table 3. Number of condominiums and samples

Area division of Bangkok city(BMA-area)	No. of condominium	No. of samples
Urban commercial & business area	10	92
Urban high density residential area	18	132
Urban-suburban middle density residential area	3	27
TOTAL	31	251

Questionnaire survey was conducted near entrance of the condominiums to residents who were willing to answer it. Respondents to the survey are those who live in the condominiums, have Thai nationality and are worker. The survey was conducted from August 11th to September 3rd, 2012 and finally got valid 251 samples.

The socio-economical characteristics of respondents are summarized in Table 4. It shows that the characteristics of respondents are high-educated and comparatively young generation. According to the 2007 household socio-economic survey by the National Statistical Office of Thailand, the total income per household in Thailand is 18,660 Baht and that in Greater Bangkok (Bangkok, Nonthaburi, Pathmtani and Samut Prakarn) is 35,004 Baht. And average size of household in Thaialnd in 2010 is 3.2 persons (WHO; 2011). From these figures, respondents in this survey, whose average household income is 51,133 Baht and average size of household is 1.92 persons, can be assumes as middle- to upper-income people.

From this result, majority of respondents can be assumed young middle-class people. As more than 70% of respondents are single, more than 85% households don't have any children to live with, more than 80% of respondents are in 20's or 30's and more than half of households rent their rooms in the condominiums, these condominiums can be considered as temporary accommodation for certain degree of respondents.

Table 4. Socio-economic characteristics of respondents

Sex Male 39%(n=99) Female 61%(n=152)	**Age** 20's 44%(n=110) 30's 38%(n=95) 40's 13%(n=32) 50's 5% (n=14) **Average**=32.6 years old	**Education** Lower than primary 2%(n=4) Primary 4%(n=9) Undergraduate 57%(n=139) Graduate 37%(n=90)
Marriage Status Single* 72.5%(n=182) Married 27.4%(n=69) *'Single' includes 'divorced' and 'bereaved'	**Household Number** 1 person 41%(n=101) 2 persons 40%(n=99) 3 persons 11%(n=28) 4 persons 5%(n=12) 5 persons 2%(n=6) 6 persons 1%(n=3) **Average**=1.92 persons	**Number of Children Living with** No child 86.4%(n=217) 1 child 9.5%(n=24) 2 children 3.6%(n=9) 3 children 0.0%(n=1)

Occupation Office worker 51%(n=127) Public servant 11%(n=27) Self-employment 11%(n=27) Specialist personnel 11%(n=27) Teacher 5%(n=13) Others 11%(n=27)	**Property Ownership** Owner 47.8%(n=120) Rental 40.6%(n=102) Rental from parents/relatives 10.0%(n=25) Others 1.6%(n=4)
Length to live Less than 1 year 16.1%(n=38) 1 year- less than 2 years 14.0%(n=33) 2 year- less than 3 years 19.9%(n=47) 3 year- less than4 years 11.4%(n=27) 4 year- less than 5 years 8.5%(n=20) 5 year- less than6 years 7.6%(n=18) 6 year- less than 7 years 8.0%(n=19) 7 year- 13.6%(n=32) **Average**=3years 10 months	**Monthly Household Income** Less than 20,000THB 8.2%(n=19) 20,000-Less than30,000THB 16.9%(n=39) 30,000-Less than40,000THB 16.9%(n=39) 40,000-Less than50,000THB 13.4%(n=31) 50,000-Less than75,000THB 20.3%(n=47) 75,000-Less than100,000THB 5.2%(n=12) More than100,000THB 19.0%(n=44) **Average**=51,133THB

3. CHANGE OF RESIDENTIAL LOCATION

3.1 Location of Former Residence

Figure 6 shows regions, provinces and areas where former residences located in. More than 90% of respondents moved from within BMR and about 70% of respondents moved from within Bangkok City. Regarding BMR-area defined in 2.1, about 36% of the respondents came from central area and about 18% from middle area and about 37% from suburban area. That is to say, more than half of respondents moved from middle and suburban area inward.

