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# Urban Accessibility in Motorcycle Dependent Cities – Case Study in Ho Chi Minh City, Vietnam

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**Abstract:** Motorcycle dependent cities have specific characteristics in terms of urban accessibility. A rapid increase in the number of motorcycles and other private motorized modes make transport problems more serious and cause severe capacity problems for the infrastructure systems in these cities. Therefore, it is necessary to optimize the development of different modes to meet travel demand and to ensure accessibility in all urban areas. This paper aims to explore accessibility conditions in Ho Chi Minh City, a typical motorcycle dependent city in Vietnam. Understanding of accessibility could be the key element for urban planning in Ho Chi Minh City in particular and motorcycle dependent cities in general. Then, management measures for motorcycles and competitive modes will be proposed to improve the accessibility conditions and thus support sustainable urban transport development for motorcycle dependent cities.

**Key words:** Motorcycle dependent cities, accessibility, traffic management measures.

## 1. Introduction

Motorcycle dependent cities (MDCs) have special characteristics of transport and land-use. In many Asian cities, such as Hanoi, Ho Chi Minh City (HCMC), Bangkok, and Taipei, the urban transport system is dominated by motorcycles that, in turn, influence land-use pattern by remaining many blocks which are accessible by motorcycle only. The term "motorcycle city" was adopted first by Barter (1999) to address the urban transport and land-use situation of Surabaya, Indonesia and HCMC, Vietnam. Khuat further defined "motorcycle dependent city" by examining three indicators: vehicle ownership, availability of transport alternatives, and use of motorcycle in the city. In a typical MDC, the urban traffic is manifested by following characteristics: (1) high motorcycle ownership (more than 350 motorcycles per 1,000 inhabitants), (2) lack of public transport alternatives (less than one bus per 1,000 inhabitants) and inadequate non-motorized trips compared with the motorcycle, (3) very high share of motorcycles in the traffic flow (more than 50%), and (4) high modal split of motorcycles (more than 40%) and extremely low modal split of public transport (less than 20%) while the percentage of non-motorized trips is still significant (about 20 to 40%). The option to use motorcycles is crucial for socioeconomic activities in MDCs. However, as cities develop, other modes of transport such as private car and public transport also develop. The inadequate transport infrastructure and deficiencies in urban planning are a raising problem in terms of accessibility. The problem of accessibility is critical since it is regarded as a measure for the integration of land-use and transport system [1-3]. Because the unique characteristics of MDCs (in terms of dominant motorcycle ownership and use) influence urban and transport development, it is necessary to study the accessibility conditions. Clearly understanding these could give valuable advice on how to improve urban and transport planning.

HCMC is known to be one of the most motorcycle dependent cities in the world. Currently, there are about 680 motorcycles per 1,000 habitants. During the past

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fifteen years, HCMC urban areas have expanded and some new urban districts have been established. The urbanization process has happened rapidly without proper planning and thus results in conflicts between urban and transport development. Those conflicts are becoming obstacles for the long-term development of the city. This study attempted to investigate the existing conditions and issues of accessibility in HCMC. Though the focus is on accessibility, mobility is also mentioned to some extent. It is expected that the results of this study and proposed traffic management measures could be helpful for enhancing accessibility within HCMC, and these could be referred by other MDCs to improve their traffic conditions.

The structure of this paper consists of four parts. The second part, *theoretical foundations*, presents the term of accessibility, indicators used for measuring the accessibility, and theoretical foundations for the survey. The third part introduces initial results of the analysis of *accessibility in HCMC*. The city is divided into different areas, and mobility and accessibility conditions are comparatively analyzed for these areas. The paper also discusses future mode choice and preferences. In the last part, *conclusions and recommendations* are made based on the main findings from the survey.

## 2. Theoretical Foundations

Studies on accessibility can be based on several foundations depending on the typical characteristics of the study area and focused aspects of accessibility. In order to study and understand accessibility conditions in a specific MDC, it is important to clarify the definitions, methods and indicators used for the entire study. By defining the terms clearly at the beginning, the scope of the study can be narrowed down, and the implications will be applicable and meaningful.

### *2.1 Defining Accessibility*

Beginning with Hansen, the term of accessibility has been used in various forms in a number of studies. Accessibility is defined as "the extent to which the land-use and transport system enables (groups of) individuals or goods to reach activities or destinations by means of a (combination of) transport mode(s)" [4-7]. This definition comprises a transport component (the ease – amount of time, cost and effort – of reaching destinations), a land-use component (spatial distribution and characteristics of potential destinations), a temporal component (availability of activities throughout the day), and an individual component (individual valuations of the components).

For economic activities, to be accessible or not seems to be a survival issue [8, 9]. Adequate access to, for example, resources, labour, consumers, and suppliers are vital conditions for the success of producers and other firms. For households, accessibility is considered to be the ease to reach employment and urban services, and it is an important measure of the quality of urban living. In other words, accessibility is a component of a "social report" for a city or region [10-12]. Since accessibility is a function of both land-use patterns and the performance of the transport system, it is an appropriate criterion to evaluate the service provided by the transport system to different categories of users [13-18].

Accessibility depends on both the transport system and the land-use pattern. The transport system itself only provides functions for mobility and freight transport. In combination with the land-use designation, the transport system provides access to spatially and temporally dispersed resources. Since travelling is a mean to reach a destination, an accessibility measure that reflects the distribution of activities within the city is a preferable measure of the ease of traversing space via a given transport system [19-21]. Morris et al. and Pirie examined the use of accessibility as a measure for transport planning. They concluded that land-use and transport planners should aim for creating favourable accessibility conditions for land-use, and that they need to take into account both the quality of the transport system and the quality of the land-use system. In some cases, improvements in accessibility may be achieved more effectively by reorganising the distribution of

activities in space and/or time.

There are two kinds of accessibility, "relative accessibility" and "integral accessibility" [22-24]. Relative accessibility describes the relation or degree of connection between any two points, whereas integral accessibility describes the relation or degree of interconnection between a given point and all others within a spatial set of points. Essentially, relative accessibility is a measure of the effort involved in making a trip while integral accessibility is some measure of total travel opportunities. In this study, integral accessibility is considered since it reflects the activities that people living in one place can really involve in other places.

*2.2 Measuring Accessibility*

Normally, accessibility can be measured by considering how easily (i.e., in terms of travel time, travel distance, and other physical constraints) people living in different locations can reach certain types of activities, normally to jobs, shopping, education, and healthcare, etc., by a particular transport mode [25-29]. In order to measure integral accessibility, indicators are selected. Accessibility indicators measure the benefit that households and firms in an area enjoy from the existence and use of the transport infrastructure relevant for their area. Accessibility indicators provide possibly the most useful and appropriate means of summarising a great deal of information on the location in relation to the distribution of urban activities and the transport system that connects them. Depending on intended application, the practical value of accessibility indicators varies on the extent to which they reflect behaviour and perception of the people. To measure integral accessibility, basically, indicators include travel time and travel distance, travel speed, cost for trips to reach places of employment and urban infrastructure and services [30-32].

*2.3 Theoretical foundation of the survey in HCMC*

To study mobility and accessibility of households, a household travel survey is often conducted. Questionnaires are designed for the survey in order to collect data and information on household's accessibility to work places, urban infrastructure and services, which are then used to derive indicators of the integral accessibility. The questionnaires are usually divided into 3 parts: (1) household characteristics and current mobility, (2) household accessibility, and (3) preferences for future transport. Questions are given to explore accessibility conditions of households to transport networks, working places, schools, markets, hospitals, recreational places, and transit stations. Transport modes to reach such places are also investigated. Main indicators often include the most frequently used mode, trip cost, travel distance and time, travel speed, parking conditions, etc. Attitudinal questions on desired transport modes and certain implemented traffic management measures are included as well.

An indicator for measuring accessibility is selected based on the four principles: (1) the indicator should incorporate an element of spatial separation that is responsive to changes in the performance of the transport system, (2) the measure should have behavioural foundations, (3) the indicator should be technically feasible and operationally simple, and (4) the measure should be understandable and easy to interpret. This study attempted to investigate mode-wise accessibility by different population groups, to transport networks, working places, schools, markets, hospitals, and recreational places and public transport system.

The size of the samples is normally determined with consideration to confidence interval and the size of the population. However, applying such an approach often results in a very large number of the samples (i.e., large-scale survey) that is definitely not affordable in this study. Therefore, this study applied a small-scale survey based on the experience of previous studies.

## 3. Accessibility in Ho chi minh City

*3.1 Case Study Area*

Located in the South of Vietnam, HCMC is the

biggest city in Vietnam in terms of population and economic contribution to the country. It is also a centre of dynamic social and cultural activities. With an area of 2,095 $km^2$ (equivalent to only 0.6% of the whole country's area) and 7.4million population (or 8.5% of the national population), the city currently contributes to 21.1% of the whole country's GDP. The city also acts as the hub of the Southern Focal Economic Development Zone, which includes HCMC and 8 provinces and cities.

Since 1986, the Government of Vietnam initiated a series of economic and political reforms (the so-called Doi Moi policy). The national economy was changed from a centrally planned to a market-based economy. As a result, the economy developed dramatically and the nation started to be integrated into the world economy. Given its favourable location, HCMC received huge investments from domestic and international organisations, and attracted a lot of migrants from other provinces and rural areas. Very soon, the city became crowed and there has been increasing demand on the infrastructure, including transportation, housing, markets, hospitals, etc. Due to land limitation, the conflicts between land allocation for industrial, commercial, residential, and transport functions occurred and created urban problems. In addition, the lack of integration between transportation and land-use caused accessibility problems. Due to the inadequate road infrastructure and poor urban planning, motorcycles have become the most effective mode of transport. Most people use motorcycles because of its convenience and low expense. Motorcycles can provide accessibility to all places in the city, even where roads are small and only alleys are available. As explained earlier, the term "Motorcycle Dependent City" is being used to describe the specific situation of high ownership and intensive use of motorcycles.

HCMC is currently divided into three types of area, city centre, newly developed areas, and rural areas as shown in Figure 1. *City centre* (Area 1 in the study) includes 13 urban districts - 1, 3, 4, 5, 6, 8, 10, 11, Go Vap, Tan Binh, Tan Phu, Binh Thanh, and Phu Nhuan. Being the centre area of the whole city, there are many high rise buildings, shopping malls, big schools, major hospitals, etc. concentrated in this area. *Newly developed areas* (Area 2) include 6 newly developed districts - 2, 7, 9, 12, Binh Tan, and Thu Duc. Those districts were mostly established from rural districts in 1997. Urbanization rate in those districts is quite high as compared to the others. Located in favourable places nearby the city centre, these districts have received huge investment in recent years to develop new residential areas. Besides, investments in infrastructure system have also been provided to support urban development. *Rural areas* (Area 3) include 5 rural districts - Hoc Mon, Nha Be, Can Gio, Cu Chi and Binh Chanh. They are remote districts with low population density. Infrastructure systems in this area are still poor due to limited investment.

### *3.2 The samples*

To understand accessibility characteristics of HCMC, we conducted a small-scale household survey in the three areas. In each area, one or two districts were selected. In each district, two wards were selected. Households in each ward were chosen randomly for investigation of their accessibility conditions. The comparison revealed differences in opportunities within certain travel distance and time for particular population groups. In total, 410 households (with 1,248 people) participated in the survey, including 200 in Area 1, 100 in Area 2, and 110 in Area 3. Urban planning and transport characteristics of each area are briefly described below.

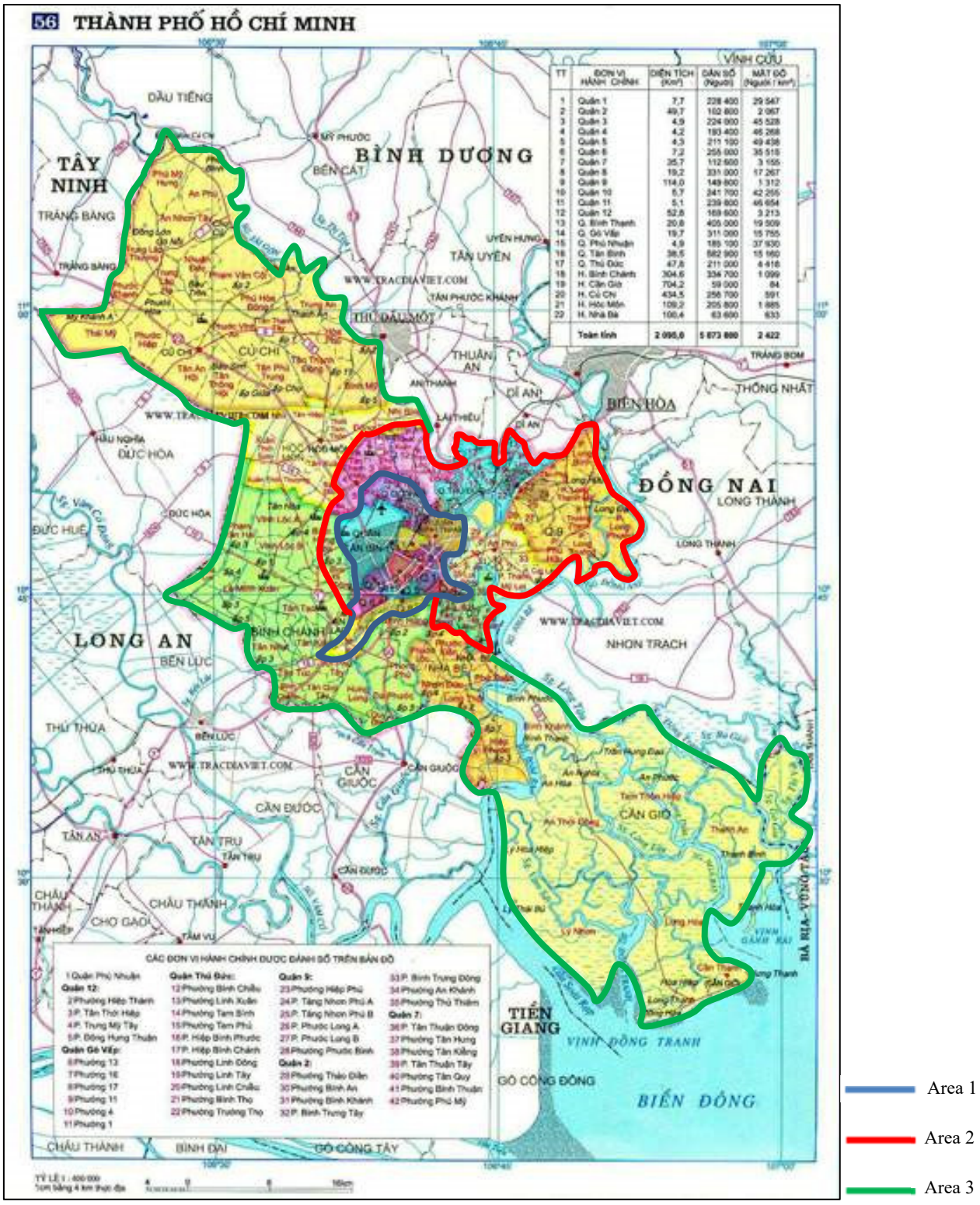


**Fig. 1 Study areas.**

Source: http://khudothimoi.com/dulieu.

In Area 1, District 1 and 3 were chosen. These districts are the centre of business, politic, culture, and tourism. In this area, major government agencies, offices for national and international organizations, and trade centres are located. Particularly, District 1 is the transport hub of the whole city with a central terminal of the public transport system and the planned Urban Rail Mass Transit system. In these districts, the road network was well planned by the French when they occupied the country. However, due to narrow roads and high traffic volumes, these districts are getting congested. In Area 2, Binh Tan District was selected. This district is located in the South-West of HCMC, about 12 km away from the city centre. In the district, there is a lot of agricultural land. However, the speed of urbanization in this district is very high, and agricultural land will very soon be converted to industrial and residential land. In Area 3, Cu Chi District was selected. This is a rural district with most of the area covered by agricultural land. However, due to a good topography, this district has been selected for big industrial zones and new urban areas in the future.

### *3.3 Age and Occupation of Sampled Population*

About 70% of the participants are of working age (25-60 years old) while the group of less than 25 years old accounts for 17%, and 13% of the participants are over 60 years old. According to HCMC's Statistical Year Book 2011, 60% of the city population was between 24 and 60 years old and 6.3% of the population was over 60 years old. The differences in the age distribution are due to the fact that the group of population less than 6 years old was not taken into account and the sample size was quite small.

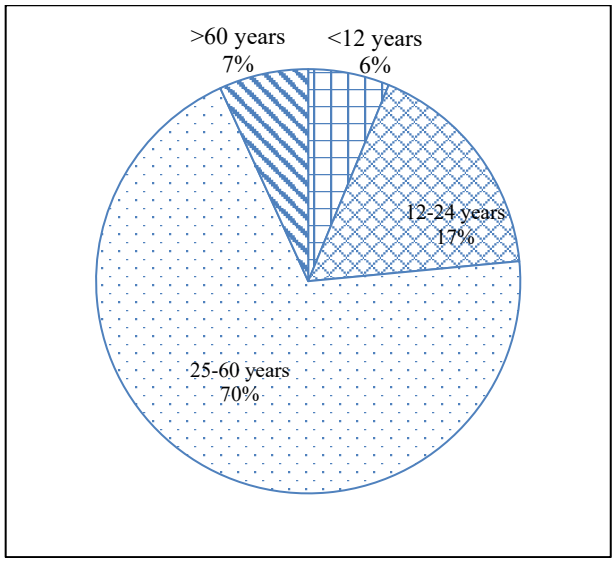


**Fig. 2 Age of household members (all areas).**
Data from the survey of 1,248 people in 410 households conducted in HCMC, 2012.

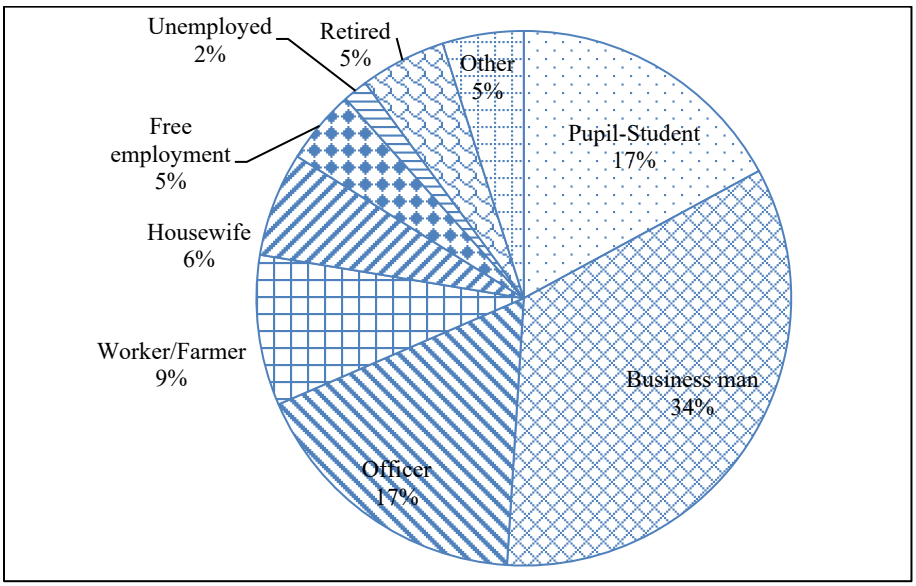


**Fig. 3 Occupation of household members (all areas).**
Data from the survey of 1,248 people in 410 households conducted in HCMC, 2012.