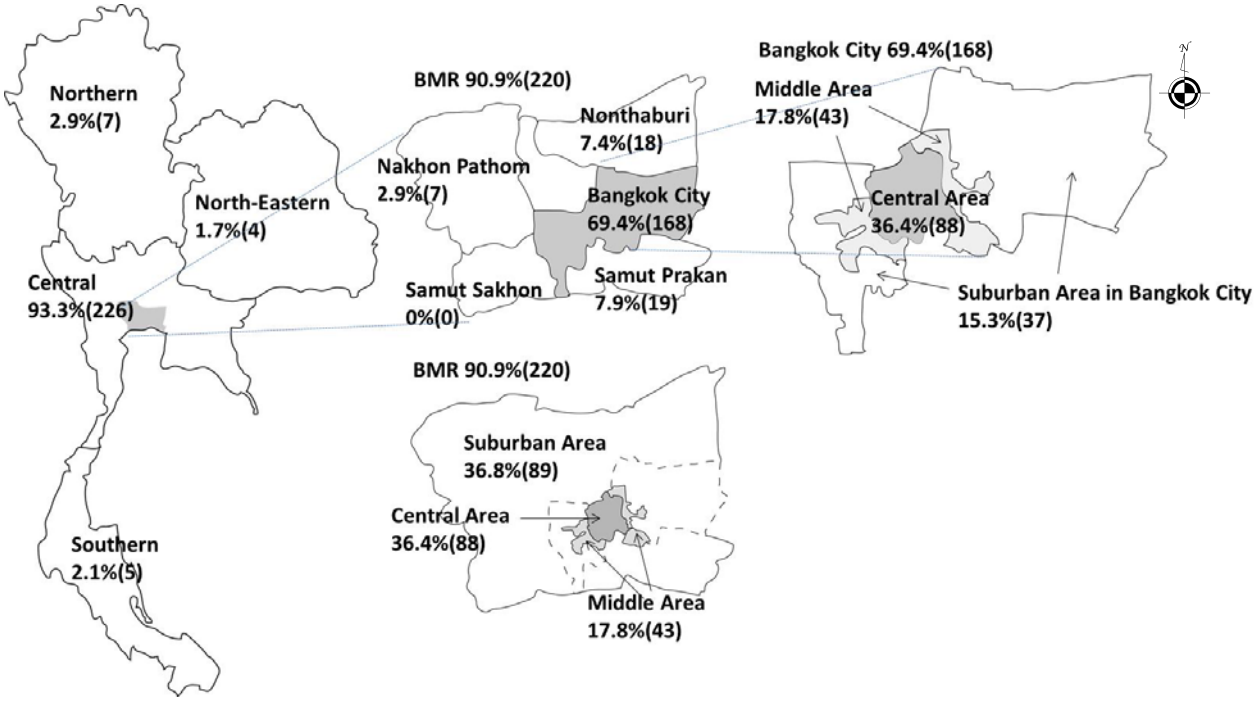

Figure 6. Location of former residences

Next, former residential types in each area are examined to investigate former life style. Figure 7 shows types of former residences. Only 25% of former residence was condominium type, about 27% was detached-house, about 34% was shop house and 12% was town house type. To compare former residential types in each area, suburban area has the lowest ratio of condominium and central area has the highest.

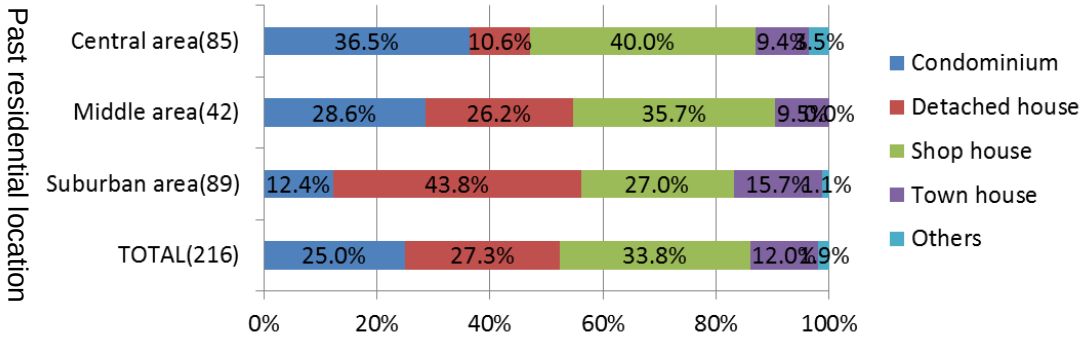

Figure 7. Types of former residences

In summary, Figure 6 and Figure 7 shows substantial number of respondents changed their life style as residential location and type.

Figure 8 shows reasons of changing residential location to the present condominiums (multiple answers). More than half answered change of his/her/family member's workplace location is the reason of changing residential location. How workplace location affected on population mobility will be examined in the next section. More than one fourth respondents changed their residential location to look for good access to public transportation. That is development of urban rail transit pulled population in catchment area of urban rail transit.

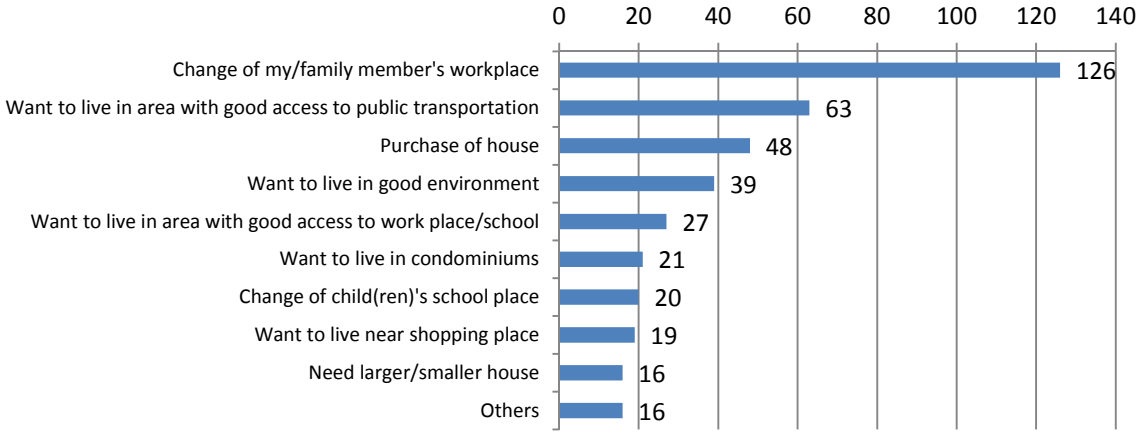

Figure 8. Reasons of change of residential location (n=236, Multiple answers)

3.2 Workplace Location

As change of workplace location is the major reason of change of residential location, change of workplace location is examined in this section.

About 60% of respondents have different workplace location in former residences from in the present condominiums (Table 6). Figure 9 shows respondents' past and present workplace location. Today, more than 90% of respondents' workplace locates in central area. That is, most of respondents live comparatively near their work place. In the past, only 67% of workplace locates in central area. That is to say that workplace location moved inward as well as residential location. Whether this change of workplace location was caused by office relocation or company transfer or job change is not clear in this study. This is reasonable because more than half of respondents' reason of change of residential location is change of workplace location. That is workplace location moved inward and population followed it.

Next, past workplace location in each former residential area is examined. In central area, pattern of workplace location is very similar with the present pattern. On the other hand, in middle area and suburban area, only about 57% went to work to central area and rest of people went to outside of central area. Therefore it is supposed that mainly workplace of former middle-area and suburban –area residents moved inward to central area.