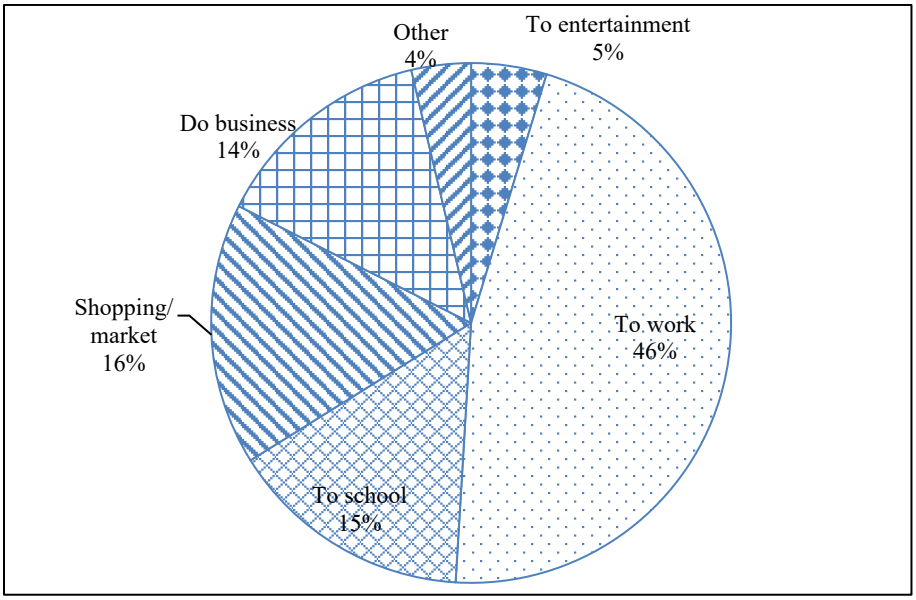


**Fig. 4 Trip Purposes of household members (all areas).**
Data from the survey of 1,248 people in 410 households conducted in HCMC, 2012.

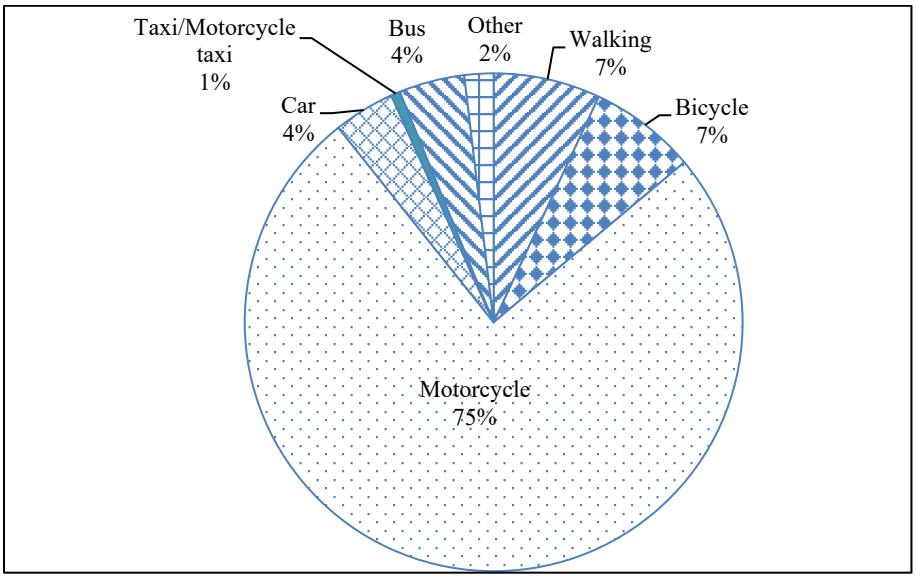


**Fig. 5 Most frequently used mode of household members (all areas).**
Data from the survey of 1,248 people in 410 households conducted in HCMC, 2012.

The sampled population is biased towards business men/women group (34%). Public/private officers account for 17%, same as school pupil/student. The worker/farmer/fisher group accounts for 9%, and housewife group is 6%.

### *3.4 Current Mobility*

3.4.1 Trip Purposes and Most Frequently Used Mode

In terms of typical trip purposes, 46.3% of the total trips are "to work" trips, followed by shopping/market trips (16.3%), "to school" trips 15.2%, and business trips 13.9%.

It shows that most of the household members use the motorcycle for their daily trips (75%). The percentage of non-motorised transport, including walking and cycling, is quite low, about 14%. The percentage of public transport is extremely low for such a large city, only 4%. The motorcycle ownership rate in HCMC is

very high, about 680 motorcycles per 1,000 habitants. Although car ownership is still low, about 33 cars per 1,000 habitants, this rate is increasing sharply.

It is important to look at how the most frequently used modes changes by area. Although motorcycles are the main mode of transport in all three areas, there is a little bit higher share of walking and motorcycle in Area 1. In Area 2, bicycle and motorcycle play as the main modes. In Area 3, besides motorcycle, there is a significant contribution of the bus system. A main reason for the differences may be the different conditions of vehicle ownership and use. In Area 1, owning a car can be affordable for many households since they normally have higher incomes than the ones living in the other areas. However, operating a car in this area is not easy due to the crowed and narrow road network and the limitation of parking spaces. Besides, the close distance to essential places, such as markets, schools, hospitals, etc. in the city centre makes private car ownership not a very urgent need for the people living here. Meanwhile, households in Area 2 have greater availability of car parking places. They can use the car more easily as the roads are more spacious. Therefore, high-income people in this area prefer to own and use the car for going to the city centre. In Area 3, since the distance to the city centre is quite far, mostly longer than 20 km, the motorcycle is not a safe and cheap mode to go to the centre. So the bus has an important role to play in transporting people.

Different age groups have different mode choices. Although the motorcycle is the major choice for all groups, there are differences in the share of the most frequently used mode. In the age of less than 12 years old, the schooling age, besides motorcycles (driven by their parents), some pupils are carried by private cars and some can take bicycle by themselves when the school is near their houses. For the group from 12 to 24 years old, the age of high school and university, besides motorcycles, bicycles and buses are also frequently used. In the group from 25 to 60 years old, the working age group, motorcycles take a dominant role. For the group older than 60 years old, there are significant shares of the people walking and using buses.

3.4.2 Average Trip Distance and Travel Time

It was found that 64% of the typical trips of the household representatives are shorter than 5 km. Within this distance, trips can be easily done by bicycle or even by walking. However, the shares of those two modes are very limited. There are 18% of the trips with

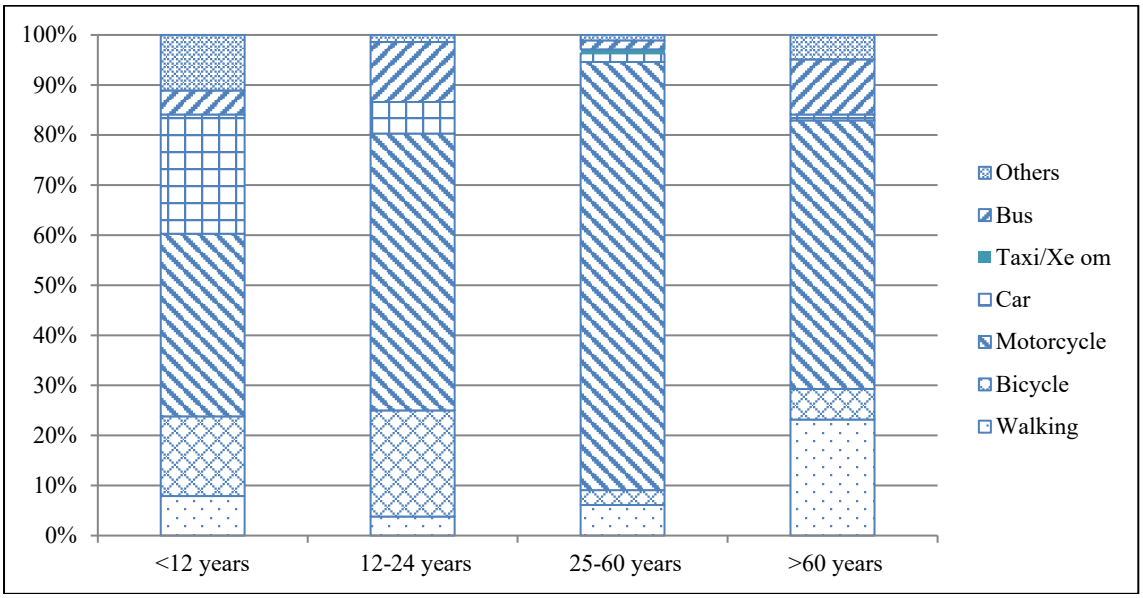


**Fig. 6 Age groups and most frequently used mode of household members.**
Data from the survey of 1,248 people in 410 households conducted in HCMC, 2012.

the distance ranging from 5 to 10 km, 7% ranging from 11 to 15 km, and 11% longer than 15 km. Regarding the travel speed, it can be seen that the average speed of motorcycle is about 20 km/h. This speed derived is slightly higher than the average travel speed of the whole city measured by KOICA, about 18 km/h.

The motorcycles are definitely the major mode of transport for all distances, from a short trip (less than 5 km) to a long trip (more than 10 km). For trips longer than 10 km, buses would be more competitive than the motorcycle because they are relatively faster and much safer. However, since motorcycles are convenient and highly accessible, it is dominant for all distances, including distances longer than 10 km. The current over-utilization of motorcycles for long trips not only decreases the current market share of the city bus service but also threatens the development of bus service and new systems in the long-term.

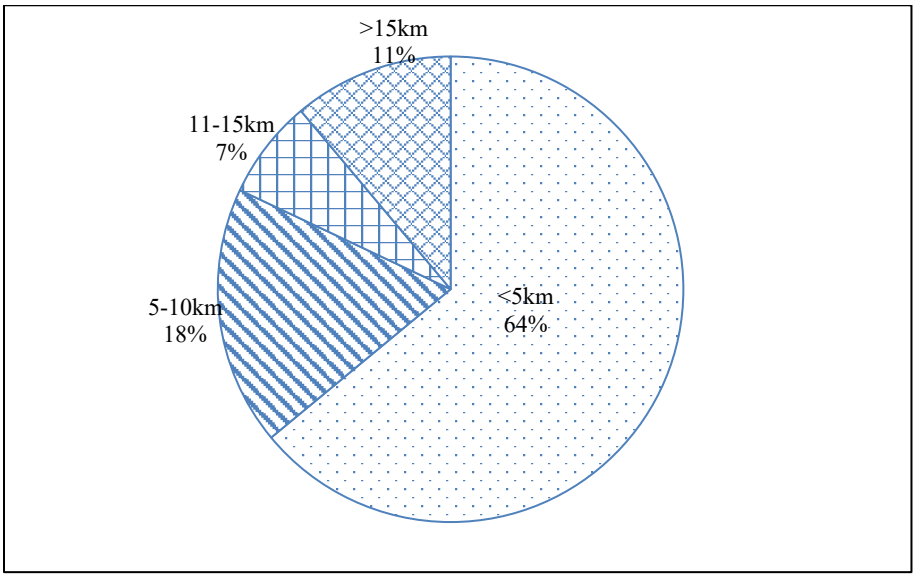


**Fig 7 Average trip distance of household representatives (all areas).**
Data from the survey of 410 households conducted in HCMC, 2012.

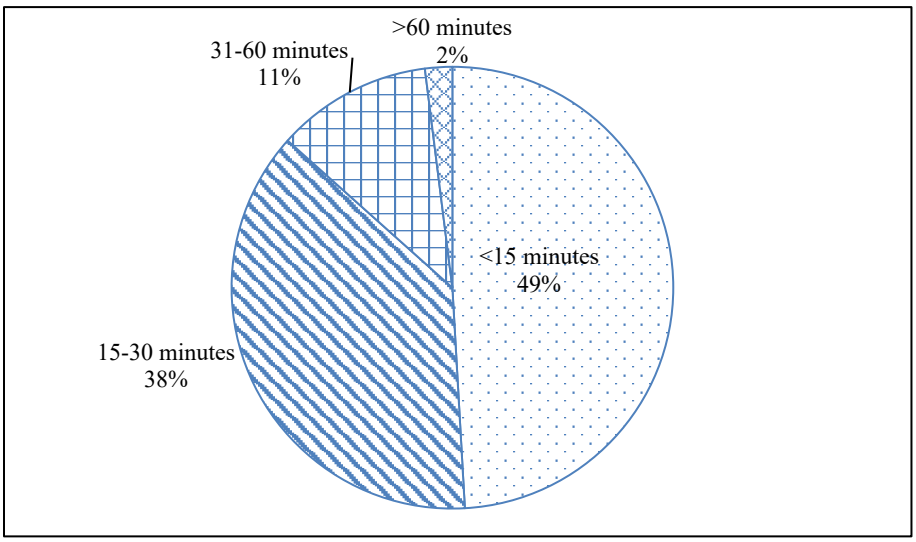


**Fig. 8 Average travel time of household representatives (all areas).**
Data from the survey of 410 households conducted in HCMC, 2012.

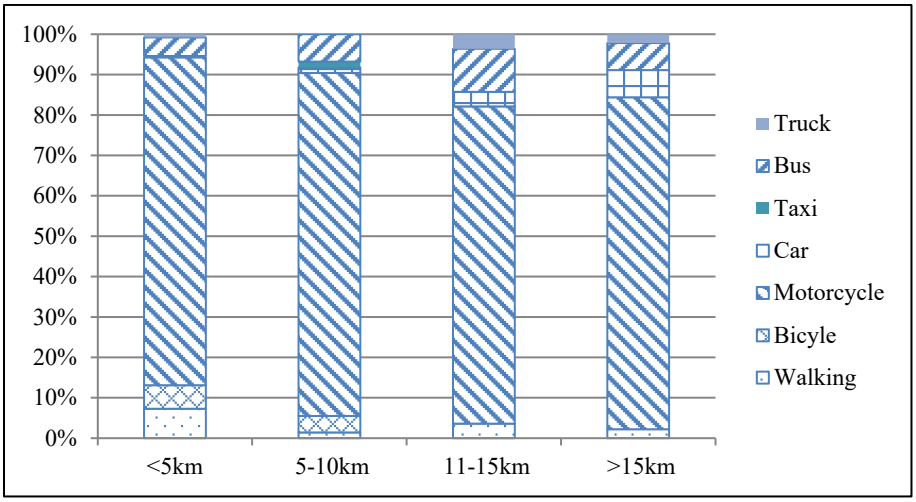


**Fig. 9 Average trip distance and most frequently used mode of household representatives (all areas).**
Data from the survey of 410 households conducted in HCMC, 2012.

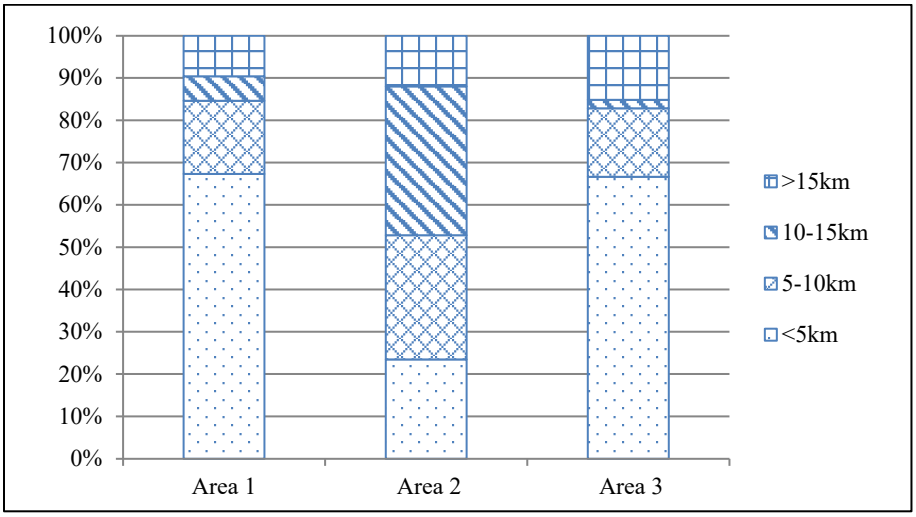


**Fig. 10 Trip distance (by area).**
Data from the survey of 410 households conducted in HCMC, 2012

For people living in Area 1, most of their typical trips have the distance of less than 5 km. For people living in Area 2, the share of typical trips longer than 10 km is significant. People living in Area 3 mostly have typical trips of less than 5 km. This means, the people living in Area 3 work mostly in their area while people living in Area 2 work in the city centre.

3.4.3 Trip cost

The survey found that 35% of the household representatives pay less than 10,000 VND (about 0.5 USD) a day for travelling, 46% pay 10,000 VND to 30,000 VND (about 0.5 USD to 1.5 USD), 14% pay 31,000 VND to 50,000 VND (about 1.5 USD to 2.6 USD), and only 5% pay more than 50,000 VND. This expense includes only fuel cost and parking fees when going by motorcycle or car, or ticket fees when going by bus.

Comparing the travel expense to the income of the household representatives, it can be seen that the group which pays less than 10,000 VND for travelling a single trip has an income of less than 3 million VND a month. Members of this group are mostly housewives, retired or elderly people. Groups having the income from 3 million VND to 10 million VND are paying mostly 10,000 to 30,000VND for travelling, and the higher income groups are paying more for their travelling.

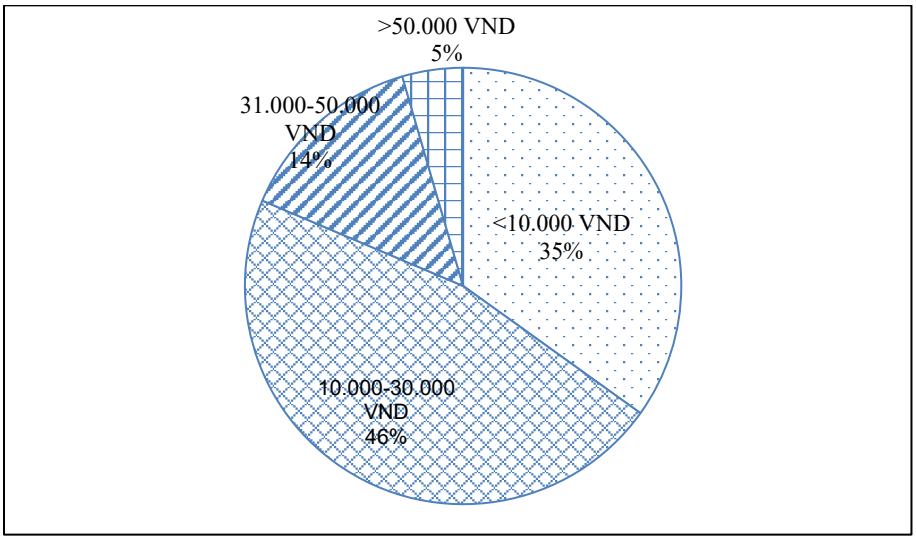


**Fig. 11 Expense for trips of household representative (all areas).**
Data from the survey of 410 households conducted in HCMC, 2012.