Table 6. Number and percentage of workplace location change

Change	59.0%(n=131)
Not change	41.0%(n=91)

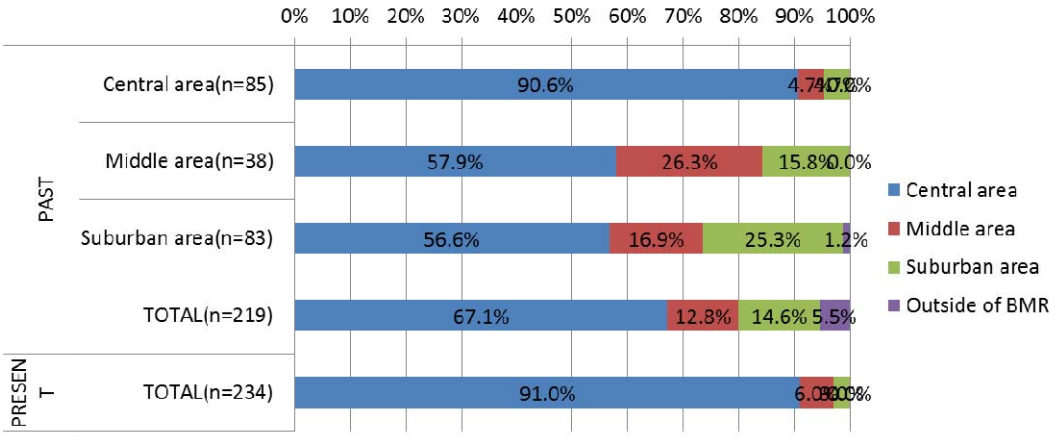

Figure 9. Past and present workplace location

Figure 10 and Table 7 shows present and past linear distance between residence and workplace. To compare present average distance 4,693m with past average distance 8,051m, there is significant decrease of distance. This result is consistent with result shown in Figure 8. In the past, average distance between residence and work place in suburban area is more than three times as long as in central area. By moving to condominiums along the urban rail transit, a number of people from suburban area decrease its commuting distance dramatically.

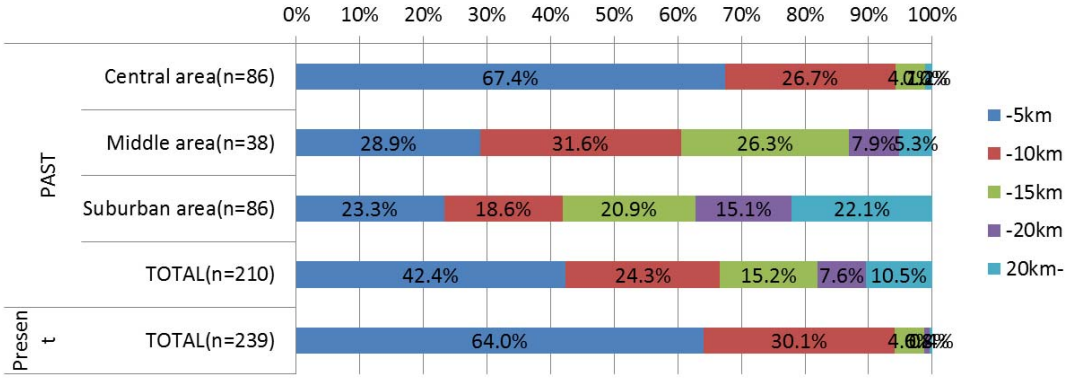

Figure 10. Past and present linear distance between residence and workplace

Table 7. Past and present average linear distance between residence and work place

Past	Central area	4,232m
	Middle area	8,587m
	Suburban area	12,829m
	Total	8,051m
Present	Total	4,693m

4. CHANGE OF TRANSPORTATION BEHAVIOR

4.1 Automobile Ownership

At first, automobile ownership in former residences and present condominiums are compared. Table 8 shows automobile ownership ratio and average number of automobile in the former residences and in the present condominiums. There is slight difference between past and present ownership ratio. On the other hand, average number of owned automobile

decreased considerably. That is to say, some of those who owned more than one automobile decreased its number but to give up automobile ownership is very difficult.