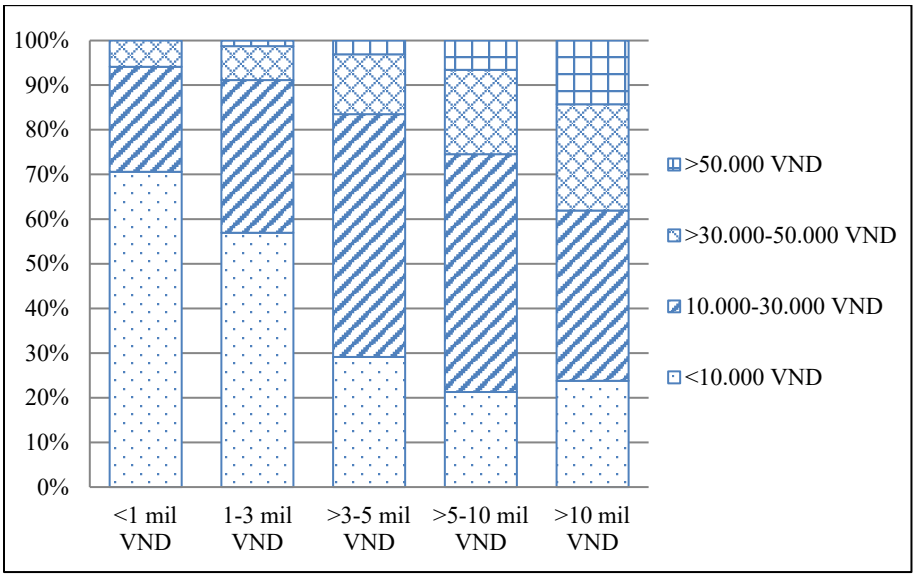


**Fig. 12 Expense for a single typical trips and income of household representative (all areas).**
Data from the survey of 410 households conducted in HCMC, 2012.

### *3.5 Household Accessibility*

#### 3.5.1 Parking Conditions

Parking spaces in HCMC are very limited. In the daytime, most of the household representatives answered that they park their vehicles at their offices or companies. Others park their vehicles in priced public parking places, which are very limited in the city. In the city centre, there are on-road parking places and these are managed and charged by local district administrators. Although the on-road parking negatively impacts the traffic flows, in the circumstance of HCMC, this solution can help improve the problem of lacking parking spaces for vehicles in the city centre.

In nighttime, almost all motorcycles are parked inside the houses. Cars are parked inside the houses or on the grounds of the houses. In some cases, cars are parked on the streets. However, parking spaces for cars inside the houses are very limited and parking spaces on streets are unsafe.

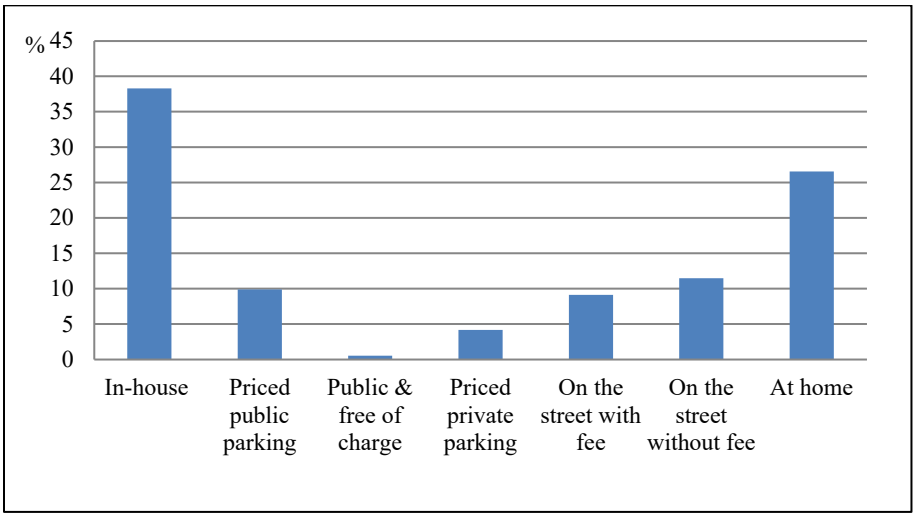


**Fig. 13 Daytime parking of household representative**
Data from the survey of 410 households conducted in HCMC, 2012.

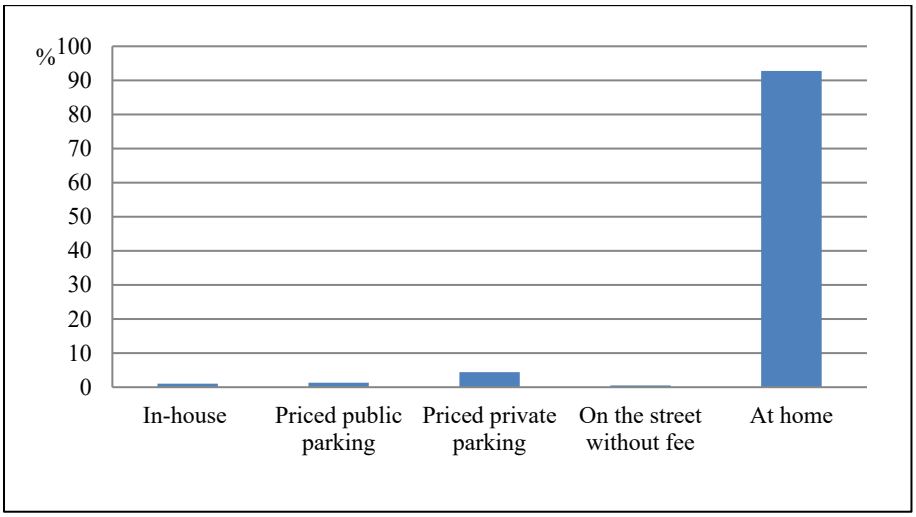


**Fig. 14 Nighttime parking of household representative.**
Data from the survey of 410 households conducted in HCMC, 2012.

3.5.2 Width of the Road and Sidewalk in Front of the House

The widths of the road and sidewalk in front of the house are important indicators to assess the ability of modes to access homes. The widths of the roads are different in different areas. In Area 1, 56% of the roads are narrower than 7m, which are difficult to be accessed by cars. 44% of the roads are wider than 7m and accessible by car. However, as previously mentioned, off-road car parking spaces in this area are very limited. Cars often park on the road and thus negatively influence the traffic flow. Therefore, the operation of cars in this area is difficult because of lack of parking spaces and low accessibility conditions. Only 32% of the roads are wider than 12 m and allow bus operations. However, with such a limited percentage of wide roads, the capacity of public transport in this area is also limited. Public transport vehicles, particularly buses, need to be suitably selected to function well in such small streets. In Area 2, the majority of the roads have widths from 7 m to 12 m. As explained above, as this area is newly developed from rural districts, there was enough land to construct spacious roads. Therefore, accessibility by car as well as by bus is better. In Area

3, roads wider than 12 m account for a significant share (nearly 40%). This is a favourable condition to develop public transport in this area.

The width and quality of the sidewalk influences accessibility, especially accessibility by walking and by bus. These are different across the three areas. In Area 1, the width is mostly less than 0.5m (38.2%). There are also 28% of the sidewalks that are from 0.5 m to 1 m wide. This situation can be explained by the limitation of land in the city centre. However, the quality of sidewalk in this area is the best among the three areas thanks to the investment and the frequent maintenance of the infrastructure system in Area 1. In Area 2, the width of sidewalks is also mostly less than 0.5 m, but there are high portions of the sidewalks with the width from 1 m to 2 m and from 0.5 m to 1 m. In Area 3, there are many sidewalks having the width from 1 m to 2 m. The results show that the quality of sidewalk in Area 1 is the best, followed by the one on Area 2, and the one in Area 3 is the worst.

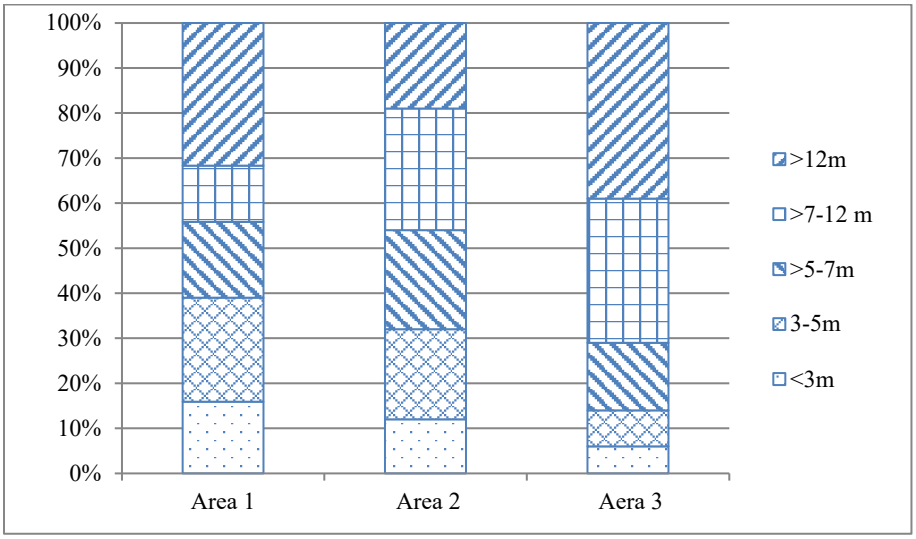


**Fig. 15 Width of the road in front of the houses (by area).**
Data from the survey of 410 households conducted in HCMC, 2012.

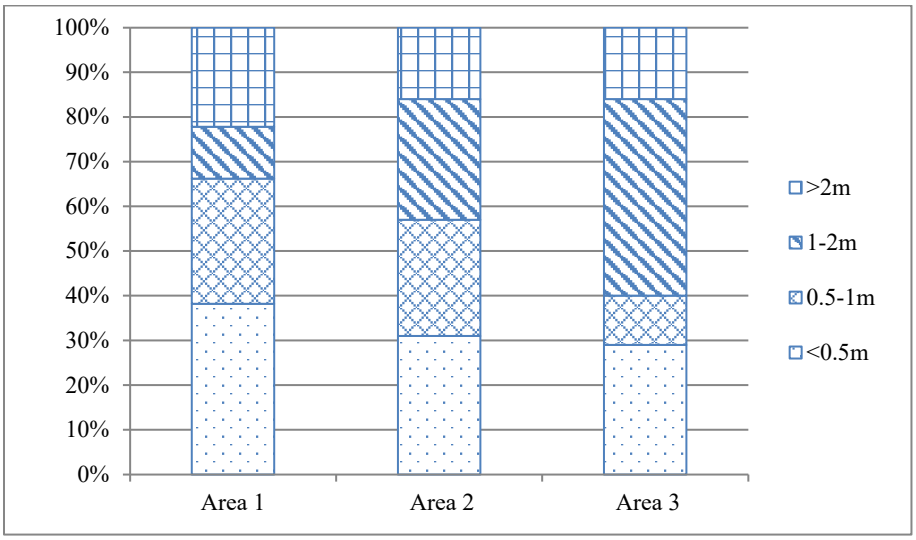


**Fig. 16 Width of the sidewalk in front of the house (by area).**
Data from the survey of 410 households conducted in HCMC, 2012.

3.5.3 Distance from the House to the Nearest Bus Station

The distance from the house to the nearest bus station shows the accessibility to public transport service. The distances are different in the three areas. In Area 1, most of the houses can access the nearest bus station within the radius of 500 m. In Area 2, the majority of the distances range from 500 m to 1,000 m. In Area 3, 60% of the distances are longer than 1,000 m. That means the bus routes network in Area 3 is still limited. To attract more passengers to public transport, particularly to the bus system, the distance from the house to the nearest bus station should be made shorter by introducing more bus stops and bus routes, including both trunk and feeder routes. The better road infrastructure in Area 3 may allow this.

3.5.4 Distance from House to the Nearest Market/Hospital/School/Recreational Place

Distances from house to the nearest supermarket/market, hospital, school and recreational place are important indicators for assessing accessibility to urban services. These services are essential for human needs. Generally, the distances are different across the three areas. Area 1 and Area 3 have better accessibilities to those services as compared to Area 2. Although Area 2 is newly developed, there are only a few new modern residential areas with good infrastructure systems and services.

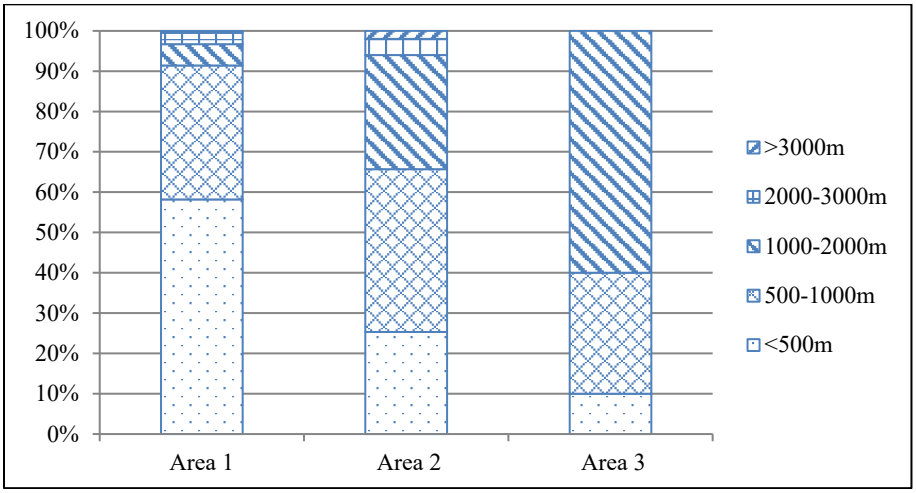


**Fig. 17 Distance from the house to the nearest bus station (by area).**
Data from the survey of 410 households conducted in HCMC, 2012n

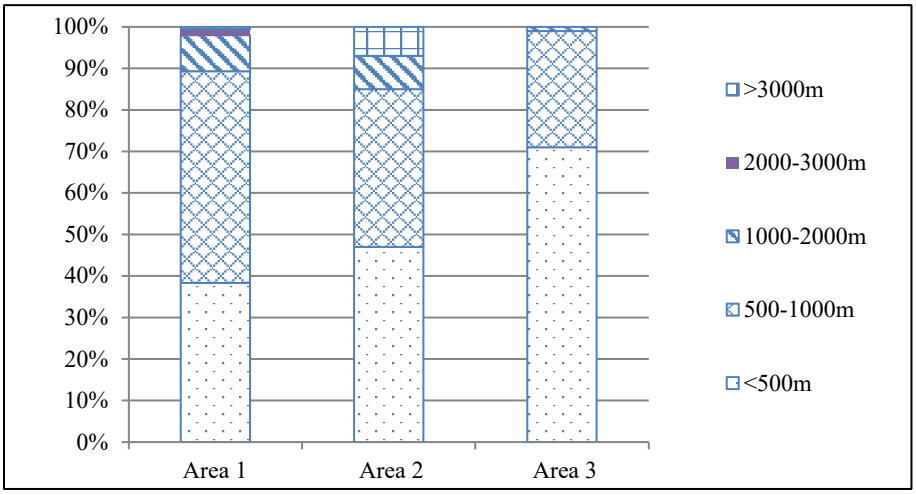


**Fig. 18 Distance from house to supermarket/market (by area).**
Data from the survey of 410 households conducted in HCMC, 2012.

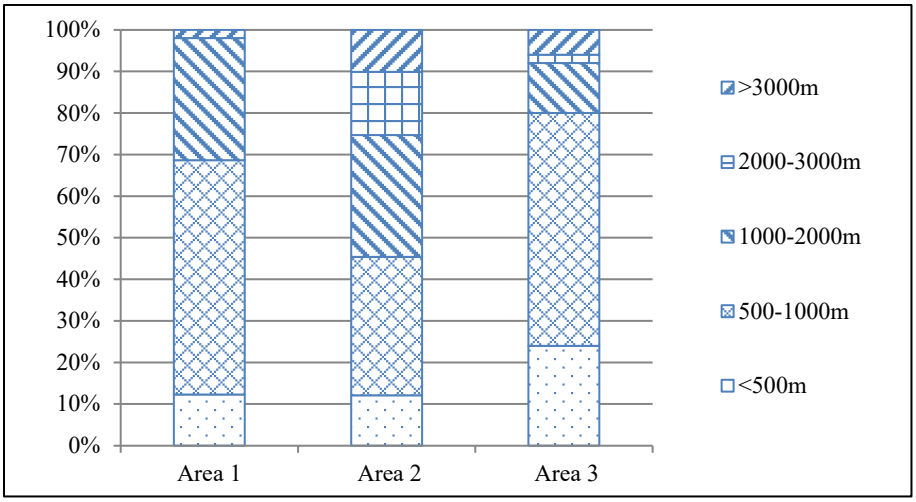


**Fig. 19 - Distance from house to hospital (by area).**
Data from the survey of 410 households conducted in HCMC, 2012.

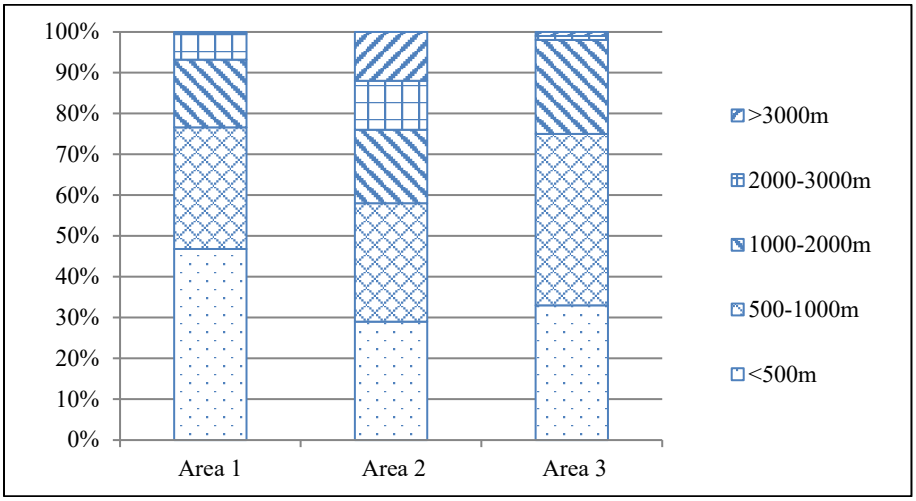


**Fig. 20 Distance from house to schools (by area).**
Data from the survey of 410 households conducted in HCMC, 2012.

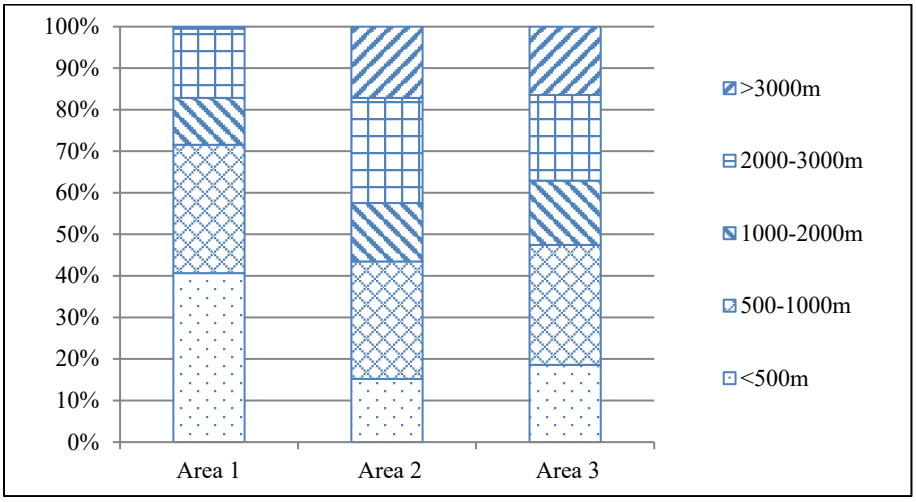


**Fig. 21 Distance from house to recreational places (by area).**
Data from the survey of 410 households conducted in HCMC, 2012.