Table 8. Automobile ownership

	BMR-area	Ownership Ratio	Average* number of owned automobile
Former residences	Central Area	56.8%	1.29
	Middle Area	65.0%	1.42
	Suburban Area	68.3%	1.46
	TOTAL	61.7%	1.40
Present condominiums	TOTAL	59.3%	1.17

*average excluding 0 values

Figure 11 shows reasons of decreasing number of owned automobile(multiple answers). Most of respondents answered that they decreased number of owned automobile because they take BTS/MRT more frequently.

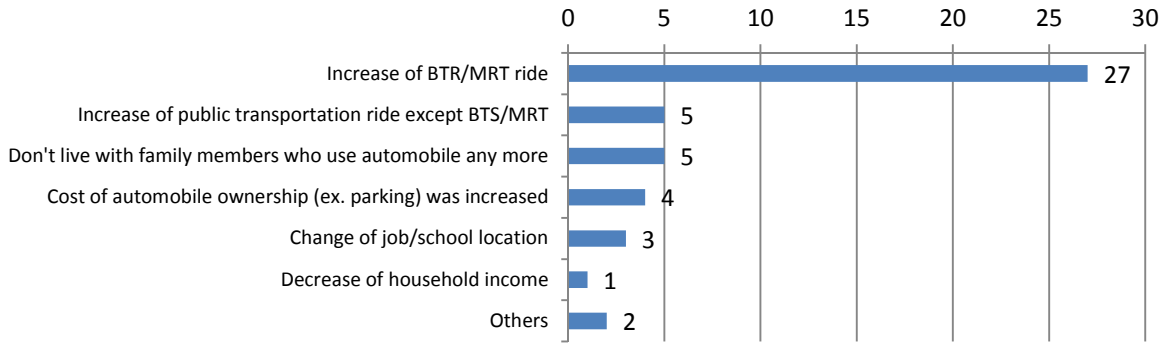

Figure 11. Reasons to decrease number of owned automobile (n=39, multiple answers)

Going back to Table 8, past automobile ownership in each area will be examined. Ownership ratio in central area is almost same as present ownership. More people owned more automobiles in suburban area than central area.

4.2 Commuting Transportation

Figure 12 shows main transportation mode of commuting traffic in the former residences and the present condominiums. Today about 60% of respondents takes public transportation for commuting. But 27% of respondents still take automobiles even though they live in catchment area of BTS/MRT stations and more than 90% of respondents' workplace location is in central area.

In comparison past commuting transportation mode with present one, share of automobile/motorcycles decreased from 43% to 27% and share of public transportation increased from 43% to 59%. It can be said that changing residence to condominiums in catchment area of BTS/MRT station decreased automobile traffic for commuting.

To compare past main transportation mode in each area, it is observed that the outer they lived, the more they takes automobiles for commuting.

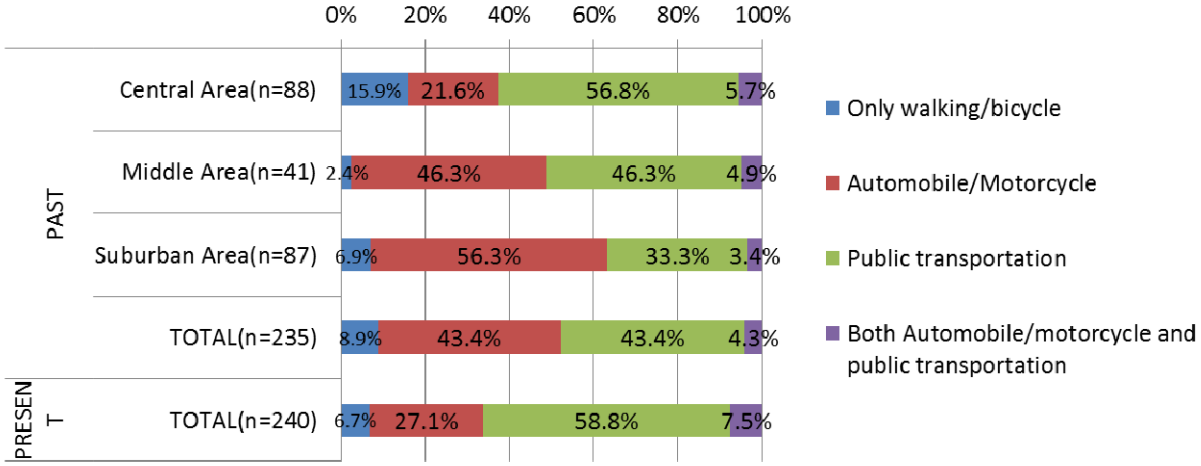

Figure 12. Past and present main transportation mode of commuting transit

4.3 Shopping Transportation

Figure 13 shows past and present share of transportation mode to go to shopping centers or department stores. Today, half of respondents take public transportation for shopping and 34% takes automobiles. More automobile dependence can be seen in shopping than commuting. However, share of public transportation was increased from 33% to 50% and share of automobiles decreased to 53% to 34%. As well as commuting transportation, moving to condominiums in catchment area of BTS/MRT station decreases automobile traffic for shopping.

Regarding with past transportation mode in each area, suburban area shows the highest dependence on automobiles and center area shows the lowest, as well as commuting transportation.

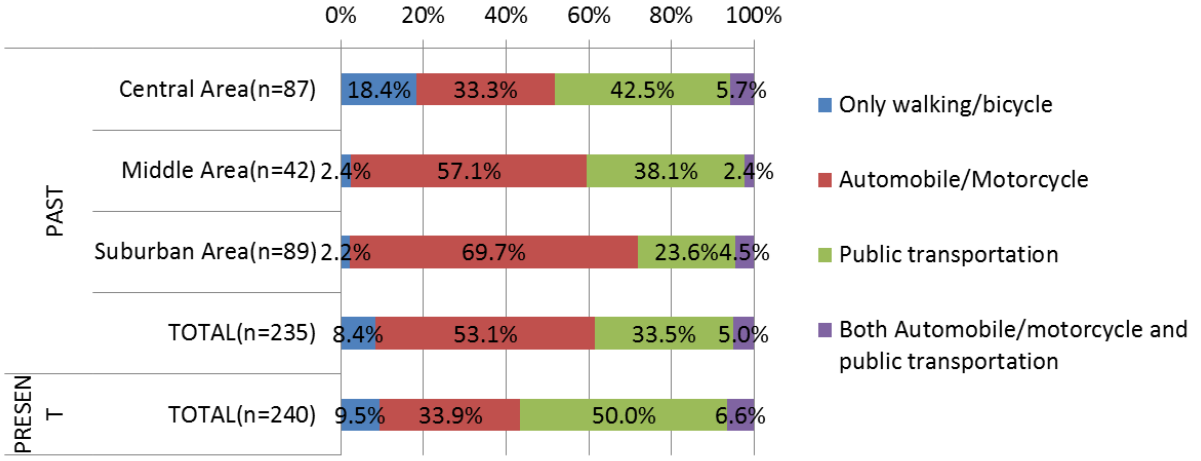

Figure 13. Past and present transportation mode for shopping

Figure 14 shows past and present shopping locations. Today most of respondents go to shopping center or department store in central area. On the other hand, more than one third of residents in suburban area went to middle and suburban area for shopping in the past.