*3.5 Preferences for Future Transport*

If the current conditions of accessibility in HCMC may remain, it will influence the mode choice and reduce the opportunity for public transport development in the future. Transport development policies and traffic management measures will help to improve accessibility conditions for the city. In order to propose effective policies and measures, it is important to understand people's mode choice preferences. Based on this understanding, potential policies and measures will be considered.

3.5.1 Measures to improve accessibility

Regarding measures that the Government should take to improve accessibility, most of the surveyed household representatives think that this should be firstly, improving the infrastructure system, including constructing new roads and bridges. This measure requires huge capital from the public and private sector and thus may be considered as a long-term solution. The improvement of infrastructure will result in the improvement of accessibility conditions.

Secondly, managing traffic better is also a measure to improve the situation. This kind of measure is affordable and does not require much investment as compared to other measures. It includes more direct traffic management and control by the policemen or reasonable adjustment of traffic flow to make it safer and faster. Thirdly, promoting public transport and limiting private modes of transport are measures to improve traffic conditions.

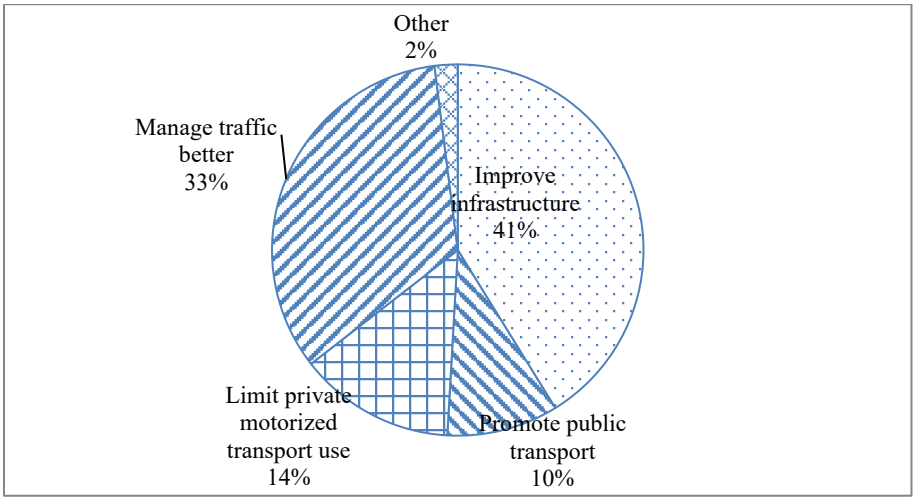


**Fig. 22 Measures to improve traffic conditions as perceived by household representatives (all areas).**
Data from the survey of 410 households conducted in HCMC, 2012.

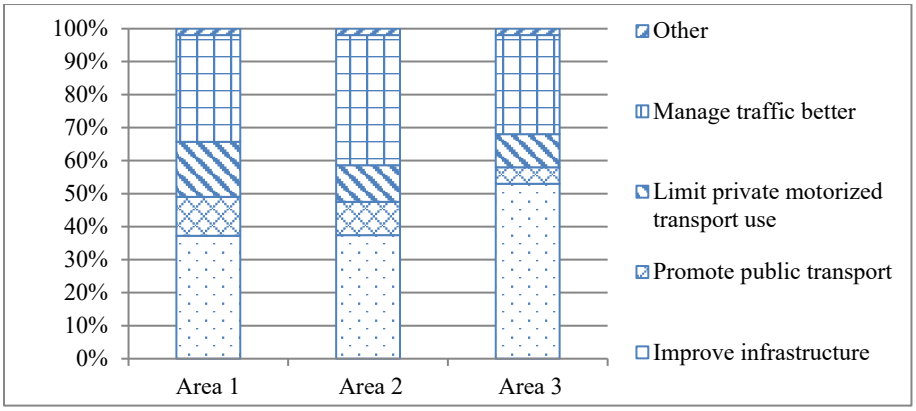


**Fig. 23 Measures to improve traffic conditions as perceived by household representatives (by area).**
Data from the survey of 410 households conducted in HCMC, 2012.

**Table 1 Percentages of frequently used modes: current and future.**

| Mode | Area 1 | | | | Area 2 | | | | Area 3 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Existing choice | | Desired/Future choice | | Existing choice | | Desired/Future choice | | Existing choice | | Desired/Future choice | |
| | % | Rank | % | Rank | % | Rank | % | Rank | % | Rank | % | Rank |
| Walking | 7.9 | 2 | 2.0 | | 4.9 | 4 | 1.0 | | 6.8 | 3 | 0 | |
| Bicycle | 6.4 | 3 | 5.4 | 5 | 7.2 | 2 | 4.0 | 5 | 8.4 | 2 | 2.0 | 4 |
| Motorcycle | 77.1 | 1 | 40.5 | 1 | 73.6 | 1 | 38.0 | 1 | 74.3 | 1 | 42.4 | 1 |
| Private car | 3.9 | 4 | 26.3 | 2 | 2.3 | | 23.0 | 3 | 4.4 | 5 | 33.3 | 2 |
| Bus | 2.8 | 5 | 5.4 | 4 | 6.2 | 3 | 7.0 | 4 | 6.0 | 4 | 1.0 | 5 |
| Taxi/Motorcycle taxi | 0.2 | | 0 | | 2 | | 0 | | 0 | | 0 | |
| BRT, Metro | 0 | | 20.5 | 3 | 0 | | 27.0 | 2 | 0 | | 21.2 | 3 |
| Truck/ container | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | |
| Other | 1.7 | | 0 | | 3.9 | 5 | 0 | | 0 | | 0 | |

*3.5.2 Desired Mode*

The current accessibility conditions by area are likely to influence the role of different modes in the future. Table 1 presents a comparison of the possible future mode choices and the current ones by area. It is expected that most of the household representatives still want to use the motorcycle in the future, even when Bus Rapid Transit (BRT) and Urban Rail Mass Transit system (URMT) are introduced. The percentage of people choosing to travel by motorcycle may decline from more than 70% to about 40%. However, the dominant role of the motorcycle may continue in the future. The percentage of people choosing to travel by bus may slightly increase, except in Area 3. It is expected that more than 20% of the respondents would use the new public transport modes. But the share of private car use is likely to increase from currently 4% or less to around 25%, especially in Area 3 (more than 30%).

Motorcycles have been used for a very long time and its advantages are undeniable. It will take time and requires strong effort and investment from the Government to change the mode choice behaviour of the travellers. In the future, the share of motorcycles may decline as the users shift to other modes, such as private car and new public transport modes. Reasons for the potential modal shift could be that people recognize the disadvantages of travelling by motorcycle (such as poor safety and low comfort) and they will be able to afford to use private cars as their incomes increase or willing to accept improved public transport services. However, a significant number of the interviewed households want to use cars and the demand for car ownership is increasing drastically. Therefore, the city needs to urgently and continuously improve the conventional bus services and introduce mass rapid transit systems, such as BRT and MRT, in order to attract the motorcycle users, and discouraging them from shifting to private cars.

## 4. Conclusions and Recommendations

*4.1 Conclusions*

Main characteristics of the current mobility can be summarized as follows:

- Different age groups have different mode choices. However, the motorcycle plays a major role in carrying out daily travel for all ages. For the age of less than 12 years old, the schooling age, besides motorcycle (driven by their parents), some pupils are transported by private cars and some can take bicycle by themselves. Within the group from 12 to 24 years, the age of high school and university, besides motorcycle, the bicycle and bus are frequently used. In the age of 25 to 60 years, the working age, the motorcycle has a dominant role, and other modes play only a minor role. Within the group of more than 60 years, the retirement

age, besides using the motorcycle, people also are walking and using the bus.

- The most frequently used modes are slightly different by trip distance. For trips shorter than 5 km, the bicycle is used frequently. However, the use of this mode is decreasing due to the poor road conditions. For trips ranging from 5 km to 10 km, motorcycles are the most frequently used mode. For trips longer than 10 km, motorcycles become slightly less preferable and buses seem to be more preferable.
- The low income group, less than 3 million VND per month (about 145 USD), pays for a single trip less than the middle income group (3-10 million VND per month). The high income group, more than 10 million VND per month (about 480 USD), pays the highest expense for a single trip as they often use car.

The descriptive analysis has shown differences in term of household accessibility across areas of the city, particularly:

- In the city centre (Area 1), due to the high density of well-planned and organised roads, working places, services, schools, hospitals, markets, etc. are well accessible. However, this area usually has congestion due to high traffic volumes and a large portion of small roads. The motorcycle is the most advantageous mode to access places in this area. Car is quite difficult to access this area, because of limited parking spaces. Public transport service, particularly buses, is easily accessible thanks to a dense bus routes network with a lot of bus stations or stops.
- The newly developed areas (Area 2) have a favourable location, not very far from the centre. In these areas, there are new and modern residential development projects (so-called new towns). These projects are well planned and located nearby main roads so that the accessibility to infrastructure, public transport system and services is easy. However, these projects occupy a small part of the total area. The rest of the area still remains residential and agricultural mixed land-use pattern, with low accessibility to infrastructure and public transport system and services.
- In rural areas (Area 3), it is quite easy to access infrastructure and services because of the population density. People live in local centres (so-called communes). All services, including markets, schools, hospitals and recreational places are quite small and the quality of the services is not as good as in Area 2 and 1. Bus plays a significant role to connect this area to the other areas, especially the city centre. However, the current bus networks are available on main roads only.

Related to desired transport modes in the future, the survey has shown that the motorcycle is likely to be the leading choice of citizens even though public transport services are being improved through the introduction of new public transport modes or systems (such as BRT and MRT). Though many of the people agree that motorcycles need to be limited for a better transport condition, they still want to use it as a main mode when being asked about their desired modes in the future. This interesting finding can be explained by the fact that the motorcycle is superior to other public transport modes (including the buses) and private cars in terms of mobility and accessibility. Any transport development policy must consider this fact seriously. People have strong desires to have transport modes that can provide safe and affordable mobility and high accessibility as well. In the current context, since the accessibility to public transport is low, the citizens do not prefer to use it and they are also in doubt about the quality of improved public transport services in the future. This is a big challenge for transport planners and authorities to overcome if they want to make public transport to be the desired mode in the future.

## 5. Recommendations

Based on the results, this study may suggest traffic management measures and transport development policies for MDCs as follows. Currently, the urban transport in HCMC is dominated by motorcycles and the use of public bus services is very small. In the long term, this situation, if continued, is not sustainable for the city. MDCs must improve and further develop

public transport in order to provide better accessibility to the people. However, the survey has shown that the motorcycle can provide good accessibility in almost all places in the city. Any motorcycle restriction policy that is under serious debate should be very carefully considered. If this policy is treated as a major solution to solve the problems of poor safety and serious pollution, both the mobility and accessibility of the majority of the population will seriously decline. Clearly, given the lack of road and parking infrastructure, private cars should not play the role of main transport mode in the future because it cannot provide better accessibility nor mobility for the city. However, the trend of using private car is in fact increasing because people seek a safer and more comfortable means of transport. This trend of traffic development is not possible for MDCs as it is obviously in conflict with transport and urban development. Therefore, it is strongly recommended that the ownership and use of private cars should be controlled, for example, by more strictly controlling the number of car parking spaces and imposing higher parking charges.

In the long-term, improvement of public transport is clearly the most effective way to meet increased travel demand and bring about safe and environmentally-friendly mobility pattern. To promote public transport, the quality of the service needs to be improved first to make it more attractive to motorcycle users. In the future, mass rapid transit such as rail-based mass rapid transit and bus rapid transit will be introduced in order to increase the share of public transport. The public transport system, including route alignments and stations, should be designed to enhance the accessibility to urban services. It is also important to note that the share of the new public transport systems in HCMC is expected to be still lower than in developed cities. One of the main reasons may be that the people simply don't know much about the new systems and therefore they obviously don't prefer them. Therefore, it is also important to raise public awareness for improved public transport services.

Walking and cycling are very important to support public transport and help to decrease the use of individual motorised transport modes. However, these non-motorized modes currently play a very small role. The survey results have shown that there would be a decreasing trend of non-motorized transportation use in the future. This negative trend should be reversed by providing more comfortable and safer spaces and conditions for walking and cycling.

For the specific case study in HCMC, area-based traffic management measures are recommended based on the survey results. These measures may include (1) public transport measures, (2) non-motorised transport measures, (3) individual motorised vehicle measures and (4) multimodal and intermodal transport measures (Khuat, 2006).

In Area 1, policies should focus on prioritizing motorcycle traffic against private car traffic and on improving public transport. Car ownership and use should be controlled by higher ownership tax and parking charge. To make the centre of this area more attractive to tourists, non-motorised transport zones should be established.

In Area 2, traffic management measures should focus on controlling the use of private modes from this area to the city centre. There should be tolling gates on roads leading to the city centre to reduce individual trips by car going to the city centre. This measure helps decrease the contribution of vehicles in Area 2 to the congested situation in the centre. As an alternative, appropriate public transport should be organized and scheduled effectively.

In Area 3, developing public transport as the main mode of transport is necessary. Main measures include public transport routing and scheduling improvement and information services. It is essential to organize feeder bus systems. Besides, incentives to use public transport should be given to the citizens living in this area. To support long term development of the city, land-use management in this area needs to be seriously considered in development projects for sustainable

urban and transport development scenarios. Transit oriented development is a promising model for this area.

In this study, since the survey was conducted on a small scale, some parts of the results may be biased towards a certain part of the population. This might influence the accuracy of the results. To capture the accessibility conditions for the whole city more accurately, it is necessary to conduct a large scale survey. Besides, some aspects of accessibility that are not sufficiently considered in this study should be taken into account comprehensively in the large scale survey.

This study has just investigated the existing accessibility conditions of the city. To make further recommendations and evaluate transport and land-use development scenarios, it seems to be essential to develop an integrated accessibility index. Besides, changes in land-use patterns and its impacts on accessibility should be also investigated. These tasks are future work.

## References


[1] Black, J. and Conroy, M. (1977). Accessibility measures and the social evaluation of urban structure. Environment and Planning A9, 1013-1031.

[2] Bertolini, L. and Dijst, M.J. (2000). Mobiliteitsmilieus, Ankers voor het vluchtende stedelijke leven. In L. Boelens (red.), Nederland Netwerkenland. Rotterdam: Nai publishers

[3] Bertolini, L. (2004). Fostering urbanity in a mobile society: an exploration of issues andconcepts. Grenoble: Paper presented at AESOP 2004.

[4] Barter, R.P. (1999). An international Comparative Perspective on Urban Transport and Urban Form in Pacific Asia: The Challenge of Rapid Motorization in Dense Cities. Doctoral Thesis. Murdoch University.

[5] Du, P.T. (2011). HCMC City Profile. HCMC Low Emission City Project. HCMC Institute for Development Studies and Clean Air Initiative for Asian Cities Centre.

[6] Du, P.T. (2012). Urban Form Characteristics in Relation with Increased Private Mode of Transport in HCMC. HCMC Institute for Development Studies.

[7] Geurs, K.T. and Ritsema van Eck, J.R. (2001). Accessibility measures: review and applications. Evaluation of accessibility impacts of land-use transport scenario's, and related social and economic impacts. RIVM - National Institute of Public Health and the Environment, Bilthoven, the Netherlands.

[8] Handy, S. and Niemeier, D.A. (1997). Measuring accessibility: an exploration of issues and alternatives. Environment and planning A, Vol. 29, pp. 1175-1194.

[9] Hansen, W. (1959). How accessibility shapes land-use. Journal of the American Institute of Planners 25, 73-76.

[10] Halden, D. (2002). Using accessibility measures to integrate land use and transport policy in Edinburgh and the Lothians. Transport Policy 9,Issue 4, 313–324.

[11] Khuat, V. H. (2006).Traffic Management in Motorcycle Dependent Cities.Doctoral Dissertation. Technische Universitaet Darmstadt.

[12] Hillman, M., Henderson and Whalley A. (1973) Personal Mobility and Transport Policy. Politicaland Economic Planning, London.

[13] Hillman, M., Henderson and Whalley A. (1976) Transport Realities and Planning Policy. Political and Economic Planning, London.

[14] HCMC Statistic Office (2011). HCMC Statistical Year Book.

[15] HCMC Institute for Development Studies (2011). HCMC Socio-economic Master Plan up to 2025.

[16] HCMC Department of Transport (2011). Annual report on transportation.

[17] Ingram, D. R. (1971). The concept of accessibility: a search for an operational form. Regional Studies 5, 101-107.

[18] Koenig, J. G. (1977). Indicators of urban accessibility: theory and application. Transportation 9, 145-172.

[19] Koica (2012). The feasibility study on Bus Rapid Transit system in HCMC, Vietnam. Final R

[20] Levinson, D. M. (1998). Accessibility and the journey to work. Journal of Transport Geography Vol. 6, No 1, pp. 11-21, 1998.

[21] Levinson, D. (1997). Job and housing tenure and the journey to work. Annuals of Regional Science 31, 451-471.

[22] Morris, J. M., Dumble, P. L. and Wigan, M. R. (1979). Accessibility indicators for transport planning. Transportation Research A 13 (4), 91-109.

[23] Oberg S. (1976). Methods of Describing Physical Access to Supply Points. Studies in Geography Series B. Human Geography No. 43, Department of Geography. The Royal University of Lund, Sweden.

[24] Pham, T.H.H., Bosch, F.V.D., Nguyen, N.Q., and Zuidgeest, M. (2011). Urban Form and Accessibility to Jobs – A Comparison of Hanoi and Randstad Metropolitan Areas.Environment and Urbanization ASIA, 2, 2 (2011): 265-285.

[25] Pirie, G. H. (1981). The possibility and potential of public policy on accessibility. Transportation Research A 15 (5), 377-381.

[26] Staatemeier, T. (2005). Accessibility: an interesting concept to address strategic planning issues in the Amsterdam region. Universiteit van Amsterdam,

Amsterdam Institute for Metropolitan and International Development Studies.

[27] Schepel, S. and Zuidgeest, M.H.P. (2009). Ideas that shape urban form: And how urban form shapes us. In C.P.T. Godefrooij and L. Sagaris (Eds), Cycling-Inclusive policy development: A handbook (pp. 32 – 46).

[28] Spiekermann, K. and Schumann, C. (2007). Update of selected potential accessibility indicators. In: ESPON 2006 Programme, Final Report, S. 1-29.

[29] Vietnamese Prime Minister (2006). HCMC Adjusted Construction Master Plan up to 2025.

[30] Wachs M. and Kumagai T. G. (1973). Physical accessibility as a social indicator. Social-Economic Planning Sci. 7.437-456.

[31] Wachs M. (1978). Report on Plenary Session, Workshop H: Behavioural Modelling, Accessibility, Mobility and Travel Need. Proc. 3rd Inter. Conf. Behavioural Travel Modelling, Tanunda, South Australia. Croom Helm, London.

[32] Wegener M., Eskelinnen H., Fürst F., Schürmann C. and Spiekermann K. (2002), Criteria for the Spatial Differentiation of the EU Territory: Geographical Position, Forschungen 102.2, Bundesamt für Bauwesen und Raumordnung, Bonn.