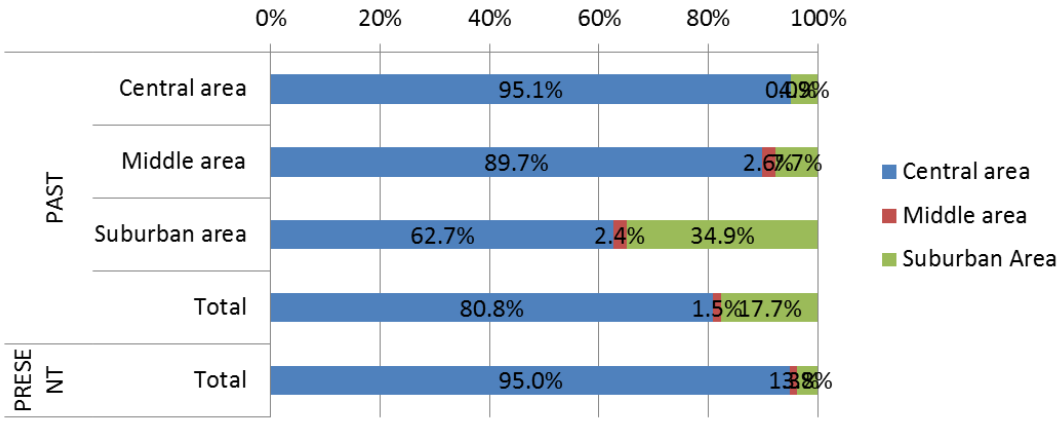

Figure14. Past and present shopping location

In summary, today, much more people use public transportation for commuting and shopping than before. But certain degree of respondents takes automobiles even though they live near BTS/MRT stations. The changing residence to condominiums along BTS/MRT stations reduced dependence on automobile. Additionally, it reduced travel distance as well, because people followed their workplace and moved their residential place inward and they changed place for shopping inward as well. These tendencies are particularly strong to respondents who came from suburban area.

5. CONCLUSION

This study focuses on condominiums along urban rail transit in Bangkok and examines their residents' change of residential location and transportation behavior.

From the questionnaire survey, most of the residents of the condominiums are middle- to upper-class young generation. As more than one third of them moved from suburban area and more than one third of them moved from middle area, it can be said that this accumulation of condominiums along urban rail transit plays a part in restraining urban sprawling. That is to say, development of rail transit network plays a part in restraining urban sprawl indirectly.

As people moved to condominiums along urban rail transit, most of their transportation behavior was changed as well. Though number of automobile ownership was slightly changed, number of owned automobile was decreased from 1.40 to 1.17. This decrease of number of owned automobile is more prominent for people who moved from suburban area. Ratio of public transportation as main transportation mode for commuting and shopping was increased from 43.4% to 58.8% and 33.5% to 50.0% respectively. Additionally, average linear distance between residence and workplace was decreased from about 8,000m to 4,700m. These trends are particularly noticeable among those who moved from suburban area. To sum up these results, by moving to condominiums near urban rail transit stations, people, especially people from suburban area changed their life style to less automobile-dependence and shorter travel distance, it is supposed to contributes on ease transportation problems such as air pollution and traffic congestion.

At the last, future trend and policy implications are discussed. As mentioned above, most of households in the condominiums are young single or couple without children and more than half of them rent rooms in it. Therefore their present accommodation seems to be temporary one and after they have children they have possibility to move to other place. In order to prevent them to come back to suburban area, it is essential to make city center more

attractive area to live in not only for young generation but also for families with children and elder generation. Additionally, to provide rooms not only for single and couples without children but also for family, that is, to provide several types of rooms in condominiums along urban rail transit is also very important. In order to restrain the urban sprawling and automobile-dependent life style, migration of suburban population to city center is necessary. Migration from suburban area can conduce to automobile traffic decline. This study shows that development of urban rail transit pulls suburban population into city center but the strongest factor of migration is change of workplace location inward. Therefore accumulation of workplace near rail transit is very essential. Some measures to attract workplace in catchment area of rail transit stations such as relaxation of land use regulation will be effective.

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